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

Report of the Tenth Session of the Scientific Committee

Victoria, Seychelles, 5-9 November 2007

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1. OPENING OF THE SESSION

1. The Tenth Meeting of the Scientific Committee (SC) was opened on 5 November 2007 in Victoria, Seychelles, by the Chairperson of the IOTC Mr. Rondolph Payet.

2. Dr. Francis Marsac (EC), the Chairperson of the Scientific Committee, gave an opening address (Appendix I) before welcoming the participants in (Appendix II).

2. ADOPTION OF THE AGENDA AND ARRANGEMENTS FOR THE SESSION

3. The Scientific Committee adopted the Agenda as presented in (Appendix III). The list of documents presented to the meeting is given in (Appendix IV).

3. ADMISSION OF OBSERVERS

4. Pursuant to Rule XIII.9 of the Rules of Procedure, the Scientific Committee acknowledged the presence of Observers from the FAO, SEAFDEC, CCAMLR (via the representative from the UK), Birdlife International, and invited experts from Taiwan,China.

4. PROGRESS REPORT FROM THE SECRETARIAT

5. The Executive Secretary described the Secretariat's recent activities and other relevant matters concerning the Commission.

6. The SC recalled its recommendation in 2007 for the Executive Secretary to convey to the Commission a plan to increase the resources of the Secretariat to an appropriate level over a period of no more than three years. The Executive Secretary informed the SC that given the reservations of the Commission to entertain any increases in the budget, the presentation of such a plan in 2007 was not appropriate.

7. The SC insisted that in order for the Secretariat to be fully efficient and effective in meeting the scientific needs of the Commission's technical bodies it requires a considerable and immediate increase in resources and instructed the Executive Secretary and the Chair of the Scientific Committee to convey this message to the Commission in 2008.

8. The SC was informed about the current Performance Review Process being undertaken on the IOTC. This includes a review of the quality of scientific advice provided by the Scientific Committee and the process followed to this achievement, to the extent to which the Commission makes the best use of scientific recommendations to implement management measures relevant to the fish stocks and other living marine resources under its purview, as well as to the effects of fishing on the marine ecosystems.

9. The SC noted that the preparation of the information for this review is going to take a substantial amount of the Secretariat's time, and this reduces further its ability to provide scientific services to the Commission's technical bodies during this period.

5. DATA COLLECTION AND STATISTICS

5.1 STATUS OF THE IOTC DATABASES

10. The Secretariat presented IOTC-2007-SC-07 summarising the main activities carried out in relation to data acquisition and data processing since the last SC meeting, and the status of the databases at the IOTC Secretariat.

11. The SC noted with concern that the levels of reporting prior to the mandatory deadlines are still very low. The levels of reporting and a summary of the state of data submissions for 2006 are provided in (Appendix V). Low levels of reporting directly affect the reliability of the assessments conducted by the Working Parties. Late reports compromise the validation, verification and utility of data, especially when data are submitted close to or during Working Party meetings.

12. The Scientific Committee reiterated that only a considerable increase in resources will enable the IOTC Secretariat to continue to provide this essential support to the statistical systems of the countries in the region. The SC stressed that this need is now even more important as the support from the IOTC-OFCF Project has been substantially reduced.

13. The SC made the following recommendations that represent the highest priority areas for members. It is expected that if these recommendations are realised, they will result in a marked improvement in the standing of the data currently available at the secretariat and ultimately the provision of scientific advice to the Commission. The SC noted that 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.
- Countries having artisanal fisheries, notably Indonesia and Sri Lanka, improving their collection and reporting of species and gear information.
- Maldives, Iran and Pakistan providing catch and effort data for their artisanal fisheries, notably gillnets, pole and lines and handlines.
- Fisheries data collection agencies in each country, notably those in India and Sri Lanka, collaborating to produce one consistent set of catch statistics.
- Members 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:

- The Republic of Korea improving the consistency of its catch and effort statistics.
- Members reporting on the activities of vessels presumed to be from non-reporting fleets.
- Members reporting on total discards of IOTC species.
- Members reporting on IOTC species taken as bycatch.
- Members ensuring that logbook coverage is appropriate to produce acceptable levels of precision in their catch and effort statistics.
- Members implementing or increasing coverage of existing Vessel Monitoring Systems in order to be able to validate data collected through logbooks.
- Members increasing observer coverage to produce acceptable levels of precision in their estimates of retained catches and discards.
- Indonesia and Taiwan,China collecting and reporting catch and effort data for their fresh tuna longliner fleets.
- India collecting and reporting catch and effort data for its longline fleet.
- Iran reporting catch and effort data for its industrial purse seine fleet.

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

- Members collecting and reporting size data for artisanal fisheries for yellowfin tuna taken by gillnet, handline and troll fisheries; in particular Pakistan, Comoros, Indonesia and Yemen (a non-member).
- India reporting their existing size data.
- Obtaining size frequency data from Thailand and Iran industrial purse seine fleets
- Taiwan,China collecting and providing size data from their fresh tuna longliners.
- China, Philippines and Seychelles providing size data from their longline fleets.
- Japan increasing size sampling coverage from its longline fleet.
- Members reviewing their existing sampling schemes to ascertain that the data collected are representative of their fisheries.

4. To estimate the levels of catches of non-IOTC species by:

- Members implementing appropriate sampling programmes to collect data on the catches of sharks, sea-birds, sea-turtles and sea-mammals in the first instance.

5. Reduce uncertainty in the following biological parameters important for the assessment of stock status of IOTC species by:

- Conversion relationships: Members submitting to the Secretariat the basic data that would be used to establish length-age keys, length-weight keys, processed weight-live weight keys focusing on the major tuna species, swordfish and neritic tunas and sharks.
- Sex ratio: Members undertaking research on the sex ratios of billfish species.
- Members collecting biological information on all the significant species caught in their fisheries, preferably through observer programmes, and providing this information (including the raw data) to the Secretariat.

14. Whilst the countries mentioned above are those that contribute most to uncertainty in data the SC stressed the need for other countries having uncertain statistics (referred to in the report) to implement the same recommendations.

15. The SC noted that the catches attributed to the artisanal fisheries in the Indian Ocean make up over 60% of the total catches of IOTC species and this is a unique situation compared to other oceans. Furthermore, the statistics on artisanal fisheries available to the Secretariat are incomplete and generally of a poor quality. Unlike other stocks where direct estimates of biomass are possible, the SC recalled that assessment of tuna is only based on catch and effort statistics and size data. Due to their size in the Indian Ocean, the data on artisanal fisheries are important for the tuna stock assessment and the SC stressed the need for countries having artisanal fisheries to improve data collection, processing and submission.

16. The SC noted that many Indian Ocean coastal countries (several of which are not members of the Commission) have limited statistical systems and lack the ability to provide the fine-scale statistical data required by the IOTC Working Parties for their stock assessments. Given that these artisanal fisheries are always very difficult to sample, and that maintaining and upgrading the current sampling schemes are costly, most of the countries in the region need strong technical support from IOTC and financial assistance in the areas of data collection and data processing (and this often includes personnel training). In particular, the Scientific Committee noted the negative consequences that the poor quality data has on the assessments of skipjack and yellowfin. The unknown fraction of juvenile bigeye taken by artisanal gears is potentially another area of concern that is likely to impact the quality of the assessment of bigeye stock.

17. The SC stressed the importance of the Secretariat to have a greater role in providing support for these countries to produce statistics as requested by the Commission. However, the SC acknowledged that the Secretariat will not be able to increase its support within its current resources.

18. The SC noted with concern the lack of catch effort and size data from an increasing number of gillnet vessels, including those from Iran, Sri Lanka and Pakistan, operating on the high seas in recent years.

19. The SC noted with concern that the amount of size frequency data for some long line fleets continues to decrease and this is adding uncertainty to the assessments of the major IOTC species. The SC recommended that the concerned countries take measures in order to improve the current situation and gradually return to an acceptable level of data coverage.

5.2 REVIEW OF DATA ON SPECIES

20. In addition to recommendations listed above, the SC endorsed the specific data recommendations made by the respective Tropical Tunas (IOTC-2007-WPTT-R) and Ecosystems and Bycatch (IOTC-2007-WPEB-R) Working Parties.

5.3 PROGRESS REPORT OF THE IOTC-OFCF PROJECT

Recent activities

21. The recent activities of the IOTC-OFCF[1] Project during 2007 were described in IOTC-2007-SC-08. Highlights included:

- Continued support for data processing for Tanzania including Zanzibar.
- In March 2007, budgets for the activities for Phase II of the IOTC-OFCF Project were finalized by the Japanese Government on an annual contract basis.
- Mr. Shunji Fujiwara, Project Coordinator resumed at IOTC Secretariat on 25 June 2007, as the OFCF expert.
- IOTC and OFCF held discussions on the details of the Phase II Implementation plan during the period of June 2006 –March 2008. Activities are to include: monitoring activities for the sampling programmes set up during Phase I, implementation of Yemen sampling programme for catch data and yellowfin size data, and improvement of Indonesian and Iranian tuna statistics.
- A trip to Indonesia was made in September 2007 to determine the status of the sampling programme to monitor fresh tuna longline vessels. Additional technical assistance in this area is being considered.
- A trip to Sri Lanka will be made in March 2008 to determine the status of the sampling programme implemented in Phase I. The sampling programmes implemented in Thailand and Maldives are being continued as part of the internal data collection schemes.
- The Project is now contacting relevant agencies in Yemen in order to initiate the proposed sampling programme for catch data and yellowfin size data. Similarly, the Project is also contacting relevant agencies in Iran to initiate work to assist improve Iranian tuna statistics.
- To date the manuscript of IOTC Field Manual has been drafted. Printing is planned in 2008 subject to the final compilation of the manual.
- The final compilation of the comprehensive report on the first phase of the IOTC-OFCF Project is re-scheduled to November 2007 and will be printed and distributed by March 2008.

22. The SC recommended that the sampling design to be implemented in Yemen by IOTC-OFCF be made in close conjunction with another EC-World Bank Project that is setting up a Fisheries Statistical system in this country, in order to complement the efforts and make the best use of resources of both projects.

23. Thailand indicated that the sampling of fresh tuna longliners initiated during Phase I of the IOTC-OFCF Project is now being pursued under internal budgets. However, it is likely the budgets allocated will not be enough to achieve the sampling goals and external funding will be required.

24. The SC acknowledged the IOTC-OFCF Project for its ongoing contribution to the improvement of the quality of data collected in several countries of the region.

6. PRESENTATION OF NATIONAL REPORTS

25. National Reports were presented by Australia (IOTC-2007-SC-INF13), China (IOTC-2007-SC-INF12), EU-France (IOTC-2007-SC-INF05), EU-Spain (IOTC-2007-SC-INF04), France Territories (IOTC-2007-SC-INF10), India (IOTC-2007-SC-INF19), Japan (IOTC-2007-SC-INF09), Kenya (IOTC-2007-SC-INF20), Korea (IOTC-2007-SC-INF07), Seychelles (IOTC-2007-SC-INF11), Sri Lanka (IOTC-2007-SC-INF18), Thailand (IOTC-2007-SC-INF15), United Kingdom (IOTC-2007-SC-INF06), and South Africa (IOTC-2007-SC-INF14). Abstracts of these reports are given in Appendix VI. From these reports the SC noted the following in particular:

26. The SC reiterated it concerns regarding the lack of reporting on the catches and effort and size frequency from the Indian artisanal fleets and the absence of information on the 78 longliners that are currently operating under the

[1] Indian Ocean Tuna Commission - Overseas Fishery Cooperation Foundation of Japan

flag of India. India indicated that efforts are being made to provide the fishing statistics for its artisanal and longline fleets.

27. The SC recommended that the Secretariat endeavour to find ways to improve the situation regarding the availability and quality of the fisheries data from India including having a greater role in providing support to produce statistics as requested by the Commission.

28. The SC also expressed their concerns about the lack of size frequency data from the Japanese longline fleet which catch a significant amount of tropical tunas and billfish. The SC further noted a complete absence of information on the catches of sharks from this major fleet. Japan informed the SC about a range of measures being employed to address these and other fisheries statistics matters, including the deployment of scientific observers on commercial long line vessels.

29. The SC noted with concern that sampling effort in Sri Lanka has decreased substantially following the conclusion of the IOTC-OFCF cooperation. Sri Lanka informed the SC this situation is not likely to improve in the short term; however, a new data collection system is under consideration with the support from the Icelandic International Development Agency (ICEIDA).

30. The SC noted the great uncertainty on the number of Sri Lankan longliners operating outside the EEZ of Sri Lanka. Sri Lanka informed the SC that a vessels registry is currently under preparation and that a better information on the trips undertaken outside the EEZ will be provided as soon as possible.

31. The SC acknowledged Thailand's request for assistance in reviewing and improving its data collection system for its industrial purse seine fleet. The SC recommended that the IOTC-OFCF project consider providing support on this matter.

32. The SC noted with concern the small number of national reports that were made available to the SC in 2007 (13 reports from an expected 30). The SC recalled that it is mandatory for all Contracting and Cooperating non-Contracting Parties (CPCs) to provide written national reports to the SC (following the guidelines set out by the SC – and available on the IOTC website) even when not attending the meeting. Furthermore, the SC requested the SC Chairperson to again present a report on the numbers and completeness of national reports to the Commission at its annual session.

7. STATUS OF TUNA AND TUNA-LIKE RESOURCES IN THE INDIAN OCEAN

7.1 REPORT OF THE WORKING PARTY ON TROPICAL TUNAS (WPTT) AND PRESENTATION OF EXECUTIVE SUMMARIES FOR BIGEYE, SKIPJACK AND YELLOWFIN TUNAS

33. The Ninth Meeting of the Working Party on Tropical Tunas (WPTT) took place in Seychelles, 16-20 July, 2007. The Chairman of the WPTT (Dr Iago Mosqueira) introduced the 2007 WPTT report (IOTC-2007-WPTT-R). The key objectives of the meeting were to undertake a major review of the stock status of yellowfin tuna.

34. The SC noted that the WPTT encountered difficulties in finalising the yellowfin tuna stock assessment and a group of scientist undertook a number of analyses, using the latest information available (including data from the tagging project) intersessionally in anticipation that more robust advice could be provided to the Scientific Committee. A report on the intersessional stock assessment of yellowfin tuna (IOTC-2007-WPTT-R-add1) was presented by the Chairperson of the WPPT.

35. The stock assessment conducted after incorporation of new information from tagging, especially a new but still provisional growth curve, led to discrepancies in the interpretation of the results. The SC noted that further work is necessary on the tagging data and that a reflection be made on the way they can be incorporated in the assessment models for the three species concerned by the RTTP-IO.

36. The SC recognised that, in general, the stock assessments of tuna should be conducted using the quarter as time interval instead of the year (as currently made) because of the seasonality of the fishery, movement of the fish and growth patterns. The SC recommends that such a time step be used for future analyses.

37. The SC recognised that revised stock estimates on yellowfin produced by the intersessionnal work lack robustness. However, the estimates of MSY are similar (around 300 000 t) and are in the order of magnitude of the long term levels of yellowfin catch recorded from 1993 to 2002 (average 325 000 t), i.e. before the episode of very high catches recorded from 2003 to 2006.

38. The SC noted that tag returns for skipjack have already provided valuable insights on this stock. For example, skipjack demonstrate a larger spatial diffusion than is known for other oceans. Furthermore, the preliminary growth from tag recoveries is consistent with the growth curve presented by the Maldives some years ago that shows that skipjack is exploited for four to five years. The new information on spatial distribution of movements as compared with the spatial extent of the fisheries is presented in the updated executive summary on skipjack tuna.

39. The SC also noted that the preliminary results from the tagging data support the hypothesis of a two stanza growth pattern for bigeye tuna. The data also show that bigeye is capable of rapid and wide ranging movements e.g. transversing the Indian Ocean. The new information on spatial distribution of movements as compared with the spatial extent of the purse seine fishery is presented in the updated executive summary on bigeye tuna.

40. The SC acknowledged that considerable work had been carried out by the WPTT intersessionally in 2007 and thanked all the scientists involved.

41. The SC reiterated the need for working parties to adhere to pre-meeting timetables to facilitate the conduct of analyses and assessments and submission of documents in a timely fashion before meetings. Notably, stock assessment documents and documents that will have a major impact on the existing knowledge of the stocks should be delivered at least two weeks prior to the meeting. Other documents should be delivered at the latest on day one of the meeting.

42. The SC noted that not all the work scheduled for the intersessional period was able to be completed in the time allocated and noted that this would not have occurred if the Secretariat had had the resources to be able to provide more assistance.

43. The SC noted with concern that the Secretariat continues to be over committed and is not able to provide the level of scientific support the working parties require. The SC believes that this problem can only be solved by the recruitment of additional scientific staff into the Secretariat. To meet working parties immediate needs, the SC recommended that the Secretariat hires a stock assessment expert to assist in the work planned for 2008.

44. The Scientific Committee endorsed the WPTT's research recommendations (reproduced as Appendix VII) and commended it for its work in 2007.

45. The SC welcomed Japan's offer to lead a small group of scientists to provide selectivity estimates for input into the stock assessments planned for 2008.

46. The SC reviewed the new assessment of yellowfin tuna developed by WPTT and adopted the revised Executive Summary (given in Appendix VIII).

47. The SC noted the first use of the RTTP-IO tagging data to estimate growth and fishing mortality rates for the industrial purse seine fleet. Although these were preliminary analyses, the SC recognised the potential of these data and the need for their inclusion in future assessments.

48. Seychelles presented the latest catch and effort information from the purse seine vessels based in the Seychelles for the period January to August 2007 (IOTC-2007-SC-INF16). The SC noted that the nominal catch rates of yellowfin have decreased from the extraordinarily high rates over the period 2003 to 2006 to the relatively low levels of the early 1980's although this fleet had modernised considerably.

49. In addition, the SC recommended that the priority matters for WPTT to address at its 2008 meeting should be:

- To undertake a revised stock assessment of yellowfin tuna.
- To undertake a revised stock assessment of bigeye tuna.
- To undertake a stock assessment of skipjack tuna.

50. The Executive Summaries for bigeye tuna and skipjack tuna were adopted (Appendix VIII), noting that they have been amended slightly to reflect the latest available catch data and preliminary tagging data, but the advice and recommendations remain unchanged.

51. Reflecting on the use of the tagging data in the 2007 yellowfin work, the SC acknowledged that these data will also have major influence on the understanding of growth, mortality, and migration and as a consequence the stock assessments for bigeye tuna and skipjack tuna.

7.2 OTHER SPECIES

7.2.1 EXECUTIVE SUMMARY ON THE STATUS OF ALBACORE TUNA

52. The Executive Summary for albacore tuna was adopted (Appendix VIII), noting that it has been amended slightly to reflect the latest available catch data, but the advice and recommendations remain unchanged.

7.2.2 EXECUTIVE SUMMARY ON THE STATUS OF SWORDFISH

53. The Executive Summary for swordfish was adopted (Appendix VIII), noting that it has been amended slightly to reflect the latest available catch data, but the advice and recommendations remain unchanged.

54. The SC was informed that the implementation of the large scale, multi-national research programme on swordfish (Indian Ocean: Structure and characteristics of the Swordfish stock, IOSSS) has been held up awaiting funding. The SC noted that the activities proposed in this programme will address many of the research needs set for this species by the IOTC Working Party on Billfish and reiterated its support for the project and hopes that work will commence in the near future.

7.2.3 EXECUTIVE SUMMARIES ON THE STATUS OF NERITIC TUNAS

55. The Executive Summaries for narrow-barred Spanish mackerel, kawakawa, bullet tuna, wahoo, longtail tuna, frigate tuna and Indo-Pacific king mackerel were adopted (Appendix VIII), noting that they have been amended slightly to reflect the latest available catch data, but the advice and remains unchanged.

56. The Secretariat informed the SC that as of 7 November no one other than the host Iranian scientists has indicated their intention to participate in the Working Party on Neritic Tunas meeting scheduled for 26-29 November, 2007 in Kish, Iran. The SC discussed this matter and concluded that this was mostly likely due to a lack of funding for most participants. Given the lack of representation, and in line with the Scientific Committees statements in 2006 (that there was a need for a minimum number of 15 participants from as many countries as possible for this meeting), the SC decided that the meeting should be cancelled for 2007 and possibly rescheduled for 2008.

57. The SC requested that the Caretaker chairperson of the WPN contact Iran immediately to convey the Committee’s thanks for the generous offer to host the meeting and apologise for any inconvenience the cancellation may have caused.

58. The SC also requested that the Chairperson of the WPN work with the Secretariat to reschedule this meeting in 2008.

7.3 MANAGEMENT ADVICE

59. The following paragraphs summarise the current management advice on the species that have been reviewed by the Scientific Committee. Note that only the status of yellowfin tuna has been revised since the last session so that the advice for other species has remained unchanged.

BIGEYE TUNA (*Thunnus obesus*)

The results of the stock assessments conducted in 2006 were broadly similar and, in general, were more optimistic than previous ones. The ASPM results indicate that the 2005 catch is close to the MSY. Furthermore, spawning stock biomass seems to be above the level that would produce MSY, and the fishing mortality in 2004 seems to below the MSY level. Current (2004) catches of juveniles bigeye by the surface fleets are also less detrimental in terms of yield-per-recruit that previous patterns.

However, the current outlook could revert to a more pessimistic one, if the exploitation pattern is to return to the pre-2003 levels, as expected. Changes in the fishery occurred in 2003 and 2004, but these were due to the exceptional catches of yellowfin, which seem to be the result of anomalous conditions. In 2005, the fishery is already showing a return to the previous pattern of exploitation, which is likely to increase the catches of bigeye tuna associated with floating objects.

If the level in catch in numbers of juvenile bigeye tuna by purse seiners fishing on floating objects returns to pre-2003 levels, this is likely to be detrimental to the stock, as fish of these sizes are below the optimum size for maximum yield-per-recruit.

The Scientific Committee also noted that juvenile bigeye tuna are caught in the FAD purse-seine fishery that targets primarily skipjack tuna. Some measures to reduce the catches of bigeye tuna in this fishery could be expected to result in a decrease in the catches of skipjack tuna.

In view of the most current assessment, the SC recommended that catches should not exceed the MSY and fishing effort should not increase further from the 2004 levels.

YELLOWFIN TUNA (*Thunnus albacares*)

Despite the major differences in outputs between the models presented in 2007, both in July and intersessionally, the estimates of MSY are similar. Acknowledging the uncertainties in the results, the models indicate that fishing levels have exceeded MSY in recent years.

In interpreting the high catches of yellowfin over the period from 2003 to 2006, the 2006 Scientific Committee noted that if the hypothesis of one or two high recruitments entering the adult stock is correct, the increased catches from these year classes are unlikely to be detrimental to the stock, but these catches would not be sustainable in the longer term unless supported by continued high recruitments. On the other hand, there could be serious consequences if the hypothesis that there was an increased catchability during this time is correct. In this case, the very large catches would represent a much higher fishing mortality and certainly would not be sustainable. Furthermore, they could lead to a sudden decline of the existing adult biomass of yellowfin tuna, potentially reducing the stock to below MSY levels.

The WPTT does not have any clear indication whether or not high recruitments did occur in the stock. On the other hand, direct observations confirm that the biological productivity in the Indian Ocean was enhanced in 2003-2004 and that a shallow thermocline prevailed in the West Indian Ocean over the period from 2001-2005. These factors could have led to higher concentration of tuna in the western part of the Indian Ocean. Therefore, the increased catchability hypothesis leading to a high fishing mortality is more likely.

Considering all the stock indicators and assessments presented this year, as well as the recent trends in fishing effort and total catches of yellowfin, the WPTT note that:

1) Recent yellowfin tuna catches are most likely above the MSY level - although there are still uncertainties on the exact level of this difference. Considering the precautionary principle, catch should be decreased to pre-2003 levels and fishing capacity should not exceed the current level.

2) The current fishing pressure on juvenile yellowfin by both purse seiners fishing on floating objects and some artisanal fisheries is likely to be detrimental to the stock if it continues, as fish of these sizes are well below the optimum size for maximum yield per recruit estimated in 2002.

3) Juvenile yellowfin tuna are caught in the purse-seine fishery that targets primarily skipjack tuna. Some measures to reduce the catches of juvenile yellowfin tuna in the FAD fishery will be accompanied by a decrease in the catches of skipjack tuna.

SKIPJACK TUNA (*Katsuwonus pelmis*)

The high productivity life history characteristics of skipjack tuna suggest this species is resilient and not prone to overfishing, and the stock status indicators indicate that there is no need for immediate concern about the status of skipjack tuna.

ALBACORE TUNA (*Thunnus alalunga*)

A stock assessment for Indian Ocean albacore was attempted in 2004 by the Working Party on Temperate Tunas. Results of the analyses conducted were considered unreliable, although one of the results suggested that current catch levels might not be sustainable. Other indicators, such as the average size in the catch and catch rates, have not shown declines in recent years.

Taking into account the absence of a reliable assessment of the status of albacore tuna and the need for a precautionary approach, the SC recommended that the Commission be very cautious in allowing increases in catch or fishing effort from the 2002 levels until the problems with the assessments have been resolved.

SWORDFISH (*Xiphias gladius*)

On the basis of the 2006 assessments and stock indicators the SC concluded that the level of catch in 2004 (about 32,000 t) is above the MSY and unlikely to be sustainable. Furthermore, while the assessments indicated that the stock (i.e. for the Indian Ocean overall) is probably not currently overfished, catch rate data from the southwest Indian Ocean suggest that overfishing of swordfish may be occurring in localised areas, in particular in the southwest Indian Ocean. Notwithstanding this, the reductions in catch rates have not been accompanied by reductions in average size of the fish in the catch, as has been the case in other oceans. The SC expressed concern regarding the very rapid increase in effort targeting swordfish in other areas of the Indian Ocean and the relatively large incidental catch of swordfish in fisheries targeting bigeye. These increases in effort exploiting swordfish have continued since 2000.

The fact that large, rapid increases in fishing effort followed by a reduction in catch rates have been seen in the southwest Indian Ocean indicates that this might also occur in other areas where fishing effort directed to swordfish is increasing rapidly.

The SC recommends that management measures focussed on controlling and/or reducing effort in the fishery targeting swordfish in the southwest Indian Ocean be implemented. Similar measures may be needed in the future if reductions in catch rates are detected in other areas of the Indian Ocean.

BULLET TUNA (*Auxis rochei*)

No quantitative stock assessment is currently available for bullet tuna in the Indian Ocean, therefore the stock status is uncertain. The SC notes the catches of bullet tuna are typically variable but relatively low compared to the other neritic species. The reasons for this are not clear: it may be problem related to reporting, or it may be a normal fluctuation in the fishery. Bullet tuna is a relatively productive species with high fecundity and rapid growth and this makes it relatively resilient and less prone to overfishing. Nevertheless, bullet tuna appears to be an important prey species for other pelagic species including the commercial tunas, therefore it should be reviewed at the first meeting of the IOTC Working Party on NeriticTunas.

FRIGATE TUNA (*Auxis thazard*)

No quantitative stock assessment is currently available for the frigate tuna in the Indian Ocean, therefore the stock status is uncertain. This species is a relatively productive species with high fecundity and rapid growth and this makes it relatively resilient and not prone to overfishing. Nevertheless, frigate tuna appears to be an important prey species for other pelagic species including the commercial tunas, therefore it should be reviewed at the first meeting of the IOTC Working Party on Neritic Tunas.

INDO-PACIFIC KING MACKEREL (*Scomberomorus guttatus*)

No quantitative stock assessment is currently available for the Indo-Pacific king mackerel in the Indian Ocean, therefore the stock status is uncertain. This species is a relatively productive species with high fecundity and rapid growth and this makes it relatively resilient and not prone to overfishing. The SC recommends Indo-Pacific king mackerel be reviewed at the first meeting of the IOTC Working Party on Neritic Tunas.

KAWAKAWA (*Euthynnis affinis*)

No quantitative stock assessment is currently available for kawakawa in the Indian Ocean, therefore the stock status is uncertain. The SC notes the decline in the catches since 2002. However, the reasons for this are not clear: it may be problem related to reporting, or it may be a normal fluctuation in the fishery — a similar decline occurred in the early 1990's. Nevertheless, the SC recommends that this species be reviewed at the first meeting of the IOTC Working Party on Neritic Tunas.

LONGTAIL TUNA (*Thunnus tonggol*)

No quantitative stock assessment is currently available for longtail tuna in the Indian Ocean, therefore the stock status is uncertain. The SC notes the decline in the catches since 2000. However, the reasons for this are not clear: it may be problem related to reporting, or it may be a normal fluctuation in the fishery — similar declines occurred in the mid 1980's, early 1990's and mid 1990's. Nevertheless, the SC recommended that this species be reviewed at the first meeting of the IOTC Working Party on Neritic Tunas.

NARROW-BARRED SPANISH MACKEREL (*Scomberomorus commerson*)

No quantitative stock assessment is currently available for narrow-barred Spanish mackerel tuna in the Indian Ocean, therefore the stock status is uncertain. The SC notes that Spanish mackerel is a relatively productive species with high fecundity and this makes it relatively resilient and less prone to overfishing; however, it recommends that this important species be reviewed at the first meeting of the IOTC Working Party on Neritic Tunas.

WAHOO (*Acanthocybium solandri*)

No quantitative stock assessment is currently available for wahoo in the Indian Ocean, therefore the stock status is uncertain. However, wahoo is a relatively productive species with high fecundity and rapid growth and these attributes make it relatively resilient and not prone to overfishing. The SC recommends that this species be reviewed at the first meeting of the IOTC Working Party on Neritic Tunas.

SOUTHERN BLUEFIN TUNA (*Thunnus maccoyii*)

The SC noted the contents of a report on the biology, stock status and management of southern bluefin tuna (IOTC-2006-SC-INF02) and thanked CCSBT for providing it.

8. STATUS OF SPECIES TAKEN AS BYCATCH IN INDIAN OCEAN FISHERIES

8.1 REPORT OF THE WORKING PARTY ON ECOSYSTEMS AND BYCATCH (WPEB)

60. The Third Meeting of the Working Party on Ecosystems and Bycatch (WPEB) took place in Seychelles on 11 to 13 July 2007. The WPEB chairperson (Mr. Kevin McLoughlin) introduced the 2007 WPEB report (IOTC-2007-WPEB-R).

61. The SC congratulated the WPEB for the progress it achieved during the year and endorsed the recommendations and workplan of the WPEB (reproduced in Appendix IX).

Sharks

62. Of special note, the SC endorsed the following technical recommendations relating to IOTC Resolution 05/05 *Concerning the conservation of sharks caught in association with fisheries managed by IOTC; including*

- that the range of data expected for tuna and tuna-like species also be requested for sharks in accordance with the procedures and standards described in IOTC Resolution 01/05 *Mandatory statistical requirements for IOTC members*.
- that the expectation of comprehensive assessments of sharks be more clearly signalled as a long-term goal and that other indicators of the status of sharks be identified and monitored until such time that a comprehensive assessment is possible.
- it was recognised that the only way to guarantee that sharks are not finned (and full utilisation of sharks is encouraged) is to require that the trunks be landed with the fins attached.
- that clarity with respect to the 5% ‘general’ target be improved in terms of the weights being referred to (e.g. dressed or live weight), the fins included in the ratio, and the cutting techniques.

63. The SC noted that the retention of fins with trunks may not be practicable.

64. The SC also noted that many of these matters are being addressed by other tuna RFMOs and recommended that the WPEB use all available information in their future work on sharks.

65. The SC recommended that the WPEB further develop its assessment of the vulnerability of Indian Ocean sharks; noting that, given its level of exploitation, the blue shark should be the first species examined.

Seabirds

66. Of special note, the SC endorsed the following matters relating to best practice seabird mitigation measures and standards, including:

- Technical recommendations relating to IOTC Resolution 06/04 *On reducing incidental bycatch of seabirds in longline fisheries* for endorsement.

- The ACAP seabird mitigation measures and standards for all longline vessels operating in the IOTC Area south of 30S (including those vessels using the American longline system). In particular, this includes requiring fishers to select two measures, to be used in combination, from the range of seabird mitigation technical measures proposed by ACAP as indicated in Table 3 of the 2007 WPEB report.

67. The SC was informed that such measures have eliminated bycatch of albatross by long liners operating in 2006 and 2007 within the CCAMLR Area. The SC supported a request from CCAMLR to establish an ongoing exchange of information on issues related to seabirds and recommended that CCAMLR be considered by the WPEB for consideration in their recommendations to the SC.

Sea turtles and sea mammals

68. The SC recommended that the WPEB determine the sources and estimate levels of sea turtle and mammal mortality due to various fishing methods, including longline, gillnets and purse seine.

Other matters

69. Recognising that accurate data on bycatch can only be obtained through observer programmes, the SC strongly encouraged further collaboration among existing observer programmes. The SC also strongly recommended the expansion of existing programmes and implementation of new observer programmes for the Indian Ocean, noting that the Secretariat should play an important role in coordinating these activities including standardization of sampling protocols.

70. Seychelles presented its newly released National Plan of Action – sharks to the SC (IOTC-2007-SC-INF17). The SC congratulated Seychelles on this comprehensive and ambitious plan and called on other IOTC members that have not yet implemented their plans to do so as soon as possible.

Ecosystem considerations

71. Work plans of two research projects focusing on biodiversity and ecological impacts of fishing, that are going to be implemented in the Indian Ocean in 2008, were presented by France-UE to the SC. MADE (a European-funded project) aims at developing measures to mitigate the adverse impact of fisheries targeting large pelagic fish in the high seas. Sharks are the major scope of the project, but focus will be made also on sea turtles and more generally, on the effect of FAD fishing on the pelagic ecosystem. BIOPS (a French-funded project) aims at characterizing and developing measures to survey the marine pelagic biodiversity. A retrospective analysis of biodiversity indices over the last 35 years from a newly set up database of historical surveys, will be undertaken to understand possible climate and/or fishing effects on the pelagic biodiversity. Both projects are involving research teams from Europe and developing countries of the region.

72. The SC recognised the great interest of these new projects as they encompass some of the major issues raised by the WPEB. The SC was informed that in general there is less oceanographic and environmental data available for the Indian Ocean compared to the other major oceans and this limits the nature and extent of analyses that can be undertaken. The SC strongly encouraged IOTC members to inform the IOTC Secretariat about any relevant historical oceanographic and environmental data sets they may hold for use by the WPEB.

73. The SC also recommended that oceanographic and environmental data be routinely collected by observers and requested that the WPEB determine what type of data should be collected.

74. SC also recommended that scientists work jointly with other regional fisheries bodies in making the best use of oceanographic, biogeochemical and ecosystem models developed in the scientific community.

75. The SC reiterated its encouragement for close collaboration with current and future global initiatives (e.g. the GLOBEC-CLIOTOP Programme) to take advantage of existing knowledge. The SC noted that the first conference of the GLOBEC-CLIOTOP programme will be held on 4-7 December 2007 in La Paz, Mexico; and that details of a project on climate change and its impact on fisheries are available on www.globec.org.

9. PREDATION WORKSHOP

76. The SC was informed about the workshop on *Predation in the tuna longline fisheries in the Indian Ocean* held in July 2007 in Seychelles (IOTC-2007-SC-INF01). The SC congratulated Japan for leading this initiative and for bringing many experts from all over the world together to discuss this topic. The SC endorsed the recommendations arising from the workshop; in particular:

- to continue research on predation mitigation measures;
- to estimate mortality rates and overall catch losses with a view to deriving estimates of the levels of predation of IOTC tuna species so they can be added to the catch series for the species concerned;
- to promote the collection of predation data by existing and future observer programmes;
- to incorporate predation information in ecosystem models to better understand the interactions between marine mammals, sharks and IOTC fisheries.

10. INDIAN OCEAN TUNA TAGGING PROGRAMME

10.1 ACTIVITIES RELATED TO THE REGIONAL TUNA TAGGING PROJECT (RTTP-IO)

77. The Chief coordinator of the EU-funded RTTP-IO provided the SC with an update on the main activities carried out since the implementation of the IOTTP (IOTC-2007-SC-21).

78. The tagging activities undertaken onboard the two vessels chartered for the RTTP-IO, the *Aita Fraxku* and the *Kermantxo*, were completed in early September 2007 and concluded by a debriefing workshop held in Seychelles. In total over 168,000 fish were tagged and released in the western Indian Ocean, in the area from the Mozambique Channel to the coast of Oman. This represented more than twice the minimum number initially proposed for the project (80,000) and higher than expected numbers of yellowfin tuna and bigeye (which is the main target species of the programme) were recaptured. The RTTP-IO started its activities in May 2005 and tagged 54,652 yellowfin (32.5 %), 78,318 skipjack (46.6 %) and 34,540 bigeye (20.5 %). To-date 18,273 tunas have been recovered from more than 20 countries, mostly in Seychelles but also in canneries or by artisanal fishermen in Mauritius, Madagascar, Comoros, Tanzania, Thailand, Yemen, Oman, South Africa, Spain, Colombia. A few recoveries have been also reported onboard Japanese, Korean and Seychellois longliners. The tag recovery scheme is now implemented in most of the participating Indian Ocean countries and in some of the distant water fishing fleets.

79. The SC congratulated the RTTP-IO and IOTC Secretariat for the successful implementation of the tagging programme to-date. It is likely that such a success will reinforce the motivation in starting new tagging programmes in the other oceans. The RTTP-IO is considered highly successful with respect to the large number of fish tagged, the fact that the three tuna species have been efficiently tagged, the high recovery rate (11%) that is expected to increase, the evidence of a good mixing in the exploited population and the exceptionally high proportion of fish recovered after a long time at liberty. The SC acknowledged that it was fortuitous having access to a major purse seine landing site which greatly contributed to the high recovery rates of tags and facilitated the execution of the essential tag seeding experiments. The SC noted the fast dispersion of the tagged fish and the large distance covered by the three species compared to other oceans

80. The SC paid special mention to the tremendous participation of the skippers and crews of the purse seiners operating in the Indian Ocean. Their positive response and participation in the tag seeding and recovery activities far exceeds those experienced in tagging projects in other oceans.

81. The SC noted that the data will provide information on growth, mortality, migration, exploitation rates and interactions between the fisheries. The SC noted that even at a preliminary stage, the tag recoveries have still brought considerable information in the present knowledge on biology and movements of the three species concerned by the RTTP-IO. Therefore, the SC encouraged the working parties to make full use of this information in future assessments. The SC reminded members, however, that before these data become publically available, the processes of validation and documentation are to be completed.

82. The SC noted that the RTTP-IO will hold technical workshops with countries in the region to provide insight and understanding on the uses of the data collected under the programme.

83. The SC thanked the institutions in the many countries involved with the programme for their assistance in publicising the RTTP, disseminating materials and informing the fishers about the programme.

84. The SC recalled the existence of the RTTP website (www.rttp-io.org) that disseminates results and other information relating to the programme.

85. The SC noted that the recovery rates of tags from longline fisheries remain very low as the return of tags appears not to be a priority for longline skippers. Furthermore, the estimation of exploitation rate, migration rate and interactions between fisheries will not be possible from tags recovered from the longline fisheries unless longline reporting rates are estimated from tag seeding experiments – which are problematic to implement.

Notwithstanding these matters, the SC noted that valuable information on stock structure and growth could be expected from longline recoveries.

86. The SC recalled that the lack of tag returns from the longline fisheries would ruin the efforts undertaken by the RTTP-IO to tag juvenile bigeye tuna that is present in significantly great proportion (20.5%) among the batch of tagged fish. Therefore, the SC recommended that all efforts be made by the members having longliners fleet to recover the tags and associated data (species, date, position and size of fish) from longline fisheries, as valuable information on stock structure, fisheries interaction and growth could be expected from those recoveries.

87. Since 2004, the IOTC Secretariat has developed and implemented a tag seeding experiment onboard the European purse-seine fleet based in Seychelles. This experiment is necessary to estimate tag reporting rate for the fleet with the best level of precision and to validate data associated to the recoveries. So far, 1935 tags have been seeded by observers or skippers onboard this fleet and the tag reporting rate have been increasing since 2004 from 45% to 92% today. Further analysis and modelling will be undertaken on this data in order to estimate more precise reporting rates for this fishery. In addition, the shedding rate calculated with the recovery of double tagged fish is 6.4%, which appears to be consistent with other large scale tuna tagging projects.

88. The SC recognised that tag seeding experiments are essential to estimate the reporting rate which is used by scientist to correct the recovery data and assess the recapture rate. The SC stressed the importance of such an operation and explained that tagging data cannot be used to determine exploitation rate if the reporting rate is unknown, which is the case for the longline and artisanal fisheries.

89. Acknowledging the huge potential of tagging data resulting from the RTTP-IO in revising current knowledge on biology and movement patterns of yellowfin, skipjack and bigeye, and in the assessment of these stocks, the SC recommended that a new Working Party dedicated to the analysis of tagging data (WPTDA) be created to undertake the appropriate processing of tagging data and prepare their incorporation into integrated stock assessment. The terms of reference of the WPTDA are presented in Appendix XI for examination by the Commission during its next session and the 2008 work plan for the working party is described in Appendix X.

10.2 Activities related to small-scale programmes

90. The IOTC Secretariat informed the SC about the progress of the Small-scale Tuna Tagging Project. The SC noted that the Western Sumatra Tuna Tagging Project in the Eastern Indian Ocean, funded by the Government of Japan, is now terminated with mitigated results due to several natural disasters occurring during the organization and implementation of the project (tsunami, abnormal oceanographic conditions, earthquakes) and to the small bait carrying capacity of the vessel chartered for the project, which was not adequate for the west Sumatra situation. The Secretariat with its partners, RCCF and CSIRO are now studying the way to continue this activity with better result. The SC was informed that a small-scale project is now in preparation in the Indian Andaman islands. This project should start early 2008 for a period of 2 months of tagging activities. Finally the SC was informed that a new project in Maldives just started, with also mitigated results due to the bad fishing season in Maldives area and unexpected weather situation. More tagging cruises are planned for early 2008.

91. The SC recommended that small scale tuna tagging be continued to the extent possible and for the Secretariat to start investigating new source of funding to support these activities.

92. The Secretariat also presented to the SC the outcomes of a workshop organized on tagging data analysis by the InterAmerican Tropical Tuna Commission in San Diego. This workshop provided expert guidance on the ways to deal with the tagging data and their use in integrated stock assessments.

11. Mandatory fisheries statistics

93. At its 11th Session, the Commission requested that the Scientific Committee examine the recent proposal on mandatory statistical requirements for IOTC Members (IOTC-2007-S11-PropE-rev1) and provide advice on which data are required for scientific purposes. The SC examined the document and made the following technical-based recommendations for the Commissions deliberations.

94. The interest of having catch and effort statistics by 1° or 5° area was extensively discussed by the SC. The SC recognised that statistics by 1° were difficult to obtain for long line fleets operating on the high seas due the length of the main lines (a set may cover up to two adjacent one degree squares). Nevertheless, the SC noted that despite this difficulty, the scientists of countries of the fleets concerned are regularly handling 1° square statistics (as for the purse seiners).

95. When 5°statistics are not appropriate for an analysis, the SC considered that it is desirable to use detailed 1° data for all fleets, purse seine, longline and others. For example, when the fine scale areas enable scientists to define fishing areas that are more consistent with spatial environmental heterogeneity then this enables the calculation of more representative CPUEs that account for the fine scale dynamics of the fleets. This in turn would lead to improved estimates of the biomass of the stocks.

Paragraph 3 (a)

Surface fisheries should be explicitly identified as surface fisheries operating on the high seas and industrial surface fisheries. Thus, the first sentence should read:

For surface fisheries operating on the high seas and all industrial surface fisheries.

Paragraph 3 (b)

The SC agreed that the provision of catch data according to numbers and weight is desirable; however either numbers or weight was acceptable. Thus, paragraph 3b should read:

Longline fisheries: catch by species, in numbers or weight, and effort as the number of hooks deployed shall be provided by 5° grid area and month strata. Documents describing the extrapolation procedures (including raising factors corresponding to the logbook coverage) shall also be submitted routinely.

The SC agreed that for the work of the working parties under the IOTC Scientific Committee, longline data should be of a resolution of 1° grid area and month strata or finer. Thus a new paragraph should be inserted into paragraph 3b, Thus:

For the work of relevant working parties under the IOTC Scientific Committee, scientists agree that longline data should be of a resolution of 1° grid area and month strata or finer. When provided, this data would be for the exclusive use by IOTC scientists, subject to the approval of the data owners and IOTC Resolution 98/02 *Data confidentiality policy and procedures* (Resolution 98/02), and should be provided in a timely fashion.

Paragraph 3 (c)

The reference to artisanal, small scale and sport fisheries can be better described as 'coastal fisheries'. Thus the first sentence should read: For coastal fisheries.

Paragraph 5. Opening sentence.

Improve the clarity of the opening sentence

Existing text

Data from fishing for tunas in association with floating objects including Fish Aggregating Devices (FADs)

Suggested revision [using a paragraph from the preamble…]

Given that the activities of supply vessels and the use of Fish Aggregating Devices (FAD) are an integral part of the fishing effort exerted by the purse seine fleet, the following data shall be provided:

Paragraph 5 (b)

The current text does not specify precisely what information is required and by whom.

Existing text

Levels of activity of supply vessels: including number of days at sea by 1° grid area and month.

Suggested revision

Number of days at sea by supply vessels by 1° grid area and month to be reported by the flag state of the supply vessel.

Paragraph 5 (c)

Aggregation of the data by quarter is considered to be adequate

Existing text

The total number and type of FADs set by the fleet per month.

Suggested revision

The total number and type of FADs set by the supply vessel and purse seine fleet per quarter. Types of FADs are defined as 1) drifting log or debris, 2) drifting raft or fad with a net, 3) drifting raft or fad without a net, 4) other (e.g. Payao, dead animal etc). All types monitored by a tracking system.

Paragraph 6 (c) to be added

In any particular year that the fisheries data is not finalised, members typically revise their data over a period of time. Thus a new paragraph, 6c, is proposed:

Suggested revision

In case where the final statistics cannot be submitted by that date, at least preliminary statistics should be provided. Beyond a delay of two years, all revisions of historical data should be formally reported and duly justified. These reports should be made on forms provided by the Secretariat and reviewed by the SC. The SC will advise the Secretariat if revisions are then accepted for scientific use.

12. STANDARDISATION OF A LOGBOOK FOR LONG LINERS OPERATING IN THE IOTC AREA

96. In 2007, the Commission adopted Resolution 07/03 *Concerning the recording of catch by fishing vessels in the IOTC Area*. which outlined the minimum data requirements for logbook information concerning industrial purse seine fleets. Following this, the Commission requested the SC determine the minimum data requirements for a logbook covering the longline fleets.

97. The SC created a small task force to work on this matter in order to harmonise the various forms currently used by the fleets. The SC agreed on the proposed minimum data requirements for all long line fleets and produced a logbook template form for illustrative purposes (Appendix XII).

98. This template is a guideline to provide a standard including most of the common items, therefore some modification to the template would be needed when applying to each fishery.

13. MINIMUM INFORMATION REQUIREMENTS FOR IOTC STOCK ASSESSMENTS

99. At its 11th Session, the IOTC agreed to a performance review process that will include a review of the quality and provision of stock assessment advice to the Commission.

100. In response to this the WPTT Chair developed a draft set of guidelines to identify what type and detail of stock assessment information should be provided to working parties in order for them to be able to provide defendable and robust technical advice to the Scientific Committee.

101. The SC thanked the WPTT Chair for his comprehensive document and adopted the guidelines in (Appendix XIII) for use by all IOTC working parties undertaking stock assessments in the future.

14. SCHEDULE OF WORKING PARTY MEETINGS IN 2008

102. The SC agreed to the following schedule of working party meetings for 2008.

Working Party	Date and place	Major topics
Tropical Tunas	23 -31 October, 2008, Bangkok, Thailand (7 days)	• Stock assessment for yellowfin tuna • Stock assessment for skipjack tuna • Stock assessment for bigeye tuna
Temperate Tunas	Possibly 2009	-
Neritic tunas	To be advised	-
Billfish	To be advised, once a chairperson has been elected.	• Stock assessment for swordfish • Review stock indicators for marlins and sailfish
Methods	1 November 2008 Bangkok, Thailand (1 day)	• Review and discuss stock assessment methods; use of tag recapture data in assessments; development of Management Strategy Evaluation tools
Ecosystems and Bycatch	20-22 October 2008, Bangkok, Thailand (3 days)	• review data available to Secretariat • review availability of observer information • access information available on sharks, seabirds, sea turtles and sea mammals • consideration of ecosystem approaches
Tagging	30 June to 4 July 2008, Seychelles (5 days)	• Preparation and use of tagging data according to work plan in (Appendix X)

103. The SC reiterated the need for a minimum number of 15 participants from as many countries as possible at the first meeting of the Working Party on Neritic Tunas, and requested that the caretaker Chairman of the WPN to find ways to boost participation and confirm the location and time for the meeting as soon as possible.

104. The SC noted the proposed schedule of working party meetings and meetings of other Commission bodies in 2008 constituted a considerable amount of work for the Secretariat and given the Secretariats current resources agreed that some changes in the proposed schedule of working group meeting may have to be made.

15. OTHER MATTERS

15.1 REPORT ON THE SECOND SESSION OF THE SWIOFC SCIENTIFIC COMMITTEE

105. The Secretariat informed the SC about the outcomes of the SWIOFC SC held in Mauritius in August 2008. The SC expressed its desire to develop a collaborative relationship with the SWIOFC SC, especially in the areas of

data collection and processing and research on IOTC species. In particular, the SC noted that the data collection activities being promoted by the SWIOFC SC presented an opportunity for several IOTC members to improve their data collection systems and ultimately increase the availability of data on IOTC species – especially those tunas caught by fisheries operating in coastal waters.

106. The SC reiterated its concerns that the levels of participation at working group meetings remains low. As a means to improve participation and the links with SWIOFC, the SC encouraged SWIOFC to consider supporting their members to attend IOTC meetings of relevance, and similarly encouraged IOTC members to attend SWIOFC meetings when possible.

15.2 Indian Ocean and Atlantic Ocean tuna atlas

107. The SC was informed that the French Government has agreed to support the publication of a two volume tuna atlas covering both the Indian and Atlantic Oceans fisheries. The atlas will be available on DVD, in a book and on the IRD website (where the atlas will be updated as appropriate). IRD is to lead the project with cooperation from the respective Secretariats of IOTC and ICCAT. The SC congratulated the EC for this initiative and looks forward to its publication in 2008.

15.3 FAO

108. FAO informed the SC about its recent activities of relevance to IOTC. The Report on the May 2006 Methodological Workshop on the Management of Tuna Fishing Capacity held in La Jolla, USA and the FAO document on tuna resources (a FAO Fisheries Technical Paper 483) will be published soon. FAO held a Workshop to Further Develop, Test and Apply a Method for the Estimation of Tuna Fishing Capacity from Stock Assessment-Related Information in May 2007. One of the recommendations of the workshop was that FAO transform the Technical Advisory Committee of its project on the management of tuna fishing capacity into the Technical Coordination Committee. The latter committee would consider and resolve the technical issues involved in the management of tuna fishing capacity; and coordinate the related research. The SC was also informed about the status of tuna catch data in FAO’s Fisheries Global Information System (FIGIS) and the outcome of the March 2007 Meeting of Committee on Fisheries (COFI).

15.4 Election of a chairperson of the Working Party on Tagging Data Analysis

109. The SC unanimously elected Dr. Alain Fonteneau (EC) as Chairperson for the newly formed Working Party on Tagging Data Analysis.

15.5 Election of a chairperson for Billfish

110. No nominations were received for this post and the SC requested that the Secretariat facilitate the election process intersessionally in order to find a Chairperson as soon as possible and organise a WPB meeting in 2008.

15.6 Time and place for the next session of the Scientific Committee

111. The Scientific Committee recommended that its Eleventh Session be held from 1 to 5 December 2008 in Seychelles and asked the Commission to consider holding its annual session not more than three months after this time in order to be able to receive the most up-to-date advice and implement management measures in a timely fashion.

16. Adoption of the Report

112. The Report of the Tenth Session of the Scientific Committee was adopted on Friday 9 November 2007.

APPENDIX I
INTRODUCTORY SPEECH OF THE CHAIRMAN OF THE SCIENTIFIC COMMITTEE

Good morning and welcome to this 10th session of the IOTC Scientific Committee.

This is my first participation as Chairman of the Scientific Committee and I would like to thank you once again for placing your trust in me last year by nominating me as head of this body. Believe me, I will spare no effort for this Committee to provide the most detailed advice to the Commission.

This is why we must have constructive discussions and integrate the most recent information available. This Committee doesn't merely rubber-stamp the recommendations of the Working Parties, it must be a place of scientific debate in order to formulate relevant management advice that will be presented to the Commission at its next session. Our Committee must focus exclusively on scientific considerations: indeed, many uncertainties remain on several subjects but acknowledging them and objectively taking them into account is part of the scientific approach. The recommendations and management advice on which we are going to work during this week must rely on tangible and explainable elements. When we have to make choices, they must be well-argued. As you know, during the joint meeting of the 5 RFMOs in Kobe in January 2007, it was decided that a Performance Review Process of each RFMO would be implemented in order to help them fulfil their mandate more efficiently. The Scientific Committee represents an essential link in our Commission and the quality of our work should have a substantial impact on the analysis undertaken by the Audit Committee. It is therefore necessary to pay special attention to the wording and the scientific argumentation of our advice.

Another element related to the performance of our organization concerns the delay between the most recent year used in the stock analyses and the year of implementation of the regulations adopted by the Commission. Let's take 2007 as an example: the assessments undertaken in July on yellowfin integrate data up to 2005; and it is not before May 2008 that the Commission will examine our Committee's recommendations, which measures would possibly be implemented in 2009. The gap between a given stock status and the effective management response is currently 4 years. In a context where the fishing power of fleets is fast developing and strategies and targets are changing, the current inertia of the process does not allow optimal management of resources. It is therefore indispensable to implement measures that will help incorporate into the assessments the most recent catch and effort statistics. We can also think about moving the date of the Working Parties and Scientific Committee forward so that the interval between the scientific advice and their consideration by the Commission is as short as possible. I would like these matters to be discussed during this session and to lead to concrete suggestions.

This year, only 2 statutory Working Parties were able to take place: the Third Session of the Working Party on Ecosystems and Bycatch from the 11th to the 13th of July and the Ninth Session of the Working Party on Tropical Tunas from the 16th to the 20th of July. Two more Working Parties were planned: one on Methods on the 14th of July, and one on Billfish in October, the latter one aiming at reviewing the indicators on marlins and sailfish. But they were cancelled in the long run. Consequently, we will have to think carefully about the programme that we will establish for 2008 so that we propose a realistic timetable and stick to it. Everyone knows that our work often suffers from an insufficient number of experts; we must think about what arrangements to make to remedy this situation, at the Secretariat's level and at the scientific organizations involved in the analyses' level.

This year was also marked by the 1st Seminar on Depredation in Indian Ocean Longline Fisheries (Predation in the tuna longline fisheries in the Indian Ocean), organized by the Japanese NRIFSF and the IOTC. This seminar was held on July 9th and 10th, before the Working Party on Ecosystems and Bycatch, to guarantee a maximum participation of experts on these matters. This seminar, the first one of this kind worldwide, allowed us to draw up an exhaustive assessment of the situation; the details of which will be presented later during the session.

Finally, I would like to congratulate the team that led the RTTP tagging programme and the IOTC Secretariat for its unfailing support of the programme. Indeed, for many reasons that will be detailed to us later, this programme is already a great success and it is recognized as such beyond the frontiers of the Indian Ocean. The operations at sea have just ended and we can expect a tremendous gain in knowledge that we will be able to exploit in future stock analyses.

We still have a lot of work to do but I think that some very positive and encouraging perspectives are ahead of us, so that the quality of our assessments can be improved. This is a goal for each one of us.

Thank you for your attention.

