Report of the Second Session of the IOTC Working Party on Neritic Tunas

Penang, Malaysia, 19–21 November 2012

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ACRONYMS

B	Biomass (total)
BLT	Bullet tuna
B_{MSY}	Biomass which produces MSY
BOBLME	Bay of Bengal Large Marine Ecosystem (project)
CMM	Conservation and Management Measure (of the IOTC; Resolutions and Recommendations)
COM	Narrow-barred Spanish mackerel
CPCs	Contracting parties and cooperating non-contracting parties
CPUE	Catch per unit of effort
current	Current period/time, i.e. $F_{current}$ means fishing mortality for the current assessment year.
EU	European Union
EEZ	Exclusive Economic Zone
F	Fishing mortality; F_{2011} is the fishing mortality estimated in the year 2011
FAD	Fish aggregation device
F_{MSY}	Fishing mortality at MSY
FRI	Frigate tuna
GUT	Indo-Pacific king mackerel
IO	Indian Ocean
IOTC	Indian Ocean Tuna Commission
KAW	Kawakawa
LL	Longline
LOT	Longtail tuna
M	Natural Mortality
MSY	Maximum sustainable yield
n.a.	Not applicable
NIO	Northern Indian Ocean
PS	Purse-seine
ROP	Regional Observer Programme
SC	Scientific Committee of the IOTC
SB	Spawning biomass (sometimes expressed as SSB)
SB_{MSY}	Spawning stock biomass which produces MSY
SFI	Smart Fishing Initiative
VB	Von Bertalanffy (growth)
WPNT	Working Party on Neritic Tunas of the IOTC
WWF	World Wildlife Fund

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EXECUTIVE SUMMARY

The Second Session of the Indian Ocean Tuna Commission's (IOTC) Working Party on Neritic Tunas (WPNT02) was held in Penang, Malaysia, from 19 to 21 November 2012. A total of 35 participants attended the Session including the two Invited Experts, Dr. Shane Griffiths from CSIRO, Australia and Dr. Terrence Dammannagoda from the Queensland University of Technology, Australia

The following are a subset of the complete recommendations from the WPNT02 to the Scientific Committee, which are provided at Appendix IV.

Outcomes of the Scientific Committee
The WPNT **RECOMMENDED** that the SC note that the neritic tuna and tuna-like species under the IOTC mandate have become as important or more important as the three tropical tuna species (bigeye tuna, skipjack tuna and yellowfin tuna) to most IOTC coastal states with a total estimated catch of 605,359 t being landed in 2011, and as a result, should be receiving appropriate management resources from the IOTC. (para. 7)

General discussion on data
The WPNT **RECOMMENDED** that the SC request the Commission to increase the IOTC Capacity Building budget line so that capacity building workshops/training can be carried out in 2013 and 2014 on the collection, reporting and analyses of catch and effort data for neritic tuna and tuna-like species. Where appropriate this training session shall include information that explains the entire IOTC process from data collection to analysis and how the information collected is used by the Commission to develop Conservation and Management Measures. (para. 26)

Kawakawa – Development of technical advice on the status
The WPNT **RECOMMENDED** that the SC note the management advice developed for kawakawa (*Euthynnus affinis*) as provided in the draft resource stock status summary – Appendix IX (para. 48)

Longtail Tuna – Development of technical advice on the status
The WPNT **RECOMMENDED** that the SC note the management advice developed for longtail tuna (*Thunnus tonggol*) as provided in the draft resource stock status summary – Appendix X (para. 64)

Narrow-Barred Spanish Mackerel – Development of technical advice on the status
The WPNT **RECOMMENDED** that the SC note the management advice developed for narrow-barred Spanish mackerel (*Scomberomorus commerson*) as provided in the draft resource stock status summary – Appendix XII (para. 76)

Data sets available
NOTING that some CPCs, in particular from India, Indonesia and Thailand, have collected large data sets on neritic tuna species over long time periods, the WPNT reiterated its previous **RECOMMENDATION** that this data, as well as data for other CPCs, be submitted to the IOTC Secretariat as per the requirements adopted by IOTC Members in Resolution 10/02. This would allow the WPNT to develop stock status indicators or comprehensive stock assessments of neritic tuna species in the future. (para. 124)

Development of management advice for other neritic tuna species
The WPNT **RECOMMENDED** that the SC note the management advice developed for bullet tuna, frigate tuna and Indo-Pacific king mackerel as provided in the draft resource stock status summary for each species: (para. 129)

- bullet tuna (*Auxis rochei*) – Appendix VII
- frigate tuna (*Auxis thazard*) – Appendix VIII
- Indo-Pacific king mackerel (*Scomberomorus guttatus*) – Appendix IX

The WPNT **RECOMMENDED** that the SC note that neritic tuna species are in many cases, the major commercial tuna and tuna-like species being exploited by the majority of Indian Ocean coastal states and as such, should be given the same status in terms of time and resource investment. (para. 131)

Risk-Based Approaches to Determining Stock Status
The WPNT **RECOMMENDED** that the IOTC Secretariat facilitate a process to provide the necessary information to the SC so that it may consider the Weight-of-Evidence approach to determine species stock status, as an addition to the current approach of relying solely on fully quantitative stock assessment techniques. (para. 136)

Research Recommendations and Priorities – Revision of the WPNT work plan

Stock structure

The WPNT **AGREED** that Table 2 should be used as a starting point for research project development to delineate potential stock structure for neritic tunas in the Indian Ocean, and **RECOMMENDED** that the SC note that in the absence of reliable evidence relating to stock structure, a precautionary approach should be undertaken whereby bullet tuna, frigate tuna, kawakawa, longtail tuna, Indo-Pacific king mackerel and narrow-barred Spanish mackerel are assumed to exist as single stocks throughout the Indian Ocean, until proven otherwise. (para. 139)

CPUE standardisation

The WPNT **RECOMMENDED** that the IOTC Secretariat undertake a series of initial training workshops/capacity building exercises on CPUE standardisation, stock assessments and other data analysis in 2013 and 2014, and for the SC to request that the Commission allocate additional funds for this purpose in the IOTC budget. (para. 151)

Review of the draft, and adoption of the Report of the Second WPNT

The WPNT **RECOMMENDED** that the Scientific Committee consider the consolidated set of recommendations arising from WPNT02, provided at Appendix IV. (para. 161)

A summary of the stock status for the six neritic tuna species under the IOTC mandate is provided in Table 1, with a total estimated catch of 605,359 t being landed in 2011.

Table 1. Status summary for species of neritic tuna and tuna-like species under the IOTC mandate.

Stock	Indicators	2009	2010	2011	2012	Advice to the Commission
Neritic tunas: These are important species for small-scale and artisanal fisheries, almost always caught within the EEZs of IO coastal states. They are caught only occasionally by industrial fisheries.						
Bullet tuna *Auxis rochei*	Catch 2011: 4,949 t Average catch 2007–2011: 2,961 t MSY: Unknown					No quantitative stock assessment is currently available for these species in the Indian Ocean, and due to a lack of fishery data for several gears, only preliminary stock indicators can be used. However, aspects of the biology, productivity and fisheries for these species combined with the lack of data on which to base a more formal assessment are a cause for considerable concern. The continued increase of annual catches for most of these species in recent years has further increased the pressure on the Indian Ocean stocks as a whole, however there is not sufficient information to evaluate the effect this will have on the resource. The apparent fidelity of these species to particular areas/regions is a matter for concern as overfishing in these areas can lead to localised depletion. Click on each species below for a full stock status summary: • Bullet tuna (*Auxis rochei*) • Frigate tuna (*Auxis thazard*) • Kawakawa (*Euthynnus affinis*) • Longtail tuna (*Thunnus tonggol*) • Indo-Pacific king mackerel (*Scomberomorus guttatus*) • Narrow-barred Spanish mackerel (*Scomberomorus commerson*)
Frigate tuna *Auxis thazard*	Catch 2011: 83,210 t Average catch 2007–2011: 75,777 t MSY: Unknown					
Kawakawa *Euthynnus affinis*	Catch 2011: 143,393 t Average catch 2007–2011: 134,314 t MSY: Unknown					
Longtail tuna *Thunnus tonggol*	Catch 2011: 177,795 t Average catch 2007–2011: 134,871 t MSY: Unknown					
Indo-Pacific king mackerel *Scomberomorus guttatus*	Catch 2011: 49,832 t Average catch 2006–2010: 44,457 t MSY: Unknown					
Narrow-barred Spanish mackerel *Scomberomorus commerson*	Catch 2011: 146,180 t Average catch 2007–2011: 130,476 t MSY: Unknown					

Colour key	Stock overfished($SB_{year}/SB_{MSY} < 1$)	Stock not overfished ($SB_{year}/SB_{MSY} \geq 1$)
Stock subject to overfishing($F_{year}/F_{MSY} > 1$)		
Stock not subject to overfishing ($F_{year}/F_{MSY} \leq 1$)		
Not assessed/Uncertain		

1. OPENING OF THE MEETING

1. The Second Session of the Indian Ocean Tuna Commission's (IOTC) Working Party on Neritic Tunas (WPNT02) was held in Penang, Malaysia, from 19 to 21 November 2012. A total of 35 participants attended the Session. The list of participants is provided at Appendix I. The meeting was opened by the Chair, Dr. Prathibha Rohit from India, who welcomed participants to Penang, Malaysia, including the two Invited Experts, Dr. Shane Griffiths from CSIRO, Australia and Dr. Terrence Dammannagoda from the Queensland University of Technology, Australia.

2. ADOPTION OF THE AGENDA AND ARRANGEMENTS FOR THE SESSION

2. The WPNT **ADOPTED** the Agenda provided at Appendix II. The documents presented to the WPNT02 are listed in Appendix III.

3. OUTCOMES OF THE FOURTEENTH SESSION OF THE SCIENTIFIC COMMITTEE

3. The WPNT **NOTED** paper IOTC–2012–WPNT02–03 which outlined the main outcomes of the Fourteenth Session of the Scientific Committee (SC), specifically related to the work of the WPNT.

4. The WPNT **NOTED** the statement from the SC that the outcomes of the WPNT meetings will form the basis of a productive and dynamic group of national scientists focused on neritic tuna and tuna-like stocks under the IOTC mandate which are known to be critically important to many of the Indian Ocean coastal states.

5. The WPNT **NOTED** the agreement from the SC that as very little is known about the population structure and migratory range of most neritic tunas in the Indian Ocean, research needs to be undertaken along two separate lines; i) genetic research to determine the connectivity of neritic tunas throughout their distributions, and ii) tagging research to better understand the movement dynamics, possible spawning locations, and post-release mortality of neritic tunas from various fisheries in the Indian Ocean.

6. The WPNT **NOTED** the recommendations of the Fourteenth Session of the SC on data and research related to neritic tunas and agreed to consider how best to progress these issues at the present meeting.

7. The WPNT **RECOMMENDED** that the SC note that the neritic tuna and tuna-like species under the IOTC mandate have become as important or more important as the three tropical tuna species (bigeye tuna, skipjack tuna and yellowfin tuna) to most IOTC coastal states with a total estimated catch of 605,359 t being landed in 2011, and as a result, should be receiving appropriate management resources from the IOTC.

4. OUTCOMES OF SESSIONS OF THE COMMISSION

4.1 Outcomes of the Sixteenth Session of the Commission

8. The WPNT **NOTED** paper IOTC–2012–WPNT02–04 which outlined the main outcomes of the Sixteenth Session of the Commission, specifically related to the work of the WPNT.

9. The WPNT **NOTED** the 15 Conservation and Management Measures (CMMs) adopted at the Sixteenth Session of the Commission (consisting of 13 Resolutions and 2 Recommendations), and in particular the following three CMMs which have a direct impact on the work of the WPNT: Resolution 12/01 *on the implementation of the precautionary approach*; Resolution 12/03 *on catch and effort recordings by fishing vessels in the IOTC area of competence*; Resolution 12/12 *To prohibit the use of large-scale driftnets on the high seas in the IOTC area* and Recommendation 12/14 *On interim target and limit reference points*.

10. The WPNT **NOTED** the Commission's request that all CPCs identified in Appendix VIII of the SC14 report, to improve their data collection and reporting to the IOTC, especially taking into account that the Commission has initiated a consultation process on developing criteria for a quota allocation system for several IOTC species (not currently neritic species). The request from the Commission was based on information provided by the SC which indicated that only minor improvements in the quantity of fisheries statistics available to the SC and its Working Parties were made in 2011. The lack of fisheries data from some gears and fleets for target and bycatch species statistics are missing or incomplete for some industrial and artisanal fisheries, as identified by the SC in

Appendix VIII of the SC14 report: "*Consolidated recommendations to CPCs on improved data collection, monitoring, reporting and research*".

11. The WPNT **NOTED** the Commission's request that all IOTC CPCs urgently implement the requirements of Resolution 11/04 *On a Regional Observer Scheme*, which states that: "*The observer shall, within 30 days of completion of each trip, provide a report to the CPCs of the vessel. The CPCs shall send within 150 days at the latest each report, as far as continuous flow of report from observer placed on the longline fleet is ensured, which is recommended to be provided with 1°x1° format to the Executive Secretary, who shall make the report available to the Scientific Committee upon request. In a case where the vessel is fishing in the EEZ of a coastal state, the report shall equally be submitted to that Coastal State*". The timely submission of observer trip reports to the IOTC Secretariat is necessary for the SC to carry out the tasks assigned to it by the Commission, including the analysis of accurate and high resolution data, in particular for bycatch, which would allow the scientists to better assess the impacts of fisheries for tuna and tuna-like species on bycatch species.

12. The WPNT **NOTED** the outcomes of the Sixteenth Session of the Commission, and agreed to consider how best to provide the SC with the information it needs, in order to satisfy the Commission's requests, throughout the course of the meeting.

4.2 Review of Conservation and Management Measures relating to neritic tunas

13. The WPNT **NOTED** paper IOTC–2012–WPNT02–05 which aimed to encourage the WPNT to review the existing Conservation and Management Measures (CMMs) relating to neritic tunas, and as necessary to 1) provide recommendations to the SC on whether modifications may be required; and 2) recommend whether other CMMs may be required.

14. The WPNT **AGREED** that it would consider proposing modifications for improvement to the existing CMMs following discussions held throughout the current WPNT meeting.

5. PROGRESS ON THE RECOMMENDATIONS OF WPNT01

15. The WPNT **NOTED** paper IOTC–2012–WPNT02–06 which provided an update on the progress made in implementing the recommendations from the First Session of the WPNT, and also provided alternative recommendations for those recommendations yet to be completed, for the consideration and potential endorsement by participants.

16. The WPNT **AGREED** to a set of revised recommendations, that are provided throughout this report and in the consolidated list of recommendations (Appendix IV), for the consideration of the SC.

6. NEW INFORMATION ON FISHERIES AND ASSOCIATED ENVIRONMENTAL DATA RELATING TO NERITIC TUNAS

IOTC database

17. The WPNT **NOTED** paper IOTC–2012–WPNT02–07 which provided an overview of the standing of a range of information received by the IOTC Secretariat for the six species of neritic tuna and tuna-like species, in accordance with IOTC Resolution 10/02 *Mandatory statistical requirements for IOTC Members and Cooperating non-Contracting Parties (CPC's)*, for the period 1950–2011. Statistics for 2011 represent preliminary catch information. A summary is provided at Appendix Va–Vf.

18. The WPNT **NOTED** the main data issues that are considered to negatively affect the quality of the statistics for neritic tunas available at the IOTC Secretariat, by type of dataset and fishery, which are provided in Appendix VI, and **RECOMMENDED** that the CPCs listed in the Appendix, make efforts to remedy the data issues identified and to report back to the WPNT at its next meeting.

19. The WPNT **AGREED** that the data held by the IOTC Secretariat on neritic tuna species remains very poor, despite the mandatory reporting requirements that were adopted by the Members of the Commission under Resolution 10/02 *Mandatory statistical requirements for IOTC Members and Cooperating non-Contracting Parties (CPC's)* (and superseded Resolutions) and **URGED** all participants to ensure their national reporting organisation improves their data collection and reporting for these species as per IOTC requirements.

20. The WPNT **NOTED** that reliable data collection for these neritic tuna species, following the IOTC standards, is more difficult than for oceanic tuna species, as neritic species are mainly targeted and caught by small scale artisanal vessels. In particular, catches of neritic tuna on board artisanal vessels are often made using several gears (seine, handline, nets, etc.) and are difficult to assign by species and by gear as per IOTC requirements.

21. The WPNT **AGREED** that although new information is contained in the papers submitted for presentation at the WPNT02 meeting, these data should be submitted formally to the IOTC Secretariat in accordance with the IOTC mandatory statistical requirements, outlined in Resolution 10/02.

Species identification

22. The WPNT **AGREED** that the development of species identification cards for neritic tuna and tuna-like species, at various life history stages interacting with IOTC fisheries needs to be developed and **RECOMMENDED** that the IOTC Secretariat, in collaboration with relevant experts, develop species identification cards by the next WPNT meeting.

23. The WPNT **RECOMMENDED** that the SC request that the Commission allocate funds in the 2013 budget to develop and print sets of the identification cards, noting that expected printing costs are in the vicinity of US$7,500 per 1000 sets of cards.

24. The WPNT **RECOMMENDED** that IOTC CPCs translate, print and disseminate the identification cards to their observers and field samplers (Resolution 11/04), and as feasible, to their fishing fleets targeting neritic tuna and tuna-like species. This would allow accurate observer, sampling and logbook data on neritic tuna and tuna-like species to be recorded and reported to the IOTC Secretariat as per IOTC requirements.

25. The WPNT **ENCOURAGED** all CPCs to implement training sessions on neritic tuna and tuna-like species identification to improve the quality of data collected in the field from their observers.

General discussion on data

26. The WPNT **RECOMMENDED** that the SC request the Commission to increase the IOTC Capacity Building budget line so that capacity building workshops/training can be carried out in 2013 and 2014 on the collection, reporting and analyses of catch and effort data for neritic tuna and tuna-like species. Where appropriate this training session shall include information that explains the entire IOTC process from data collection to analysis and how the information collected is used by the Commission to develop Conservation and Management Measures.

27. The WPNT **NOTED** that some CPCs do not currently have a sampling scheme dedicated to record catch and size frequency data for neritic tunas, and **RECOMMENDED** that such systems are developed.

28. The WPNT **NOTED** that the development of such systems may require substantial funding and that the IOTC Secretariat could assist CPCs to coordinate the development of project proposals in order to seek support from funding agencies.

29. The WPNT **NOTED** that WWF are currently assisting Pakistan to improve species identification and data collection, and are soon to commence a similar project with I.R. Iran. WWF indicated that it would be willing to offer assistance to other CPCs in the northern Indian Ocean to improve their data collection systems for neritic tuna species.

30. The WPNT reiterated its previous **RECOMMENDATION** that the IOTC Secretariat request that any datasets for neritic tuna species held by SWIOFP be provided to the IOTC Secretariat before the next meeting of the WPNT.

7. KAWAKAWA – REVIEW OF NEW INFORMATION ON STOCK STATUS

7.1 Review of the statistical data available for kawakawa

31. The WPNT **NOTED** paper IOTC–2012–WPNT02–07 which provided an overview of the standing of a range of information received by the IOTC Secretariat for kawakawa, in accordance with IOTC Resolution 10/02 *Mandatory statistical requirements for IOTC Members and Cooperating non-Contracting Parties (CPC's)*, for the period 1950–2011. Statistics for 2011 represent preliminary catch information. A summary is provided at Appendix Vc.

7.2 Review new information on the biology, ecology, stock structure, their fisheries and associated environmental data for kawakawa

I.R. Iran neritic tuna fisheries

32. The WPNT **NOTED** paper IOTC–2012–WPNT02–14 Rev_1 which provided an overview of the growth and mortality parameters of kawakawa (*Euthynnus affinis*) in the northern part of the Gulf and Oman Sea, based on length frequency data, including the following abstract provided by the authors:

"*Neritic tuna species are as important as tuna species for coastal countries in the Indian Ocean. Euthynnus affinis is one of the neritic species which was caught as a by catch in the Persian Gulf and Oman Sea. In order to come up with the responsible fishing pattern, there was a need to identify population dynamic parameters. Data were collected randomly from three major fish-landing sites Jask, Bandar Abbas and Bandar Lengeh in the northern part of the Persian Gulf and Oman Sea from 2005 to 2007. The average of fork length estimated 66 cm. The parameter b in the present study (W = a.FLb) were close to 3 and indicating that E. affinis had isometric growth. The growth parameters of L∞ and K were computed 95.06cm and 0.67 (1/year) respectively and results showed that E. affinis grows very fast in the first 2 years. These parameters indicated that E. affinis was found to attain a fork length of 49 cm at the end of first year.* – see paper for full abstract."

33. The WPNT **NOTED** that as a direct result of piracy activities in the western Indian Ocean, many of the vessels from the I.R. Iran targeting tropical tuna species on the high seas have moved back to the EEZ of I.R. Iran and are now targeting neritic tuna and tuna-like species. This has resulted in substantial increases in the total catch and effort of neritic tuna and tuna-like species under the IOTC mandate.

34. The WPNT **AGREED** that given the importance of accurate age determination to growth and mortality estimation studies, I.R. Iran should, as a priority, carry out ageing (i.e. using otoliths) and age validation (i.e. using oxytetracycline tagging) studies on kawakawa and other neritic tunas and if necessary to request assistance from other IOTC CPCs who have experience in this area.

35. The WPNT **AGREED** that in addition to ageing studies, the priority areas of research for I.R. Iran on kawakawa and other neritic tunas are:
    - To identify if neritic tunas in the Gulf and Oman Sea are part of a larger homogeneous Indian Ocean genetic population/stock or whether a separate population/stock is in existence which may warrant delineation of neritic tunas into separate management units
    - To identify if neritic tunas spawning grounds in the Gulf and Oman Sea are suitable candidates for area-based management (i.e. closed time-area restrictions)

36. The WPNT **NOTED** paper IOTC–2012–WPNT02–23 which provided a preliminary study of population structure of kawakawa, *Euthynnus affinis* in the straits of Malacca, including the following abstract provided by the authors:

"*Kawakawa, Euthynnus affinis, small epipelagic, migratory, neritic tuna is one of the major commercial tuna species being caught in Malaysia. Therefore, its sustainability needs to be ensured by effective management. In this study, genetic variation was assessed using sequence analyses of mitochondrial DNA (mtDNA) cytochrome b (cyt b) gene. A 331 bp segment of cyt b gene was sequenced in 113 samples collected from 4 different sources (Kuala Perlis (KP), Bayan Baru (BB), Batu Lanchang (BL), and Jalan Tenggiri (JT)). Seventy four haplotype sequences were homologous (99%) to each other while thirty nine were divergent (3%) indicating a single population along the straits of Malacca. The results obtained need to be supported by more individuals and gene studied, examination of historical aspects of population distribution and further analysis.*"

37. The WPNT **NOTED** that the use of mitochondrial DNA markers (haploid inheritance) is less likely to be able to determine if stock differentiation exists as only a small level of genetic mixing is required to produce a homogeneous state. It was indicated that the use of nuclear DNA such as microsatellites, is more likely to identify heterogeneity in the stock.

38. **NOTING** that the findings of the study support a single stock hypothesis for kawakawa along the straits of Malacca, the WPNT **REQUESTED** that Malaysia, in collaboration with other countries in the Bay of Bengal, and the IOTC Secretariat, develop a project proposal aimed at expanding this study to include neighbouring countries or preferably, all countries bordering the Bay of Bengal, so that the current default single stock hypothesis can be verified. Malaysia, with the assistance of the IOTC Secretariat should circulate the project proposal to potential funding agencies on behalf of the WPNT.

39. The WPNT **AGREED** that a similar study in the western Indian Ocean should be carried out by relevant coastal states, and a similar proposal could be developed, to ensure consistency in methodology and potential cost sharing.

7.3 Data for input into stock assessments

40. The WPNT **NOTED** that in 2012, a simple approach using the Schaeffer Surplus production model with observation error was used to examine stock status. Catch trends with CPUE data was used from the east coast of India and Thailand, and then a ratio estimator expanding from these areas to the entire Indian Ocean was used.

41. The WPNT **AGREED** that efforts to obtain improved CPUE data by sector should be attempted in 2013 so that the improved indicators could be used in a revised assessment.

7.4 Stock assessment

42. The WPNT **NOTED** paper IOTC–2012–WPNT02–25 which provided a preliminary analysis of stock status indicators for kawakawa and longtail tuna, using surplus production models with effort: an observation error based approach, including the following abstract provided by the authors:

> "*Surplus production models for Indian Ocean Kawakawa and Longtail are developed with observation error on estimated catch and the index of abundances. Catch data from 1950 onwards are available for both species though the data quality is unreliable. Even though the catch data is non-informative, using the data from India and Thailand and expanding to the entire Indian Ocean provide some informative results that suggest the current state of the resources are fully exploited or overfished in recent years. Based on the preliminary assessment, the optimal yield levels of 101,000 tons is estimated for Kawakawa and 115,000 tons for Longtail Tuna. Current (2011) estimates of spawning Biomass are 100,000 tons for Kawakawa and around 148,000 Tons for Yellowtail. These are respectively very near optimal spawning stock size for Kawakawa (0.99) and about 1.5 times optimal stock size for Longtail.*"

43. The WPNT **AGREED** that the analysis presented was a good start to assess the resource status for kawakawa and longtail tuna. Although some questions were raised about the effort series used, the WPNT **NOTED** that it was the only source of information available to incorporate in the assessment. Further efforts need to be made to obtain the necessary data to develop indices of abundance (e.g. standardised CPUE) for coastal states in the western (e.g. I.R. Iran, Pakistan, Oman, Yemen), and eastern Indian Ocean (e.g. Indonesia).

44. The WPNT **AGREED** that the results were preliminary, though catch trends in recent years for kawakawa and longtail tuna indicate that the resources may be fully exploited (i.e. at MSY levels). Any additional increase in catch and/or effort is likely to be detrimental to the status of the stocks.

7.5 Selection of Stock Status indicators

45. The WPNT **AGREED** that a preliminary surplus production assessment indicates that the Indian Ocean stock may be fully exploited/over exploited and the current spawning stock size levels may be at optimal spawning stock size (0.99). Further exploratory analysis of the data available should be undertaken in preparation for the next WPNT meeting.

46. The WPNT **AGREED** that in the absence of reliable evidence relating to stock structure, a precautionary approach should be taken whereby kawakawa is assumed to exist as a single stock throughout the Indian Ocean.

47. The WPNT **AGREED** that there are limited stock status indicators available for kawakawa and further work is urgently required in 2013.

7.6 Development of technical advice on the status of kawakawa

48. The WPNT **RECOMMENDED** that the SC note the management advice developed for kawakawa (*Euthynnus affinis*) as provided in the draft resource stock status summary – Appendix IX

49. The WPNT **REQUESTED** that the IOTC Secretariat update the draft stock status summary for kawakawa with the latest 2011 catch data, and for the summary to be provided to the SC as part of the draft Executive Summary, for its consideration.

8. LONGTAIL TUNA – REVIEW OF NEW INFORMATION ON STOCK STATUS

8.1 Review of the statistical data available for longtail tuna

50. The WPNT **NOTED** paper IOTC–2012–WPNT02–07 which provided an overview of the standing of a range of information received by the IOTC Secretariat for longtail tuna, in accordance with IOTC Resolution 10/02 *Mandatory statistical requirements for IOTC Members and Cooperating non-Contracting Parties (CPC's)*, for the period 1950–2011. Statistics for 2011 represent preliminary catch information. A summary is provided at Appendix Vd.

