Report of the 5th Session of the IOTC Working Party on Neritic Tunas

Zanzibar, Tanzania, 26–29 May 2015

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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.
EEZ	Exclusive Economic Zone
F	Fishing mortality; F_{2013} is the fishing mortality estimated in the year 2013
FAD	Fish aggregating 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
MPF	Meeting participation fund
MSY	Maximum sustainable yield
n.a.	Not applicable
PS	Purse-seine
ROS	Regional Observer Scheme
SC	Scientific Committee of the IOTC
SB	Spawning biomass (sometimes expressed as SSB)
SB_{MSY}	Spawning stock biomass which produces MSY
SWIOFP	South West Indian Ocean Fisheries Project
SRA	Stock-reduction analysis
VB	Von Bertalanffy (growth)
WPNT	Working Party on Neritic Tunas of the IOTC
WWF	World Wide Fund for Nature (a.k.a World Wildlife Fund)

STANDARDISATION OF IOTC WORKING PARTY AND SCIENTIFIC COMMITTEE REPORT TERMINOLOGY

SC16.07 (para. 23) The SC **ADOPTED** the reporting terminology contained in Appendix IV and **RECOMMENDED** that the Commission considers adopting the standardised IOTC Report terminology, to further improve the clarity of information sharing from, and among its subsidiary bodies.

HOW TO INTERPRET TERMINOLOGY CONTAINED IN THIS REPORT

Level 1: From a subsidiary body of the Commission to the next level in the structure of the Commission:
RECOMMENDED, RECOMMENDATION: Any conclusion or request for an action to be undertaken, from a subsidiary body of the Commission (Committee or Working Party), which is to be formally provided to the next level in the structure of the Commission for its consideration/endorsement (e.g. from a Working Party to the Scientific Committee; from a Committee to the Commission). The intention is that the higher body will consider the recommended action for endorsement under its own mandate, if the subsidiary body does not already have the required mandate. Ideally this should be task specific and contain a timeframe for completion.

Level 2: From a subsidiary body of the Commission to a CPC, the IOTC Secretariat, or other body (not the Commission) to carry out a specified task:
REQUESTED: This term should only be used by a subsidiary body of the Commission if it does not wish to have the request formally adopted/endorsed by the next level in the structure of the Commission. For example, if a Committee wishes to seek additional input from a CPC on a particular topic, but does not wish to formalise the request beyond the mandate of the Committee, it may request that a set action be undertaken. Ideally this should be task specific and contain a timeframe for the completion.

Level 3: General terms to be used for consistency:
AGREED: Any point of discussion from a meeting which the IOTC body considers to be an agreed course of action covered by its mandate, which has not already been dealt with under Level 1 or level 2 above; a general point of agreement among delegations/participants of a meeting which does not need to be considered/adopted by the next level in the Commission's structure.
NOTED/NOTING: Any point of discussion from a meeting which the IOTC body considers to be important enough to record in a meeting report for future reference.

Any other term: Any other term may be used in addition to the Level 3 terms to highlight to the reader of and IOTC report, the importance of the relevant paragraph. However, other terms used are considered for explanatory/informational purposes only and shall have no higher rating within the reporting terminology hierarchy than Level 3, described above (e.g. **CONSIDERED**; **URGED**; **ACKNOWLEDGED**).

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EXECUTIVE SUMMARY

The 5th Session of the Indian Ocean Tuna Commission's (IOTC) Working Party on Neritic Tunas (WPNT05) was held in Zanzibar, Tanzania from 26–29 May 2015. A total of 31 participants (37 in 2014, 42 in 2013, 35 in 2012) attended the Session. The list of participants is provided at Appendix I. In the absence of the Chairperson (Dr Prathibha Rohit), the meeting was opened by the acting Chairperson, Dr Farhad Kaymaram from I.R. Iran, who welcomed participants to the meeting including the Invited Expert, Dr Shijie Zhou from CSIRO, Australia.