APPENDIX II
LIST OF PARTICIPANTS

AUSTRALIA/AUSTRALIE

Mr. Kevin McLoughlin
Senior Fisheries Scientist
Fisheries and Marine Sciences Programme - Bureau of Rural Sciences
Dept. of Agriculture, Fisheries and Forestry
G.P.O. Box 858
Canberra 2601
AUSTRALIA
Tel: +61- 02 6272 4015
Fax: +61-02 6272 4014
Email: kevin.mcloughlin@brs.gov.au

CHINA/CHINE

Prof Xu Liuxiong
Dean/Professor
College of Marine Science & Technology
Shanghai Fisheries University
334 Jun Gong Road
Shanghai 200090
CHINA
Tel: +0086-21-65710203
Fax: +0086-21-65710203
Email: lxxu@shfu.edu.cn

EUROPEAN COMMUNITY/COMMUNAUTÉ EUROPÉENNE

Dr. Alain Fonteneau
Scientist
IRD - Centre de Recherche Halieutique Méditerrannéenne et Tropicale
UR 109 THETIS
B.P. 271
Av. Jean Monnet
34203 Sète Cedex
FRANCE
Tel: +33 4 99 57 3255
Fax: +33 4 99 57 3295
Email:alain.fonteneau@ird.fr / fonteneau@ird.fr

Alicia Delgado de Molina
Scientist
Tunidos Dpt
Instituto Espaniol de Oceanografia
P.O.B 1373
S/C Tenerife 38080
SPAIN
Tel: +34 922549400
Fax: +34 922549554
Email: alicia.delgado@ca.ieo.es

Dr. Francis Marsac
Scientific Coordinator THETIS Research Group
IRD - Centre de Recherche Halieutique Méditerrannéenne et Tropicale
B.P. 171
Av Jean Monnet
34203 Sète Cedex
FRANCE
Tel: +33 499573226
Fax: +33 499573295
Email: marsac@ird.fr

M. Javier Ariz Telleria
Scientist
Instituto Espanol De Oceanographia
Department of Fisheries
B.P. 1373 Auda San Andrres
Santa Cruz Tranrrife 38080
SPAIN
Tel: +34922549400
Fax: +34922549554
Email: javier.ariz@ca.ieo.es

M. Renaud Pianet
Scientist
IRD US 007 OSIRIS
B.P. 570
Victoria
SEYCHELLES
Tel: +248 224742
Fax: +248 224742
Email:renaudpianet@ird.fr

Mr. Juan José Areso
Spanish Fisheries Representative
Oficina Espanola de Pesca (Spanish Fisheries Office)
P.O.Box 497
Fishing Port
Victoria
Mahe
SEYCHELLES
Tel: +248 324578
Fax: +248 324578
Email: jjareso@seychelles.net

Mr. Juan Pedro Monteagudo Gonzalez
SCIENTIFIC ADVISOR- ANABAC
Buques Atuneros Congeladores (ANABAC)
Txibitxiaga, 24 entreplanta
Bermeo 48370
Vizcaya
SPAIN
Tel: +34 94 688 2806
Fax: +34 94 688 0643
Email: monteagudog@yahoo.es

Dr Henri Grizel
Delegue Regional IFREMER
IFREMER, Délégation de la Réunion
B.P. 60
Rue Jean Bertho
Le Port Cedex 97822
LA REUNION
Tel: +262-262420340
Fax: +262-262433684
Email: Henri.Grizel@ifremer.fr

Dr Hilario Murua
Scientist
Azti –Tecnalia
Marine Research
Herrera Kaia, Portualde t1g
Pasaia 20110
SPAIN
Tel: +34943 004800 ext 821
Fax: +34943 004801
Email: hmurua@pas.azti.es

INDIA/INDE

Dr. Vishnu Shripatrao Somvanshi
Director General
Fishery Survey of India
Department of Animal Husbandry Dairing and Fisheries
Botawala Chambers
Sir P.M Road
Mumbai 400001
INDIA
Tel: +91 22 22617101
Fax: +91 22 22702270
Email: somvanshi@rediffmail.com

JAPAN/JAPON

Dr. Tsutomu (Tom) Nishida
Research Coordinator for Ocean and Resources
National Research Institute of Far Seas Fisheries
Fisheries Research Agency of Japan
5-7-1, Shimizu - Orido
Shizuoka 424-8633
JAPAN
Tel: +054336 6052
Fax: +0543366052
Email: tnishida@affrc.go.jp

Dr. Peter Makoto Miyake
Scientific Advisor
Japan Tuna Fisheries Co-operative Association
3-3-4 Shimorenjaku, Mitaka-Shi
Tokyo 181 0013
JAPAN
Tel: +81 422 46 3917
Fax: +81 422 43 7089
Email: miyake@sistelcom.com / p.mmiyake@gamma.ocn.ne.jp

Dr Hiroaki Okamoto
National Research Institute of Far Seas Fisheries
Fisheries Research Agency of Japan
5-7-1, Shimizu - Orido
Shizuoka 424-8633
JAPAN
Tel: +81 543 36-6043
Fax: +81 543 35 9642
Email: okamoto@fra.affrc.go.jp

KENYA

Stephen Ndegwa
Fisheries Officer
Fisheries Department
Ministry of Livestock & Fisheries Development
P.O.B 90423 Liwatoni
KENYA
Tel: +254 412315904
Fax: +254 412315904
Email: ndegwafish@yahoo.com

REPUBLICOF KOREA/REPUBLIQUE DE COREE

Mr. Soon-Song Kim
Distan WaterFisheries Resources Division
NationalFisheriesResearch& Development Institute
Fisheries Resources Department
408-1 Shirang-ri, Gijang-gun
Busan City 619-902
KOREA
Tel: +82 51 720 2321
Fax: +82 51 720 2337
Email: sskim@mfrdi.re.kr

SEYCHELLES

Mr. Riaz Aumeeruddy
Ag Director , Fisheries Research
And Development Division
Seychelles Fishing Authority
P.O. Box 449
Fishing Port
Victoria
Mahé
SEYCHELLES
Tel: 248 670300
Fax: 284 224508
Email: raumeeruddy@sfa.sc

Ms. Juliette Dorizo
Fisheries Statistician
Seychelles Fishing Authority
P.O. Box 449
Fishing Port
Victoria
Mahé
SEYCHELLES
Tel: +248 670327
Fax: +248 224508
Email: jdorizo@sfa.sc

Florian Giroux
Seychelles Fishing Authority
P.O. Box 449
Fishing Port
Victoria
Mahé
SEYCHELLES
Tel: 248 670331
Fax: +248 224508
Email: fgiroux@sfa.sc

Mr Rondolph Payet
CEO
Seychelles Fishing Authority
P.O. Box 449
Fishing Port
Victoria
Mahé
SEYCHELLES
Tel: +248 670312
Fax: +248 224508
Email: rpayet@sfa.sc

SRI LANKA

Dr. Champa Amarasiri
Director Research and Development
Marine Biological Resources Division
National Aquatic Resources Research and Development Agency (NARA)
Crow Island
Colombo 15
SRI LANKA
Tel.+94 112 521914
Fax:+94 11 2521914
Email: champa@nara.ac.lk

THAILAND/THAILANDE

Praulai Nootmorn
Director
Andaman Sea Fisheries Research and Development Centre
77 Tumbon Vichit
Maung District,
Phuket 83000
THAILAND
Tel: +66 76 391138
Fax:+ 66 76 391139
E-mail: nootmorn@yahoo.com

Cdr Pornchai Singhaboon
Fisheries Biologist-Navigator
Deep Sea Fisheries Research and Development Institute
Phoyothin Road
Bankok 10900
THAILAND
Tel: +66 02 5620533
Fax:+ 66 02 5620533
E-mail: **pornslek@hotmail.com**

UNITED KINGDOM/ROYAUME UNI

Dr. Chris Mees
Research Director
MRAG Ltd
18 Queen Street, London
W1J 5PN
UNITED KINGDOM
Tel: +44-20 7255 7783
Fax: +44-20 7499 5388
Email: c.mees@mrag.co.uk

SOUTH AFRICA

Craig Smith
Pelagic & High Sea's Fisheries Manager
Department of Environmental Affairs and Tourism
Marine and Coastal Management
P/Bag x2
Cape Town 8012
SOUTH AFRICA
Tel: +2721 4023048
Email: csmith@deat.gov.za

OBSERVERS/OBSERVATEURS

BIRDLIFE INTERNATIONAL

Dr Naomi Doak
Science Co-ordinator
Nature Seychelles/Birdlife International
P.O.B 1310
Victoria, Mahe
SEYCHELLES
Tel: +248 601100
Fax: +248 601102
Email: naomi@natureseychelles.org

SEAFDEC

Dr Somboon Siriraksophon
Head Of Capture Fishery Technology
SEAFDEC/Training Department
P.O.B 97 Suksawadi Street
Thailand
Phone: 6624256100
Fax: 6624256110
E-mail: **somboon@seafdec.org**

RUSSIA/LA RUSSIE

Dr. Sergei Yu. Leontiev
Head of Laboratory of Foreign Zone and High Seas
Russian Federal Research Institute of Fisheries and Oceanography
17 A, V.Krasnoselskaya Ul Moscow 107140
RUSSIA
Tel: +495 264-9465
Fax: +495 264-9465/9187
Email: leon@vniro.ru

FAO

Dr. Jacek Majkowski
Fishery Resources Officer
Food and Agriculture Organization
Viale dell Terme di Caracalla
00100 Rome
ITALY
Tel: +39 06 570 56656
Fax: +39 06 570 53020
Email: jacek.majkowski@fao.org

CHAIR OF THE WORKING PARTY ON TROPICAL TUNAS/ LE PRESIDENT DU GROUPE DE TRAVAIL SUR LES THONS TROPICAUX

Dr. Iago Mosqueira
Scientist
Centre for Environment , Fisheries& Aquaculture Science
Lowestoft Laboratory
Pakefield Road, Lowestoft
Suuffolk NR 33 0HT UK
UNITED KINGDOM
Tel: +44 0 150205508003
Fax: +44 0 1502 5524511
Email: iagomosqueira@suk.cefas.co.uk

INVITED EXPERTS/EXPERTS INVITES

Hsien-Yaw Yang
Section Chief
Taiwan Fisheries Agency
NOI, Fishing Harbour North Road
Kaoksinng 80672
TAIWAN,CHINA
Tel: +-88698239878
Fax: +8867815 7078
Email: hsien.yazz@yahoo.com.tw

Ren-Fen Wu
Deputy Director
Overseas Fisheries Development Council
Information Department
19, Lane 113, Roosevelt Rd.sec.e
Taipei 106
TAIWAN,CHINA
Tel: +886-2-2738-1522
Fax: +886-2-2738-4329
Email: fan@ofdc.org.tw

Chien-Chung Hsu
Institute of Oceanography
National Taiwan University
Taipei 106
TAIWAN,CHINA
Tel: +886-2-33661393
Fax: +886-2-23661198
Email:hsucc@ntu.edu.t

IOTC SECRETARIAT/SECRETARIAT CTOI

Indian Ocean Tuna Commission
P.O.Box 1011 Fishing Port
Victoria
SEYCHELLES
Tel: (+248) 225591
Fax: (+248) 224364

Mr. Alejandro Anganuzzi
Executive Secretary
Email: aa@iotc.org

Dr. Chris O'Brien
Deputy Secretary
Email: cob@iotc.org

Mr. Miguel Herrera
Data Coordinator
Email: mh@iotc.org

Mr. Marco Garcia
Systems Analyst/Programmer, IOTC
E-mail: marco.garcia@iotc.org

M. Julien Million
Tagging Assistant
Email: julien.million@iotc.org

Ms. Amélie Brito
Translator assisting the Secretariat
Email: amelie.brito@gmail.com

IOTC-OFCF Project/ Projet OFCF-CTOI

Mr. Shunji Fujiwara
IOTC-OFCF Fishery Expert
Email: sf@iotc.org

Regional Tuna Tagging Project – Indian Ocean / Projet Regional De Marquage De Thons – Ocean Indien

Dr. Jean-Pierre. Hallier
Chief Coordinator RTTP
Regional Tuna Tagging Project - Indian Ocean
Room 35-37 Kingsgate House
SEYCHELLES
Tel: +248 610846
Fax: +248 610841
Email: Jean-pierre.hallier@iotc.org

Mr Michael Stockwell
Administration/Financial officer

Ms. Theresa Athayde
Publicity Tag recovery officer

Thanks to the Interpreters

Mr Lucas Amuri
Email: lucasamuri@yahoo.com

Mr. Lewis Moutou
Email: lewismoutou@intnet.mu

Ms. Maria. Pavlidis
Email: marlipav@iconnect.co.ke

Mrs Marguerite Heese
E-Mail: heese@icon.co.ta

Mrs Catherine Jele
E-Mail: cathou@yebo.co.za

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Nishan Sugathadasa

APPENDIX III
AGENDA OF THE IOTC SCIENTIFIC COMMITTEE –TENTH SESSION

1. **OPENING OF THE SESSION**
2. **ADOPTION OF THE AGENDA AND ARRANGEMENTS FOR THE SESSION**
3. **ADMISSION OF OBSERVERS**
4. **UPDATE ON COMMISSION AND SECRETARIATS ACTIVITIES**
5. **DATA COLLECTION AND STATISTICS**
   - 5.1 Status of the IOTC Databases
6. **PRESENTATION OF NATIONAL REPORTS**
7. **STATUS OF TUNA AND TUNA-LIKE RESOURCES IN THE INDIAN OCEAN**
   - 7.1 Tropical Tunas (IOTC-2007-WPTT-R)
     - *7.1.1 Executive Summary of the status of the yellowfin tuna resource (stock assessment updated in 2007).*
     - *7.1.2 Executive Summary of the status of the bigeye tuna resource.*
     - *7.1.3 Executive Summary of the status of the skipjack tuna resource.*
   - 7.2 Billfish (IOTC-2006-WPB-R)
     - *7.2.1 Executive Summary of the status of the swordfish resource*
   - 7.3 Other species
     - *7.3.1 Executive Summary of the status of the albacore tuna resource (IOTC-2006-SC-R).*
     - *7.3.2 Executive Summary of the status of the neritic tuna resources (IOTC-2006-SC-R).*
     - *7.3.3 Proposed Executive Summaries of the status of the shark resources (IOTC-2007-WPEB-R).*
     - *7.3.4 Report on biology, stock status and management of southern bluefin tuna (from CCSBT)*
8. **STATUS OF SPECIES TAKEN AS BYCATCH IN INDIAN OCEAN TUNA FISHERIES**
   - 8.1 Report of the Working Party on Ecosystems and Bycatch (IOTC-2007-WPEB-R)
9. **PRESENTATION ON THE RECENT WORKSHOP ON *PREDATION IN THE TUNA LONGLINE FISHERIES IN THE INDIAN OCEAN* (JULY 2007 IN SEYCHELLES) – INCLUDING THE OUTCOMES AND RECOMMENDATIONS.**
10. **ACTIVITIES IN RELATION WITH THE INDIAN OCEAN TUNA TAGGING PROGRAMME (IOTTP)**
    - 10.1 RTTP-IO (the large-scale project)
    - 10.2 Report on recent activities related to the IOTTP (small-scale projects)
11. **EXAMINATION OF THE MANDATORY STATISTICAL DATA REQUIREMENTS**
12. **MINIMUM DATA REQUIREMENTS FOR THE LONGLINE FLEET**
13. **SCHEDULE OF WORKING PARTY MEETINGS IN 2007-2008**
14. **OTHER MATTERS**
    - 14.1 Report from the 2nd Session of the Scientific Committee of the South West Indian Ocean Commission.
    - 14.2 Updated information on the process towards an independent IOTC
    - 14.3 Implications of Kobe meeting recommendations on the IOTC
    - 14.4 Request for executive summaries for istiophorids
    - 14.5 Time and place for the next session of the Scientific Committee.
15. **ADOPTION OF THE REPORT**

APPENDIX IV
LIST OF DOCUMENTS

Reference / Référence	Title / Titre
IOTC-2007-SC-01	[E] Draft agenda for the Scientific Committee - 2007 [F] Ordre du jour prévisionnel de la Comité scientifique - 2007
IOTC-2007-SC-02	[E + F] List of documents / Liste des documents
IOTC-2007-SC-03	[E] Executive summaries of the status of the major Indian Ocean tunas and billfish (albacore, bigeye, yellowfin, skip jack and swordfish) [F] Résumés exécutifs sur l'état des principaux thons et poissons porte-epee de l'ocean Indien (germon, patudo, albacore, listao et espadon)
IOTC-2007-SC-04	[E] Proposed amendments to mandatory statistical requirement for IOTC [F] Proposition d'amendements aux statistiques exigibles par la CTOI de la part des parties membres
IOTC-2007-SC-05	[E] Executive summaries of the status of Indian Ocean neritic tunas (Spanish mackerel, kawakawa, bullet tuna, wahoo, longtail tuna, frigate tuna, Indo-Pacific King Mackerel) [F] Résumés exécutifs sur l'état des thons nérétiques de l'ocean Indien (bonitou, l'auxide, thazard ponctué, thonine orientale, thon mignon, thazard rayé et thazard batard)
IOTC-2007-SC-06	[E+F] Executive summaries of the status of Indian Ocean sharks (blue, silky, oceanic whitetip, shortfin mako, scalloped hammerhead) / Synthèses sur l'etat de la ressource de requins de l'océan Indien (bleu, soyeux, océanique, taupe bleu, marteau halicorne)
IOTC-2007-SC-07	[E] Report on IOTC data collection and statistics. *IOTC Secretariat* [F] Rapport de la CTOI sur la collecte des données et des statistiques. *Secrétariat de la CTOI*
IOTC-2007-SC-08	[E] A proposal for guidelines for the presentation of fish stock assessment models to IOTC Working Parties.
IOTC-2007-WPEB-R	[E] Report of the Third Session of the IOTC Working Party on Ecosystems and Bycatch [F] Rapport de la troisième session du groupe de travail de la CTOI sur les écosystèmes et les prises accessoires.
IOTC-2007-WPTT-R	[E] Report of the Ninth Session of the IOTC Working Party on Tropical Tunas. [F] Rapport de la neuvième session du Groupe de travail de la CTOI sur les thons tropicaux.
IOTC-2007-WPTT-R-add1	[E] Report on the intersessional work carried out by members of the Working Party on Tropical Tuna on the status of the yellowfin tuna stock [F] Rapport sur les travaux réalisés en intersession sur l'état du stock d'albacore par les membres du Groupe de travail sur les thons tropicaux
Information papers	
IOTC-2007-SC-INF01	Workshop on the Depredation in tuna longline fisheries in the Indian Ocean. 9-14 July 2007, Seychelles. 50pp
IOTC-2007-SC-INF02	(CCSBT) Report on biology, stock status and management of southern bluefin tuna: 2007
IOTC-2007-SC-INF03	Upon the IRD project to publish an atlas on Atlantic and Indian oceans tuna fisheries. Alain Fonteneau, IRD scientist
IOTC-2007-SC-INF04	EC-Spain National Report
IOTC-2007-SC-INF05	UE-France - Rapport National.
IOTC-2007-SC-INF06	United Kingdom National Report.
IOTC-2007-SC-INF07	Republic of Korea National Report.
IOTC-2007-SC-INF08	Progress Report on the IOTC-OFCF Project to improve statistical systems in Indian Ocean coastal countries
IOTC-2007-SC-INF09	Japan National Report.
IOTC-2007-SC-INF10	Rapport national de la France (territoires) – année 2007.
IOTC-2007-SC-INF11	Seychelles National Report
IOTC-2007-SC-INF12	China National Report
IOTC-2007-SC-INF13	Australia National Report
IOTC-2007-SC-INF14	South Africa National Report
IOTC-2007-SC-INF15	Thailand National Report
IOTC-2007-SC-INF16	Preliminary analysis of tuna catches by Purse Seiners fishing in the Western Indian Ocean over the period January to August 2007. J. Dorizo,V. Lucas, A. Fonteneau.
IOTC-2007-SC-INF17	Seychelles NPOA Sharks
IOTC-2007-SC-INF18	Sri Lanka National Report
IOTC-2007-SC-INF19	India National Report
IOTC-2007-SC-INF20	Kenya National Report
IOTC-2007-SC-INF21	The RTTP-IO after the end of the tagging operations. Jean-Pierre Hallier. Powerpoint presentation.

APPENDIX V
AVAILABILITY OF IOTC STATISTICS FOR THE YEAR 2006

Excerpt from document IOTC-2007-SC-07

Table 1. Proportion of the NC, CE and SF statistics available at the IOTC Secretariat compared to the total catches estimated for 2006 (as of 15th October 2007) and proportion of catches available from the flag country (SO) *versus* total catches so far available.

Statistics available for 2005	Estim Catch	NC		CE		SF	
		BD	SC	BD	SC	BD	SC
IOTC species 1000t	1605	680	1272	527	794	497	680
%Available for 2006		**42**	**79**	**33**	**49**	**31**	**42**
%Available for 2005		43	58	33	43	29	32
Tropical tunas 1000t	1105	594	963	486	699	471	633
Temperate tunas 1000t	34	17	33	2	18	6	12
Billfish 1000t	75	29	54	13	27	15	25
Neritic tunas 1000t	391	39	221	26	50	5	11

Estim. Catch: Total catches estimated
NC: Amount of catch available
CE: Amount of catch for which catches and effort are available
SF: Amount of catch for which size frequency data are available
SO: Amount of catch available from the flag countries
Available before the deadline for data submission (**BD**, 30th June) and at the time of the Scientific Committee Meeting (**SC**)

Table 2: Availability of IOTC statistics for the year 2005

Key Tables 2i - 2v

Gear	Industrial purse seine (**PS**), industrial longline (**LL**) and artisanal gears (**ART**)		**NC**	Nominal Catch	Fully available
Catch	Recent catches amounting to (thousands of tonnes)		**CE**	Catch and Effort	Partially available
			SF	Size Frequency	Not available
TI	Timeliness	Good (before 1st July)	**SO**	Data Source	Statistics fully available from flag country
		Fair (whithin July)			Statistics partially available from flag country
		Poor (after 1st August)			Statistics available from sources other than flag country

2i – Tropical tunas (YFT, BET, SKJ)

Gear	Fleet	Catch	Sps	NC	CE	SF	TI	SO	Comments
PS	EUROPEAN COMMUNITY	306.2	SY	Fully	Partially	Fully	Good	Fully from flag	Effort from supply vessels not available
PS	SEYCHELLES	79.1	SY	Fully	Partially	Fully	Good	Fully from flag	Effort from supply vessels not available
PS	THAILAND	22.6	SB	Fully	Fully	Not	Good	Fully from flag	
PS	IRAN I R	12.3	YS	Fully	Not	Not	Fair	Fully from flag	
PS	FRANCE-TERRITORIES	3.0	SY	Fully	Fully	Fully	Good	Fully from flag	
PS	JAPAN	2.8	SB	Fully	Fully	Not	Good	Fully from flag	
PS	AUSTRALIA	0.4	S	Fully	Partially	Not	Fair	Fully from flag	CE confidential
PS	NEI[1]	28.1	SY	Not	Not	Not	Poor	Other sources	
LL	CHINA	12.6	BY	Fully	Fully	Not	Fair	Fully from flag	
LL	TAIWAN,CHINA	70.6	BY	Fully	Not	Partially	Good	Partially from flag	SF only available for some fresh-tuna longliners (IOTC/OFCF)
LL	JAPAN	36.0	YB	Fully	Fully	Not	Poor	Fully from flag	
LL	INDONESIA	15.9	YB	Fully	Not	Partially	Good	Fully from flag	SF not available per 5 degrees area
LL	SEYCHELLES	6.7	BY	Fully	Fully	Partially	Good	Fully from flag	SF not available for the industrial longline fleet
LL	KOREA REP	5.8	YB	Not	Not	Not	Poor	Other sources	
LL	PHILIPPINES	3.6	YB	Fully	Not	Not	Good	Fully from flag	
LL	OMAN	3.5	YB	Fully	Fully	Not	Good	Fully from flag	
LL	MALAYSIA	1.6	Y	Fully	Partially	Not	Good	Fully from flag	CE not available per 5 degrees area
LL	EUROPEAN COMMUNITY	1.5	BY	Partially	Partially	Not	Fair	Fully from flag	NC and CE not available for all EC flags (UK and Spain)
LL	THAILAND	0.3	BY	Fully	Partially	Not	Good	Fully from flag	CE not available per 5 degrees area
LL	SOUTH AFRICA	0.2	Y	Fully	Fully	Fully	Poor	Fully from flag	
LL	BELIZE	0.2	Y	Fully	Partially	Not	Good	Fully from flag	CE inconsistent (size of squares)
LL	MAURITIUS	0.2	Y	Fully	Fully	Partially	Poor	Fully from flag	SF not available for all species and not per 5 degrees area
LL	AUSTRALIA	0.1	B	Fully	Partially	Partially	Fair	Fully from flag	CE confidential; SF not per area
LL	KENYA	0.0	B	Not	Not	Not	Poor	Other sources	
LL	INDIA	0.0	Y	Partially	Partially	Partially	Poor	Fully from flag	Data only available for research vessels
LL	GUINEA	0.0	Y	Partially	Partially	Not	Good	Fully from flag	NC/CE incomplete (only May-June available)
LL	SENEGAL	0.0	Y	Not	Not	Not	Poor	Other sources	
LL	NEI-FROZEN[1]	10.2	YB	Not	Not	Not	Poor	Other sources	
LL	NEI-FRESH[2]	7.0	Y	Partially	Partially	Partially	Poor	Other sources	Data partially available from IOTC/OFCF sampling schemes
Artisanal	MALDIVES	161.3	SY	Fully	Partially	Partially	Fair	Fully from flag	CE not available per 5 degrees area; SF not available per gear
Artisanal	IRAN I R	131.1	SY	Fully	Not	Not	Fair	Fully from flag	
Artisanal	SRI LANKA	59.8	SY	Fully	Partially	Partially	Good	Fully from flag	Data partially available from IOTC/OFCF sampling schemes
Artisanal	INDONESIA	53.3	SY	Not	Not	Not	Poor	Other sources	
Artisanal	YEMEN AR RP	19.2	Y	Not	Not	Not	Poor	Other sources	
Artisanal	OMAN	17.8	Y	Partially	Not	Not	Good	Fully from flag	NC not available per gear
Artisanal	INDIA	12.6	SY	Partially	Not	Not	Poor	Fully from flag	NC not available per gear
Artisanal	COMOROS	9.1	YS	Not	Not	Not	Poor	Other sources	
Artisanal	PAKISTAN	8.4	SY	Not	Not	Not	Poor	Other sources	
Artisanal	FRANCE-TERRITORIES	0.8	SY	Fully	Not	Not	Fair	Fully from flag	
Artisanal	TANZANIA	0.7	Y	Not	Not	Not	Poor	Other sources	
Artisanal	EUROPEAN COMMUNITY	0.3	Y	Fully	Fully	Not	Good	Fully from flag	
Artisanal	MAURITIUS	0.1	Y	Not	Not	Not	Poor	Other sources	
Artisanal	KENYA	0.1	Y	Not	Not	Not	Poor	Other sources	
Artisanal	JORDAN	0.1	S	Not	Not	Not	Poor	Other sources	
Artisanal	UK-TERRITORIES	0.0	Y	Fully	Fully	Not	Good	Fully from flag	
Artisanal	SEYCHELLES	0.0	Y	Fully	Fully	Not	Fair	Fully from flag	
Artisanal	EAST TIMOR	0.0	Y	Not	Not	Not	Poor	Other sources	
Artisanal	AUSTRALIA	0.0	S	Fully	Partially	Not	Fair	Fully from flag	CE confidential
Artisanal	SOUTH AFRICA	0.0	Y	Fully	Fully	Not	Poor	Fully from flag	

Sps Yellowfin tuna (**Y**), bigeye tuna (**B**) and skipjack tuna (**S**)

1 Vessels whose catches are not reported by their flag states

2 Non-reporting vessels from India and Indonesian vessels operating in countries other than Indonesia

2ii – Temperate tunas (ALB, SBF)

Gear	Fleet	Availability of statistics					TI	SO	Comments
		Catch	Sps	NC	CE	SF			
	AUSTRALIA	5.9	S						CE confidential
P	EUROPEAN COMMUNITY	1.3	A						Effort from supply vessels not available
S	SEYCHELLES	0.0	A						Effort from supply vessels not available
	NEI[1]	0.0	A						
	CHINA	0.1	A						
	TAIWAN,CHINA	10.4	A						SF only available for some fresh-tuna longliners (IOTC/OFCF)
	JAPAN	9.1	AS						Preliminary catches (not raised)
	INDONESIA	4.6	AS						SF not available per 5 degrees area
	BELIZE	0.7	A						CE inconsistent (size of squares)
	EUROPEAN COMMUNITY	0.8	A						NC and CE not available for all EC flags
	THAILAND	0.1	A						CE not available per 5 degrees area
L	KOREA REP	0.2	A						
L	MALAYSIA	0.0	A						CE not available per 5 degrees area
	SEYCHELLES	0.1	A						
	SOUTH AFRICA	0.0	A						
	MAURITIUS	0.0	A						SF not available per 5 degrees area
	AUSTRALIA	0.0	A						CE confidential
	KENYA	0.0	A						
	NEI-FROZEN[1]	0.6	A						
	NEI-FRESH[2]	0.2	A						Data partially available from IOTC/OFCF sampling schemes
A	EUROPEAN COMMUNITY	0.1	A						
R	AUSTRALIA	0.0	A						CE confidential
T	SOUTH AFRICA	0.0	A						

Sps Southern bluefin tuna (**S**) and albacore (**A**)
1 Vessels whose catches are not reported by their flag states
2 Non-reporting vessels from India and Indonesian vessels operating in countries other than Indonesia

2iii – Billfish (SWO, MARL, SFA, SSP)

Gear	Fleet	Availability of statistics					TI	SO	Comments
		Catch	Sps	NC	CE	SF			
	CHINA	1.0	S						
	TAIWAN,CHINA	13.1	SM						SF only available for some fresh-tuna longliners (IOTC/OFCF)
	EUROPEAN COMMUNITY	9.0	S						NC and CE and SF not available for all EC flags
	JAPAN	3.4	SM						
	INDONESIA	3.1	SM						SF not available per 5 degrees area
	SEYCHELLES	1.0	S						SF not available for the industrial longline fleet
	GUINEA	0.8	S						NC/CE incomplete (only May-June available)
	MAURITIUS	0.7	S						SF not available for all species and not per 5 degrees area
	KOREA REP	0.6	SM						
	KENYA	0.3	S						
L	AUSTRALIA	0.3	S						CE confidential; SF not per area
L	MALAYSIA	0.3	SF						CE not available per 5 degrees area
	SOUTH AFRICA	0.2	S						
	PHILIPPINES	0.1	S						
	SENEGAL	0.1	S						
	BELIZE	0.0	S						CE inconsistent (size of squares)
	OMAN	0.3	MS						
	INDIA	0.0	F						Data only available for research vessels
	THAILAND	0.0	MS						CE not available per 5 degrees area
	NEI-FROZEN[1]	3.8	MS						
	NEI-FRESH[2]	0.9	S						Data partially available from IOTC/OFCF sampling schemes
	SRI LANKA	10.9	FM						Data partially available from IOTC/OFCF sampling schemes
	IRAN I R	10.6	F						
	INDIA	7.8							
A	PAKISTAN	3.5							
r	INDONESIA	0.8							
t	TANZANIA	0.6							
i	COMOROS	0.4	F						
s	OMAN	0.3	F						NC not available per gear
a	MAURITIUS	0.3							
n	KENYA	0.2	F						
a	UN ARAB EMIRATES	0.1							
l	EUROPEAN COMMUNITY	0.0	F						
	FRANCE-TERRITORIES	0.0	F						
	SAUDI ARABIA	0.0	F						
	SEYCHELLES	0.0	F						
	UK-TERRITORIES	0.0	M						

Sps Swordfish (**S**), blue marlin and/or black marlin and/or striped marlin (**M**), Indo-Pacific sailfish (**F**) and short-billed spearfish (**P**)
1 Vessels whose catches are not reported by their flag states
2 Non-reporting vessels from India and Indonesian vessels operating in countries other than Indonesia

2iv – Neritic tunas (FRZ, LOT, KAW, COM, GUT, STS, WAH)

Gear	Fleet	Availability of statistics: Catch	Sps	NC	CE	SF	TI	SO	Comments
PS	IRAN I R	2.3	L						Statistics incomplete for industrial purse seiners
	AUSTRALIA	1.9	K						CE confidential
	EUROPEAN COMMUNITY	0.4	F						Statistics incomplete
	SEYCHELLES	0.2	F						Statistics incomplete
LL	INDONESIA	0.1	W						
	CHINA								
	TAIWAN,CHINA	0.0	W						
	AUSTRALIA	0.0	W						CE confidential
	EUROPEAN COMMUNITY	0.0	W						NC not available for all EC flags
	SOUTH AFRICA	0.0	W						
	THAILAND	0.0	W						CE not available per 5 degrees area
	INDIA	0.0							Data only available for research vessels
	KENYA	0.0	W						
	NEI-FROZEN[1]	0.0	W						
	NEI-FRESH[2]	0.0	W						Data partially available from IOTC/OFCF sampling schemes
Artisanal	INDONESIA	110.8	KL						
	INDIA	104.5	CK						NC not available per gear
	IRAN I R	50.7	LK						
	MALAYSIA	20.3	KL						NC and CE not fully available per species
	THAILAND	16.9	KL						NC and CE not fully available per species
	PAKISTAN	13.6	CL						
	OMAN	13.2	LC						NC not available per gear
	MADAGASCAR	12.0	C						
	YEMEN AR RP	11.9	LK						
	UN ARAB EMIRATES	8.4	CL						
	SAUDI ARABIA	7.8	C						
	MALDIVES	5.2	FK						CE not available per 5 degrees area; SF not available per gear
	SRI LANKA	4.7	CF						Data partially available from IOTC/OFCF sampling schemes
	QATAR	1.9	C						
	KENYA	1.2	C						
	EGYPT	0.9	C						
	COMOROS	0.7	K						
	TANZANIA	0.5							
	SEYCHELLES	0.4	K						CE not available per 5 degrees area
	AUSTRALIA	0.3	C						CE confidential
	KUWAIT	0.2	G						
	ERITREA	0.1	C						
	BANGLADESH	0.1							
	BAHRAIN	0.1	C						
	DJIBOUTI	0.1							
	JORDAN	0.0	K						
	EUROPEAN COMMUNITY	0.0	W						
	SUDAN	0.0	C						
	SOUTH AFRICA	0.0	G						
	UK-TERRITORIES	0.0	K						

Sps	Longtail tuna (**L**), frigate tuna and/or bullet tuna (**F**), kawakawa (**K**), narrow-barred Spanish mackerel (**C**), Indo-Pacific king mackerel (**G**), streaked seerfish (**S**) and wahoo (**W**)
1	Vessels whose catches are not reported by their flag states
2	Non-reporting vessels from India and Indonesian vessels operating in countries other than Indonesia

2v – Sharks seabirds and sea turtles

Gear	Fleet	Species					Comments
		Sharks			Sea Birds	Sea Turtles	
		NC	CE	SF			
PS	EUROPEAN COMMUNITY				n/a		Preliminary results from observer programmes reported to WPEB
	SEYCHELLES				n/a		
	THAILAND				n/a		
	IRAN I R				n/a		
	AUSTRALIA				n/a		
	FRANCE-TERRITORIES				n/a		
	JAPAN				n/a		
	NEI				n/a		
LL	CHINA						NC catches might be estimated from available catches in the past
	TAIWAN,CHINA						NC not per species; NC incomplete; SF from IOTC-OFCF sampling
	JAPAN						Preliminary results from observer programmes reported to WPEB
	INDONESIA						NC not per species; NC incomplete
	EUROPEAN COMMUNITY						NC/CE not available for all fleets and/or not per species
	SEYCHELLES						NC/CE not per species; NC/CE likely to be incomplete
	KOREA REP						NC estimated by the IOTC Secretariat (incomplete and not per species)
	OMAN						NC/CE not per species; NC/CE likely to be incomplete
	PHILIPPINES						NC catches might be estimated using catches from other fleets
	MALAYSIA						NC/CE not per species; NC/CE likely to be incomplete
	BELIZE						NC not per species; NC likely to be incomplete
	MAURITIUS						NC/CE not per species; NC/CE likely to be incomplete
	GUINEA						NC/CE incomplete (only May-June available; not per species)
	THAILAND						NC catches might be estimated from available catches in the past
	SOUTH AFRICA						Preliminary results from observer programmes reported to WPEB
	AUSTRALIA						NC likely to be incomplete
	KENYA						NC estimated by the IOTC Secretariat (not per species)
	SENEGAL						NC estimated by the IOTC Secretariat (incomplete)
	INDIA						Preliminary results from observer programmes reported to WPEB
	MADAGASCAR						NC catches might be estimated using catches from other fleets
	NEI-FROZEN[1]						NC estimated by the IOTC Secretariat (incomplete and not per species)
	NEI-FRESH[2]						NC/SF estimated by the IOTC Secretariat (incomplete and not per species)
Artisanal	IRAN I R				n/a		NC catches presumed to be high
	MALDIVES				n/a		NC catches presumed to be low
	INDONESIA				n/a		NC not per species; NC likely to be incomplete
	INDIA				n/a		NC catches presumed to be high
	SRI LANKA				?		NC/CE not fully per species
	OMAN				n/a		NC estimated by the IOTC Secretariat (not per species)
	YEMEN AR RP				n/a		NC estimated by the IOTC Secretariat (incomplete and not per species)
	PAKISTAN				n/a		NC estimated by the IOTC Secretariat (incomplete and not per species)
	MALAYSIA				n/a		NC/CE not per species
	THAILAND				n/a		NC catches presumed to be low
	MADAGASCAR				n/a		NC catches presumed to be low
	COMOROS				n/a		NC catches presumed to be low
	UN ARAB EMIRATES				n/a		NC estimated by the IOTC Secretariat (not per species)
	SAUDI ARABIA				n/a		NC estimated by the IOTC Secretariat (not per species)
	QATAR				n/a		NC catches presumed to be low
	TANZANIA				n/a		NC estimated by the IOTC Secretariat (not per species)
	KENYA				n/a		NC/CE only available for sport fishery
	EGYPT				n/a		NC estimated by the IOTC Secretariat (not per species)
	FRANCE-TERRITORIES				n/a		NC not per species
	SEYCHELLES				n/a		NC catches presumed to be low
	EUROPEAN COMMUNITY				n/a		NC/CE likely to be incomplete
	MAURITIUS				?		NC catches presumed to be low
	AUSTRALIA				?		Catches likely to be incomplete
	KUWAIT				n/a		NC catches presumed to be low
	ERITREA				n/a		NC estimated by the IOTC Secretariat (not per species)
	JORDAN				n/a		NC catches presumed to be low
	BANGLADESH				n/a		NC catches presumed to be low
	BAHRAIN				n/a		NC catches presumed to be low
	DJIBOUTI				n/a		NC catches presumed to be low
	SUDAN				n/a		NC estimated by the IOTC Secretariat (not per species)
	UK-TERRITORIES				n/a		NC/CE not per species
	SOUTH AFRICA				?		NC likely to be incomplete
	EAST TIMOR				n/a		NC catches presumed to be low

Catches of seabirds are not likely to occur (**n/a**) or may occur (**?**)

1 Vessels whose catches are not reported by their flag states

2 Non-reporting vessels from India and Indonesian vessels operating in countries other than Indonesia

APPENDIX VI
NATIONAL REPORT ABSTRACTS

AUSTRALIA

Document IOTC-2007-SC-INF13: Pelagic longline and purse seine are the two main fishing methods used by Australian vessels to target tuna and billfish in the IOTC area. In 2006, Australian longliners caught 310 t of broadbill swordfish, 38 t of yellowfin tuna and 59 t of bigeye tuna in the IOTC area. These catches are at similar levels to those of 2005 and are less than 20% of peak catches taken in 2001 and 2002. The number of active longliners and levels of fishing effort have declined significantly due to reduced profitability, primarily as a result of lower fish prices and high costs. The purse seine fishery caught 5629 t of southern bluefin tuna in 2006. The 2006 catch to skipjack tuna increased from the insignificant amounts caught in the previous three years, but for confidentiality reasons the actual amount cannot be reported. In 2002, 1144 t of skipjack tuna were caught by purse seine.

The Australian Government made an important change to the management of fisheries in 2007 with the release of a harvest strategy policy. All Australian-Government managed fisheries are required to put a harvest strategy in place in 2008, requiring the use of defined target and limit reference points. For the Australian tuna longline fishery operating in the Indian Ocean, given the current assessment information available, reference points are likely to be based around empirical indicators based on catch per unit of effort and size-based information.

Fleet development plans are to be submitted to the IOTC in 2008. Quota is to be allocated to operators in the tuna longline fishery in 2008 and restriction on catches will be Australia's prime management approach rather than restrictions on the number of vessels operating.

CHINA

Document IOTC-2007-SC-INF12: Longlining fishing has been the only fishing methods applied by the fishing fleets in the IOTC waters. 67 vessels were registered with IOTC Secretariat in 2006. The number of the larger scale deep frozen longliners increased from 16 in 2003 to 41 in 2006. In 2006, most fishing occurred in the area 40-85ºE, 25ºN-25ºS. Some of deep frozen longliners seasonally accessed the EEZs of Pakistan, Tanzania and Seychelles. The total catch of tuna and tuna-like species in the IOTC waters in 2006 was 14,858 t (up 4 % from 2005). The catch of BET was 8702 t (cf 8,867 t in 2005); yellowfin tuna was 3,857 t (cf 4,259 t in 2005); swordfish was 775 t and other species including billfish and albacore was 1,511 t.

Shanghai Fisheries University (SFU) has been responsible for the programmes of the training and data collection and compilation of the Indian Ocean tuna fishery statistics with the cooperation of the Branch of Distant Water Fisheries of China Fisheries Association. Two observers were dispatched on board a fresh tuna longliner in the Indian Ocean in September 2006 for three months. Biological and environmental data were collected and actual hook depth was measured. A comparison of the effect of the circle hooks and ring hooks on the catch rate of main targeting tuna species was also conducted.

The Chinese Fisheries Authority continues to strengthen its management of tuna fisheries. Main measures which have been taken in recent years include: continuing the implementation of fishing license system; having all fishing companies report their catch data every month; continuing to implement the national tuna observer programme in the Oceans; and installing VMS on all the large scale tuna longliners. The following measure and activities will be taken in coming year by China: strengthening relationships with nations who are willing to provide access to Chinese tuna boats; encouraging scientists to conduct research on the incidental catch of sea turtles and sea birds, request fishing companies to report situation about the incidental catch of sea turtles and sea birds; implementing a logbook system; improving the data reporting system.

EC-FRANCE

Document IOTC-2007-SC-INF10: Three French fleets are operating tuna fishing activities in the Indian Ocean. The total catches of tuna and tuna-like species reached 105,100 t in 2006 (compared to 111,000 t in 2005). Following the arrival of 2 new purse seiners based in Mayotte, transportation capacity increased notably in 2006 compared to 2005 (+21%), as did nominal effort (in fishing or research days) and total number of on objects (+17%). Despite this higher effort, total purse seine catch in 2006 decreased (-5%) from 107,100 to 101,800 tonnes; this included yellowfin down 21% and bigeye down 16%, on the other hand, the skipjack catch increased (+16%). Following the unusual 2003-2005 period marked by very high yellowfin catches in free schools, the general situation in 2006 seems to have normalized again. The total catch per research day (CPUE) in 2006 strongly decreased (-28%) and is back to the level observed prior to 2003 for all species and fishing methods. The spatial distribution of the purse seine fishery has changed from that observed between 2003 and 2005.

The longline fleet gained three 16 metre units, thus increasing the total number of longliners from 30 vessels in 2004 to 39 vessels in 2006. Although swordfish remains the target species of this fleet, catches of tuna species (yellowfin, bigeye and albacore) are increasing. Catches 2006 were 2,787 t of tunas and associated species (20% less than in 2005, mainly due to reductions in swordfish and albacore).

The artisanal fleet represents 80 % of the Reunion fishing vessels and about 60 % of the catch is large pelagics (amounting to between 520 and 870 t).

Most of the recommendations concerning France made by the various Working Parties have been or are about to be implemented (IOTC-2007-SC-INF05). Of note is the observer programme onboard French purse seiners which was implemented in October 2005, and another observer programme which started in 2007 onboard longliners based in Reunion.

The IRD tuna research system includes observatory-type activities and a research programme on dynamics of the tropical ecosystem. The projects launched in 2006 continued in 2007. These projects aim at understanding the effects of climate on spatial dynamics of marine predators (tunas, seabirds, pinnipeds) and on fisheries. Two projects deal with the articulation between local-scale movements around FADs and large-scale movements outside FADs. ASCLME and SWIOFP international projects are in their starting phase and campaigns at sea are planned in 2008. Two new projects will start in 2008: European-funded MADE (Mitigating Adverse Effects of fisheries) will study bycatch mitigation measures in longline and purse seine fisheries; French-funded BIOPS (*BIOdiversité Pélagique : Suivi par indicateurs écosystémiques*[2]) will draw up an inventory of pelagic biodiversity and assess the effects of fishing on this biodiversity. These two projects fall within the scope of a better accounting for the ecosystem dimension in fisheries management. The two IRD departments actively participated in the work conducted by the IOTC in its Working Parties and also in research on high sea ecosystems. These activities are detailed in the National Report (CTOI-2007-SC-Inf 05).

At IFREMER, the new system of fisheries monitoring (SIH : *Système d'Information Halieutique*[3]) implemented in 2005 to improve the quality and storage of statistical data was confirmed. An international programme examining swordfish genetics, stock structure, otolith microchemistry of otoliths and biology is expected to begin in 2008 with the participation of about 10 Indian Ocean fishing countries. Within the scope of SWIOFP, two programmes are being discussed with concerned countries: implementation of FADs with monitoring of aggregation and assessment of the impacts of these devices on fishing; study of turtles migration routes between breeding and feeding sites.

The ECOMAR laboratory of the University of Reunion, in collaboration with CNRS and IRD, is conducting research on seabirds ecology and its use as bio-indicator of high sea ecosystems health situation. The programme piloted by ECOMAR on this thematic and funded by the WIOMSA (Western Indian Ocean Marine Science Association) has just concluded; a restitution seminar will be held in Seychelles in December 2007.

EC-SPAIN

Document IOTC-2007-SC-INF04: In 2006 a total of 22 purse seiners and 28 longliners operated in the area. Total catches in 2006 were: 70,924 t of yellowfin tuna, 118,857 t of skipjack tuna, 9,952 t of bigeye tuna, 438 t of albacore and 5,155 t of swordfish, resulting in a total of 205,698 t. The purse seine catch in 2006 was up by 10% as a consequence of the important increase of the catch of skipjack. tuna (26%). 1,737 samples were taken and 313,283 fish were measured. For the longline fleet, in 2006, 32,888 swordfish were measured (30% of the total landings) and sex at age for most spatio-temporal strata was obtained.

Spanish scientists have actively participated in the meetings and activities of the DWS, WPTT, WPEB and the SC. This year, 10 documents were presented. Research programmes are being conducted in conformance with scientific recommendations and a joint IEO-AZTI working plan has been established. Observers have been estimating the bycatch associated with the purse seine fishery since 2004. There were 13 trips in 2006 and 16 in first ten months of 2007. Opportunistic tagging of swordfish and by-catch of longline catch have continued in 2006 with a total of 171 swordfish, 198 sharks and other bycatch species. Two swordfish and two blue sharks were recaptured during 2006.

Between the end of the year 2005 and April 2006, two experimental surveys were undertaken in the southeast areas of the Indian Ocean, in reaching 42º South and in Central areas of the Indian Ocean (5ºNorth-10ºSouth / 60º-95ºEast). In November 2007 a four month Pilot Action using a Spanish longliner in the Atlantic / Indian Ocean convergence area will begin. In

[2] Pelagic Biodiversity: Monitoring by Ecosystems Indicators

[3] Halieutic Information System

addition to the collection of biological and fishing data, tagging with conventional and pop-up tags (10 fish in each ocean) will be undertaken. The first results expected in the middle of 2008.

INDIA

Document IOTC-2007-SC-INF19: India being the fourth largest marine fish producer in the world and second in inland fish production, has very vital role in the world fisheries. The present marine fish production from the 2.02 million sq.km EEZ area is about 2.9 million t against the potential of 3.92 million t, leaving limited scope for further enhancement from near shore waters. The remaining one million tonnes fish are to come from the deepsea and oceanic regions. During 2006-07 Indian marine fish products export was to the tune of 1.85 billion dollars and the target for the current year is 2 billion dollars. The main component of the marine products export from India is shrimps; however, the Government has decided to lay a greater focus on the products like tuna.

Presently, nearly 80 nations harvest tuna from the oceans of the world. Though, India has vast tuna resources their exploitation to the optimum level has not made any impressive progress. This may be due to lack of awareness about the resources and non-availability of appropriate technology and infrastructure for tuna fishing. The Fishery Survey of India, Mumbai has successfully located various tuna resources grounds all along the Indian coasts including Andaman and Nicobar Islands and made tuna longline fishing familiar in India. Presently, with the newly acquired two monofilament tuna longliners Matsya Vrushti and Matsya Drushti the monofilament longlining is introduced for the first time in Indian Waters and reported fairly good tuna catches.

JAPAN

Document IOTC-2007-SC-INF09: No abstract supplied.

KENYA

Document IOTC-2007-SC-INF20: No abstract supplied.

REPUBLIC OF KOREA

Document IOTC-2007-SC-INF07: The Korean tuna longline fishery has shown a decreasing trend from the late 1970s to recent years in both number of fishing vessels and annual catches. In 2006, total catch amounted to 7,375 t by 26 longliners in the Indian Ocean, which is slightly higher compared to 2005. The catch comprised 93 t of southern bluefin tuna, 3,210 t of yellowfin tuna, 237 t of albacore, 2,945 t of bigeye tuna, 409 t of other tunas, 475 t of billfishes and 6 t of sharks. The National Fisheries Research and Development Institute (NFRDI) began to operate a fisheries observer programme in 2002 to monitor Korean distant-water fisheries for tunas and to meet the requirements of regional fisheries bodies. In 2006 and 2007, one Korean observer monitored one of the Korean tuna longline vessels in the western Indian Ocean.

SEYCHELLES

Document IOTC-2007-SC-INF11: In 2006 there was an increase in number of licences issued, and total carrying capacity of the entire purse seine fleet. The total number of sets made and total catch for the entire fleet remained stable despite a slight increase in fishing effort. Overall a sharp decline in yellowfin catch rate was observed whilst the catch rate of skipjack showed an increasing trend. This corresponded to the reduced catches of yellowfin on free swimming school and the increase catches of skipjack on FAD's associated schools. For the Seychelles purse seine fleet a slight decrease in carrying capacity was observed in 2006 whilst the number of fishing days remained more or less constant. The total catch for the Seychelles fleet decreased by 9% corresponding to a decrease in the number of sets made.

In 2006 there was a decrease of 22% in number of licenses issued to longliners to fish inside the Seychelles EEZ. Fishing effort and total reported catch for the entire fleet showed a decreasing trend in 2005 and 2006 which may be attributed to the low level of logbook returns for these two years. The total reported catches for the Seychelles fleet decreased by 42% in 2006 coinciding with a decrease of 16% in fishing effort resulting in a decrease in catch rate.

During 2006, six semi industrial vessels conducted 40 longline fishing trips targeting swordfish (compared to 43 trips in 2005). A decrease of 25% in catches was reported although the fishing effort decreased by only 1%. In 2006 eight semi industrial vessels continued to target sharks and landed a total of 17.91 t of shark meat and 22.15 t of shark fins representing a decrease of 20% in shark meat landed over the 21.81 t of shark meat landed in 2005.

SOUTH AFRICA

South Africa's most important commercial tuna fishery in the Indian Ocean is the large pelagic longline fishery comprising a swordfish-directed fishery (20 vessels) and a tuna-directed fishery (30 vessels). Only South African flag vessels are permitted to participate in the swordfish fishery but foreign flag vessels are temporarily permitted to operate under charter agreement in the tuna-directed fishery. Longline catches peaked in 2005 at >3 500t. According to South Africa's fishery policy the foreign vessels had 12 months in which to reflag, but this never occurred and as a result these vessels were not allowed to fish in 2006. This resulted in 2006 having the lowest annual catch since 1999. Swordfish nominal catch rates are low, but have appeared to stabilize at approximately 400kg.1000hooks-1. Yellowfin tuna catches have fluctuated over recent years and was high (354 kg.1000hooks-1) in 2006. Nominal bigeye tuna catch rate in 2006 was 120kg.1000hooks-1 down by almost 50% compared with 2005. A pelagic shark fishery targets mako and to a lesser extent blue sharks. The shark catches made in the Indian Ocean peaked in 2005 with almost 700 t of shark landed (dressed weight). Despite an increase in shark effort in 2006 the catch and catch rates have declined. This fishery is scheduled to be closed in 2008 due to the concerns of the stock status of shark populations. South Africa has an emerging commercial rod and reel fishery within its tuna pole fishery.

Many of the recommendations of the Scientific Committee including the submission of mandatory length frequency, catch and effort data according to the required spatial resolution have been implemented. A national observer programme is in place and VMS is mandatory. Data is collected data on seabirds, turtles, sharks and predator interactions with the longline fishery. The National Research Programme currently includes: Swordfish life history and stock structure; quantifying the impact of longlining on sharks, turtles and seabirds and to determine possible mitigation and management measures; the dynamics of South African commercial and recreational fisheries targeting yellowfin and to determine the life history and stock structure of this species; Sedgewicks ORI recreational tagging programme for all linefish species.

SRI LANKA

Document IOTC-2007-SC-INF18: Small scale gill nets and tuna long lines are the two main fishing methods used by Sri Lankan fishermen to target for tuna and tuna like fishes. There are over 3000 boats operating in offshore waters. They fish in the EEZ of Sri Lanka as well as outside waters. In 2006 the catch of offshore fleet was 60,044 t which comprised 50% skipjack and 25% yellowfin tuna. This was a 11.5 t increase from 2005. Even though the main fishing gear is gill netting more than 40% of the fleet carry long lines particularly during non-monsoon seasons. Sri Lanka owns eight small sized (52ft) fresh tuna longliners targeting for yellowfin and bigeye. In 2006 the catch from these boats was135.5 t comprising 40% yellowfin, 11% bigeye and 40% bill fishes. These boats operate throughout the year in EEZ of Sri Lanka and high seas. It is estimated that a further 26,000 t of medium sized yellowfin and other tuna are landed by coastal tuna longline fishery operated with 20-40 km distance from the shore especially in the north west and northeast coasts of Sri Lanka. The fishery is conducted by 5-6 m long outboard engine day-boats. The fishery is highly seasonal and conducted during non-monsoonal months. The reported species composition was dominated by 65% of yellowfin tuna.

Due to the nature of the fishery and non-availability of adequate resources, the present data collection system does not provide adequate reliable information for management and development. Therefore, the Ministry of Fisheries and Aquatic Resources has taken initiatives to improve and upgrade the fisheries statistical system with technical and financial assistance from ICEIDA.

THAILAND

Document IOTC-2007-SC-INF15: Six species of neritic tuna are fished for in the Andaman Sea Coast, Thailand using mainly purse seines and to a lesser extent gill nets and trawl. Around 17,000 t of neritic tunas have been taken annually since 1999. Thailand has two distance tuna longliners, namely Mook Andaman number 018 and 028 which have operated since 2000. Catch and catch rate of long liners varied from 94-414 ts and 1.1-1.7 fish per 100 hooks, respectively. The longliners fished mainly in the Western Indian Ocean. Bigeye tuna was the main composition, followed by yellowfin tuna, albacore, swordfish, marlins and sharks.

Six tuna purse seiners have been operating under Thai flag in the Indian Ocean since September 2005. These vessels range between 1,400-2,700 gross tonnage. The operating areas range from 10058.5'N-8022.4'S and 42028'E-85036.3'E. Tunas caught by this fleet are taken back to Thailand for canning. Before the commencement of the current fleet in 2005 the total annual catches were less than 2,000 t. After the entry of the six tuna purse seiners, production rose sharply to12,216 t in 2005 and increased almost double fold in 2006. The highest catches were taken in February – May. Monthly CPUEs ranged from 15 to 55 t/day. The high CPUE was in the period February – May. Skipjack made up 71.98% of the total catch, followed by bigeye 17.02%, yellowfin 10.06% and the bonito 0.94%. The sizes of skipjack, bigeye and yellowfin in 2006 were 41-76 cm, 41-133 cm and 33-152 cm respectively, and with mean length 67.5, 77.5 and 61.5 cm respectively.

The national research programmes and implementation of Department Of Fisheries was reported to this meeting.

UNITED KINGDOM

Document IOTC-2007-SC-INF06: The UK National Report summarises fishing by vessels licensed to fish for tuna and tuna like species in the British Indian Ocean Territory (Chagos Archipelago) Fisheries Conservation and Management Zone (FCMZ) during the 2006 / 2007 fishing season. Five UK flagged vessels were also registered with IOTC to fish during 2005, but they did not fish in the BIOT FCMZ, and are reported to IOTC by the UK Department for Environment Food and Rural Affairs (DEFRA). In 2006/07, 34 licences were issued to 26 longline vessels of two size classes (±100 GRT). The estimated total catch was 590 t comprising 45% yellowfin tuna, 41% bigeye tuna, and 11% other species. 56 licences were issued to 55 Purse seine vessels that year. The total catch for the 2006/07 season by purse seiners was 95 t. The reported species composition (before correction) was dominated by skipjack tuna (98%), and bigeye tuna (2%), based on catch reports and logbooks where catch composition available. It is estimated that a further 21 t of tuna and tuna like species were landed by recreational fishers on Diego Garcia. The five UK vessels caught 1860.7 t from the IOTC area of which swordfish (54%) and sharks (32%) were the predominant species. There was no BIOT or UK observer programme during 2006/07. New stock assessment models were applied to the assessment of yellowfin tuna for the WPTT in July. Data on by catch, conversion factors for sharks and depredation were made available to the Commission through its various activities.

APPENDIX VII
WORKING PARTY ON TROPICAL TUNAS RESEARCH RECOMMENDATIONS AND PRIORITIES

1. Further collaboration with Yemen (such as that proposed by the IOTC-OFCF project) to improve the quality of fisheries information.
2. Regular analysis and reporting of the results of biological sampling programmes undertaken at tuna canneries.
3. The differences between the current longline indices of abundance, and the relative effects of the various factors introduced in the standardization procedures should be further explored. The dependency of all the assessment methods on these indices makes this work of critical importance.
4. Given the availability of new data from the Maldives fisheries and tagging data from the RTTP-IO scientists are encouraged to carry out research on the dynamics and biology of skipjack tuna with a view to providing advice on the current status of this resource during the 2008 meeting of WPTT.
5. Tagging programmes have shown their usefulness in the assessment of tuna resources in the Indian Ocean. The Working Party recommended that the possibility of a continuing tagging programme, including both small and medium scale activities, be further explored. The networks associated with the tag recovery phase developed by the RTTP-IO should be further utilized. Furthermore, the possible use of localised tagging platforms, such as the Maldives, should be considered. The use of alternative tagging techniques, such as RFID or PIT tags, should be considered for future programmes.
6. Scientists are encouraged to continue their work on the use of integrated statistical assessment models. Such models make use of a wide range of information, such as that obtained from tagging, and proficiency with such models will be required to make the best use of this valuable information.
7. Noting the newly available ocean circulation and biogeochemical models, further exploration of the ecosystem and environmental factors influencing Indian Ocean fisheries is encouraged.
8. Exploration of the possible impacts of extraordinary events such as the recent high yellowfin catches could be greatly aided by the development of Management Strategy Evaluation systems and/or Operating Models of the tropical tuna fishery. Work along this line is to be encouraged and scientists are invited to report on their developments.
9. 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.

APPENDIX VIII
EXECUTIVE SUMMARIES OF THE STATUS OF THE MAJOR INDIAN OCEAN TUNAS, BILLFISH, NERITIC TUNAS AND SHARKS

Executive summary of the status of the albacore tuna resource

(As adopted by the IOTC Scientific Committee on 9 November 2007)

BIOLOGY

Albacore (*Thunnus alalunga*) is a temperate tuna living mainly in the mid oceanic gyres of the Pacific, Indian and Atlantic oceans. Indian Ocean albacore is distributed from 5°N to 40°S. In the Pacific and Atlantic oceans there is a clear separation of southern and northern stocks associated with the oceanic gyres that are typical of these areas. In the Indian Ocean, there is probably only one southern stock because there is no northern gyre.