8.2 Review new information on the biology, ecology, stock structure, their fisheries and associated environmental data for longtail tuna

Australia longtail tuna fisheries – recreational

51. The WPNT **NOTED** paper IOTC–2012–WPNT02–16 which provided innovative and cost-effective approaches for surveying specialised recreational longtail tuna fishers in Australian waters, including the following abstract provided by the authors:

"*Advances in fishing technologies have increased the efficiency and diversification of recreational fisheries. This poses challenges for surveying specialised or 'hard-to-reach' recreational fishers (e.g. sport fishers) that may take the majority of the recreational catch for some species, such as longtail tuna, but are too rare within the general population to be sampled cost-effectively using existing methods. We trialled two new methods – time-location sampling (TLS) and online diaries – for surveying specialised recreational fishers who target longtail tuna in Australian waters. Results were compared with a concurrent traditional access point survey (APS). Online diaries were inexpensive but unsuitable for collecting representative data due to avidity, volunteerism, and differential recruitment bias. APS yielded high resolution data on catch, effort and size composition but was expensive and ineffective for sampling all components of the fishery. In contrast, TLS conducted at fishing tackle stores was cost-effective for accessing the breadth of fisher types due to the need for all fishers to purchase or to inspect fishing-related products at some point. –* see paper for full abstract."

52. The WPNT **AGREED** that given the frequent absence of complete list frames for recreational fisheries, undertaking multiple time-location sampling surveys to collect catch rate data and to simultaneously estimate population size using capture-recapture approaches in order to estimate the total recreational catch of species of interest, is highly desirable.

53. The WPNT **AGREED** with the conclusions from the study that:
    - Despite longtail tuna being a 'recreational only' species in Australia, their vulnerability to capture in coastal fisheries and their life history suggests their sustainability needs to be monitored.
    - Collecting representative recreational fisheries data is both logistically difficult and expensive for 'hard-to-reach' fishers.
    - Access point surveys yield high resolution data but are considerable more expensive than other methods
    - Online surveys are relatively inexpensive, although they yield highly biased data sets.
    - Time-location sampling is a cost-effective method that can provide probability-based estimates of total catch.
    - Future surveys of hard-to-reach populations may benefit from combining time-location sampling surveys with a mark-recapture survey to obtain improved estimates of total catch, effort and participation.

8.3 Data for input into stock assessments

54. The WPNT **NOTED** that limited new information was presented in 2012, despite longtail tuna being one of the agreed priority species for consideration in 2012.

8.4 Stock assessment updates

55. The WPNT **NOTED** paper IOTC–2012–WPNT02–22 which provided a stock assessment of longtail tuna in Australian waters: data input, model selection and assessing population status, including the following abstract provided by the authors:

"*A stock assessment of longtail tuna (Thunnus tonggol) in Australian waters was undertaken using yield per-recruit analyses to assess the current stock status using best available information and a sensitivity analysis to demonstrate potential effects of using biased datasets on assessment outcomes. Exploited age compositions differed between the commercial (age classes 3-4 years) and sport fishery (4-6 years). The fishing mortality ($F_{current}$) from these fisheries for 2004-2006 was estimated as 0.167-0.320 yr-1. Longtail tuna became vulnerable to both fisheries at age 2-3 years. Yield-per-recruit analyses revealed that the current fishing mortality rate did not exceed biological reference points. However, any significant increase in fishing mortality may result in recruitment overfishing due to longtail tuna being slow-growing and the stock currently in the vicinity of F40% reference point. Various scenarios were modelled to demonstrate the effects of low quality length-at-age, ignoring gear selectivity, and underestimating age-at-maturity. –* see paper for full abstract."

56. The WPNT **NOTED** that the combination of low quality length-at-age data and ignoring selectivity, had a profound effect on the estimated population status and inferred the population was at risk of being recruitment overfished, while assuming an age-at-maturity of five years instead of two years showed that the population may be growth overfished.

57. The WPNT **NOTED** the preliminary nature of the stock assessment for longtail tuna, as the structure of the stock, the age-at-maturity, age and growth (validation studies including small fish), post-release survival (commercial and recreational) are largely unknown and that time series of representative annual commercial and recreational catch, effort, and size/age frequency data for all fisheries catching longtail tuna are needed.

58. The WPNT **AGREED** that the results presented highlight the importance of collecting high quality biological data and unbiased fishery data before attempting to complete stock assessments intended to guide management policy.

59. The WPNT **NOTED** that small fish are rare in Australian waters (<50 cm FL) which may suggest ontogenetic movements from areas outside the Australian EEZ, most likely from the area north-west of Australia. In comparison, large fish such as those found in the Australian EEZ are rare in most areas of the Indian Ocean with longtail tuna caught in I.R. Iran fisheries in the Gulf and Oman Sea range in size from 26–128 cm (FL), with an average length of 74 cm (FL).

60. The WPNT **NOTED** that:
    - before increasing commercial and/or recreational fishing pressure on longtail tuna in Australia, additional basic biological information is required to inform management.
    - from this study, longtail tuna appears to be a slow-growing and long-lived (18 years) species – like other large *Thunnus* spp. and as a result is considered highly susceptible to overfishing.

61. The WPNT **AGREED** that in light of the slow growth of longtail tuna relative to other tropical tuna species found in this study, coupled with its restricted coastal distribution throughout its worldwide distribution, this species may be vulnerable to overexploitation if not managed in a precautionary manner until reliable quantitative biological data are collected (e.g. length at sexual maturity).

8.5 Selection of Stock Status indicators

62. The WPNT **AGREED** that in the absence of reliable evidence relating to stock structure, a precautionary approach should be undertaken whereby longtail is assumed to exist as a single stock throughout the Indian Ocean. The stock status indicators presented by the IOTC Secretariat, including recent catch, effort and size data be provided in the management advice to the SC.

63. The WPNT **AGREED** that there are limited stock status indicators available for longtail tuna (although preliminary work by the IOTC secretariat, IOTC–2012–WPNT02–25, on a surplus production model in the Indian Ocean indicate that the stock may be fully exploited/overexploited and spawning stock size levels currently may exceed S_{MSY} by 50%) and further work is urgently required in 2013.

8.6 Development of technical advice on the status of longtail tuna

64. The WPNT **RECOMMENDED** that the SC note the management advice developed for longtail tuna (*Thunnus tonggol*) as provided in the draft resource stock status summary – Appendix X

65. The WPNT **REQUESTED** that the IOTC Secretariat update the draft stock status summary for longtail tuna with the latest 2011 catch data, and for the summary to be provided to the SC as part of the draft Executive Summary, for its consideration.

9. NARROW-BARRED SPANISH MACKEREL – REVIEW OF NEW INFORMATION ON STOCK STATUS

9.1 Review of the statistical data available for narrow-barred Spanish mackerel

66. The WPNT **NOTED** paper IOTC–2012–WPNT02–07 which provided an overview of the standing of a range of information received by the IOTC Secretariat for narrow-barred Spanish mackerel, in accordance with IOTC Resolution 10/02 *Mandatory statistical requirements for IOTC Members and Cooperating non-Contracting Parties (CPC's)*, for the period 1950–2011. Statistics for 2011 represent preliminary catch information. A summary is provided at Appendix Vf.

9.2 Review new information on the biology, ecology, stock structure, their fisheries and associated environmental data for narrow-barred Spanish mackerel

67. The WPNT **NOTED** that more data is required, from different fisheries and gears, in order to estimate accurate biological parameters for narrow-barred Spanish mackerel, and **URGED** scientists working on this species to work in collaboration with scientists from other countries throughout the species range in the Indian Ocean.

9.3 Data for input into stock assessments

68. The WPNT **NOTED** that no new information was presented in 2012, despite narrow-barred Spanish mackerel being one of the agreed priority species for consideration in 2012.

9.4 Stock assessment updates

69. The WPNT **AGREED** that although no fully quantitative stock assessment was undertaken for narrow-barred Spanish mackerel caught in IOTC fisheries in 2012, further exploratory analysis of the data available should be undertaken in preparation for the next WPNT meeting.

70. The WPNT **AGREED** that quantitative stock assessments of narrow-barred Spanish mackerel resources should be carried out prior to the next WPNT meeting, with CPCs collaborating to undertake the assessments based on biologically meaningful scales within the IOTC area of competence. Any assessment will greatly benefit by the provision of data sets to the IOTC Secretariat, as required by IOTC Resolution 10/02.

9.5 Selection of Stock Status indicators

71. The WPNT **AGREED** that in the absence of reliable evidence relating to stock structure, a precautionary approach should be undertaken whereby narrow-barred Spanish mackerel is assumed to exist as a single stock throughout the Indian Ocean. The stock status indicators presented by the IOTC Secretariat, including recent catch, effort and size data be provided in the management advice to the SC.

72. The WPNT **RECALLED** the preliminary assessment presented at the previous WPNT, on the biology and fishery for narrow-barred Spanish mackerel (*Scomberomorus commerson*), in the southern Gulf which suggested that there is a single stock of narrow-barred Spanish mackerel in the Gulf and neighbouring area, i.e. Oman and Arabian Seas.

73. The WPNT **NOTED** that the fishery, in the southern Gulf, is based on the harvest of immature fish that have not contributed to the reproductive capacity of the population or achieved their full growth potential.

74. The WPNT **RECALLED** the key findings of a study presented to the previous WPNT meeting which indicated that the narrow-barred Spanish mackerel resource in the southern Gulf is characterised by both growth and recruitment overfishing and that the stock may be at approximately 13% of its unexploited size.

75. The WPNT **AGREED** that a full stock assessment of the narrow-barred Spanish mackerel resource cannot be made at present due to the paucity of the information available from the entire range of the stock.

9.6 Development of technical advice on the status of narrow-barred Spanish mackerel

76. The WPNT **RECOMMENDED** that the SC note the management advice developed for narrow-barred Spanish mackerel (*Scomberomorus commerson*) as provided in the draft resource stock status summary – Appendix XII

77. The WPNT **REQUESTED** that the IOTC Secretariat update the draft stock status summary for narrow-barred Spanish mackerel with the latest 2011 catch data, and for the summary to be provided to the SC as part of the draft Executive Summary, for its consideration.

10. OTHER NERITIC TUNA SPECIES – REVIEW OF NEW INFORMATION ON STOCK STATUS

10.1 Review of data available at the Secretariat for other neritic tuna species

78. The WPNT **NOTED** paper IOTC–2012–WPNT02–07 which provided an overview of the standing of a range of information received by the IOTC Secretariat for bullet tuna, frigate tuna and Indo-Pacific king mackerel, in accordance with IOTC Resolution 10/02 *Mandatory statistical requirements for IOTC Members and Cooperating non-Contracting Parties (CPC's)*, for the period 1950–2011. Statistics for 2011 represent preliminary catch information. A summaries are is provided at Appendix Va, b and e.

10.2 Review new information on the biology, stock structure, fisheries and associated environmental data

Thailand neritic tuna fisheries

79. The WPNT **NOTED** paper IOTC–2012–WPNT02–08 which provided an overview of neritic tuna catches from the Thailand purse seine fishery in the Andaman Sea, including the following abstract provided by the authors:

"*Neritic tuna in the Andaman Sea was caught mainly from purse seine fishery, namely Thai purse seine (53.12%), light luring purse seine (19.76%) and purse seine with aggregating devices (15.20%). Operate net made from black nylon with mesh size as 2.5 cm. The peak of fishing season for neritic tunas took place during Northeast monsoon season. The fishing grounds were distributed along the coast at 30-80 m depth of water. The species composition was found four species, namely kawakawa (Euthynnus affinis) 8.11%, longtail tuna (Thunnus tonggol) 5.31%, bullet tuna (Auxis rochei) 3.73%, frigate tuna (Auxis thazard)*

2.95% of total catch from purse seiners. Thai purse seine caught T. tonggol (39.49%), E. affinis (6.09%), A. tharzard (4.67%) and A. rochei (2.87%). Light luring purse seine caught A. affinis (9.28%), A. rochei (4.35%), A. tharzard (3.09%) and T. tonggol (3.04%). Purse seine with aggregating devices caught A. affinis (6.79%), A. rochei (4.37%), A. tharzard (2.43 %) and T. tonggol (1.61%). – see paper for full abstract."

80. The WPNT **NOTED** that neritic tunas are targeted by two main fishing methods, purse seine and drifting gillnet. Lights are sometimes used as a luring/attracting technique, as are FADs and advanced fish finder equipment.

81. The WPNT **NOTED** that neritic tunas are becoming more important to the Thailand economy and have been the primary target species for Thailand artisanal fishers since 1982 due to high prices offered by Thai tuna canneries.

82. The WPNT **NOTED** the catches of small fishes reported in the Andaman sea by Thai vessels and that these sizes are not reported in Andaman and Nicobar islands by Indian vessels. It was thought that this was probably due to the difference in the gear used, i.e. purse seine by Thailand and gillnets in the Andaman and Nicobar islands by India.

83. **NOTING** that the nominal catch (NC) data provided at the WPNT02 meeting were found to conflict with the NC data history provided by Thailand in recent years, and for catch-and-effort data for most of the history of the gillnet fleet, the WPNT **RECOMMENDED** that Thailand liaise with the IOTC Secretariat to provide a fully justified revised catch history which will replace the data currently held by the IOTC Secretariat before the next WPNT meeting.

Sri Lanka neritic tuna fisheries

84. The WPNT **NOTED** paper IOTC–2012–WPNT02–09 Rev_1 which provided a review of neritic tuna resources in Sri Lanka, including the following abstract provided by the authors:

"*This paper reviews the trend of neritic tuna fishery in Sri Lanka with an update of the status of resources. Among the neritic tuna, Auxis thazard (frigate tuna), Auxis rochei (bullet tuna) and Euthynnis affinis (kawakawa) are the major components while Scomberomorus commerson (narrow- barred spanish mackerel) is dominating the species associated with neritic tuna. In the 1990's neritic tuna accounted for more than 8 percent of the total tuna production but declined up to 4 percent during the 2000's. The reduction in the relative contribution was greatly influenced by the growing concern towards oceanic tuna. Annual neritic tuna production of 1258Mt in 1982 followed an increasing trend until 1997 with a maximum of 9117Mt and thereafter production declined. Until the mid 2000's catches were mainly dominated by Auxis thazard followed by Euthynnis affinis and Auxis rochei where gillnet has been the main gear. After the tsunami in 2004, an increase tendency of practicing new fishing methods along with gillnets was observed and resulted in the production being increased with a higher contribution of Euthynnis affinis for few years.* – see paper for full abstract."

85. The WPNT **NOTED** that in 2011, neritic tuna species represented 13% of the total tuna production by Sri Lanka, with frigate tuna (*Auxis thazard*) contributing more than half of neritic tuna catches. The proportion of neritic tuna was higher from the southeast and southern coastal waters of Sri Lanka.

86. The WPNT **NOTED** that Sri Lanka is currently in the process of strengthening existing data collection and reporting system on both coastal and offshore large pelagic fisheries with the assistance of IOTC-OFCF project. Where possible, the data collection programme should be expanded into the northern areas of the country.

87. **NOTING** that a small pole-and-line fishery has restarted in the area of Trincomali, Sri Lanka, the WPNT **ENCOURAGED** Sri Lanka to monitor and collect data on this fishery, as per IOTC minimum requirements for pole-and-line vessels described in IOTC Resolution 12/03, and to provide detailed information on this fishery (catch by species, effort) at the next WPNT meeting.

India neritic tuna fisheries

88. The WPNT **NOTED** paper IOTC–2012–WPNT02–10 Rev_1 which provided an overview of the status and potential of neritic tunas exploited from Indian waters, including the following abstract provided by the authors:

"*Tuna like fishes are being exploited from the seas around India since time immemorial by coastal based fleets of varying specifications and with different craft-gear combinations. Their catch was mainly neritic tunas and small ones of oceanic tunas from shelf and adjacent oceanic areas. Tuna forms mostly an incidental catch in many gears. Major share of the catch was landed by gillnets (51.7%) and hooks and line (24.8%). Other gears, which catch tunas are pole & line, purse seines, ring seines, trawls and bag nets. Catch was supported by nine species, five neritic and four oceanic tunas. Neritic tunas represent 71% of the total tuna catch and remains the mainstay of the tuna fishery with a landing of 59,200 ton during 2011. Catch in the year registered marginal decline over 60,300 t of 2010. Fishery was supported by Kawakawa*

(Euthynnus affinis, 34,400 t), frigate tuna (Auxis thazard, 10,200 t), bullet tunas (Auxis rochei, 2,600 t), longtail tuna (Thunnus tonggol, 11,600 t) and bonito (Sarda orientalis, 400 t). – see paper for full abstract."

89. The WPNT **AGREED** that at present very little is known about the population structure and migratory range of most of the neritic tuna species, and that they are likely to be shared stocks among countries. As such, any stock assessment of these species should be carried out on a biologically relevant scale, once appropriate management units and associated data sets have been identified.

90. **NOTING** the efforts by India to revise its catch data since 2007 for all species, that now includes catch from Lakshadweep and the Andaman islands, the WPNT **RECOMMENDED** that this revised data is reported to the IOTC Secretariat, preferably before the next WPNT meeting.

91. The WPNT **RECALLED** that presenting data at a working party meeting does not constitute a formal submission to the IOTC. Any data submissions need to be made in accordance with the relevant IOTC Resolution, in this case 10/02.

I.R. Iran neritic tuna fisheries

92. The WPNT **NOTED** paper IOTC–2012–WPNT02–11 Rev_1 which provided an overview of neritic tuna catches from I.R. Iran, including the following abstract provided by the authors:

"*Of important neritic tuna species in Iranian Fishing grounds in Persian Gulf and Oman Sea are consist of: Narrow-barred Spanish mackerel, Indo-Pacific king mackerel, longtail tuna, kawakawa and frigate tuna which have a considerable effect in economical activities of coastal residents. Around 6,500 out of 12 thousand fishing crafts, are engaged in tuna activities. The Catch level of tuna and tuna-like species in 2011 was equal to 183 thousand tonnes, of which 105 thousand tonnes belongs to coastal waters and the rest (78 thousand tonnes) was belong to off-shore fishery. For better conservation and management actions on tuna fishes, necessary planning and programming have been carried out to improve the situation. The main management measures include: providing Logbook for tuna fishes, picking out Observer and trained them onboard, providing a guideline to identify the bigeye and yellowfin tuna, planning to gather information on Tuna By-catch and Discards, adapting IOTC regulation with national implementation condition and so forth. –* see paper for full abstract."

93. The WPNT **NOTED** that over the last few years there has been a substantial increase in the number of neritic tunas measured, so that the number of tuna and tuna-like fish measured in 2011 was in the region of 50,000 fish.

94. The WPNT **NOTED** the efforts by I.R. Iran to improve the management of neritic tuna resources around Iran, which included the implementation of a logbook program for all tunas, initially to 400 fishing vessels; and a species identification guide.

Indonesia neritic tuna fisheries

95. The WPNT **NOTED** paper IOTC–2012–WPNT02–12 which provided the catch and size distribution of bullet and frigate tuna caught by drifting gillnets in Indian Ocean based at Cilacap fishing port-Indonesia, including the following abstract provided by the authors:

"*In Indonesia, bullet and frigate tuna in the Indian Ocean were caught by various of fishing gears including, drifting gillnet" and landed in various fishing port in along coastal of west Sumatera (Banda Aceh, Pariaman, Bungus/Padang and Painan) as well as south Java (Muarabaru/Jakarta and Cilacap), Bali (Kedonganan and Benoa) and Nusatenggara. In Cilacap, especially tuna drifting gillnet fishery produces bullet and frigate tuna as by product. This paper presents the information on catch and size distribution of bullet tuna (Auxis rochei Risso, 1810) and frigate tuna (Auxis thazard Lacepède, 1800) caught by drifting gillnet based at Cilacap Fishing Port. Data and information obtained through catch monitoring, port sampling and landing report of Cilacap Fishing Port 2011 as well as from Capture Fisheries Statistics of Indonesia 2010. The catch estimation of bullet and frigate tuna on drift gillnet fishery based at Cilacap fishing port in 2011 about 3.220 and 47.346 tons respectively. –* see paper for full abstract."

96. **NOTING** that the nominal catch (NC) data provided at the WPNT02 meeting were found to conflict with the NC data history provided by Indonesia in recent years, and for catch-and-effort data for most of the history of the gillnet fleet, the WPNT **RECOMMENDED** that Indonesia liaise with the IOTC Secretariat to provide a fully justified revised catch history which will replace the data currently held by the IOTC Secretariat before the next WPNT meeting.

97. The WPNT **NOTED** that bullet tuna and frigate tuna caught by the Indonesian drifting gillnet in Indian Ocean based at Cilacap Fishing Port are considered a byproduct species, accounting for 0.4% and 1.6% of the total catch, respectively.

98. The WPNT **NOTED** that it was surprising that no catch of longtail tuna are currently recorded by the gillnet fishery based in Cilacap, while catches of longtail tuna in Indonesia are reported at around 19,000 t. Indonesia agreed to inform the WPNT on the areas where the catches of longtail tuna are coming from at its next session.

99. The WPTN **NOTED** that sampling for tuna and tuna-like species is currently only conducted in Cilacap and Bali, and that there are plans to expand the sampling to other ports with BOBLME.

Pakistan neritic tuna fisheries

100. The WPNT **NOTED** paper IOTC–2012–WPNT02–13 which provided an overview of neritic tuna catches from Pakistan, including the following abstract provided by the authors:

"*Neritic tunas form an important part of the tuna fisheries of Pakistan and other northern Indian Ocean countries. Longtail tuna is the dominating among the neritic tuna species followed by kawakawa, frigate tuna and narrow barred Spanish mackerel. Gillnet is being used to catch neritic tuna in the area which is marred with high bycatch of sharks, cetaceans and turtle. Uncontrolled increase in tuna fleet, use of very large gillnets (length between 5 and 11 km), inadequacy in data collection, poor handling on board fishing vessels and landing centers are some of the major issues faced by neritic tuna fisheries of Pakistan*."

101. The WPNT **NOTED** that WWF and Smart Fishing Initiatives (SFI) have started a programme to establish an alliance of the Northern Indian Ocean (NIO) countries with the aim to make their tuna fisheries compliant with IOTC and other international requirements, develop and implement Fisheries Improvement Plans (FIP's) for selected fisheries and human resources development to cope with the challenges of tuna fisheries management. WWF/SFI have initiated a programme to support tuna fisheries data collection systems in Pakistan especially generating information about bycatch of tuna gillnet fisheries.

102. The WPNT **NOTED** that gillnet fisheries are expanding rapidly in Pakistan waters. Gillnets used in Pakistan are often more than 2.5 km reaching 25 km or more in some cases, in direct contravention with IOTC Resolution 12/12 *To Prohibit The Use Of Large-Scale Driftnets On The High Seas In The IOTC Area*.

103. The WPNT **REMINDED** participants that Resolution 12/12 *to prohibit the use of large-scale driftnets on the high seas in the IOTC area*, paragraph 1, states that: *The use of large-scale driftnets on the high seas within the IOTC area of competence shall be prohibited* and **RECALLED** that this Resolution is binding. Where "Large-scale driftnets" are defined as gillnets or other nets or a combination of nets that are more than 2.5 kilometers in length whose purpose is to enmesh, entrap, or entangle fish by drifting on the surface of, or in, the water column.

104. The WPNT **NOTED** the excellent work being undertaken by WWF in assisting Pakistan to record and sample tuna catches at points of unloading.

India Indo-Pacific king mackerel catches

105. The WPNT **NOTED** paper IOTC–2012–WPNT02–15 Rev_1 which provided the fishery, biology and population dynamics of the Indo-Pacific king mackerel, *Scomberomorus guttatus* exploited in India, including the following abstract provided by the authors:

"*Scomberomorus guttatus known popularly as the spotted seer and known worldwide as the Indo-Pacific king mackerel is a preferred table fish in India. The family Scombridae is represented by four species viz. S. commerson (62.0%), S. guttatus (37.7%), S. lineolatus (0.1%) and Acanthocybium solandri (0.2%) in India and it comprised 1.6% of the total marine fish catch of the country. Exploitation is mainly by gillnets and the hooks and line. S. guttatus is represented in the capture fishery of all the coastal states of India with high catches along West Bengal, Andhra Pradesh, Gujarat and Maharashtra. The annual catch of S. guttatus during 2007-2011 ranged between 15,225 t and 23,796 t with an average catch of 19,712 t. The post-monsoon and winter seasons (September to January) were the most productive seasons in terms of catch and catch rate. The fork length of S. guttatus landed by gillnets ranged between 20 cm and 60 cm with the mean length at 42.2 cm. –* see paper for full abstract."

106. **NOTING** that monofilament gillnets are recognised to have highly detrimental impacts on fishery ecosystems, as they are non-selective, and that the use of monofilament gillnets have already been banned in a large number of IOTC CPCs, the WPNT **RECOMMENDED** that the IOTC Secretariat facilitate a review of the use of monofilament gillnets by IOTC CPCs to i) determine the number of CPCs using then, ii) estimate total catch and bycatch, etc., taken by monofilament gillnets in comparison to other net material, and iii) to report the findings at the next WPNT meeting.

Madagascar neritic tuna fisheries

107. The WPNT **NOTED** paper IOTC–2012–WPNT02–17 which provided an overview of neritic tunas bycatch by the national bottom longliners in Madagascar, including the following abstract provided by the authors:
"*National fleets targeting demersal fishes are encountered in Madagascar's EEZ. It is bottom longliners allowed which catch also neritic tunas as bycatches. Trip reports are provided by observers of CSP during the period from 2007 to 2011, covering around 30% of fleets, have been used on this analysis of the national bottom longliners catches, including the spatial distribution and species composition of the catch. Mapped from geographic coordinates, the longline fishery targeting the demersal fishes is present in the East coast of the Malagasy EEZ since 2007 up to now. However, from 2010, this costal fishery is present also at the middle West of Madagascar EEZ. Analyzing the composition of catches, neritic tunas are caught by this fishery. For this observation period, the catch rates of neritic tuna vary from year to year with a rate not exceeding 11%. Two neritic tunas species are identified by observers. The first predominated one is Acanthocybium solandri (Wahoo), and the second one, Scomberomorus commerson (Narrow-barred Spanish Mackerel), is a poorly represented species.*"

108. The WPNT **NOTED** that neritic tuna and tuna-like species are more likely to be caught during setting and hauling of the bottom longline, and/or using other gears on the bottom longliner (e.g. trolling when steaming to the fishing grounds).

109. The WPNT **NOTED** that other traditional fishing gears may also be catching neritic tuna species and **ENCOURAGED** Madagascar to develop data collection systems for its artisanal fisheries.

Stock structure of tunas in the Indian Ocean

110. The WPNT **NOTED** paper IOTC–2012–WPNT02–18 which provided a review of a study carried out on genetic stock structure of two tuna species (skipjack tuna and yellowfin tuna) in the north western Indian Ocean, including the following abstract provided by the authors:
"*Tuna are large marine, pelagic fish that are widely distributed across the world's oceans. The general perception about large species of tuna has been that they consist of homogeneous stocks across large geographical whole ocean basins which are supported by reported examples of trans-oceanic movement. This perception and a general lack of detailed knowledge about tuna stocks has led to many tuna fisheries being managed at ocean-wide scale as single stocks. Recent studies on some tuna species that has employed otolith, electronic tagging and genetic approaches however, have found evidence for heterogeneous stocks and multiple management units.* – see paper for full abstract."

111. **NOTING** that the results of the study, if accurate, would have major ramifications for the way tuna are managed in the IOTC area of competence, the WPNT **AGREED** that it would be useful to extend this type of study to other species and areas in the Indian ocean to investigate potential stock structure.

112. The WPNT **AGREED** on the need for validation of the results and for the methods used to be applied to neritic tunas at a sub-regional scale in the Indian Ocean.

113. The WPNT **NOTED** that in addition to genetic stock structure, a correlation between the genetic group and the length mode was identified in the study area.

Indonesia Indo-Pacific king mackerel catches

114. The WPNT **NOTED** paper IOTC–2012–WPNT02–19 which provided a brief review Indo-Pacific King mackerel (*Scomberomorus guttatus*) in Indonesia, including the following abstract provided by the authors:
"*Indo-Pacific King Mackerel (Scomberomorus guttatus) in simultaneously food industrial trade is classified as an export commodity fisheries product. A continual research concerning about resource, exploitation rate, handling technologies became commercial food product, are an comprehensives step as constitute on preliminary fisheries effort studies to gain developing and making efficient use of high quality products commodity. Introducing fish stock in a synopsis beginning with life cycle, habitat, fish behaviors, migratory status and stock abundance, constitute for optimal resources utilization strategy and continuously. An indo-Pacific King Mackerel are known as local migratory types, i.e. anadromus and catadromus. Studies on feeding habits and their food preferences mostly on preferable prey fish is stolephorus and from behaviors movement towards prey classified as greedy and active predators until adults, due to this it could be one of effective and efficient. Intensifications utilization through increasing fishing gear affectivity and unit of fishing vessel group endeavoring will become a victuals for technology relocations to gain fishing extensive by empowering local community fishers.*"

115. The WPNT **NOTED** that the increasing demand at export for Indo-Pacific king mackerel, and this had a direct impact on the catches of this species in Indonesian waters which have been steadily increasing during the last decade.