The following are a subset of the complete recommendations from the WPNT04 to the Scientific Committee which are provided at Appendix XIII.

Capacity building workshop

WPNT05.01 (para. 83) **NOTING** that capacity building in this area of work is needed with funding to enable countries to compile this raw data needed as a first step, the WPNT **RECOMMENDED** that a workshop is organised by the IOTC Secretariat in collaboration with WWF-Pakistan to analyse the data sets collaboratively using a meta-analysis based approach. WWF Pakistan have offered to provide support specifically for the north western Indian Ocean countries but that additional funding will be needed for the participation of other CPCs. This workshop would also include training for people in data poor assessment approaches, as well as possibly focus on basic data for assessments, like CPUE and how to standardise such data.

Integrated stock assessment methods

WPNT05.02 (para. 100) The WPNT **RECOMMENDED** that alternative methods should be explored for similar analyses in the future for other species such as longtail tuna and narrow-barred Spanish mackerel.

Data input for stock assessments

WPNT05.03 (para. 217) **ACKNOWLEDGING** the importance of indices of abundance for future stock assessments, the WPNT **RECOMMENDED** that the development of standardised CPUE series is explored before the next assessment. An indicative budget is provided (Table 19).

Table 19. Estimated costs for an inter-sessional meeting to investigate CPUE standardisation from the neritic tuna fleets (Indonesia, I.R. Iran and India (3 total), possibly Kenya and Thailand (2 alternatively if this doesn't work)) operating in the IOTC area of competence

Description	**Unit price (US$)**	**Units required**	**Total (US$)**
Meeting venues across all CPCs	0	Hosts to provide	-
Consultant travel (three countries 1 week at a time) + 1 week for Final results	15,000	SA Consultant 1	15,000
Time Consultant	500/day	50 days (25 days work for CPUE standardizations + 25 days assembling datasets with CPC's help)	25,000
Time Stock Assessment Scientist (IOTC)	0 (as time donated)	10 days	0
Final Meeting with IOTC Secretariat and CPCs at WPNT		4 days + 2 day travel	3,500
Total estimate (US$)			**43,500**

Presentation of results for management advice

WPNT05.04 (para. 226) The WPNT **RECOMMENDED** that the SC ask the WPM evaluate the proposed methodology and further develop this method of presenting management advice for data poor stocks.

Capacity building budget

WPNT05.05 (para. 247) The WPNT **RECOMMENDED** that the SC request that the Commission further increases the IOTC Capacity Building budget line so that capacity building training on data analysis and applied stock assessment approaches, with a priority being data poor approaches, can be carried out in 2016.

Revision of the WPNT Program of Work (2016-2018)

WPNT05.06 (para. 248) The WPNT **RECOMMENDED** that the SC consider and endorse the WPNT Program of Work (2016–2020), as provided at Appendix VI.

WPNT05.07 (para. 254) The WPNT **RECOMMENDED** that the invited expert works with CPCs to pull together all data for Indian Ocean stocks and undertake a meta-analysis or hierarchical approach to analyse the data. This should be combined with capacity building activities in data poor stock assessment techniques. An indicative budget is provided at Table 20.

Table 20. Estimated budget required to hire a consultant to carry out a workshop for data mining and capacity building on neritic tuna and tuna-like species in 2016 and 2017.

Description	Unit price	Units required	2016 Total (US$)	2017 Total (US$)
Workshop to support neritic tuna stock assessments and/or indicator development through data-mining, meta-analysis (Longtail tuna, kawakawa, narrow-barred Spanish mackerel, Indo-Pacific king mackerel) (fees)	500	15	11,250	11,250
Neritic tuna capacity building workshop (travel)	5,000	1	5,000	5,000
		Total estimate	**16,250**	**16,250**

Meeting participation fund (MPF)

WPNT05.08 (para. 260) The WPNT participants were unanimous in their thanks for the support for their participation in the meeting due to the MPF and **RECOMMENDED** that the Scientific Committee also consider the WPNT06 as a high priority meeting for MPF.