Albacore is a highly migratory species and individuals swim large distances during their lifetime. It can do this because it is capable of thermoregulation, has a high metabolic rate, and advanced cardiovascular and blood/gas exchange systems. Pre-adults (2-5 year old albacore) appear to be more migratory than adults. In the Pacific Ocean, the migration, distribution availability, and vulnerability of albacore are strongly influenced by oceanographic conditions, especially oceanic fronts. It has been observed on all albacore stocks that juveniles concentrate in cold temperate areas (for instance in a range of sea-surface temperatures between 15 and 18°C), and this has been confirmed in the Indian Ocean where albacore tuna are more abundant north of the subtropical convergence (an area where these juvenile were heavily fished by driftnet fisheries during the late 1980's). It appears that juvenile albacore show a continuous geographical distribution in the Atlantic and Indian oceans in the north edge of the subtropical convergence. Albacore may move across the jurisdictional boundary between ICCAT and IOTC.

The maximum age reported for Indian Ocean albacore is eight years. However, this may be an underestimate as albacore have been reported live to at least 10 years in the Pacific Ocean.

Little is known about the reproductive biology of albacore in the Indian Ocean but it appears, based on biological studies and on fishery data, that the main spawning grounds are located east of Madagascar between 15° and 25°S during the 4^{th} and 1^{st} quarters of each year (Figure 1). In the Pacific Ocean, albacore grow relatively slowly (compared to skipjack and yellowfin) and become sexually mature at about 5-6 years old. Like other tunas, adult albacore spawn in warm waters (SST>25°C). It is likely that the adult Indian Ocean albacore tunas do yearly circular counter-clockwise migrations following the surface currents of the south tropical gyre between their tropical spawning and southern feeding zones. In the Atlantic Ocean, large numbers of juvenile albacore are caught by the South African pole-and-line fishery (catching about 10.000 t yearly) and it has been hypothesized that these juveniles may be taken from a mixture of fish born in the Atlantic (north east of Brazil) and from the Indian Ocean.

Overall, the biology of albacore stock in the Indian Ocean is not well known and there is relatively little new information on albacore stocks.

FISHERIES

Albacore are caught almost exclusively under drifting longlines (98 %), and between 20° and 40°S (Table 1, Figure 1), with remaining catches recorded under purse seines and other gears (Table 1).

A fleet using drifting gillnets targeting juvenile albacore operated in the southern Indian Ocean (30° to 40° South) between 1985 and 1992 harvesting important amounts of this species. This fleet, from Taiwan,China, had to stop fishing in 1992 due to a worldwide ban on the use of drifting gillnets. Albacore is currently both a target species and a bycatch of industrial longline fisheries and a bycatch of other fisheries.

The catches of albacore increased rapidly during the first years of the fishery, remaining relatively stable until the mid-1980s, except for some very high catches recorded in 1973, 1974 and 1982. The catches increased markedly during the 1990's due to the use of drifting gillnets, with total catches reaching around 30,000 t. Catches have steadily increased since 1993, after the drop recorded in 1992 and 1993 as a consequence of the end of the drifting gillnet fishery. Catches between 1998 and 2001 were relatively high (ranging from 37,700 t to 40,600 t). By contrast, the average annual catch for the period from 2002 to 2006 was 24,900 t.

Longliners from Japan and Taiwan,China have been operating in the Indian Ocean since the early 1950s and they have been the major fishers for albacore since then (Table 1). While the Japanese albacore catch ranged from 8,000 t to 18,000 t in the period 1959 to 1969, in 1972 catches rapidly decreased to around 1,000 t due to changing the target species mainly to southern bluefin and bigeye tuna, then ranged between 200 t to 2,500 t as albacore became a bycatch fishery. In recent years the Japanese albacore catch has been around 2,000 to 4,000 t. By contrast, catches by Taiwanese longliners increased steadily from the 1950's to average around 10,000 t by the mid-1970s. Between 1998 and 2002 catches ranged between 21,500 t to 26,900 t, equating to just over 60 % of the total Indian Ocean albacore catch. Since 2003 the albacore catches by Taiwanese longliners have been less that 13,200 t.

The catches of albacore by longliners from the Republic of Korea, recorded since 1965, have never been above 10,000 t. Important albacore catches of around 3,000 t to 5,000 t have been recorded in recent years for a fleet of fresh-tuna longliners operating in Indonesia (Figure 3).

Large sized albacore are also taken seasonally in certain areas (Figure 5), most often in free-swimming schools, by the purse seine fishery.

A feature of Indian Ocean albacore fisheries is that it is the only ocean where juvenile albacore are rarely targeted by fisheries. In the Atlantic and Pacific oceans surface fisheries often actively target small albacore to the extent that juveniles contribute to the majority of albacore catches. This, however, does not discount the possibility that the juvenile albacore from the Indian Ocean are not being subjected to significant levels of fishing pressure as the small fish targeted off the west coast of South Africa may have migrated to the Atlantic Ocean from the Indian Ocean (Figure 1).

AVAILABILITY OF INFORMATION FOR STOCK ASSESSMENT

Nominal Catch (NC) Data

The catches of albacore recorded in the IOTC databases are thought to be complete, at least until the mid-1980s. The fleets for which the majority of the catches of albacore are recorded have always reported good catch statistics to the IOTC. The catches of albacore recorded for Illegal and/or Unregulated and/or Unreported (IUU) fleets (recorded mostly as NEI- in the IOTC Database), which have been operating in the Indian Ocean since the early 1980s, have always been estimated by the Secretariat. In recent years the quantities of the NEI catches have decreased markedly.

Catch-and-Effort (CE) Data

Catch and effort data are fully or almost fully available up to the early 1990s but only partially available since then, due to the almost complete lack of catch and effort records from IUU and the Indonesian longline fleet.

The effort statistics are thought good quality for most of the fleets for which long catches series are available, with the exception of the Republic of Korea and Philippines. The use of data for these countries is, therefore, not recommended.

Size Frequency Data

The size frequency data for the Taiwanese longline fishery for the period 1980-2004 is now available. In general, the amount of catch for which size data for the species are available before 1980 is still very low. The data for the Japanese longline fleets is available; however, the number of specimens measured per stratum has been decreasing in recent years. Few data are available for the other fleets.

STOCK ASSESSMENT

The WPTMT conducted a series of analyses based on fitting a production model to various combinations of catch-and-effort data (from Japanese and Taiwanese longline fisheries, and the Taiwanese gillnet fishery). The results of one of the analyses suggested that the stock could be below the level that would produce MSY and that the current fishing mortality is above that required to achieve the MSY, while the remainder failed to produce plausible parameter estimates. In all analyses, there was a discrepancy between the observed and predicted CPUE trends for the most recent years (Figure 5) and the model could not explain appropriately the apparent lack of response in the CPUE to the increase in the catch. Several explanations have been proposed, including a possible increase in productivity of the albacore stock due to a change in environmental conditions, or the inability of the CPUE series to adequately reflect changes in the population abundance. Regarding the first hypothesis, the size frequency data does not offer any evidence supporting the hypothesis of recent increased recruitments.

MANAGEMENT ADVICE

A stock assessment for Indian Ocean albacore (*Thunnus alalunga*) was attempted in 2004 by the Working Party on Temperate Tunas. Results of the analyses conducted were considered unreliable, although one of the results suggested that current catch levels might not be sustainable. Other indicators, such as the average size in the catch and catch rates, have not shown declines in recent years.

Taking into account the absence of a reliable assessment of the status of albacore tuna and the need for a precautionary approach, the SC recommended that the Commission be very cautious in allowing increases in catch or fishing effort from the 2002 levels until the problems with the assessments have been resolved.

ALBACORE TUNA SUMMARY

Maximum Sustainable Yield:	unknown
Preliminary catch in 2006 *(data as of October 2007)*	23,500 t
Mean catch over the last 5 years (2002-06)	24,900 t
Catch in 2005	20,700 t
Catch in 2002	33,100 t
Current Replacement Yield	-
Relative Biomass ($B_{current}/B_{MSY}$)	unknown
Relative Fishing Mortality ($F_{current}/F_{MSY}$)	unknown

Note: This Executive Summary has been updated to take account of recent catch data. The management advice, and stock assessment results are based on data up to 2002.

Table 1. *Best scientific estimates of the catches of albacore tuna (as adopted by the IOTC Scientific Committee) by gear and main fleets for the period 1957-2006 (in thousands of tonnes).*
Data as of October 2007

Gear	Fleet	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83
Purse seine	Other Fleets																								0.0	0.0	0.0	0.0
Purse seine	Total																								0.0	0.0	0.0	0.0
Longline	Taiwan,China	0.7	1.0	1.2	1.1	1.4	1.3	1.6	1.5	1.1	1.7	1.6	7.6	7.7	7.2	7.0	7.0	12.0	17.4	6.4	9.7	9.8	12.8	15.0	11.0	12.3	21.9	17.0
Longline	Japan	4.7	6.3	10.4	11.1	15.2	17.6	12.6	17.8	11.4	13.1	14.1	10.1	8.6	4.9	3.3	1.4	2.0	2.8	1.3	1.2	0.4	0.4	0.4	0.6	1.2	1.3	1.7
Longline	Indonesia																		0.0	0.1	0.1	0.1	0.2	0.3	0.2	0.2	0.2	0.2
Longline	Korea, Republic of									0.5	0.6	6.2	0.9	4.4	1.7	2.4	3.8	9.1	9.8	3.9	4.2	2.1	4.6	2.0	1.8	0.9	0.6	0.6
Longline	Other Fleets								0.1	0.2	0.2	0.0	0.8	0.2	0.7	0.6	0.5	0.4	0.2	0.1	0.0	0.1	0.1	0.0	0.0	0.1	0.1	0.2
Longline	Total	5.3	7.3	11.6	12.1	16.6	19.0	14.1	19.4	13.2	15.6	22.0	19.3	20.9	14.4	13.3	12.7	23.5	30.2	11.6	15.3	12.5	18.1	17.7	13.7	14.7	24.2	19.6
Gillnet	Taiwan,China																										0.1	0.1
Gillnet	Total																										0.1	0.1
Other gears	Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0
All	Total	5.3	7.3	11.6	12.1	16.6	19.0	14.2	19.4	13.2	15.6	22.0	19.3	20.9	14.4	13.4	12.8	23.5	30.3	11.7	15.3	12.5	18.2	17.7	13.7	14.8	24.7	19.8

Gear	Fleet	Av02/06	Av57/06	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06
Purse seine	France	0.4	0.2	0.3	0.5	0.2	0.2	0.2	0.0	0.0	0.9	1.4	0.3	0.3	0.4	0.4	0.5	0.5	0.2	0.4	0.7	0.3	0.6	0.1	0.1	0.9
Purse seine	Spain	0.3	0.2	0.2	0.1		0.0	0.1		0.1	1.1	1.5	0.9	1.8	0.6	0.8	1.0	0.3	0.2	0.4	0.3	0.2	0.5	0.1	0.0	0.4
Purse seine	Other Fleets	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.2	0.3	0.4	0.1	0.5	0.4	0.4	0.5	0.8	0.2	0.4	0.3	0.3	0.4	0.1	0.1	0.1
Purse seine	Total	0.8	0.5	0.6	0.7	0.2	0.2	0.3	0.0	0.3	2.2	3.3	1.3	2.6	1.3	1.6	2.0	1.6	0.6	1.2	1.3	0.8	1.5	0.3	0.2	1.4
Longline	Taiwan,China	13.4	10.4	13.9	6.2	11.1	13.1	11.0	7.1	5.8	13.1	11.1	12.0	14.4	14.2	16.9	15.2	21.6	22.5	21.7	26.9	21.5	13.1	12.5	10.4	9.5
Longline	Japan	3.9	4.6	1.8	2.3	2.5	2.3	1.3	0.9	1.0	1.0	1.8	1.3	1.8	2.0	2.4	3.2	3.2	2.3	2.6	3.0	3.2	2.3	3.6	4.1	6.5
Longline	Indonesia	3.3	0.7	0.3	0.3	0.1	0.3	0.3	0.4	0.4	0.3	0.5	0.4	0.6	0.7	1.3	1.6	1.5	1.7	2.7	2.9	2.6	4.8	4.2	2.6	2.2
Longline	NEI-Deep-freezing	1.1	1.4		0.0	0.7	0.7	1.7	1.0	1.2	2.5	1.8	3.2	4.2	4.2	7.3	4.8	9.0	9.5	8.2	3.1	2.3	1.1	0.5	0.8	0.9
Longline	Seychelles	0.5	0.1																0.0	0.4	0.8	1.1	1.2	0.1	0.1	0.1
Longline	Belize	0.4	0.1																		1.4	0.6	0.2	0.1	0.7	0.7
Longline	France-Reunion	0.4	0.1								0.0	0.0	0.1	0.1	0.1	0.3	0.2	0.3	0.3	0.5	0.6	0.3	0.3	0.4	0.7	0.5
Longline	Korea, Republic of	0.2	1.3	0.4	0.5	0.4	0.4	0.4	0.3	0.2	0.3	0.1	0.1	0.1	0.1	0.2	0.3	0.2	0.1	0.2	0.1	0.0	0.1	0.4	0.2	0.2
Longline	Other Fleets	0.6	0.3	0.2	0.0	0.1	0.1	0.2	0.5	0.6	0.6	0.7	0.6	0.8	0.4	0.2	0.3	0.8	0.6	0.4	0.5	0.5	0.4	0.4	0.6	1.4
Longline	Total	24.0	19.0	16.7	9.3	14.8	17.0	14.9	10.2	9.0	17.8	16.0	17.7	22.1	21.8	28.7	25.6	36.5	37.0	36.6	39.2	32.2	23.4	22.1	20.4	22.0
Gillnet	Taiwan,China		1.9		0.7	18.2	14.0	14.4	10.6	25.7	9.0	2.6														
Gillnet	Total		1.9		0.7	18.2	14.0	14.4	10.6	25.7	9.0	2.6														
Other gears	Total	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
All	Total	24.9	21.5	17.4	10.8	33.2	31.3	29.6	20.8	35.1	29.1	22.0	19.1	24.8	23.2	30.4	27.7	38.1	37.7	37.8	40.6	33.1	25.0	22.4	20.7	23.5

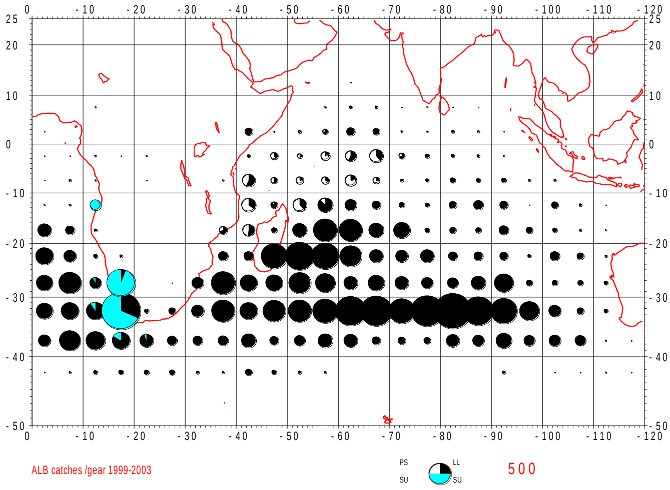


Figure 1. *Average albacore catches by gear during the period 1999-2003. Map shows the distribution of albacore extending from the Indian Ocean to the Atlantic Ocean. LL = longline, PS = purse seine, SU = pole and line.* *Data as of October 2007*

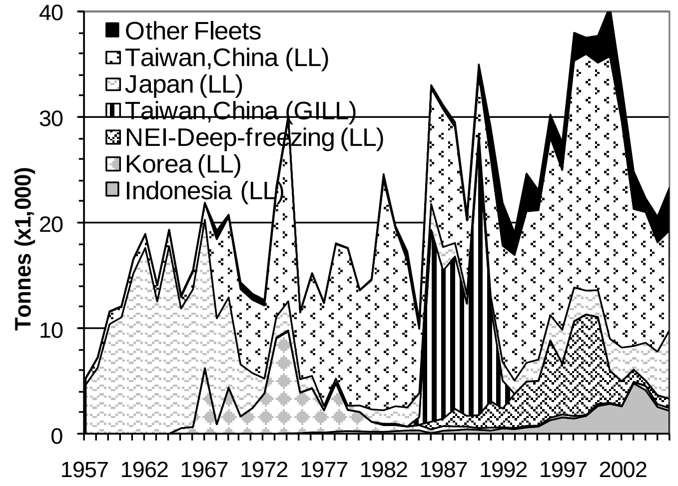


Figure 2. *Catches of albacore per fleet and year recorded in the IOTC Database (1957-2006).* *Data as of October 2007*

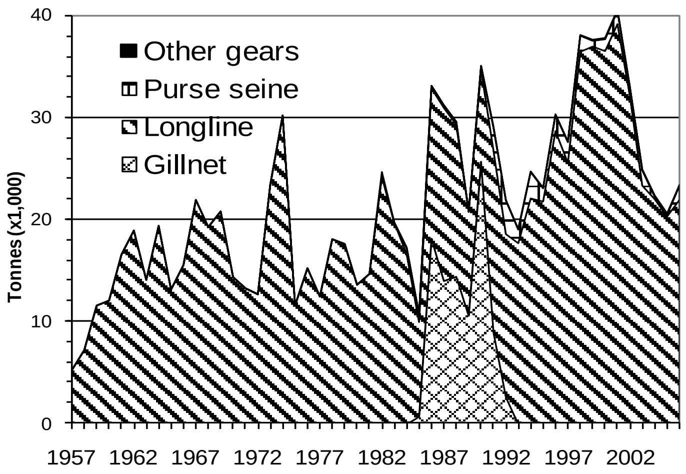


Figure 3. *Annual of catches albacore (thousand of metric tonnes) by gear from 1957 to 2006.* *Data as of October 2007*

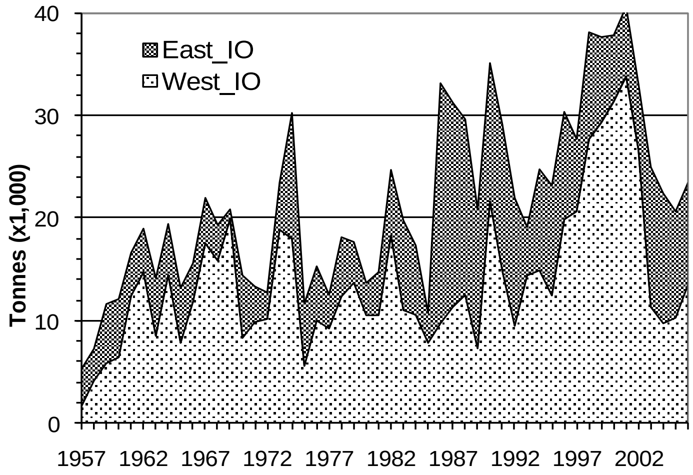


Figure 4. *Catches of albacore in relation to the eastern and western areas of the Indian Ocean (1957-2006).* *Data as of October 2007*

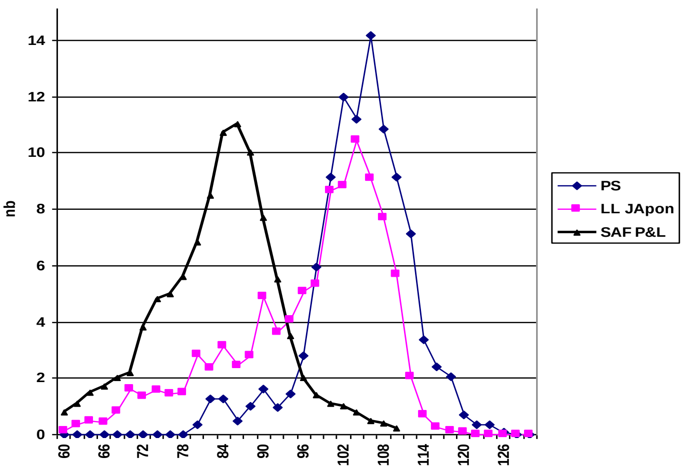


Figure 5. *Average sizes of albacore taken by various fisheries in the Indian Ocean, longliners and purse seiners, and by the pole-and-line fishery in the west coast of South Africa (Atlantic Ocean).*

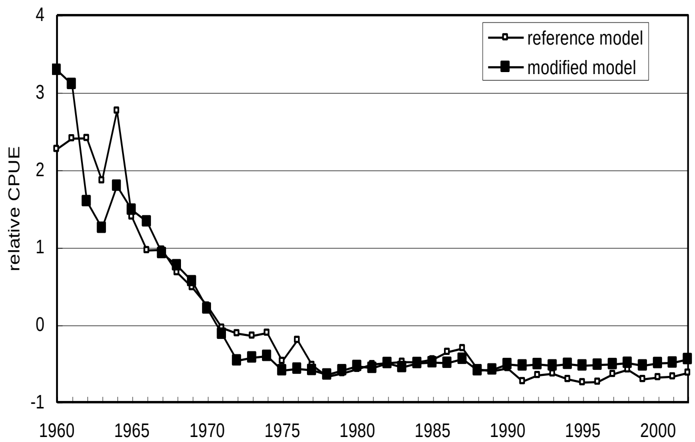


Figure 6. *Standardized CPUEs for the reference and modified models. The CPUE for the modified model was calculated using data from Area 2 and Area 4 where albacore is generally abundant.*

Executive summary of the status of the bigeye tuna resource

(As adopted by the IOTC Scientific Committee on 9 November 2007)

BIOLOGY

Bigeye tuna *(Thunnus obesus)* inhabit the tropical and subtropical waters of the Pacific, Atlantic and Indian Oceans in waters down to around 300 m. Juveniles frequently school at the surface underneath floating objects with yellowfin and skipjack tunas. Association with floating objects appears less common as bigeye grow older.

The tag recoveries from the RTTP-IO provide evidence of large scale movements of bigeye in the Indian Ocean, thus supporting the current assumption of a single stock for the Indian Ocean. The new information on the spatial distribution of tagged fish compared with the spatial extent of the purse seine fishery is presented in Figure 1. The range of the stock (as indicated by the distribution of catches) includes tropical areas, where reproduction occurs, and temperate waters which are believed to be feeding grounds. Of the three tropical tuna species, bigeye tuna lives the longest (more than 15 years) and that makes it the species most vulnerable, in relative terms, to over-exploitation. Bigeye have been reported to grow to 200 cm (fork length) long and over 200 kg and start reproducing when they are approximately three years old, at a length of about 100 cm. Preliminary analyses using the tagging data of the RTTP-IO support the hypothesis of a two-stanza growth pattern for bigeye tuna with slow growing juveniles, an assumption that has not been considered so far in stock assessments

THE FISHERIES

Bigeye tuna is mainly caught by industrial fisheries and appears only occasionally in the catches of artisanal fisheries. 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 123,000 t over the period 2001 to 2005. 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 2). The average annual catch by longliners for the period from 2002 to 2006 was 94,500t. Taiwan,China is the major longline fleet fishing for bigeye and it currently takes just under 50% of the total catch (Table 1). Large bigeye tuna (averaging just above 40 kg) are primarily caught by longlines, and in particular deep longliners (Figure 4). Since the early 1990’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 2002 to 2006 was 26,000 t (Table 1). Forty to sixty boats have operated in this fishery since 1984. Purse seiners mainly take small juvenile bigeye (averaging around 5 kg) whereas longliners much larger and heavier fish (Figures 4, 5 and 6); and while purse seiners take much lower tonnages of bigeye compared to longliners (Figure 2), they take larger numbers of individual fish (Figure 7).

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 (Figures 2 and 3). The relative increase in catches in the eastern Indian Ocean in the late 1990’s was mostly due to increased activity of small longliners fishing for fresh tuna. This fleet started operating around 1985. In the western Indian Ocean, the catches of bigeye are mostly the result of the activity of large longliners and purse seiners.

AVAILABILITY OF INFORMATION FOR ASSESSMENT PURPOSES

The reliability of the total catches has continued to improve over the past years, although still up to 25% of the catch has to be estimated. The fact that most of the catch of bigeye tuna comes from industrial fisheries has facilitated the estimation of total catches. Catch and effort data, potentially useful to construct indices of abundance, is also considered to be of good overall quality. Size-frequency information is considered to be relatively good for most of the purse-seine fisheries, but insufficient for the longline fisheries. This is due primarily to a lack of reporting from the Korean fleets in the 1970’s, lack of reporting from Taiwanese fleets since 1989 and insufficient sample sizes in recent years in the Japanese fishery.

Information on biological parameters is scarce and improvements are needed in particular concerning natural mortality. The ongoing large-scale tagging programme is expected to improve knowledge on a range of biological characteristics. A new growth curve was presented in 2003 which was considered to be an important improvement over previously existing information.

In the case of the purse-seine fishery, it was not possible to derive indices of abundance from catch-and-effort information, because the interpretation of nominal fishing effort was complicated by the use of FADs and increases in fishing efficiency that were difficult to quantify. In the case of the longline fisheries, indices of abundance were derived, although there still remain uncertainties whether they fully take into account targeting practices on different species (Figure 8).

The Japanese longline standardised CPUE (1960 to 2004) for the Indian Ocean tropical waters is currently used to derive the index of bigeye abundance. In 2006, sea surface temperature and gear characteristics were included in the GLM standardisation procedure. This index generally declined from 1960 until 2002, with the exception of higher values in 1977 and 1978. Abundance values in 2003 and 2004 were higher than the lowest historical value in 2002 (Figure 8). A similar analysis of the Taiwanese CPUE series was also presented in 2006. After standardisation, this index shows a variable but generally decreasing trend, similar to that of the Japanese fleet (Figure 8). This is in contrast with previous years, when significant differences could be observed between both indices; and appears to be the result of an increase in the information input into the analysis by Taiwanese researchers. Given that the standardisation procedure of the Taiwanese index is still work in progress, the WPTT decided to apply the Japanese index in the recent stock assessment runs, while recognizing and encouraging the significant improvements achieved in the generation of an index of abundance for the Taiwanese fleet.

Catch at size and catch at age data were updated in 2006. Given that a catch-at-size matrix is an integral part of both length and age based assessment methods, the WPTT expressed their ongoing concerns about the low levels of size sampling being collected in the Indian Ocean. Notwithstanding these concerns the WPTT was encouraged by the potential of the information being obtained from the RTTP-IO in the belief that this programme is going to be important alternative source of size data in the very near future.

STOCK ASSESSMENT

In 2006, five stock assessment models were applied to the Indian Ocean bigeye tuna stock using an agreed list of input parameters. Ten year projections were also carried out for a range of scenarios.

Results

From the range of MSY estimates, the SC chose the value of 111,200 t. This was the MSY estimated by the ASPM and it was reported ahead of the estimates from the other methods because ASPM results have been reported in previous executive summaries; and the WPTT noted that several of the other assessment approaches used in 2006 needed further exploration and development. Given that the mean annual catch for the period 2001-2005 was 123,000 t and the preliminary catch estimate for 2005 is 112,400 t, it appears that the stock is being exploited at around its maximum level. Results from the ASPIC analysis plotting the annual catches as a function of fishing mortality illustrate the MSY and its uncertainty (Figure 9).

Despite the broad agreement of the models in estimating MSY, they produced quite different estimates of absolute levels of virgin and current biomass, and thus in the ratios of current levels of F and SSB to MSY. This was probably due to how the variations in CPUE were interpreted by each model. While acknowledging the value of assessing the status of bigeye from a wide range of modelling perspectives, the WPTT recommended that the results of the ASPM (Table 2) would be used in the Bigeye Executive Summary in 2006.

The ASPM results indicate that the 2005 catch is close to the MSY. Furthermore, spawning stock biomass appears to be above the level that would produce MSY, and the fishing mortality in 2004 appears to below the MSY level.

Biomass trajectories indicate that the spawning stock biomass is currently just above the MSY level, but it has been declining since the late 1970’s (Figure 10). Similarly, the current fishing mortality is estimated be to just above the MSY level, but fishing mortality has been increasing steadily since the 1980’s (Figure 11).

Ten year projections were carried out using the following scenarios:

- constant catch at 2004 levels
- with a 10% reduction in 2004 catch levels
- constant F at 2004 levels, at 2000-02 levels and at 1998-01 levels

If 2004 catch levels were to continue, SSB is predicted to decline gradually over the next 10 years (Figure 12). At a constant catch equivalent to 10 % below the 2004 catch level, the rate of decline in SSB is less severe.

Three different fishing mortality at age scenarios were selected as they reflected different patterns of exploitation for juvenile and adult bigeye. In the period 1998-2000, the fishing pressure on juveniles was higher than it was during the period 2000-2002. The 2004 scenario reflects a fishery in which there was relatively lower pressure on juveniles compared to the other time periods. Scenarios based on F levels were presented, and the results indicate that the three levels considered (2004, 2000-02 and 1998-2001) would not have a strong effect in the trajectories of future SSB, as the differences are relatively minor given the current level of uncertainty (Figure 13).

The effects of the three scenarios of fishing mortality were also considered in terms of yield per recruit. A multi-fleet YPR analysis indicated that an exploitation pattern such as the one observed in 2004 would have a positive impact on the yield per recruit obtained, when compared to the 2000-02 and 1998-01 fishing mortalities by fleet. A slightly higher yield per recruit resulted from a pattern of exploitation in which there was lower pressure on juveniles. Yield per recruit increased from 1.98 kg for the 1998-2001 pattern of exploitation, to 2.06 kg for the 2000-02 pattern, up to 2.22 kg if the 2004 pattern of exploitation were to be retained.

Despite the progress made in the 2006 assessments, uncertainties in the results and projections still exist. These uncertainties relate to:

- Uncertainties concerning the available indices of abundance.
- How well the model structures used in the assessments approximate the true dynamics of the population, and about the quality of the estimation of some of the model key parameters.
- Insufficient size information for the catches of longline fisheries, especially in recent years.
- Uncertainties associated with estimating catch-at-size and catch-at-age.
- Uncertainty about the natural mortality at various life stages, including uncertainty about the functional form of its dependency with age.
- Uncertainty about the changes in catchability of the different fisheries involved, especially in the purse-seine fishery. Future consideration of an increase in efficiency could result in a more pessimistic appraisal of the stock status. For example, it is possible that the fishing mortality that would result in the MSY has already been exceeded.

Notes about exploitation patterns

The exploitation patterns observed in 2003 and 2004 could be considered anomalous, and heavily influenced by the high abundances of yellowfin tuna, which concentrated the activity of the surface fleets. The decrease in the fishing pressure on bigeye currently observed is likely to be temporal, as the fleets appear to have come back in the second half of 2005 to their previous pattern of activity.

Two other factors could also influence the short term evolution of the fishery. Rising fuel costs appear to be having an effect on the operating procedures of the surface fleets. Distances travelled at night, and consequently the number of FADs visited, are being reduced to save on fuel costs. The effect of this change could be however reduced by the increasing use of supply vessels, tasked with visiting FADs and informing purse seiners of the abundance of fish around them. The second factor is the limitation on the activity of all fishing fleets on the coast and EEZ of Somalia, due to the increase in the activity of pirates in the area. Some purse seine fleets have receive indications from their governments not to venture into those waters. An important fishery on FADs has traditionally taken place in this area on the last quarter of the year, with significant catches of juvenile bigeye.

Another factor to consider when analysing the possible futures trends in SSB is the increasing trend in effective fishing power observed in the fleets involved in this fishery.

MANAGEMENT ADVICE

The results of the stock assessments conducted in 2006 were broadly similar and, in general, were more optimistic than previous ones. The ASPM results indicate that the 2005 catch is close to the MSY. Furthermore, spawning stock biomass seems to be above the level that would produce MSY, and the fishing mortality in 2004 seems to below the MSY level. Current (2004) catches of juveniles bigeye by the surface fleets are also less detrimental in terms of yield-per-recruit that previous patterns.

However, the current outlook could revert to a more pessimistic one, if the exploitation pattern is to return to the pre-2003 levels, as expected. Changes in the fishery occurred in 2003 and 2004, but these were due to the exceptional catches of yellowfin, which seem to be the result of anomalous conditions. In 2005, the fishery is already showing a return to the previous pattern of exploitation, which is likely to increase the catches of bigeye tuna associated with floating objects.

If the level in catch in numbers of juvenile bigeye tuna by purse seiners fishing on floating objects returns to pre-2003 levels, this is likely to be detrimental to the stock, as fish of these sizes are below the optimum size for maximum yield-per-recruit.

The Scientific Committee also noted that juvenile bigeye tuna are caught in the FAD purse-seine fishery that targets primarily skipjack tuna. Some measures to reduce the catches of bigeye tuna in this fishery could be expected to result in a decrease in the catches of skipjack tuna.

In view of the most current assessment, the SC recommended that catches should not exceed the MSY and fishing effort should not increase further from the 2004 levels.

BIGEYE TUNA SUMMARY

Maximum Sustainable Yield:	111,200 t (95,000 – 128,000)
Preliminary catch in 2006 *(data as of October 2007)*	105,700 t
Catch in 2005	114,600 t
Mean catch over the last 5 years (2002-2006)	121,800 t
Current Replacement Yield	-
Relative Biomass (SSB_{2004}/SSB_{MSY})	1.34 (1.04 – 1.64)
Relative Fishing Mortality (F_{2004}/F_{MSY})	0.81 (0.54 – 1.08)
90% Confidence intervals provided in brackets	

Note: This Executive Summary has been updated to take account of recent catch data. The management advice, and stock assessment results are based on data up to 2004.

***Table 1**. Best scientific estimates of the catches of bigeye tuna (as adopted by the IOTC Scientific Committee) by gear and main fleets for the period 1957-2006 (in thousands of tonnes).*

Data as of October 2007

Gear	Fleet	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83
Purse seine	France																									0.0	0.0	0.2
Purse seine	NEI-Other																											0.0
Purse seine	Other Fleets																						0.0	0.0	0.0	0.0	0.1	0.3
Purse seine	Total																						0.0	0.0	0.0	0.0	0.1	0.6
Longline	Taiwan,China	0.9	1.5	1.5	1.3	1.9	1.2	1.7	1.8	1.4	2.2	2.3	7.2	8.0	10.0	5.6	5.5	4.0	6.0	5.3	4.2	6.2	4.9	7.4	8.9	6.8	11.3	11.3
Longline	Indonesia																	0.0	0.2	0.4	0.3	0.3	0.4	0.4	0.5	0.5	0.8	1.9
Longline	Japan	11.1	10.2	8.4	14.8	13.0	17.3	11.6	16.0	17.6	21.4	21.8	23.6	14.4	12.7	11.2	8.3	5.2	6.9	5.5	2.1	3.1	10.9	4.2	5.9	7.8	11.4	18.3
Longline	Seychelles																											0.0
Longline	Korea, Republic of									0.2	0.2	0.6	6.8	7.6	3.5	4.9	4.9	7.3	14.7	26.2	21.8	26.1	34.1	21.5	19.3	19.4	19.5	17.4
Longline	Other Fleets								0.2	0.4	0.4	0.1	1.9	0.5	1.6	1.3	1.2	0.9	0.5	0.2	0.1	0.2	0.2	0.0	0.2	0.3	0.3	0.5
Longline	Total	12.0	11.7	9.9	16.1	15.0	18.5	13.3	18.0	19.5	24.1	24.8	39.5	30.4	27.8	23.0	20.0	17.4	28.4	37.7	28.5	35.9	50.5	33.5	34.9	34.8	43.4	49.5
Other gears	Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.2	0.1	0.2
All	Total	12.0	11.7	9.9	16.1	15.0	18.5	13.3	18.0	19.5	24.1	24.8	39.5	30.4	27.8	23.0	20.1	17.6	28.5	37.8	28.7	36.1	50.7	33.6	35.0	35.1	43.6	50.3

Gear	Fleet	Av02/06	Av57/06	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06
Purse seine	Spain	9.7	3.6	0.8	1.3	1.8	5.0	6.8	5.9	4.9	6.0	3.6	5.4	5.9	12.2	11.4	15.9	11.2	16.0	11.3	7.8	10.9	8.5	8.6	10.3	10.0
Purse seine	France	6.1	2.7	2.3	4.3	7.1	7.0	6.2	3.6	4.6	5.4	3.8	5.0	5.4	7.3	6.9	7.8	6.4	8.5	6.7	5.5	7.3	5.3	5.8	6.5	5.3
Purse seine	Seychelles	3.9	0.6								0.0	0.0					0.9	2.0	3.0	1.8	2.8	3.7	3.4	4.4	4.8	3.5
Purse seine	NEI-Other	2.8	1.2	0.5	0.6	1.0	0.8	0.8	0.5	1.0	1.5	0.9	1.9	2.5	3.4	3.4	6.2	5.2	7.5	6.0	3.1	4.1	2.5	2.3	2.5	2.5
Purse seine	NEI-Ex-Soviet Union	1.4	0.5							0.0		0.4	1.0	0.3	1.3	1.1	1.2	1.9	3.9	2.9	2.6	0.7	2.4	2.2	1.4	0.4
Purse seine	Other Fleets	2.2	0.9	0.5	0.9	0.7	0.7	1.3	2.0	2.2	2.6	2.5	2.6	4.8	4.2	1.7	2.0	1.6	1.7	1.3	1.9	2.4	0.8	0.5	2.5	4.6
Purse seine	Total	26.0	9.5	4.0	7.2	10.6	13.4	15.1	12.0	12.7	15.6	11.3	16.0	18.9	28.4	24.5	34.0	28.3	40.7	29.9	23.7	29.0	22.9	23.8	28.0	26.3
Longline	Taiwan,China	48.6	17.3	10.9	12.2	16.8	17.6	19.4	19.9	20.8	29.0	24.0	39.7	27.8	32.7	29.8	34.1	39.7	37.1	36.4	42.1	50.2	60.0	56.9	40.2	35.8
Longline	Indonesia	12.9	5.7	2.4	2.4	0.7	2.4	3.2	4.5	4.5	4.5	7.6	7.9	10.8	12.2	23.2	27.9	26.1	30.5	20.9	21.1	26.3	11.8	10.3	8.8	7.2
Longline	Japan	11.7	12.3	14.0	17.2	15.8	15.5	12.3	7.7	8.2	7.8	5.6	8.3	17.5	17.2	16.5	18.8	17.1	14.0	13.6	13.0	13.9	10.0	10.6	12.5	11.7
Longline	China	6.7	0.9												0.2	0.6	1.8	2.3	2.4	2.9	3.1	2.8	4.6	8.3	8.9	8.7
Longline	Seychelles	4.4	0.5	0.1	0.1									0.0	0.0	0.1	0.0	0.1	0.1	0.5	1.0	2.2	3.7	7.0	5.4	3.9
Longline	NEI-Deep-freezing	4.1	2.9		0.1	1.1	0.9	2.9	2.8	4.4	5.5	3.8	10.7	8.1	9.7	13.0	10.8	16.7	16.7	14.0	4.4	5.2	4.7	5.3	2.6	2.9
Longline	Korea, Republic of	1.8	8.3	11.7	12.8	11.9	14.4	17.1	12.2	10.7	2.3	4.8	5.3	8.6	6.4	11.3	10.6	3.4	1.4	3.4	1.5	0.2	1.2	2.5	2.6	2.6
Longline	Philippines	1.3	0.2															1.4	0.7	1.3	0.9	0.8	1.4	0.9	1.5	1.8
Longline	NEI-Fresh Tuna	0.8	1.0						1.9	2.6	2.3	2.6	2.9	4.6	3.8	4.3	5.3	4.7	4.8	4.6	0.3	0.4	0.5	1.0	0.7	1.3
Longline	NEI-Indonesia Fresh Tuna		1.5			0.1		2.0	7.5	9.2	9.4	11.4	9.2	11.9	6.5	2.7	2.9	0.2	0.0							
Longline	Other Fleets	2.1	0.6	0.6	0.0	0.3	0.3	0.2	0.0	0.0	0.0	0.3	1.4	0.2	1.2	0.2	0.2	0.4	0.9	0.9	2.7	2.5	2.2	1.7	2.1	2.0
Longline	Total	94.5	51.1	39.7	44.9	46.6	51.2	57.0	56.6	60.4	60.8	60.1	85.4	89.5	89.8	101.5	112.4	112.1	108.7	98.4	90.2	104.5	100.0	104.6	85.4	77.9
Other gears	Total	1.3	0.4	0.4	0.3	0.2	0.4	2.2	0.7	0.7	0.7	0.5	0.6	0.7	1.2	0.9	0.9	0.9	1.2	0.6	1.0	1.2	1.3	1.3	1.2	1.4
All	Total	121.8	61.1	44.1	52.4	57.5	65.0	74.3	69.3	73.8	77.1	71.9	101.9	109.1	119.4	126.9	147.3	141.4	150.5	128.9	114.9	134.8	124.3	129.7	114.6	105.7

Table 2. *2006 bigeye tuna stock assessment. Summary of results obtained by the ASPM stock assessment methods. B = Total biomass, SSB = spawning stock biomass. Brackets contain 90 % CI's.*

	ASPM Results
B_0	1,380,000 t
B_{2004}	720,000 t
B_{MSY}	
Ratio B_{2004} / B_0	0.52 (0.43-0.61)
Ratio B_{2004} / B_{MSY}	
SSB_0	1,150,000 t
SSB_{2004}	430,000 t
SSB_{MSY}	350,000 t
Ratio SSB_{2004} / SSB_{MSY}	1.34 (1.04-1.64)
Ratio SSB_{2004} / SSB_0	0.39 (0.31-0.47)
MSY	111,195 t (94,738-127,652)
C_{2004}	126,518 t
F_{2004}	0.29
F_{MSY}	0.30
Ratio F_{2004} / F_{MSY}	0.81 (0.54-1.08)

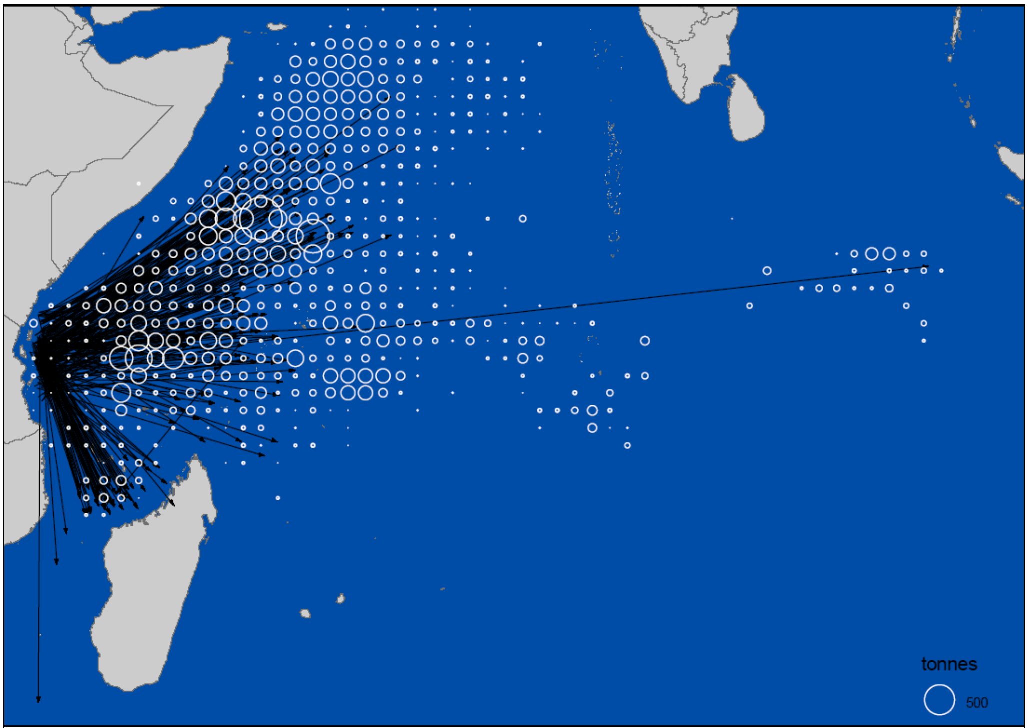


Figure 1. *Tag recapture trajectories for bigeye tuna tagged in the south west Indian Ocean by the RTTP-IO and location of purse seine fishing in 2006. The reference circle represents 500 t.*

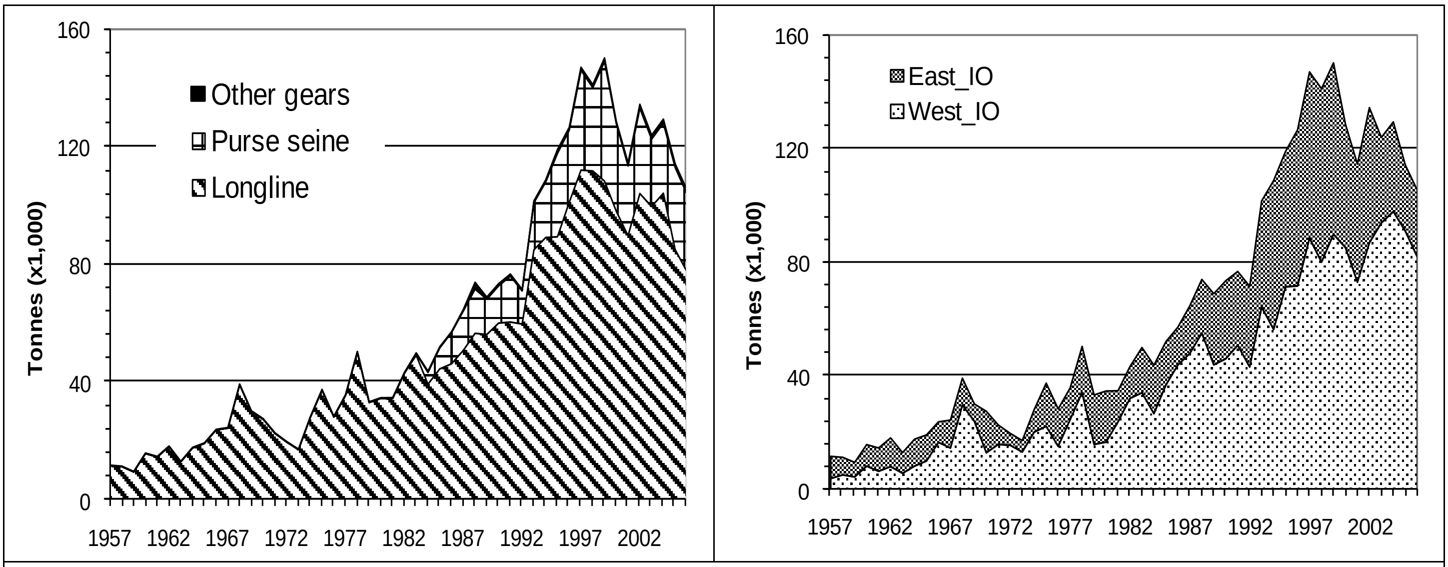


Figure 2. *Yearly catches (thousand of metric tonnes) of bigeye tuna by gear from 1957 to 2006 (left) and by area (Eastern and Western Indian Ocean, right).* Data as of October 2007

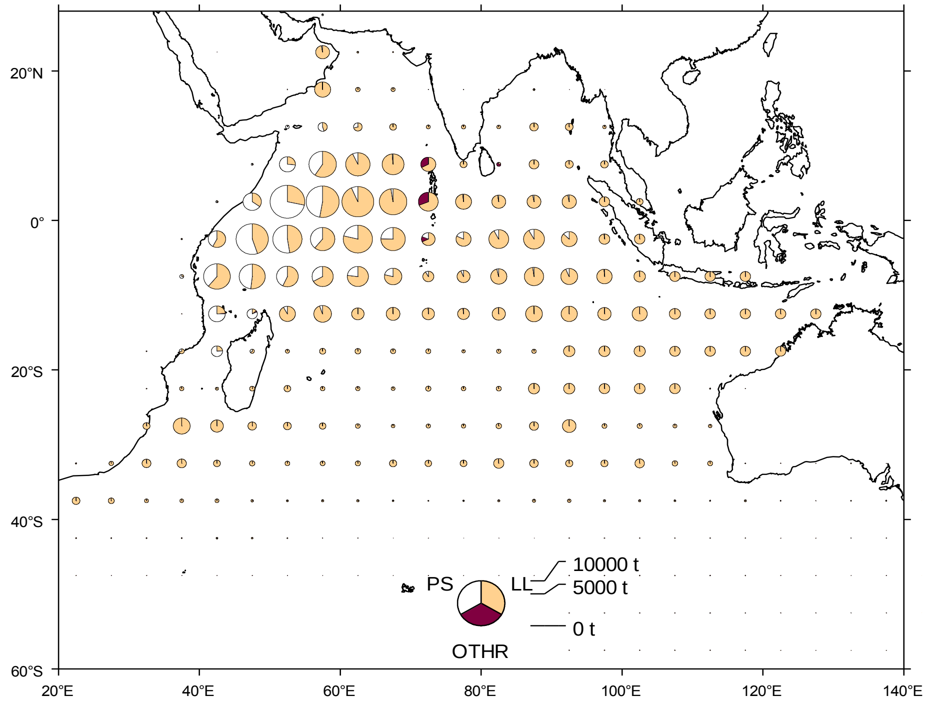


Figure 3. *Mean of annual total catches of bigeye tuna (t) by longline and purse seine vessels operating in the Indian Ocean over the period 2000 to 2006.* Data as of October 2007

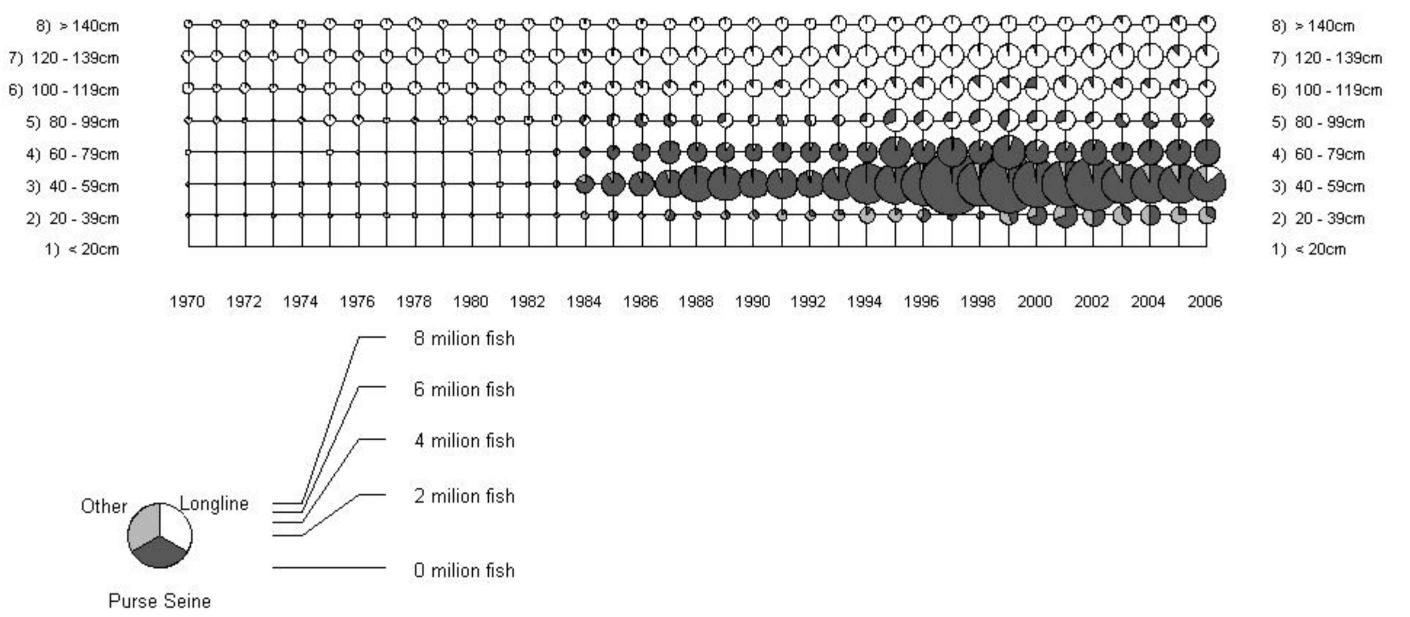


Figure 4. *Mean catch at size of bigeye in purse seine (PS) and longline (LL) catches over the period 1970-2006*

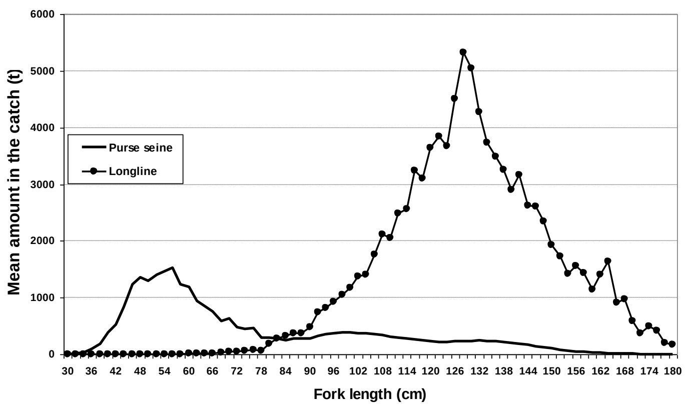


Figure 5. *Mean catch at size (weight) of bigeye measured from purse seine and longline catches from 1996-2005.*

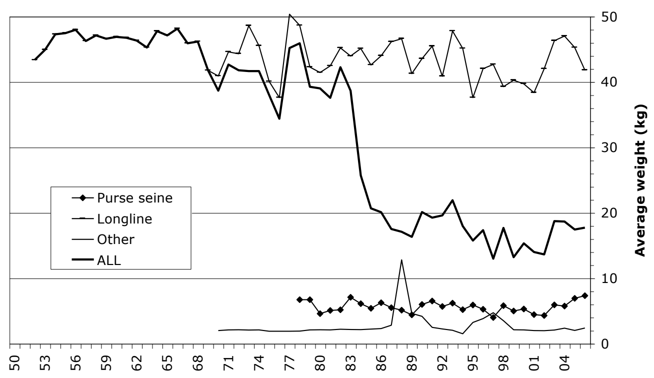


Figure 6. *Mean weight of bigeye measured from purse seine (PS) and longline (LL) catches over time.* *Data as of July 2007*

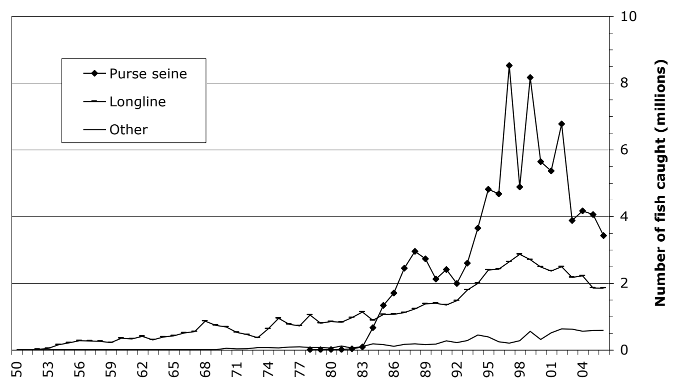


Figure 7. *Catch in numbers of bigeye tuna by gear (PS: purse seine; LL: longline).* *Data as of July 2007*

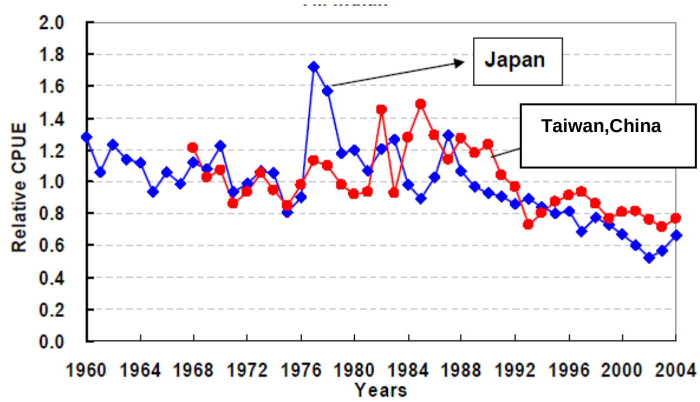


Figure 8. *Standardised CPUE indices for the Japanese and Taiwanese longline fleets in the Indian Ocean tropical waters*

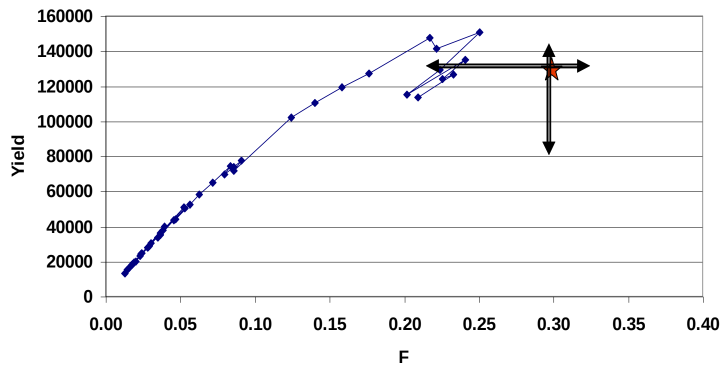


Figure 9. *2006 bigeye tuna stock assessment: Plot of annual bigeye tuna catches as a function of mean fishing mortality derived from the ASPIC model. The star represents MSY and the arrowed lines represent the associated uncertainty (source A. Fonteneau).*

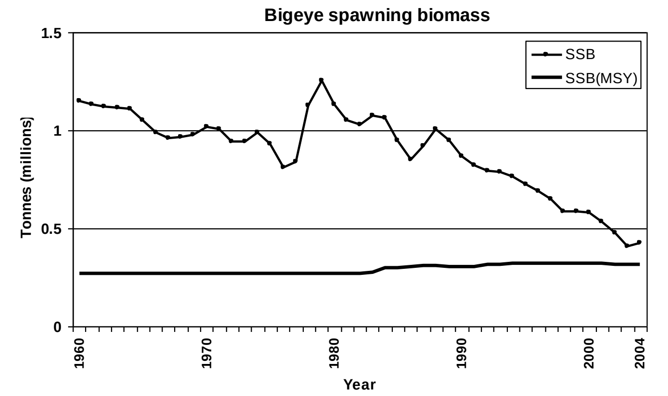


Figure 10. *2006 bigeye tuna stock assessment (ASPM): Spawning stock trajectories relating estimates of annual spawning stock size and the estimated maximum sustainable yield of the spawning stock biomass.*

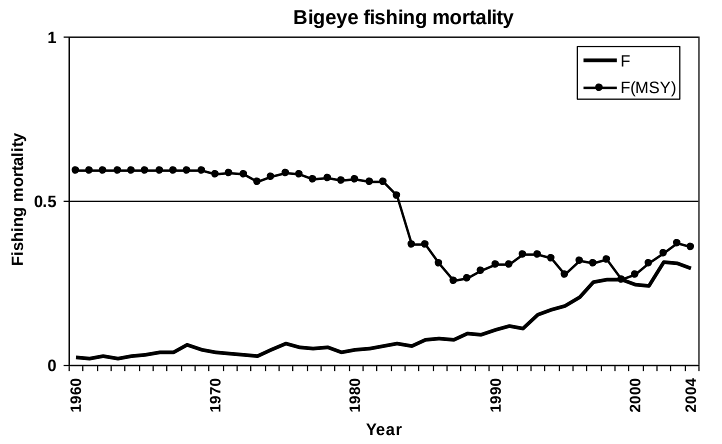


Figure 11. *2006 bigeye tuna stock assessment (ASPM): Fishing mortality trajectories relating estimates of annual fishing mortality and the estimated maximum sustainable level of fishing mortality.*

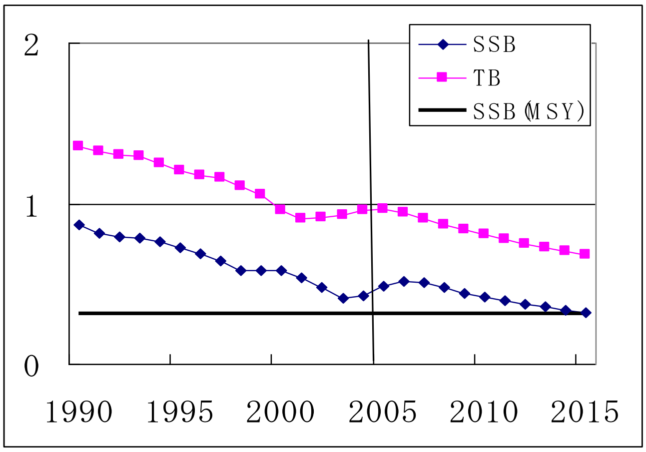
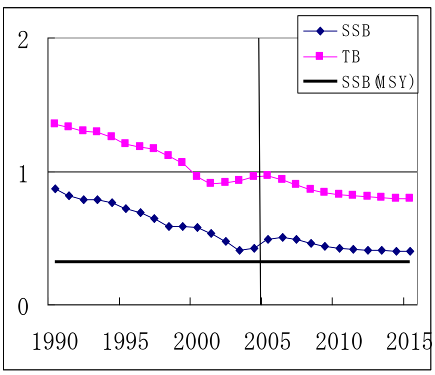
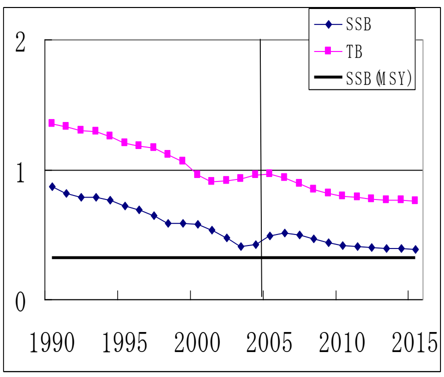


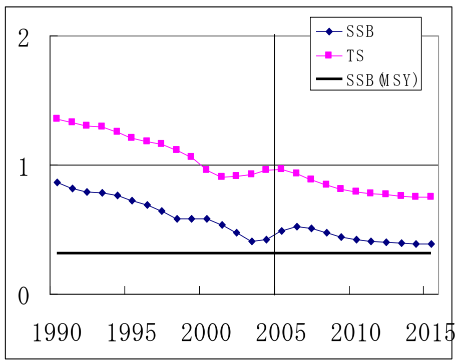
Figure 12. *2006 bigeye tuna stock assessment: Forward projections from the ASPM model illustrating trends in total biomass and spawning biomass for bigeye tuna in the Indian Ocean if catches were maintained at the 2004 level.*



(a) F (2004) = 0.293



(b) F (2000-2002) = 0.265



(c) F (1998-2001) = 0.251

Figure 13. *2006 bigeye tuna stock assessment: Forward projections from the ASPM model illustrating trends in total biomass and spawning biomass for bigeye tuna in the Indian Ocean at various levels of fishing mortality (a) F in 2004 (b) F between 2000-02 (c) F between 1998 and 2001.*

Executive summary of the status of the skipjack tuna resource

(As adopted by the IOTC Scientific Committee on 9 November 2007)

BIOLOGY

Skipjack tuna (*Katsuwonus pelamis*) is a cosmopolitan species found in the tropical and subtropical waters of the three oceans. It generally forms large schools, often in association with other tunas of similar size such as juveniles of yellowfin and bigeye.