Malaysian neritic tuna fisheries

116. The WPNT **NOTED** paper IOTC–2012–WPNT02–20 which provided a review of catches from Malaysian purse seine vessels in the Strait of Malacca, including the following abstract provided by the authors:

"*Purse seines contribute about 95% of the neritic tuna catch in the Malacca Straits followed by trawlers, 3.5% and the rest from other traditional fishing gears. The main neritic tuna species caught by the purse seines are longtail (Thunnus tonggol) and kawakawa (Euthynnus affinis) with the ratio 3 to 1. For frigate tuna (Auxis thazard),even though the species occur along the longtail and kawakawa stocks, they are rarely caught by the larger purse seines (> 70GRT) with a very small number. The monthly catch of the purse seines varied by percentage 8 – 32% from the average and there is no apparent landing pattern that may indicate a strong seasonal tuna fishery in the Malacca Straits. On average, the bigger purse seines (>70GRT) give higher CPUE (mt/vessel/trip) compared to the small vessels. The trend of annual CPUE from the purse seines fishery showed that the neritic tuna resources in the Malacca Straits still at the sustainable level. –* see paper for full abstract."

117. The WPNT **NOTED** that the Malaysian purse seine fishery operating in the Malacca Strait and targeting small pelagics is also catching large amounts of neritic tunas, and that the effort and catches from this fishery have been steadily increasing over the last decade.

118. The WPNT **AGREED** that neritic tuna in the Malacca Strait would require shared management among the various bordering countries, i.e. Thailand, Malaysia, Indonesia, and if possible with other neighbouring countries of the Bay of Bengal, i.e. Bangladesh, India, Myanmar and Sri Lanka.

Tanzania neritic tuna fisheries

119. The WPNT **NOTED** paper IOTC–2012–WPNT02–21 which provided an overview of Tanzania neritic tuna fisheries, including the following abstract provided by the authors:

"*The most commonly landed neritic tuna in Tanzania are the Kawawaka, Frigate tuna, Kingfish as well as juvenile of Yellow fin and Big eye tuna. By far the main gear used to catch the fish are ring nets and gill nets even though troll lines are sometimes used. There is limited updated information concerning the composition of neritic tuna species in surface gill net fisheries but past studies have shown that their composition can reach up to 80% of the total catch. This signifies their importance in the pelagic artisanal fisheries of Tanzania. The fishery take place within sheltered areas throughout the Tanzanian cost with less fish being caught in the Southern part of the country*."

120. The WPNT **NOTED** the information presented in the paper will prove to be highly useful in updating the species Executive Summaries and potentially in future stock assessments. Tanzanian scientists are currently undertaking research examining the population genetic structure and migration patterns of *Euthynnus affinis* and *Scomberomorus commerson* in the coastal waters of Tanzania, and **REQUESTED** that an update on this research be presented at the next WPNT meeting.

Maldives neritic tuna fisheries

121. The WPNT **NOTED** paper IOTC–2012–WPNT02–24 which provided a review of the catches of neritic tunas in the Maldives and notes on the new logbook data, including the following abstract provided by the authors:

"*The Maldives reported to have caught 2422 t of kawakawa and 1696 t of frigate tuna in 2011. These represented about 2.5 (kawakawa) and 1.7% (frigate tuna) of the major tuna species caught. Main gear for kawakawa and frigate tuna was pole and line taking 75 and 80% of the catch respectively. It is believed that neritic tuna catch values are underestimated for the country due to underreporting. Better catch estimates as well as catch and effort data could be obtained from the tuna fishery logbooks that were introduced in 2010. Despite the mandatory nature, about 5% of the trips were reported in 2011, prompting the Ministry to take remidial measures. Revision of the logbook design, development of a software for data entry as well as awareness programs are being implemented to improve the newly establish logbook reporting scheme. Some of the issues with the logbook data and measures being taken to improve its collection are summarized*."

122. The WPNT **NOTED** that while logbooks have been designed and distributed to the entire Maldivian fleet, only 5% of the trips were reported in 2011, and that some issues have been identified in the data collected.

123. The WPNT **NOTED** that the logbooks are currently being revised and awareness campaigns being conducted to increase the recording and reporting of catch by fishers, and **AGREED** that this system would be highly valuable for the collection of accurate data on neritic tuna species in the Maldives.

10.3 Stock status indicators for other neritic tuna species

Data sets available

124. **NOTING** that some CPCs, in particular from India, Indonesia and Thailand, have collected large data sets on neritic tuna species over long time periods, the WPNT reiterated its previous **RECOMMENDATION** that this data, as well as data for other CPCs, be submitted to the IOTC Secretariat as per the requirements adopted by IOTC Members in Resolution 10/02. This would allow the WPNT to develop stock status indicators or comprehensive stock assessments of neritic tuna species in the future.

125. The WPNT **ENCOURAGED** cooperation and collaboration among scientists from countries catching neritic tunas and tuna-like species, so as to ensure any future stock assessment is based on datasets from biologically relevant spatial scales.

Stock structure

126. The WPNT **AGREED** that in the absence of reliable evidence relating to stock structure, a precautionary approach should be undertaken whereby bullet tuna, frigate tuna and Indo-Pacific king mackerel should be assumed to exist as a single stock throughout the Indian Ocean. The stock status indicators presented by the IOTC Secretariat, including recent catch, effort and size data be provided in the management advice to the SC.

Stock assessments

127. The WPNT **AGREED** that although no stock assessment was undertaken for bullet tuna, frigate tuna and Indo-Pacific king mackerel caught in IOTC fisheries in 2012, further exploratory analysis of the data available should be undertaken and presented at the next WPNT meeting.

128. The WPNT **AGREED** that an integrated stock assessment of the bullet tuna, frigate tuna and Indo-Pacific king mackerel resources cannot be made at present due to the scarcity and paucity of the information available from IOTC CPC's.

10.4 Development of management advice for other neritic tuna species

129. The WPNT **RECOMMENDED** that the SC note the management advice developed for bullet tuna, frigate tuna and Indo-Pacific king mackerel as provided in the draft resource stock status summary for each species:
    - bullet tuna (*Auxis rochei*) – Appendix VII
    - frigate tuna (*Auxis thazard*) – Appendix VIII
    - Indo-Pacific king mackerel (*Scomberomorus guttatus*) – Appendix IX

130. While recognizing the potential positive impacts of closured areas for neritic tuna and tuna-like species, the WPNT **AGREED** that where feasible, closed areas should take into account the full migratory range of the species, so as to ensure appropriate life history stages are protected within the management unit. Management objectives are unlikely to be achieved by the unilateral initiatives of any one of the littoral states. Regional collaboration in assessment and management are imperative in this context.

131. The WPNT **RECOMMENDED** that the SC note that neritic tuna species are in many cases, the major commercial tuna and tuna-like species being exploited by the majority of Indian Ocean coastal states and as such, should be given the same status in terms of time and resource investment.

10.5 Update of other neritic tuna species Executive Summaries for the consideration of the Scientific Committee

132. The WPNT **REQUESTED** that the IOTC Secretariat update the draft stock status summary for bullet tuna, frigate tuna and Indo-Pacific king mackerel with the latest 2011 catch data, and for the summaries to be provided to the SC as part of the draft Executive Summaries, for its consideration.

11. RISK-BASED APPROACHES TO DETERMINING STOCK STATUS

133. The WPNT **NOTED** paper IOTC–2012–WPNT02–INF01 which provided an outline of potential risk-based methods to determine stock status for data poor species and appropriate management actions.

134. The WPNT **NOTED** that a Weight-of-Evidence approach has been, and is currently being used in a number of countries to routinely determine stock status for data poor fisheries. The approach involves developing and applying a decision-making framework by assembling an evidentiary base to support status determination. Specifically, the framework aims to provide a structured, scientific process for the assembly and review of

indicators of biomass status and levels of fishing mortality. Arguments for status determination are based upon layers of partial evidence. Ideally there would be independence between these layers which will be developed with a mixture of quantitative and qualitative reasoning. The framework provides guidance with which to interpret those indicators, and aims to provide a transparent and repeatable process for status determination. The framework includes elements to describe attributes of the stock and fishery; documentation of lines of evidence; and documentation of status determination.

135. The WPNT **NOTED** that for neritic tuna and tuna-like stocks, particularly in smaller fisheries, only a subset of the types of evidence are likely to be available and/or useful. As a result, expert judgment has an important role in status determination, with an emphasis on documenting the key evidence and rationale for the decision.

136. The WPNT **RECOMMENDED** that the IOTC Secretariat facilitate a process to provide the necessary information to the SC so that it may consider the Weight-of-Evidence approach to determine species stock status, as an addition to the current approach of relying solely on fully quantitative stock assessment techniques.

12. RESEARCH RECOMMENDATIONS AND PRIORITIES

12.1 Revision of the WPNT work plan

137. The WPNT **NOTED** the range of research projects on neritic tunas and tuna-like species under the IOTC mandate, currently underway, or in development within the IOTC area of competence, and reminded participants to ensure that the projects described are including in their National Reports to the SC, which are due on 26 November, 2012.

Stock structure

138. The WPNT **AGREED** that there was a clear need to determine the degree of shared stocks for all neritic tunas under the IOTC mandate in the Indian Ocean, so as to better equip the SC in providing management advice based on defensible management units.

139. The WPNT **AGREED** that Table 2 should be used as a starting point for research project development to delineate potential stock structure for neritic tunas in the Indian Ocean, and **RECOMMENDED** that the SC note that in the absence of reliable evidence relating to stock structure, a precautionary approach should be undertaken whereby bullet tuna, frigate tuna, kawakawa, longtail tuna, Indo-Pacific king mackerel and narrow-barred Spanish mackerel are assumed to exist as single stocks throughout the Indian Ocean, until proven otherwise.

140. The WPNT **AGREED** that research on stock structure should take two separate approaches:
    - genetic research to determine the connectivity of neritic tunas throughout their distributions: such studies should be developed at the sub-regional level (Table 2), with the assistance and support from the IOTC Secretariat for the development of project proposals.
    - tagging research to better understand and estimate exploitation rates, the movement dynamics, possible spawning locations, natural mortality, fishing mortality and post-release mortality of neritic tunas from various fisheries in the Indian Ocean.

141. The WPNT **NOTED** that tagging projects could potentially be more expensive for neritic tunas than for oceanic tunas, due to their lower abundance and that catches are mainly by artisanal vessels for which an extensive recovery network would need to be developed through the different coastal states of the Indian Ocean.

142. The WPNT **NOTED** the range of tagging projects which have been carried out on neritic tunas in the Indian Ocean and **REQUESTED** that Malaysia/SEAFDEC provide the results of the studies at the next WPNT meeting.

143. The WPNT **NOTED** that the Maldives has prepared a project proposal to undertake tagging studies in its waters, and **ENCOURAGED** other countries to develop similar proposals, with the assistance of the IOTC Secretariat if required.

144. The WPNT **AGREED** that genetic studies be given a higher priority for immediate research over tagging studies until appropriate funding has been identified. Any study should be designed in a such a way as to simultaneously collect biological material (e.g. tissue/fin clippings, ototliths, gonads, length/weight, and possibly morphometrics) in order to estimate biological parameters for future stock assessments. Both genetic, tagging and biological studies would need to be rigorously planned and preferably combined, to ensure data is collected across all temporal and spatial strata for each gear type to ensure biological parameters are representative of the population(s) being fished.

145. The WPNT **NOTED** the offer by the Invited Experts to assist in developing stock structure studies at the Queensland University of Technology (QUT), Australia and in developing genetic studies with collaboration from CSIRO and welcomed students from coastal CPCs to undertake such analysis at QUT. As the first step, QUT offered to facilitate workshops and training for IOTC CPCs to encourage technology transfer with partial funding from QUT and other sources to be identified.

Biological information

146. The WPNT **AGREED** that quantitative biological studies are necessary for all neritic tunas throughout their range to determine key biological parameters including age-at-maturity and fecundity-at-age/length relationships, age-length keys, age and growth.

147. The WPNT **NOTED** that I.R. Iran, U.A.E., Oman and Australia all have laboratories equipped with otolith and/or genetic processing facilities and associated expertise. CPCs interested in undertaking biological research should make contact with the relevant agencies to make use of this regional expertise/facilities.

148. The WPNT **AGREED** that in situations where direct ageing has not been undertaken, age composition could be derived from a well designed length frequency analysis.

CPUE standardisation

149. The WPNT **AGREED** that there was an urgent need to develop standardised CPUE series for each neritic tuna species for the Indian Ocean as a whole or by sub-region as appropriate, once stock structure and management units have been determined.

150. The WPNT **AGREED** that where feasible, support should be provided by the IOTC Secretariat and other CPCs, to aid in the development of standardised CPUE series for each neritic tuna species.

151. The WPNT **RECOMMENDED** that the IOTC Secretariat undertake a series of initial training workshops/capacity building exercises on CPUE standardisation, stock assessments and other data analysis in 2013 and 2014, and for the SC to request that the Commission allocate additional funds for this purpose in the IOTC budget.

Stock assessment

152. **NOTING** that there is an urgent need to carry out stock status determinations for neritic tunas and tuna-like species under the IOTC mandate, and that at present the data held at the IOTC Secretariat would be insufficient to undertake integrated stock assessments for any stock, the WPNT **AGREED** that alternative approaches be considered to determine stock status, by building layers of partial evidence, such as CPUE indices combined with catch data, life-history parameters and yield-per recruit metrics.

Priority species for research in 2013

153. The WPNT **AGREED** that as regionally appropriate, kawakawa, longtail tuna and narrow-barred Spanish mackerel, should be the priority species for research in 2013, although research should also continue on other neritic tuna species. Capacity building activities by the IOTC Secretariat should focus on using a single species as an example.

Table 2. Neritic tunas and tuna-like species under the IOTC mandate with potential sub-regions/stock identified

	Possible sub-regions and countries / Management Units				
Species / Stock	**East Africa** (Kenya, Tanzania, Mozambique, Madagascar, Seychelles, Mauritius, La Réunion, Comoros, Somalia)	**Gulf, Oman Sea** (I.R. Iran, Oman, Pakistan, U.A.E., Yemen, Somalia, Qatar)	**West India** (India, Pakistan, Sri Lanka, Maldives)	**East India/Bay of Bengal** (India, Sri Lanka, Malaysia, Indonesia, Thailand, Myanmar, Bangladesh)	**Indonesia and Australia** (Australia, Malaysia, Indonesia, Thailand)
Bullet tuna (*Auxis rochei*)	–	–	■	■	■
Frigate tuna (*Auxis thazard*)	■	■	■	■	■
Kawakawa (*Euthynnus affinis*)	■	■	■	■	
Longtail tuna (*Thunnus tonggol*)	■	■	■	■	
Indo-Pacific king mackerel (*Scomberomorus guttatus*)	■	■	■	■	■
Narrow-barred Spanish mackerel (*Scomberomorus commerson*)	■	■	■	■	■

Black bars refer to potential management units for further examination/research, by species. Countries in red text are not yet Members of the IOTC, however collaborative research is encouraged.

Priority projects for 2013 and 2014

154. The WPNT **RECOMMENDED** that the SC endorse the list of priority research topics for neritic tunas as provided in Table 3, and those CPCs and others, who have committed to undertake / commence the projects in 2013.

Table 3. Priority research projects for obtaining the information necessary to develop stock status indicators for neritic tuna species in the Indian Ocean

Research project	Sub-projects	Priority	Interested parties
Stock structure (connectivity)	Genetic research to determine the connectivity of neritic tunas throughout their distributions	High	Bay of Bengal countries (proposal to be initiated by Malaysia); QUT (Australia); Maldives; Iran, Pakistan, Oman, U.A.E.
	Tagging research to better understand the movement dynamics, possible spawning locations, natural mortality, fishing mortality and post-release mortality of neritic tunas from various fisheries in the Indian Ocean	Med	Maldives, Malaysia, Indonesia
	Gen-tag methodology	Med	
	Otolith microchemistry/isotope research	Low	
Biological information (parameters for stock assessment)	Age and growth research	High	
	Age-at-Maturity	High	
	Fecundity-at-age/length relationships	Medium	
Ecological information	Feeding ecology	Low	
	Life history research	Low	
CPUE standardisation	Develop standardised CPUE series for each neritic tuna species for the Indian Ocean	High	
Stock assessment / Stock indicators	At present the data held at the IOTC Secretariat would be insufficient to undertake stock assessments for any neritic tuna species under the IOTC mandate/simplified approaches could be pursued	High	
	Develop alternative approaches to determining stock status via and indicator based assessment	High	IOTC Secretariat

13. OTHER BUSINESS

13.1 Development of priorities for an Invited Expert at the next WPNT meeting

155. The WPNT **NOTED** with thanks, the outstanding contributions of the invited experts for the meeting, Dr. Shane Griffiths (CSIRO – Australia) and Dr. Terrence Dammannagoda (QUT – Australia). The WPNT **ENCOURAGED** them both to maintain links with IOTC scientists to aid in the improvement of research approaches for IOTC neritic tuna stocks.

156. The WPNT **RECOMMENDED** the following core areas of expertise and priority areas for contribution that need to be enhanced for the next meeting of the WPNT in 2013, by an Invited Expert:

- Expertise: stock structure/connectivity; including from regions other than the Indian Ocean; data poor assessment approaches.
- Priority areas for contribution: kawakawa, longtail tuna and narrow-barred Spanish mackerel biology, ecology and fisheries.

13.2 Date and place of the Third WPNT

157. The WPNT participants were unanimous in thanking Malaysia for hosting the Second Session of the WPNT and **COMMENDED** Malaysia on the warm welcome, the excellent facilities and assistance provided to the IOTC Secretariat in the organisation and running of the Session.

158. Following a discussion on who would host the Third Session of the WPNT, the WPNT **RECOMMENDED** that the IOTC Secretariat liaise with Tanzania to determine if it would be feasible to hold the next meeting of the WPNT in Dar es Salaam or Zanzibar, in June/July 2013. The exact dates and meeting location will be confirmed and communicated by the IOTC Secretariat to the SC for its consideration at its next session to be held in December 2012.

Meeting participation fund

159. **NOTING** that the IOTC Meeting Participation Fund (MPF), adopted by the Commission in 2010 (Resolution 10/05 *On the establishment of a Meeting Participation Fund for developing IOTC Members and non-Contracting Cooperating Parties*), allowed the participation of 10 national scientists to the WPNT02 meeting, the WPNT **RECOMMENDED** that this fund be maintained into the future, as neritic tunas are very important resources for many of the coastal countries of the Indian Ocean.

160. The WPNT **RECOMMENDED** that the rules of procedure for the administration of the IOTC MPF be modified to include funding for Chairs and Vice-Chairs from IOTC developing coastal states, noting that without access to this fund, the ability of developing coastal state scientists to offer their services as Chairs and Vice-Chairs will be very limited. The same rules for document provision shall apply to Chairs and Vice-Chairs funded by the MPF.

13.3 Review of the draft, and adoption of the Report of the Second WPNT

161. The WPNT **RECOMMENDED** that the Scientific Committee consider the consolidated set of recommendations arising from WPNT02, provided at Appendix IV.

162. The report of the Second Session of the Working Party on Neritic Tunas (IOTC–2012–WPNT02–R) was **ADOPTED** on the 21 November 2012.

APPENDIX I
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APPENDIX II
AGENDA FOR THE SECOND WORKING PARTY ON NERITIC TUNAS

Date: 19–21 November 2012
Location: Penang, Malaysia
Time: 09:00 – 17:00 daily
Chair: Dr. Prathibha Rohit; **Vice-Chair**: Dr. Farhad Kaymaram

1. OPENING OF THE MEETING (Chair)

2. ADOPTION OF THE AGENDA AND ARRANGEMENTS FOR THE SESSION (Chair)

3. OUTCOMES OF THE FOURTEENTH SESSION OF THE SCIENTIFIC COMMITTEE (Secretariat)

4. OUTCOMES OF SESSIONS OF THE COMMISSION
- 4.1 Outcomes of the Sixteenth Session of the Commission (Secretariat)
- 4.2 Review of Conservation and Management Measures relating to neritic tunas (Secretariat)

5. PROGRESS ON THE RECOMMENDATIONS OF WPNT01 (Chair and Secretariat)

6. NEW INFORMATION ON FISHERIES AND ASSOCIATED ENVIRONMENTAL DATA RELATING TO NERITIC TUNAS
- 6.1 Review new information on fisheries and associated environmental data (CPC papers)

7. KAWAKAWA – REVIEW OF NEW INFORMATION ON STOCK STATUS
- 7.1 Review of the statistical data available for kawakawa (Secretariat)
- 7.2 Review new information on the biology, ecology, stock structure, their fisheries and associated environmental data for kawakawa (CPC papers)
- 7.3 Data for input into stock assessments:
  - Catch and effort
  - Catch at size
  - Growth curves and age-length key
  - Catch at age
  - CPUE indices and standardised CPUE indices
  - Tagging data
- 7.4 Stock assessment updates
- 7.5 Selection of Stock Status indicators
- 7.6 Development of technical advice on the status of kawakawa

8. LONGTAIL TUNA – REVIEW OF NEW INFORMATION ON STOCK STATUS
- 8.1 Review of the statistical data available for longtail tuna (Secretariat)
- 8.2 Review new information on the biology, ecology, stock structure, their fisheries and associated environmental data for longtail tuna (CPC papers)
- 8.3 Data for input into stock assessments:
  - Catch and effort
  - Catch at size
  - Growth curves and age-length key
  - Catch at age
  - CPUE indices and standardised CPUE indices
  - Tagging data
- 8.4 Stock assessment updates
- 8.5 Selection of Stock Status indicators
- 8.6 Development of technical advice on the status of longtail tuna

9. NARROW-BARRED SPANISH MACKEREL – REVIEW OF NEW INFORMATION ON STOCK STATUS

9.1 Review of the statistical data available for narrow-barred Spanish mackerel (Secretariat)

9.2 Review new information on the biology, ecology, stock structure, their fisheries and associated environmental data for narrow-barred Spanish mackerel (CPC papers)

9.3 Data for input into stock assessments:

- Catch and effort
- Catch at size
- Growth curves and age-length key
- Catch at age
- CPUE indices and standardised CPUE indices
- Tagging data

9.4 Stock assessment updates

9.5 Selection of Stock Status indicators

9.6 Development of technical advice on the status of narrow-barred Spanish mackerel

10. OTHER NERITIC TUNA SPECIES – REVIEW OF NEW INFORMATION ON STOCK STATUS

10.1 Review of data available at the secretariat for other neritic tuna species (Secretariat)

10.2 Review new information on the biology, stock structure, fisheries and associated environmental data (all)

10.3 Stock status indicators for other neritic tuna species (all)

10.4 Development of management advice for other neritic tuna species (all)

10.5 Update of other neritic tuna species Executive Summaries for the consideration of the Scientific Committee (all)

11. RISK-BASED APPROACHES TO DETEMINING STOCK STATUS (Secretariat)

12. RESEARCH RECOMMENDATIONS AND PRIORITIES

12.1 Revision of the WPNT work plan (Chair)

13. OTHER BUSINESS

13.1 Development of priorities for an Invited Expert at the next WPNT meeting (Chair)

13.2 Date and place of the Third Working Party on Neritic Tunas (Chair and Secretariat)

13.3 Review of the draft, and adoption of the Report of the Second Working Party on Neritic Tunas (Chair)

APPENDIX III
LIST OF DOCUMENTS

Document	Title	Availability
IOTC–2012–WPNT02–01a	Draft: Agenda of the Second Working Party on Neritic Tunas	✓(17 August 2012)
IOTC–2012–WPNT02–01b	Draft: Annotated agenda of the Second Working Party on Neritic Tunas	✓(14 November 2012)
IOTC–2012–WPNT02–02	Draft: List of documents	✓(7 November 2012)
IOTC–2012–WPNT02–03	Outcomes of the Fourteenth Session of the Scientific Committee (Secretariat)	✓(2 November 2012)
IOTC–2012–WPNT02–04	Outcomes of the Sixteenth Session of the Commission (Secretariat)	✓(4 November 2012)
IOTC–2012–WPNT02–05	Review of Conservation and Management Measures relating to neritic tunas (Secretariat)	✓(4 November 2012)
IOTC–2012–WPNT02–06	Progress made on the recommendations of WPNT01 (Secretariat and Chair)	✓(4 November 2012)
IOTC–2012–WPNT02–07	Review of the statistical data available for the neritic tuna species (Secretariat)	✓(7 November 2012)
IOTC–2012–WPNT02–08	Neritic tunas from purse seine fishery in the Andaman Sea coast of Thailand, 2012 (C. Sa-nga-ngam, P. Nootmorn, T. Jaiyen, S. Boonsuk, K. Loychuen and S. Rodpradit)	✓(18 October 2012)
IOTC–2012–WPNT02–09 Rev_1	A review on neritic tuna resources in Sri Lanka (K.H.K. Bandaranayake and R. Maldeniya)	✓(19 October 2012) ✓(16 November 2012)
IOTC–2012–WPNT02–10 Rev_1	Status and potential of neritic tunas exploited from Indian waters (E.M. Abdussamad, P. Rohit, K.P. Said Koya and M. Sivadas)	✓(4 November 2012) ✓(15 November 2012)
IOTC–2012–WPNT02–11 Rev_1	Fishery in Iran with particular reference to neritic tunas (R.A. Naderi)	✓(4 November 2012) ✓(10 November 2012)
IOTC–2012–WPNT02–12	Catch and size distribution of bullet and frigate tuna caught by drifting gillnet in Indian Ocean based at Cilacap fishing port-Indonesia (A.A. Widodo, F. Satria and A. Barata)	✓(4 November 2012)
IOTC–2012–WPNT02–13	Status of fisheries of neritic tuna in Pakistan (M.M. Khan)	✓(4 November 2012)
IOTC–2012–WPNT02–14 Rev_1	Growth and mortality parameters of *Euthynnus affinis* in the northern part of the Persian Gulf and Oman Sea (F. Kaymaram and M. Darvishi)	✓(4 November 2012) ✓(14 November 2012)
IOTC–2012–WPNT02–15 Rev_1	Fishery, biology and population dynamics of the Indo-Pacific king mackerel, *Scomberomorus guttatus* (Bloch & Schneider, 1801) exploited in India (P. Rohit and S. Ghosh)	✓(5 November 2012) ✓(8 November 2012)
IOTC–2012–WPNT02–16	Innovative and cost-effective approaches for surveying specialised recreational longtail tuna fishers in Australian waters (S. Griffiths, M.T. Zischke, M.L. Tonks, J.G. Pepperell and S.Tickell)	✓(7 November 2012)
IOTC–2012–WPNT02–17	Overview on neritic tunas bycatch by the national bottom longliners in Madagascar (R. Fanzava)	✓(8 November 2012)
IOTC–2012–WPNT02–18	Independent tuna length frequency and genotypic data sets suggest multiple breeding units in the Indian Ocean: Are the data correlated? (S.T. Dammannagoda, S.C. Ratnasiri, D.A. Hurwood and P.B. Mather)	✓(8 November 2012)
IOTC–2012–WPNT02–19	A brief review Indo-Pacific King mackerel (*Scomberomorus guttatus*) in Indonesia (K. Zarochman)	✓(8 November 2012)
IOTC–2012–WPNT02–20	Catch performance of the purse seines for the neritic tuna fishing in the Strait of Malacca (S.Basir and S. Jamon)	✓(12 November 2012)
IOTC–2012–WPNT02–21	Overview of Tanzania neritic tuna fisheries (Z. El Kharousy and J. Grayson)	✓(12 November 2012)
IOTC–2012–WPNT02–22	Stock assessment of longtail tuna in Australian waters: data input, model selection and assessing population status (S. Griffiths)	✓(14 November 2012)

Document	Title	Availability
IOTC–2012–WPNT02–23	A preliminary study of population structure of kawakawa, *Euthynnus affinis* (Cantor 1849) in the straits of Malacca (A.R. Masazurah, M.N. Siti Azizah and B. Samsidin)	✓(14 November 2012)
IOTC–2012–WPNT02–24 Rev_1	Catches of neritic tunas in Maldives and notes on the new logbook reporting scheme (Mohamed Ahusan, M. Shiham Adam)	✓(14 November 2012) ✓(20 November 2012)
IOTC–2012–WPNT02–25 Rev_1	Indian Ocean neritic tuna stock assessments (kawakawa and longtail): using surplus production models with effort: an observation error based approach (R. Sharma, M. Herrera and J. Million)	✓(14 November 2012) ✓(21 November 2012)
Information papers		
IOTC–2012–WPNT02–INF01	Development of national guidelines to improve the application of risk-based methods in the scope, implementation and interpretation of stock assessments for data-poor species (J. Scandol, M. Ives and M. Lockett)	✓(4 November 2012)

APPENDIX IV
CONSOLIDATED RECOMMENDATIONS OF THE SECOND SESSION OF THE WORKING PARTY ON NERITIC TUNAS

Note: Appendix references refer to the Report of the Second Session of the Working Party on Neritic Tunas (IOTC–2012–WPNT02–R)

Outcomes of the Scientific Committee

WPNT02.01 (para. 7) The WPNT **RECOMMENDED** that the SC note that the neritic tuna and tuna-like species under the IOTC mandate have become as important or more important as the three tropical tuna species (bigeye tuna, skipjack tuna and yellowfin tuna) to most IOTC coastal states with a total estimated catch of 605,359 t being landed in 2011, and as a result, should be receiving appropriate management resources from the IOTC.

IOTC database

WPNT02.02 (para. 18) The WPNT **NOTED** the main data issues that are considered to negatively affect the quality of the statistics for neritic tunas available at the IOTC Secretariat, by type of dataset and fishery, which are provided in Appendix VI, and **RECOMMENDED** that the CPCs listed in the Appendix, make efforts to remedy the data issues identified and to report back to the WPNT at its next meeting.

Species identification

WPNT02.03 (para. 22) The WPNT **AGREED** that the development of species identification cards for neritic tuna and tuna-like species, at various life history stages interacting with IOTC fisheries, needs to be developed and **RECOMMENDED** that the IOTC Secretariat, in collaboration with relevant experts, develop species identification cards by the next WPNT meeting.

WPNT02.04 (para. 23) The WPNT **RECOMMENDED** that the SC request that the Commission allocate funds in the 2013 budget to develop and print sets of the identification cards, noting that expected printing costs are in the vicinity of US$7,500 per 1000 sets of cards.

WPNT02.05 (para. 24) The WPNT **RECOMMENDED** that IOTC CPCs translate, print and disseminate the identification cards to their observers and field samplers (Resolution 11/04), and as feasible, to their fishing fleets targeting neritic tuna and tuna-like species. This would allow accurate observer, sampling and logbook data on neritic tuna and tuna-like species to be recorded and reported to the IOTC Secretariat as per IOTC requirements.

General discussion on data

WPNT02.06 (para. 26) The WPNT **RECOMMENDED** that the SC request the Commission to increase the IOTC Capacity Building budget line so that capacity building workshops/training can be carried out in 2013 and 2014 on the collection, reporting and analyses of catch and effort data for neritic tuna and tuna-like species. Where appropriate this training session shall include information that explains the entire IOTC process from data collection to analysis and how the information collected is used by the Commission to develop Conservation and Management Measures.

WPNT02.07 (para. 27) The WPNT **NOTED** that some CPCs do not currently have a sampling scheme dedicated to record catch and size frequency data for neritic tunas, and **RECOMMENDED** that such systems are developed.

WPNT02.08 (para. 30) The WPNT reiterated its previous **RECOMMENDATION** that the IOTC Secretariat request that any datasets for neritic tuna species held by SWIOFP be provided to the IOTC Secretariat before the next meeting of the WPNT.

Kawakawa – Development of technical advice on the status

WPNT02.09 (para. 48) The WPNT **RECOMMENDED** that the SC note the management advice developed for kawakawa (*Euthynnus affinis*) as provided in the draft resource stock status summary – Appendix IX

Longtail Tuna – Development of technical advice on the status

WPNT02.10 (para. 64) The WPNT **RECOMMENDED** that the SC note the management advice developed for longtail tuna (*Thunnus tonggol*) as provided in the draft resource stock status summary – Appendix X

Narrow-Barred Spanish Mackerel – Development of technical advice on the status

WPNT02.11 (para. 76) The WPNT **RECOMMENDED** that the SC note the management advice developed for narrow-barred Spanish mackerel (*Scomberomorus commerson*) as provided in the draft resource stock status summary – Appendix XII

Thailand neritic tuna fisheries

WPNT02.12 (para. 83) **NOTING** that the nominal catch (NC) data provided at the WPNT02 meeting were found to conflict with the NC data history provided by Thailand in recent years, and for catch-and-effort data for most of the history of the gillnet fleet, the WPNT **RECOMMENDED** that Thailand liaise with the IOTC Secretariat to provide a fully justified revised catch history which will replace the data currently held by the IOTC Secretariat before the next WPNT meeting.

India neritic tuna fisheries

WPNT02.13 (para. 90) **NOTING** the efforts by India to revise its catch data since 2007 for all species, that now includes catch from Lakshadweep and the Andaman islands, the WPNT **RECOMMENDED** that this revised data is reported to the IOTC Secretariat, preferably before the next WPNT meeting.

Indonesia neritic tuna fisheries

WPNT02.14 (para. 96) **NOTING** that the nominal catch (NC) data provided at the WPNT02 meeting were found to conflict with the NC data history provided by Indonesia in recent years, and for catch-and-effort data for most of the history of the gillnet fleet, the WPNT **RECOMMENDED** that Indonesia liaise with the IOTC Secretariat to provide a fully justified revised catch history which will replace the data currently held by the IOTC Secretariat before the next WPNT meeting.

India Indo-Pacific king mackerel catches

WPNT02.15 (para. 106) **NOTING** that monofilament gillnets are recognised to have highly detrimental impacts on fishery ecosystems, as they are non-selective, and that the use of monofilament gillnets have already been banned in a large number of IOTC CPCs, the WPNT **RECOMMENDED** that the IOTC Secretariat facilitate a review of the use of monofilament gillnets by IOTC CPCs to i) determine the number of CPCs using then, ii) estimate total catch and bycatch, etc., taken by monofilament gillnets in comparison to other net material, and iii) to report the findings at the next WPNT meeting.

Data sets available

WPNT02.16 (para. 124) **NOTING** that some CPCs, in particular from India, Indonesia and Thailand, have collected large data sets on neritic tuna species over long time periods, the WPNT reiterated its previous **RECOMMENDATION** that this data, as well as data for other CPCs, be submitted to the IOTC Secretariat as per the requirements adopted by IOTC Members in Resolution 10/02. This would allow the WPNT to develop stock status indicators or comprehensive stock assessments of neritic tuna species in the future.

Development of management advice for other neritic tuna species

WPNT02.17 (para. 129) The WPNT **RECOMMENDED** that the SC note the management advice developed for bullet tuna, frigate tuna and Indo-Pacific king mackerel as provided in the draft resource stock status summary for each species:

- bullet tuna (*Auxis rochei*) – Appendix VII
- frigate tuna (*Auxis thazard*) – Appendix VIII
- Indo-Pacific king mackerel (*Scomberomorus guttatus*) – Appendix IX

WPNT02.18 (para. 131) The WPNT **RECOMMENDED** that the SC note that neritic tuna species are in many cases, the major commercial tuna and tuna-like species being exploited by the majority of Indian Ocean coastal states and as such, should be given the same status in terms of time and resource investment.

Risk-Based Approaches to Determining Stock Status

WPNT02.19 (para. 136) The WPNT **RECOMMENDED** that the IOTC Secretariat facilitate a process to provide the necessary information to the SC so that it may consider the Weight-of-Evidence approach to determine species stock status, as an addition to the current approach of relying solely on fully quantitative stock assessment techniques.

Research Recommendations and Priorities – Revision of the WPNT work plan

Stock structure

WPNT02.20 (para. 139) The WPNT **AGREED** that Table 2 should be used as a starting point for research project development to delineate potential stock structure for neritic tunas in the Indian Ocean, and **RECOMMENDED** that the SC note that in the absence of reliable evidence relating to stock structure, a precautionary approach should be undertaken whereby bullet tuna, frigate tuna, kawakawa, longtail tuna, Indo-Pacific king mackerel and narrow-barred Spanish mackerel are assumed to exist as single stocks throughout the Indian Ocean, until proven otherwise.

CPUE standardisation

WPNT02.21 (para. 151) The WPNT **RECOMMENDED** that the IOTC Secretariat undertake a series of initial training workshops/capacity building exercises on CPUE standardisation, stock assessments and other data analysis in 2013 and 2014, and for the SC to request that the Commission allocate additional funds for this purpose in the IOTC budget.

Priority projects for 2013 and 2014

WPNT02.22 (para. 154) The WPNT **RECOMMENDED** that the SC endorse the list of priority research topics for neritic tunas as provided in Table 3, and those CPCs and others, who have committed to undertake / commence the projects in 2013.

Development of priorities for an Invited Expert at the next WPNT meeting

WPNT02.23 (para. 156) The WPNT **RECOMMENDED** the following core areas of expertise and priority areas for contribution that need to be enhanced for the next meeting of the WPNT in 2013, by an Invited Expert:

- Expertise: stock structure/connectivity; including from regions other than the Indian Ocean; data poor assessment approaches.
- Priority areas for contribution: kawakawa, longtail tuna and narrow-barred Spanish mackerel biology, ecology and fisheries.

Date and place of the Third WPNT

WPNT02.24 (para. 158) Following a discussion on who would host the Third Session of the WPNT, the WPNT **RECOMMENDED** that the IOTC Secretariat liaise with Tanzania to determine if it would be feasible to hold the next meeting of the WPNT in Dar es Salaam or Zanzibar, in June/July 2013. The exact dates and meeting location will be confirmed and communicated by the IOTC Secretariat to the SC for its consideration at its next session to be held in December 2012.

Meeting participation fund

WPNT02.25 (para. 159) **NOTING** that the IOTC Meeting Participation Fund (MPF), adopted by the Commission in 2010 (Resolution 10/05 *On the establishment of a Meeting Participation Fund for developing IOTC Members and non-Contracting Cooperating Parties*), allowed the participation of 10 national scientists to the WPNT02 meeting, the WPNT **RECOMMENDED** that this fund be maintained into the future, as neritic tunas are very important resources for many of the coastal countries of the Indian Ocean.

WPNT02.26 (para. 160) The WPNT **RECOMMENDED** that the rules of procedure for the administration of the IOTC MPF be modified to include funding for Chairs and Vice-Chairs from IOTC developing coastal states, noting that without access to this fund, the ability of developing coastal state scientists to offer their services as Chairs and Vice-Chairs will be very limited. The same rules for document provision shall apply to Chairs and Vice-Chairs funded by the MPF.

Review of the draft, and adoption of the Report of the Second WPNT

WPNT02.27 (para. 161) The WPNT **RECOMMENDED** that the Scientific Committee consider the consolidated set of recommendations arising from WPNT02, provided at Appendix IV.

APPENDIX VA
MAIN STATISTICS FOR BULLET TUNA (*AUXIS ROCHEI*)

Extract from IOTC–2012–WPNT02–07

Bullet tuna** – **Fisheries and catch trends

Bullet tuna is caught mainly by gillnet, handline, and trolling, across the broader Indian Ocean area (Table 1; Fig. 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[1].

TABLE 1. Bullet tuna: Best scientific estimates of the catches of bullet tuna by type of fishery for the period 1950–2011 (in metric tonnes) (Data as of October 2012)

Fishery	By decade (average)						By year (last ten years)									
	1950s	1960s	1970s	1980s	1990s	2000s	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Purse seine	-	3	10	81	164	200	210	209	169	169	208	213	214	199	171	226
Gillnet	5	9	35	92	694	908	1,186	469	922	545	1,127	1,453	1,089	1,356	2,322	3,970
Line	12	16	72	187	495	595	553	541	473	478	596	808	729	686	617	754
Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	**17**	**28**	**117**	**360**	**1,353**	**1,704**	**1,948**	**1,219**	**1,565**	**1,192**	**1,932**	**2,474**	**2,032**	**2,241**	**3,110**	**4,949**

Estimated catches of bullet tuna reached around 1,000 t in the early 1990's, increasing markedly in the following years to reach a peak in 1998 at around 2,800 t. The catches decreased sharply in the following years and remained around 2,000 t until the mid-2000's. The highest reported catches of bullet tuna were taken in 2011 with 4,950 t estimated as being landed. The high catches of bullet tuna recorded since 2006, compared to previous years, are thought to be highly uncertain. The difference in catches may come from improved identification of specimens of frigate tuna and bullet tuna in recent years, leading to higher catches of bullet tuna reported to the IOTC Secretariat

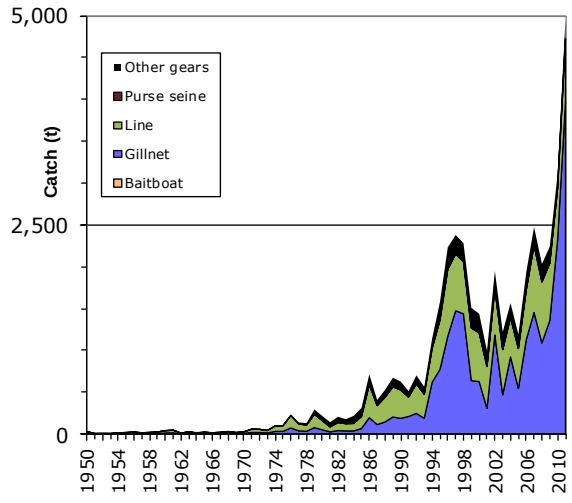


Fig. 1. Bullet tuna: Annual catches of bullet tuna by gear recorded in the IOTC Database (1950–2011)

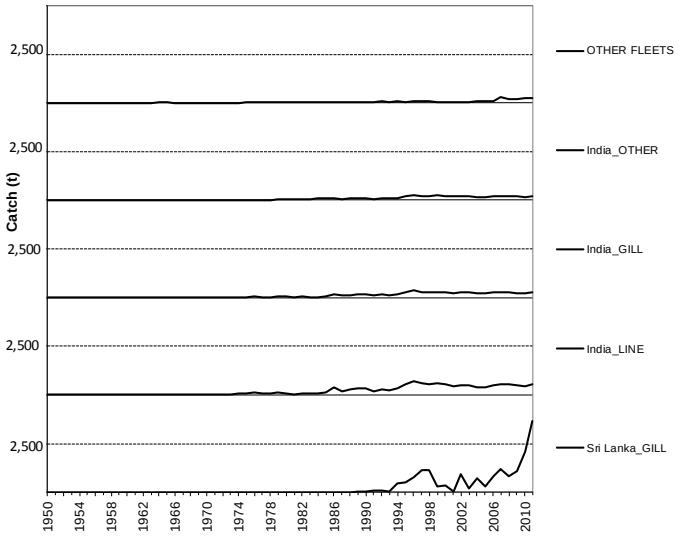


Fig. 2. Bullet tuna: Catches of bullet tuna recorded in the IOTC database for main fishing fleets (1950–2011)

[1] The uncertainty in the catch estimates has been assessed by the IOTC 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.

In recent years, the countries attributed with the highest catches of bullet tuna are Sri Lanka and India (Fig. 2). Length frequency data for bullet tuna is only available for some Sri Lanka fisheries and periods.

Bullet tuna – Uncertainty of catches

Retained catches are highly uncertain for all fisheries (Fig. 3) due to:

- Aggregation: Bullet tuna are usually not reported by species being aggregated with frigate tunas or, less frequently, other small tuna species.
- Mislabelling: Bullet tuna are usually mislabelled as frigate tuna, their catches reported under the latter species.
- Underreporting: the catches of bullet tuna by industrial purse seiners are rarely, if ever, reported.

It is for the above reasons that the catches of bullet tunas in the IOTC database are thought to represent only a small fraction of the total catches of this species in the Indian Ocean. In particular, catches reported by India in recent years are unreliable and need to be verified.

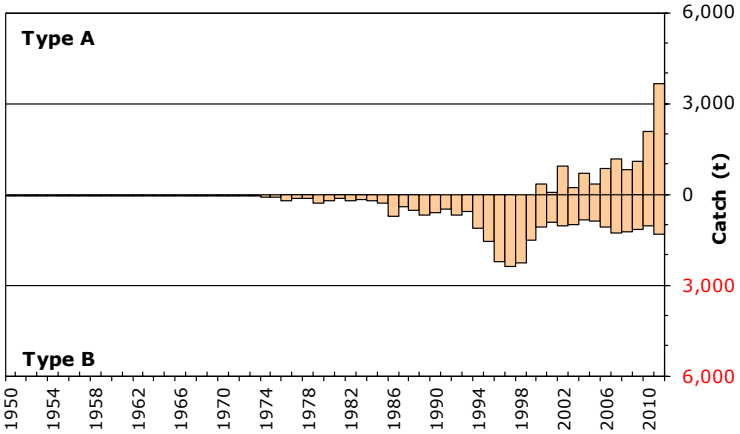


Fig. 3. Bullet tuna: Uncertainty of annual catch estimates for bullet tuna (1950–2011). Catches below the zero-line (Type B) refer to fleets that do not report catch data to the IOTC (estimated by the IOTC Secretariat), do not report catch data by gear and/or species (broken by gear and species by the IOTC Secretariat) or any of the other reasons provided in the document. Catches over the zero-line (Type A) refer to fleets for which no major inconsistencies have been found to exist. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets (Data as of October 2012)

- Discard levels are moderate for industrial purse seine fisheries. The EU recently reported discard levels of bullet tuna for its purse seine fleet, for 2003–07, estimated using observer data.
- Changes to the catch series: The catch series of bullet tuna has changed substantially since the WPNT meeting in 2011, following reviews of catches of frigate tuna and bullet tuna for the coastal fisheries in India, with an increased proportion of frigate tuna to the previously reported total catches of both frigate tuna and bullet tuna.

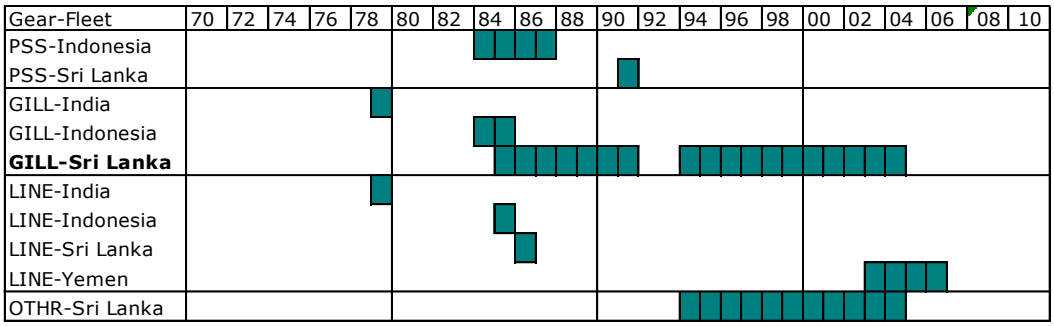
Bullet tuna – Effort trends

Effort trends are unknown for bullet tuna in the Indian Ocean.

Bullet tuna – Catch–per–unit–effort (CPUE) trends

Catch-and-effort series are not available for most fisheries (Fig. 4) and, when available, they are usually considered to be of poor quality for the fisheries having reasonably long catch-and-effort data series, as it is the case with the gillnet fisheries of Sri Lanka (Fig. 5).

TABLE. 4. Bullet tuna: Availability of catches and effort series, by fishery and year (1970–2011)[2]. Note that no catch and effort data are available for the period 1950–78



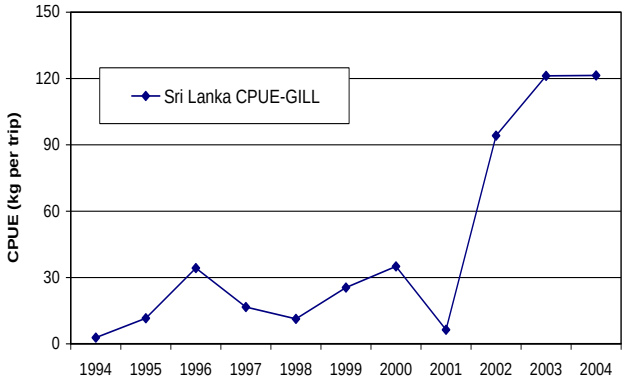
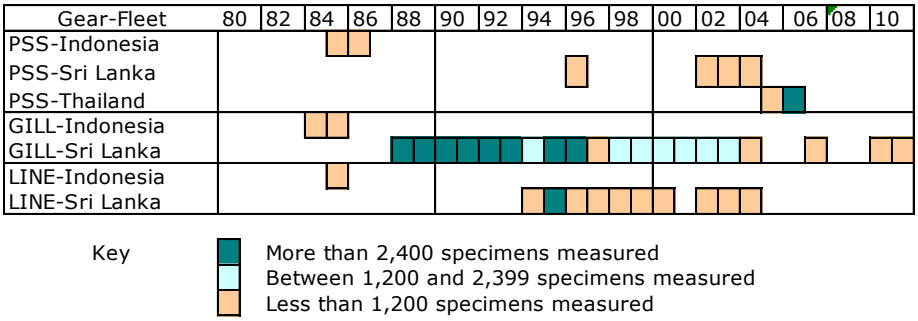


Fig. 5. Bullet tuna: Nominal CPUE series for the gillnet fishery of Sri Lanka derived from the available catches and effort data (1994–2004)

Bullet tuna – Fish size or age trends (e.g. by length, weight, sex and/or maturity)

- The size of bullet tuna taken by the Indian Ocean fisheries typically ranges between 13–48 cm depending on the type of gear used, season and location.
- Trends in average weight cannot be assessed for most fisheries. Reasonable long series of length frequency data are only available for Sri Lankan gillnets and lines but the amount of specimens measured has been very low in recent years (Table 5).
- Catch-at-Size(age) data are not available for bullet tuna due to the paucity of size data available from most fleets and the uncertain status of the catches for this species. Length distributions derived from the data available for some selected fisheries are shown in Fig. 6
- Sex ratio data have not been provided to the Secretariat by CPCs.

TABLE. 5. Bullet tuna: Availability of length frequency data, by fishery and year (1980–2011)[3]. Note that no length frequency data are available for the period 1950–83



[2] Note that the above list is not exhaustive, showing only the fisheries for which catches and effort are available in the IOTC database. Furthermore, when available catches and effort may not be available throughout the year existing only for short periods

[3] Note that the above list is not exhaustive, showing only the fisheries for which size data are available in the IOTC database. Furthermore, when available size data may not be available throughout the year existing only for short periods

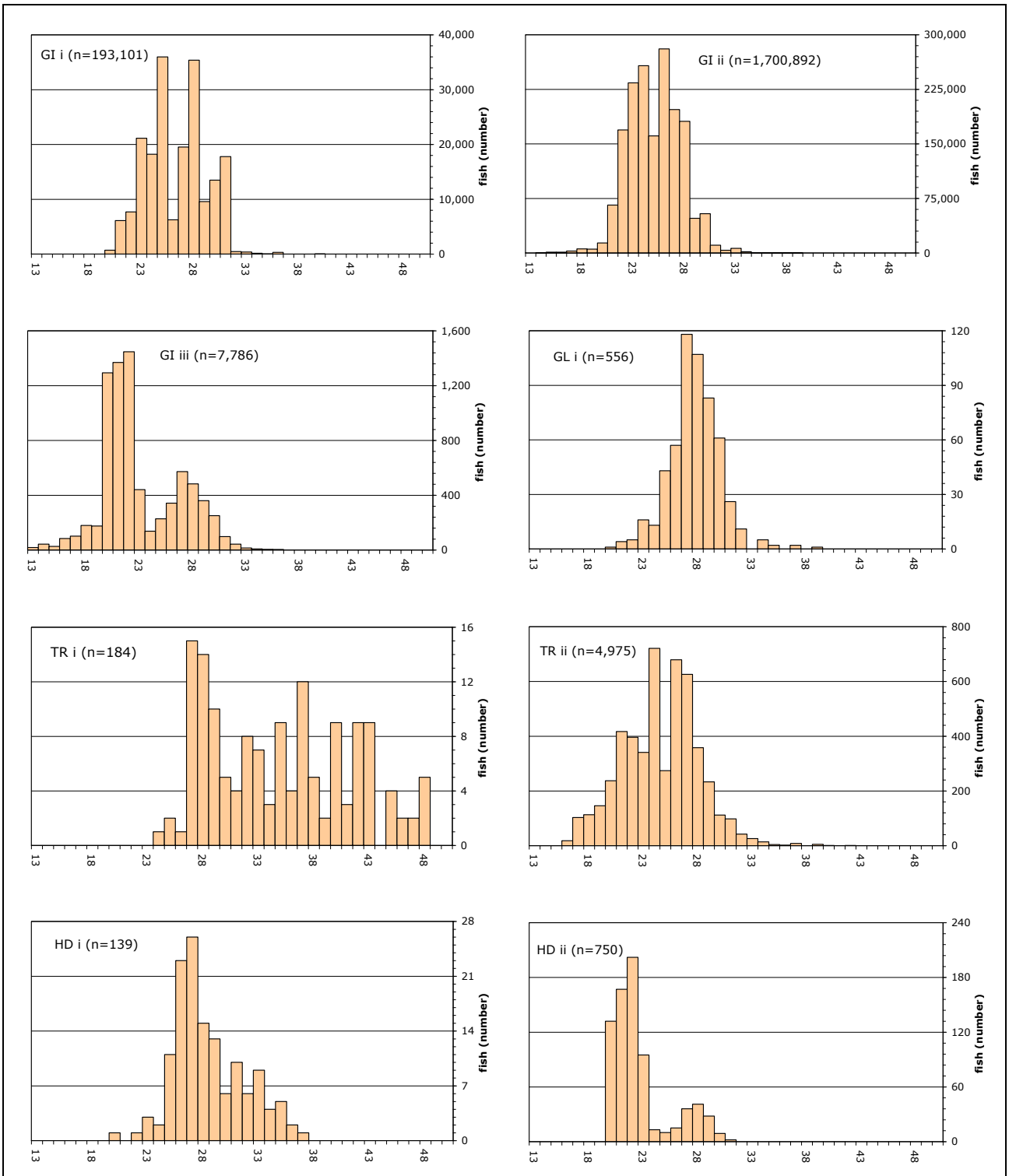


Fig. 6. Bullet tuna: Length frequency distributions (total amount of fish measured by 1cm length class by decade) derived from the data available at the IOTC Secretariat for selected fisheries and periods. GI: Gillnet fisheries: i. Sri Lanka 1980–89, ii. Sri Lanka 1990-99, iii. Sri Lanka 2000–06. GL: Gillnet and longline combination: i. Sri Lanka 2000–06. TR: Troll line fisheries: i. Sri Lanka 1980–89, ii. Sri Lanka 1990–99. HD: Hand line fisheries: i. Sri Lanka 1990–99, ii. Sri Lanka 2000–06

APPENDIX VB
MAIN STATISTICS FOR FRIGATE TUNA (*AUXIS THAZARD*)

Extract from IOTC–2012–WPNT02–07

Frigate tuna – Fisheries and catch trends

Frigate tuna is taken from across the Indian Ocean area using gillnets, pole-and-lines, handlines and trolling gear (Table 1; Fig. 1). This species is also an important incidental catch for industrial purse seine vessels and is the target of some ring net fleets. The catch estimates for frigate tuna were derived from very small amounts of information and are therefore highly uncertain[4].

The catches provided in Table 1 are based on the information available at the IOTC Secretariat and the following observations on the catches cannot currently be verified. Estimated catches have increased steadily since the late 1970's reaching around 15,000 t in the early 1980's and over 45,000 t by the mid-1990's, and remaining at the same level over the following ten years. Catches increased substantially 2005, with current catches at around 80,000 t (Table 1; Fig. 2). The catches of frigate tuna have been higher in the east since the late 1990's, with ¾ of the catches of frigate tuna taken in the eastern Indian Ocean in recent years.