Skipjack exhibits characteristics that result in a higher productivity when compared to other tuna species. Preliminary tagging recoveries of the RTTP-IO show that skipjack is exploited for at least 4 to 5 years in the Indian ocean. This species has a high fecundity, and spawns opportunistically throughout the year in the whole inter-equatorial Indian Ocean (north of 20°S, with surface temperature greater than 24°C) when conditions are favourable. The size at first maturity is about 41-43 cm for both males and females (and as such most of the skipjack taken by the fisheries are fish that have already reproduced).

Little is known about the growth of skipjack, and no new information or document on biology were presented at the working party. It is still a priority to gain more knowledge on the skipjack time-and-space variability in growth patterns.

The tag recoveries from the RTTP-IO provide evidence of rapid, large scale movements of skipjack tuna in the Indian Ocean, thus supporting the current assumption of a single stock for the Indian Ocean. The new information on the spatial distribution of tagged fish compared with the spatial extent of the purse seine fishery is presented in Figures 1 and 2.

Because of the above characteristics, skipjack tuna stocks are considered to be resilient and not prone to overfishing.

FISHERIES

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 2002 to 2006 was 514,100 t (Figure 3 and Table 1). Preliminary data indicate that catches in 2006 may have been the highest reported in the history of the fishery 596,200 t).

It should be noted that an important amount of the skipjack catch (an average of 75,000 t since 2000) is estimated from data (mainly from some artisanal fisheries) which do not identify the species in the catch. Figure 4 illustrates the evolution of the importance of the catch which has to be disaggregated.

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 3). In general, there is low inter-annual variability in the catches taken in the Indian Ocean compared to those taken in other oceans.

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. Catch rates by purse seiners show an increasing trend in two of the three main fishing areas (Figure 5) possibly due to an increase in fishing power and to an increase in the number of FADs (and the technology associated with them) in the fishery.

The Maldivian fishery has effectively increased its fishing effort with the mechanisation of its pole and line fishery since 1974, 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 (Figure 6).

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.

The average weight of skipjack caught in the Indian Ocean is 2.8 kg for purse-seine (2000-2005 average), 3.0 kg for the Maldivian baitboats and 4-5 kg for the gillnet (Figure 7). For all fisheries combined, it fluctuates between 3.0-3.5 kg; this is larger than in the Atlantic, but smaller than in the Pacific.

AVAILABILITY OF INFORMATION FOR STOCK ASSESSMENT

During its last assessment in 2003, the WPTT analyzed the information available and considered that the uncertainties in the information were too large to conduct a complete assessment of the Indian Ocean skipjack tuna.

Fishery indicators

As an alternative, the WPTT decided to analyse various fishery indicators to gain a general understanding of the state of the stock. Several of these indicators were updated in 2006.

1. **Trends in catches**: The trend in catches indicate a large and continuous increase in the catches of skipjack tuna since the mid-1980's (Figure 3). This is mainly due to the expansion of the FAD-associated fishery in the western Indian Ocean. There is no sign that the rate of increase in the catches of skipjack is diminishing.
2. **Nominal CPUE Trends:** Figure 5 shows the catch and nominal CPUE trends of the purse seine fishery for three major skipjack fishing areas: East-Somalia, North-West Seychelles and Mozambique Channel. In the Somalia and North-West Seychelles areas, catches have been variable but generally increasing. In each of these areas, despite some inter annual variation, the current nominal CPUE's are around the same as those of the early 1990's. Since this is a period during which it is believed that effective purse-seine effort has increased substantially (increase of efficiency), it is likely that the true abundance in these areas has decreased. In itself, this is not unexpected given the large increase in catches over that period. However, as these areas may be source of skipjack recruitment to the Maldives artisanal fishery, there is a potential for interactions to occur between these fisheries.
3. **Average weight in the catch by fisheries:** The Working Party noted that the average weights of the skipjack taken from various areas and gears have remained relatively stable since 1991 (Figure 8). Figure 7 shows catches at size expressed as average weight from the major gears, purse seine, baitboat and gillnet and others, as well as the mean weight for the total catch. The purse seine and the baitboat fisheries take the greatest catch around 40-65 cm while catches taken from gillnet fisheries ranges from 70-80 cm.
4. **Number of 1 CWP squares visited or fished:** This indicator (Figure 9) reflects the spatial extension of a fishery. Trends observed in the number of CWP with effort or catch since 1991 suggest that the area exploited by the purse-seine fishery has changed little since 1991, apart in 1998 when a particularly strong El Niño episode resulted in a much wider spatial distribution of the fishery.

Length-based analyses

The WPTT did not develop a formal stock assessment for skipjack tuna. However, a length-based cohort analysis was carried during the meeting to analyze skipjack catches and length frequencies (Figure 10). In the 1980's, there was a marked increase of catches of smaller size fish (40-60 cm) due to the development of the purse seine fishery. The largest mode (60 cm+) reflects the artisanal fisheries (mainly the Maldives's pole-and-line one). The marked increase in the catch of large skipjack (60-70 cm) since 2000 is reflected for most gears by marked increase of the mean weight of their catches (Figure 7).

The patterns of mean fishing mortality by fish for four 5 years periods (Figure 11) illustrate the evolution of the fishery and highlight the increased mortality due to the purse seine and the artisanal fisheries in the recent period.

Interaction between skipjack fisheries and other species

Purse seiners catch 40-60 cm skipjack whereas artisanal fisheries catch 60-70 cm fish, thus the fishing pressure applied by purse seiners on smaller size skipjack is likely to affect the catches of larger sized skipjack by the artisanal fisheries. Furthermore, large numbers of juvenile bigeye and yellowfin tuna are caught in the course of purse-seine sets on FADs that target skipjack tuna.

Managers need to be aware that such interactions between fleets, gears and species have the potential to cause competition and conflict and may affect the efficacy of management measures aimed at particular fleets or gears in isolation. For example, the western Indian Ocean purse-seine fishery for small skipjack versus the Maldivian baitboat fishery for larger skipjack; and the purse seine fishery for skipjack which catches juvenile bigeye versus the bigeye longline fishery; the purse seine catch of juvenile yellowfin on FADs versus their catch of large free school yellowfin). Such interactions have to be taken in account when management decisions are considered.

STOCK ASSESSMENT

No quantitative stock assessment is currently available for skipjack tuna in the Indian Ocean. The range of stock indicators available to the Scientific Committee does not signal that there are any problems in the fishery currently.

The Scientific Committee also notes that in most fisheries, declining catches combined with increasing effort are usually indicators that a stock is being exploited close or above its MSY. In the case of skipjack tuna, catches have continued to increase as effort increased. This is illustrated in the trend of yearly skipjack catches of the Indian Ocean using Relative Rate of Catch Increase (RRCI), a modified version of the Grainger and Garcia index (Figure 12). Furthermore, the majority of the catch comes from fish that are sexually mature (greater than 40 cm) and therefore likely to have already reproduced.

The SC noted that, although there might be no reason for immediate concern, it is clear that the catches cannot be increased at the current rate indefinitely. Therefore, it recommends that skipjack be monitored regularly.

MANAGEMENT ADVICE

The high productivity life history characteristics of skipjack tuna suggest this species is resilient and not prone to overfishing, and the stock status indicators indicate that there is no need for immediate concern about the status of skipjack tuna.

SKIPJACK TUNA SUMMARY

Maximum Sustainable Yield:	unknown
Preliminary catch in 2006 *(data as of October 2007)*	596,000 t
Catch in 2005	529,600 t
Mean catch over the last 5 years (2002-06)	514,100 t
Current Replacement Yield:	-
Relative Biomass (B_{cur}/B_{MSY}):	unknown
Relative Fishing Mortality (F_{cur}/F_{MSY}):	unknown

Note: This Executive Summary has been updated to take account of recent catch data. The management advice, and stock assessment results are based on data up to 2002.

Table 1. *Best scientific estimates of the catches of skipjack tuna (as adopted by the IOTC Scientific Committee) by gear and main fleets for the period 1957-2006 (in thousands of tonnes).Data as of October 2007*

Gear	Fleet	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83
Purse seine	France																									0.2	1.0	9.4
Purse seine	NEI-Other																											0.4
Purse seine	Japan																					0.1	0.9	0.6	0.4	0.1	0.5	0.6
Purse seine	Other Fleets	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.8	2.7	1.5
Purse seine	Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.9	0.6	1.4	2.0	4.2	11.9
Baitboat	Maldives	10.0	10.0	10.0	9.0	8.0	8.0	8.0	8.0	14.1	16.9	18.9	17.5	19.6	27.6	28.0	17.5	19.5	22.5	14.9	18.6	13.7	13.2	17.3	22.2	19.6	15.3	19.3
Baitboat	India	0.2	0.3	0.2	0.4	0.6	0.2	0.4	0.3	0.3	0.2	0.3	0.3	0.3	0.3	0.6	0.6	2.6	0.8	1.0	1.9	1.3	1.7	2.3	2.7	1.7	2.2	2.5
Baitboat	Other Fleets														0.2	0.0	0.4	5.0	10.8	2.1	0.1	0.6	0.8	0.4	0.0	0.2	1.4	1.3
Baitboat	Total	10.2	10.3	10.2	9.4	8.6	8.2	8.4	8.3	14.4	17.1	19.2	17.8	19.9	28.1	28.7	18.4	27.2	34.1	18.0	20.5	15.5	15.7	20.0	24.9	21.5	18.9	23.0
Gillnet	Sri Lanka	1.6	1.7	1.9	2.4	3.0	4.5	6.0	5.8	5.6	6.3	7.1	8.0	8.8	6.9	5.0	8.8	10.5	9.3	7.2	12.7	12.6	14.8	12.3	16.2	18.3	17.9	16.3
Gillnet	Indonesia	1.3	1.4	1.3	1.3	1.7	1.7	1.8	1.9	2.1	2.3	2.2	2.4	2.6	1.9	2.0	3.2	3.5	3.8	5.8	7.6	5.7	5.6	8.4	9.2	9.4	14.1	16.8
Gillnet	Pakistan	1.9	0.9	0.9	1.1	1.0	1.6	2.4	3.4	3.6	4.8	4.7	4.7	4.3	3.9	3.2	3.8	3.0	4.1	4.5	4.2	3.8	2.2	3.8	1.8	2.7	3.4	1.1
Gillnet	Other Fleets	0.3	0.3	0.3	0.6	0.8	0.2	0.5	0.4	0.3	0.3	0.4	0.4	0.4	0.4	0.8	0.8	3.2	1.1	1.3	2.6	1.6	2.1	2.8	0.3	0.3	0.5	0.3
Gillnet	Total	5.1	4.4	4.5	5.5	6.5	8.1	10.7	11.4	11.7	13.8	14.5	15.5	16.0	13.1	10.9	16.6	20.2	18.2	18.8	27.1	23.6	24.7	27.4	27.5	30.7	35.9	34.5
Line	Total	0.7	0.8	0.8	0.9	1.1	1.3	1.7	1.7	1.7	1.9	2.0	2.3	2.5	3.5	3.2	3.7	4.3	4.1	4.6	6.2	5.3	5.1	5.3	6.4	6.8	4.9	5.1
Other gears	Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
All	Total	16.1	15.4	15.5	15.8	16.2	17.6	20.9	21.7	27.8	32.8	35.7	35.7	38.4	44.9	42.9	38.9	51.7	56.5	41.5	53.9	44.6	46.5	53.3	60.3	61.0	63.9	74.5

Gear	Fleet	Av 02/06	Av 57/06	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06
Purse seine	Spain	91.4	27.2	6.4	18.6	19.1	27.9	39.7	63.9	47.9	41.8	46.7	51.3	61.6	69.6	66.3	62.9	58.6	74.3	79.4	68.5	91.3	88.0	64.4	94.3	118.9
Purse seine	France	44.5	18.6	27.3	29.8	36.1	35.6	36.1	43.1	29.0	39.4	45.0	48.2	58.4	48.7	40.1	31.3	30.3	42.7	39.9	36.3	54.4	38.9	38.0	43.2	48.1
Purse seine	Seychelles	38.0	5.2								1.8	0.6					4.9	10.7	15.8	11.6	26.2	29.9	36.8	30.0	46.0	47.5
Purse seine	NEI-Other	21.1	8.4	8.2	8.4	6.4	4.8	7.0	7.9	11.0	10.8	10.8	17.4	24.5	22.3	18.4	24.3	31.2	33.4	40.8	26.4	31.9	27.4	14.0	15.7	16.2
Purse seine	NEI-Ex-Soviet Union	12.7	4.0							0.7		10.1	8.7	8.2	18.4	14.7	11.2	10.2	17.3	19.8	19.2	6.8	24.7	17.8	11.3	2.7
Purse seine	Japan	2.2	3.5	0.7	0.3	0.6	0.9	2.3	3.4	10.9	15.9	31.6	31.3	20.1	16.1	7.0	6.7	5.7	4.6	2.3	1.8	1.9	2.4	1.5	3.1	2.0
Purse seine	Other Fleets	10.9	3.7	3.1	3.2	4.5	10.1	7.9	8.4	8.8	13.1	6.4	7.1	6.3	3.9	2.9	4.9	5.1	10.1	6.0	10.2	22.4		0.1	9.2	22.9
Purse seine	Total	220.7	70.7	45.7	60.4	66.7	79.2	92.9	126.8	108.3	122.8	151.3	163.9	179.2	178.9	149.4	146.3	152.0	198.2	199.9	188.6	238.6	218.3	165.7	222.8	258.3
Baitboat	Maldives	118.6	42.8	32.3	42.2	45.1	42.6	58.2	57.8	60.7	58.3	57.6	58.0	69.0	69.9	66.2	68.1	77.8	92.3	78.8	86.8	113.9	107.5	104.5	130.4	136.7
Baitboat	India	2.9	2.7	3.2	3.1	4.0	5.4	4.7	5.9	5.4	5.6	5.9	12.7	6.8	6.9	7.2	7.8	2.0	2.3	4.6	2.7	3.2	3.1	4.0	0.4	4.0
Baitboat	Other Fleets		0.7	1.0	1.0	1.1	1.3	1.2	1.3	1.2	1.3	1.3	1.4	0.1	0.5											
Baitboat	Total	121.6	46.3	36.5	46.3	50.1	49.4	64.2	65.0	67.3	65.2	64.8	72.1	75.8	77.3	73.4	75.9	79.8	94.5	83.4	89.5	117.0	110.6	108.5	130.9	140.7
Gillnet	Iran, Islamic Republic	58.2	7.6						0.3	0.8	1.1	4.3	4.4	7.4	1.1	2.5	8.3	4.7	13.9	18.5	23.2	23.1	36.0	53.6	79.4	98.8
Gillnet	Sri Lanka	56.4	23.2	13.3	14.8	14.5	15.3	15.8	17.3	20.4	23.1	27.0	31.5	38.8	40.5	47.2	56.0	56.8	72.4	73.1	68.3	74.1	70.0	70.0	34.0	33.8
Gillnet	Indonesia	45.8	18.0	14.5	16.0	15.2	18.9	19.7	23.4	20.6	22.1	23.5	28.4	30.7	29.5	40.9	48.8	45.2	47.1	46.8	56.3	36.7	38.1	52.4	50.9	50.9
Gillnet	Pakistan	3.5	3.8	1.2	2.0	1.5	3.7	5.6	7.5	7.6	7.5	6.1	6.9	8.1	7.1	4.4	4.6	4.5	4.8	4.6	3.6	3.3	3.2	3.5	3.8	3.8
Gillnet	Other Fleets	0.9	0.9	0.5	0.5	0.5	0.6	0.6	0.9	0.9	0.6	0.7	1.2	1.3	1.6	1.2	1.9	0.6	0.7	0.9	0.4	0.5	0.6	0.8	1.1	1.4
Gillnet	Total	164.7	53.4	29.6	33.4	31.9	38.5	41.7	49.5	50.4	54.4	61.6	72.3	86.3	79.8	96.1	119.6	111.9	139.0	143.9	151.7	137.6	147.9	180.2	169.2	188.7
Line	Total	6.5	4.6	4.7	4.6	4.7	5.0	5.2	8.1	7.9	7.9	12.2	9.2	5.7	5.9	5.6	5.6	5.0	3.5	3.9	4.0	4.8	4.0	9.5	6.2	8.0
Other gears	Total	0.6	0.1	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.2	1.2	0.5	0.6	0.5
All	Total	514.1	175.1	116.5	144.6	153.4	172.1	204.0	249.5	234.0	250.3	290.0	317.8	347.1	342.1	324.5	347.4	348.8	435.4	431.2	433.8	498.2	482.0	464.5	529.6	596.2

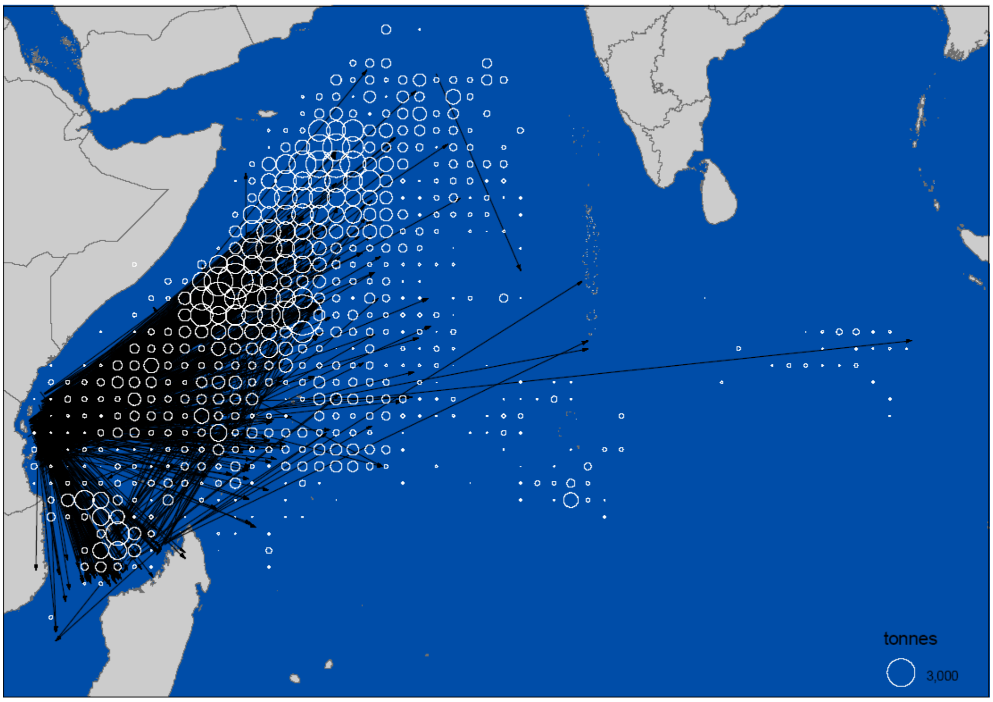


Figure 1. *Tag recapture trajectories for skipjack tuna tagged in the south west Indian Ocean by the RTTP-IO and location of purse seine fishing in 2006. The reference circle represents 3000 t.*

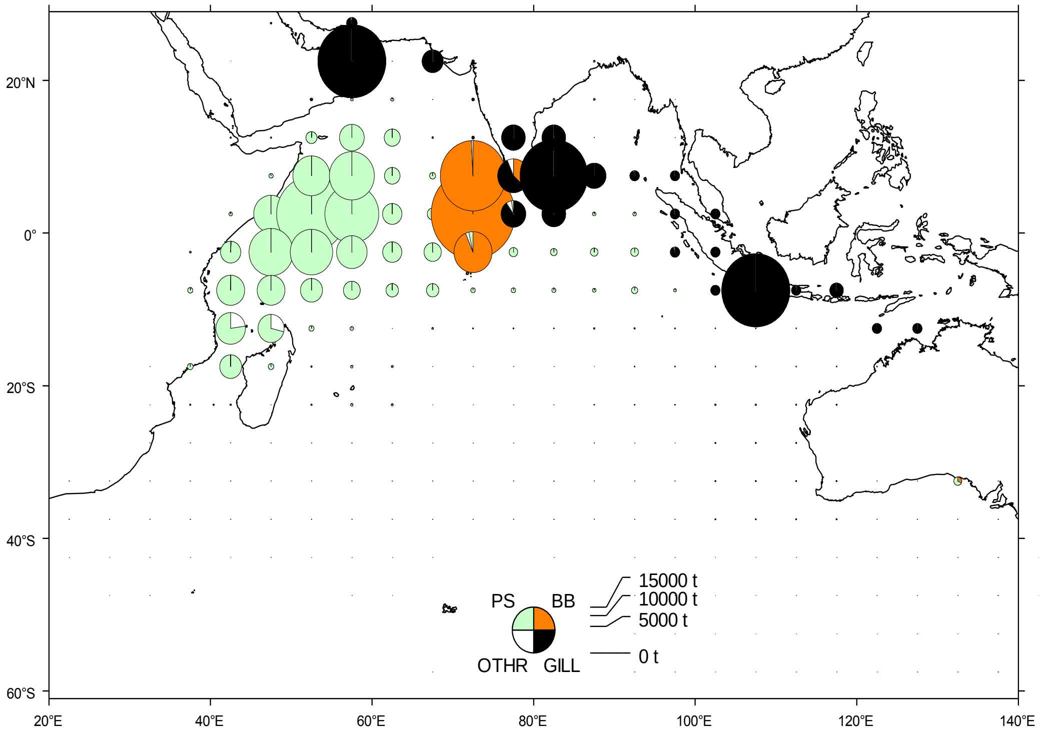


Figure 2. *Mean spatial distribution of skipjack tuna catches in the Indian Ocean by gear type, 2000-2006. BB = bait boat (pole and line); GILL = gillnet; LL = longline; PS = purse seine.* *Data as of October 2007*

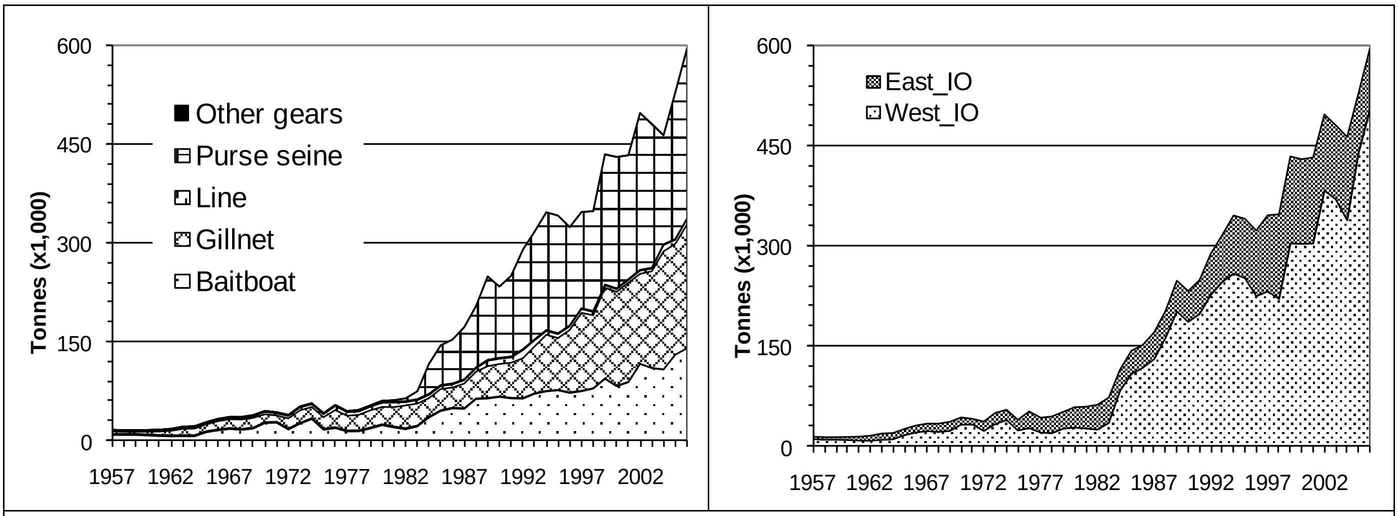


Figure 3. *Yearly catches (thousand of metric tonnes) of skipjack tuna by gear (left) and by area (Eastern and Western Indian Ocean, top right) from 1957 to 2006. Data as of October 2007*

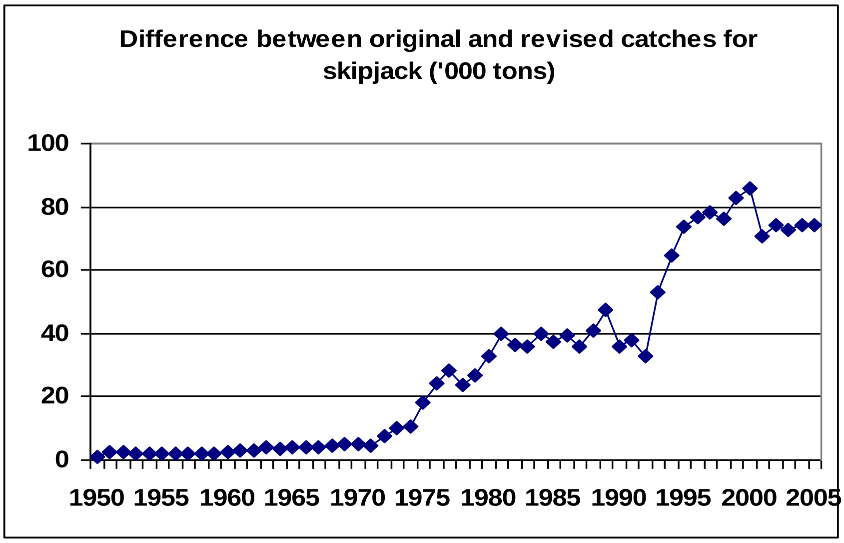


Figure 4. *Total amount of the skipjack catches estimated from aggregated data*

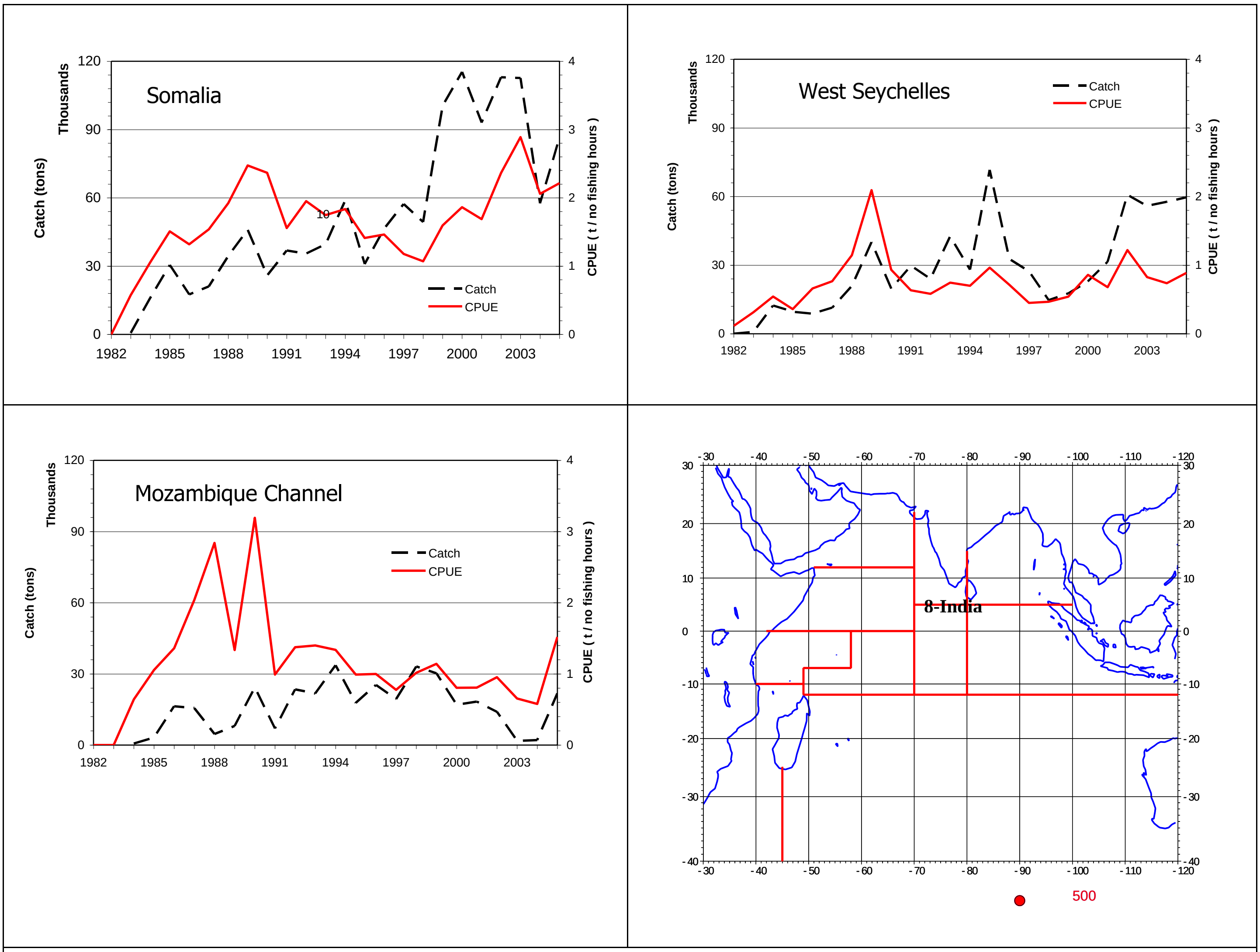


Figure 5. *Nominal CPUEs for three important purse seine fishing ground areas: East Somalia (top left); Mozambique Channel (top right) and North-West Seychelles (bottom left).*
Areas used for the calculation of the CPUE trends are represented (bottom right). Data as of July 2006

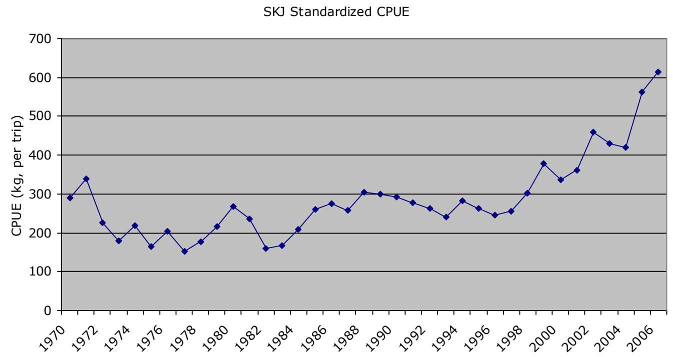


Figure 6. *Time series of CPUE, nominal and adjusted effort of the Maldivian baitboats fishery, 1970-2002 (from IOTC-2007-WPTT-R).*

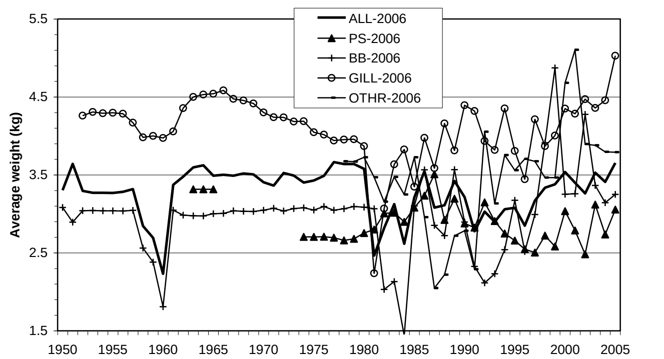


Figure 7. *Skipjack tuna average weight by main gear (from size-frequency data) and for the whole fishery (estimated from the total catch at size), 1950-2006.* Data as of June 2007

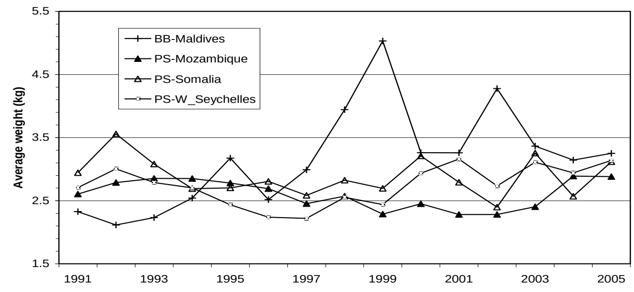


Figure 8. *Time series of average weight of skipjack caught by the purse seine and baitboat fisheries by major areas. (1991-2005).* Data as of June 2006

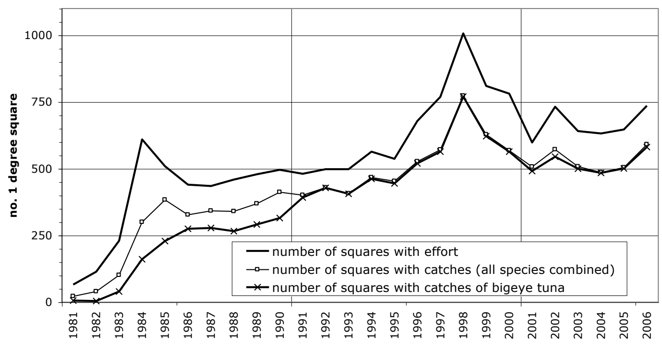


Figure 9. *Number of one degree CWP squares explored by the purse seine fishery (IOTC-2007-WPTT-R)*

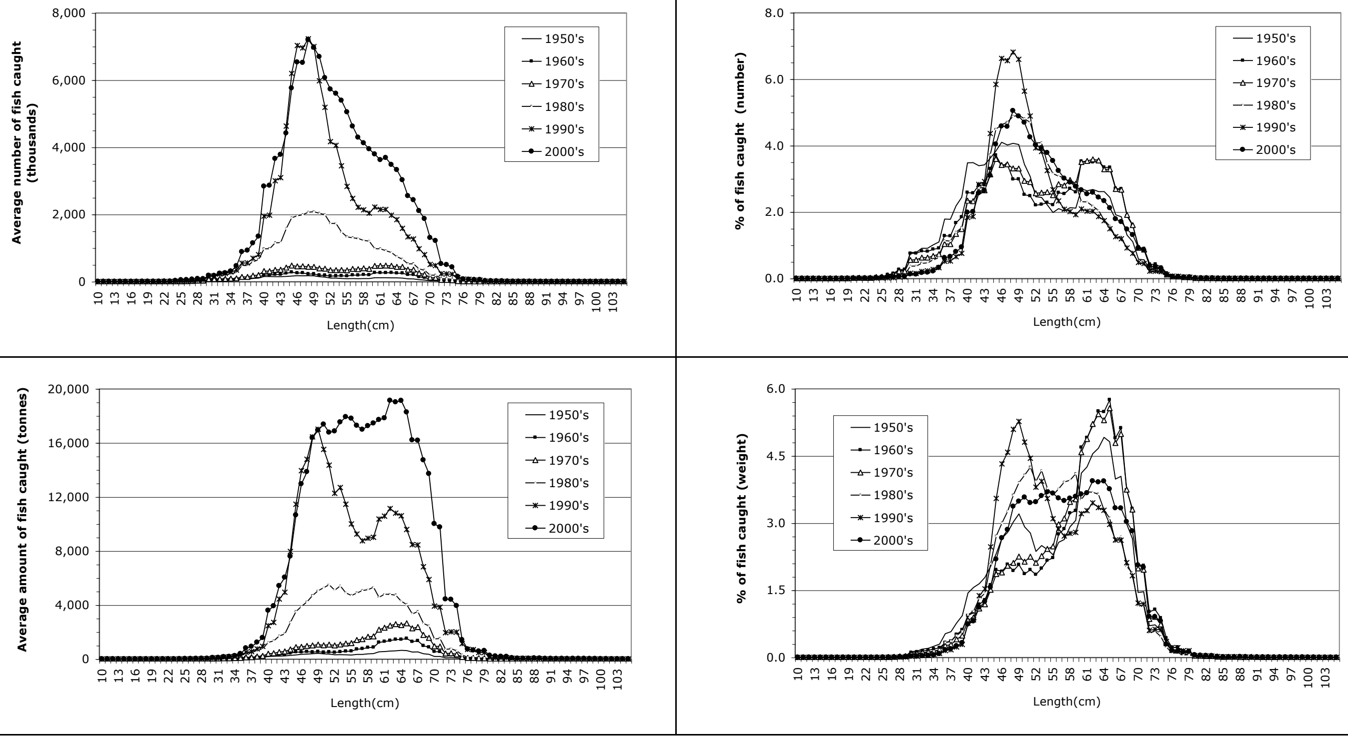


Figure 10. *Catch by size in numbers (top left) and weight (bottomleft) for the periods: 1950-59, 1960-69, 1970-79, 1980-89, 1990-99 and 2000-2005. Right panels are in proportions.* Data as of June 2007

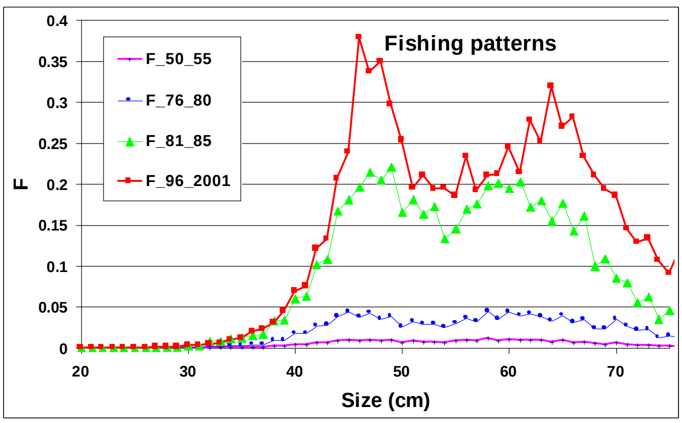


Figure 11. *Estimated mean fishing mortality by size for four periods: 1950-55, 1976-80, 1981-85, and 1996-2001.*

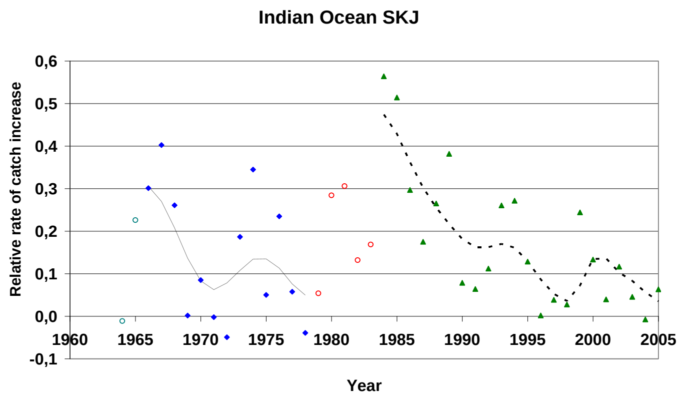


Figure 12. *Relative Rate of Catch Increase (RRCI) for skipjack, 1960-2005)*

Executive summary of the status of the yellowfin tuna resource

(As adopted by the IOTC Scientific Committee on 9 November 2007)

BIOLOGY

Yellowfin tuna *(Thunnus albacares)* is a cosmopolitan species distributed mainly in the tropical and subtropical oceanic waters of the three major oceans, where it forms large schools. The sizes exploited in the Indian Ocean range from 30 cm to 180 cm fork length. Smaller fish (juveniles) form mixed schools with skipjack and juvenile bigeye tuna and are mainly limited to surface tropical waters, while larger fish are found in surface and sub-surface waters. Intermediate age yellowfin are seldom taken in the industrial fisheries, but are abundant in some artisanal fisheries, mainly in the Arabian Sea.

The tag recoveries of the RTTP-IO provide evidence of large movements of yellowfin tuna, thus supporting the assumption of a single stock for the Indian Ocean. Fisheries data indicate that medium sized yellowfin concentrate for feeding in the Arabian Sea, that dispersion not being yet reflected in the present set of tag recovery data. The new information on the spatial distribution of tagged fish compared with the spatial extent of the purse seine fishery is presented in Figure 1.

Longline catch data indicates that yellowfin are distributed continuously throughout the entire tropical Indian Ocean, but some more detailed analysis of fisheries data suggests that the stock structure may be more complex. A study of stock structure using DNA was unable to detect whether there were subpopulations of yellowfin tuna in the Indian Ocean.

Spawning occurs mainly from December to March in the equatorial area (0-10°S), with the main spawning grounds west of 75°E. Secondary spawning grounds exist off Sri Lanka and the Mozambique Channel and in the eastern Indian Ocean off Australia. Yellowfin size at first maturity has been estimated at around 100 cm, and recruitment occurs predominantly in July. Newly recruited fish are primarily caught by the purse seine fishery on floating objects. Males are predominant in the catches of larger fish at sizes than 150 cm (this is also the case in other oceans).

Preliminary tag data of the RTTP-IO clearly support a two-stanza growth pattern for yellowfin but more work is needed to achieve an appropriate integration of otoliths and tagging data and agree on a growth model to be used in the assessment of this stock.

There are no direct estimates of natural mortality (M) for yellowfin in the Indian Ocean. In stock assessments, new estimates of M at length based on those from other oceans have been used. These were then converted to estimates of M at age using two growth curve models. This indicated a higher M on juvenile fish than for older fish.

There is little information on yellowfin movement patterns in the Indian Ocean, and what information there is comes from analysis of fishery data, which can produce biased results because of their uneven coverage. However, there is good evidence that medium sized yellowfin concentrate for feeding in the Arabian Sea. Feeding behaviour is largely opportunistic, with a variety of prey species being consumed, including large concentrations of crustacea that have occurred recently in the tropical areas and small mesopelagic fishes which are abundant in the Arabian Sea.

FISHERY

Catches by area, gear, country and year from 1957 to 2006 are shown in Table 1 and illustrated in Figure 2. 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.

The geographical distribution of yellowfin tuna catches in the Indian Ocean in recent years by the main gear types is shown in Figure 3. 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 (Figure 4) and smaller fish are more common in the catches taken north of the equator (Figure 5). Catches of yellowfin increased rapidly to around 128,000 t in 1993. Subsequently, they fluctuated around that level, until 2003 and 2004 when they were substantially higher (224,100 t and 233,800 t, respectively). In recent years, catches appear to be higher in the first quarter of the year (Figure 6). The amount of effort exerted by the EU purse seine vessels (fishing for yellowfin and other tunas) varies seasonally and from year to year. Since 2000 between 800 and 1200 boat days per month were fished annually (Figure 7).

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 mixed or pure 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 (Figure 4), 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 and bigeye 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). The total longline catch of yellowfin reached a maximum in 1993 (196,000 t). Since then, catches have typically fluctuated between 80,000 t and 123,000 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 catch has been around 130,000-140,000 t, with the catch by gillnets (the dominant artisanal gear) at around 80,000 t to 90,000 t.

Yellowfin 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 catch, mostly from the western Indian Oceana 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 for the period January to August 2007 were much lower i.e. 61,329 t and similar to the levels last experienced in 1999.

Yellowfin catches in number by gear (purse seine, longline and bait boat) are reported in Figure 8. Current estimates of annual mean weights of yellowfin caught by different gears and by the whole fishery are shown in Figure 9. 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 and 2004; where most of the very large catches were obtained from fish of larger sizes.

AVAILABILITY OF INFORMATION FOR ASSESSMENT PURPOSES

The reliability of the estimates of the total catch has continued to improve over the past few years, and the Secretariat has conducted several reviews of the nominal catch databases in recent years. This has led to marked increases in estimated catches of yellowfin tuna since the early 1970s. In particular, the estimated catches for the Yemen artisanal fishery have been revised upwards sharply, based on new information, but they still remain highly uncertain..

Estimates of annual catches at size for yellowfin were calculated using the best available information prior to the 2007 WPTT meeting. A number of papers dealing with fisheries data, biology, CPUE trends and assessments were discussed by the WPTT in 2007, and additional data analyses were performed during that meeting. Estimated catches at age were calculated using the catch-at-size data and three alternative growth curves. The growth curves were used to develop natural mortality at age, maturity at age and average weight at age schedules. M was assumed to be higher on juvenile than adult fish.

In 2007 a new standardised Japanese longline CPUE for yellowfin tuna (1968 to 2005) was derived for an area combining, area 3 north of 30°S, area 2 and area 5. The CPUE indices are variable from year to year but generally decline steeply from 1960 until the late 1970's. From the late 1970's to the early 1990's the index is relatively stable. From the mid 1990's to 2005 the index is at lower levels than previously, but again relatively stable (Figure 10).

A new standardised CPUE for yellowfin tuna caught in the Taiwanese longline fishery (1968 to 2005) was also developed in 2007. Overall, the indices have been variable from year to year, but relatively stable since the late 1970s. The catch rate has shown a slowly increasing trend since 1997 (Figure 10).

Since the early 1990's the Taiwanese fleet has concentrated its operation in the Arabian Sea area whereas the Japanese fleet has operated more in the central and western Indian Ocean. It appears that the the Japanese and Taiwanese longline fisheries are now spatially distinct and both indices of abundance need to be viewed and modelled separately.

STOCK ASSESSMENT

Four stock assessment models were applied to the Indian Ocean yellowfin tuna stock in July 2007; however, there remained strong uncertainties in each of the assessments conducted. In particular, none of the assessments were able to consistently explain the trends in standardized CPUEs in the early years of the fishery without using trends in catchabilities or recruitment for which there is no evidence. Also, the trends observed in recent years were not fully consistent with those of total catches and the models had great difficulty at combining these contradictory sources of information. Several scientists and the Secretariat were assigned to attempt a number of extended analyses to assist the deliberations of the Scientific Committee on the management advice for this stock.

The ASPM and SS2 assessment models were re-run using new catch at size and catch at age data based on the new growth equation generated by tag data from the RTTP-IO; revised Taiwanese CPUE in the whole sub-areas; and the newly-defined tropical CPUE series for the Japanese longline fleet. The two assessments also used the previous catch at size (CAS) and catch at age (CAA) inputs to compare the results with those based of the new CAS and CAA matrices. Both models showed that using the new CAS/CAA set produced more optimistic results (larger population sizes) due to the faster growing curve leading to relatively large discrepancies in weights in older ages between the new and the previous growth equations

Both the ASPM and SS2 models produced similar estimates for MSY-related parameters. Other parameters such as the F ratio showed large differences and this may be due to the differences in model structures. The estimates of MSY, SSB (MSY) and F (MSY) were similar in both in ASPM and SS2 and this indicates that fishing levels have exceeded the MSY in recent years probably due to high catches over the period from 2003 to 2005.

EXCEPTIONAL CATCHES DURING 2003, 2004, 2005 AND 2006

Yellowfin catches in the Indian Ocean were very high over the period 2003 to 2006 (Figure 2). Preliminary figures indicate that the total catch of yellowfin in 2007 is going to be lower than in the last four years. The catches in each of the years over the period 2003-2006 were over 30 % higher than the average annual catch taken in the previous five years (343,400 t), and were, except for 2006, substantially greater than the previous high in 1993 (407,000 t). These anomalous catches occurred all over the western Indian Ocean, in particular in a small area off eastern Africa, although the anomaly extended over a much wider area, from the Arabian Sea to South Africa, in both industrial (purse seine on free-swimming schools and longline) and artisanal fisheries. The fish caught were of large sizes (100-150 cm FL).The Scientific Committee discussed two possible hypotheses explaining the observed high catches, noting that it is possible that a combination of factors was responsible for this event. There are two main categories of factors:

Increase in the biomass of the population:

According to this hypothesis, there may have been several large recruitments to the population in the late 1990's or early 2000's that could have been responsible for the large increase in yellowfin catches. In these years, environmental conditions favourable to good recruitment may have occurred in the Indian Ocean. But recruitment is not the only process by which the biomass could increase. Additional explanations could be reduced natural mortality during some critical life stage and/or increased growth rates related to favourable environmental conditions.

The Scientific Committee noted there is no evidence from existing data of unusually large numbers of small fish being caught in the surface fisheries in the early 2000's. This could indicate that either the juveniles from these large cohorts were present, but outside the normal purse seine fishing grounds (e.g. in the eastern Indian Ocean), or that the recent cohorts were only at average levels.

An increase in catchability due to a concentration of the resource and/or an increase in the fishing efficiency

It is also possible that during 2003, 2004 and 2005, the catchability of large yellowfin tuna had increased. Possible factors that could have caused this include aggregation of large yellowfin tuna over a relatively small area and/or depths that made it easier for purse seiners and longliners to catch them in large quantities and technological improvements on purse-seiners that could have the schools more vulnerable to fishing. No technological improvements have been reported for industrial longliners during this period.

While these factors might explain the high catches of industrial fisheries in a small area off eastern Africa, there are also reports of exceptionally high catches by the commercial and artisanal fisheries from Yemen, Oman, Iran, South Africa and Maldives.

Large concentrations of the shallow water crustacean *Natosquilla investigatoris* and swimming crabs, were reported to have occurred in 2003 and 2004 in the western Indian Ocean, and yellowfin tuna were observed feeding voraciously on them. New information on anomalies in the thermocline depth and primary productivity in 2003 also supported the hypothesis that there may have been an increased catchability due in some part to environmental factors.

By the end of 2002, most purse seine vessels had new sonar equipment installed. These devices potentially enable skippers to locate schools at distances up to 5 km, both night and day. This could make schools more vulnerable to fishing, and catches could be expected to increase. However, there is no indication of similar increases in efficiency in the Atlantic Ocean, where vessels were also fitted with the same equipment. In addition, higher catches also occurred in artisanal and longline fisheries for which there is no indication of recent technological advances.

MANAGEMENT ADVICE

Despite the major differences in outputs between the models presented in 2007, both in July and intersessionally, the estimates of MSY are similar. Acknowledging the uncertainties in the results, the models indicate that fishing levels have exceeded MSY in recent years.

In interpreting the high catches of yellowfin over the period from 2003 to 2006, the 2006 Scientific Committee noted that if the hypothesis of one or two high recruitments entering the adult stock is correct, the increased catches from these year classes are unlikely to be detrimental to the stock, but these catches would not be sustainable in the longer term unless supported by continued high recruitments. On the other hand, there could be serious consequences if the hypothesis that there was an increased catchability during this time is correct. In this case, the very large catches would represent a much higher fishing mortality and certainly would not be sustainable. Furthermore, they could lead to a sudden decline of the existing adult biomass of yellowfin tuna, potentially reducing the stock to below MSY levels.

The WPTT does not have any clear indication whether or not high recruitments did occur in the stock. On the other hand, direct observations confirm that the biological productivity in the Indian Ocean was enhanced in 2003-2004 and that a shallow thermocline prevailed in the West Indian Ocean over the period from 2001-2005. These factors could have led to higher concentration of tuna in the western part of the Indian Ocean. Therefore, the increased catchability hypothesis leading to a high fishing mortality is more likely.

Considering all the stock indicators and assessments presented this year, as well as the recent trends in fishing effort and total catches of yellowfin, the WPTT note that:

1) Recent yellowfin tuna catches are most likely above the MSY level - although there are still uncertainties on the exact level of this difference. Considering the precautionary principle, catch should be decreased to pre-2003 levels and fishing capacity should not exceed the current level.

2) The current fishing pressure on juvenile yellowfin by both purse seiners fishing on floating objects and artisanal fisheries is likely to be detrimental to the stock if it continues, as fish of these sizes are well below the optimum size for maximum yield per recruit estimated in 2002.

3) Juvenile yellowfin tuna are caught in the purse-seine fishery that targets primarily skipjack tuna. Some measures to reduce the catches of juvenile yellowfin tuna in the FAD fishery will be accompanied by a decrease in the catches of skipjack tuna.

YELLOWFIN TUNA SUMMARY

Maximum Sustainable Yield (2007):	The results from 2007 assessment results ranged from (271,000 t – 360,000 t)
Preliminary catch in 2006 *(data as of October 2007)*	493,300 t
Catch in 2005	478,900 t
Mean catch over five years before 2003 (1998 – 2002)	343,400 t
Current Replacement Yield	-
Relative Biomass $B_{current}/ B_{MSY}$	uncertain
Relative Fishing Mortality $F_{current}/_{FMSY}$	uncertain

Note: This Executive Summary has been updated to take account of recent catch data. The management advice, and stock assessment results are based on data up to 2005.