In recent years, the countries attributed with the highest catches are Indonesia (65%), India (14%), Iran (7%), and Sri Lanka (5%) (Table 1; Fig. 2).

TABLE 1. Frigate tuna: Best scientific estimates of the catches of frigate tuna by type of fishery for the period 1950–2011 (in metric tonnes) (Data as of October 2012)

Fishery	By decade (average)						By year (last ten years)									
	1950s	1960s	1970s	1980s	1990s	2000s	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Purse seine	-	12	891	6,433	16,228	30,473	24,052	25,214	29,826	27,602	31,262	33,701	41,257	39,637	39,674	40,097
Gillnet	265	407	1,252	3,689	10,456	14,926	12,025	11,971	11,023	10,509	14,399	20,880	22,401	24,651	28,525	32,121
Line	447	666	1,197	2,916	5,658	5,265	5,374	5,038	4,745	4,600	5,298	5,584	5,486	5,810	5,015	6,149
Other	1,782	2,580	3,304	3,957	6,852	6,078	6,175	6,266	5,542	6,345	4,818	5,285	6,050	6,878	4,842	4,843
Total	**2,494**	**3,666**	**6,644**	**16,995**	**39,194**	**56,742**	**47,626**	**48,489**	**51,134**	**49,055**	**55,778**	**65,449**	**75,194**	**76,976**	**78,056**	**83,210**

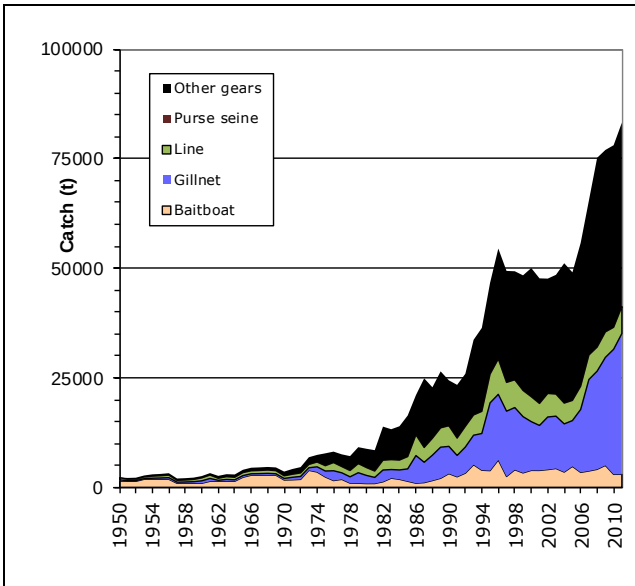


Fig. 1. Frigate tuna: Annual catches of frigate tuna by gear recorded in the IOTC Database (1950–2011)

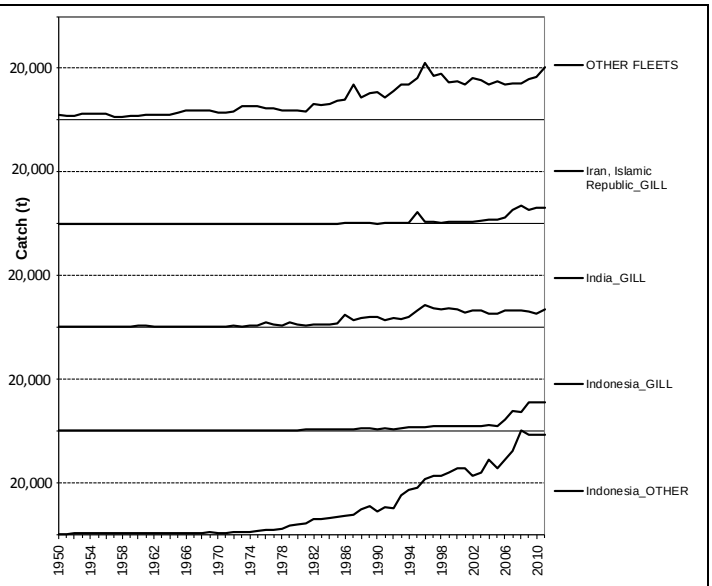


Fig. 2. Frigate tuna: Catches of frigate tuna recorded in the IOTC Database for main fishing fleets (1950–2011)

[4] The uncertainty in the catch estimates has been assessed by the IOTC 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 non-reporting fleets for which catches had to be estimated.

Frigate tuna – uncertainty of catches

Retained catches are highly uncertain (Fig. 3) notably for the following fisheries:

- Artisanal fisheries of Indonesia: Indonesia did not report catches of frigate tuna by species or by gear for 1950–2004; catches of frigate tuna, bullet tuna and other species were reported aggregated for this period. The Secretariat used the catches reported since 2005 to break the aggregates for 1950–2004 by gear and species. The catches estimated for the frigate tuna represent around 65% of the total catches of this species in the Indian Ocean in recent years.
- Artisanal fisheries of India: Although India reports catches of frigate tuna they are not always reported by gear. The IOTC Secretariat has allocated the catches of frigate tuna by gear for years in which this information was not available. In recent years, the catches of frigate tuna in India have represented 14% of the total catches of this species in the Indian Ocean.
- Artisanal fisheries of Myanmar (and Somalia): None of these countries have ever reported catches of frigate tuna to the IOTC Secretariat. Catch levels are unknown.
- Other artisanal fisheries: The catches of frigate tuna and bullet tuna are seldom reported by species and, when reported by species, they usually refer to both species (due to mislabelling, with all catches assigned to the frigate tuna).
- Industrial fisheries: The catches of frigate tuna recorded for industrial purse seiners are thought to be a fraction of those retained on board. Due to this species being a bycatch, its catches are seldom recorded in the logbooks, nor can they be monitored in port. The EU recently reported catch levels of frigate tuna for its purse seine fleet, for 2003–07, estimated using observer data.

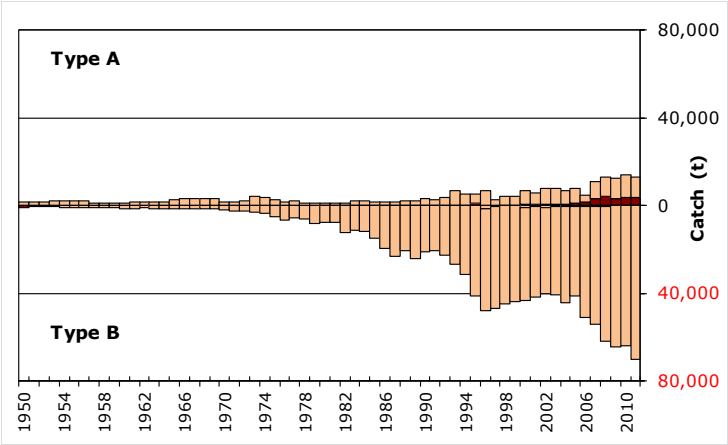


Fig. 3. Frigate tuna: Uncertainty of annual catch estimates for frigate tuna (1950–2011). Catches below the zero-line (Type B) refer to fleets that do not report catch data to the IOTC (estimated by the IOTC Secretariat), do not report catch data by gear and/or species (broken by gear and species by the IOTC Secretariat) or any of the other reasons provided in the document. Catches over the zero-line (Type A) refer to fleets for which no major inconsistencies have been found to exist. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets (Data as of October 2012)

- Discard levels are moderate for industrial purse seine fisheries. The EU recently reported discard levels of frigate tuna for its purse seine fleet, for 2003–07, estimated using observer data.
- Changes to the catch series: The catch series of frigate tuna has not changed substantially since the WPNT meeting in 2011.

Frigate tuna – Effort trends

Effort trends are unknown for frigate tuna in the Indian Ocean.

Frigate tuna – Catch–per–unit–effort (CPUE) trends

Standardised CPUE series have not yet been developed. Catch-and-effort series are available from some fisheries but they are considered highly incomplete (Fig. 4). In most cases catch-and-effort data are only available for short periods. Reasonably long catch-and-effort series (extending for more than 10 years) are only available for Maldives baitboats and hand and troll lines (Table 2) and Sri Lanka gillnets. The catches and effort recorded for Sri Lankan gillnets are, however, thought to be inaccurate due to the dramatic changes in CPUE recorded between consecutive years.

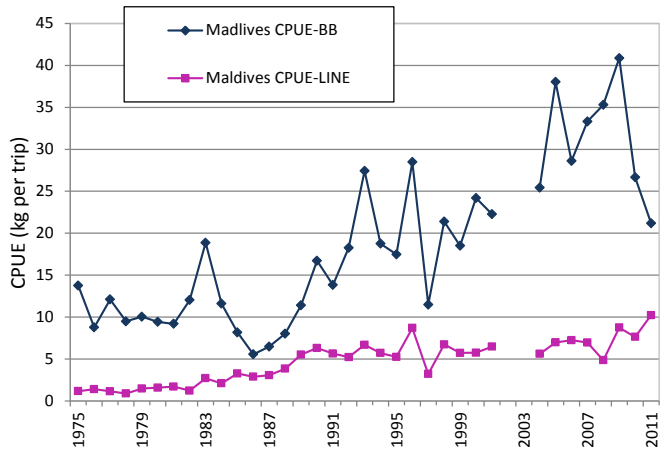
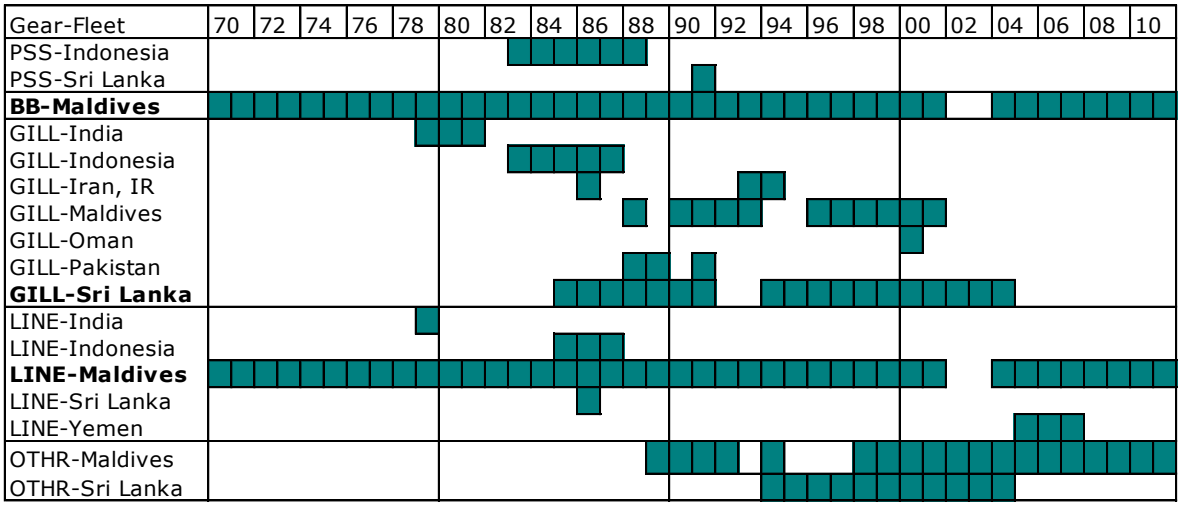


Fig. 4. Frigate tuna: Nominal CPUE series for the baitboat (BB using mechanized boats) and line (LINE, including handlines and trolling using mechanized boats) fisheries of Maldives derived from the available catches and effort data (1975–2011)

TABLE 2. Frigate tuna: Availability of catches and effort series, by fishery and year (1970–2011)[5]. Note that no catches and effort are available for the period 1950–69 in the IOTC Secretariat databases

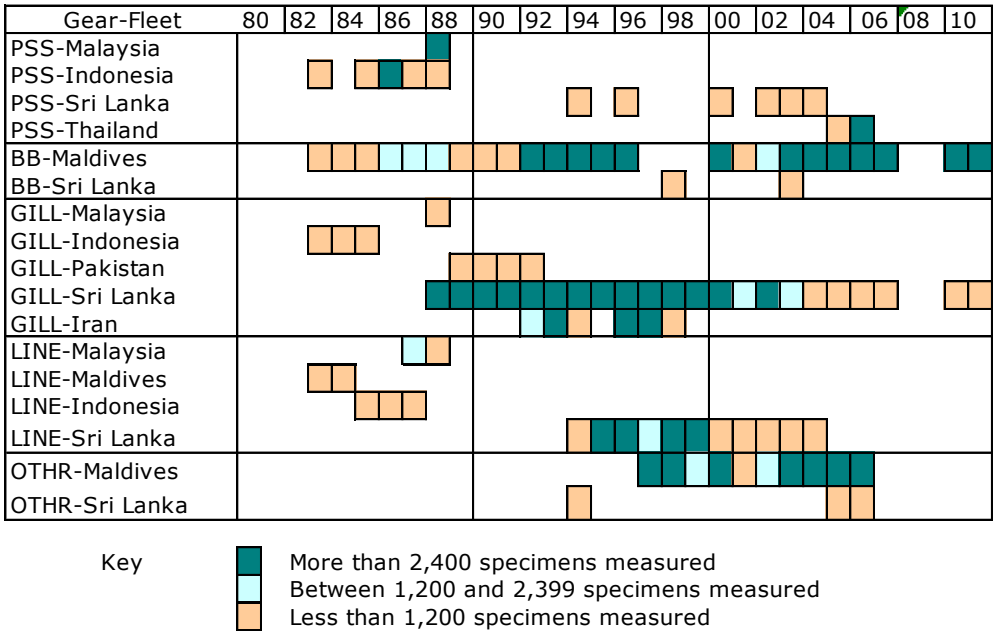


Frigate tuna – Fish size or age trends (e.g. by length, weight, sex and/or maturity)

- Trends in average weight can only be assessed for Sri Lankan gillnets and Maldivian pole-and-lines but the amount of specimens measured has been very low in recent years (Table 3). The length frequency data available from the mid-eighties to the early nineties was obtained with the support of the IPTP (Indo-Pacific Tuna Programme). Unfortunately, data collection did not continue in most countries after the end of the IPTP activities.

[5] Note that the above list is not exhaustive, showing only the fisheries for which catches and effort are available in the IOTC database. Furthermore, when available catches and effort may not be available throughout the year existing only for short periods

TABLE 3: Frigate tuna: Availability of length frequency data, by fishery and year (1980–2011)[6]. Note that no length frequency data are available for the period 1950–82



- The size of frigate tunas taken by the Indian Ocean fisheries typically ranges between 20 and 50 cm depending on the type of gear used, season and location (Fig. 5). The fisheries operating in the Andaman Sea (coastal purse seines and troll lines) tend to catch frigate tuna of small to medium size (15–40 cm) while the gillnet, baitboat and other fisheries operating in the Indian Ocean catch usually larger specimens (25–50 cm).
- Catch-at-Size(Age) data are not available for the frigate tuna due to the paucity of size data available from most fleets (Table 3) and the uncertain status of the catches for this species (Fig. 3). Length distributions derived from the data available for some selected fisheries are shown in Fig. 5.
- Sex ratio data have not been provided to the Secretariat by CPCs.

[6] Note that the above list is not exhaustive, showing only the fisheries for which size data are available in the IOTC database. Furthermore, when available size data may not be available throughout the year existing only for short periods

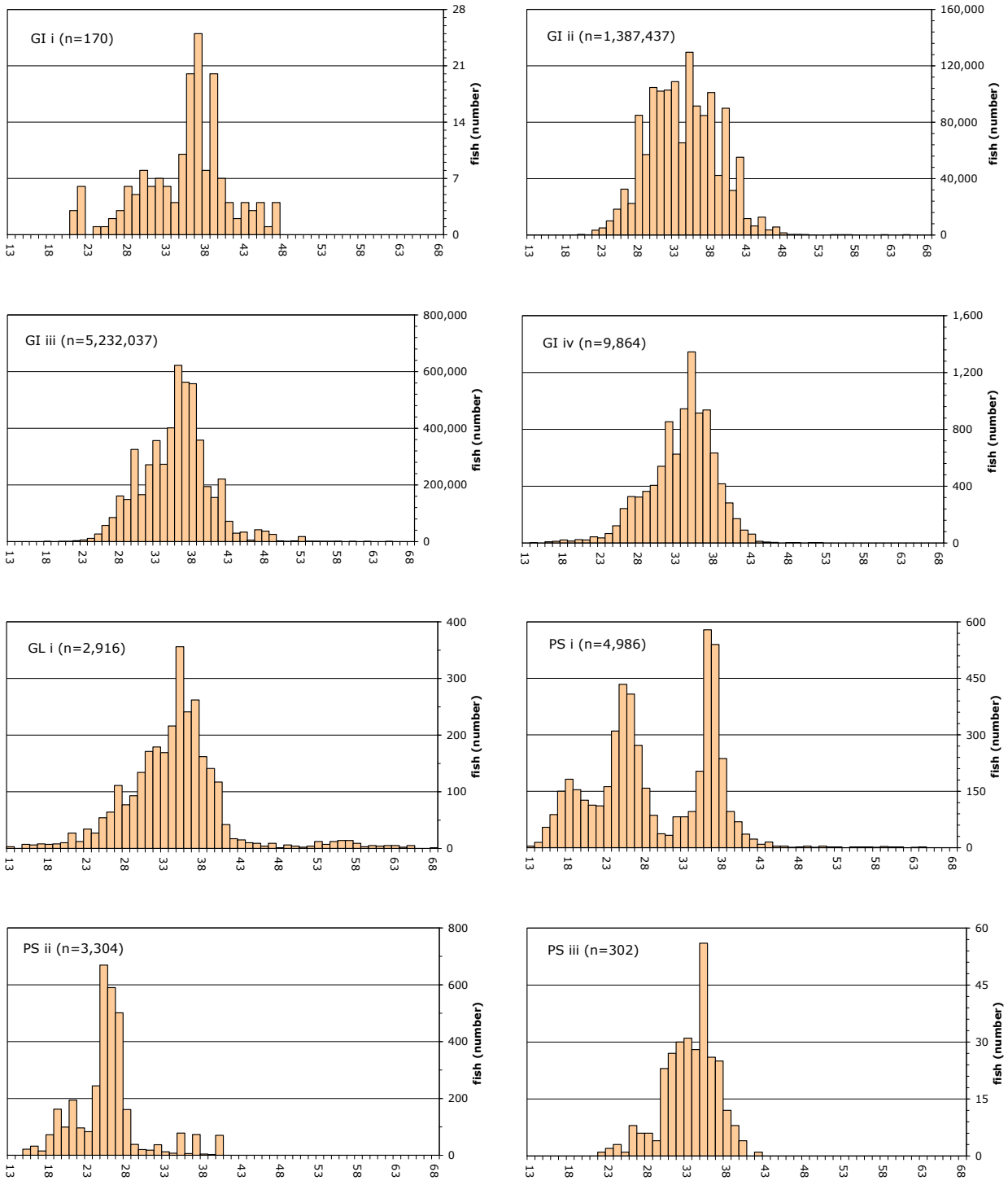


Fig. 5. Frigate tuna: Length frequency distributions (total amount of fish measured by 1 cm length class by decade) derived from the data available at the IOTC Secretariat for selected fisheries and periods. GI: Gillnet fisheries: i. Indonesia 1980–89, ii. Sri Lanka 1980–89, iii. Sri Lanka 2000–06, iv. Sri Lanka 2000–06. GL: Gillnet and longline combination: i. Sri Lanka 2000–06. PS: Coastal purse seine fisheries: i. Indonesia 1980–89, ii. Malaysia 1980–89, iii. Sri Lanka 2000–06 (ring net)

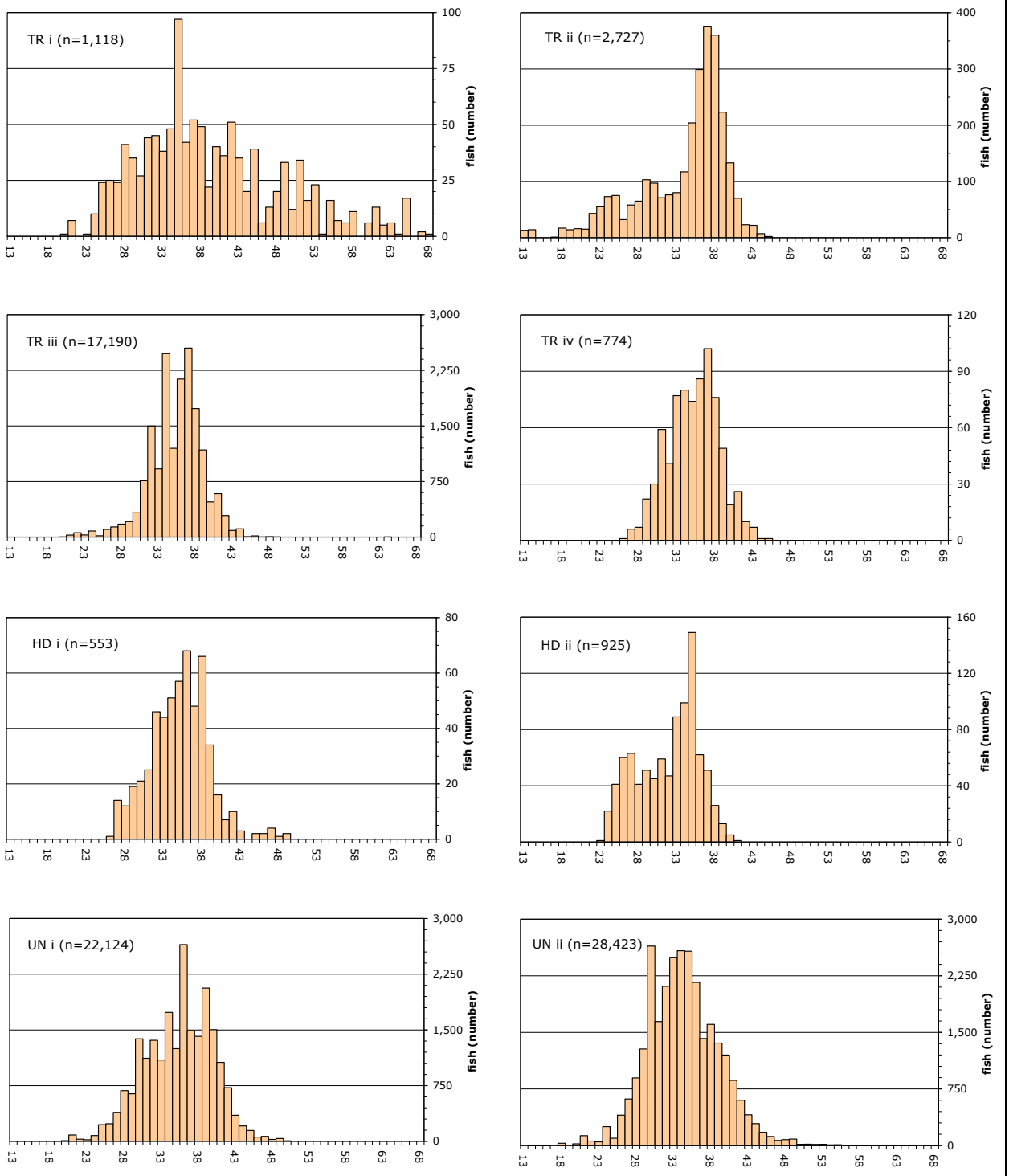


Fig. 5 (cont). Frigate tuna: Length frequency distributions (total amount of fish measured by 1cm length class by decade) derived from the data available at the IOTC Secretariat for selected fisheries and periods. TR: Troll line fisheries: i. Indonesia 1980–89, ii. Malaysia 1980–89, iii. Sri Lanka 1990–99, iv. Sri Lanka 2000–06. HD: Hand line fisheries: i. Sri Lanka 1990–99, ii. Sri Lanka 2000–06. UN: Unclassified fisheries (mainly pole and line): i. Maldives 1990-99, ii. Maldives 2000–06

APPENDIX VC
MAIN STATISTICS FOR KAWAKAWA (*EUTHYNNUS AFFINIS*)

Extract from IOTC–2012–WPNT02–07

Kawakawa – Fisheries and catch trends

Kawakawa is caught mainly by coastal purse seines, gillnets and, to a lesser extent, handlines and trolling (Table 1; Fig. 2); and may be also 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] (Fig. 2).

TABLE 1. Best scientific estimates of the catches of kawakawa by type of fishery for the period 1950–2011 (in metric tonnes) (Data as of October 2012)

Fishery	By decade (average)						By year (last ten years)									
	1950s	1960s	1970s	1980s	1990s	2000s	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Purse seine	100	385	1,809	9,487	32,303	56,275	46,863	49,163	53,563	52,262	60,772	63,524	70,433	71,567	71,494	69,207
Gillnet	1,908	3,411	8,055	16,754	27,630	37,542	35,484	35,359	30,302	31,340	37,589	41,616	50,676	46,533	46,107	56,601
Line	1,423	2,007	4,414	8,449	11,590	11,054	10,018	8,882	9,757	9,893	10,453	11,462	15,357	15,041	13,749	15,093
Other	0	60	277	737	1,576	2,002	1,852	2,006	1,897	2,188	1,546	2,539	2,286	2,483	3,310	2,492
Total	**3,431**	**5,863**	**14,555**	**35,427**	**73,098**	**106,873**	**94,216**	**95,410**	**95,520**	**95,683**	**110,360**	**119,141**	**138,752**	**135,625**	**134,660**	**143,393**

The catches provided in Table 1 are based on the information available at the IOTC Secretariat and the following observations on the catches cannot currently be verified. Annual estimates of catches for the kawakawa increased markedly from around 10,000 t in the mid-1970's to reach the 50,000 t mark in the mid-1980's and 143,000 t in 2011, the highest catches ever recorded for this species. In recent years the majority of the catches of kawakawa have been taken in the East Indian Ocean.

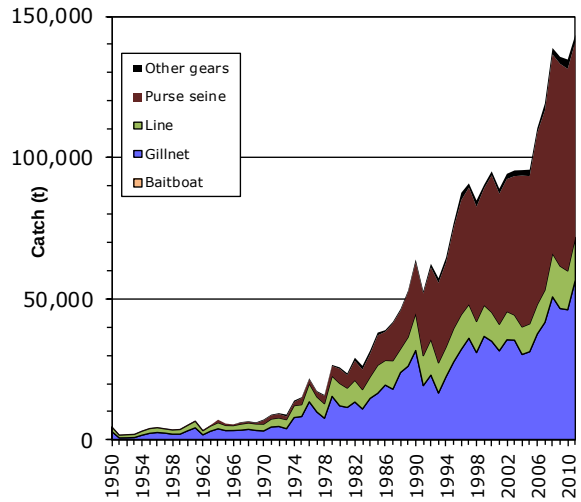


Fig. 1. Kawakawa: Annual catches of kawakawa by gear recorded in the IOTC database (1950–2011)

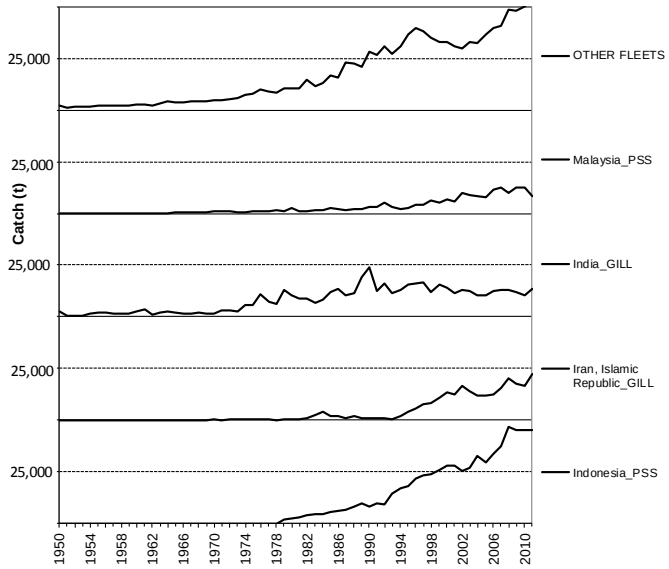


Fig. 2. Kawakawa: Catches of kawakawa recorded in the IOTC Database for main fishing fleets (1950–2011).

[7] The uncertainty in the catch estimates has been assessed by the IOTC 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.

In recent years, the countries attributed with the highest catches are Indonesia (38%), India (17%), Iran (14%), Malaysia (8%) and Thailand (6%) (Fig. 2).

Kawakawa – Uncertainty of catches

Retained catches are uncertain (Fig. 3), notably for the following fisheries:

- Artisanal fisheries of Indonesia: Indonesia did not report catches of kawakawa by species or by gear for 1950–2004; catches of kawakawa, longtail tuna and, to a lesser extent, other species were reported aggregated for this period. The IOTC Secretariat used the catches reported since 2005 to break the aggregates for 1950–2004 by gear and species. The catches of kawakawa estimated for this component represent around 38% of the total catches of this species in recent years.
- Artisanal fisheries of India: Although India reports catches of kawakawa they are not always reported by gear. The IOTC Secretariat has allocated the catches of kawakawa by gear for years in which this information was not available. The catches of kawakawa have represented 17% of the total catches of this species in the Indian Ocean in recent years.
- Artisanal fisheries of Myanmar (and Somalia): None of these countries have ever reported catches to the IOTC Secretariat. Catch levels are unknown.
- Other artisanal fisheries: The catches of kawakawa are usually not reported by species, being combined with catches of other small tuna species like skipjack tuna and frigate tuna (e.g. coastal purse seiners of Malaysia and Thailand).
- Industrial fisheries: The catches of kawakawa recorded for industrial purse seiners are thought to be a fraction of those retained on board. Due to this species being a bycatch, its catches are seldom recorded in the logbooks, nor are they monitored in port. The EU recently reported catch levels of frigate tuna for its purse seine fleet, for 2003–07, estimated using observer data.
- Discard levels are moderate for industrial purse seine fisheries. The EU recently reported discard levels of kawakawa for its purse seine fleet, for 2003–07, estimated using observer data.
- The catch series of kawakawa has not changed substantially since the WPNT meeting in 2011.

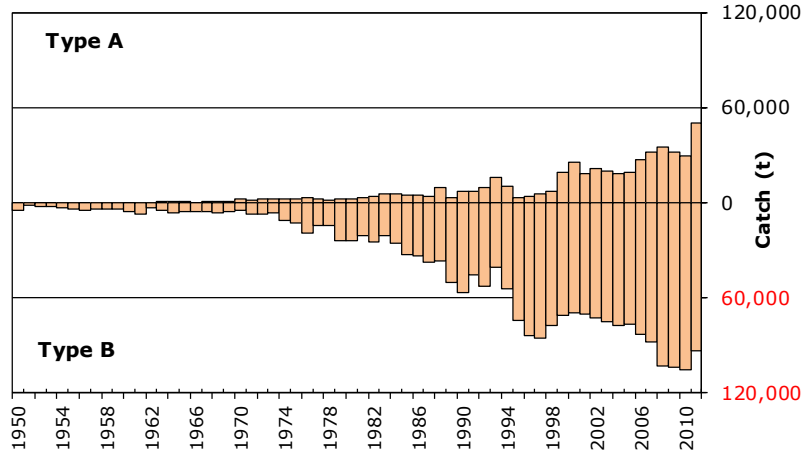


Fig. 3. Kawakawa: Uncertainty of annual catch estimates for kawakawa (1950–2011). Catches below the zero-line (Type B) refer to fleets that do not report catch data to the IOTC (estimated by the IOTC Secretariat), do not report catch data by gear and/or species (broken by gear and species by the IOTC Secretariat) or any of the other reasons provided in the document. Catches over the zero-line (Type A) refer to fleets for which no major inconsistencies have been found to exist. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets (Data as of October 2012)

Kawakawa – Effort trends

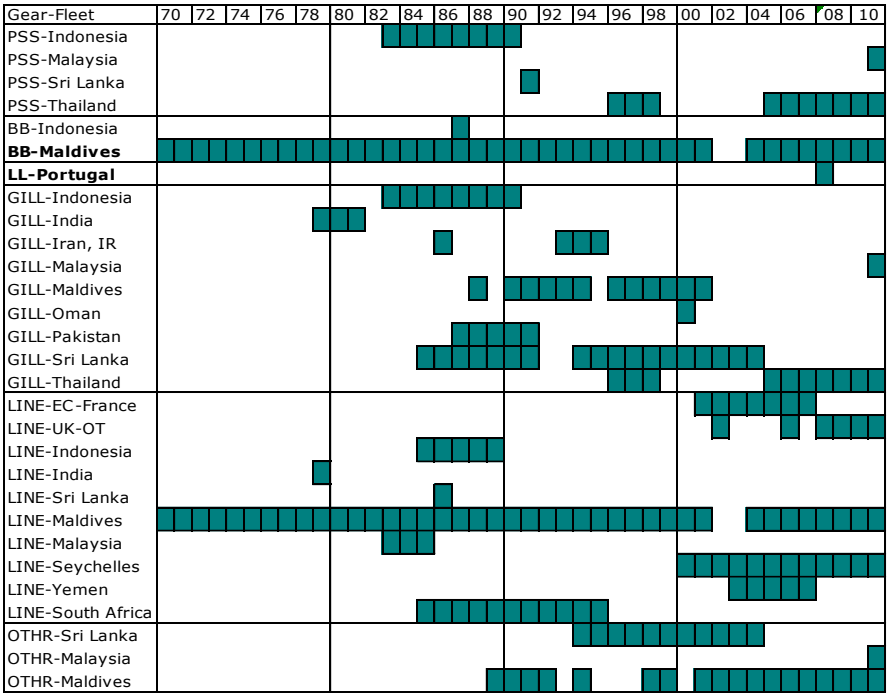
Effort trends are unknown for kawakawa in the Indian Ocean.

Kawakawa – Catch–per–unit–effort (CPUE) trends

Standardised CPUE series have not yet been developed. Catch-and-effort series are available from some fisheries but they are considered highly incomplete. In most cases catch-and-effort data are only available for short periods (Table 2). Reasonably long catch-and-effort data series (extending for more than 10 years) are only available for Maldives baitboats and troll lines and Sri Lanka gillnets (Fig. 4). The catch-and-effort data recorded for Sri Lankan

gillnets are, however, thought to be inaccurate due to the dramatic changes in CPUE recorded between consecutive years.

TABLE 2. Kawakawa: Availability of catches and effort series, by fishery and year (1970-2011)[8]. Note that no catch and effort data are available for the period 1950–69 in the IOTC Secretariat databases



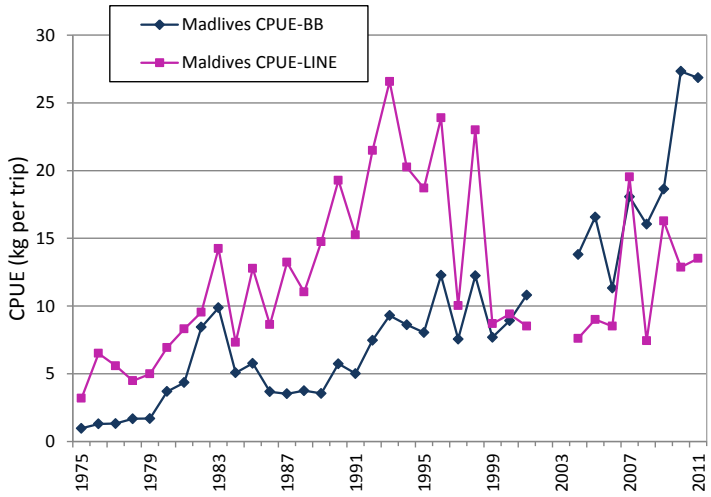


Fig. 4. Kawakawa: Nominal CPUE series for the baitboat (BB) and troll line (TROL) fisheries of Maldives (1975–2011) derived from the available catches and effort data

Kawakawa – Fish size or age trends (e.g. by length, weight, sex and/or maturity)

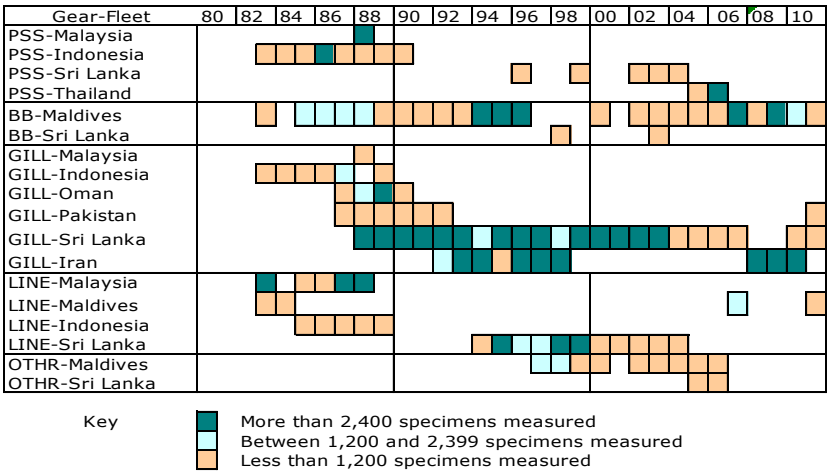
- The size of kawakawa taken by the Indian Ocean fisheries typically ranges between 20 and 60 cm depending on the type of gear used, season and location (Fig. 5). The coastal purse seine fisheries operating

[8] Note that the above list is not exhaustive, showing only the fisheries for which catches and effort are available in the IOTC database. Furthermore, when available catches and effort may not be available throughout the year existing only for short periods

in the Andaman Sea tend to catch kawakawa of small size (15–30 cm) while the gillnet, baitboat and other fisheries operating in the Indian Ocean catch usually larger specimens (25–55 cm).

- Trends in average weight can only be assessed for Sri Lankan gillnets but the amount of specimens measured has been very low in recent years (Table 3). The length frequency data available from the mid-eighties to the early nineties was obtained with the support of the IPTP (Indo-Pacific Tuna Programme). Unfortunately, data collection did not continue after the end of the IPTP activities.
- Catch-at-Sizeage) data are not available for the kawakawa due to the paucity of size data available from most fleets (Table 3) and the uncertain status of the catches for this species. Length distributions derived from the data available for some selected fisheries are shown in Fig. 56.
- Sex ratio data have not been provided to the IOTC Secretariat by CPCs.

TABLE 3. Kawakawa: Availability of length frequency data, by fishery and year (1980-2011)[9]. Note that no length frequency data are available for the period 1950–82



[9] Note that the above list is not exhaustive, showing only the fisheries for which size data are available in the IOTC database. Furthermore, when available size data may not be available throughout the year existing only for short periods

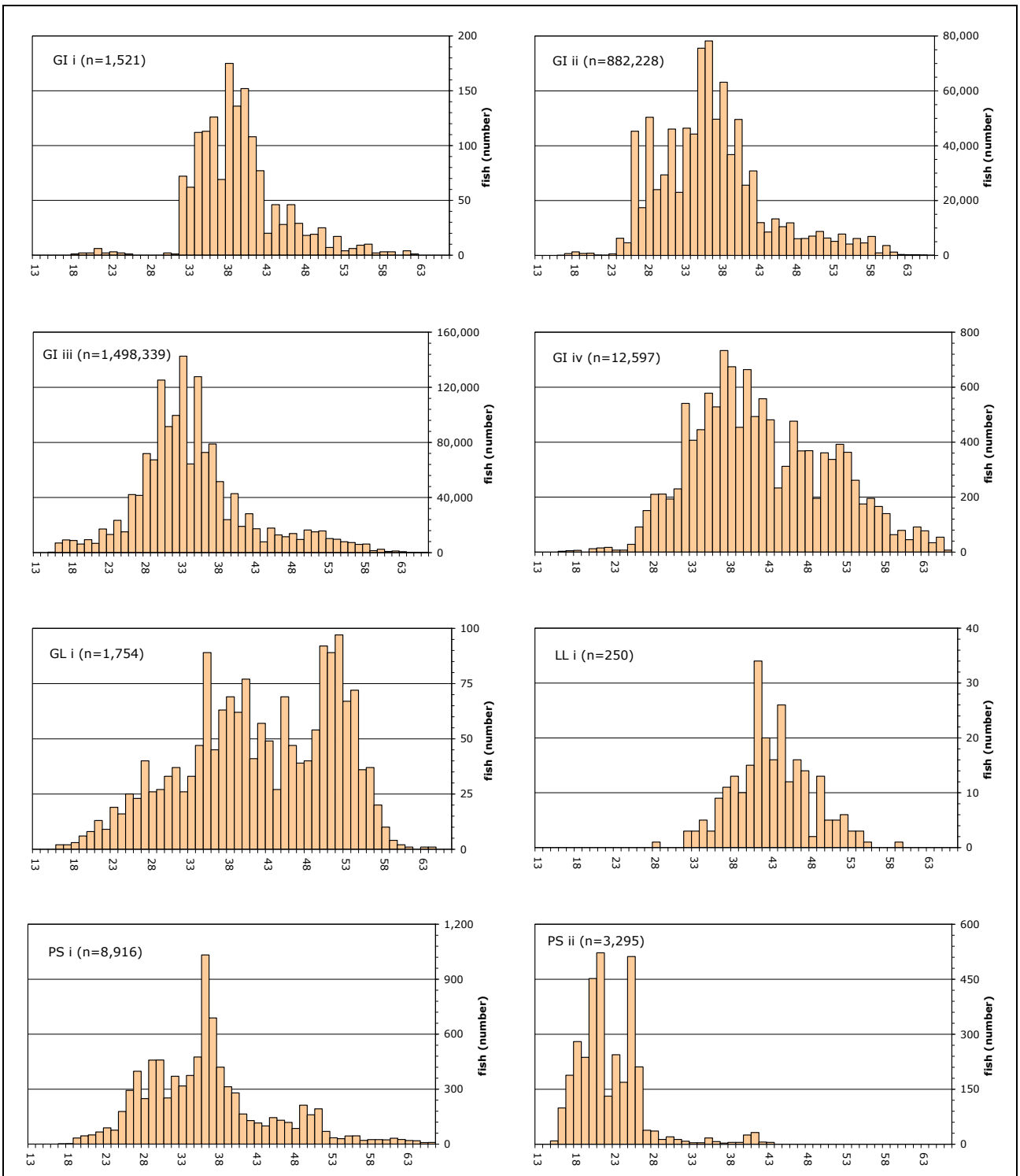


Fig. 5. Kawakawa: Length frequency distributions (total amount of fish measured by 1cm length class by decade) derived from the data available at the IOTC Secretariat for selected fisheries and periods. GI: Gillnet fisheries: i. Indonesia 1980–89, ii. Sri Lanka 1980–89, iii. Sri Lanka 1990–99, iv. Sri Lanka 2000–06. GL: Gillnet and longline combination: i. Sri Lanka 2000–06. LL: Coastal longline fisheries: i. Sri Lanka 1990–99. PS: Coastal purse seine fisheries: i. Indonesia 1980–89, ii. Malaysia 1980–89

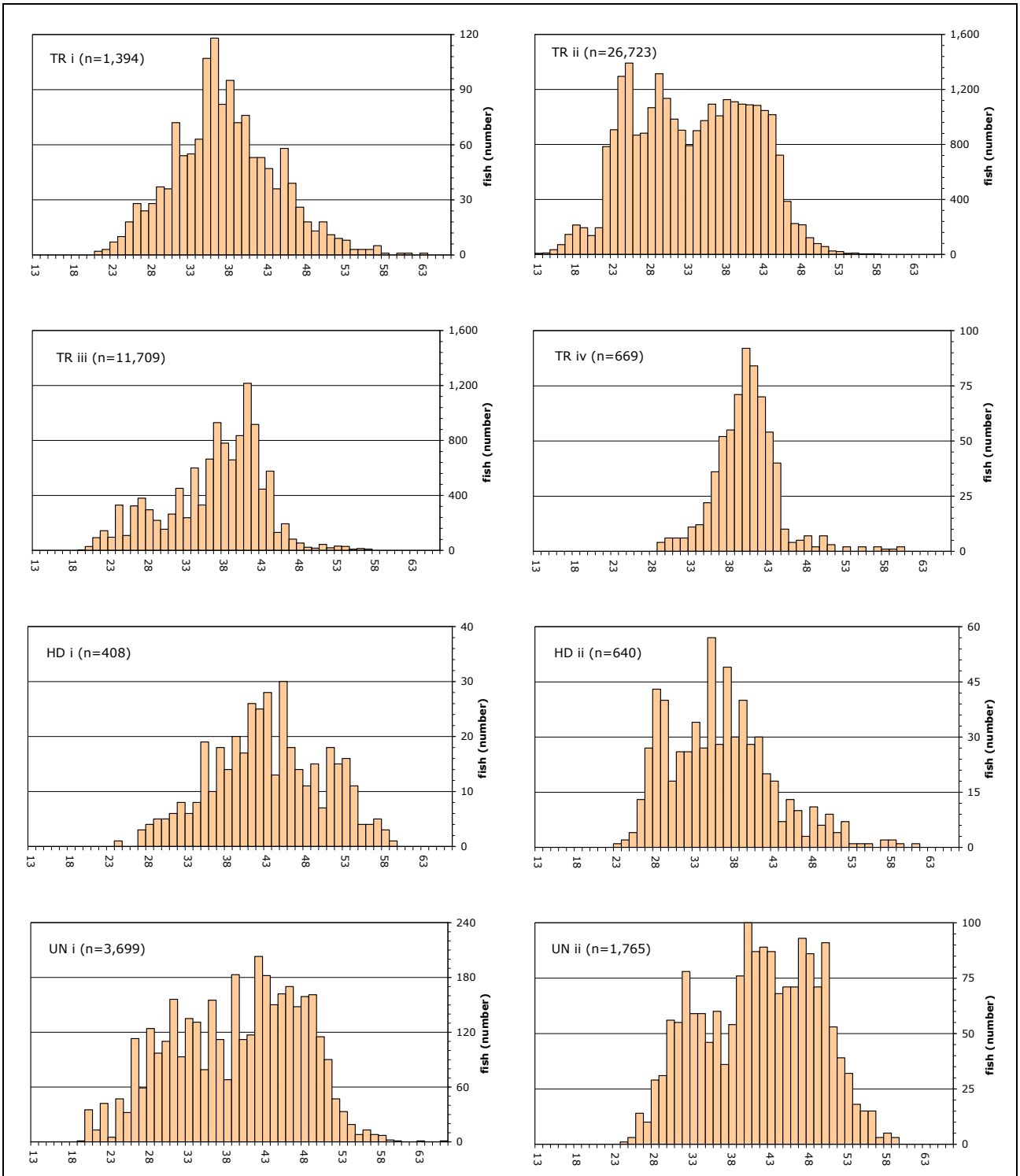


Fig. 5 (cont). Kawakawa: Length frequency distributions (total amount of fish measured by 1cm length class by decade) derived from the data available at the IOTC Secretariat for selected fisheries and periods. TR: Troll line fisheries: i. Indonesia 1980–89, ii. Malaysia 1980–89, iii. Sri Lanka 1990–99, iv. Sri Lanka 2000–06. HD: Hand line fisheries: i. Sri Lanka 1990–99, ii. Sri Lanka 2000–06. UN: Unclassified fisheries (mainly pole and line): i. Maldives 1990–99, ii. Maldives 2000–06

APPENDIX VD
MAIN STATISTICS FOR LONGTAIL TUNA (*THUNNUS TONGGOL*)

Extract from IOTC–2012–WPNT02–07

Longtail tuna – Fisheries and catch trends

Longtail tuna is caught mainly by using gillnets and to a lesser extent, seine nets and trolling (Table 1; Fig. 1). The catch estimates for longtail tuna were derived from small amounts of information and are therefore uncertain[10]. The catches provided in Table 1 are based on the information available at the IOTC Secretariat and the following observations on catches cannot currently be verified. Estimated catches of longtail tuna increased steadily from the mid 1950's to the year 2000 when over 100,000 t were landed. Catches then declined until 2005 (77,361 t). Since 2005, catch have increased continually with the highest catches ever recorded at around 180,000 t, landed in 2011.

In recent years (2009–11), the countries attributed with the highest catches of longtail tuna are Iran (42%) and Indonesia (29%) and, to a lesser extent, Oman, Pakistan, Malaysia, India and Thailand (25%) (Table 1; Fig. 2). In particular, Iran has reported large increases in the catch of longtail tuna since 2009. The increase in catches of longtail tuna coincides with a decrease in the catches of skipjack tuna and is thought to be the consequence of increased gillnet effort in coastal waters due to the threat of Somali piracy in the western tropical Indian Ocean.

TABLE 1. Longtail tuna: Best scientific estimates of the catches of longtail tuna by type of fishery for the period 1950–2011 (in metric tonnes) (Data as of October 2012)

Fishery	By decade (average)						By year (last ten years)									
	1950s	1960s	1970s	1980s	1990s	2000s	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Purse seine	44	204	999	4,388	8,195	13,379	15,348	13,369	11,223	9,333	13,107	17,552	14,215	16,404	15,483	23,972
Gillnet	2,960	6,751	11,225	30,740	50,398	74,182	63,255	69,692	62,421	57,765	68,953	74,632	87,204	105,659	127,015	144,094
Line	978	1,277	2,697	3,484	5,630	8,085	7,839	6,984	8,220	8,974	10,538	10,742	6,573	6,487	6,503	7,003
Other	290	489	1,054	2,164	2,500	1,802	1,710	1,603	1,665	1,290	1,338	1,890	2,090	1,804	2,306	2,726
Total	**4,272**	**8,722**	**15,975**	**40,776**	**66,724**	**97,448**	**88,153**	**91,647**	**83,529**	**77,361**	**93,935**	**104,815**	**110,082**	**130,354**	**151,307**	**177,795**

The size of longtail tuna taken by IOTC fisheries typically ranges between 15 and 120 cm depending on the type of gear used, season and location (Fig. 9). The fisheries operating in the Andaman Sea (coastal purse seines and troll lines) tend to catch longtail tuna of small size (15–55cm) while the gillnet fisheries operating in the Arabian Sea catch larger specimens (40–100cm).

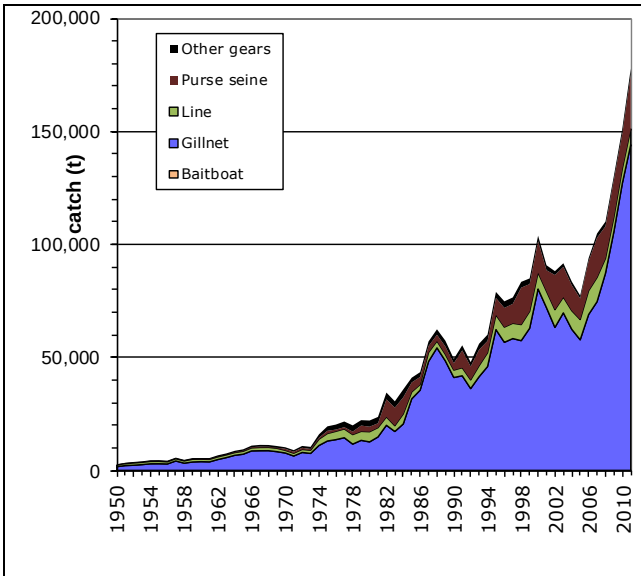


Fig. 1. Longtail tuna: Annual catches of longtail tuna by gear recorded in the IOTC Database (1950–2011)

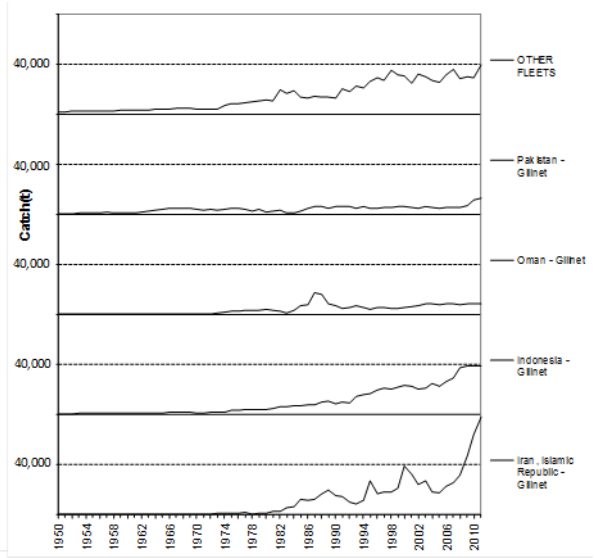


Fig. 2. Longtail tuna: Catches of longtail tuna recorded in the IOTC Database for main fishing fleets (1950–2011)

[10] The uncertainty in the catch estimates has been assessed by the IOTC 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 non-reporting fisheries for which catches had to be estimated.

Longtail tuna: uncertainty of catches

Retained catches are uncertain (Fig. 3), notably for the following fisheries:

- Artisanal fisheries of Indonesia: Indonesia did not report catches of longtail tuna by species or by gear for 1950–2004; catches of longtail tuna, kawakawa and other species were reported aggregated for this period. The IOTC Secretariat used the catches reported since 2005 to break the aggregates for 1950–2004 by gear and species. The catches estimated for the longtail tuna represent around 30% of the total catches of this species in the Indian Ocean in recent years.
- Artisanal fisheries of India and Oman: Although these countries report catches of longtail tuna, until recently the catches have not been reported by gear. The IOTC Secretariat used alternative information to assigning the catches reported by species. The catches of longtail tuna that had to be allocated by gear represented 9% of the total catches of this species in recent years.
- Artisanal fisheries of Mozambique, Myanmar (and Somalia): None of these countries have ever reported catches of longtail tuna to the IOTC Secretariat. Catch levels are unknown but are not considered substantial.
- Other artisanal fisheries: The IOTC Secretariat had to estimate catches of longtail tuna for the artisanal fisheries of Yemen (no data reported to the IOTC Secretariat) and Malaysia (catches not reported by species). The catches estimated for the longtail tuna represent 8% of the total catches of this species in recent years.
- Discard levels are believed to be very low although they are unknown for most fisheries.
- Changes to the catch series: There have not been significant changes to the catches of longtail tuna since the WPNT meeting in 2011.

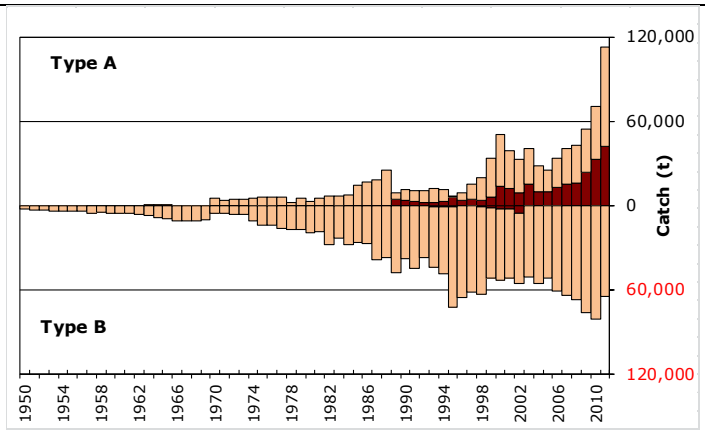


Fig. 3. Uncertainty of annual catch estimates for longtail tuna (1950–2011). Catches below the zero-line (Type B) refer to fleets that do not report catch data to the IOTC (estimated by the IOTC Secretariat), do not report catch data by gear and/or species (broken by gear and species by the IOTC Secretariat) or any of the other reasons provided in the document. Catches over the zero-line (Type A) refer to fleets for which no major inconsistencies have been found to exist. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets (Data as of October 2012)

Longtail tuna – Effort trends

Effort trends are unknown for longtail tuna in the Indian Ocean.

Longtail tuna – Catch–per–unit–effort (CPUE) trends

Standardised CPUE series have not yet been developed. Nominal CPUE series are however available from some fisheries but they are considered highly incomplete (Table 2). In most cases catch-and-effort data are only available for short periods of time. Reasonably long catch and effort series (extending for more than 10 years) are only available for Thailand small purse seines and gillnets (Fig. 4). No catch and effort data are available from sports fisheries, other than for partial data from the sports fisheries of Kenya.