Table 1. *Best scientific estimates of the catches of yellowfin tuna (as adopted by the IOTC Scientific Committee) by gear and main fleets for the period 1957 to 2006.* Data as of October 2007

Gear	Fleet	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83
Purse seine	France																									0.2	1.0	10.5
Purse seine	NEI-Other																											0.7
Purse seine	Other Fleets							0.0	0.0	0.0					0.0		0.0		0.0	0.0		0.0	0.2	0.1	0.1	0.1	0.1	1.5
Purse seine	Total							0.0	0.0	0.0					0.0		0.0		0.0	0.0		0.0	0.2	0.1	0.1	0.3	1.2	12.6
Baitboat	Maldives	2.0	2.0	2.0	1.0	1.5	1.5	1.5	1.5	1.0	1.5	1.7	1.7	1.8	2.3	1.4	2.5	6.9	5.0	4.6	5.2	4.9	3.8	4.4	4.4	5.6	4.5	7.7
Baitboat	Other Fleets	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.7	1.3	0.3	0.1	0.1	0.1	0.2	0.3	0.5	0.3	0.1
Baitboat	Total	2.0	2.0	2.0	1.0	1.5	1.5	1.5	1.5	1.0	1.5	1.7	1.7	1.8	2.3	1.4	2.6	7.6	6.3	4.8	5.4	5.0	3.9	4.6	4.7	6.1	4.9	7.8
Longline	Taiwan,China	1.3	1.8	2.4	2.2	2.9	3.5	3.4	2.9	2.2	4.4	3.4	22.7	21.1	14.9	11.9	11.8	5.7	4.4	4.6	3.4	8.1	4.2	3.7	3.8	4.1	4.7	5.6
Longline	Japan	31.9	22.6	22.2	36.1	32.7	44.2	22.0	22.2	24.9	40.8	30.2	48.3	23.1	10.3	13.4	7.9	3.9	4.9	6.4	2.8	2.1	4.6	3.3	3.2	4.9	7.3	7.8
Longline	Indonesia																	0.1	0.3	0.7	1.0	1.3	1.3	1.4	2.1	2.6	2.7	0.8
Longline	Korea, Republic of									0.1	0.1	0.4	5.3	9.2	5.2	7.4	10.3	10.8	13.2	13.4	13.7	33.1	26.6	18.0	13.2	12.4	19.4	16.2
Longline	Other Fleets								0.3	0.5	0.5	0.1	2.4	0.6	1.9	1.6	1.5	1.2	0.7	0.2	1.1	0.9	0.2	0.4	0.5	0.4	0.4	0.7
Longline	Total	33.1	24.5	24.6	38.3	35.6	47.7	25.4	25.3	27.7	45.7	34.0	78.6	54.0	32.4	34.4	31.5	21.7	23.5	25.4	21.9	45.4	37.0	26.9	22.8	24.4	34.5	31.1
Gillnet	Sri Lanka	1.0	1.1	1.2	1.5	1.8	2.7	3.6	3.5	3.3	3.7	4.1	4.6	5.1	4.0	2.9	4.5	5.4	4.8	3.9	7.0	6.4	6.9	7.6	8.4	9.6	9.5	9.1
Gillnet	Oman	0.5	0.5	0.7	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.9	2.9	3.4	3.8	4.0	4.4	4.1	5.0	4.8	3.5	1.6
Gillnet	Pakistan	1.4	0.7	0.7	0.9	0.8	1.2	1.8	2.5	2.7	3.6	3.5	3.5	3.2	2.9	2.4	2.8	2.2	3.0	3.4	3.1	2.8	1.6	2.8	1.3	2.0	2.5	0.8
Gillnet	Other Fleets	0.4	0.4	0.4	0.5	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.6	0.6	1.1	1.4	0.9	0.7	1.5	2.0	3.5	4.0	3.1	0.8	2.3	1.6
Gillnet	Total	3.4	2.8	3.0	3.4	3.8	5.1	6.6	7.2	7.3	8.6	9.1	9.6	9.8	8.2	6.6	9.2	10.0	11.6	11.3	15.4	15.2	16.5	18.5	17.8	17.3	17.9	13.1
Line	Yemen	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.2	0.2	0.3	0.3	0.7	0.8	0.9	1.0	1.0	1.0	1.1	0.8	0.8	1.5
Line	Comoros														0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Line	Maldives														0.3	0.2	0.2	0.3	0.3	0.3	0.5	0.4	0.5	0.7	0.7	0.7	0.3	0.3
Line	Other Fleets	0.5	0.5	0.5	0.7	0.9	0.9	1.2	1.4	1.1	1.2	1.4	1.5	1.6	1.2	1.3	1.7	2.6	1.8	1.6	2.3	5.0	3.8	3.4	3.7	3.7	4.3	3.2
Line	Total	0.7	0.7	0.8	1.0	1.1	1.1	1.4	1.6	1.3	1.4	1.6	1.7	1.9	1.8	1.8	2.2	3.3	3.0	2.8	3.8	6.6	5.5	5.2	5.6	5.3	5.5	5.3
All	Total	39.3	30.0	30.4	43.7	42.1	55.3	34.9	35.6	37.4	57.3	46.5	91.7	67.4	44.7	44.2	45.6	42.6	44.3	44.3	46.5	72.2	63.1	55.3	51.1	53.4	63.9	69.9

Gear	Fleet	Av02/06	Av57/06	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06
Purse seine	Spain	72.3	22.3	11.5	18.4	20.0	26.3	44.9	41.1	43.7	44.0	37.8	47.8	43.1	65.1	59.4	61.0	38.6	51.9	49.4	47.7	53.4	79.0	80.8	77.5	70.9
Purse seine	France	52.9	19.5	36.7	39.1	43.3	46.8	59.9	38.4	45.3	38.1	45.3	39.5	35.8	39.6	35.6	31.2	22.4	30.8	37.7	34.1	36.4	63.3	63.5	57.2	44.3
Purse seine	Seychelles	32.7	4.2								0.4	0.2					2.8	7.4	9.8	11.6	12.9	16.6	33.3	48.8	36.5	28.1
Purse seine	NEI-Other	17.2	6.9	8.4	9.4	6.3	5.2	7.9	4.5	11.9	11.9	8.1	15.5	19.7	19.3	16.7	21.9	20.3	25.8	27.1	18.9	19.1	24.5	14.8	14.3	13.5
Purse seine	NEI-Ex-Soviet Union	8.1	2.7							0.8		5.2	8.7	5.8	14.6	11.7	9.8	5.3	11.8	10.9	8.9	2.2	15.1	13.8	7.8	1.4
Purse seine	Iran, Islamic Republic	8.0	1.3									2.1	3.4	2.7	4.3	1.6	1.9	3.3	2.5	2.2	2.2	5.0	8.3	11.0	7.3	8.4
Purse seine	Other Fleets	2.8	2.4	1.7	1.8	3.8	5.5	5.9	5.8	6.9	11.0	14.2	13.6	7.2	6.5	4.6	3.5	3.2	2.1	1.3	5.3	6.4	0.7	0.3	3.2	3.4
Purse seine	Total	194.0	59.3	58.2	68.8	73.4	83.8	118.6	89.8	108.7	105.4	112.9	128.4	114.4	149.4	129.7	132.2	100.4	134.8	140.3	130.0	139.0	224.1	233.0	203.7	170.1
Baitboat	Maldives	15.5	6.5	8.2	6.9	6.2	7.4	5.9	5.5	4.9	7.0	8.0	9.3	12.4	11.8	11.5	12.2	13.0	12.6	10.0	11.1	16.3	16.1	14.4	14.9	15.8
Baitboat	Other Fleets	0.8	0.3	0.2	0.4	0.2	0.3	0.2	0.2	0.3	0.4	0.5	0.5	0.4	0.4	0.5	0.5	0.4	0.5	0.6	0.5	0.6	0.6	0.4	2.1	0.4
Baitboat	Total	16.3	6.8	8.4	7.3	6.4	7.7	6.1	5.8	5.2	7.5	8.5	9.8	12.8	12.2	12.0	12.7	13.4	13.1	10.6	11.6	16.9	16.7	14.9	17.0	16.3
Longline	Taiwan,China	43.0	17.4	5.8	7.3	16.2	22.3	22.7	22.4	31.6	30.7	56.0	88.2	34.1	23.1	27.9	18.4	23.4	17.7	17.4	26.9	33.2	29.7	49.8	67.6	34.7
Longline	Japan	18.6	15.1	7.9	9.5	10.7	8.3	9.3	4.6	6.3	4.4	5.7	5.7	9.7	8.0	12.8	15.6	16.8	14.7	15.5	13.9	13.9	17.2	16.0	21.8	24.2
Longline	Indonesia	16.0	7.4	0.8	0.8	0.7	1.3	2.3	3.8	4.6	5.5	9.3	10.8	14.8	16.7	31.8	38.2	35.7	41.7	29.6	28.4	24.2	20.2	15.3	12.0	8.5
Longline	NEI-Deep-freezing	4.0	2.7		0.1	1.1	1.2	3.4	3.2	6.7	5.9	8.9	23.8	9.9	6.9	12.1	5.9	9.8	7.7	6.6	2.2	3.4	2.8	5.7	3.9	4.1
Longline	NEI-Fresh Tuna	3.6	4.4						11.9	16.6	14.4	16.7	16.5	23.7	17.1	17.7	21.2	16.6	14.8	13.3	0.5	0.5	1.0	1.5	5.9	8.8
Longline	Korea, Republic of	2.7	7.1	10.2	12.5	15.5	13.2	14.2	8.7	7.5	3.2	4.4	4.3	4.0	2.7	4.0	4.2	2.6	1.0	2.0	1.5	0.3	2.1	4.1	3.5	3.5
Longline	NEI-Indonesia Fresh Tuna		2.0			0.1		2.7	10.3	12.6	12.9	15.6	12.6	16.3	8.9	3.7	4.0	0.3	0.0							
Longline	Other Fleets	11.0	3.4	0.7	0.3	1.0	0.6	0.4	0.4	0.1	1.9	20.1	33.6	8.0	4.2	3.9	2.0	4.0	6.0	5.6	5.3	4.6	7.6	11.9	19.9	11.0
Longline	Total	98.9	59.6	25.5	30.5	45.2	46.9	54.9	65.2	86.0	78.8	136.7	195.6	120.5	87.6	113.8	109.3	109.3	103.7	90.0	78.8	80.2	80.6	104.4	134.6	94.8
Gillnet	Iran, Islamic Republic	31.2	7.0						1.0	2.3	3.2	12.1	13.3	19.5	22.5	28.5	20.0	18.0	24.3	13.5	18.0	19.0	29.5	39.7	35.8	32.1
Gillnet	Sri Lanka	28.7	11.8	6.4	6.9	7.1	7.4	7.7	8.4	9.6	11.6	13.9	16.6	21.6	19.0	23.8	29.6	29.3	37.1	33.8	28.2	30.3	33.9	33.9	19.6	25.7
Gillnet	Oman	14.8	6.2	4.6	2.3	2.5	5.9	15.6	16.2	14.4	9.0	13.5	11.5	19.2	21.4	11.6	9.9	11.3	7.4	7.1	6.3	5.3	10.3	24.6	15.9	17.9
Gillnet	Pakistan	4.1	3.0	0.9	1.5	2.6	2.4	3.9	8.6	3.3	4.9	3.9	2.6	2.4	2.1	3.3	3.9	3.9	9.4	5.4	4.0	3.3	3.5	3.3	5.3	5.3
Gillnet	Other Fleets	4.0	2.1	1.5	3.5	4.5	3.1	2.7	1.3	1.6	2.2	2.0	2.6	3.0	2.8	3.1	3.4	3.2	3.5	3.7	3.2	3.4	3.5	3.4	4.5	5.3
Gillnet	Total	82.8	30.1	13.4	14.2	16.6	18.9	29.9	35.5	31.2	31.0	45.4	46.7	65.7	67.9	70.3	66.8	65.7	81.8	63.5	59.7	61.3	80.6	104.8	81.1	86.3
Line	Yemen	25.9	6.8	2.3	3.1	3.9	4.6	5.4	6.2	6.9	7.7	8.5	7.6	8.3	13.2	15.0	17.0	19.1	21.1	23.1	25.2	27.2	25.3	31.3	26.4	19.2
Line	Comoros	6.1	2.0	0.2	0.2	0.2	0.2	0.2	3.7	3.7	3.7	5.0	5.0	5.9	5.9	5.8	5.6	5.6	5.4	5.9	5.4	5.8	6.1	6.2	6.2	6.2
Line	Maldives	5.0	0.8	0.3	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.3	0.3	0.2	0.3	0.3	0.3	0.6	0.7	1.6	2.5	4.2	2.5	6.8	5.5	5.8
Line	Other Fleets	3.4	2.5	2.8	3.6	3.4	3.4	3.1	2.8	3.3	3.1	3.2	3.2	3.0	3.1	2.9	2.8	2.2	2.3	2.9	2.9	2.7	2.6	2.7	4.4	4.6
Line	Total	40.3	12.1	5.5	7.1	7.7	8.5	9.0	12.9	14.1	14.7	17.0	16.1	17.4	22.4	24.0	25.7	27.5	29.6	33.5	36.1	40.0	36.5	47.0	42.4	35.8
Other gears	Total	0.1	0.0					0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	0.2	0.2	0.1	0.1
All	Total	432.5	167.9	111.0	127.9	149.3	165.7	218.4	209.1	245.3	237.3	320.5	396.5	330.8	339.5	349.7	346.6	316.2	362.9	337.9	316.1	337.4	438.7	504.2	478.9	403.3

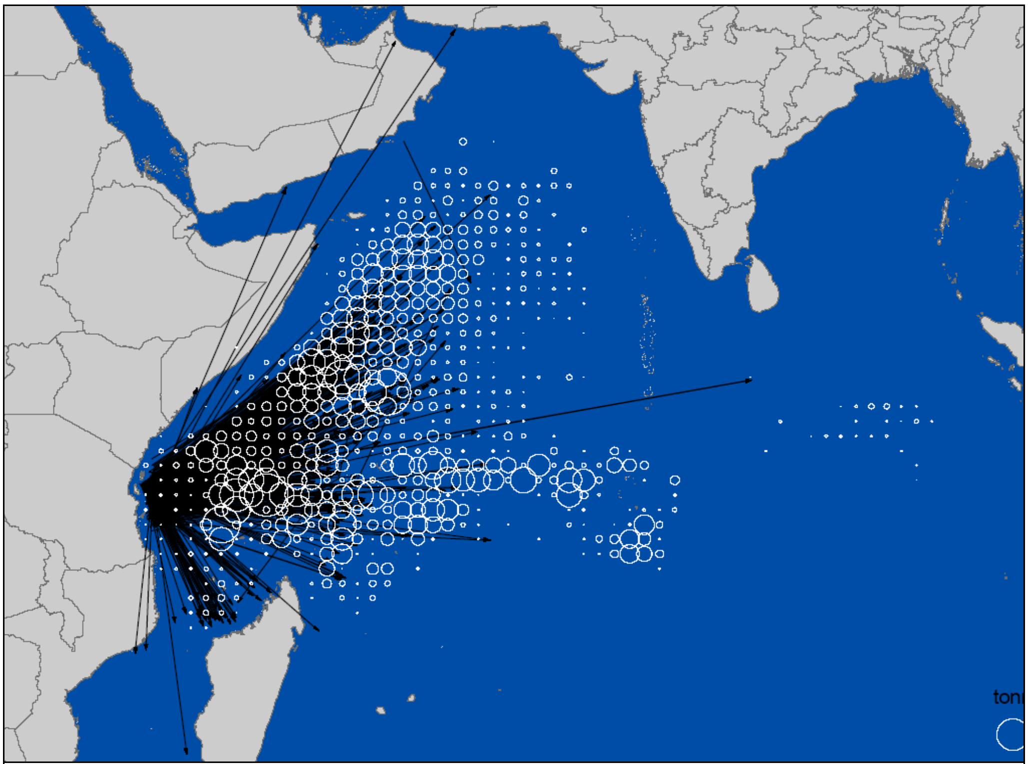


Figure 1. *Tag recapture trajectories for yellowfin tuna tagged in the south west Indian Ocean by the RTTP-IO and location of purse seine fishing in 2006. The reference circle represents 2000 t.*

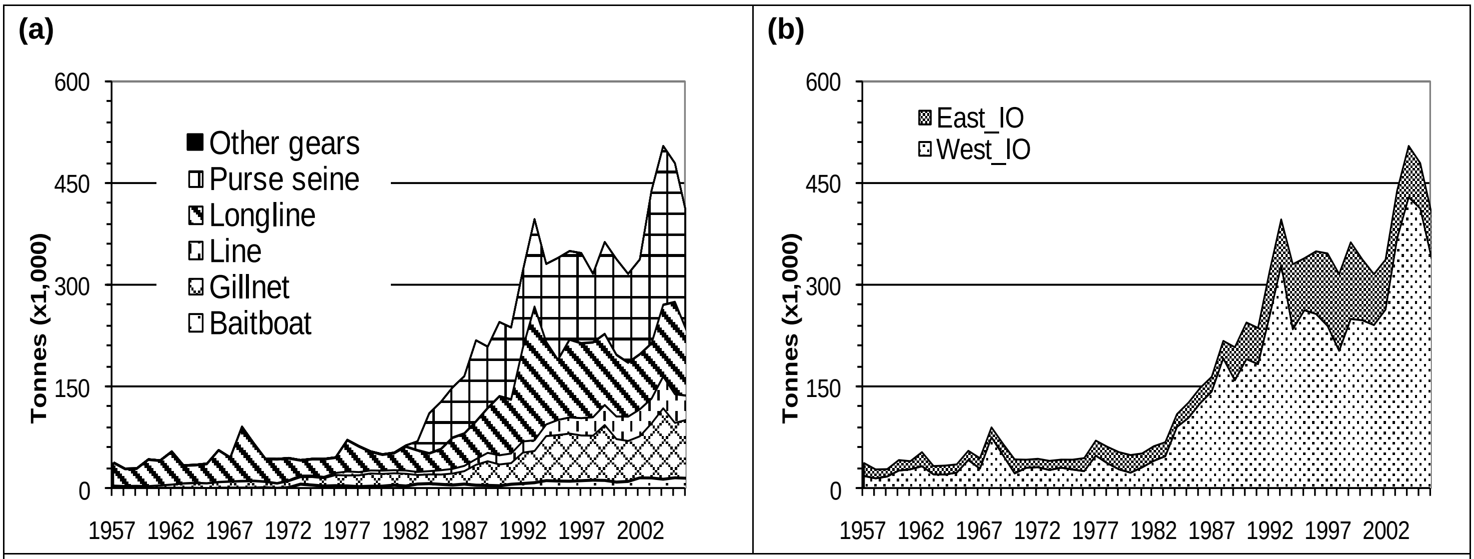
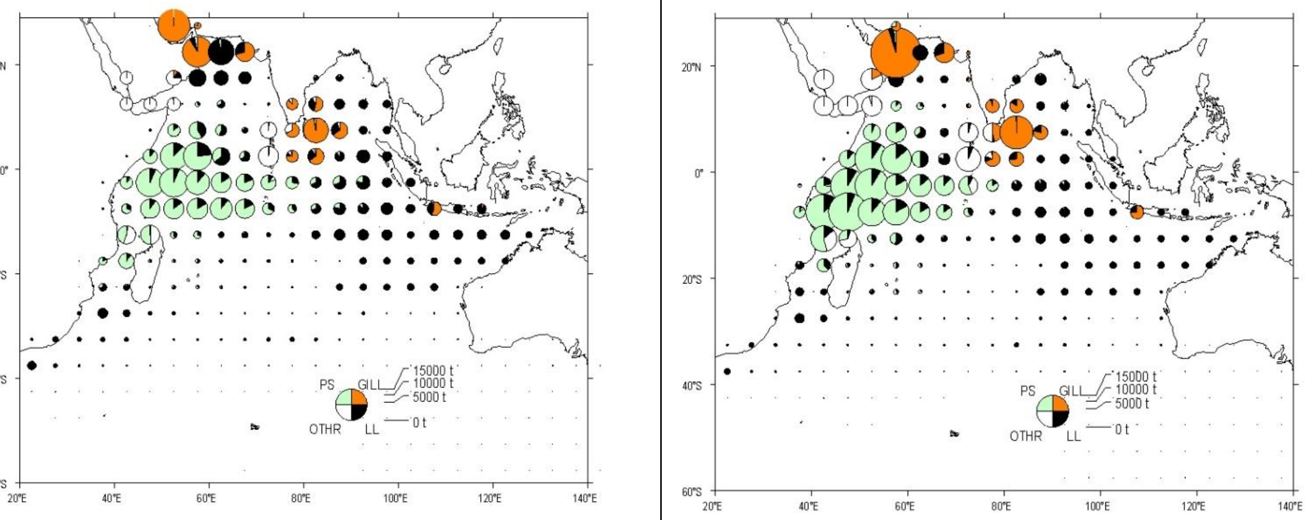


Figure 2. *Yearly catches (tonnes x 1000) of yellowfin by (a) gear and (b) area from 1957 to 2006.*

Data as of October 2007



1990-1999	2000-2006

Figure 3. *Location and size of yellowfin tuna catches in the Indian Ocean by gear type. GILL = gillnet, LL = longline, PS = purse seine.* *Data as of October 2007*

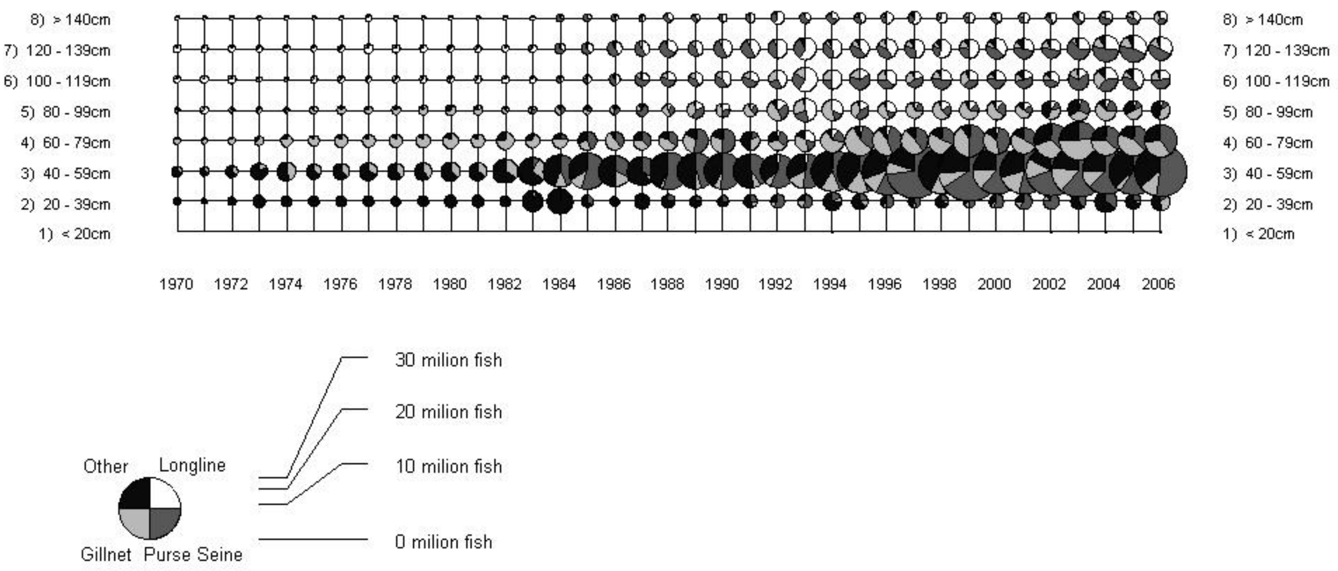


Figure 4. *Yellowfin tuna**:** total catches at size in the Indian Ocean by gear from 1970 to 2006*

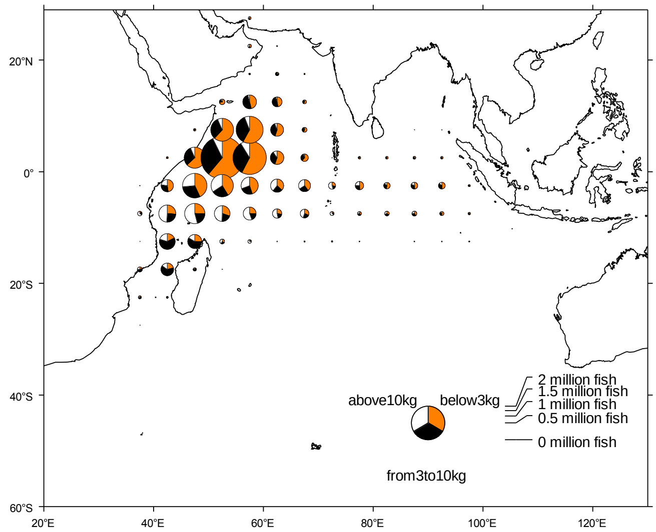


***Figure 5.** Yellowfin tuna**:** location of catches of small (<3 kg) medium (3-10 kg) and large (>10 kg) sized fish taken by purse seiners from 1997 to 2006..*

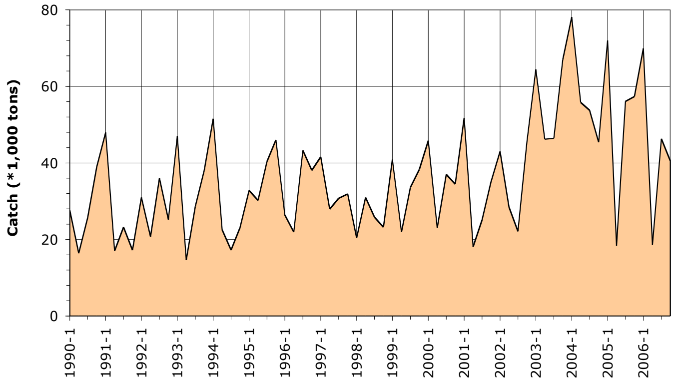


***Figure 6.** Yellowfin tuna**:** quarterly catches by purse seiners in the Indian Oceans over the period 1999 to 2005*

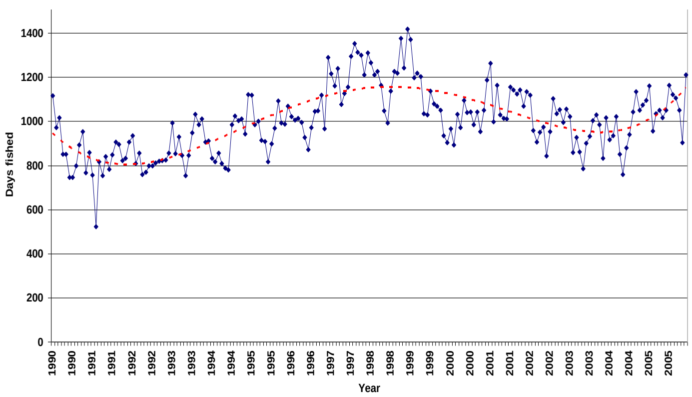


***Figure 7.** Amount of effort (boat days per month) exerted by the EU purse seine fleet in the Indian Ocean.*

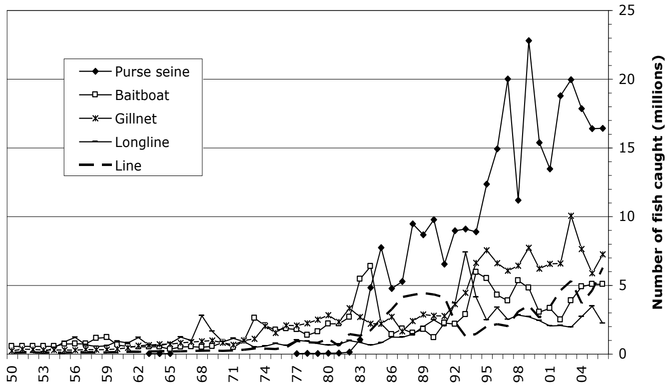


***Figure 8.** Numbers of yellowfin caught by gear-type.*

Data as of July 2007

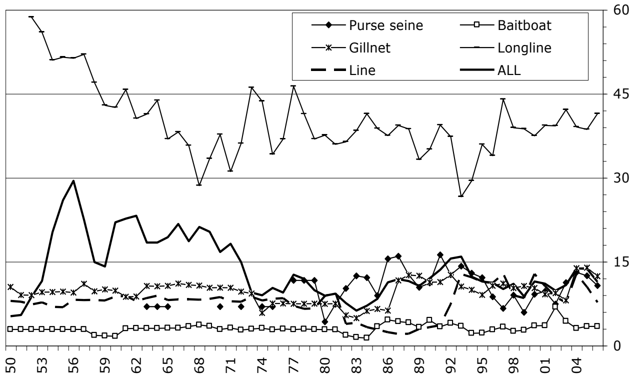


***Figure 9.** Mean weight (kg) of yellowfin individuals in the catch by gear and for all gear-types (estimated from the total catch at size). PS: purse seine, BB: bait boat, LL: longline, GIL: gillnet, OTH: other. Data as of July 2007*

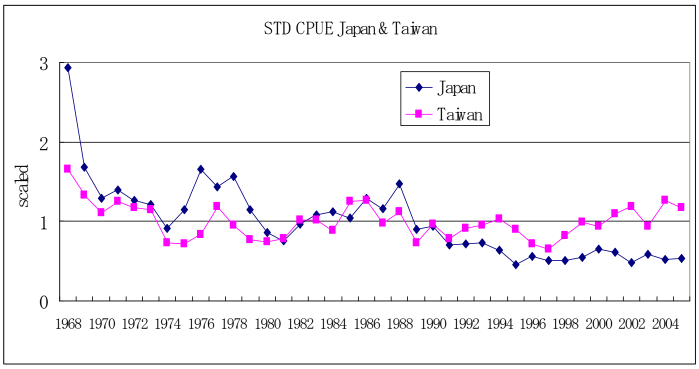


***Figure 10.** Yearly standardised CPUE indices for yellowfin tuna based on the Japanese and Taiwan,China longline catch rates in the Indian Ocean.October 2007*

Executive summary of the status of the Indian Ocean swordfish resource

(As adopted by the IOTC Scientific Committee on 9 November 2007)

BIOLOGY

Swordfish (*Xiphius gladius*) is a large oceanic apex predator that inhabits all the world's oceans and in the Indian Ocean ranges from the northern coastal state coastal waters to 50°S. Swordfish is known to undertake extensive diel vertical migrations, from surface waters during the night to depths of 1000m during the day, in association with movements of the deep scattering layer and cephalopods, their preferred prey. By contrast with tunas, swordfish is not a gregarious species, although densities increase in areas of oceanic fronts and seamounts.

Genetic studies of the stock structure of swordfish in the Indian Ocean have failed to reveal spatial heterogeneity, and for the purposes of stock assessments one pan-ocean stock has been assumed. However, spatial heterogeneity in stock indicators (CPUE trends), indicate the potential for localised depletion of swordfish in the Indian Ocean.

As with many species of billfish, swordfish exhibit sexual dimorphism in maximum size, growth rates and size and age at maturity – females reaching larger sizes, growing faster and maturing later than males. Length and age at 50% maturity in SW Indian Ocean swordfish is 170 cm (maxillary-fork length = LJFL) for females and 120 cm for males. These sizes correspond to ages of 6-7 years and 1-3 years for females and males, respectively.

Swordfish are highly fecund, batch spawners with large females producing many millions of eggs per spawning event. One estimate for Indian Ocean populations suggests that a female swordfish in equatorial waters may spawn as frequently as once every three days over a period of seven months.

Swordfish are long lived – having a maximum age of more than 30 years. The species also exhibits rapid growth in the first year of life - by one year of age, a swordfish may reach 90 cm (~15 kg). The average size of swordfish taken in Indian Ocean longline fisheries is between 40 kg and 80 kg (depending on latitude).

The species life history characteristics of relatively late maturity, long life and sexual dimorphism make it vulnerable to over exploitation.

FISHERIES

Swordfish are taken as a target or by-catch of longline fisheries throughout the Indian Ocean (Figure 1) and is likely to be a component of the "unidentified Billfish" catch by Sri Lankan gill net fisheries in the central northern Indian Ocean

Exploitation of swordfish in the Indian Ocean was first recorded by the Japanese in the early 1950's as a by-catch in their tuna longline fisheries. Over the next thirty years, catches in the Indian Ocean increased slowly as the level of coastal state and distant water fishing nation longline effort targeted at tunas increased. In the 1990's, exploitation of swordfish, especially in the western Indian Ocean, increased markedly, peaking in 1998 at around 35,000 t (Figure 2, Table 1). By 2002, twenty countries were reporting catches of swordfish (Figure 3, Table 1). The average annual catch for the period from 2002 to 2006 was 31,100 t and in was 28,000 t in 2005. The highest catches are taken in the south west Indian Ocean; however, in recent years the fishery has been extending eastward (Figure 4).

Since the early 1990's China,Taiwan has been the dominant swordfish catching fleet in the Indian Ocean (41-60 % of total catch). Taiwanese longliners, particularly in the south western and equatorial western Indian Ocean, target swordfish using shallow longlines at night. The night sets for swordfish contrast with the daytime sets used by the Japanese and Taiwanese longline fleets when targeting tunas.

During the 1990's a number of coastal and island states, notably Australia, La Reunion/France, Seychelles and South Africa have developed longline fisheries targeting swordfish, using monofilament gear and light sticks set at night. This gear achieves significantly higher catch rates than traditional Japanese and Taiwanese longlines. As a result, coastal and island fisheries have rapidly expanded to take over 10,000 t of swordfish per annum in the late 1990's.

STOCK STATUS

While the 2006 stock assessments (IOTC-2006-WPB-R) represent a major advance in the assessment of Indian Ocean swordfish the results should be considered preliminary and as such (and as in previous years) the Scientific Committee has considered a range of information (e.g. indicators of abundance and stock status such as trends in CPUE and size composition) to formulate its technical advice in 2006.

The standardised CPUE of swordfish for the Japanese fleet for all areas of the Indian Ocean combined showed a variable but continuous decline over time (Figure 5). However, this result appears to be driven by the declining trend in the areas north of the equator (areas 3 and 4 combined – see Figure 5) as the CPUE trend from the areas south of the equator (areas 6, 7 and 8 combined – see Figure 5) appears to have stabilised in recent years. Catch rates following 1990 are markedly lower than those prior to this time (particularly in southern areas) and this may be due to an apparent regime shift in fishing practices after 1990 (Figure 6). This marked decrease in CPUE also follows substantial increases in catches throughout the 1990's, particularly in the western Indian Ocean (Figure 2). The apparent fidelity of swordfish to particular areas is a matter for concern as this can lead to localised depletion. In previous years, localised depletion was inferred on the basis of decreasing CPUEs following fine scale analyses of the catch effort data. While no fine scale analyses of CPUE were carried out in 2006, localised depletion may still be occurring in some areas. Localised depletion has occurred in other parts of the world where swordfish have been heavily targeted.

The annual average sizes of swordfish in the respective Indian Ocean fisheries are variable but show no trend Figure 7). While there are no clear signals of declines in the size-based indices, these indices should be carefully monitored. It was noted that since females mature at a relatively large size, a reduction in the biomass of large animals could potentially have a strong effect on the spawning biomass.

Notwithstanding the uncertainties in the 2006 assessments using surplus production models, the overall results were consistent, particularly in terms of the current levels of fishing mortality and stock biomass levels (Figure 8). Stock biomass decreased markedly from the early 1990's corresponding to a sharp increase in fishing mortality. Based on the point estimates and confidence limits, on balance the assessment model results (excluding the high productivity scenario which was considered to be the least plausible) indicate that the fishing mortality has exceed the MSY level in recent years although the stock does not appear to be in an overfished state. The current catch level (around 31,500 t) is above the MSY and probably not sustainable.

MANAGEMENT ADVICE

On the basis of the 2006 assessments and stock indicators the SC concluded that the level of catch in 2004 (about 32,000 t) is above the MSY and unlikely to be sustainable. Furthermore, while the assessments indicated that the stock i.e. for the Indian Ocean overall is probably not currently overfished, catch rate data from the southwest Indian Ocean suggest that overfishing of swordfish may be occurring in localised areas, in particular in the southwest Indian Ocean. Notwithstanding this, the reductions in catch rates have not been accompanied by reductions in average size of the fish in the catch, as has been the case in other oceans. The SC expressed concern regarding the very rapid increase in effort targeting swordfish in other areas of the Indian Ocean and the relatively large incidental catch of swordfish in fisheries targeting bigeye. These increases in effort exploiting swordfish have continued since 2000.

The fact that large, rapid increases in fishing effort followed by a reduction in catch rates have been seen in the southwest Indian Ocean indicates that this might also occur in other areas where fishing effort directed to swordfish is increasing rapidly.

The SC recommends that management measures focussed on controlling and/or reducing effort in the fishery targeting swordfish in the southwest Indian Ocean be implemented. Similar measures may be needed in the future if reductions in catch rates are detected in other areas of the Indian Ocean.

SWORDFISH SUMMARY

Maximum Sustainable Yield:	estimates range between 23,540 t and 27,000 t.
Preliminary catch in 2006 *(data as of October 2007)*	29,000 t
Catch in 2005	28,000 t
Mean catch over the last 5 years (2002-06)	31,100 t
Current Replacement Yield	-
Relative Biomass (B_{2004}/B_{MSY})	estimates range between 1.17 – 1.60
Relative Fishing Mortality (F_{2004}/F_{MSY})	estimates range between 0.74 – 1.29

Note: This Executive Summary has been updated to take account of recent catch data. The management advice, and stock assessment results are based on data up to the end of 2004.

***Table 1**. Best scientific estimates of the catches of swordfish (as adopted by the IOTC Scientific Committee) by gear and main fleets for the period 1957-2006 (in thousands of tonnes). Data as of October 2007*

Gear	Fleet	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83
Longline	Taiwan,China	0.1	0.1	0.2	0.2	0.3	0.3	0.5	0.5	0.3	0.3	0.2	0.6	0.8	1.2	0.9	0.9	0.6	1.0	0.9	0.9	0.9	0.6	1.1	1.3	1.1	1.5	1.9
Longline	Indonesia																		0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0
Longline	Japan	0.6	0.7	0.9	1.2	1.3	1.4	1.1	1.3	1.5	1.7	2.2	1.7	1.6	1.2	1.1	0.9	0.8	0.8	0.8	0.4	0.3	0.9	0.6	0.6	0.8	1.0	1.2
Longline	Korea, Republic of									0.0	0.0	0.0	0.1	0.2	0.2	0.2	0.1	0.1	0.3	0.5	0.6	0.7	0.8	0.6	0.3	0.4	0.3	0.3
Longline	Other Fleets								0.1	0.2	0.0	0.0	0.1	0.0	0.1					0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0
Longline	Total	0.7	0.9	1.2	1.4	1.6	1.7	1.6	1.9	2.0	2.1	2.5	2.6	2.6	2.7	2.1	2.0	1.6	2.0	2.3	1.9	1.9	2.4	2.3	2.3	2.3	2.8	3.4
Other gears	Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
All	Total	0.7	0.9	1.2	1.4	1.6	1.7	1.6	1.9	2.0	2.1	2.5	2.6	2.6	2.7	2.1	2.0	1.6	2.0	2.3	1.9	1.9	2.4	2.3	2.3	2.3	2.8	3.4

Gear	Fleet	Av02/06	Av57/06	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06
Longline	Taiwan,China	10.9	5.0	1.7	2.0	3.2	3.8	5.4	4.1	3.8	4.7	9.0	15.3	12.5	18.3	17.6	17.2	16.8	14.7	15.2	12.9	13.5	14.4	12.3	7.5	6.8
Longline	Spain	4.5	0.6										0.2	0.7	0.0	0.0	0.5	1.4	2.0	1.0	1.9	3.5	4.3	4.7	5.1	5.2
Longline	NEI-Deep-freezing	3.1	1.4		0.0	0.2	0.2	0.8	0.6	0.8	0.9	1.4	4.2	3.6	5.4	7.7	5.5	7.3	6.5	6.0	1.6	1.8	2.3	4.5	3.4	3.5
Longline	Indonesia	1.9	0.4	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.5	0.5	1.0	1.2	1.1	1.3	0.7	0.6	1.3	2.6	2.4	1.7	1.3
Longline	Japan	1.4	1.3	1.3	2.2	1.3	1.4	1.5	1.0	1.0	0.9	1.7	1.4	2.6	1.7	2.1	2.8	2.2	1.5	1.6	1.2	1.3	1.1	1.2	1.5	1.8
Longline	Portugal	1.2	0.1															0.1	0.2	0.2	0.6	0.8	0.9	0.9	1.1	2.2
Longline	Seychelles	1.1	0.1												0.0	0.1	0.2	0.2	0.3	0.5	0.7	0.6	1.4	1.4	1.2	0.8
Longline	France-Reunion	0.9	0.3								0.0	0.1	0.3	0.7	0.8	1.3	1.6	2.1	1.9	1.7	1.6	0.8	0.8	0.9	1.2	0.9
Longline	Australia	0.8	0.2						0.0		0.0	0.0	0.2	0.1	0.1	0.0	0.0	0.3	1.4	1.8	2.9	1.3	1.8	0.4	0.3	0.3
Longline	China	0.6	0.1												0.1	0.2	0.3	0.1	0.4	0.4	0.3	0.4	0.8	0.7	0.6	0.8
Longline	Guinea	0.6	0.1																		0.0	0.5	0.5	0.5	0.8	0.8
Longline	Mauritius	0.6	0.1												0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.6	0.7	0.6	0.7
Longline	South Africa	0.5	0.1														0.0	0.4	0.1	0.0	0.3	0.9	0.8	0.2	0.2	0.2
Longline	Korea, Republic of	0.2	0.2	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.1	0.1	0.2	0.1	0.0	0.1	0.0	0.0	0.1	0.3	0.3	0.3
Longline	NEI-Fresh Tuna	0.1	0.2						0.5	0.7	0.6	0.7	0.7	1.1	0.9	0.9	1.1	1.0	0.9	0.9	0.0	0.0	0.1	0.1	0.2	0.3
Longline	Other Fleets	1.0	0.2	0.0	0.0	0.0	0.1	0.1	0.3	0.4	0.4	0.5	0.4	0.5	0.3	0.1	0.1	0.7	0.3	0.0	0.8	0.9	0.8	0.8	1.4	1.3
Longline	Total	29.5	10.4	3.2	4.2	4.9	5.6	7.9	6.7	7.0	7.8	13.8	23.1	22.3	28.1	31.3	30.7	33.9	31.6	30.1	25.5	27.9	33.1	32.0	27.2	27.3
Gillnet	Sri Lanka	1.5	0.4			0.0	0.0	0.0	0.0	0.1	0.2	0.3	1.9	0.9	0.9	1.0	1.3	0.9	1.1	2.8	2.4	2.7	1.4	1.4	0.7	1.1
Gillnet	Other Fleets		0.0			0.0	0.1	0.3	0.1	0.1	0.0	0.0														
Gillnet	Total	1.5	0.4			0.1	0.1	0.3	0.2	0.2	0.2	0.3	1.9	0.9	0.9	1.0	1.3	0.9	1.1	2.8	2.4	2.7	1.4	1.4	0.7	1.1
Other gears	Total	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.5
All	Total	31.1	10.9	3.2	4.2	4.9	5.7	8.2	6.9	7.2	8.0	14.1	25.1	23.2	28.9	32.2	32.1	34.8	32.7	32.9	28.0	30.6	34.5	33.4	28.0	29.0

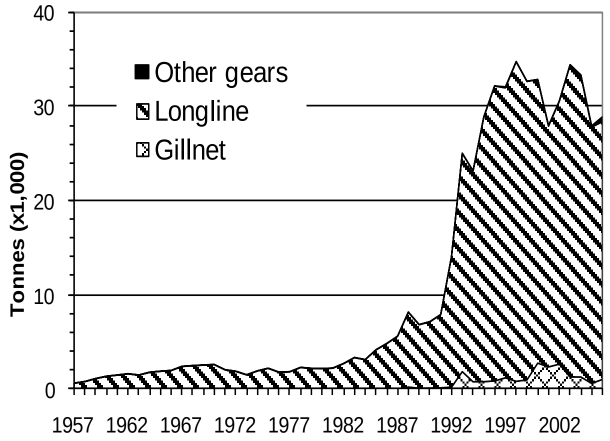


Figure 1. *Catches of Swordfish per gear and year recorded in the IOTC Database (1957-2006).*

Data as of October 2007

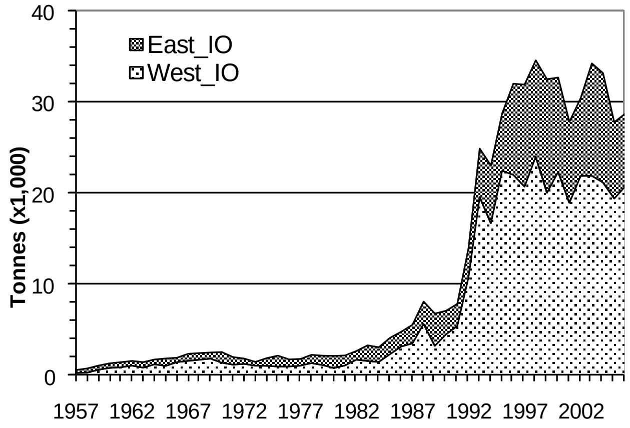
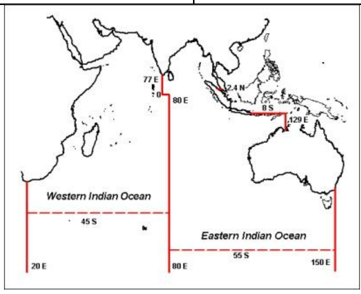


Figure 2. *Trends of the swordfish catches in the western and the eastern area of the Indian Ocean from 1956 – 2006.*

Data as of October 2007



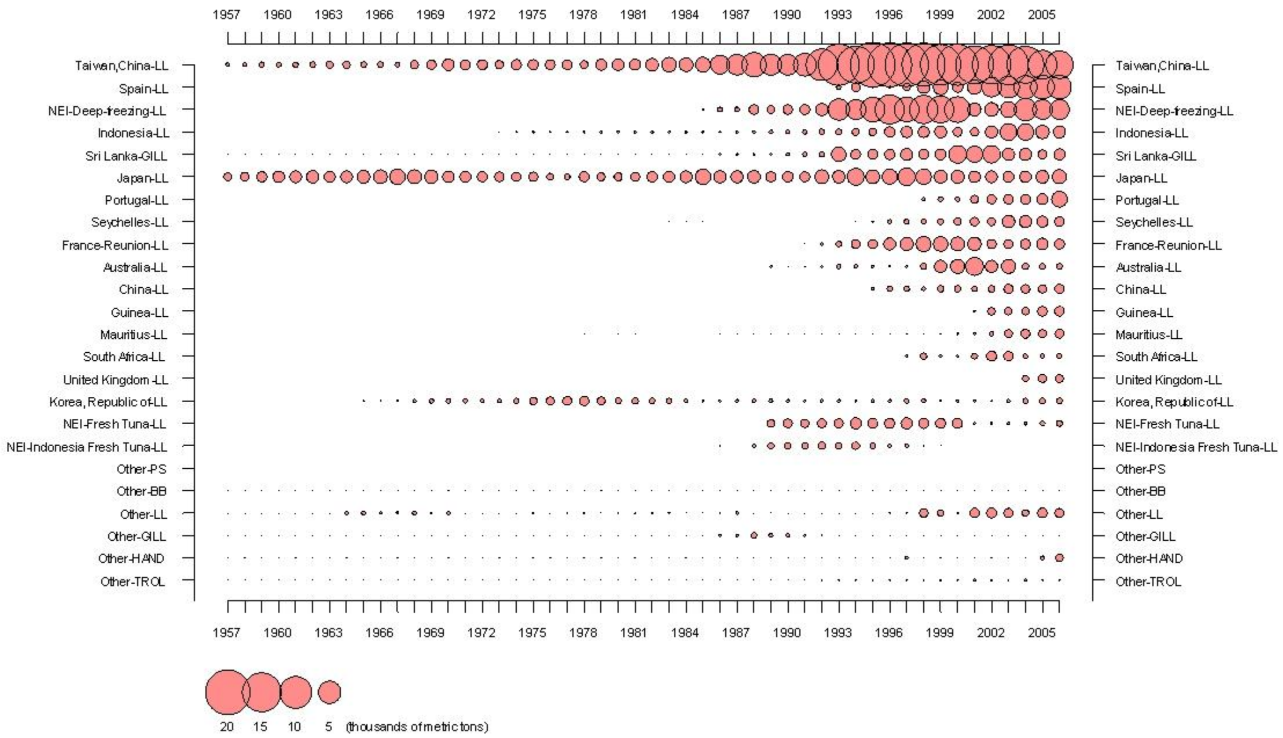
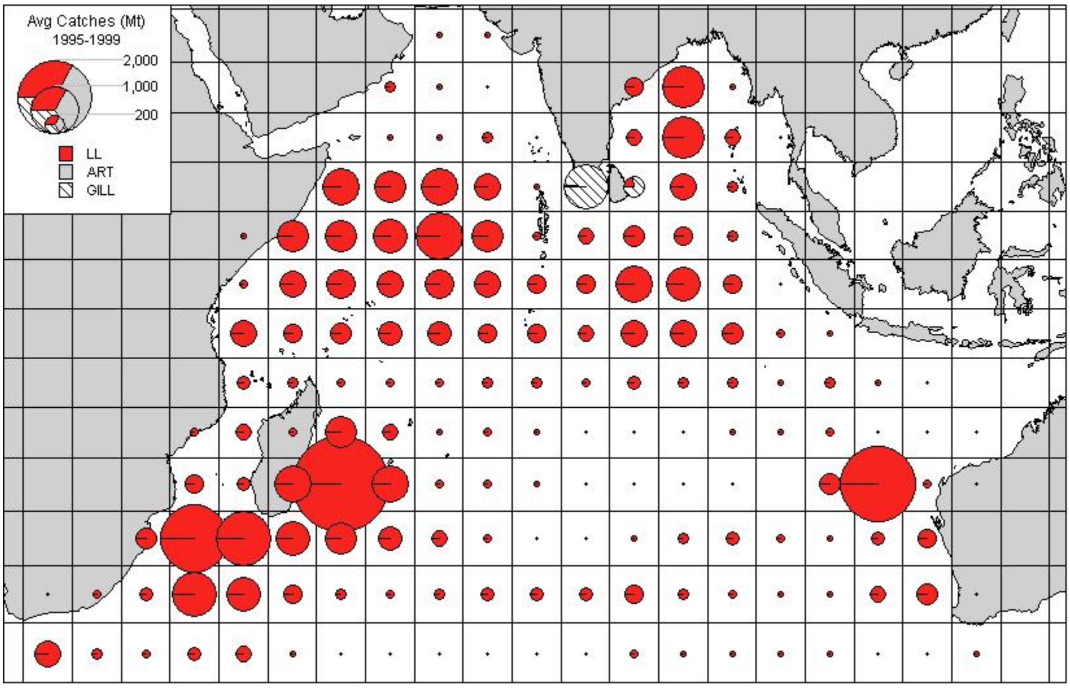


Figure 3. *Catches of swordfish in the Indian Ocean for the period 1957-2006, in thousands of metric tons by gear and country/fleet. Data as of October 2007*

1995-1999



2000-2004

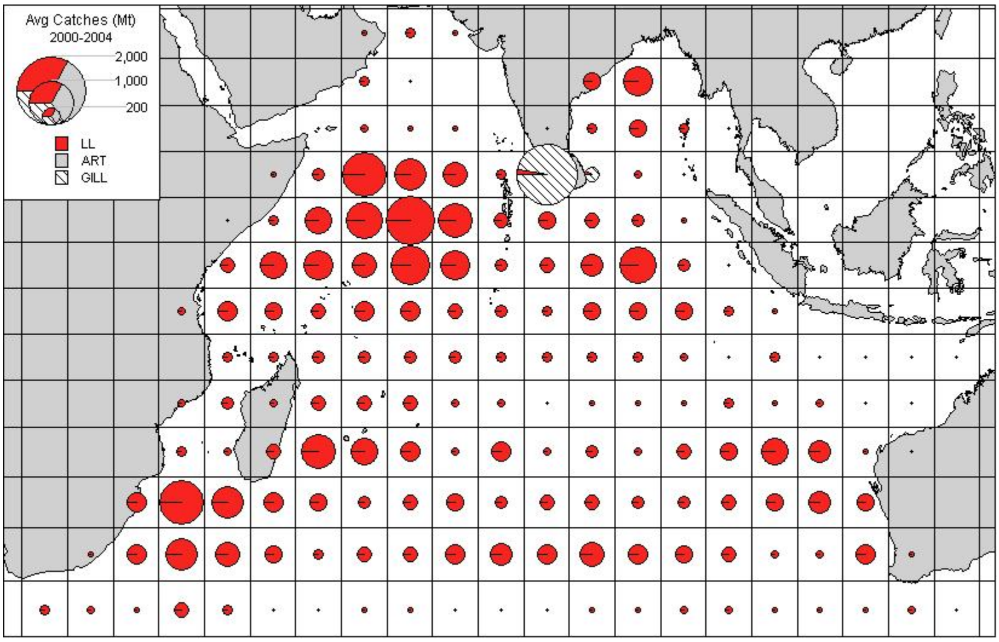


Figure 4. *Mean annual catches of swordfish (t) for the periods 1995 to 1999 and 2000 to 2004 for longline, gillnet and other fisheries in the Indian Ocean.*

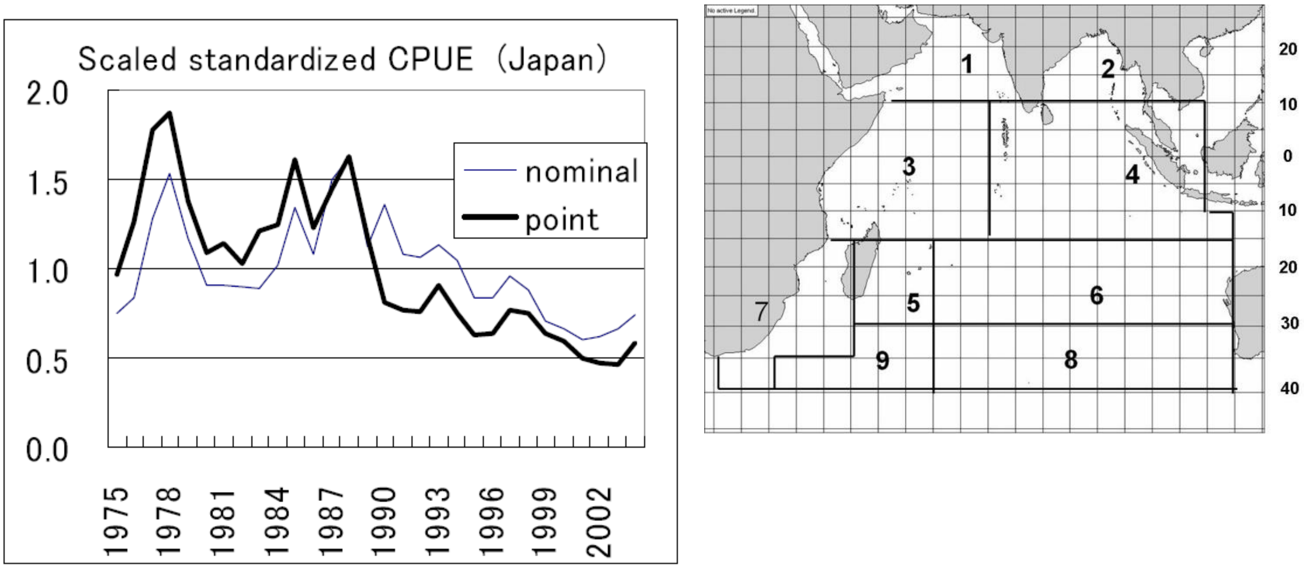


__Figure 5.__ Catch per unit effort indices (nominal and standardised) for swordfish caught by the Japanese fleet in the Indian Ocean (average set to 1). Insert (top right): Areas used in the standardisation of catch rates.

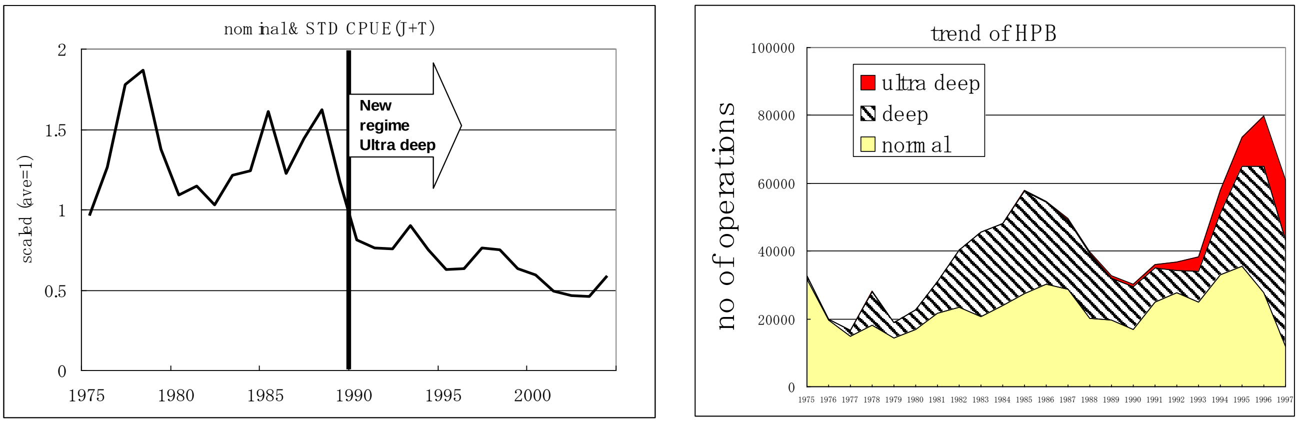


__Figure 6.__ Indications of a possible regime shift in catch rates related to changes in the setting practices of Japanese longliners over time. Nominal catch rates (left) number of operations performed using normal, deep and ultra-deep longline sets (right).

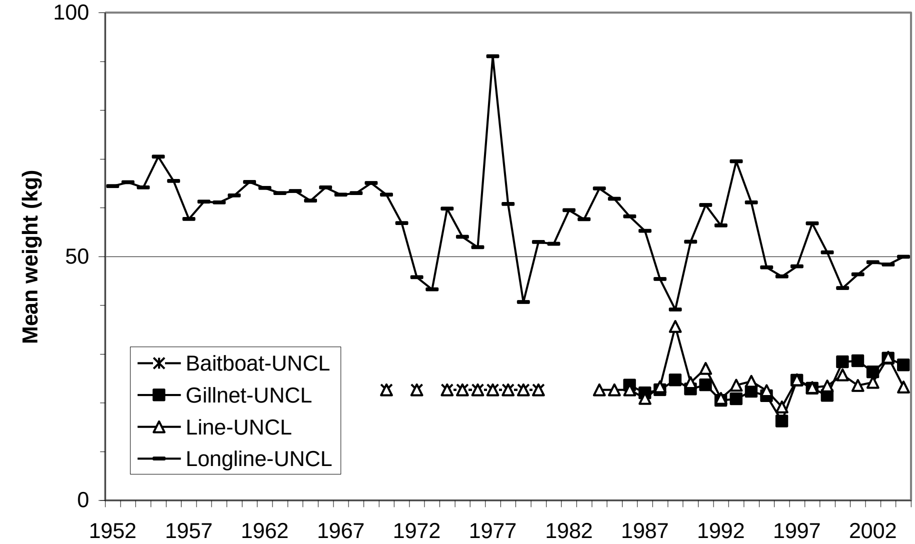
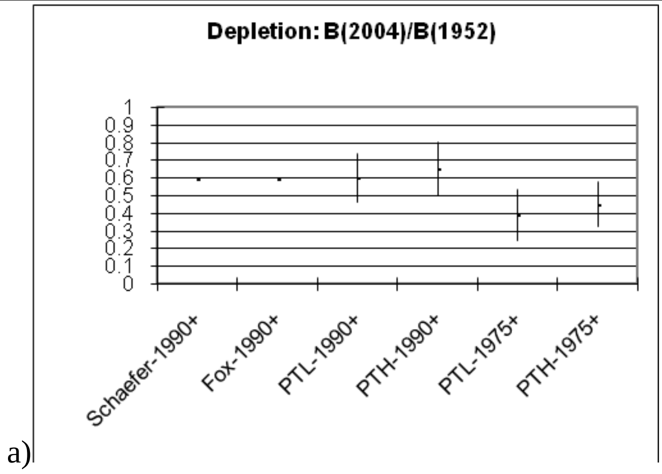
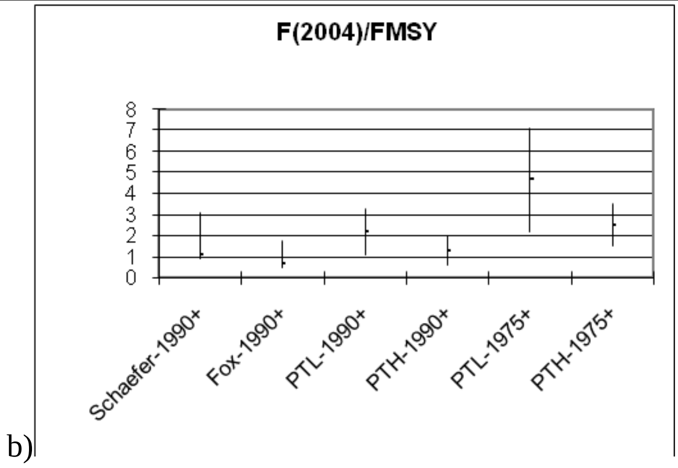


Figure 7. *Trends in average size of swordfish in Indian Ocean fisheries.*





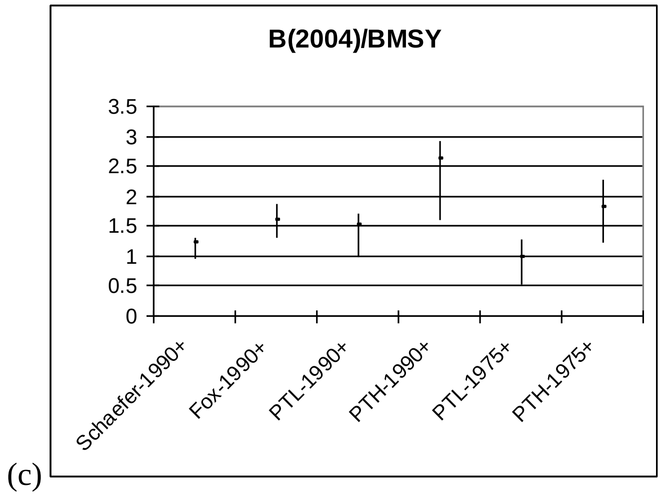


Figure 8. *2006 Indian Ocean swordfish stock assessment results. Stock status estimates from the six successful production model fits. (a) Current biomass levels as a proportion of the biomass in 1952 (when the stock was considered to be at carrying capacity i.e. at equilibrium in an unfished state (b) Current fishing mortality relative to the level of fishing mortality at MSY (c) current biomass relative to the estimated biomass at MSY. Confidence limits are 80% for the Fox and Schaefer models (Confidence limit estimates are not available for the depletion estimates) and 95% for the Pella-Tomlinson models.*

Executive summary of the status of the bullet tuna resource

(*As adopted by the IOTC Scientific Committee on 9 November 2007*)

BIOLOGY

Bullet tuna (*Auxis rochei*) is an oceanic species found in the equatorial areas of the major oceans. It is a highly migratory species with a strong schooling behaviour. Adults are principally caught in coastal waters and around islands that have oceanic salinities.

Adults can grow to 50 cm fork length. Bullet tuna mature at around two years old — about 35 cm (FL). It is a multiple spawner with fecundity ranging between 31,000 and 103,000 eggs per spawning (according to the size of the fish). Larval studies indicate that bullet tuna spawn throughout its range.

Bullet tuna feed on small fishes, particularly anchovies, crustaceans (commonly crab and stomatopod larvae) and squids. Cannibalism is common. Because of their high abundance, bullet tunas are considered to be an important prey for a range of species, especially the commercial tunas.

No information is available on the stock structure of bullet tuna in Indian Ocean.

FISHERIES

Bullet tuna is caught mainly by gillnet and line across the broader Indian Ocean area (Figure 1). This species is also an important catch for artisanal purse seiners. The catch estimates for bullet tuna were derived from very small amounts of information and are therefore highly uncertain[4] (Figure 2). The catches provided in Table 1 are based on the information available at the Secretariat and the following observations on the catches cannot currently be verified. Estimated catches of bullet tuna reached around 1,000 t in the early 1990's and peaked at 2,700 t in 2005. The average annual catch estimated for the period 2002 to 2006 is 2,200 t. In recent years, the countries attributed with the highest catches of bullet tuna are India, Indonesia and Sri Lanka (Table 1, Figure 3).

The fisheries in the Indian Ocean mainly catch bullet tuna ranging between 15 and 25 cm.

AVAILABILITY OF INFORMATION FOR STOCK ASSESSMENT

There is no information on the stock structure of bullet tuna in the Indian Ocean.

There is some age and growth information available for bullet tuna in the Indian Ocean.

Possible fishery indicators:

1. **Trends in catches**: The catch estimates for bullet tuna are highly uncertain. Catches fluctuate from year to year but have been steadily increasing since the early 1980's.
2. **Nominal CPUE Trends:** data not available to the Secretariat.
3. **Average weight in the catch by fisheries:** data not available to the Secretariat.
4. **Number of squares fished:** data not available to the Secretariat.

[4] The uncertainty in the catch estimates has been assessed by the Secretariat and is based on the amount of processing required to account for the presence of conflicting catch reports, the level of aggregation of the catches by species and or gear, and the occurrence of unreporting fisheries for which catches had to be estimated.

STOCK ASSESSMENT

While some localised, sub-regional assessments may have been undertaken, no quantitative stock assessment has been undertaken by the IOTC Working Party on Neritics.

MANAGEMENT ADVICE

No quantitative stock assessment is currently available for bullet tuna in the Indian Ocean, therefore the stock status is uncertain.

The SC notes that the catches of bullet tuna are typically variable but relatively low compared to the other neritic species. The reasons for this are not clear: it may be problem related to reporting, or it may be a normal fluctuation in the fishery. Bullet tuna is a relatively productive species with high fecundity and rapid growth and this makes it relatively resilient and less prone to overfishing. Nevertheless, bullet tuna appears to be an important prey species for other pelagic species including the commercial tunas, therefore it should be reviewed at the first meeting of the IOTC Working Party on NeriticTunas.

BULLET TUNA SUMMARY

Maximum Sustainable Yield:	-
Preliminary catch in 2006 *(data as of October 2007)*	3,500 t
Catch in 2005	2,700 t
Mean catch over the last 5 years (2002-06)	2,200 t
Current Replacement Yield:	-
Relative Biomass ($B_{current}/B_{MSY}$):	-
Relative Fishing Mortality ($F_{current}/F_{MSY}$):	-

Table 1. *Best scientific estimates of the catches of bullet tuna (as adopted by the IOTC Scientific Committee) by gear and main fleets for the period 1957-2006 (in thousands of tonnes).*
Data as of October 2007

Gear	Fleet	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83
Gillnet	India	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Gillnet	Indonesia															0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gillnet	Other Fleets	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gillnet	Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1
Line	India	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1
Line	Other Fleets	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Line	Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Other gears	India	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other gears	Other Fleets							0.0	0.0	0.0					0.0		0.0		0.0	0.0								
Other gears	Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
All	Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.2	0.1	0.1	0.2	0.2	0.1	0.2	0.2

Gear	Fleet	Av02/06	Av57/06	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06
Gillnet	India	0.4	0.1	0.0	0.1	0.2	0.1	0.1	0.2	0.2	0.1	0.2	0.1	0.2	0.1	0.3	0.2	0.2	0.2	0.2	0.3	0.3	0.4		1.1	0.4
Gillnet	Sri Lanka	0.3	0.2			0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.5	0.5	0.8	1.2	1.1	0.3	1.5	0.4	0.4	0.3	0.3	0.2	0.4
Gillnet	Indonesia	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Gillnet	Other Fleets	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gillnet	Total	0.9	0.3	0.0	0.1	0.2	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.8	0.7	1.2	1.5	1.5	0.7	1.9	0.8	0.8	0.8	0.4	1.4	1.0
Line	India	1.0	0.2	0.1	0.1	0.4	0.2	0.3	0.3	0.3	0.3	0.4	0.2	0.5	0.3	0.5	0.4	0.5	0.4	0.5	0.5	0.5	0.8	0.5	1.2	1.7
Line	Other Fleets	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Line	Total	1.0	0.2	0.1	0.1	0.4	0.2	0.3	0.3	0.3	0.3	0.4	0.3	0.5	0.3	0.5	0.5	0.5	0.4	0.5	0.5	0.5	0.8	0.5	1.2	1.7
Other gears	India	0.2	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.2	0.1	0.3
Other gears	Sri Lanka	0.1	0.0																							0.4
Other gears	Total	0.3	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.2	0.1	0.8
All	Total	2.2	0.6	0.2	0.3	0.7	0.4	0.5	0.7	0.6	0.7	0.9	0.6	1.4	1.1	1.8	2.1	2.1	1.2	2.5	1.4	1.6	1.9	1.1	2.7	3.5

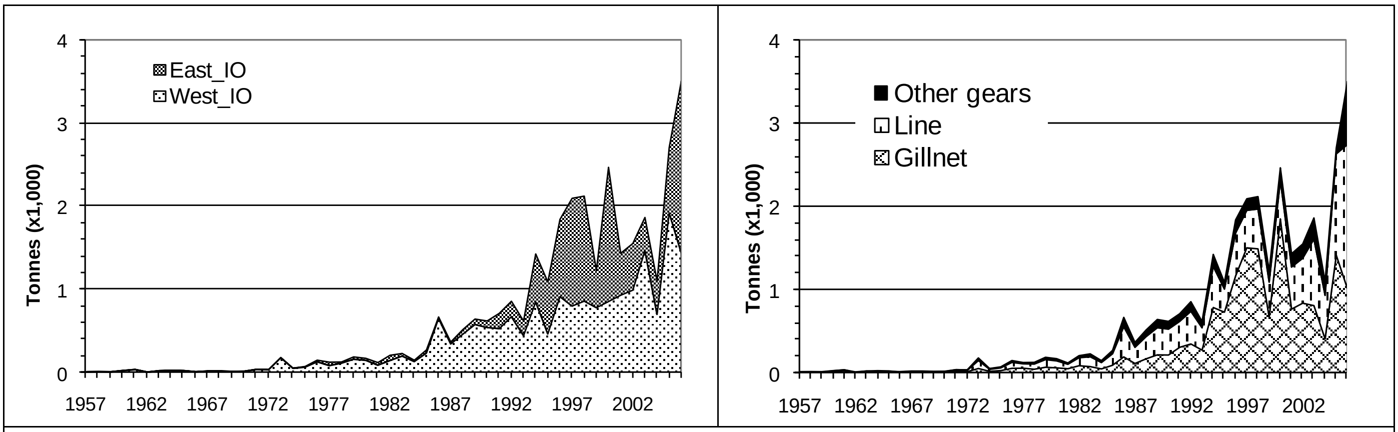


Figure 1*. Bullet tuna: annual catches from 1957 to 2006 by area (left) and gear (right).* Data as per October 2007

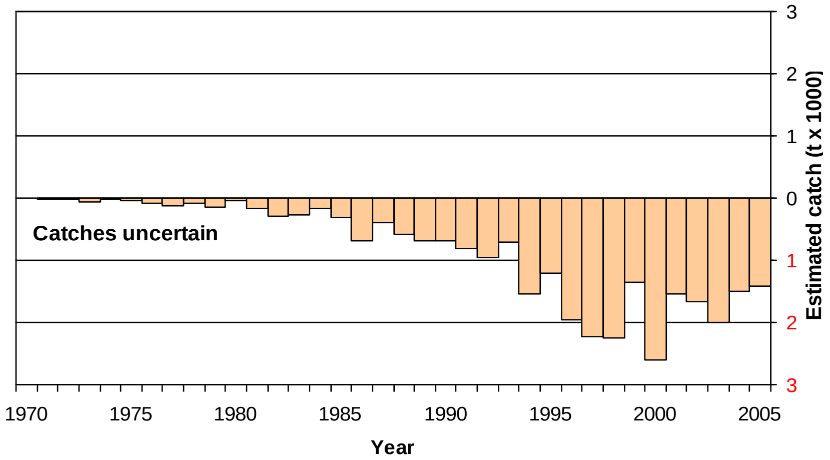


Figure 2*. Bullet tuna: uncertainty of annual catch estimates. The amount of the catch below the zero-line has been categorised as uncertain according to the criteria given in the text.*

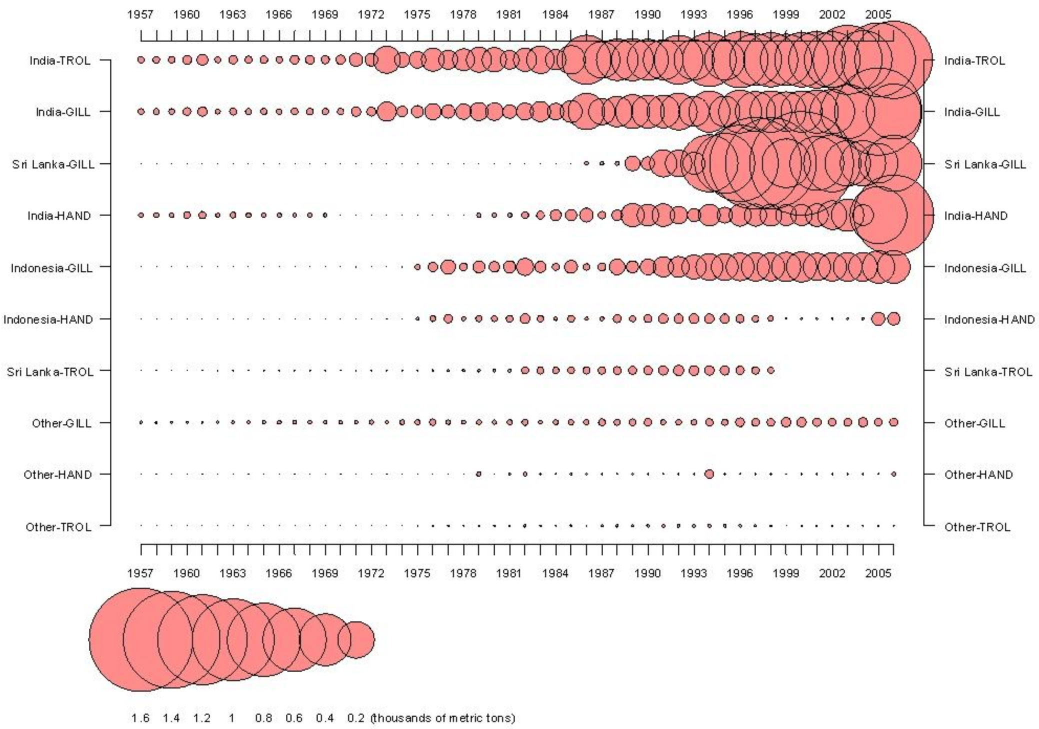


Figure 3. *Bullet tuna: catches by gear and main fleets for the period 1957-2006 (in thousands of tonnes).* Data as of October 2007

Executive summary of the status of the frigate tuna resource

(*As adopted by the IOTC Scientific Committee on 9 November 2007*)

BIOLOGY

Frigate tuna (*Auxis thazard*) is a highly migratory species found in both coastal and oceanic waters. It is highly gregarious and often schools with other Scombrids.

In other oceans, frigate tuna grows to around 65 cm fork length but the largest size reported for the Indian Ocean is 58 cm (off Sri Lanka).

Size at first maturity is between 29 cm and 35 cm fork length depending on location. In the southern Indian Ocean, the spawning season extends from August to April whereas north of the equator it is from January to April. Fecundity ranges between 200,000 and 1.06 million eggs per spawning (depending on size).

Frigate tuna feeds on small fish, squids and planktonic crustaceans (e.g. decapods and stomatopods). Because of their high abundance, frigate tuna are considered to be an important prey for a range of species, especially the commercial tunas.

No information is available on the stock structure of frigate tuna in Indian Ocean.

FISHERIES

Frigate tuna is taken from across the Indian Ocean area using gillnets, bait boats and lines (Figure 1). This species is also an important catch for industrial purse seiners. The catch estimates for frigate tuna were derived from very small amounts of information and are therefore highly uncertain[5] (Figure 2). The catches provided in Table 1 are based on the information available at the Secretariat and the following observations on the catches cannot currently be verified. Estimated catches have increased steadily since the late 1970's, reaching around 10,000 t in the early 1980's and over 30,000 t by the mid-1990's. The average annual catch estimated for the period 2002 to 2006 is 32,100 t. In recent years, the countries attributed with the highest catches are India , Indonesia , Maldives and Iran and Sri Lanka (Table 1, Figure 3).

The size of frigate tunas taken by the Indian Ocean fisheries typically ranges between 25 and 40 cm depending on the type of gear used, season and location.

AVAILABILITY OF INFORMATION FOR STOCK ASSESSMENT

There is no information on the stock structure of frigate tuna in the Indian Ocean.

Age and growth, fecundity estimates and size at first maturity information is available for frigate tuna in the Indian Ocean.

Possible fishery indicators:

1. **Trends in catches**: The catch estimates for frigate tuna are highly uncertain. Catches fluctuate from year to year but have been steadily increasing since the mid 1950's.

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[5] The uncertainty in the catch estimates has been assessed by the Secretariat and is based on the amount of processing required to account for the presence of conflicting catch reports, the level of aggregation of the catches by species and or gear, and the occurrence of unreporting fisheries for which catches had to be estimated.

2. **Nominal CPUE Trends:** data not available to the Secretariat.
3. **Average weight in the catch by fisheries:** data not available to the Secretariat.
4. **Number of squares fished:** data not available to the Secretariat.

STOCK ASSESSMENT

While some localised, sub-regional assessments have been undertaken by national scientists, no quantitative stock assessment has been undertaken by the IOTC Working Party on Neritics.

MANAGEMENT ADVICE

No quantitative stock assessment is currently available for the frigate tuna in the Indian Ocean, therefore the stock status is uncertain. This species is a relatively productive species with high fecundity and rapid growth and this makes it relatively resilient and not prone to overfishing. Nevertheless, frigate tuna appears to be an important prey species for other pelagic species including the commercial tunas, therefore it should be reviewed at the first meeting of the IOTC Working Party on Neritic Tunas.

FRIGATE TUNA SUMMARY

Maximum Sustainable Yield:	-
Preliminary catch in 2006 *(data as of October 2007)*	37,000 t
Catch in 2005	25,800 t
Mean catch over the last 5 years (2002-06)	32,100 t
Current Replacement Yield:	-
Relative Biomass ($B_{current}/B_{MSY}$):	-
Relative Fishing Mortality ($F_{current}/F_{MSY}$):	-

Table 1. *Best scientific estimates of the catches of frigate tuna (as adopted by the IOTC Scientific Committee) by gear and main fleets for the period 1957-2006 (in thousands of tonnes).*

(Data as of October 2007)

Gear	Fleet	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83
Baitboat	Maldives	0.9	0.9	0.9	0.9	1.4	1.4	1.4	1.4	2.3	2.8	2.8	2.8	2.8	1.7	1.7	1.8	3.9	3.5	2.3	1.5	1.8	0.9	0.9	0.8	0.8	1.2	2.0
Baitboat	Other Fleets														0.0		0.0		0.0	0.0							0.1	0.1
Baitboat	Total	0.9	0.9	0.9	0.9	1.4	1.4	1.4	1.4	2.3	2.8	2.8	2.8	2.8	1.7	1.7	1.8	3.9	3.5	2.4	1.5	1.8	0.9	0.9	0.8	0.8	1.2	2.0
Gillnet	Indonesia															0.0	0.0	0.0	0.0	0.3	1.0	2.2	0.6	1.5	1.2	1.6	3.1	1.3
Gillnet	India	0.2	0.2	0.2	0.3	0.5	0.1	0.3	0.4	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	1.6	0.4	0.6	0.9	0.6	0.9	1.2	1.1	0.7	1.1	1.5
Gillnet	United Arab Emirates																		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1.0	0.4
Gillnet	Oman	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1
Gillnet	Other Fleets	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.3	0.2	0.1
Gillnet	Total	0.2	0.2	0.2	0.4	0.5	0.2	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.2	0.4	0.4	1.7	0.8	1.3	2.4	3.2	2.0	3.1	2.7	2.8	5.5	3.4
Line	India	0.1	0.1	0.1	0.2	0.3	0.1	0.2	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.9	0.2	0.3	0.5	0.3	0.5	0.6	0.6	0.3	0.5	0.8
Line	Indonesia															0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.1	0.2	0.2	0.2	0.5	0.2
Line	Maldives	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.2	0.2	0.2	0.1	0.2
Line	Sri Lanka	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.7	0.7
Line	Other Fleets																							0.0		0.0	0.0	0.1
Line	Total	0.2	0.2	0.2	0.3	0.4	0.2	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.2	0.3	0.3	1.0	0.4	0.5	0.8	0.9	0.8	1.1	1.1	0.9	1.8	1.9
Other gears	Thailand														0.2	0.5	0.4	0.7	0.5	1.2	0.8	0.7	0.9	0.1	0.0	0.1	1.3	0.5
Other gears	India	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
Other gears	Other Fleets							0.0	0.1	0.0					0.2	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.3	0.1	0.1	0.2
Other gears	Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.4	0.6	0.6	0.9	0.7	1.4	1.0	0.8	1.2	0.4	0.5	0.3	1.5	0.9
All	Total	1.4	1.4	1.4	1.6	2.4	1.8	2.1	2.3	3.0	3.4	3.5	3.4	3.4	2.5	3.0	3.2	7.5	5.3	5.5	5.7	6.7	4.8	5.4	5.1	4.8	10.1	8.2

Gear	Fleet	Av02/06	Av57/06	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06
Baitboat	Other Fleets		0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1													
Baitboat	Total	3.8	2.4	1.8	1.3	0.9	1.0	1.5	2.0	3.1	2.4	3.2	5.1	3.8	3.7	6.1	2.3	3.8	3.1	3.7	3.7	3.9	4.1	3.3	4.6	3.2
Gillnet	Indonesia	9.5	3.0	0.5	1.7	0.4	0.7	2.6	1.5	2.6	4.3	4.5	6.0	7.5	7.4	8.0	8.4	8.1	9.0	9.5	7.8	8.4	8.6	8.6	11.0	11.1
Gillnet	India	7.4	2.6	1.0	1.7	4.8	2.5	3.4	4.2	4.0	3.9	4.9	3.3	6.1	3.4	6.6	5.8	6.3	5.7	6.2	6.8	7.2	10.1	8.0	2.7	9.1
Gillnet	Sri Lanka	1.5	0.6			0.0	0.0	0.0	0.3	0.3	0.2	0.4	1.2	1.7	1.7	2.7	3.9	3.8	1.8	1.4	1.5	1.7	1.9	1.9	1.4	0.6
Gillnet	Iran, Islamic Republic	1.5	0.4			0.3	0.4	0.3	0.2	0.1	0.5	0.3	0.4	0.2	4.4	0.7	0.6	0.5	0.6	0.8	0.6	0.6	1.1	1.5	1.6	2.4
Gillnet	United Arab Emirates	0.2	0.2	0.4	0.4	0.5	0.5	0.5	0.5	0.6	0.5	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.3	0.3	0.3	0.3	0.2	0.2	0.2
Gillnet	Oman	0.2	0.2	0.2	0.1	0.1	0.3	0.5	0.9	0.6	0.1	0.2	0.4	0.5	0.8	0.6	0.9	0.6	0.6	0.5	0.6	0.2	0.1	0.3	0.2	0.2
Gillnet	Other Fleets	0.3	0.1	0.3	0.2	0.1	0.2	0.3	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.3	0.3
Gillnet	Total	20.6	7.2	2.4	4.2	6.3	4.7	7.7	7.9	8.2	9.6	11.1	12.0	16.8	18.5	19.4	20.2	20.1	18.5	19.0	17.9	18.6	22.4	20.7	17.4	23.9
Line	India	4.1	1.4	0.5	0.9	2.4	1.3	1.7	2.1	2.0	2.0	2.5	1.7	3.1	1.7	3.4	3.0	3.2	2.9	3.1	3.4	3.7	4.9	4.4	0.8	6.9
Line	Indonesia	0.3	0.2	0.1	0.3	0.1	0.2	0.4	0.2	0.4	0.5	0.5	0.6	0.6	0.5	0.4	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.1	0.7	0.6
Line	Maldives	0.3	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.5	0.3	0.3	0.4	0.2	0.4	0.3	0.3	0.3	0.3	0.2	0.3	0.4	0.3
Line	Sri Lanka	0.0	0.3	0.5	0.6	0.6	0.7	0.7	0.8	0.9	1.0	1.2	1.1	1.1	1.0	0.8	0.7	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Line	Other Fleets	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Line	Total	4.8	2.1	1.4	2.1	3.4	2.4	3.1	3.4	3.7	3.9	4.6	3.9	5.1	3.6	5.1	4.1	4.3	3.3	3.5	3.8	4.0	5.2	4.8	1.9	7.8
Other gears	Thailand	1.0	0.8	0.6	1.7	0.8	7.5	1.4	1.1	0.9	0.9	1.2	1.2	0.9	1.4	0.9	0.9	0.6	0.4	1.0	1.0	0.8	1.1	1.1	1.1	1.1
Other gears	India	0.7	0.3	0.1	0.2	0.6	0.3	0.4	0.5	0.5	0.5	0.6	0.4	0.7	0.4	0.8	0.7	0.8	0.7	0.8	0.8	0.9	1.3	0.8	0.1	0.2
Other gears	Sri Lanka	0.6	0.2				0.0	0.1	0.1	0.2	0.2	0.3	0.4	0.4	0.6	0.6	0.7	0.8	1.0	1.0	0.9	1.0	0.9	0.9	0.2	0.1
Other gears	Other Fleets	0.6	0.2	0.3	0.4	0.4	0.3	0.0	0.3	0.0	0.1	0.0	0.0	0.0	0.0	1.2	0.2	0.0	0.0	0.9	0.5	1.1	0.4	0.4	0.6	0.7
Other gears	Total	2.9	1.5	1.0	2.3	1.8	8.1	1.9	2.0	1.6	1.7	2.2	1.9	2.1	2.4	3.6	2.5	2.2	2.1	3.7	3.3	3.7	3.7	3.3	1.9	2.0
All	Total	32.1	13.2	6.6	10.0	12.4	16.2	14.2	15.3	16.6	17.6	21.1	22.9	27.8	28.1	34.2	29.2	30.4	27.0	29.9	28.7	30.3	35.5	32.0	25.8	37.0

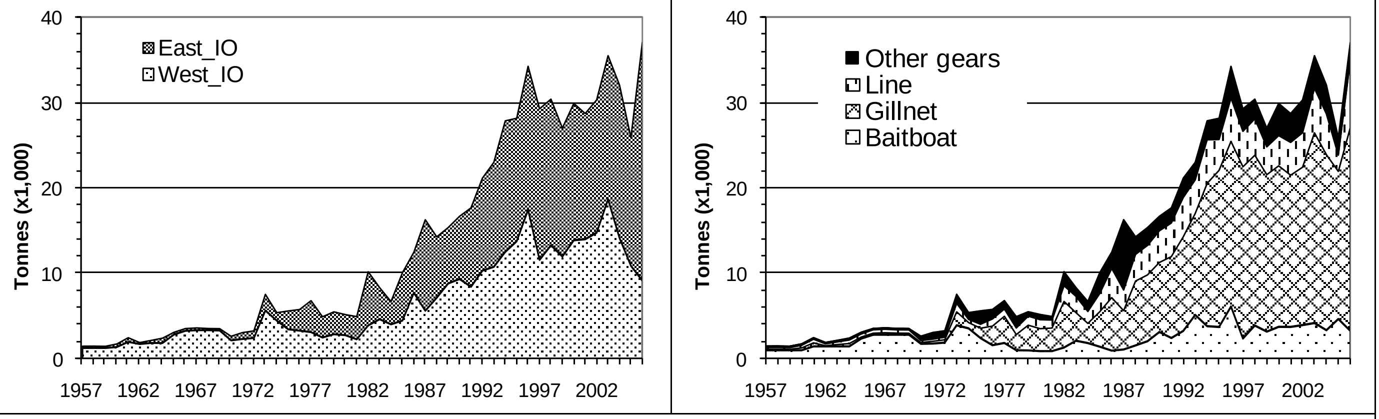

Figure 1*. Frigate tuna: annual catches from 1957 to 2006 by area (left) and gear (right).* *Data as per October 2007*

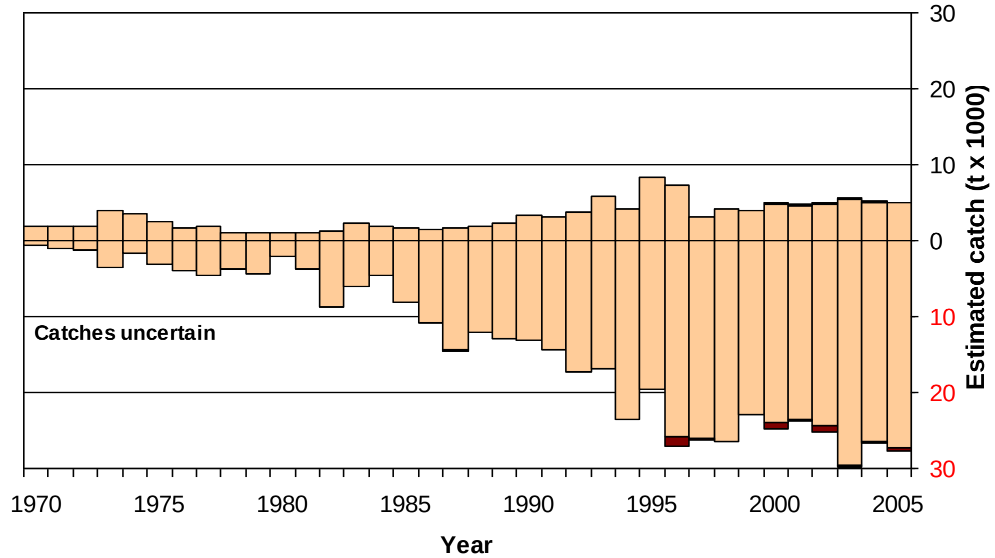

Figure 2*. Frigate tuna: uncertainty of annual catch estimates. The amount of the catch below the zero-line has been categorised as uncertain according to the criteria given in the text. Dark sections represent estimates of catches by industrial fleets.*

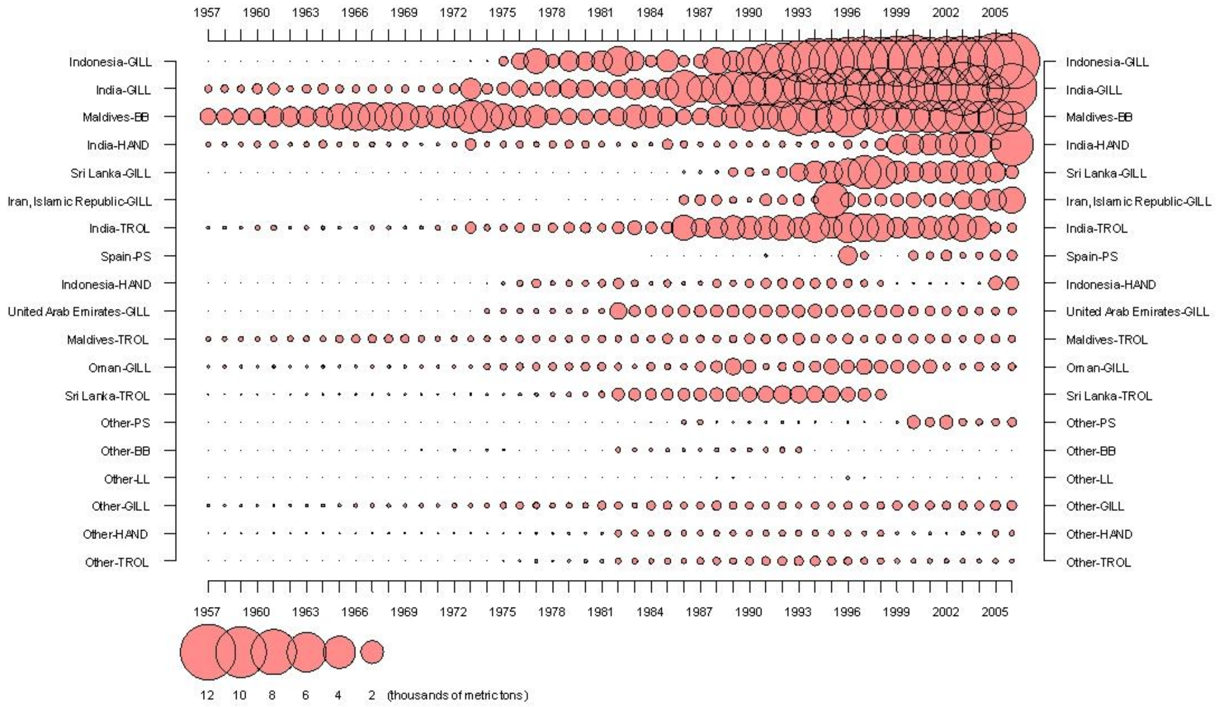

Figure 3. *Frigate tuna: **c**atches by gear and main fleets for the period 1957-2006.(Data as per October 2007)*

Executive summary of the status of the Indo-Pacific king mackerel resource

(*As adopted by the IOTC Scientific Committee on 9 November 2007*)

BIOLOGY

The Indo-Pacific king mackerel (*Scomberomorus guttatus*) is a migratory species that forms small schools and inhabits coastal waters, sometimes entering estuarine areas. It is found in waters from the Persian Gulf, India and Sri Lanka, Southeast Asia, as far north as the Sea of Japan.

Adults can reach a maximum length of 76 cm fork length. Maturity is reached at around 48-52 cm total length (TL) or 1-2 years old in southern India, and about 40 cm (TL) in Thailand. Based on the occurrence of ripe females and the size of maturing eggs, spawning probably occurs from April to July in southern India and in May in Thailand waters. Fecundity increases with age in the Indian waters, ranging from around 400,000 eggs at age 2 years to over one million eggs at age 4 years.

The Indo-Pacific king mackerel feeds mainly on small schooling fishes (e.g. sardines and anchovies), squids and crustaceans.

No information is available on the stock structure of Indo-Pacific king mackerel stock structure in Indian Ocean.

FISHERIES

The Indo-Pacific king mackerel is mostly caught by gillnet fisheries in the Indian Ocean (Figure 1), in particular artisanal fleets from India and more recently Indonesia (Table 1). The catch estimates for Indo-Pacific king mackerel were derived from very small amounts of information and are therefore highly uncertain[6] (Figure 2). The catches provided in Table 1 are based on the information available at the Secretariat and the following observations on the catches cannot currently be verified. Estimated catches have increased steadily since the mid 1960's, reaching around 10,000 t in the early 1970's and over 30,000 t by 1989. The average annual catch estimated for the period 2002 to 2006 is 33,100 t. In recent years, the countries attributed with the highest catches are Indonesia, India and Iran (Table 1, Figure 3).

AVAILABILITY OF INFORMATION FOR STOCK ASSESSMENT

There is no information on the stock structure of Indo-Pacific king mackerel in the Indian Ocean.

Age and growth, fecundity estimates and size at first maturity information is available for Indo-Pacific king mackerel in the Indian Ocean.

Possible fishery indicators:

1. **Trends in catches**: The catch estimates for Indo-Pacific king mackerel are highly uncertain. Catches fluctuate from year to year but have been steadily increasing since the mid 1960's.
2. **Nominal CPUE Trends:** data not available to the Secretariat.
3. **Average weight in the catch by fisheries:** data not available to the Secretariat.
4. **Number of squares fished:** data not available to the Secretariat.

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[6] The uncertainty in the catch estimates has been assessed by the Secretariat and is based on the amount of processing required to account for the presence of conflicting catch reports, the level of aggregation of the catches by species and or gear, and the occurrence of unreporting fisheries for which catches had to be estimated.

STOCK ASSESSMENT

No quantitative stock assessment has been undertaken by the IOTC Working Party on Neritics.

MANAGEMENT ADVICE

No quantitative stock assessment is currently available for the Indo-Pacific king mackerel in the Indian Ocean, therefore the stock status is uncertain. This species is a relatively productive species with high fecundity and rapid growth and this makes it relatively resilient and not prone to overfishing.

The SC recommends Indo-Pacific king mackerel be reviewed at the first meeting of the IOTC Working Party on Neritic Tunas.

INDO-PACIFIC KING MACKEREL SUMMARY

Maximum Sustainable Yield:	-
Preliminary catch in 2006 *(data as of October 2007)*	29,100 t
Catch in 2005	29,500 t
Mean catch over the last 5 years (2002-06)	33,100 t
Current Replacement Yield:	-
Relative Biomass ($B_{current}/B_{MSY}$):	-
Relative Fishing Mortality ($F_{current}/F_{MSY}$):	-

Table 1. *Best scientific estimates of the catches of Indo-Pacific king mackerel (as adopted by the IOTC Scientific Committee) by gear and main fleets for the period 1957-2006 (in thousands of tonnes). Data as of October 2007*

Gear	Fleet	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83
Gillnet	Indonesia	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.4	0.5	0.6	0.6	0.8	1.1	0.5	0.4	0.4	0.5	0.5	0.6	1.1	1.0
Gillnet	India	2.4	2.1	1.8	2.3	3.1	2.9	2.4	3.2	2.7	2.9	2.9	3.5	3.2	3.8	4.8	6.0	3.9	7.0	6.2	6.9	5.3	4.9	7.6	8.2	7.7	7.8	7.8
Gillnet	Iran, Islamic Republic																										1.4	1.6
Gillnet	Malaysia	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1								1.4	1.5	1.7	1.4	1.6	1.9	1.7
Gillnet	Saudi Arabia																									0.0	0.0	0.0
Gillnet	Thailand														0.1		0.0	0.2	0.1	0.1	0.3	0.6	0.4	0.7	0.5	0.7	0.2	0.1
Gillnet	Yemen	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.5	0.5	0.6	0.6	0.7	0.6	0.7	0.6	0.5	0.1
Gillnet	Pakistan	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.3	0.4	0.1	0.3	0.3	0.3
Gillnet	Other Fleets														0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Gillnet	Total	3.1	2.8	2.5	2.8	3.6	3.6	3.1	4.0	3.5	4.0	3.9	4.6	4.2	4.6	5.7	7.2	5.1	8.5	8.0	8.4	8.6	8.1	11.5	11.4	11.5	13.3	12.8
Line	India	0.3	0.3	0.3	0.3	0.5	0.4	0.4	0.5	0.4	0.4	0.4	0.5	0.5	0.5	0.7	0.9	0.6	1.0	0.9	1.0	0.8	0.7	1.1	1.2	1.1	1.1	1.1
Line	Other Fleets	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.2	0.1	0.1	0.1
Line	Total	0.4	0.3	0.3	0.4	0.5	0.4	0.4	0.5	0.4	0.5	0.4	0.6	0.5	0.6	0.7	0.9	0.6	1.0	0.9	1.0	0.8	0.8	1.1	1.4	1.2	1.2	1.2
Other gears	India	1.5	1.3	1.1	1.4	1.9	1.8	1.5	2.0	1.6	1.8	1.7	2.2	1.9	2.3	3.0	3.7	2.4	4.3	3.8	4.2	3.2	3.0	4.6	5.0	4.7	4.8	4.8
Other gears	Thailand														0.1	0.3	0.2	0.0	0.0	0.0	0.4	0.1	0.1	0.0	0.2	0.2	0.7	0.7
Other gears	Malaysia	0.0	0.0	0.0	0.2	0.3	0.3	0.3	0.6	0.8	0.9	0.7	0.8	0.8									0.0	0.1	0.0		0.3	0.0
Other gears	Other Fleets	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Other gears	Total	1.5	1.3	1.1	1.6	2.2	2.1	1.8	2.6	2.5	2.7	2.5	3.0	2.7	2.4	3.2	3.9	2.4	4.3	3.8	4.5	3.3	3.1	4.8	5.3	4.9	5.7	5.6
All	Total	5.0	4.4	3.9	4.8	6.3	6.2	5.3	7.1	6.4	7.1	6.8	8.1	7.4	7.5	9.6	11.9	8.1	13.8	12.8	14.0	12.7	12.0	17.4	18.0	17.6	20.3	19.5

Gear	Fleet	Av02/06	Av57/06	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06
Gillnet	Indonesia	10.4	4.1	0.9	1.4	1.4	1.6	9.3	11.6	5.4	4.7	1.9	8.9	5.7	10.6	13.8	11.9	11.8	11.2	11.7	13.2	9.5	10.5	14.3	8.9	8.9
Gillnet	India	7.4	6.5	11.2	9.8	5.5	7.1	8.6	10.3	7.5	11.4	9.9	12.1	9.3	9.8	7.2	8.2	12.8	7.9	7.8	8.5	9.3	8.7	7.0	6.1	5.9
Gillnet	Iran, Islamic Republic	3.8	1.3	0.9	0.5	0.5	0.7	0.7	1.7	2.3	2.5	2.2	1.6	1.6	5.4	4.3	2.3	3.9	3.5	4.1	2.5	4.0	3.7	4.3	3.1	4.0
Gillnet	Malaysia	0.6	0.8	1.0	1.3	1.7	1.9	1.6	1.2	1.3	1.4	1.7	1.4	1.4	0.9	1.0	1.1	1.5	0.3	0.4	0.5	0.9	0.8	0.7	0.4	0.5
Gillnet	Saudi Arabia	0.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.7	0.7
Gillnet	Thailand	0.4	0.3	0.2	0.3	0.3	0.5	0.4	0.3	0.4	0.3	0.5	0.6	0.4	0.6	0.5	0.5	0.7	0.9	0.3	0.4	0.5	0.5	0.2	0.4	0.3
Gillnet	Yemen	0.3	0.4	0.8	0.6	0.7	0.6	0.5	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Gillnet	Pakistan	0.2	0.2	0.3	0.3	0.5	0.5	0.6	0.0	0.1	0.8	0.0					0.1	0.1	0.3	0.3	0.2	0.2	0.2	0.1	0.2	0.2
Gillnet	Other Fleets	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.0	0.1	0.2	0.1	0.2	0.2	0.3	0.2	0.3	0.3	0.2	0.2	0.1	0.2	0.1	0.1
Gillnet	Total	23.8	13.6	15.3	14.3	10.6	13.0	21.7	25.7	17.6	21.6	16.9	25.3	19.0	28.1	27.5	25.0	31.7	25.0	25.5	26.1	25.3	25.1	27.4	20.2	21.1
Line	India	1.1	1.0	1.6	1.4	0.8	1.0	1.3	1.5	1.1	1.7	1.4	1.8	1.4	1.4	1.1	1.2	1.9	1.1	1.1	1.2	1.4	1.3	1.0	1.2	0.9
Line	Other Fleets	0.1	0.1	0.0	0.0	0.1	0.3	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1
Line	Total	1.2	1.0	1.7	1.5	0.9	1.3	1.3	1.6	1.2	1.7	1.5	1.8	1.5	1.4	1.1	1.2	1.9	1.2	1.2	1.3	1.4	1.3	1.1	1.3	1.0
Other gears	India	4.9	4.0	6.9	6.0	3.4	4.4	5.3	6.3	4.6	7.0	6.1	7.4	5.7	6.0	4.4	5.0	7.9	4.8	4.8	5.2	5.7	5.3	4.6	4.9	3.8
Other gears	Thailand	2.4	0.7	0.4	0.4	0.7	0.7	0.3	0.8	0.9	0.9	1.2	1.2	0.9	1.4	2.5	2.5	2.4	1.1	1.6	1.7	2.2	2.2	2.7	2.4	2.4
Other gears	Malaysia	0.8	0.3	0.0		0.2	0.3	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1.1	1.3	0.8	0.7	0.8	0.7	0.7	0.8
Other gears	Other Fleets	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0
Other gears	Total	8.1	5.1	7.3	6.4	4.3	5.3	5.7	7.2	5.6	8.1	7.4	8.7	6.7	7.5	7.0	7.6	10.4	7.1	7.7	7.7	8.8	8.5	8.0	8.0	7.0
All	Total	33.1	19.6	24.3	22.2	15.7	19.7	28.7	34.4	24.3	31.4	25.8	35.7	27.2	37.0	35.6	33.8	44.0	33.2	34.4	35.1	35.5	34.9	36.5	29.5	29.1

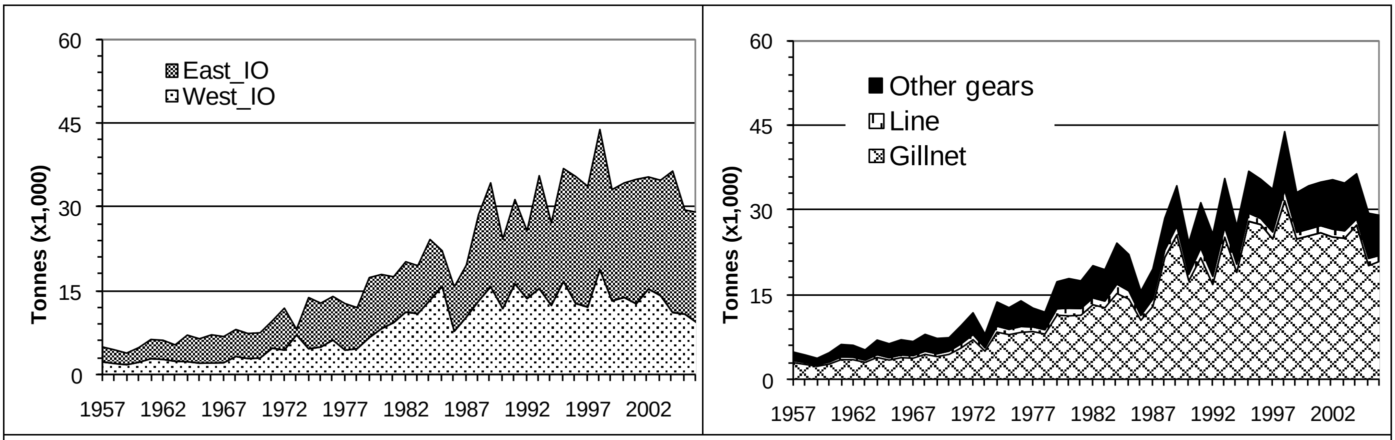

Figure 1*. Indo-Pacific king mackerel: annual catches from 1957 to 2006 by area (left) and gear (right).* Data as of October 2007

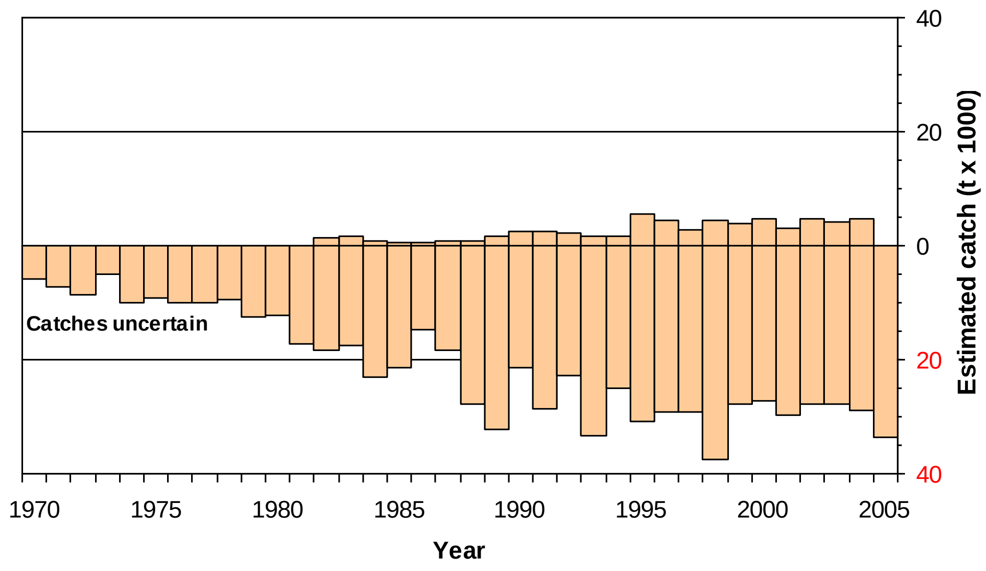

Figure 2*. Indo-Pacific king mackerel: uncertainty of annual catch estimates. The amount of the catch below the zero-line has been categorised as uncertain according to the criteria given in the text.*

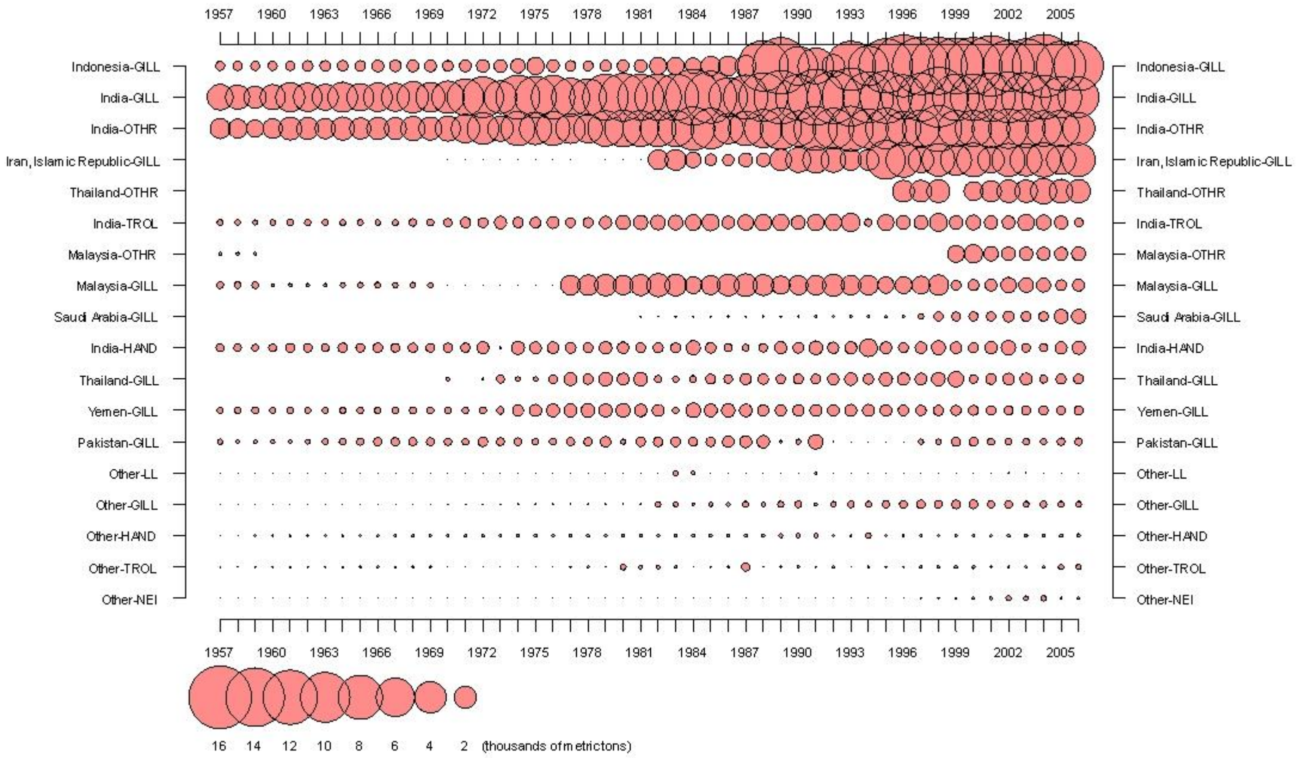

Figure 3. *Indo-Pacific king mackerel: estimated catches by gear and main fleets for the period 1957-2006 (in thousands of tonnes). Data as of October 2007*

Executive summary of the status of the kawakawa resource

(*As adopted by the IOTC Scientific Committee on 9 November 2007*)

BIOLOGY

Kawakawa (*Euthynnus affinis*) lives in open waters close to the shoreline and prefers waters temperatures ranging from 18° to 29°C. Kawakawa form schools by size with other species sometimes containing over 5,000 individuals. Kawakawa are often found with yellowfin, skipjack and frigate tunas. Kawakawa are typically found in surface waters, however, they may range to depths of over 400 m (they have been reported under a fish-aggregating device employed in 400 m), possibly to feed.

Kawakawa grow a length of 100 cm FL and can weigh up to 14 kg but the more common size is around 60 cm. Juveniles grow rapidly reaching lengths between 50 and 65 cm by three years of age.

On the Natal coast in South Africa, sexual maturity is attained at 45-50 cm and spawning occurs mostly during summer. A 1.4 kg female (48 cm FL) may spawn approximately 0.21 million eggs per batch (corresponding to about 0.79 million eggs per season).

Kawakawa larvae are patchy but widely distributed and can generally be found close to land masses. Large changes in apparent abundance are linked to changes in ocean conditions. This species is a highly opportunistic predator feeding on small fishes, especially on clupeoids and atherinids; also squid, crustaceans and zooplankton.

No information is available on stock structure of kawakawa in Indian Ocean.

FISHERIES

Kawakawa is caught mainly by gillnets and purse seiners (Table 1 and Figure 1) and may be an important by-catch of the industrial purse seiners. The catch estimates for kawakawa were derived from very small amounts of information and are therefore highly uncertain[7] (Figure 2). The catches provided in Table 1 are based on the information available at the Secretariat and the following observations on the catches cannot currently be verified. Annual estimates of catch kawakawa increased markedly from around 10,000 t in the late 1970's to reach the 50,000 t mark in the mid-1980's. Since 1997, catches have been around 100,000 t. The average annual catch estimated for the period 2002 to 2006 is 109,600 t. In recent years, the countries attributed with the highest catches are Indonesia, India and Iran (Table 1, Figure 3).

A high percentage of the kawakawa captured by Thai purse seiners in the Andaman sea is comprised of fish 8 to 42 cm long.

AVAILABILITY OF INFORMATION FOR STOCK ASSESSMENT

There is no information on the stock structure of kawakawa in the Indian Ocean.

Numerous studies have been undertaken to investigate the age and the growth of kawakawa. These include various studies based on age and length distributions using various body parts (e.g. vertebrae, dorsal spines, and otoliths). Fecundity of kawakawa has also been studied in the Indian Ocean.

Possible fishery indicators:

[7] The uncertainty in the catch estimates has been assessed by the Secretariat and is based on the amount of processing required to account for the presence of conflicting catch reports, the level of aggregation of the catches by species and or gear, and the occurrence of unreporting fisheries for which catches had to be estimated.

1. **Trends in catches**: The catch estimates for kawakawa are highly uncertain. The trend in catches indicates a large and continuous increase in the catches from the mid-1980's to 2002 (Figure 1). The estimated catches decreased over the period 2002-2005.
2. **Nominal CPUE Trends:** data not available to the Secretariat.
3. **Average weight in the catch by fisheries:** data not available to the Secretariat.
4. **Number of squares fished:** data not available to the Secretariat.

STOCK ASSESSMENT

While some localised, sub-regional assessments may have been undertaken, no quantitative stock assessment has been undertaken by the IOTC Working Party on Neritics.

MANAGEMENT ADVICE

No quantitative stock assessment is currently available for kawakawa in the Indian Ocean, therefore the stock status is uncertain.

The SC notes the catches have been relatively stable for the past 10 years.. Nevertheless, the SC recommends that this species be reviewed at the first meeting of the IOTC Working Party on Neritic Tunas.

KAWAKAWA SUMMARY

Maximum Sustainable Yield:	-
Preliminary catch in 2006 *(data as of October 2007)*	114,800 t
Catch in 2005	101,100 t
Mean catch over the last 5 years (2002-06)	109,600 t
Current Replacement Yield:	-
Relative Biomass ($B_{current}/B_{MSY}$):	-
Relative Fishing Mortality ($F_{current}/F_{MSY}$):	-

Table 1. *Best scientific estimates of the catches of kawakawa (as adopted by the IOTC Scientific Committee) by gear and main fleets for the period 1957-2006 (in thousands of tonnes).* Data as of October 2007.