TABLE 2. Longtail tuna: Availability of catches and effort series, by fishery and year (1970–2011)[11]. Note that no catch and effort data are available for the period 1950–1971 in the IOTC Secretariat databases

Gear-Fleet	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	00	02	04	06	08	10
PSS-Indonesia																					
PSS-Malaysia																					
PSS-Thailand																					
PS-Iran, IR																					
PS-Seychelles																					
PS-NEI																					
GILL-India																					
GILL-Indonesia																					
GILL-Iran, IR																					
GILL-Malaysia																					
GILL-Oman																					
GILL-Pakistan																					
GILL-Thailand																					
LINE-Australia																					
LINE-Indonesia																					
LINE-Malaysia																					
LINE-Yemen																					
OTHR-Australia																					
OTHR-Malaysia																					

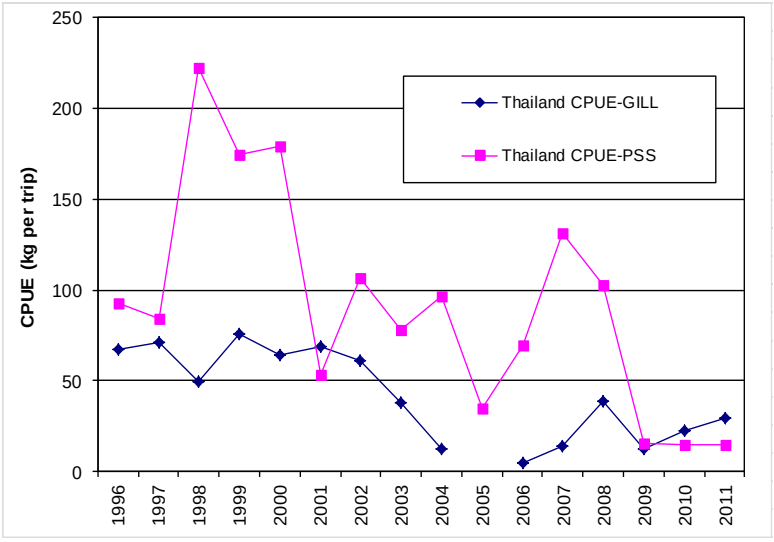


Fig. 4. Longtail tuna: Nominal CPUE series for the gillnet (GILL) and coastal purse seine (PSS) fisheries of Thailand derived from the available catches and effort data (1996–2011)

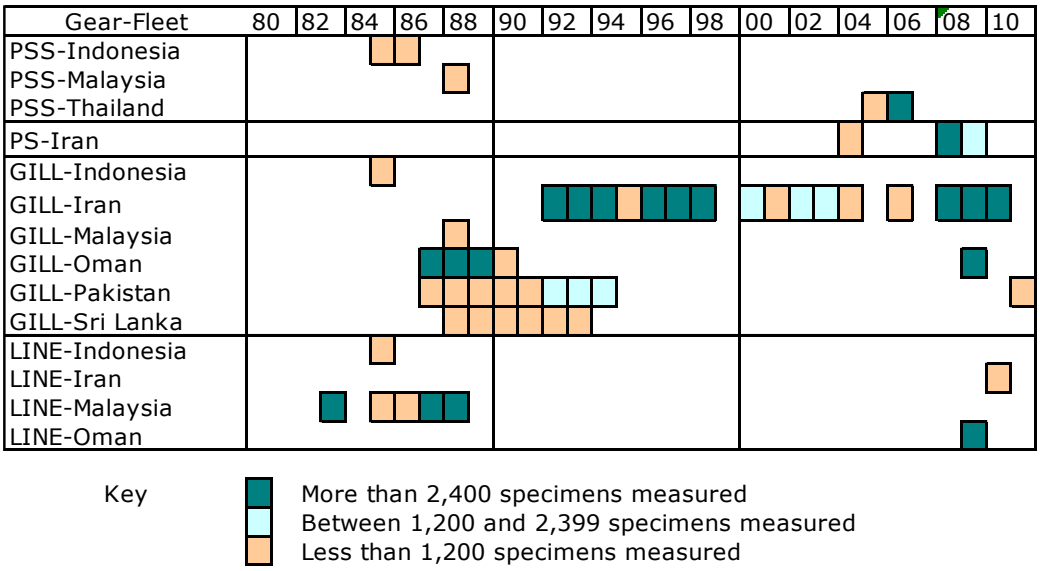
Longtail tuna – Fish size or age trends (e.g. by length, weight, sex and/or maturity)

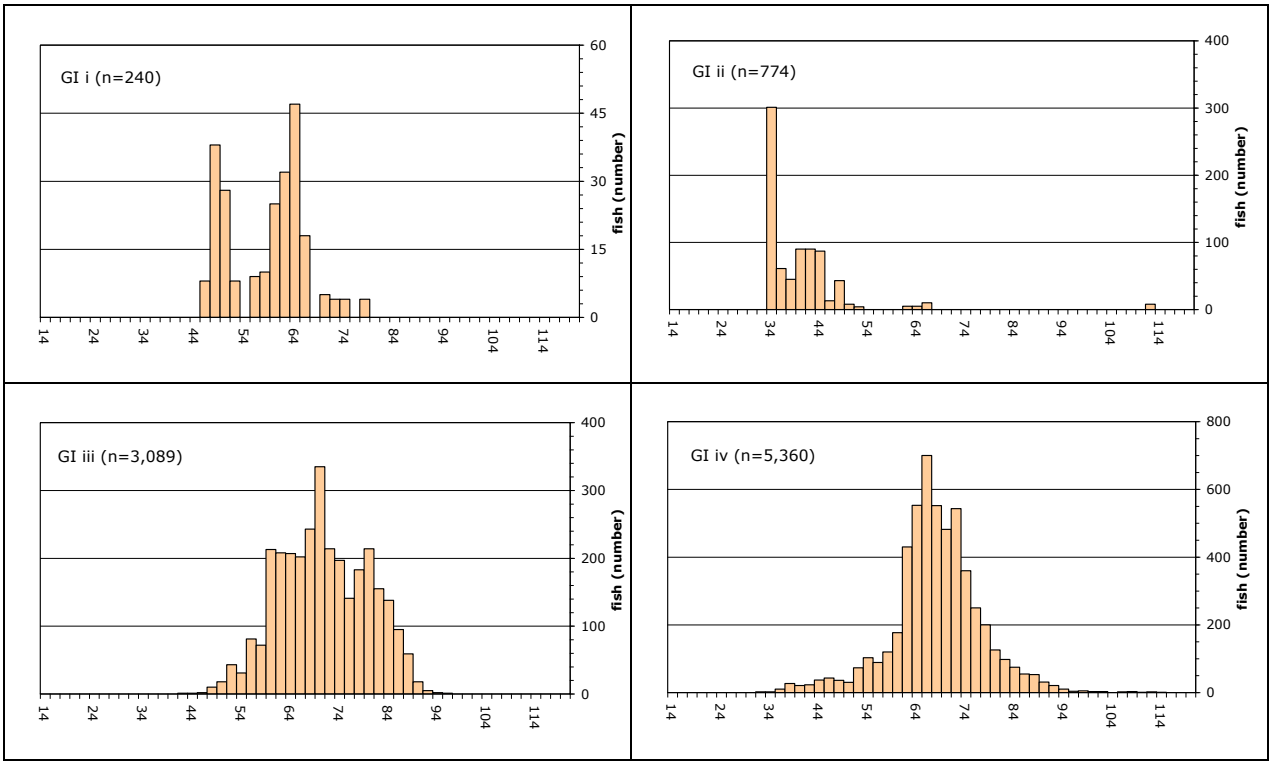
- The size of longtail tuna taken by the Indian Ocean fisheries typically ranges between 15–120 cm depending on the type of gear used, season and location. The fisheries operating in the Andaman Sea (coastal purse seines and troll lines) tend to catch longtail tuna of small size (15–55cm) while the drifting gillnet fisheries operating in the Arabian Sea catch larger specimens (40–100cm).
- Trends in average weight can only be assessed for I.R. Iran drifting gillnets but the amount of specimens measured has been very low in recent years (Table 3). The length frequency data available from the mid-eighties to the early nineties was obtained with the support of the IPTP (Indo-Pacific Tuna Programme). Unfortunately, data collection did not continue after the end of the IPTP activities.

[11] Note that the above list is not exhaustive, showing only the fisheries for which catches and effort are available in the IOTC database. Furthermore, catch-and-effort data are sometimes incomplete for a given year, existing only for short periods.

- Catch-at-Size(Age) tables are not available for the longtail tuna due to the paucity of size data available from most fleets and the uncertain status of the catches for this species. Length distributions derived from the data available for some selected fisheries are shown in Fig. 5.
- Sex ratio data have not been provided to the Secretariat by CPCs.
- Trends in average weight can only be assessed for Iranian gillnets but the amount of specimens measured has been very low in recent years (Table 3). The length frequency data available from the mid-eighties to the early nineties was obtained with the support of the IPTP (Indo-Pacific Tuna Programme). Unfortunately, data collection did not continue after the end of the IPTP activities.

TABLE 3. Longtail tuna: Availability of length frequency data, by fishery and year (1980–2011)[12]. Note that no catch and effort data are available for the period 1950–1982 in the IOTC Secretariat databases





[12] Note that the above list is not exhaustive, showing only the fisheries for which size data are available in the IOTC database. Furthermore, when available size data may not be available throughout the year existing only for short periods

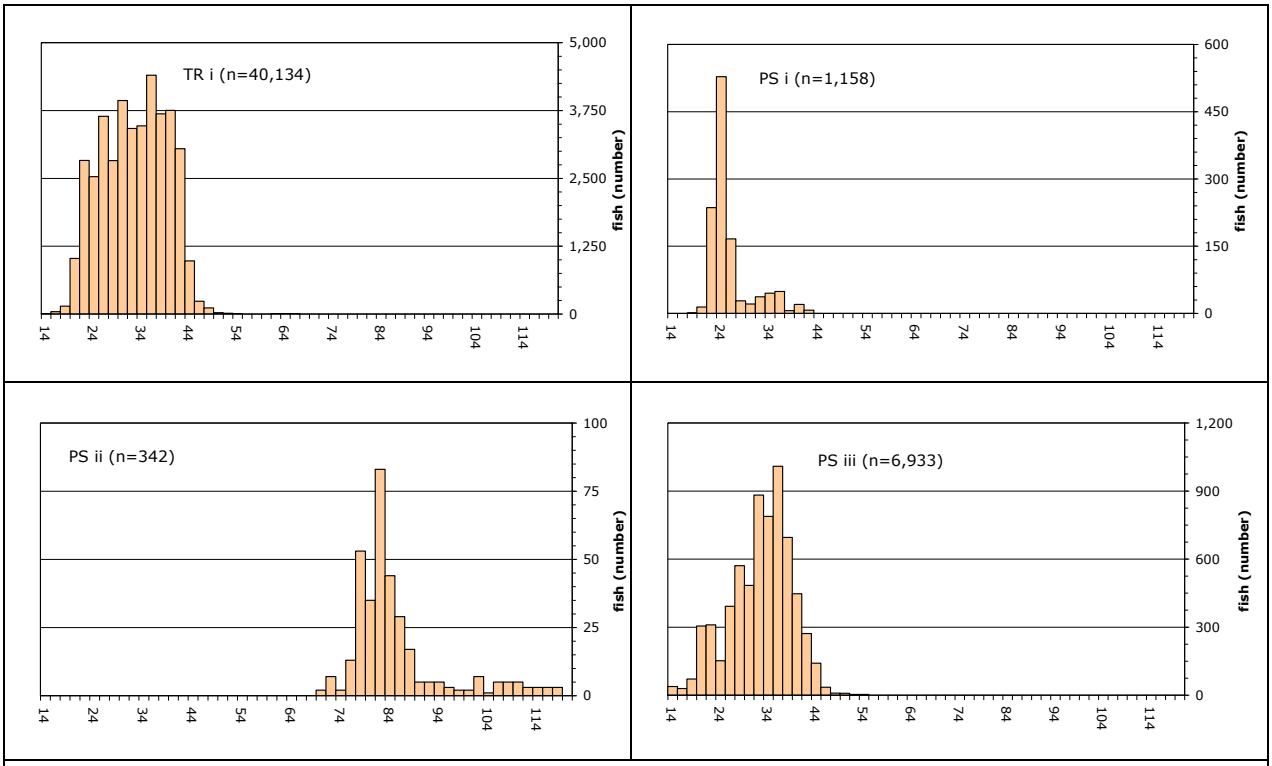


Fig. 5. Longtail tuna: Length frequency distributions (total amount of fish measured by 2 cm length class by decade) derived from the data available at the IOTC Secretariat for selected fisheries and periods. GI: Gillnet fisheries: i. Sri Lanka 1980–89, ii. Sri Lanka 1990–99, iii. Pakistan 1990–99, iv. Iran 2000–06. TR: Troll line fisheries: i. Malaysia 1980–89. PS: Coastal purse seine fisheries: i. Malaysia 1980–89, ii. Iran 2000–06, iii. Thailand 2000–06

APPENDIX VE
MAIN STATISTICS FOR INDO-PACIFIC KING MACKEREL (*SCOMBEROMORUS GUTTATUS*)

Extract from IOTC–2012–WPNT02–07

Indo-Pacific king mackerel – Fisheries and catch trends

The Indo-Pacific king mackerel[13] is mostly caught by gillnet fisheries in the Indian Ocean but significant numbers are also caught trolling (Table 1; Fig. 1). The catch estimates for Indo-Pacific king mackerel were derived from very small amounts of information and are therefore highly uncertain[14] (Fig. 1).

TABLE 1. Indo-Pacific king mackerel: Best scientific estimates of the catches of Indo-Pacific king mackerel by type of fishery for the period 1950–2011 (in metric tonnes) (Data as of October 2012)

Fishery	By decade (average)						By year (last ten years)									
	1950s	1960s	1970s	1980s	1990s	2000s	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Purse seine	0	0	48	239	493	294	286	352	222	229	296	263	269	526	513	541
Gillnet	2,315	3,562	7,354	12,764	20,446	20,702	20,169	19,958	19,222	17,129	22,112	22,259	24,622	23,343	22,799	26,194
Line	455	585	1,330	2,017	2,512	5,189	3,132	3,743	4,529	4,829	6,364	7,033	8,220	9,494	9,306	9,740
Other	1,193	1,657	3,641	5,324	8,460	9,537	9,019	8,877	8,294	8,871	10,639	9,907	10,017	12,513	11,370	13,357
Total	**3,963**	**5,805**	**12,372**	**20,344**	**31,911**	**35,721**	**32,606**	**32,929**	**32,268**	**31,058**	**39,411**	**39,462**	**43,128**	**45,876**	**43,988**	**49,832**

The catches provided in Table 1 are based on the information available at the IOTC 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 25,000 t since the mid-1990's. Catches increased steadily since then until 1995, in which catches around 43,000 t were recorded. The catches of Indo-Pacific king mackerel between 1997 and 2005 were more or less stable, estimated at around 30,000 t. Current catches have been higher, close to 45,000 t. The highest catches were recorded in 2011, at around 50,000 t.

In recent years, the countries attributed with the highest catches are India (38%) and Indonesia (34%) and, to a lesser extent, Myanmar and Iran (17%) (Fig. 2).

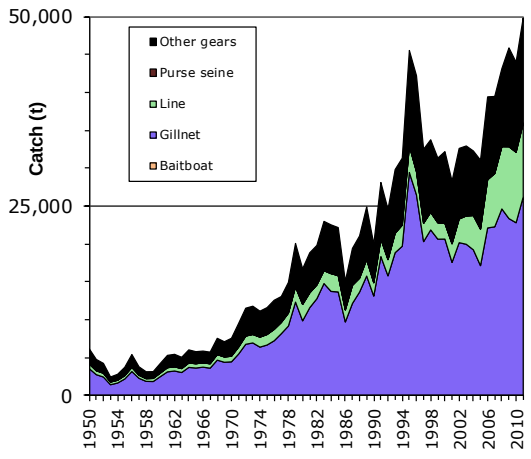


Fig. 1. Indo-Pacific king mackerel: Annual catches of Indo-Pacific king mackerel by gear recorded in the IOTC database (1950–2011)

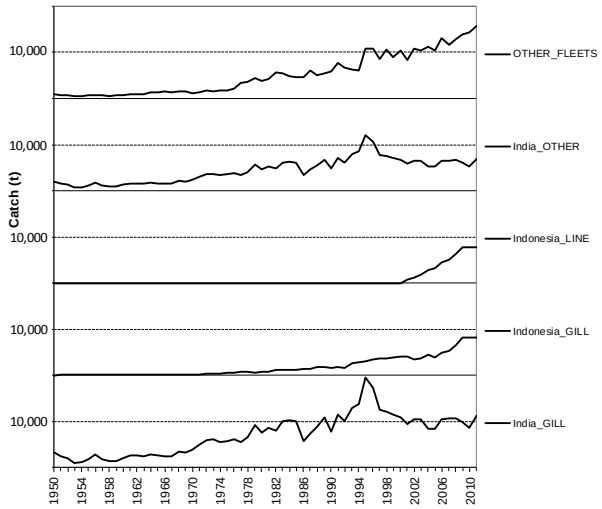


Fig. 2. Indo-Pacific king mackerel: Catches of Indo-Pacific king mackerel recorded in the IOTC database for main fishing fleets (1950–2011)

[13] Hereinafter referred to as King mackerel

[14] 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.

Indo-Pacific king mackerel – Uncertainty of catches

Retained catches are highly uncertain (Fig. 3) for all fisheries due to:

- Aggregation: Indo-Pacific king mackerels are usually not reported by species being aggregated with narrow-barred Spanish mackerel or, less frequently, other small tuna species.
- Mislabelling: Indo-Pacific king mackerels are usually mislabelled as narrow-barred Spanish mackerel, their catches reported under the latter species.
- Underreporting: the catches of Indo-Pacific king mackerel may be not reported for some fisheries catching them as a bycatch.
- It is for the above reasons that the catches of Indo-Pacific king mackerel in the IOTC database are thought to represent only a small fraction of the total catches of this species in the Indian Ocean.
- Discard levels are believed to be low although they are unknown for most fisheries.
- Changes to the catch series: There have not been significant changes to the catches of Indo-Pacific king mackerel since the WPNT in 2011.

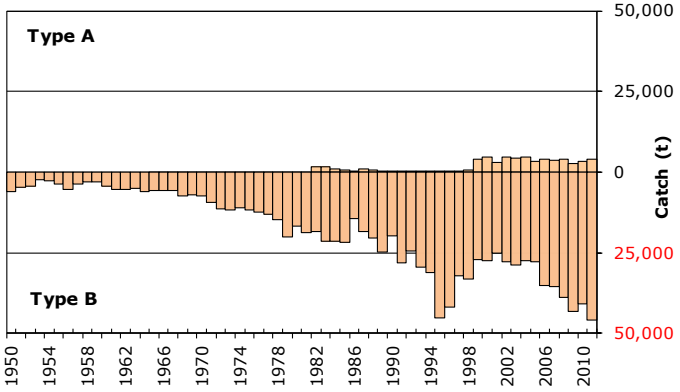


Fig. 3. Indo-Pacific king mackerel: Uncertainty of annual catch estimates for Indo-Pacific king mackerel (1950–2011). Catches below the zero-line (Type B) refer to fleets that do not report catch data to the IOTC (estimated by the IOTC Secretariat), do not report catch data by gear and/or species (broken by gear and species by the IOTC Secretariat) or any of the other reasons provided in the document. Catches over the zero-line (Type A) refer to fleets for which no major inconsistencies have been found to exist. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets (Data as of October 2012)

Indo-Pacific king mackerel – Effort trends

Effort trends are unknown for Indo-Pacific King mackerel in the Indian Ocean.

Indo-Pacific king mackerel – Catch–per–unit–effort (CPUE) trends

Standardised CPUE series have not yet been developed. Nominal CPUE series are however available from some fisheries but they are considered highly incomplete. In most cases catch-and-effort data are only available for short periods of time. This makes it impossible to derive any meaningful CPUE from the existing data (Table 2). This makes it impossible to derive any meaningful CPUE from the existing data.

TABLE 2. Indo-Pacific king mackerel: Availability of catches and effort series, by fishery and year (1970–2011)[15]. Note that no catches and effort are available for the period 1950–85 at the IOTC Secertariat

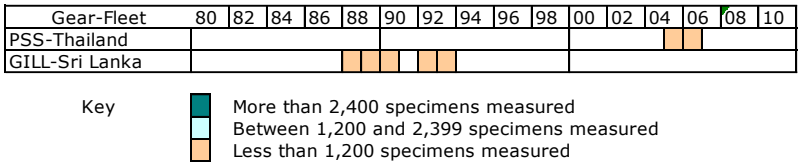
Gear-Fleet	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	00	02	04	06	08	10
PSS-Indonesia																					
LINE-South Africa																					
LINE-Yemen																					

[15] Note that the above list is not exhaustive, showing only the fisheries for which catches and effort are available in the IOTC database. Furthermore, when available catches and effort may not be available throughout the year existing only for short periods

Indo-Pacific king mackerel – Fish size or age trends (e.g. by length, weight, sex and/or maturity)

- Trends in average weight cannot be assessed for most fisheries. Samples of Indo-Pacific king mackerel are only available for the coastal purse seiners of Thailand and gillnets of Sri Lanka but they refer to very short periods and the numbers sampled are very small (Table 3).
- Catch-at-Size(age) data are not available for the Indo-Pacific king mackerel due to the paucity of size data available from most fleets and the uncertain status of the catches for this species.
- Sex ratio data have not been provided to the Secretariat by CPCs.

TABLE 3. Indo-Pacific king mackerel: Availability of length frequency data, by fishery and year (1980–2011)[16]. Note that no length frequency data are available at all for 1950–82



[16] Note that the above list is not exhaustive, showing only the fisheries for which size data are available in the IOTC database. Furthermore, when available size data may not be available throughout the year existing only for short periods

APPENDIX VF
MAIN STATISTICS FOR NARROW-BARRED SPANISH MACKEREL (*SCOMBEROMORUS COMMERSON*)

Extract from IOTC–2012–WPNT02–07

Narrow-barred Spanish mackerel – Fisheries and catch trends

Narrow-barred Spanish mackerel is targeted throughout the Indian Ocean by artisanal and recreational fishers. The main method of capture is gillnet, but significant numbers of are also caught trolling (Table 1; Fig. 1).

TABLE 1. Narrow-barred Spanish mackerel: Best scientific estimates of the catches of narrow-barred Spanish mackerel by type of fishery for the period 1950–2011 (in metric tonnes) (Data as of October 2012)

Fishery	By decade (average)						By year (last ten years)									
	1950s	1960s	1970s	1980s	1990s	2000s	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Purse seine	0	0	237	1,137	2,633	2,252	1,953	2,350	1,610	2,136	3,950	1,902	1,969	3,275	4,126	3,781
Gillnet	7,161	15,163	26,820	57,670	73,907	80,768	73,513	77,674	75,970	67,372	78,848	84,687	97,639	91,822	98,972	107,815
Line	2,806	4,027	7,722	11,558	11,894	13,019	12,127	13,339	11,764	12,464	13,442	12,574	14,211	14,188	13,815	14,495
Other	1,368	2,011	4,257	6,630	11,340	15,379	15,646	14,856	13,245	13,792	16,549	15,851	16,015	18,521	16,631	20,090
Total	**11,336**	**21,201**	**39,036**	**76,996**	**99,774**	**111,418**	**103,239**	**108,220**	**102,587**	**95,764**	**112,789**	**115,014**	**129,834**	**127,806**	**133,544**	**146,180**

The catch estimates for narrow-barred Spanish mackerel were derived from very small amounts of information and are therefore highly uncertain[17]. The catches provided in Table 1 are based on the information available at the IOTC Secretariat and the following observations on the catches cannot currently be verified. The catches of narrow-barred Spanish mackerel increased from around 50,000 t the mid-1970's to over 100,000 t by the mid-1990's. The highest catches of narrow-barred Spanish mackerel were recorded in 2011, amounting to 146,000 t. Narrow-barred Spanish mackerel is caught in both Indian Ocean basins, with higher catches recorded in the west.

In recent years, the countries attributed with the highest catches of narrow-barred Spanish mackerel are Indonesia (27%) and India (25%) and, to a lesser extent, Iran, Myanmar, Pakistan, and the UAE (25%) (Fig. 2).

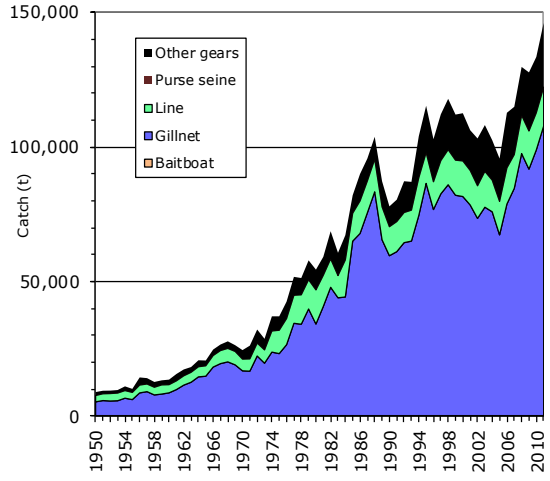


Fig. 1. Narrow-barred Spanish mackerel: Annual catches of narrow-barred Spanish mackerel by gear recorded in the IOTC database (1950–2011)

Fig. 2. Narrow-barred Spanish mackerel: Catches of narrow-barred Spanish mackerel recorded in the IOTC database for main fishing fleets (1950–2011)

[17] 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

Narrow-barred Spanish mackerel – uncertainty of catches

Retained catches are uncertain (Fig. 3), notably for the following fisheries:

- Artisanal fisheries of India and Indonesia: India and Indonesia have only recently reported catches of narrow-barred Spanish mackerel by gear, including catches by gear for the years 2005–08 and 2007–08, respectively. In both cases, the IOTC Secretariat used the catches reported by gear to break previous catches of this species by gear. The catches of narrow-barred Spanish mackerel estimated for this component represent more than 52% of the total catches of this species in recent years.
- Artisanal fisheries of Madagascar: To date, Madagascar has not reported catches of narrow-barred Spanish mackerel to the IOTC. During 2010 the IOTC Secretariat conducted a review aiming to break the catches recorded in the FAO database as narrow-barred Spanish mackerel by species, on the assumption that all catches of nertitic tunas had been combined under this name. The new catches estimated are thought to be very uncertain.
- Artisanal fisheries of Mozambique (and Somalia): None of these countries have ever reported catches of narrow-barred Spanish mackerel to the IOTC Secretariat. Catch levels are unknown.
- Other artisanal fisheries: Oman and the UAE do not report catches of narrow-barred Spanish mackerel by gear. Although most of the catches are believed to be taken by gillnets, some narrow-barred Spanish mackerel may be also caught by using small surrounding nets, lines or other artisanal gears. Thailand and Malaysia report catches of narrow-barred Spanish mackerel and Indo-Pacific king mackerel aggregated.
- All fisheries: In some cases the catches of seerfish species are mislabelled, the catches of Indo-Pacific king mackerel and, to a lesser extent, other seerfish species, labelled as Spanish mackerel. Similarly, the catches of wahoo in some longline fisheries are thought to be mislabelled as narrow-barred Spanish mackerel. This mislabelling is thought to have little impact in the case of the narrow-barred Spanish mackerel but may be important for other seerfish species.
- Discard levels are believed to be low although they are unknown for most fisheries.
- Changes to the catch series: The catch series of narrow-barred Spanish mackerel has not changed substantially since the WPNT meeting in 2011.

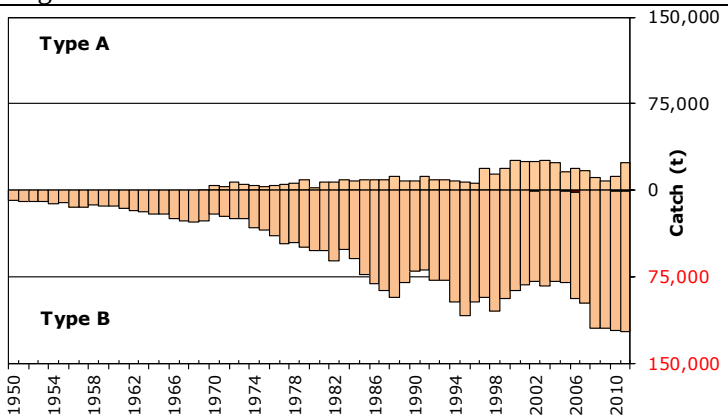


Fig. 3. Narrow-barred Spanish mackerel: Uncertainty of annual catch estimates for narrow-barred Spanish mackerel (1950–2011). Catches below the zero-line (Type B) refer to fleets that do not report catch data to the IOTC (estimated by the IOTC Secretariat), do not report catch data by gear and/or species (broken by gear and species by the IOTC Secretariat) or any of the other reasons provided in the document. Catches over the zero-line (Type A) refer to fleets for which no major inconsistencies have been found to exist. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets (Data as of October 2012)

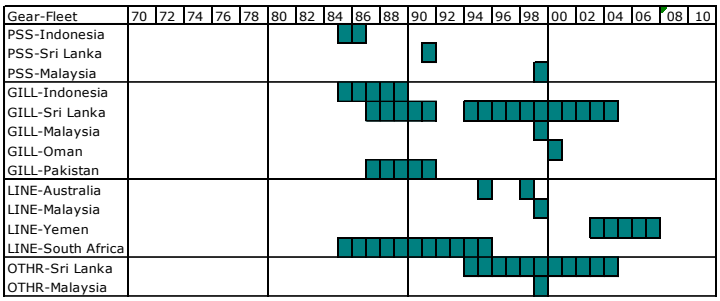
Narrow-barred Spanish mackerel – Effort trends

Effort trends are unknown for narrow-barred Spanish mackerel in the Indian Ocean.

Narrow-barred Spanish mackerel – Catch–per–unit–effort (CPUE) trends

Standardised CPUE series have not yet been developed. Nominal CPUE series are available from some fisheries but they are considered highly incomplete (Table 2). In most cases catch-and-effort data are only available for short periods. Reasonably long catch-and-effort data series (extending for more than 10 years) are only available for Sri Lanka gillnets (Fig. 4). The catches and effort recorded are, however, thought to be unrealistic due to the dramatic changes in CPUE recorded in 2003 and 2004.

TABLE 2. Narrow-barred Spanish mackerel: Availability of catches and effort series, by fishery and year (1970–2011)[18]. Note that no catches and effort are available for the period 1950–84 and 2008–11



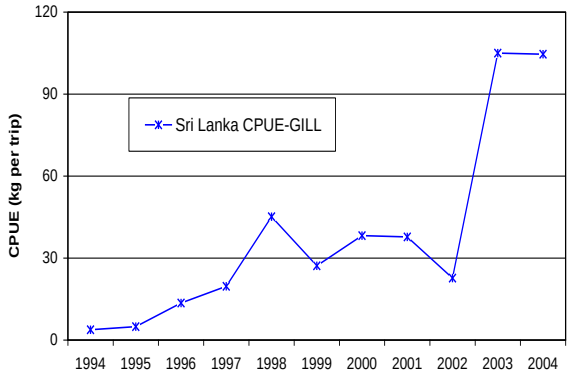
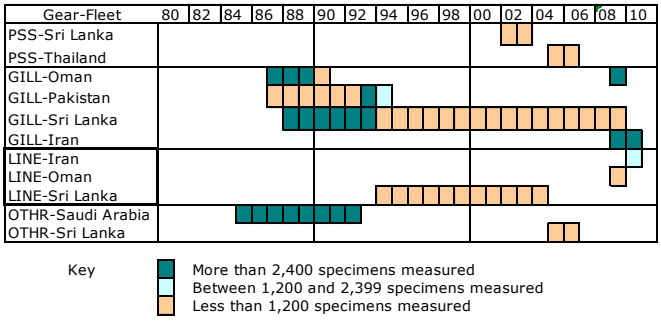


Fig. 4. Narrow-barred Spanish mackerel: Nominal CPUE series for the gillnet fishery of Sri Lanka derived from the available catches and effort data (1994–2004)

Narrow-barred Spanish mackerel – Fish size or age trends (e.g. by length, weight, sex and/or maturity)

- The size of narrow-barred Spanish mackerel taken by the Indian Ocean fisheries typically ranges between 30 and 140 cm depending on the type of gear used, season and location (Fig. 5). The size of narrow-barred 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, narrow-barred Spanish mackerel caught in the Oman Sea are typically larger than those caught in the Persian Gulf.
- Trends in average weight can only be assessed for Sri Lankan gillnets (Fig. 5) but the amount of specimens measured has been very low in recent years. The length frequency data available from the mid-eighties to the early nineties was obtained with the support of the IPTP (Indo-Pacific Tuna Programme). Unfortunately, data collection did not continue after the IPTP activities came to an end.
- Catch-at-Size(age) data are not available for the narrow-barred Spanish mackerel due to the paucity of size data available from most fleets (Table 3) and the uncertain status of the catches for this species. Length distributions derived from the data available for some selected fisheries are shown in Fig. 5.
- Sex ratio data have not been provided to the Secretariat by CPCs.

TABLE 3. Narrow-barred Spanish mackerel: Availability of length frequency data, by fishery and year (1980–2011). Note that no length frequency data are available for the period 1950–84



[18] Note that the above list is not exhaustive, showing only the fisheries for which catches and effort are available in the IOTC database. Furthermore, when available catches and effort may not be available throughout the year existing only for short periods

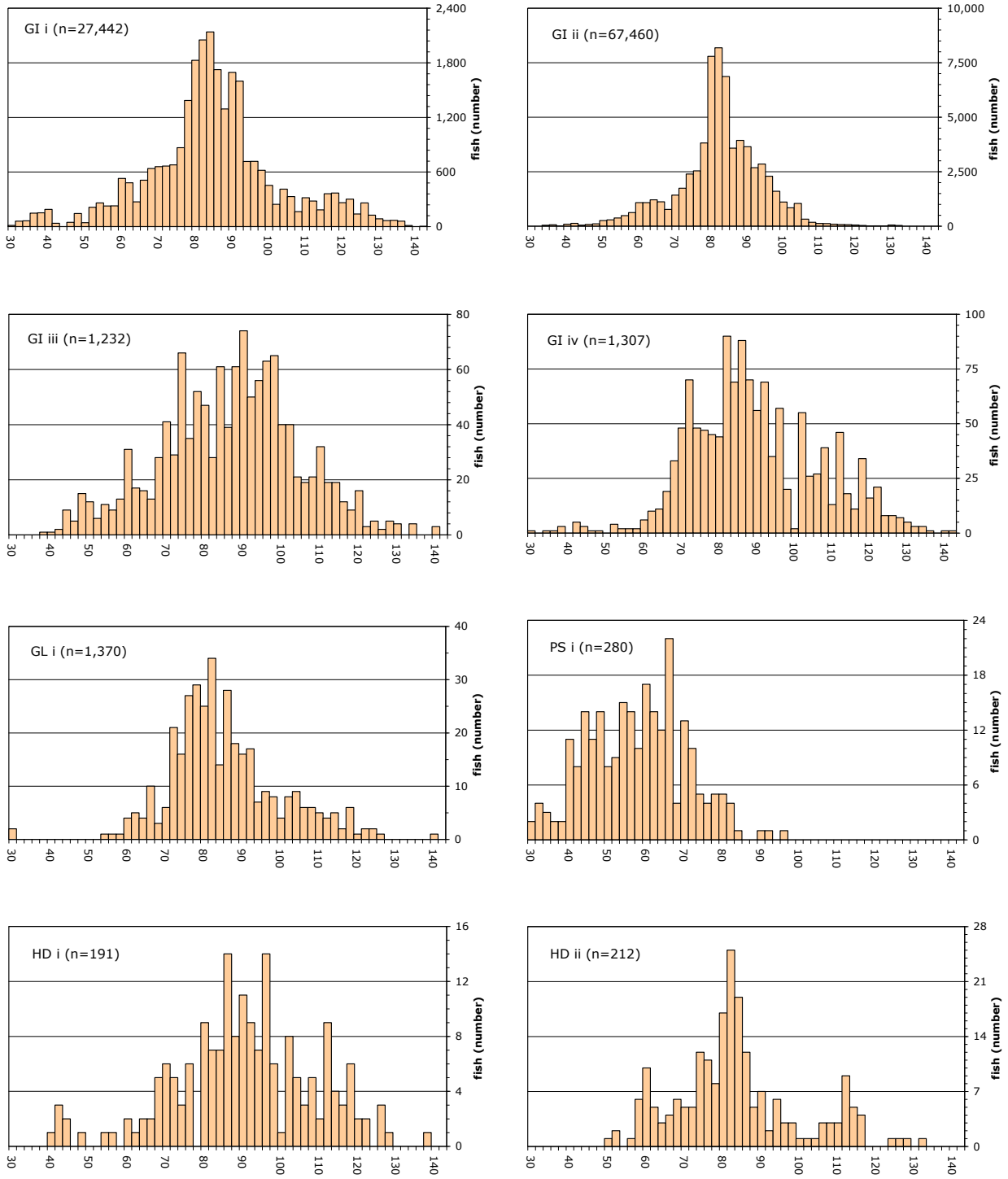


Fig. 5. Narrow-barred Spanish mackerel: Length frequency distributions (total amount of fish measured by 2cm length class by decade) derived from the data available at the IOTC Secretariat for selected fisheries and periods. GI: Gillnet fisheries: i. Sri Lanka 1980-89, ii. Sri Lanka 1990–99, iii. Pakistan 1990–99, iv. Sri Lanka 2000–06. GL: Gillnet and longline combination: i. Sri Lanka 2000–06. PS: Coastal purse seine fisheries: i. Thailand 2000–06. HD: Hand line fisheries: i. Sri Lanka 1990–99, ii. Sri Lanka 2000–06

APPENDIX VI
MAIN ISSUES IDENTIFIED RELATING TO THE STATISTICS OF NERITIC TUNAS

Extract from IOTC–2012–WPNT02–07

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

1. Catch-and-Effort data from Coastal Fisheries:

- **Coastal** fisheries of **Yemen, Madagascar, Mozambique,** and **Myanmar**: The catches of neritic tunas for these fisheries have been estimated by the IOTC Secretariat in recent years. The quality of the estimates is thought to be poor due to the paucity of the information available about the fisheries operating in these countries.
- **Coastal** fisheries of **Sri Lanka, Indonesia, India, Oman, Thailand** and **Malaysia:** These countries do not report catches of neritic tunas by species and/or gear, as required by the IOTC. The IOTC Secretariat allocated catches by gear and species where necessary.

2. Catch-and-Effort data from Surface and Longline Fisheries:

- **Drifting gillnet** fisheries of **Iran** and **Pakistan,** and **Gillnet** and **Longline** fishery of **Sri Lanka**: A substantial component of these fleets operate in offshore waters, including waters beyond the EEZs of the flag countries concerned. Although all countries have reported total catches of neritic tunas, they have not reported catch-and-effort data as per the IOTC standards.
- **All industrial tuna purse seine** fisheries: The total catches of frigate tuna, bullet tuna, and kawakawa reported for industrial purse seine fleets are considered to be very incomplete, as they do not account for all catches retained onboard and do not include amounts of neritic tuna discarded[19]. The same applies to catch-and-effort data.
- **Discard levels for all fisheries**: The total amount of neritic tunas discarded at sea remains unknown for most fisheries and time periods.

3. Size data from All Fisheries:

- **Coastal** fisheries of **Sri Lanka, Indonesia, India, Oman, Thailand, Malaysia, Yemen, Madagascar, Mozambique,** and **Myanmar:** None of these countries has reported length frequency data for neritic tuna species in recent years.
- **Drifting gillnet** fisheries of **Iran** and **Pakistan,** and **Gillnet** and **Longline** fishery of **Sri Lanka**: A substantial component of these fleets operate in offshore waters, including waters beyond the EEZs of the flag countries concerned. Although all countries have reported total catches, and I.R. Iran and Sri Lanka have provided some data on the sizes of neritic tunas caught by their fisheries, the length frequency data has not been provided as per the IOTC standards.
- **All industrial tuna purse seine** fisheries: There is a generalised lack of length frequency data of neritic tuna species retained catches and discards from industrial purse seiners, in particular longtail tuna (purse seiners from Iran operating in the Arabian Sea), and frigate tuna, bullet tuna, and kawakawa (all purse seine fleets).

4. Biological data for all tropical tuna species:

All fisheries: There is a generalised lack of biological data for most neritic tuna species, in particular the basic data that would be used to establish length-weight-age keys, non-standard measurements-fork length keys and processed weight-live weight keys for these species

[19] This information is available for purse seiners operating under EU flags for 2003-07, as estimated using data collected by observers.

APPENDIX VII
BULLET TUNA – DRAFT RESOURCE STOCK STATUS SUMMARY

DRAFT: STATUS OF THE INDIAN OCEAN BULLET TUNA (BLT: *AUXIS ROCHEI*) RESOURCE

TABLE 1. Bullet tuna: Status of bullet tuna (*Auxis rochei*) in the Indian Ocean

Area[1]	**Indicators**		**2012 stock status determination**
Indian Ocean	Catch[2] 2011:	4,949 t	
	Average catch[2] 2007–2011:	2,961 t	
	MSY:	unknown	
	F_{2011}/F_{MSY}:	unknown	
	SB_{2011}/SB_{MSY}:	unknown	
	SB_{2011}/SB_0:	unknown	

[1]Boundaries for the Indian Ocean stock assessment are defined as the IOTC area of competence.
[2]Nominal catches represent those estimated by the IOTC Secretariat. If these data are not reported by CPCs, the IOTC Secretariat estimates total catch from a range of sources including: partial catch and effort data; data in the FAO FishStat database; catches estimated by the IOTC from data collected through port sampling; data published through web pages or other means; data reported by other parties on the activity of vessels; and data collected through sampling at the landing place or at sea by scientific observers.

Colour key	Stock overfished($SB_{year}/SB_{MSY} < 1$)	Stock not overfished ($SB_{year}/SB_{MSY} \geq 1$)
Stock subject to overfishing($F_{year}/F_{MSY} > 1$)		
Stock not subject to overfishing ($F_{year}/F_{MSY} \leq 1$)		
Not assessed/Uncertain		

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. There remains considerable uncertainty about stock structure and about the total catches. No quantitative stock assessment is currently available for bullet tuna in the Indian Ocean, and due to a lack of fishery data for several gears, only preliminary stock indicators can be used. Therefore stock status remains uncertain (Table 1). However, aspects of the fisheries for this species combined with the lack of data on which to base a more formal assessment are a cause for considerable concern.

Outlook. The continued increase of annual catches for bullet tuna is likely to have further increased the pressure on the Indian Ocean stock as a whole, however there is not sufficient information to evaluate the effect this will have on the resource. Research emphasis on improving indicators and exploration of stock structure and stock assessment approaches for data poor fisheries are warranted. The following should be noted:

- the Maximum Sustainable Yield estimate for the whole Indian Ocean is unknown.
- annual catches urgently need to be reviewed.
- improvement in data collection and reporting is required to assess the stock.

APPENDIX VIII
FRIGATE TUNA – DRAFT RESOURCE STOCK STATUS SUMMARY

DRAFT: STATUS OF THE INDIAN OCEAN FRIGATE TUNA (FRI: *AUXIS THAZARD*) RESOURCE

TABLE 1. Frigate tuna: Status of frigate tuna (*Auxis thazard*) in the Indian Ocean

Area[1]	**Indicators**		**2012 stock status determination**
Indian Ocean	Catch[2] 2011:	83,210 t	
	Average catch[2] 2007–2011:	75,777 t	
	MSY:	unknown	
	F_{2011}/F_{MSY}:	unknown	
	SB_{2011}/SB_{MSY}:	unknown	
	SB_{2011}/SB_{0}:	unknown	

[1]Boundaries for the Indian Ocean stock assessment are defined as the IOTC area of competence.
[2]Nominal catches represent those estimated by the IOTC Secretariat. If these data are not reported by CPCs, the IOTC Secretariat estimates total catch from a range of sources including: partial catch and effort data; data in the FAO FishStat database; catches estimated by the IOTC from data collected through port sampling; data published through web pages or other means; data reported by other parties on the activity of vessels; and data collected through sampling at the landing place or at sea by scientific observers.

Colour key	Stock overfished($SB_{year}/SB_{MSY} < 1$)	Stock not overfished ($SB_{year}/SB_{MSY} \geq 1$)
Stock subject to overfishing($F_{year}/F_{MSY} > 1$)		
Stock not subject to overfishing ($F_{year}/F_{MSY} \leq 1$)		
Not assessed/Uncertain		

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. There remains considerable uncertainty about stock structure and about the total catches. No quantitative stock assessment is currently available for frigate tuna in the Indian Ocean, and due to a lack of fishery data for several gears, only preliminary stock indicators can be used. Therefore stock status remains uncertain (Table 1). However, aspects of the fisheries for this species combined with the lack of data on which to base a more formal assessment are a cause for considerable concern.

Outlook. The continued increase of annual catches for frigate tuna is likely to have further increased the pressure on the Indian Ocean stock as a whole, however there is not sufficient information to evaluate the effect this will have on the resource. Research emphasis on improving indicators and exploration of stock structure and stock assessment approaches for data poor fisheries are warranted. The following should be noted:

- the Maximum Sustainable Yield estimate for the whole Indian Ocean is unknown.
- annual catches urgently need to be reviewed.
- improvement in data collection and reporting is required to assess the stock.

APPENDIX IX
KAWAKAWA – DRAFT RESOURCE STOCK STATUS SUMMARY

DRAFT: STATUS OF THE INDIAN OCEAN KAWAKAWA (KAW: *EUTHYNNUS AFFINIS*) RESOURCE

TABLE 1. Kawakawa: Status of kawakawa (*Euthynnus affinis*) in the Indian Ocean

Area[1]	Indicators		2012 stock status determination
Indian Ocean	Catch[2] 2011:	143,393 t	
	Average catch[2] 2007–2011:	134,314 t	
	MSY:	unknown	
	F_{2011}/F_{MSY}:	unknown	
	SB_{2011}/SB_{MSY}:	unknown	
	SB_{2011}/SB_0:	unknown	

[1]Boundaries for the Indian Ocean stock assessment are defined as the IOTC area of competence.
[2]Nominal catches represent those estimated by the IOTC Secretariat. If these data are not reported by CPCs, the IOTC Secretariat estimates total catch from a range of sources including: partial catch and effort data; data in the FAO FishStat database; catches estimated by the IOTC from data collected through port sampling; data published through web pages or other means; data reported by other parties on the activity of vessels; and data collected through sampling at the landing place or at sea by scientific observers.

Colour key	Stock overfished($SB_{year}/SB_{MSY} < 1$)	Stock not overfished ($SB_{year}/SB_{MSY} \geq 1$)
Stock subject to overfishing($F_{year}/F_{MSY} > 1$)		
Stock not subject to overfishing ($F_{year}/F_{MSY} \leq 1$)		
Not assessed/Uncertain		

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. There remains considerable uncertainty about stock structure and about the total catches. A preliminary surplus production assessment undertaken in 2012 indicates that the Indian Ocean stock may be fully exploited/over exploited and the current spawning stock size levels may be at optimal spawning stock size. However, further exploratory analysis of the data available should be undertaken in preparation for the next WPNT meeting before the assessment results are used for stock status determination. Due to a lack of fishery data for several gears, only preliminary stock indicators can be used. Therefore stock status remains uncertain (Table 1). However, aspects of the fisheries for this species combined with the lack of data on which to base a more formal assessment are a cause for considerable concern.

Outlook. The continued increase of annual catches for kawakawa is likely to have further increased the pressure on the Indian Ocean stock as a whole, however there is not sufficient information to evaluate the effect this will have on the resource. Research emphasis on improving indicators and exploration of stock structure and stock assessment approaches for data poor fisheries are warranted. The following should be noted:

- the Maximum Sustainable Yield estimate for the whole Indian Ocean is unknown.
- annual catches urgently need to be reviewed.
- improvement in data collection and reporting is required to assess the stock.

APPENDIX X
LONGTAIL TUNA – DRAFT RESOURCE STOCK STATUS SUMMARY

DRAFT: STATUS OF THE INDIAN OCEAN LONGTAIL TUNA (LOT: *THUNNUS TONGGOL*) RESOURCE

TABLE 1. Longtail tuna: Status of longtail tuna (*Thunnus tonggol*) in the Indian Ocean

Area[1]	**Indicators**		**2012 stock status determination**
Indian Ocean	Catch[2] 2011:	177,795 t	
	Average catch[2] 2007–2011:	134,871 t	
	MSY:	unknown	
	F_{2011}/F_{MSY}:	unknown	
	SB_{2011}/SB_{MSY}:	unknown	
	SB_{2011}/SB_0:	unknown	

[1]Boundaries for the Indian Ocean stock assessment are defined as the IOTC area of competence.
[2]Nominal catches represent those estimated by the IOTC Secretariat. If these data are not reported by CPCs, the IOTC Secretariat estimates total catch from a range of sources including: partial catch and effort data; data in the FAO FishStat database; catches estimated by the IOTC from data collected through port sampling; data published through web pages or other means; data reported by other parties on the activity of vessels; and data collected through sampling at the landing place or at sea by scientific observers.

Colour key	Stock overfished($SB_{year}/SB_{MSY} < 1$)	Stock not overfished ($SB_{year}/SB_{MSY} \geq 1$)
Stock subject to overfishing($F_{year}/F_{MSY} > 1$)		
Stock not subject to overfishing ($F_{year}/F_{MSY} \leq 1$)		
Not assessed/Uncertain		

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. There remains considerable uncertainty about stock structure and about the total catches. A preliminary surplus production assessment undertaken in 2012 indicates that the Indian Ocean stock may be fully exploited/over exploited and the current spawning stock size levels may exceed S_{MSY} by 50% and spawning stock size levels currently and further work is urgently required in 2013. However, further exploratory analysis of the data available should be undertaken in preparation for the next WPNT meeting before the assessment results are used for stock status determination. Due to a lack of fishery data for several gears, only preliminary stock indicators can be used. Therefore stock status remains uncertain (Table 1). However, aspects of the biology, productivity and fisheries for this species combined with the lack of data on which to base a more formal assessment are a cause for considerable concern.

Outlook. The continued increase of annual catches for longtail tuna in recent years has further increased the pressure on the Indian Ocean stock as a whole, however there is not sufficient information to evaluate the effect this will have on the resource. The apparent fidelity of longtail tuna to particular areas/regions is a matter for concern as overfishing in these areas can lead to localised depletion. Research emphasis on improving indicators and exploration of stock structure and stock assessment approaches for data poor fisheries are warranted. The following should be noted:

- the Maximum Sustainable Yield estimate for the whole Indian Ocean is unknown.
- annual catches urgently need to be reviewed.
- improvement in data collection and reporting is required to assess the stock.

APPENDIX XI
INDO-PACIFIC KING MACKEREL – DRAFT RESOURCE STOCK STATUS SUMMARY

DRAFT: STATUS OF THE INDIAN OCEAN INDO-PACIFIC KING MACKEREL (GUT: *SCOMBEROMORUS GUTTATUS*) RESOURCE

TABLE 1. Indo-Pacific king mackerel: Status of Indo-Pacific king mackerel (*Scomberomorus guttatus*) in the Indian Ocean

Area[1]	**Indicators**		**2012 stock status determination**
Indian Ocean	Catch[2] 2011:	49,832 t	
	Average catch[2] 2007–2011:	44,457 t	
	MSY:	unknown	
	F_{2011}/F_{MSY}:	unknown	
	SB_{2011}/SB_{MSY}:	unknown	
	SB_{2011}/SB_0:	unknown	

[1]Boundaries for the Indian Ocean stock assessment are defined as the IOTC area of competence.
[2]Nominal catches represent those estimated by the IOTC Secretariat. If these data are not reported by CPCs, the IOTC Secretariat estimates total catch from a range of sources including: partial catch and effort data; data in the FAO FishStat database; catches estimated by the IOTC from data collected through port sampling; data published through web pages or other means; data reported by other parties on the activity of vessels; and data collected through sampling at the landing place or at sea by scientific observers.

Colour key	Stock overfished($SB_{year}/SB_{MSY} < 1$)	Stock not overfished ($SB_{year}/SB_{MSY} \geq 1$)
Stock subject to overfishing($F_{year}/F_{MSY} > 1$)		
Stock not subject to overfishing ($F_{year}/F_{MSY} \leq 1$)		
Not assessed/Uncertain		

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. There remains considerable uncertainty about stock structure and about the total catches. No quantitative stock assessment is currently available for Indo-Pacific king mackerel in the Indian Ocean, and due to a lack of fishery data for several gears, only preliminary stock indicators can be used. Therefore stock status remains uncertain (Table 1). However, aspects of the fisheries for this species combined with the lack of data on which to base a more formal assessment are a cause for considerable concern.

Outlook. The continued increase of annual catches for Indo-Pacific king mackerel is likely to have further increased the pressure on the Indian Ocean stock as a whole, however there is not sufficient information to evaluate the effect this will have on the resource. Research emphasis on improving indicators and exploration of stock structure and stock assessment approaches for data poor fisheries are warranted. The following should be noted:

- the Maximum Sustainable Yield estimate for the whole Indian Ocean is unknown.
- annual catches urgently need to be reviewed.
- improvement in data collection and reporting is required to assess the stock.

APPENDIX XII
NARROW-BARRED SPANISH MACKEREL – DRAFT RESOURCE STOCK STATUS SUMMARY

DRAFT: STATUS OF THE INDIAN OCEAN NARROW-BARRED SPANISH MACKEREL (COM: *SCOMBEROMORUS COMMERSON*) RESOURCE

TABLE 1. Narrow-barred Spanish mackerel: Status of narrow-barred Spanish mackerel (*Scomberomorus commerson*) in the Indian Ocean

Area[1]	**Indicators**		**2012 stock status determination**
Indian Ocean	Catch[2] 2011:	146,180 t	
	Average catch[2] 2007–2011:	130,476 t	
	MSY:	unknown	
	F_{2011}/F_{MSY}:	unknown	
	SB_{2011}/SB_{MSY}:	unknown	
	SB_{2011}/SB_0:	unknown	

[1]Boundaries for the Indian Ocean stock assessment are defined as the IOTC area of competence.
[2]Nominal catches represent those estimated by the IOTC Secretariat. If these data are not reported by CPCs, the IOTC Secretariat estimates total catch from a range of sources including: partial catch and effort data; data in the FAO FishStat database; catches estimated by the IOTC from data collected through port sampling; data published through web pages or other means; data reported by other parties on the activity of vessels; and data collected through sampling at the landing place or at sea by scientific observers.

Colour key	Stock overfished($SB_{year}/SB_{MSY} < 1$)	Stock not overfished ($SB_{year}/SB_{MSY} \geq 1$)
Stock subject to overfishing($F_{year}/F_{MSY} > 1$)		
Stock not subject to overfishing ($F_{year}/F_{MSY} \leq 1$)		
Not assessed/Uncertain		

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. There remains considerable uncertainty about stock structure and about the total catches. No quantitative stock assessment is currently available for narrow-barred Spanish mackerel for the entire Indian Ocean, and due to a lack of fishery data for several gears, only preliminary stock indicators can be used. Therefore stock status remains uncertain (Table 1). However, aspects of the fisheries for this species combined with the lack of data on which to base a more formal assessment are a cause for considerable concern. Although indicators from the Gulf and Oman Sea suggest that overfishing is occurring in this area, the degree of connectivity with other regions remains unknown.

Outlook. The continued increase of annual catches for narrow-barred Spanish mackerel in recent years has further increased the pressure on the Indian Ocean stock as a whole, however there is not sufficient information to evaluate the effect this will have on the resource. The apparent fidelity of narrow-barred Spanish mackerel to particular areas/regions is a matter for concern as overfishing in these areas can lead to localised depletion. Research emphasis on improving indicators and exploration of stock structure and stock assessment approaches for data poor fisheries are warranted. The following should be noted:

- the Maximum Sustainable Yield estimate for the whole Indian Ocean is unknown.
- annual catches urgently need to be reviewed.
- improvement in data collection and reporting is required to assess the stock.