Gear	Fleet	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83
Purse seine	Malaysia	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.4	0.5	0.4	0.3	1.2	0.8	0.9	0.5	0.7	1.2	0.8	0.9	1.7	1.0	2.5	1.0	0.8	1.4
Purse seine	Thailand														0.1	0.4	0.4	0.6	0.5	1.1	0.7	0.6	0.8	0.1	0.0	0.0	1.2	0.4
Purse seine	India	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1
Purse seine	Other Fleets							0.2	0.8	0.3					0.0		0.0		0.0	0.0						0.0	0.0	0.0
Purse seine	Total	0.1	0.1	0.1	0.2	0.2	0.1	0.3	1.0	0.6	0.4	0.5	0.4	0.3	1.3	1.3	1.4	1.3	1.2	2.4	1.6	1.6	2.6	1.3	2.7	1.2	2.1	1.9
Gillnet	Indonesia	1.2	1.2	1.1	1.2	1.5	1.5	1.6	1.7	1.9	2.0	1.9	2.0	2.2	1.7	1.7	2.7	2.9	4.7	9.6	12.0	14.8	10.8	12.1	17.2	20.8	2.8	0.5
Gillnet	India	0.9	1.0	0.9	1.7	2.4	0.7	1.4	1.3	1.0	0.9	1.3	1.2	1.0	1.0	2.1	2.0	9.9	2.8	3.5	6.4	4.4	6.0	8.1	12.8	7.5	7.9	6.1
Gillnet	Iran, Islamic Republic														0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3		0.2	0.2	0.4	0.7	2.5
Gillnet	Yemen	0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.4	0.4	0.5	0.5	0.4	0.5	0.6	0.6	0.7	0.6	1.8	1.0	0.9	0.8
Gillnet	Oman	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.7	0.8	0.9	1.0	1.1	1.0	1.2	1.1	0.8	0.4
Gillnet	Pakistan	0.7	0.4	0.4	0.4	0.4	0.6	0.9	1.3	1.4	1.8	1.8	1.8	1.6	1.4	1.2	1.4	1.1	1.5	1.7	1.6	1.4	0.8	1.4	0.7	1.0	1.3	0.4
Gillnet	United Arab Emirates														0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	2.0	0.9
Gillnet	Other Fleets	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.2	0.1	0.2	0.1	0.2	0.3	0.5	0.3	0.1	0.2	0.2	0.6	0.5	0.2
Gillnet	Total	3.3	3.0	3.0	3.8	4.8	3.4	4.4	4.8	4.9	5.3	5.7	5.7	5.5	5.0	5.8	7.1	15.1	10.5	16.7	22.5	22.8	19.6	23.7	34.3	32.7	17.0	11.8
Line	Maldives											0.3	0.3	0.4	0.4	0.3	0.4	0.6	0.5	0.3	0.9	0.9	0.7	0.6	0.9	1.0	1.2	1.3
Line	Indonesia	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.4	0.4													15.6	19.0
Line	Other Fleets	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.3	0.3	0.4	0.3	0.3	0.2	0.3	0.4	0.5	0.5	1.0	1.0
Line	Total	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.7	0.7	0.8	0.7	0.5	0.6	0.9	0.9	0.6	1.2	1.1	1.0	1.0	1.4	1.5	17.8	21.2
Other gears	Maldives											0.2	0.2	0.2	0.3	0.2	0.3	0.6	0.4	0.2	0.2	0.2	0.2	0.2	0.3	0.5	1.0	1.1
Other gears	India	0.5	0.5	0.5	0.9	1.2	0.4	0.7	0.7	0.6	0.5	0.7	0.7	0.6	0.6	1.2	1.1	4.3	1.5	1.9	3.2	2.2	2.9	3.9	6.3	4.0	4.0	3.3
Other gears	Other Fleets	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.7
Other gears	Total	0.5	0.5	0.5	0.9	1.2	0.4	0.7	0.7	0.6	0.5	0.9	0.9	0.8	0.8	1.4	1.4	4.9	1.9	2.0	3.5	2.4	3.0	4.1	6.6	4.5	5.5	5.0
All	Total	4.0	3.9	3.8	5.1	6.4	4.2	5.7	6.7	6.4	6.6	7.7	7.6	7.4	7.9	9.0	10.5	22.1	14.5	21.6	28.7	27.8	26.2	30.1	45.0	39.9	42.4	40.0

Gear	Fleet	Av02/06	Av57/06	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06
Purse seine	Malaysia	9.3	2.6	1.6	2.5	2.1	1.3	1.9	2.0	3.1	3.4	5.5	3.4	1.9	2.4	4.0	4.2	6.1	5.4	6.9	6.0	10.1	8.7	8.5	7.8	11.4
Purse seine	Thailand	6.4	2.5	0.6	1.5	0.7	4.5	2.2	2.2	4.5	7.0	7.7	7.2	5.7	8.6	6.4	5.9	4.3	2.6	6.3	6.2	4.9	7.0	7.0	6.5	6.5
Purse seine	India	1.1	0.5	0.1	0.2	0.4	0.2	0.2	0.5	0.7	1.2	1.5	1.2	0.9	1.1	1.0	1.3	1.2	1.6	1.6	1.4	1.6	1.7	1.0	0.4	1.0
Purse seine	Other Fleets	0.3	0.1	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2
Purse seine	Total	17.1	5.6	2.3	4.2	3.2	6.0	4.3	4.7	8.2	11.6	14.7	11.8	8.5	12.1	11.4	11.5	11.7	9.6	14.9	13.6	16.7	17.5	16.6	14.7	20.1
Gillnet	Indonesia	42.7	15.7	6.5	0.9	2.2	2.3	12.4	12.1	9.6	20.9	17.6	27.6	34.5	34.9	37.8	41.0	40.4	46.3	48.9	40.3	43.2	44.5	48.7	39.1	38.1
Gillnet	India	17.4	8.6	7.6	11.2	12.0	9.3	10.1	17.5	22.4	13.8	17.4	13.8	9.7	12.1	11.1	15.3	14.1	17.8	18.5	15.8	18.3	18.0	12.4	17.4	20.8
Gillnet	Iran, Islamic Republic	13.3	3.0	3.9	1.7	1.9	0.6	2.2	0.8	0.7	0.7	0.7	0.5	2.1	3.9	5.7	7.8	7.9	10.9	13.5	12.5	16.4	14.1	11.6	11.8	12.6
Gillnet	Yemen	2.6	1.2	1.2	2.1	1.5	1.4	1.7	1.3	1.6	1.7	1.7	0.6	1.3	1.3	1.5	1.7	1.9	2.1	2.3	2.5	2.7	1.6	3.1	3.0	2.6
Gillnet	Oman	2.3	1.1	1.1	1.0	1.1	2.6	3.5	2.0	2.2	1.1	1.6	0.9	1.5	2.2	2.4	2.5	1.8	1.5	1.7	2.0	1.5	2.9	2.5	2.2	2.5
Gillnet	Pakistan	2.1	1.6	0.5	0.8	1.6	2.0	4.1	1.4	2.1	1.9	1.5	1.5	1.7	1.4	2.9	2.8	3.0	3.5	3.1	2.3	1.6	1.8	2.1	2.5	2.5
Gillnet	United Arab Emirates	0.6	0.8	0.9	0.8	1.2	1.8	1.9	2.0	2.1	2.0	2.1	1.2	2.3	2.1	2.1	2.2	2.2	2.2	0.7	0.9	0.7	0.7	0.6	0.6	0.6
Gillnet	Other Fleets	2.2	0.9	0.4	0.3	0.3	0.5	0.7	0.7	0.9	1.0	1.2	0.8	1.8	2.1	2.3	3.4	3.6	2.3	2.2	3.0	3.4	2.4	1.8	1.5	1.6
Gillnet	Total	83.2	32.8	22.1	18.9	21.9	20.6	36.6	37.9	41.5	43.1	43.8	46.9	54.9	60.0	65.7	76.7	74.8	86.7	90.9	79.2	87.8	86.1	82.9	78.0	81.3
Line	India	5.7	1.6								4.3	5.5	4.3	3.0	3.8	3.5	4.8	4.4	5.6	5.8	4.9	5.7	5.4	4.2	4.5	8.8
Line	Maldives	0.5	0.6	0.7	1.4	0.7	0.9	0.6	0.8	1.0	0.8	1.2	1.9	0.9	1.0	1.2	0.6	1.4	0.5	0.5	0.4	0.4	0.5	0.5	0.6	0.3
Line	Indonesia	0.3	3.8	16.3	20.4	20.1	18.7	11.5	15.2	10.7	4.4	3.4	6.6	7.1	6.0	5.5	3.4	2.4	0.1	0.1	0.1	0.1	0.1	0.2	0.0	1.0
Line	Other Fleets	0.9	0.7	1.1	0.9	1.0	2.6	1.2	1.2	1.2	1.5	1.6	1.3	1.5	1.4	1.3	1.3	1.1	0.9	0.5	0.7	0.5	0.7	0.6	1.1	1.7
Line	Total	7.4	6.7	18.2	22.7	21.8	22.3	13.3	17.2	13.0	11.1	11.6	14.2	12.6	12.1	11.5	10.1	9.3	7.0	6.9	6.1	6.8	6.7	5.4	6.1	11.8
Other gears	Maldives	1.8	0.8	0.8	1.0	0.6	0.5	0.6	0.6	1.0	0.8	1.3	1.7	1.7	1.7	2.6	1.5	2.2	1.2	1.4	1.7	1.8	1.9	1.8	2.1	1.3
Other gears	India	0.0	1.8	4.1	5.2	5.7	4.3	4.9	8.3	9.7											0.0		0.0			
Other gears	Other Fleets	0.1	0.1	0.7	0.5	0.5	0.5	0.3	0.4	0.3	0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.2	0.3
Other gears	Total	1.9	2.7	5.6	6.7	6.8	5.3	5.8	9.3	10.9	0.9	1.4	1.8	1.7	1.7	2.6	1.5	2.2	1.3	1.4	1.8	1.9	2.0	1.9	2.3	1.6
All	Total	109.6	47.7	48.1	52.5	53.7	54.2	60.0	69.0	73.6	66.7	71.5	74.7	77.7	86.0	91.2	99.8	98.0	104.6	114.2	100.7	113.0	112.3	106.8	101.1	114.8

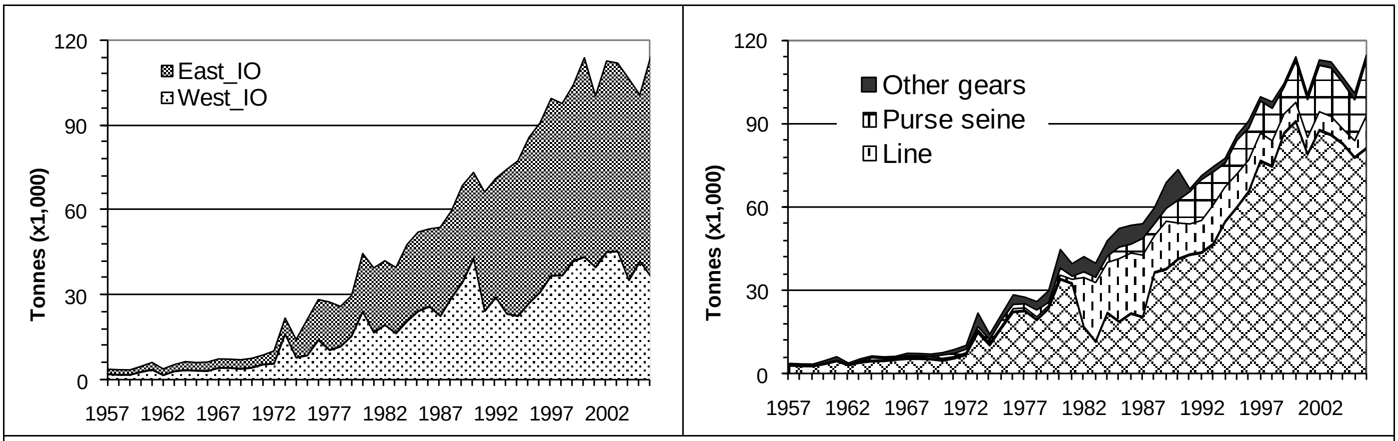

Figure 1. *Kawakawa: (a) annual catches from 1957 to 2006 by (on the left) area i.e. Eastern and Western Indian Ocean and (on the right) gear.* *Data as of October 2007*

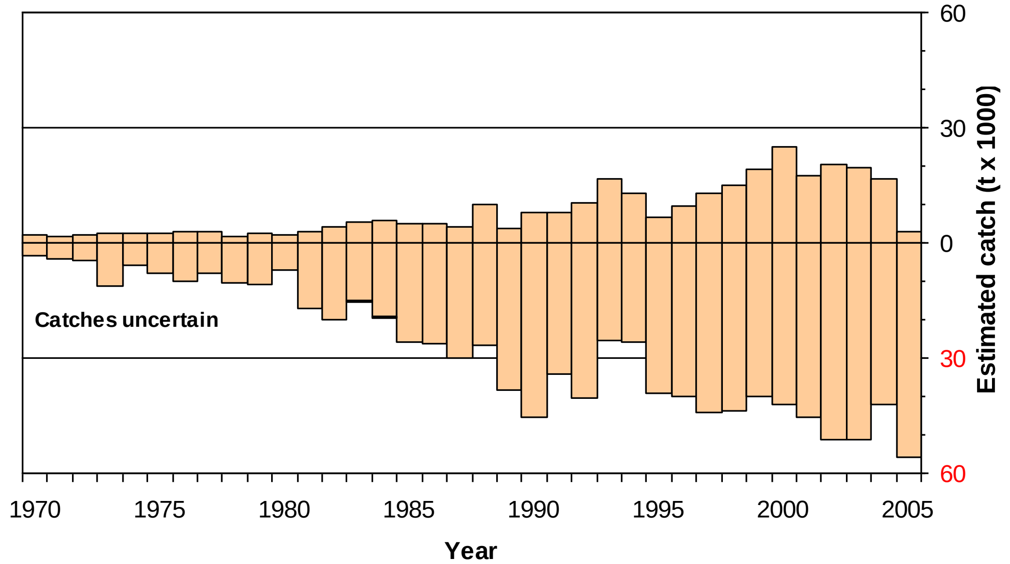

Figure 2. *Kawakawa: uncertainty of annual catch estimates. The amount of the catch below the zero-line has been categorised as uncertain according to the criteria given in the text.*

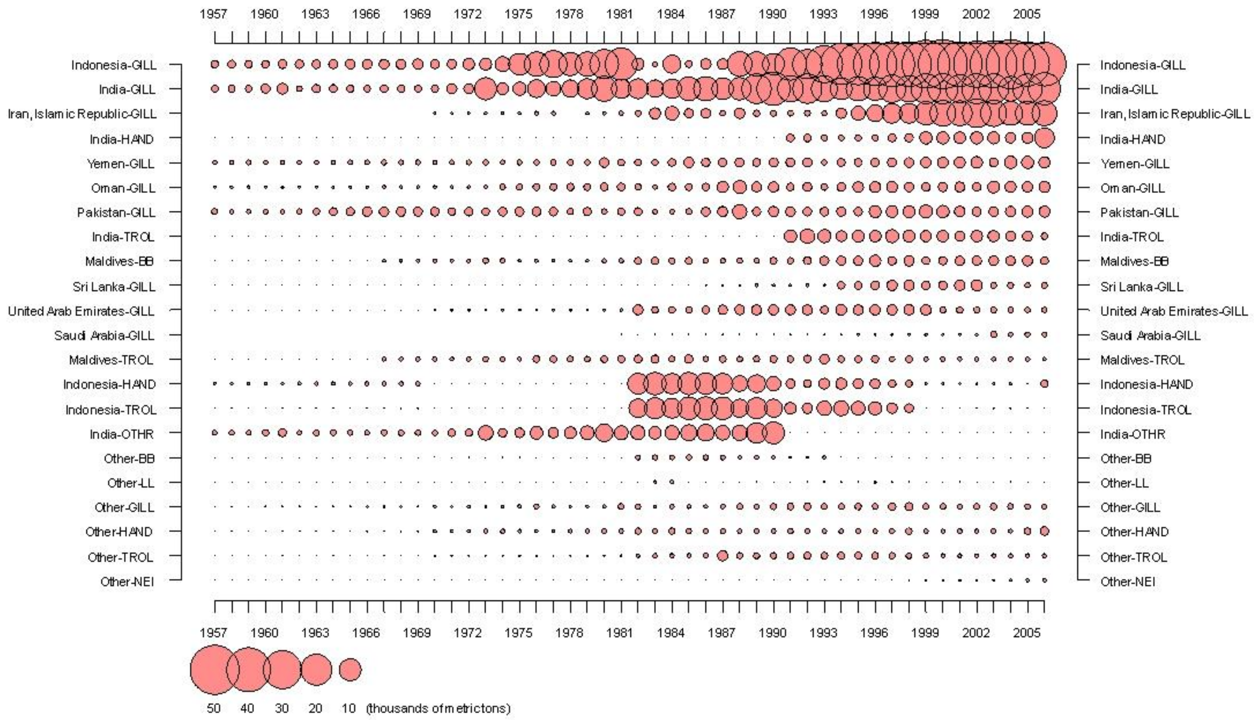

Figure 3. *Catches of kawakawa by gear and main fleets for the period 1957-2006 (in thousands of tonnes).*

Data as of October 2007

Executive summary of the status of the longtail tuna resource

(*As adopted by the IOTC Scientific Committee on 9 November 2007*)

BIOLOGY

Longtail tuna *(Thunnus tonggol)* is an oceanic species that forms schools of varying sizes. It is most abundant over areas of broad continental shelf.

Longtail tuna grows to around 145 cm FL or 35.9 kg, but the most common size in Indian Ocean ranges from 40 to 70 cm. Longtail tuna grows rapidly to reach 40 to 46 cm in FL in one year.

The spawning season varies according to location. Off the west coast of Thailand there are two distinct spawning seasons: January-April and August-September.

Longtail tuna feeds on a variety of fish, cephalopods, and crustaceans, particularly stomatopod larvae and prawns.

No information is available on the stock structure of longtail tuna in the Indian Ocean.

FISHERIES

Longtail tuna is caught mainly by gillnet and in a lesser extent by artisanal purse seiners and most of the catch is taken in the western Indian Ocean area (Figure 1). The catch estimates for longtail tuna were derived from very small amounts of information and are therefore highly uncertain[8] (Figure 2). The catches provided in Table 1 are based on the information available at the Secretariat and the following observations on the catches cannot currently be verified. Estimated catches of longtail tuna increased steadily from the mid 1950's, reaching around 9,000 t in the early 1970's and over 50,000 t by the mid-1980's and peaking at 97,700 t in 2002. The average annual catch estimated for the period 2002 to 2006 is 90,800 t . In recent years, the countries attributed with the highest catches of longtail tuna are Indonesia, Iran, Oman, Yemen and Pakistan (Table 1, Figure 3).

AVAILABILITY OF INFORMATION FOR STOCK ASSESSMENT

There is no information on the stock structure of longtail tuna in the Indian Ocean.

Age and the growth are available for Longtail tuna in other oceans.

Possible fishery indicators:

1. **Trends in catches**: The catch estimates for longtail tuna are highly uncertain. There has been a variable but steady increase in the catches from the mid-1950's (Figure 1). .
2. **Nominal CPUE Trends:** data not available to the Secretariat.
3. **Average weight in the catch by fisheries:** data not available to the Secretariat.
4. **Number of squares fished:** data not available to the Secretariat.

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[8] The uncertainty in the catch estimates has been assessed by the Secretariat and is based on the amount of processing required to account for the presence of conflicting catch reports, the level of aggregation of the catches by species and or gear, and the occurrence of unreporting fisheries for which catches had to be estimated.

STOCK ASSESSMENT

While some localised, sub-regional assessments may have been undertaken, no quantitative stock assessment has been undertaken by the IOTC Working Party on Neritics.

MANAGEMENT ADVICE

No quantitative stock assessment is currently available for longtail tuna in the Indian Ocean, therefore the stock status is uncertain.

The SC notes the catches of longtail tuna are increasing and recommended that this species be reviewed at the first meeting of the IOTC Working Party on Neritic Tunas.

LONGTAIL TUNA SUMMARY

Maximum Sustainable Yield:	-
Preliminary catch in 25006 *(data as of October 2007)*	92,400 t
Catch in 2005	81,000 t
Mean catch over the last 5 years (2002-06)	90,800 t
Current Replacement Yield:	-
Relative Biomass ($B_{current}/B_{MSY}$):	-
Relative Fishing Mortality ($F_{current/}F_{MSY}$):	-

Table 1. *Best scientific estimates of the catches of longtail tuna (as adopted by the IOTC Scientific Committee) by gear and main fleets for the period 1957-2006 (in thousands of tonnes).*
Data as of October 2007

Gear	Fleet	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83
Purse seine	Malaysia	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.2	0.2	0.2	0.1	0.7	0.5	0.5	0.3	0.4	0.7	0.5	0.5	0.9	0.6	1.4	0.6	0.5	0.8
Purse seine	Thailand														0.0	0.2	0.2	0.3	0.2	0.5	0.3	0.3	0.4	1.8	0.6	1.1	6.9	6.8
Purse seine	Other Fleets							0.0	0.0	0.0					0.0		0.0		0.0	0.0					0.0	0.0	0.0	0.0
Purse seine	Total	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.2	0.2	0.2	0.1	0.7	0.7	0.7	0.6	0.6	1.2	0.8	0.8	1.3	2.4	2.0	1.7	7.4	7.6
Gillnet	Indonesia	1.0	1.0	1.0	1.0	1.3	1.3	1.4	1.5	1.6	1.8	1.7	1.8	1.9	1.2	1.3	2.0	2.2	3.5	7.2	9.1	11.1	8.1	9.1	13.0	15.6	14.2	14.8
Gillnet	Iran, Islamic Republic														0.6	0.1	0.7	0.9	0.9	0.9	1.4	1.6		0.8	1.0	2.2	2.9	5.6
Gillnet	Oman	0.7	0.7	0.9	0.7	0.7	0.7	0.7	0.7	0.8	0.8	1.0	1.0	1.0	0.9	1.0	1.1	1.2	3.8	4.4	5.0	5.3	5.8	5.4	6.6	6.3	4.6	2.1
Gillnet	Yemen	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.3	0.4	0.4	0.5	1.1	1.3	1.4	1.5	1.7	1.5	1.7	1.4	1.2	0.4
Gillnet	Pakistan	2.0	1.0	1.0	1.2	1.1	1.7	2.5	3.5	3.8	5.1	4.9	4.9	4.5	4.1	3.3	3.9	3.1	4.3	4.7	4.4	3.9	2.3	4.0	1.8	2.8	3.5	1.2
Gillnet	India	0.4	0.4	0.4	0.8	1.1	0.3	0.6	1.1	0.5	0.5	0.5	0.4	0.4	0.3	0.5	0.6	3.0	0.8	1.0	1.5	1.0	1.6	2.0	2.9	1.7	2.6	1.2
Gillnet	United Arab Emirates	0.9	0.9	1.3	1.3	1.3	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.7	0.9	0.9	0.9	0.9	1.5	1.5	1.4	1.4	1.4	1.4	1.4	0.4	4.0	2.6
Gillnet	Other Fleets	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.2	0.2	0.2	0.1	0.4	0.2	0.4	0.1	0.3	0.5	0.9	0.6	0.3	0.4	0.6	1.4	1.0	0.4
Gillnet	Total	5.3	4.4	5.0	5.4	5.9	6.0	7.1	8.7	8.9	10.3	10.5	10.4	10.1	8.7	7.6	10.0	11.8	16.1	21.6	25.1	26.5	21.2	24.7	28.9	31.8	34.1	28.2
Other gears	India	0.0	0.1	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.5	0.2	0.2	0.4	0.3	0.3	0.5	0.7	0.4	0.6	0.3
Other gears	Other Fleets	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	1.0
Other gears	Total	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.1	0.2	0.2	0.6	0.2	0.3	0.4	0.3	0.4	0.5	0.7	0.5	0.6	1.3
All	Total	5.6	4.6	5.3	5.7	6.2	6.4	7.5	9.1	9.3	10.8	11.0	10.9	10.5	9.5	8.5	10.9	12.9	16.9	23.1	26.3	27.6	22.8	27.6	31.7	33.9	42.1	37.1

Gear	Fleet	Av02/06	Av57/06	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06
Purse seine	Malaysia	4.0	1.2	1.0	1.5	1.3	0.8	0.8	1.1	1.3	1.5	2.4	1.5	0.8	1.0	1.7	1.8	2.6	2.3	3.0	2.6	4.3	3.7	3.6	3.4	4.9
Purse seine	Thailand	2.9	1.9	5.9	2.2	1.5	1.4	1.2	1.4	1.0	5.3	2.0	3.2	2.0	3.4	4.0	3.7	9.9	5.1	4.4	1.0	2.7	3.2	2.8	2.9	2.9
Purse seine	Iran, Islamic Republic	2.9	0.5													0.7	0.8	1.5	2.1	2.7	3.0	5.8	3.6	1.5	1.2	2.3
Purse seine	Other Fleets	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.0	0.3	0.1	0.0	0.0
Purse seine	Total	9.9	3.6	6.9	3.7	2.8	2.2	2.0	2.6	2.3	6.7	4.4	4.7	2.8	4.5	6.4	6.3	14.0	9.6	11.2	6.6	12.9	10.8	8.1	7.5	10.1
Gillnet	Indonesia	31.9	14.5	15.4	15.5	15.4	16.0	17.8	20.6	15.0	18.8	15.4	25.8	31.1	30.6	32.5	33.4	32.1	34.9	36.8	29.5	32.4	33.1	35.5	29.1	29.4
Gillnet	Iran, Islamic Republic	21.8	8.7	6.1	11.8	11.7	12.1	16.9	19.4	14.9	14.6	9.8	8.2	11.5	27.2	16.5	17.9	18.2	21.3	38.7	31.9	24.1	26.7	18.0	17.3	22.8
Gillnet	Oman	7.7	4.6	6.1	6.6	7.5	17.3	15.8	8.8	7.0	4.3	5.2	6.9	5.6	4.2	5.4	5.1	4.4	4.8	5.5	6.1	6.9	8.0	8.2	7.5	7.9
Gillnet	Yemen	5.6	1.7	1.0	1.1	0.5	0.6	0.7	0.6	1.4	0.7	1.4	1.8	2.4	2.3	2.6	3.0	3.3	3.7	4.0	4.4	4.7	3.7	5.4	6.3	7.6
Gillnet	Pakistan	5.2	4.0	1.3	2.1	4.4	6.0	6.3	4.9	6.3	6.1	5.8	4.5	5.8	5.0	4.7	5.6	5.5	6.4	6.1	5.2	4.9	5.9	5.1	4.9	4.9
Gillnet	India	3.7	2.2	1.8	4.5	1.6	3.3	2.4	2.8	3.6	2.9	1.9	2.9	3.0	4.2	3.1	3.3	3.7	6.6	7.3	6.5	4.6	3.0	1.4	3.4	6.1
Gillnet	United Arab Emirates	2.2	2.2	2.6	2.4	3.4	3.1	3.4	3.4	3.4	3.3	3.4	3.4	3.8	4.9	5.0	3.2	3.2	3.2	1.5	1.5	1.9	2.9	2.0	2.0	2.0
Gillnet	Other Fleets	0.9	0.7	0.5	0.8	0.9	1.5	1.3	0.7	0.7	0.8	0.7	1.0	0.7	0.8	1.9	1.8	1.5	1.4	1.2	1.0	1.4	1.1	0.4	0.9	0.7
Gillnet	Total	78.9	38.6	34.7	44.9	45.4	60.0	64.4	61.2	52.1	51.4	43.6	54.5	63.9	79.3	71.7	73.3	71.9	82.5	101.0	86.1	80.9	84.5	76.1	71.5	81.6
Other gears	India	1.0	0.7	0.4	1.2	0.4	0.8	0.7	0.7	0.9	1.2	0.8	1.2	1.2	1.7	1.3	1.3	1.5	2.7	3.0	2.6	1.9	1.3	0.5	1.1	0.0
Other gears	Other Fleets	1.0	0.6	2.9	1.5	2.4	2.2	1.0	0.9	1.1	0.9	1.1	0.6	1.4	1.1	0.9	0.7	0.8	0.7	0.5	1.3	0.6	1.1	1.7	0.9	0.7
Other gears	Total	2.0	1.3	3.4	2.6	2.8	3.0	1.7	1.6	2.0	2.1	1.9	1.8	2.6	2.8	2.2	2.0	2.3	3.4	3.4	4.0	2.5	2.4	2.3	2.0	0.8
All	Total	90.8	43.5	45.0	51.2	51.0	65.3	68.1	65.3	56.5	60.3	49.9	61.0	69.4	86.6	80.2	81.6	88.2	95.4	115.7	96.7	96.3	97.7	86.5	81.0	92.4

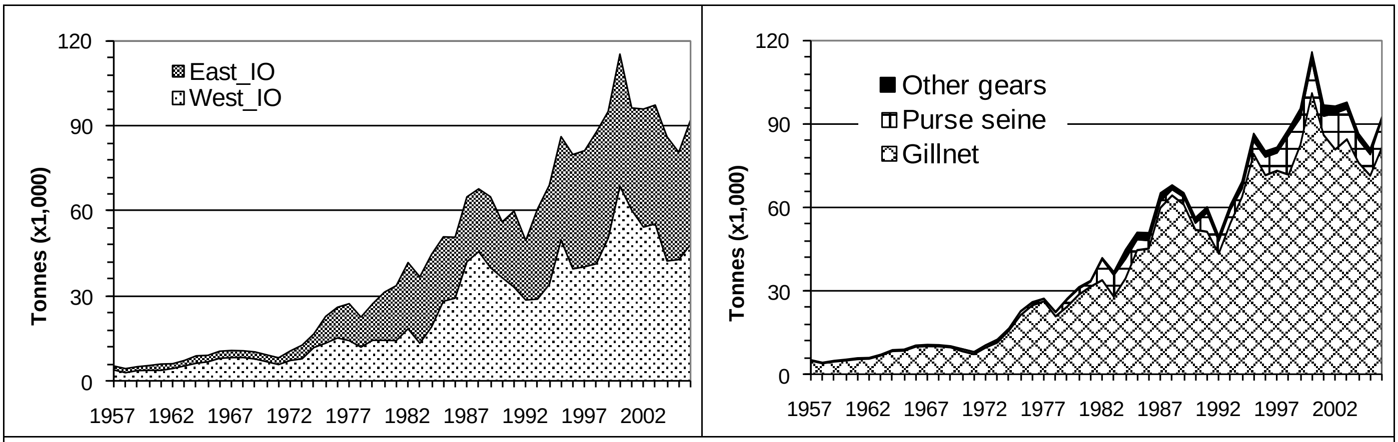

Figure 1. *Longtail tuna: annual catches from 1957 to 2006 by area (left) and gear (right).* *Data as per October 2007*

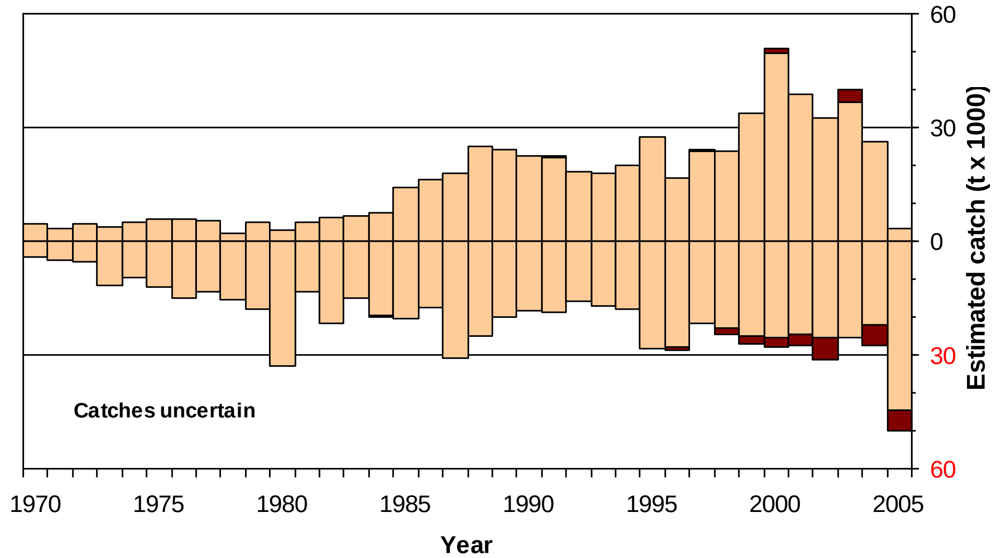

Figure 2. *Longtail tuna: uncertainty of annual catch estimates. The amount of the catch below the zero-line has been categorised as uncertain according to the criteria given in the text. Dark sections represent estimates of catches by industrial fleets*

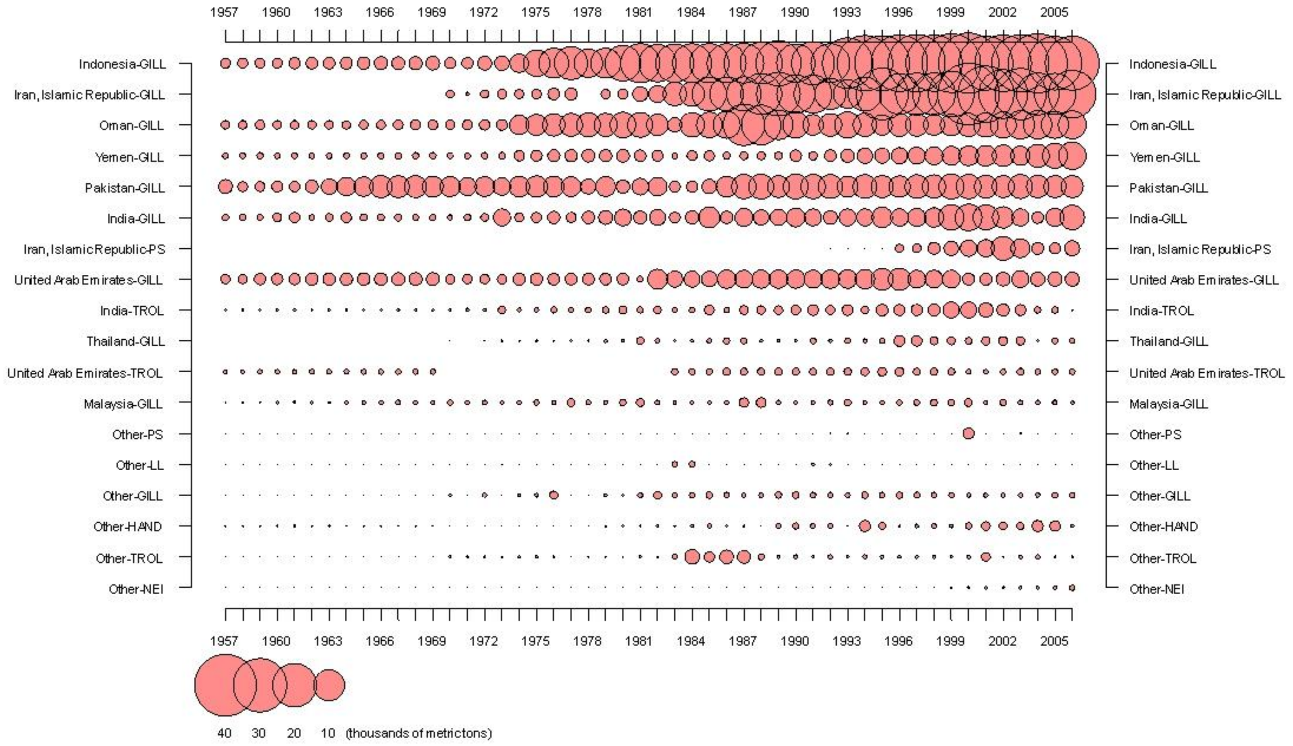

Figure 3. *Longtail tuna: **c**atches by gear and main fleets for the period 1957-2006 (in thousands of tonnes).*

Data as of October 2007

Executive summary of the status of the narrow-barred Spanish mackerel resource

(*As adopted by the IOTC Scientific Committee on 9 November 2007*)

BIOLOGY

The narrow-barred Spanish mackerel or king seer *(Scomberomorus commerson*) is a pelagic, top level predator found throughout tropical marine waters of the Indo-West Pacific. Juveniles inhabit shallow inshore areas whereas adults are found in coastal waters out to the continental shelf. Adults are usually found in small schools but often aggregate at particular locations on reefs and shoals to feed and spawn. Spanish mackerel appear to undertake lengthy migrations. Spanish mackerel feed primarily on small fishes such as anchovies, clupeids, carangids, also squids and shrimps.

Spanish mackerel may live for up to 15 years, and grow to 240 cm fork length or 70 kg. Females are multiple spawners. Year-round spawning has been observed in east African waters, with peaks during late spring to summer (April-July) and autumn (September-November) coinciding with the two seasonal monsoons which generate high abundances of plankton and small pelagic fish. Size at first maturity is estimated to be around 52 cm for males and 81 cm for females.

Genetic studies carried out on *S. commerson* from Djibouti, Oman and U.A.E. showed there were small genetic differences among stocks in these three places.

FISHERIES

Spanish mackerel is targeted throughout the Indian Ocean by artisanal and recreational fishers. The main method of capture is gill net, but significant numbers of are also caught using trolling lines.

The catch estimates for Spanish mackerel were derived from very small amounts of information and are therefore highly uncertain[9] (Figure 2). The catches provided in Table 1 are based on the information available at the Secretariat and the following observations on the catches cannot currently be verified. The catches of Spanish mackerel increased from around 50,000 t the mid-1970’s to 100,000 t by the mid-1990’s. The current average annual catch is around 112,200 t (for the period 2002 to 2006), with most of the catch obtained taken from the west Indian Ocean area. (Figures 1, 3 and Table 1). In recent years, the countries attributed with the highest catches of Spanish mackerel are Indonesia, Madagascar, Pakistan, Iran and Saudi Arabia.

The size of Spanish mackerel taken varies by location with 32-119 cm fish taken in the Eastern Peninsular Malaysia area, 17-139 cm fish taken in the East Malaysia area and 50-90 cm fish taken in the Gulf of Thailand. Similarly, Spanish mackerel caught in the Oman Sea are typically larger than those caught in the Persian Gulf.

AVAILABILITY OF INFORMATION FOR STOCK ASSESSMENT

Numerous studies have been completed in Indian Ocean to determine the fecundity, the size at first maturity and age and growth parameters.

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[9] The uncertainty in the catch estimates has been assessed by the Secretariat and is based on the amount of processing required to account for the presence of conflicting catch reports, the level of aggregation of the catches by species and or gear, and the occurrence of unreporting fisheries for which catches had to be estimated.

Genetic studies carried out on *S. commerson* from Djibouti, Oman and U.A.E. showed there were small genetic differences among stocks in these three places, therefore, stock assessment purposes, the use of sub-stocks may be appropriate.

Possible fishery indicators:

1. **Trends in catches**: The catch estimates for narrow-barred Spanish mackerel are highly uncertain. The trend in catches indicate a large and continuous increase in the catches from the 1970's to 2000, followed by a period of relatively stable catches at around 120,000 t (Figure 1).
2. **Nominal CPUE Trends:** data not available to the Secretariat.
3. **Average weight in the catch by fisheries:** data not available to the Secretariat.
4. **Number of squares fished:** data not available to the Secretariat.

STOCK ASSESSMENT

While some localised, sub-regional assessments have been undertaken, typically by national scientists, no quantitative stock assessment has been undertaken by the IOTC Working Party on Neritics.

MANAGEMENT ADVICE

No quantitative stock assessment is currently available for narrow-barred Spanish mackerel tuna in the Indian Ocean, therefore the stock status is uncertain. The SC notes that Spanish mackerel is a relatively productive species with high fecundity and this makes it relatively resilient and less prone to overfishing; however, it recommends that this important species be reviewed at the first meeting of the IOTC Working Party on Neritic Tunas.

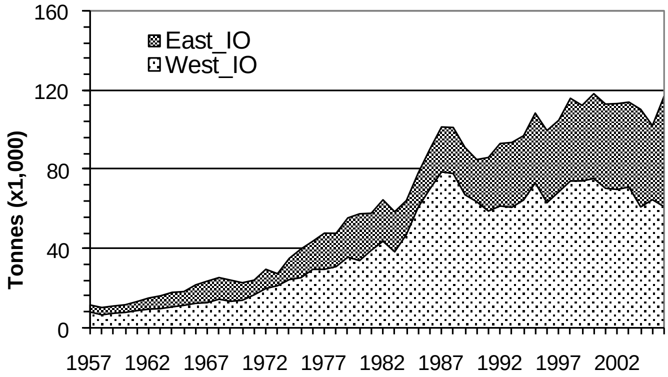
NARROW-BARRED SPANISH MACKEREL SUMMARY

Maximum Sustainable Yield:	-
Preliminary catch in 2006 *(data as of October 2007)*	117,900 t
Catch in 2005	103,000 t
Mean catch over the last 5 years (2002-065)	112,200 t
Current Replacement Yield:	-
Relative Biomass ($B_{current}/B_{MSY}$):	-
Relative Fishing Mortality ($F_{current}/F_{MSY}$):	-

Table 1. *Best scientific estimates of the catches of narrow-barred Spanish mackerel (as adopted by the IOTC Scientific Committee) by gear and main fleets for the period 1957-2006 (in thousands of tonnes).* Data as of October 2007

Gear	Fleet	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83
Gillnet	Indonesia	0.5	0.6	0.5	0.6	0.7	0.8	0.8	0.8	1.0	1.0	0.9	0.9	1.0	1.1	1.2	1.4	1.2	1.1	5.6	3.7	5.0	4.3	3.9	6.1	4.4	6.1	7.7
Gillnet	India	2.6	2.3	2.0	2.6	3.4	3.2	2.7	3.1	2.6	2.8	2.7	3.8	3.3	3.8	5.5	6.0	6.1	6.6	6.3	7.3	5.3	5.1	7.9	9.3	7.8	11.0	10.0
Gillnet	Pakistan	2.1	1.1	1.1	1.3	1.2	1.8	2.7	3.8	4.1	5.5	5.3	5.3	4.8	4.4	3.5	7.5	4.9	4.4	3.1	3.7	5.4	5.8	9.2	2.0	7.3	7.4	8.0
Gillnet	Iran, Islamic Republic																										0.1	1.4
Gillnet	United Arab Emirates	1.0	1.0	1.6	1.6	1.6	1.8	1.8	1.8	2.0	2.0	2.1	2.1	2.1	2.2	2.4	2.4	2.4	3.7	3.7	3.6	3.6	3.6	3.6	3.6	3.5	6.5	5.4
Gillnet	Sri Lanka	0.9	1.0	1.2	1.2	1.3	2.1	3.0	2.6	2.2	3.8	5.4	5.3	5.2	3.9	2.6	2.9	3.3	3.2	3.1	3.9	3.8	3.9	4.5	6.1	5.0	4.5	4.0
Gillnet	Saudi Arabia																									0.6	0.5	0.7
Gillnet	Oman	1.3	1.3	1.6	1.3	1.3	1.3	1.3	1.3	1.4	1.4	1.7	1.7	1.7	1.6	1.7	1.9	2.1	6.7	7.8	8.9	9.4	10.3	9.5	11.7	11.1	8.2	3.6
Gillnet	Yemen	0.8	0.8	1.0	0.8	0.8	0.8	0.8	0.8	0.9	0.9	1.0	1.0	1.0	0.8	0.9	1.0	1.1	2.6	3.1	3.5	3.7	4.0	3.7	4.1	3.3	2.9	0.9
Gillnet	Qatar																										0.2	0.2
Gillnet	Malaysia	0.3	0.3	0.3	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2								2.9	3.1	3.4	2.7	3.2	3.9	3.4
Gillnet	Other Fleets	0.0	0.0	0.0				0.0	0.0	0.5	0.2	0.1	0.0	0.0	0.7	0.7	0.8	0.8	0.8	0.9	1.6	2.6	1.8	2.2	1.7	3.2	2.8	2.7
Gillnet	Total	9.6	8.5	9.2	9.4	10.3	11.9	13.2	14.4	14.9	17.7	19.5	20.4	19.4	18.5	18.4	24.0	21.8	29.1	33.6	36.2	41.7	41.9	47.8	47.3	49.6	54.1	47.8
Line	India	0.4	0.3	0.3	0.4	0.5	0.5	0.4	0.5	0.4	0.4	0.4	0.5	0.5	0.6	0.8	0.9	0.9	1.0	0.9	1.1	0.8	0.7	1.1	1.4	1.1	1.6	1.5
Line	Saudi Arabia																									0.2	0.2	0.3
Line	Other Fleets	0.5	0.6	0.9	0.7	0.7	1.0	1.3	1.2	1.2	1.6	1.9	2.0	2.0	1.3	1.0	1.0	1.2	1.1	1.6	1.6	1.9	1.9	1.9	3.3	2.7	1.8	2.8
Line	Total	0.9	0.9	1.2	1.1	1.2	1.4	1.7	1.6	1.5	2.0	2.3	2.5	2.4	1.8	1.8	1.8	2.1	2.1	2.5	2.7	2.6	2.6	3.1	4.6	4.0	3.6	4.6
Other gears	India	1.6	1.4	1.2	1.6	2.1	2.0	1.7	1.9	1.6	1.7	1.7	2.3	2.0	2.3	3.4	3.6	3.7	4.0	3.8	4.5	3.2	3.1	4.8	5.7	4.8	6.7	6.1
Other gears	Thailand														0.1	0.3	0.2	0.0	0.0	0.0	0.4	0.1	0.1	0.0	0.3	0.2	0.7	0.7
Other gears	Other Fleets	0.1	0.1	0.1	0.2	0.3	0.3	0.3	0.7	0.9	0.9	0.8	0.9	0.8	0.7	0.9	0.6	0.3	0.5	0.5	0.7	0.9	0.8	0.5	0.5	0.0	0.3	0.1
Other gears	Total	1.7	1.5	1.3	1.8	2.4	2.3	2.0	2.6	2.5	2.6	2.5	3.2	2.9	3.1	4.5	4.4	4.1	4.6	4.4	5.6	4.2	4.0	5.4	6.4	5.0	7.7	7.0
All	Total	12.2	10.9	11.6	12.3	13.9	15.7	16.8	18.6	18.9	22.3	24.2	26.0	24.7	23.4	24.7	30.2	28.0	35.8	40.5	44.4	48.5	48.5	56.3	58.3	58.6	65.4	59.4

Gear	Fleet	Av02/06	Av57/06	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06
Gillnet	Indonesia	19.8	7.7	6.5	6.2	7.6	8.6	10.2	9.7	8.5	10.0	10.8	13.5	12.4	13.7	15.9	14.9	16.8	16.2	18.4	20.8	17.2	18.0	22.6	20.3	21.1
Gillnet	India	18.2	9.4	10.6	9.3	13.3	10.3	11.7	12.3	9.1	9.8	13.9	11.8	14.0	16.3	14.0	14.5	18.3	17.7	20.8	15.7	20.6	19.4	15.7	13.7	21.4
Gillnet	Pakistan	8.8	6.5	6.9	7.4	7.6	7.8	10.2	6.8	6.3	10.2	8.4	8.4	7.2	8.6	10.1	12.5	12.7	13.2	10.7	9.3	8.7	9.3	9.5	8.2	8.2
Gillnet	Iran, Islamic Republic	7.6	2.1	0.6	0.7	0.7	1.1	1.0	2.5	3.4	3.7	3.3	2.9	3.1	11.1	3.6	3.9	4.0	4.6	7.1	6.1	8.6	8.1	7.1	5.9	8.3
Gillnet	United Arab Emirates	4.3	4.3	5.4	4.2	6.7	5.7	6.1	6.4	6.3	6.0	6.2	6.2	6.9	6.8	7.1	8.3	8.6	9.0	8.2	9.0	3.3	4.9	4.4	4.4	4.4
Gillnet	Sri Lanka	3.2	3.7	3.7	3.8	4.0	4.1	4.3	4.3	4.3	4.2	4.1	4.1	4.1	4.8	4.0	4.2	4.6	5.0	5.0	4.9	5.1	4.5	4.5	0.7	0.9
Gillnet	Saudi Arabia	3.2	2.5	0.8	7.1	7.7	7.0	7.1	6.7	7.6	7.8	7.9	8.3	8.5	6.0	5.0	3.7	4.7	3.8	3.5	4.8	4.0	3.1	2.9	2.9	2.9
Gillnet	Oman	2.7	5.7	10.7	20.3	14.3	25.3	27.8	11.1	7.8	3.6	3.6	3.1	3.8	6.1	5.2	5.9	3.1	3.4	2.6	2.8	2.1	2.8	3.2	2.7	2.9
Gillnet	Yemen	1.8	2.2	4.5	3.5	3.8	3.3	2.6	2.3	3.1	3.2	2.6	3.1	3.3	3.0	2.4	2.3	2.2	2.2	2.1	2.0	1.9	1.8	1.8	1.8	1.8
Gillnet	Qatar	1.6	0.3	0.3	0.3	0.1	0.1	0.1	0.2	0.6	0.7	0.8	0.6	0.4	0.3	0.3	0.4	0.6	0.5	0.8	1.0	1.0	1.9	1.5	1.9	1.9
Gillnet	Malaysia	1.3	1.5	2.1	2.6	3.5	3.8	3.2	2.4	2.7	2.8	3.5	2.8	2.7	1.9	2.1	2.3	3.0	0.7	0.9	1.0	1.7	1.5	1.4	0.8	1.0
Gillnet	Other Fleets	3.2	1.9	1.8	2.5	2.8	2.9	2.6	2.6	3.4	3.0	3.5	3.0	2.6	3.2	3.4	3.3	3.7	3.9	2.8	3.3	3.3	3.3	2.8	3.3	3.3
Gillnet	Total	75.7	47.8	53.9	68.0	72.1	80.0	87.2	67.3	63.1	65.2	68.5	67.9	69.1	81.8	73.2	76.1	82.6	80.1	82.8	80.8	77.5	78.7	77.4	66.6	78.1
Line	Madagascar	12.0	4.1			3.8	7.9	0.4	8.5	10.0	8.0	8.0	10.0	10.0	10.0	10.0	10.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
Line	India	2.8	1.4	1.5	1.4	1.9	1.5	1.7	1.8	1.3	1.4	2.0	1.7	2.0	2.4	2.0	2.1	2.7	2.6	3.0	2.3	3.0	2.8	2.3	2.8	3.2
Line	Saudi Arabia	2.4	0.9	0.3	1.2	1.4	2.0	2.3	2.5	1.3	1.4	2.2	2.6	2.9	0.9	1.0	2.3	2.4	2.7	2.4	2.3	2.3	2.7	2.2	2.4	2.4
Line	Other Fleets	2.8	2.2	2.4	2.1	2.7	3.6	2.7	3.2	3.5	3.7	3.1	3.6	3.8	2.7	2.9	3.1	2.9	2.3	2.7	3.7	2.4	3.0	2.9	3.1	2.5
Line	Total	20.0	8.6	4.3	4.7	9.8	14.9	7.1	16.0	16.1	14.6	15.4	17.9	18.8	16.0	15.9	17.5	19.9	19.5	20.1	20.3	19.7	20.5	19.5	20.4	20.2
Other gears	India	12.0	5.8	6.5	5.7	8.1	6.3	7.2	7.5	5.5	6.0	8.5	7.2	8.6	9.9	8.6	8.9	11.2	10.8	12.7	9.6	12.6	11.9	10.2	11.7	13.7
Other gears	Thailand	2.7	0.8	0.4	0.5	0.8	0.7	0.4	0.8	1.0	0.9	1.3	1.2	1.0	1.4	2.8	2.7	2.7	1.1	1.8	1.9	2.5	2.5	3.0	2.7	2.7
Other gears	Other Fleets	1.8	0.6	0.1	0.0	0.2	0.4	0.2	0.3	0.1	0.2	0.3	0.3	0.4	0.1	0.1	0.4	0.5	1.6	1.7	1.2	1.8	1.3	1.1	1.7	3.2
Other gears	Total	16.5	7.2	6.9	6.2	9.1	7.4	7.8	8.6	6.6	7.1	10.1	8.7	9.9	11.5	11.4	12.0	14.4	13.6	16.3	12.8	16.9	15.7	14.3	16.1	19.6
All	Total	112.2	63.6	65.1	78.9	91.0	102.3	102.1	91.9	85.8	86.9	93.9	94.5	97.9	109.3	100.5	105.7	116.8	113.2	119.2	113.9	114.1	114.9	111.2	103.0	117.9



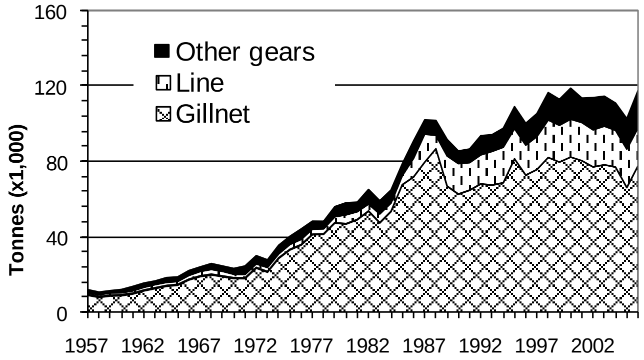


Figure 1. *Narrow-barred Spanish mackerel: (a) annual catches from 1957 to 2006 by (on the left) area i.e. Eastern and Western Indian Ocean and (on the right) gear. Data as of October 2007*

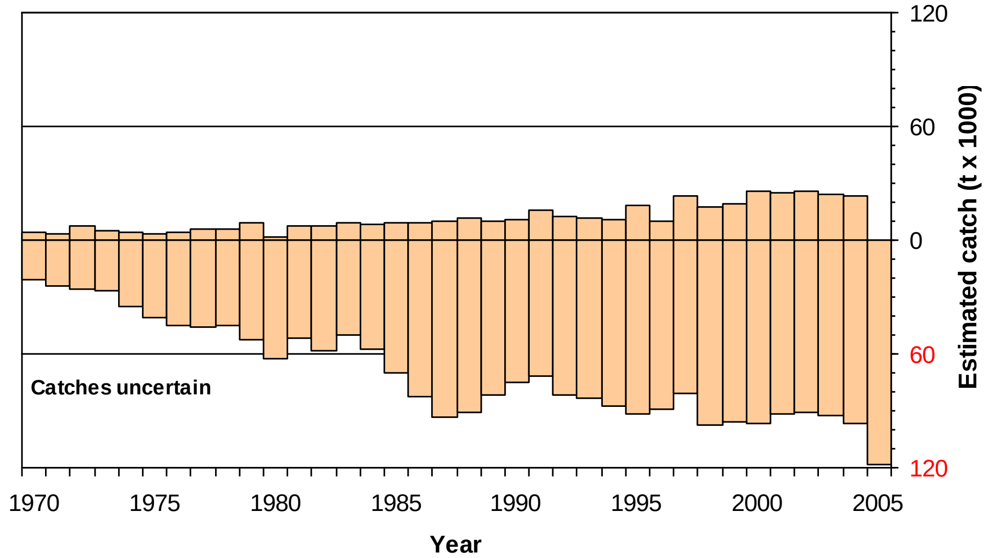


Figure 2*. Narrow-barred Spanish mackerel: uncertainty of annual catch estimates. The amount of the catch below the zero-line has been categorised as uncertain according to the criteria given in the text.*

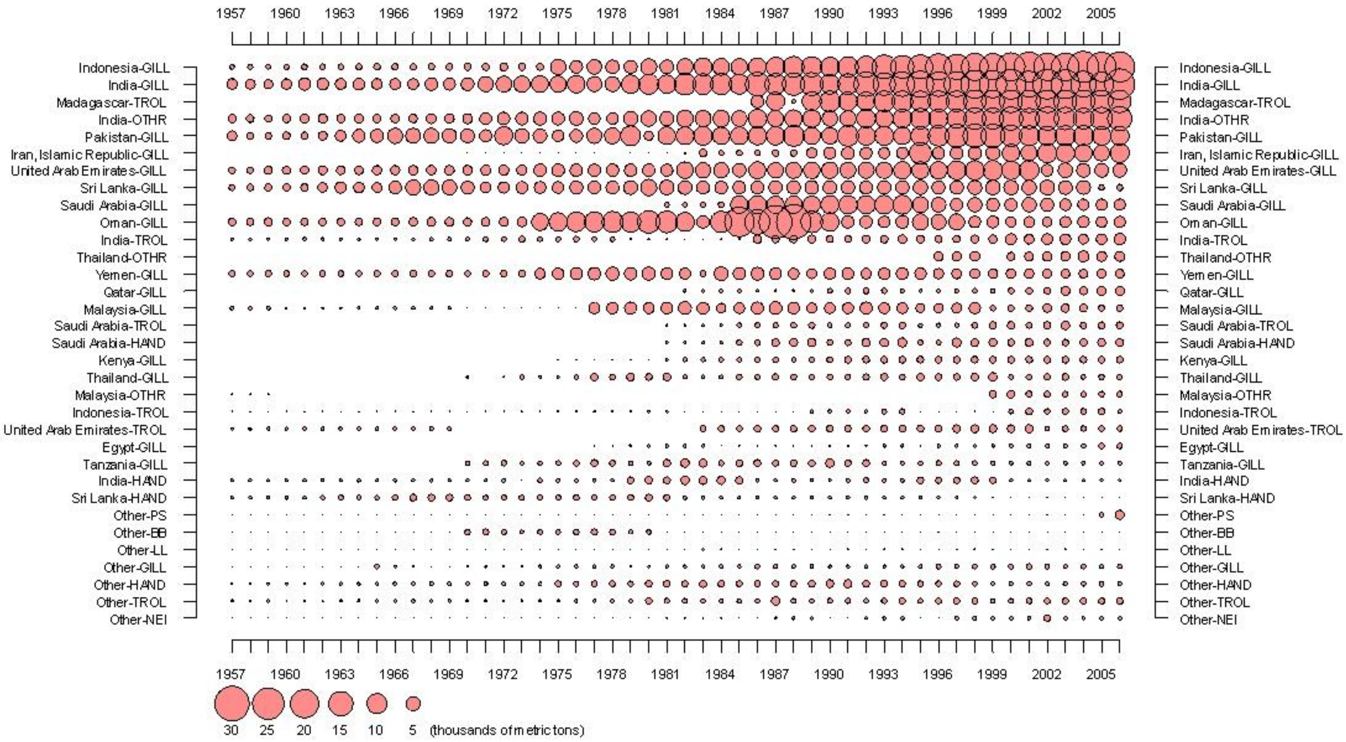


Figure 3. *Narrow barred Spanish mackerel: catches of by gear and main fleets for the period 1957-2006 (in thousands of tonnes).* *Data as of October 2007*

Executive summary of the status of the wahoo resource

(*As adopted by the IOTC Scientific Committee on 9 November 2007*)

BIOLOGY

Wahoo (*Acanthocybium solandri*) occurs widely in the tropical and sub-tropical waters of the major oceans. Larger individuals are solitary but may also be found in small, loose aggregations. Like other oceanic scombrids, wahoo are often found in association with current lines, near seamounts and around floating objects and debris. Little is known of their early life history; however wahoo larvae are pelagic and prefer shallow water less than 100 m in depth. The distribution of juveniles is unknown.

As a top-level predator, wahoo feeds on a range of open-water prey including other scombrids (e.g. skipjack tuna, frigate tuna), scads, flying fish, squid and occasionally fishes of the mixed scattering layer (e.g. lantern fish).

Wahoo live for over six years, grow rapidly and can reach a size of 210 cm fork length and around 83 kg. Size changes with latitude, with average weight increasing with distance from the equator; this is apparently correlated to cooler temperatures.

Sexual maturity occurs at around 90 cm but some wahoo may commence spawning after one year. Spawning occurs year-round in the tropics and during the summer months in subtropical waters. Wahoo are probably multiple spawners, with spawning occurring over a protracted period when favourable conditions (temperature, food) are encountered. Fecundity is relatively high (e.g. six million eggs per spawning for a 131 cm fish). Males appear to predominate at sizes greater than 140 cm.

Little information is available on wahoo movement, although seasonal changes in availability and the latitudinal variation in average size suggest that some seasonal migration may occur.

No information is available on the stock structure of wahoo in Indian Ocean.

FISHERIES

Wahoo is mainly taken with hand line and gillnet combined with drifting long line, it is also a bycatch of longline fisheries. Trolling is a common method to catch wahoo in Maldives. It is caught in similar quantities in both western and eastern areas of the Indian Ocean (Figure 1). The catch estimates for wahoo were derived from very small amounts of information and are therefore underestimated and highly uncertain[10] (Figure 2). The catches provided in Table 1 are based on the information available at the Secretariat and the following observations on the catches cannot currently be verified. Estimated catches of wahoo jumped from negligible levels to just below 300 t in the 1980's. Catches peaked in 1991 at 900 t and thereafter fluctuated between 300 and 500 t. The current average annual catch is around 500 t (for the period 2002 to 2006). In recent years, the countries attributed with the highest catches of wahoo are Indonesia, Sri Lanka, Tanzania, Indonesia, France and Kenya.

[10] The uncertainty in the catch estimates has been assessed by the Secretariat and is based on the amount of processing required to account for the presence of conflicting catch reports, the level of aggregation of the catches by species and or gear, and the occurrence of unreporting fisheries for which catches had to be estimated.

AVAILABILITY OF INFORMATION FOR STOCK ASSESSMENT

There is no information on the stock structure of wahoo in the Indian Ocean.

Information is available on fecundity, the size at first maturity, age and growth of wahoo in other oceans.

Possible fishery indicators:

1. **Trends in catches**: The catch estimates for wahoo are highly uncertain. Catches have been variable but around the 300-500 t mark since early 1990's (Figure 1).
2. **Nominal CPUE Trends:** data not available to the Secretariat.
3. **Average weight in the catch by fisheries:** data not available to the Secretariat.
4. **Number of squares fished:** data not available to the Secretariat.

STOCK ASSESSMENT

While some localised, sub-regional assessments may have been undertaken, no quantitative stock assessment has been undertaken by the IOTC Working Party on Neritics.

MANAGEMENT ADVICE

No quantitative stock assessment is currently available for wahoo in the Indian Ocean, therefore the stock status is uncertain. However, wahoo is a relatively productive species with high fecundity and rapid growth and these attributes make it relatively resilient and not prone to overfishing.

The SC recommends that this species be reviewed at the first meeting of the IOTC Working Party on Neritic Tunas.

WAHOO SUMMARY

Maximum Sustainable Yield:	-
Preliminary catch in 2006 *(data as of October 2007)*	300 t
Catch in 2005	500 t
Mean catch over the last 5 years (2002-06)	500 t
Current Replacement Yield:	-
Relative Biomass ($B_{current}/B_{MSY}$):	-
Relative Fishing Mortality ($F_{current}/F_{MSY}$):	-

Table 1. *Best scientific estimates of the catches of wahoo (as adopted by the IOTC Scientific Committee) by gear and main fleets for the period 1957-2006 (in thousands of tonnes). Data as of October 2007*

Gear	Fleet	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83
Gillnet	India	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Gillnet	Other Fleets	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gillnet	Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Line	Tanzania														0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0			
Line	India	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Line	Sri Lanka	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2
Line	Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.2	0.2
Other gears	Indonesia																						0.0	0.0	0.0	0.0	0.0	0.0
Other gears	India	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Other gears	Other Fleets									0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other gears	Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
All	Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.2	0.3

Gear	Fleet	Av02/06	Av57/06	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06
Gillnet	Sri Lanka	0.1	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.1	0.0	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1
Gillnet	India	0.0	0.0	0.0	0.0	0.0			0.1	0.0	0.3	0.0	0.0		0.0	0.0	0.0					0.0	0.0	0.0	0.1	0.0
Gillnet	Other Fleets	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gillnet	Total	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.3	0.0	0.2	0.2	0.1	0.0	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.1	0.2	0.1
Line	France-Territories	0.1	0.0												0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.1		
Line	France-Reunion	0.1	0.0										0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.0
Line	Tanzania	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Line	Kenya	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Line	India	0.0	0.0	0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0					0.0	0.0	0.0	0.0	0.0
Line	Sri Lanka	0.0	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Line	Other Fleets	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Line	Total	0.2	0.1	0.2	0.3	0.3	0.3	0.4	0.3	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.1	0.1
Other gears	Indonesia	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
Other gears	India	0.0	0.0	0.0	0.0	0.0			0.1	0.0	0.2	0.0	0.0		0.0	0.0	0.0			0.0		0.0	0.0	0.0	0.1	0.0
Other gears	Other Fleets	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other gears	Total	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
All	Total	0.5	0.2	0.3	0.3	0.3	0.3	0.4	0.6	0.4	0.9	0.4	0.5	0.5	0.4	0.4	0.4	0.3	0.5	0.4	0.4	0.5	0.5	0.4	0.5	0.3

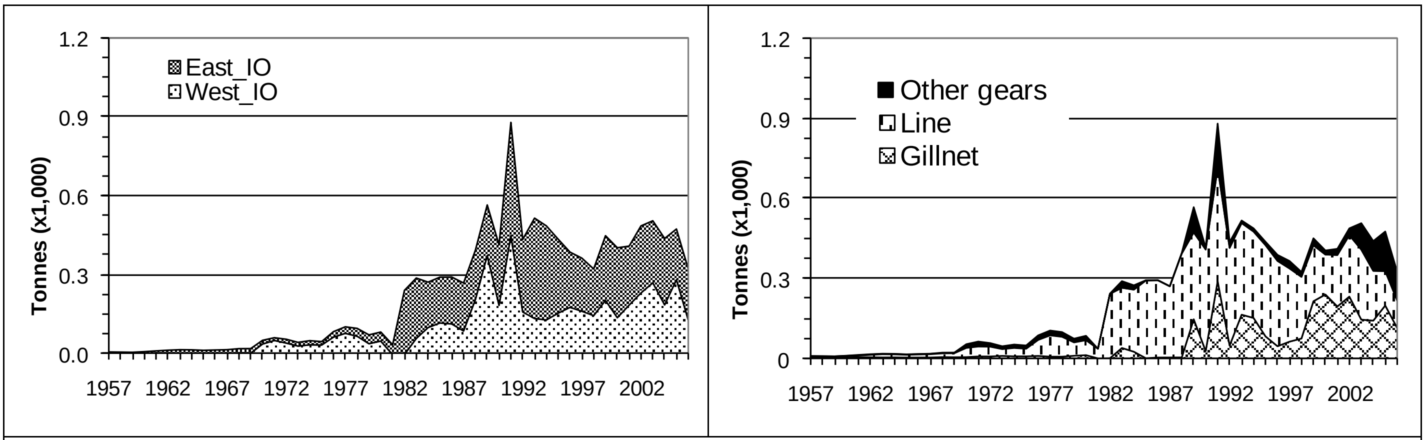


Figure 1. *Wahoo: annual catches (thousand of metric tonnes) by area (left) and gear (right) from 1957 to 2006). Data as of October 2007*

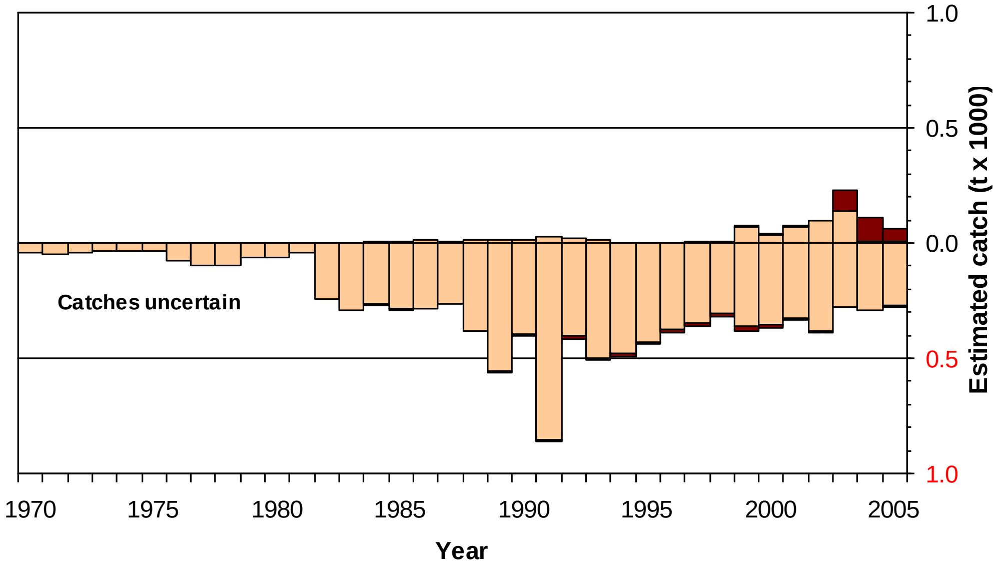


Figure 2. *Wahoo: uncertainty of annual catch estimates. The amount of the catch below the zero-line has been categorised as uncertain according to the criteria given in the text. Dark sections represent estimates of catches by industrial fleets.*

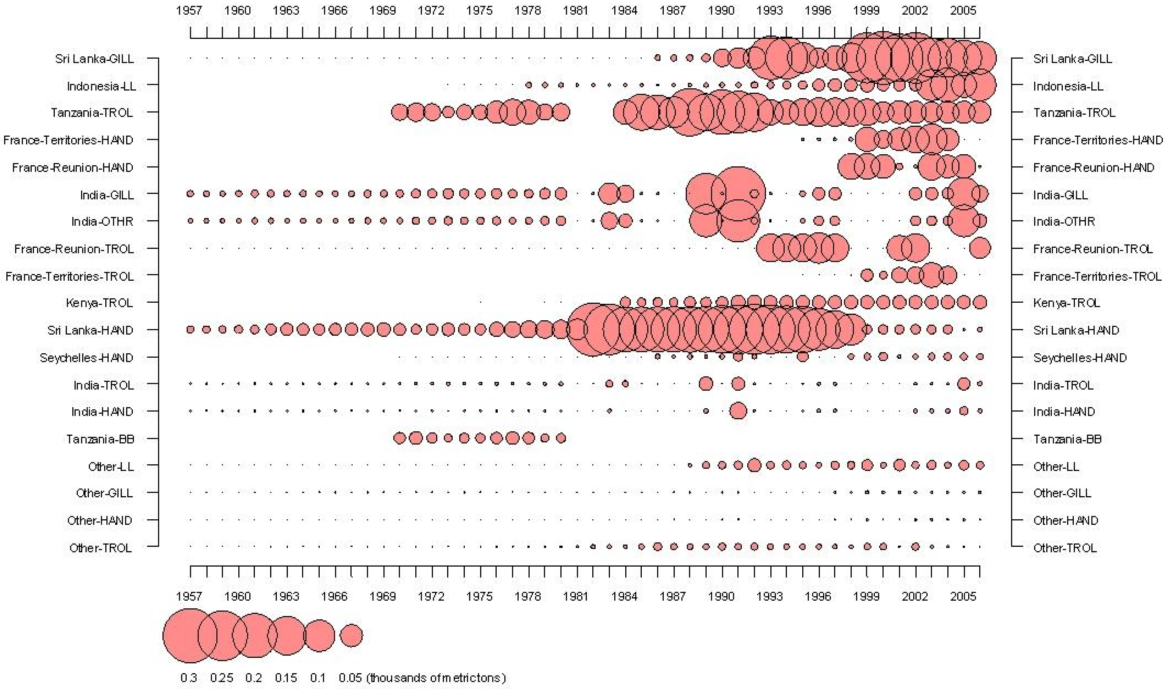


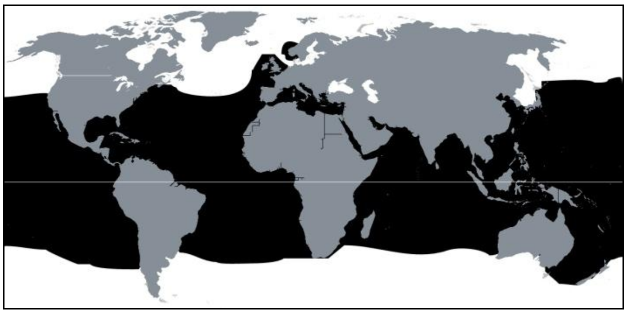
Figure 3. *Wahoo: catches by gear and main fleets for the period 1957-2006 (in thousands of tonnes).* Data as of October 2007

Executive summary of the status of the blue shark resource

(*As adopted by the IOTC Scientific Committee 9 November 2007*)

BIOLOGY

The blue shark (*Prionace glauca*) is common in pelagic oceanic waters throughout the tropical and temperate oceans worldwide. It has one of the widest ranges of all the shark species. It may also be found close inshore and in estuaries. Blue shark is most common in relatively cool waters (7 to 16°C) often close to the surface. In the tropical Indian Ocean, the greatest abundance of blue sharks occurs at depths of 80 to 220 m, in temperatures ranging from 12 to 25°C. The distribution and movements of blue shark are strongly influenced by seasonal variations in water temperature, reproductive condition, and availability of prey.



The worldwide distribution of the blue shark

The blue shark is often found in large single sex schools containing individuals of similar size. Adult blue sharks have no known predators; however, subadults and juveniles are eaten by both shortfin makos and white sharks as well as by sea lions. Fishing is likely to be a major contributor to adult mortality.

In the Atlantic Ocean, the oldest blue sharks reported were a 16 year old male and a 13 year old female. Longevity is estimated to be between 20-26 years of age and maximum size is around 3.8 m FL. Size increases when latitude decreases.

Sexual maturity is attained at 5 years of age in both sexes. Blue shark is a viviparous species, with a yolk-sac placenta. Once the eggs have been fertilised there is a gestation period of between 9 and 12 months. Litter size is quite variable, ranging from four to 135 pups and may be dependent on the size of the female. The average litter size observed from the Indian Ocean is 38. New-born pups are around 40 to 51 cm in length. Generation time is about eight years. In Indian Ocean, between latitude 2 ºN and 6 ºS, pregnant females are present for most of the year.

FISHERIES

Blue sharks are often targeted by some semi-industrial, artisanal and recreational fisheries and are a bycatch of industrial fisheries (pelagic longline tuna and swordfish fisheries and purse seine fishery). The blue shark appears to have a similar distribution to swordfish. Typically, the fisheries take blue sharks between 1.8-2.4 m fork length or 30 to 52 kg. Males are slightly smaller than the females. In other Oceans, angling clubs are known for organising sharks fishing competitions where blue sharks and mako sharks are targetted. Sport fisheries for sharks are apparently not so common in the Indian Ocean.

There is little information on the fisheries prior to the early 1970's, and some countries continue not to collect shark data while others do collect it but do not report it to IOTC. It appears that significant catches of sharks have gone unrecorded in several countries. Furthermore, many catch records probably under-represent the actual catches of sharks because they do not account for discards (i.e. do not record catches of sharks for which only the fins are kept or of sharks usually discarded because of their size or condition) or they reflect dressed weights instead of live weights.

In 2005, seven countries reported catches of blue sharks in the IOTC region. These are not given in this summary because their representativeness is highly uncertain. Apparently, as other shark stocks have declined less blue sharks are being discarded.

FAO also compiles landings data on elasmobranchs, but the statistics are limited by the lack of species-specific data and data from the major fleets.

Availability Of Information For Stock Assessment

There is little information on blue shark biology and no information is available on stock structure.

Possible fishery indicators:

5. **Trends in catches**: The catch estimates for blue shark are highly uncertain as is their utility in terms of minimum catch estimates.
6. **Nominal CPUE Trends:** Data not available. There are no surveys specifically designed to assess shark catch rates in the Indian Ocean. Trends in localised areas might be possible in the future (for example, from the Kenyan recreational fishery).
7. **Average weight in the catch by fisheries:** data not available.
8. **Number of squares fished:** CE data not available.

Stock Assessment

No quantitative stock assessment has been undertaken by the IOTC Working Party on Ecosystems and Bycatch.

Management Advice

There is a paucity of information available on this species and this situation is not expected to improve in the short to medium term. There is no quantitative stock assessment or basic fishery indicators currently available for blue shark in the Indian Ocean therefore the stock status is highly uncertain.

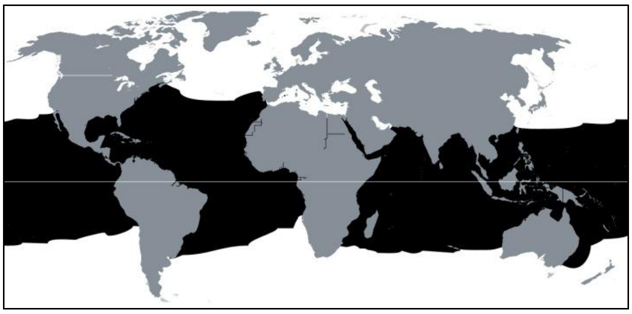
Blue sharks are commonly taken by a range of fisheries in the Indian Ocean and in some areas they are fished in their nursery grounds. Because of their life history characteristics – they are relatively long lived (16-20 years), mature at 4-6 years, and have relativity few offspring (25-50 pups every two years), the blue shark is vulnerable to overfishing.

Executive summary of the status of the silky shark resource

(*As adopted by the IOTC Scientific Committee 9 November 2007*)

BIOLOGY

The silky shark (*Carcharhinus falciformis*) is one of the most abundant large sharks inhabiting warm tropical and subtropical waters throughout the world.



The worldwide distribution of the silky shark

Although essentially pelagic, the silky shark is not restricted to the open ocean. It also ranges to inshore areas and near the edges of continental shelves and over deepwater reefs. Silky sharks live down to 500 m but has been caught as deep as 4000 m. Typically, smaller individuals are found in coastal waters. Small silky sharks are also commonly associated with schools of tuna.

Silky sharks often form mixed-sex schools containing similar sized individuals. Maximum age is estimated at 20+ years for males and 22+ years for females and maximum size is over 3 m long.

The age of sexual maturity is variable. In the Atlantic Ocean, off Mexico, silky sharks mature at 10-12 years. By contrast in the Pacific Ocean, males mature at around 5-6 years and females mature at around 6-7 year. The silky shark is a viviparous species with a gestation period of around 12 months. Females give birth possibly every two years. The number of pups per litter ranges from 9-14 in the western Indian Ocean, and 2-11 in the central Indian Ocean. Pups measure around 75-80 cm TL at birth and spend first their first few months in near reefs before moving to the open ocean. Generation time is estimated to be 8 years.

FISHERIES

Silky sharks are often targeted by some semi-industrial, artisanal and recreational fisheries and are a bycatch of industrial fisheries (pelagic longline tuna and swordfish fisheries and purse seine fishery). Sri Lanka has had a large fishery for small sized silky shark for over 40 years.

There is little information on the fisheries prior to the early 1970's, and some countries continue not to collect shark data while others do collect it but do not report it to IOTC. It appears that significant catches of sharks have gone unrecorded in several countries. Furthermore, many catch records probably under-represent the actual catches of sharks because they do not account for discards (i.e. do not record catches of sharks for which only the fins are kept or of sharks usually discarded because of their size or condition) or they reflect dressed weights instead of live weights.

Catches of silky shark in the IOTC region are not given in this summary because their representativeness is highly uncertain.

FAO also compiles landings data on elasmobranchs, but the statistics are limited by the lack of species-specific data and data from the major fleets.

AVAILABILITY OF INFORMATION FOR STOCK ASSESSMENT

There is little information available on silky shark biology and no information is available on stock structure.

Possible fishery indicators:

1. **Trends in catches**: The catch estimates for silky shark are highly uncertain as is their utility in terms of minimum catch estimates.

2. **Nominal CPUE Trends:** data not available.
3. **Average weight in the catch by fisheries:** data not available.
4. **Number of squares fished:** CE data not available.

STOCK ASSESSMENT

No quantitative stock assessment has been undertaken by the IOTC Working Party on Ecosystems and Bycatch.

MANAGEMENT ADVICE

There is a paucity of information available on this species and this situation is not expected to improve in the short to medium term. There is no quantitative stock assessment or basic fishery indicators currently available for silky shark in the Indian Ocean therefore the stock status is highly uncertain. Although the Sri Lankan fishery for small sized silky shark has been sustained for over 40 years, the level of catch over this period is uncertain.

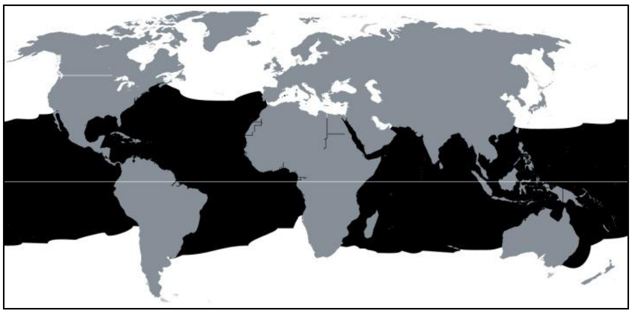
Silky sharks are commonly taken by a range of fisheries in the Indian Ocean and in some areas they are fished in their nursery grounds. Because of their life history characteristics – they are relatively long lived (over 20 years), mature at 6-12 years, and have relativity few offspring (<20 pups every two years), the silky shark is vulnerable to overfishing.

Executive summary of the status of the oceanic whitetip shark resource

(*As adopted by the IOTC Scientific Committee 9 November 2007*)

BIOLOGY

The oceanic whitetip shark (*Carcharhinus longimanus*) is one of the most common large sharks in warm oceanic waters. It is typically found in shallower waters near oceanic islands.



The worldwide distribution of the oceanic whitetip shark

Oceanic whitetip sharks are relatively large sharks and grow to up to 4 m. Females grow larger than males. The maximum weight reported for this species is 167.4 kg.

Both males and females mature at around 4 to 5 years old or about 1.8-1.9 m TL. Oceanic whitetip sharks are viviparous. Litter sizes range from 1-15 pups, with larger sharks producing more offspring. Each pup is approximately 60-65 cm at birth. In the south western Indian Ocean, whitetips appear to mate and give birth in the early summer, with a gestation period which lasts about one year. The reproductive cycle is believed to be biennial. The locations of the nursery grounds are not well known but they are thought to be in oceanic areas.

The population dynamics and stock structure of the oceanic whitetip shark in the Indian Ocean are not known.

FISHERIES

Oceanic whitetip sharks are often targeted by some semi-industrial, artisanal and recreational fisheries and are a bycatch of industrial fisheries (pelagic longline tuna and swordfish fisheries and purse seine fishery).

There is little information on the fisheries prior to the early 1970's, and some countries continue not to collect shark data while others do collect it but do not report it to IOTC. It appears that significant catches of sharks have gone unrecorded in several countries. Furthermore, many catch records probably under-represent the actual catches of sharks because they do not account for discards (i.e. do not record catches of sharks for which only the fins are kept or of sharks usually discarded because of their size or condition) or they reflect dressed weights instead of live weights.

Catches of oceanic whitetip sharks in the IOTC region are not given in this summary because their representativeness is highly uncertain.

FAO also compiles landings data on elasmobranchs, but the statistics are limited by the lack of species-specific data and data from the major fleets.

AVAILABILITY OF INFORMATION FOR STOCK ASSESSMENT

There is little information available on oceanic whitetip shark biology and no information is available on stock structure.

Possible fishery indicators:

1. **Trends in catches**: The catch estimates for silky shark are highly uncertain as is their utility in terms of minimum catch estimates.
2. **Nominal CPUE Trends:** data not available.
3. **Average weight in the catch by fisheries:** data not available.

4. **Number of squares fished:** CE data not available.

STOCK ASSESSMENT

No quantitative stock assessment has been undertaken by the IOTC Working Party on Ecosystems and Bycatch.

MANAGEMENT ADVICE

There is a paucity of information available on this species and this situation is not expected to improve in the short to medium term. There is no quantitative stock assessment or basic fishery indicators currently available for oceanic whitetip shark in the Indian Ocean therefore the stock status is highly uncertain.

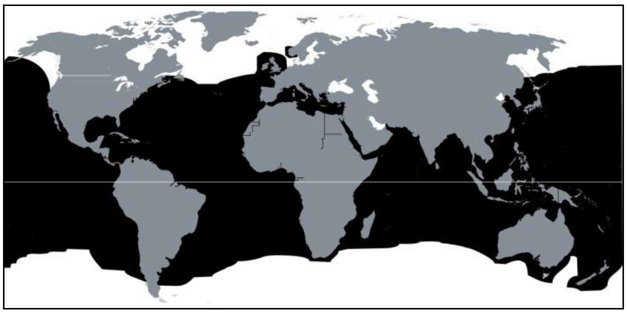
Oceanic whitetip sharks are commonly taken by a range of fisheries in the Indian Ocean. Because of their life history characteristics – they are relatively long lived, mature at 4-5 years, and have relativity few offspring (<20 pups every two years), the oceanic whitetip shark is vulnerable to overfishing.

Executive summary of the status of the shortfin mako shark resource

(*As adopted by the IOTC Scientific Committee on 9 November 2007*)

BIOLOGY

The shortfin mako shark (*Isurus oxyrinchus*) is widely distributed in tropical and temperate waters above 16°C. Makos prefer epipelagic and littoral waters from the surface down to depths of 500 meters. Shortfin mako is not known to school. It has a tendency to follow warm water masses polewards in the summer. Tagging results from the North Atlantic Ocean showed that makos migrated over long distances and this suggests that there is a single well-mixed population in this area. No information is available on stock structure of shortfin mako in Indian Ocean



The worldwide distribution of the shortfin mako shark

The shortfin mako shark is a large and active shark and one of the fastest swimming shark species. It is known to leap out of the water when hooked and is often found in the same waters as swordfish. This species is at the top of the food chain, feeding on other sharks and fast-moving fishes such as swordfish and tunas.

The maximum age of shortfin makos in Northwest Atlantic Ocean is estimated to be over 24 years with the largest individuals reaching 4 m and 570 kg.

Sexual maturity is attained at 7 to 8 years or at around 2.7-3.0 m TL for females and 2.0-2.2 m TL for males. The length at maturity of female shortfin makos differs between the Northern and Southern hemispheres. The nursery areas are apparently in deep tropical waters. Female shortfin makos are ovoviviparous. Developing embryos feed on unfertilized eggs in the uterus during the gestation period which lasts 15-18 months. Litter size ranges from 4 to 25 pups, with larger sharks producing more offspring. Growth of the pups is very fast to reach 70 cm (TL) at birth. The length of the reproductive cycle is around three years. Generation time is estimated to be 14 years.

FISHERIES

Shortfin mako sharks are often targeted by some semi-industrial, artisanal and recreational fisheries and are a bycatch of industrial fisheries (pelagic longline tuna and swordfish fisheries and purse seine fishery). In other Oceans, due to its energetic displays and edibility, the shortfin mako is considered one of the great gamefish of the world.

There is little information on the fisheries prior to the early 1970's, and some countries continue not to collect shark data while others do collect it but do not report it to IOTC. It appears that significant catches of sharks have gone unrecorded in several countries. Furthermore, many catch records probably under-represent the actual catches of sharks because they do not account for discards (i.e. do not record catches of sharks for which only the fins are kept or of sharks usually discarded because of their size or condition) or they reflect dressed weights instead of live weights.

Catches of shortfin mako sharks in the IOTC region are not given in this summary because their representativeness is highly uncertain.

FAO also compiles landings data on elasmobranchs, but the statistics are limited by the lack of species-specific data and data from the major fleets.

AVAILABILITY OF INFORMATION FOR STOCK ASSESSMENT

There is little information available on shortfin mako shark biology and no information is available on stock structure.

Possible fishery indicators:

1. **Trends in catches**: The catch estimates for shortfin mako are highly uncertain as is their utility in terms of minimum catch estimates.
2. **Nominal CPUE Trends:** data not available.
3. **Average weight in the catch by fisheries:** data not available.
4. **Number of squares fished:** CE data not available.

STOCK ASSESSMENT

No quantitative stock assessment has been undertaken by the IOTC Working Party on Ecosystems and Bycatch.

MANAGEMENT ADVICE

There is a paucity of information available on this species and this situation is not expected to improve in the short to medium term. There is no quantitative stock assessment or basic fishery indicators currently available for shortfin mako shark in the Indian Ocean therefore the stock status is highly uncertain.

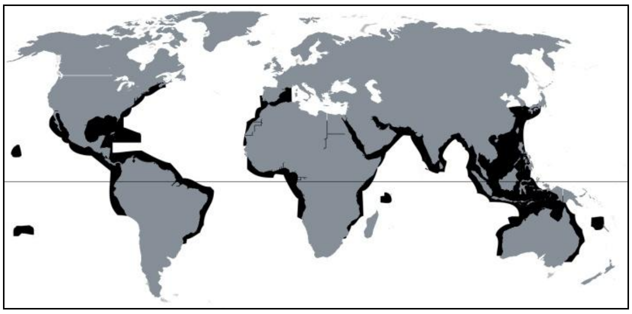
Shortfin mako sharks are commonly taken by a range of fisheries in the Indian Ocean. Because of their life history characteristics – they are relatively long lived (over 24 years), mature at 7-8 years, and have relativity few offspring (<30 pups every three years), the shortfin mako sharks is vulnerable to overfishing.

Executive summary of the status of the scalloped hammerhead shark resource

(*As adopted by the IOTC Scientific Committee on 9 November 2007*)

BIOLOGY

The scalloped hammerhead shark (*Sphyrna lewini*) is widely distributed and common in warm temperate and tropical waters down to 275 m. It is also found in estuarine and inshore waters.



The worldwide distribution of the scalloped hammerhead shark

In some areas, the scalloped hammerhead shark forms large resident populations. In other areas, large schools of small-sized sharks are known to migrate pole wards seasonally.

Scalloped hammerhead sharks feeds on pelagic fishes, other sharks and rays, squids, lobsters, shrimps and crabs.

The maximum age for Atlantic Ocean scalloped hammerheads is estimated to be over 30 years with the largest individuals reaching over 2.4 m.

Males in the Indian Ocean mature at around 1.4-1.65 m TL. Females mature at about 2.0 m TL. The scalloped hammerhead shark is viviparous with a yolk sac-placenta. The young are around 38-45 cm TL at birth, and litters consist of 15-31 pups. The reproductive cycle is annual and the gestation period is 9-10 months. The nursery areas are in shallow coastal waters.

FISHERIES

Scalloped hammerhead sharks are often targeted by some semi-industrial, artisanal and recreational fisheries and are a bycatch of industrial fisheries (pelagic longline tuna and swordfish fisheries and purse seine fishery).

There is little information on the fisheries prior to the early 1970's, and some countries continue not to collect shark data while others do collect it but do not report it to IOTC. It appears that significant catches of sharks have gone unrecorded in several countries. Furthermore, many catch records probably under-represent the actual catches of sharks because they do not account for discards (i.e. do not record catches of sharks for which only the fins are kept or of sharks usually discarded because of their size or condition) or they reflect dressed weights instead of live weights.

Catches of scalloped hammerhead sharks in the IOTC region are not given in this summary because their representativeness is highly uncertain.

FAO also compiles landings data on elasmobranchs, but the statistics are limited by the lack of species-specific data and data from the major fleets.

AVAILABILITY OF INFORMATION FOR STOCK ASSESSMENT

There is little information available on scalloped hammerhead shark biology and no information is available on stock structure.

Possible fishery indicators:

1. **Trends in catches**: The catch estimates scalloped hammerhead are highly uncertain as is their utility in terms of minimum catch estimates.
2. **Nominal CPUE Trends:** data not available.

3. **Average weight in the catch by fisheries:** data not available.
4. **Number of squares fished:** CE data not available.

STOCK ASSESSMENT

No quantitative stock assessment has been undertaken by the IOTC Working Party on Ecosystems and Bycatch.

MANAGEMENT ADVICE

There is a paucity of information available on this species and this situation is not expected to improve in the short to medium term. There is no quantitative stock assessment or basic fishery indicators currently available for scalloped hammerhead shark in the Indian Ocean therefore the stock status is highly uncertain.

Scalloped hammerhead sharks are commonly taken by a range of fisheries in the Indian Ocean. They are extremely vulnerable to gillnet fisheries. Furthermore, pups occupy shallow coastal nursery grounds, often heavily exploited by inshore fisheries. Because of their life history characteristics – they are relatively long lived (over 30 years), and have relativity few offspring (<31 pups each year), the scalloped hammerhead shark is vulnerable to overfishing.

APPENDIX IX
RECOMMENDATIONS AND WORKPLAN OF THE WORKING PARTY ON ECOSYSTEMS AND BYCATCH

Using observers to collect data on bycatch

The WPEB 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.

General bycatch

The WPEB identified there is an urgent need to:

- Quantify the effects of fisheries on non-target species and overall on marine ecosystems.
- Develop mitigation measures to reduce adverse effects on these species.

Sharks

The WPEB strongly recommended that shark research should be a major priority for national research bodies.

The WPEB committed to work intersessionally to develop a list of priority shark species and status indicators to enable the resources be monitored to the extent possible. To this end the WPEB recommended that the following preliminary list (Table 1) be refined as a result of a risk analysis over the coming year. The WPEB agreed that given the level of exploitation of blue shark work on this species should commence immediately.

The WPEB recommended that the following work proposal be undertaken:

Recognizing that many CPCs have already developed National Plans of Actions for the Conservation and Management of Sharks (NPOA-Sharks) WPEB recommends the following actions:

1. Species identification and biological data collection:

a. IOTC to develop guidelines on sharks identification and data collection

b. CPCs, which conduct research cruises and observer programmes are requested to develop a digital photo archive of shark species recorded during cruises and make it available to all CPCs through IOTC.

c. CPCs are requested to develop activities to collect data and obtain relationships between fin weight and body weight of sharks and report their results to IOTC as soon as they become available, but at the latest by 2010.

d. IOTC to develop a regional training module for observers and scientists aimed to improve shark biological data collection and precision.

e. These training activities will extend in the future on all the bycatch species in line with IOTC's long-term goal to develop an ecosystem-based approach to fisheries management.

2. Fisheries statistics

a. Each CPC should submit existing fisheries statistics on bycatch, including historical fisheries data and fin trade data to IOTC as soon as they become available, but at the latest by 2009.

b. As required by IOTC Resolution 05/05 *Concerning the conservation of sharks caught in association with fisheries managed by IOTC*, each CPC should, as a matter of priority, develop obligatory requirements in their national fisheries statistics systems to ensure collection of reliable statistics on shark catches and discards (by species in numbers of individuals and total weight) and submit these data to IOTC.

3. Research and management

a. Each CPC should identify the principal shark species involved in their national fisheries either as target species or as bycatch,

b. Those CPCs that have not yet prepared a NPOA-Sharks should do so.

c. Each CPC should identify research priorities for sharks involved in the national fisheries based on species life history traits and overall vulnerability to fishing pressure. National research as well as the list of endangered species developed by IUCN should be used for such needs.

d. Each CPC should identify their national needs and relevant funding requirements in order to highlight shark sustainability issues to the public and to International Funding Agencies.

e. Research on population and demographic structure of shark populations involved in the IOTC managed fisheries.

f. Submission of existing collections of biological data to IOTC at the finest level available (including data on length frequency distribution, sex ratio, fishing gear, time area strata).

4. Other actions

a. IOTC is requested to continue to enlarge the compilation of existing and published data on life history patterns of the sharks listed.

b. All CPCs to develop mitigation measures and fishing gear aimed at reducing non-targeted shark bycatch in the IOTC managed fisheries (e.g. circle hooks, shark scaring bait, and other shark-scaring devices).

c. When sufficient information is compiled, IOTC should coordinate a regional plan of action for conservation and management of sharks (RPOA-Sharks), with the active participation of CPCs.

Seabirds

The WPEB supported the following research on seabird mitigation measures (Appendix VI of the WPEB report) and encouraged scientists to contribute to this work.

Mitigation measure	Research needs
Night setting	Data on current time of sets by WCPFC fisheries. Effect of night sets on target catch for different fisheries.
Side setting	Currently untested in the Southern Ocean against seabird assemblages of diving seabirds and albatrosses - urgent need for research. In Japan, NRIFSF will continue testing in 2007.
Single bird scaring line	Optimal design for pelagic fisheries under development: refine to minimise tangling, optimise aerial extent and positioning, and ease hauling/retrieval. Two studies in progress developing optimal bird scaring lines for pelagic fisheries including Washington Sea Grant and Global Guardian Trust in Japan. Controlled studies demonstrating their effectiveness in pelagic fisheries remain very limited.
Paired bird scaring lines	Development and trialling of paired bird scaring line systems for pelagic fisheries.
Weighted branch lines	Mass and position of weight both affect sink rate. Further research on weighting regimes needed. Testing of safe-leads in progress. Where possible, effect on target catch as well as seabird bycatch should be evaluated. Research on use of integrated-weight branch lines (wire trace) in pelagic fisheries also needs further exploration.
Blue dyed bait	Need for tests in Southern Ocean.
Line shooter	Data needed on effects on hook sink rates in pelagic fisheries.
Underwater setting chute	Design problems to overcome
Management of offal discharge	Further information needed on opportunities and constraints in pelagic fisheries (long and short term).
Thawing bait	Evaluate sink rate of partially thawed bait.

Sea turtles

The WPEB recommended that the following research be undertaken on sea turtles:

- Ongoing research to test the efficacy of circle hooks in reducing sea turtle mortality.
- Estimate the levels of sea turtle mortality due to various fishing methods, including long line, gillnets and purse seine. With respect to purse seine – also estimate the mortality caused by the use of FADs on sea turtles, by considering the various categories of FADs used by the PS fleets, in order to propose agreed mitigation measures to reduce this mortality.
- Describe the sources and scale of ghostfishing taking place in the Indian Ocean - including mortality due to lost FADs.

Marine mammals

While the WPEB agreed that marine mammals were, at this stage, a lower priority than sharks, sea birds and sea turtles, future work in this area is encouraged. Some recommendations for future work in this area included:

- Analysis of purse-seine fishery log-books in order to update the original information on marine mammal diversity and distribution within the IOWS as compiled for baleen whales by Robineau (1991) using data from the period 1982 to 1985
- Review the existing marine mammal data in the IOTC databases
- Encouragement of national scientists to make reports on the sightings made by observers of all marine mammals observed in operations within the IOTC.

Ecosystem approaches

The WPEB recommended that analyses of the purse seine observer data be undertaken to compare species diversity over time – starting in the 1980's. This analysis should also examine the spatial interactions between whales and the fisheries with reference to the Indian Ocean whale sanctuary.

The WPEB also recommended that the data from the historical Soviet fishing operations in the Indian Ocean also be examined in an attempt to understand changes pelagic diversity, and also identify hotspots and which species are likely to interact with the fisheries.

APPENDIX X

ANALYSIS OF THE TAGGING-RECOVERY OF THE IOTC

The different tagging operations done by IOTC (RTTP-IO, Small-scale tagging and tag seeding) now are reaching a phase where they can be exploited by the scientific community.

The analysis of the tagging-recovery data necessitates a preamble: the preparation of different clean databases according to the different scientific objectives. To achieve this goal, the PMU of the RTTP and the IOTC will have to verify and validate the tagging data and combine these data with ancillary data coming from various sources (i.e. reference catches, tag-seeding experiments, etc.). Then datasets, suitable for different analyses, will be prepared and documented by the IOTC and RTTP, some with the help of external experts. The preparation of the different databases according to the scientific objectives requires different amount of work. Therefore these data sets cannot be ready at the same time.

Integrated stock assessment models require extended computer time to be completed. Therefore, it is often not possible to finalise all the analyses during the limited time available to the working parties. Some integrated models still have some difficulties to integrate the spatial component; and more than one model will need to be tried.

Considering this situation, the best scenario will be:

- A preparatory work in order to obtain the data sets necessary for the different analysis.
- A reactivation of the Working Party on Tagging which will hold a new meeting on June 30-July 4 2008.
- An intercessional preparatory work including the necessary data preparation and runs of integrated stock assessment models to be completed at the IOTC headquarters and fully presented at the Working Party on Tagging.
- Further work as necessary will be completed and presented at the 2008 meeting of the WPTT (to be held on October 9-17th 2008) including an assessment of the status of the tuna stocks integrating the tag recovery data.

In terms of data preparation to fulfil these overall requirements:

1) A dataset for each species on growth;
2) A dataset with all recoveries from double-tagged fish to assess the tag shedding rates;
3) A dataset for the assessment of the reporting rates;
4) A dataset on all the recoveries done by the different tagging projects of the IOTC, by recovery platform, with reference catch and associated reporting rate;
5) A spatial and timely distribution of the recoveries as precise as possible with the degree of confidence.

For points 1 to 4, the work must be carried out before July's meeting and for some of them some preliminary analysis could be ready before this meeting. For point 5, the preparation of this dataset will require more work and it might not be ready for July's meeting.

APPENDIX XI
DRAFT TERMS OF REFERENCE FOR AN IOTC WORKING PARTY ON TAGGING DATA ANALYSIS (WPTDA)

These Terms of Reference for the new Working Party on Tagging Data Analysis reflect the Scientific Committee's acknowledgement of the huge potential of tagging data resulting from the RTTP-IO in revising current knowledge on biology and movement patterns of yellowfin, skipjack and bigeye, and in the assessment of these stocks,

Recognizing that a number of priority issues have been identified for the WPTDA by the Scientific Committee, the WP will undertake the following:

Analyses of the tagging data (together with other IOTC data such as catch and effort from the fishing fleets) in particular:

- To estimate the parameters of growth models for the three species.
- To estimate tag shedding rates.
- To estimate tag reporting rate for the necessary recovery platforms.
- To estimate fishing mortality and hence exploitable population sizes for the different fisheries for each species, using direct methods and integrated stock assessment models.
- To estimate the transfer rates between different regions of the Indian Ocean with the use of stock assessment models with spatial structure.
- To facilitate and manage the incorporation of the tagging data into stock assessments models.
- To discuss indicators of mixing between tagged and untagged tuna populations.
- To compare the results of the RTTP-IO with those from projects in other oceans.

APPENDIX XII
STANDARD LOGBOOK TEMPLATE FOR LONGLINE FISHERY IN THE INDIAN OCEAN

In this longline logbook template for Indian Ocean, minimal information of longline operation and catch are included. "Catch" in this logbook means retained catch, and discarded individuals are not included. Other detail information may be optionally added into this form. As this format is developed based on that used by distant longliners, it could be modified for use of coastal longline fisheries.

Ce modèle de fiche de pêche pour l'océan Indien décrit les informations de base sur les opérations et les captures à la palangre. Dans le cadre de ce modèle, on entend par «captures» l'ensemble des prises conservées à bord, les rejets n'étant pas inclus. Des informations supplémentaires pourront être ajoutées à ce formulaire. Ce modèle ayant été conçu à partir de celui utilisé par les palangriers hauturiers, il pourra être nécessaire de l'adapter pour les pêcheries palangrières côtières.

This logbook format consists of two parts, header part and body part. Header part includes information on vessel, trip and gear configuration, and should be written once for each trip. Body part, which contains information of longline operation and catch, should be filled for each set. The followings are the explanation of the items included in header and body parts.

Ce modèle comprend deux parties: l'en-tête et le corps. L'en-tête, qui contient des informations sur le navire, la marée et la configuration de l'engin de pêche, doit être rempli pour une seule fois par marée. Le corps qui contient des informations sur les opérations et les captures, doit être rempli à chaque calée. Les paragraphes suivants décrivent les diverses informations à saisir dans le formulaire.

1. Header parts (recorded once in one cruise) / En-tête (saisi une fois par marée)

1-1 INFORMATION OF REPORT / INFORMATIONS DE DECLARATION

1) Reporting date: Fill date of the submission of logbook. / Date de déclaration : saisissez la date de soumission de la fiche de pêche.

2) Reporting person: Enter a name and telephone number of reporting person. / Personne déclarante: saisissez le nom et le numéro de téléphone de la personne déclarante.

1-2 VESSEL INFORMATION / INFORMATIONS SUR LE NAVIRE

1) Vessel name / Nom du navire

2) Call sign: If call sign is not available, other identical code as registration number should be used. / Indicatif radio: si l'indicatif radio n'est pas disponible, utiliser un autre code tel que le numéro de registre.

3) Vessel size: Gross tonnage (in MT) and/or overall length (in m). / Taille du navire: tonnage brut en tonnes et/ou longueur hors-tout en mètres.

4) License number / Numéro de licence

5) Number of crew / Effectif de l'équipage

1-3 CRUISE INFORMATION / INFORMATIONS SUR LA MAREE

1) Departure (Arrival) date: Fill departure (arrival) dates. / Date de départ (d'arrivée): saisissez la date de départ (d'arrivée).

2) Departure (Arrival) port: Fill name of port of departure (arrival). / Port de départ (d'arrivée): saisissez le port de départ (d'arrivée).

1-4 GEAR CONFIGURATION / CONFIGURATION DE L'ENGIN

1) Branch line length (m): Straight length in meter between snap and hook. See Fig. 1. / Longueur des avançons (m) : longueur droite en mètres entre l'émerillon et l'hameçon (voir fig. 1).

2) Float line length (m): Straight length in meter from the float to the snap. / Longueur des ralingues de flotteurs (m) : longueur droite en mètres entre le flotteur et l'émerillon.

3) Length between branch (m): Straight length of main line in meter between successive branch lines. / Longueur entre les avançons: Longueur droite en mètres de ligne principale entre avançons successifs.

Note a:

Usually each vessel has several types of float line (and branch line) and change them to adjust the depth of fishing gear. In this sense, it is ideal to collect this information on gear configuration per each set.

En général, chaque navire a plusieurs types de ralingues de flotteurs et d'avançons et les change pour ajuster la profondeur de pêche. Il serait donc idéal de collecter ces informations sur les engins à chaque calée.

Note b:

Other important gear specification would be gear materials. However, there are so many kinds of gear materials that it is difficult to classify simply. As for main line, it may be able to classify into four categories, Thick rope (Cremona rope), Thin rope (PE or other materials), Nylon braided and Nylon monofilament. In the case of branch line, it is more difficult to classify, because blanch line consists of several parts of different size and/or materials.

Il serait intéressant d'avoir des informations sur le matériau utilisé pour la palangre. Cependant, il existe tellement de matériaux différents qu'il est difficile d'établir une classification simple. Pour la ligne principale, on pourrait utiliser quatre catégories: brin épais (Crémone), brin fin (PE ou autres matériaux), Nylon tressé ou Nylon monofilament. Dans le cas des avançons, la classification est plus difficile car ceux-ci sont formés de plusieurs parties faites de lignes de différentes tailles et/ou matériaux.

Note c:

Total landings amount of sales also useful to validate the catch in weight recorded at ocean.

Le poids total de captures débarquées serait également utile pour valider le poids des captures enregistré en mer.

2. Body parts (recorded for each set) / Corps de la fiche de pêche (saisi pour chaque calée)

2-1 OPERATION / OPÉRATIONS

1) Date: Fill date when set was made (YYYY/MM/DD). / Date: date à laquelle la palangre est calée (AAAA/MM/JJ).

2) Position: noon (local time) position or position of start of gear setting). / Position: position à midi (heure locale) ou position au début de la calée.

Latitude (XX°XX', N or S) / Latitude (XX°XX', N ou S)

Longitude (XXX°XX', E or W) / Longitude (XX°XX', E ou O)

3) Time (24hr) of starting setting gear: Local time in 24 hr of starting setting gear / Heure de début de la calée: heure locale de début de la calée.

4) SST: Record sea surface temperature at noon with one decimal point, if available (XX.X °C). / SST: température de surface de la mer à midi, enregistrée avec une décimale, si disponible (XX,X°C).

5) The number of hooks between floats: Specify number of hooks between floats (hooks per basket). If different hooks between floats were used in a single set, select most representative one. / Nombre d'hameçons entre flotteurs: spécifier le nombre d'hameçons entre les flotteurs (nombre d'hameçons par panier). Si le nombre est variable au sein d'une même calée, indiquer le plus représentatif.

6) The number of hooks used: Fill total number of hooks used in a set. / Nombre d'hameçons utilisés: saisir le nombre total d'hameçons utilisés dans la calée.

Note a:

When more than one operation was made in one day, two lines are used for one day.

Lorsque plus d'une opération ont été faites en une journée, remplir une ligne par calée.

Note b:

Record (date and noon position) of non-fishing day (steaming, searching, engine trouble, etc.) is optional.

La saisie des jours (date et position à midi) sans pêche (navigation, recherche, problèmes de moteur, etc.) est facultative.

Note c:

Area code of operation (ex. Seychelles EEZ, High sea, etc.) may be used optionally.

Le code de la zone d'opération (par exemple ZEE des Seychelles, haute mer…) peut être utilisé facultativement.

Note d:

Other time on operation, that is end of setting, start and end of hauling, duration of operation may be added optionally.

Il est possible d'ajouter facultativement d'autres données horaires sur les opérations, telles que la fin de calée, le début et la fin du virage, la durée totale des opérations, etc.

Note e:

For swordfish longliners, information of use of light stick must be important to be recorded as minimal requirement.

Pour les palagriers pêchant l'espadon, il est important de noter les informations sur l'utilisation des bâtonnets lumineux.

Note f:

Bait information is important because catchability for each species would be different between the bait species (especially fish or squid). Bait used is often changed by set depending on area, target and depth of gear or other factor. Sometime, different baits are used for shallow hook and deep hook (or start and end of set) in the same set. Therefore, if bait information is optionally added into logbook form, it would be better to record per set, with ratio of squid and fish if possible.

Les informations sur les appâts sont importantes car la capturabilité de chaque espèce varie avec les appâts (particulièrement avec les poissons et les calmars). Les appâts utilisés changent souvent selon les calées, en fonction de la zone, de la profondeur de l'engin etc. Parfois, différents appâts sont utilisés pour les hameçons peu profonds et profonds (ou du début et de la fin) de la palangre. Si les informations sur les appâts sont facultativement ajoutées au modèle de fiche de pêche, il conviendrait de saisir les informations pour chaque calée, avec si possible le rapport poissons/calmars.

2-2 CATCH / CAPTURES

1) Catch in number by species per operation: Fill number of catch by species in upper row. / Captures en nombre par espèces et par opérations : saisir les captures en nombre pour chaque espèce dans la ligne supérieure.

2) Catch in weight by species per operation: Fill **processed weight** in kg by species in lower row. / Captures en poids par espèces et par opérations: saisir le **poids transformé** en kg par espèces dans la ligne inférieure.

2-3 SPECIES / ESPÈCES

1) Tunas (Southern bluefin, Albacore, Bigeye, Yellowfin, Skipjack) / Thons (thon rouge, germon, thon obèse, albacore, listao).

2) Marlins (Swordfish, Striped marlin, Blue marlin, Black marlin, Shortbill spearfish, Sailfish) / Portes-épée (espadon, marlin rayé, marlin bleu, marlin noir, marlin à rostre court, voilier)

3) Sharks (Blue shark, Porbeagle, Mako shark, other sharks) / Requins (peau bleue, requin-taupe commun, petite taupe, autres requins).

4) Other fishes / Autres poissons

2-4 REMARKS / REMARQUES

1) Discard of tuna, tuna-like fish and sharks should be recorded in the remarks. / Les rejets de thons, thonidés et requins devraient être indiqués dans les commentaires.

2) Other information is also written in the remarks. / Saisir toute autre information dans les commentaires.

Note a:

These species included in the logbook is regarded as minimum requirement. Optionally other shark and/or fish species should be added. Maybe, other shark and fish species caught frequently would be different by area and fishery.

Les espèces mentionnées dans ce modèle représentent la liste de base, et d'autres espèces peuvent être ajoutées. Il est difficile d'indiquer une liste plus étendue, les espèces fréquemment capturées variant suivant les zones et les pêcheries.

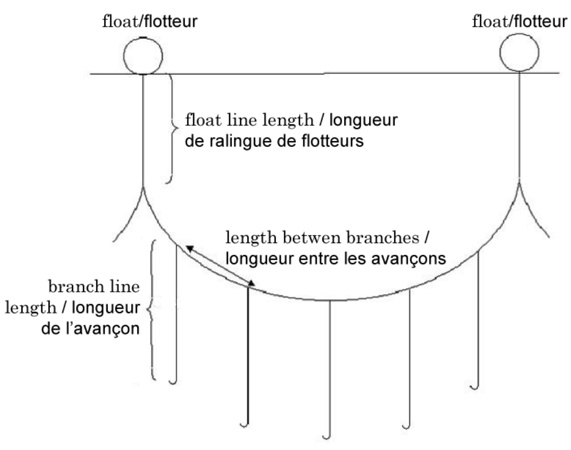


Figure 1. Schematic diagram of longline gear / Diagramme schématique d'une palangre.

LOGBOOK TEMPLATE: Tuna Longliners / MODÈLE DE FICHE DE PÊCHE: palangriers thoniers

Flag country / Pavillon			
Date reported / Date de déclaration †		Name of captain / Nom du capitaine	
Reporting person / Personne déclarante	Name / Nom		Phone / Téléphone
Departure date / Date de départ †		Departure port / Port de départ	
Arrival date / Date d'arrivée †		Arrival port / Port d'arrivée	

Name of boat / nom du navire		
Vessel size / Taille du navire	GT (tons)/TB (tonnes)	LOA (m) / LHT (m)
License number / Numéro de licence		
Call sign / Indicatif radio		
Number of crew / Effectif équipage		

† use YYYY/MM/DD for dates / utilisez AAAA/MM/JJ pour les dates

Gear configuration / configuration de l'engin	
Branch line length / Longueur des avan¨ons (m)	
Float line length / longueur des ralingues de flotteurs (m)	
Length between branch lines / longueur entre les avan¨ons (m)	
Target / cibles	1. Tuna/thons ( ) 2. Swordfish/espadon ( ) 3. Other/ autres ( )

Type of weight / type de poids
☐ whole / entier
☐ processed / transformˇ

In each set, catch should be given both in number and weight (in kg) in upper and lower row, respectively

Pour chaque calée, les captures doivent être indiquées en nombre et poids (kg) respectivement dans les lignes supérieure et inférieure.

Date	Position								Tunas / thons					Billfishes / Portes-ˇpˇe						Sharks / requins					Remarks (discard or other information) / remarques (rejets ou autres informations)
	Latitude		Longitude						southern bluefin / thon rouge	albacore / germon	bigeye / patudo	yellowfin / albacore	skipjack / listao	Swordfish / espadon	Stripped marlin / marlin rayˇ	blue marlin / marlin bleu	black marlin /marlin noir	Sailfish / voilier	Shortbill spearfish / marlin □ rostre court	Blue shark / Peau bleue	Porbeagle / requin taupe	Mako / petite taupe	Other / autres		
	Degree / Degrˇs ą	NS	Degree / Degrˇs ą	EW																					
		N S		E W																					
		N S		E W																					
		N S		E W																					
		N S		E W																					

for dates, use the YYYY/MM/DD format / pour les dates, utiliser le format AAAA/MM/JJ
ą for positions, use the format: / pour les positions, utiliser le formatŽ: XX□ XX'
** for SST, use a value with one decimal point / pour la SST, utiliser une valeur □ une dˇcimale

APPENDIX XIII
GUIDELINES FOR THE PRESENTATION OF STOCK ASSESSMENT MODELS

A set of guidelines for the presentation of stock assessment models and results was agreed by the SC. These guidelines attempt to ensure greater transparency and facilitate peer-review of models employed in the provision of advice on the status of the stocks. Scientists presenting model runs should provide to the Secretariat a copy of all input and output files and of the executable file or files used. These will be archived for future testing and replication. Scientists are encouraged to freely share the source code of the methods used.

Documents should describe the available data and mention, if necessary, data sources or observations not included in the analysis. When referring to datasets provided by the Secretariat, the date, coverage and precise database should be mentioned. Data sources not previously seen by a Working Party might need their own document presenting them. This includes standardized CPUE series or other data sources processed prior to use.

The population dynamics that are modelled and the techniques used should be clearly presented including a description of the partition, annual cycle, and other relevant population processes.

Alternative scenarios and retrospective analyses should ideally be carried and, if included, a description of the motivation for the selection of base and alternative cases should be added, giving detail of how the alternative case assumptions differ from those of the base case. The description of any retrospective analyses should cover the assumptions involved and results obtained. Projections should be similarly documented.

Documentation guidelines

Software inspection and archival

- Input and output files of all alternative runs or scenarios presented should be made available during the meeting for inspection by interested members and for later archiving by the Secretariat. Ideally, these should be stored together with a copy of the software used in the analysis. When this is not possible due to licensing issues, a complete reference of the versions of both software and operating system employed should be made. Similarly, confidential inputs need not be provided but they should be documented and identified.
- Software used should ideally be open sourced using an appropriate license, or at least be made available to interested parties for inspection under a limited license. If closed source software is used, this should be clearly justified and sufficient tests as to its validity and reliability, under similar circumstances as those under which it will be used in IOTC-related work, should be carried out and its results made available.
- Comprehensive testing, including regression testing and testing of the influence of various assumptions, is greatly encouraged in all cases.

Observations

- Describe the available data and mention, if necessary, data sources or observations not included in the analysis. When referring to datasets provided by the Secretariat, indicate the date, coverage (years, fleets, areas), and precise database (e.g.NC, CE).
- Data sources not previously seen by a Working Party might need their own document presenting them. This includes standardized CPUE series or other data sources processed prior to use.

Population dynamics

- Describe the population dynamics that are modelled and the techniques used including a description of the partition (age/length/sex groups, maturity, spatial structure, movement dynamics, if necessary), annual cycle (time steps, growth assumptions, natural and fishing mortality functions, recruitment, and sequence of those), and relevant population processes. Fixed parameters should be identified and documented. Emphasis should be placed in describing the formal statistical methods applied, including modelling methods, and form, limits and assumptions of both free and derived parameters.

Statistical methods

1. Describe of the formal statistical methods, including
    1. Software name, version number, bibliographic references and source
    2. Maximum likelihood or objective function

    3. Bootstrap assumptions and McMC algorithm, if used.
- Describe the free parameters used by the model, including
    1. Name and description of the parameter
    2. Details of the estimation bounds/functional relationships with other parameters
    3. Details of the prior assumed (if any), and source of the prior
    4. Weightings for likelihood terms
    5. Adjustment of variance by scaling/adding process error
    6. Penalties
- Describe the derived parameters used by the model, including
    1. Name, description and definitions of derived parameters (be precise with those that have alternative definitions, e.g., B0, MSY, BMSY)
    2. Details of any bounds/functional relationships with other parameters.
    3. Details of any priors assumed (including source).

Scenarios and retrospective analyses

- Alternative scenarios and retrospective analyses should be carried when possible and, if included, a description of the motivation for the selection of base and alternative cases should be added, giving detail of how the alternative case assumptions differ from those of the base case. Description of any retrospective analyses, should cover the assumptions involved and results obtained. Projections should be similarly documented.