WPNT05.09 (para. 261) The WPNT **RECOMMENDED** that the SC and Commission note the following:

1) The participation of developing coastal state scientists to the WPNT has been consistently high following the adoption and implementation of the IOTC Meeting Participation Fund 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*), now incorporated into the IOTC Rules of Procedure (2014), as well as though the hosting of the WPNT in developing coastal State Contracting Parties (Members) of the Commission (Table 21).
2) The continued success of the WPNT, at least in the short term, appears heavily reliant on the provision of support via the MPF which was established primarily for the purposes of supporting scientists to attend and contribute to the work of the Scientific Committee and its Working Parties.
3) The MPF should be utilised so as to ensure that all developing Contracting Parties of the Commission are able to attend the WPNT meeting, as neritic tunas are very important

resources for many of the coastal countries of the Indian Ocean.

Table 21. Working Party on Neritic Tunas participation summary.

Meeting	Host Country	Total participants	Developing CPC participants	Host country participants	MPF recipients
WPNT01	India	28	23	11	9
WPNT02	Malaysia	35	26	13	10
WPNT03	Indonesia	42	34	16	11
WPNT04	Thailand	37	28	12	13
WPNT05	Tanzania	26	26	16	9
Total		173	137	68	52

Review of the draft, and adoption of the Report of the 5th Working Party on Neritic Tunas

WPNT05.10 (para. 262) The WPNT **RECOMMENDED** that the Scientific Committee consider the consolidated set of recommendations arising from WPNT05, provided at Appendix XIII, as well as the management advice provided in the draft resource stock status summary for each of the six neritic tuna (and mackerel) species under the IOTC mandate, and the combined Kobe plot for the three species assigned a stock status in 2015 (Fig. 14):

- bullet tuna (*Auxis rochei*) – Appendix VII
- frigate tuna (*Auxis thazard*) – Appendix VIII
- kawakawa (*Euthynnus affinis*) – Appendix IX
- longtail tuna (*Thunnus tonggol*) – Appendix X
- Indo-Pacific king mackerel (*Scomberomorus guttatus*) – Appendix XI
- narrow-barred Spanish mackerel (*Scomberomorus commerson*) – Appendix XII

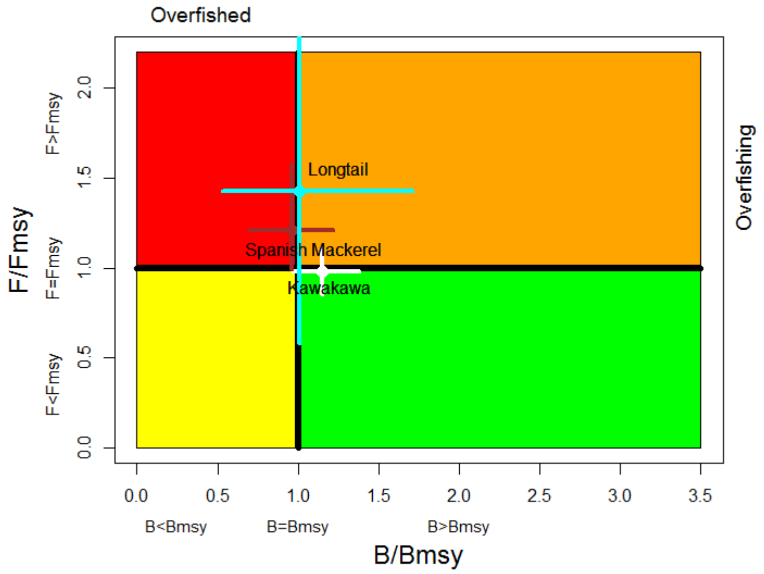


Figure 14. Combined Kobe plot for kawakawa (white), longtail tuna (blue), and narrow-barred Spanish mackerel (brown), showing the estimates of stock size (B) and current fishing mortality (F) in 2013 in relation to optimal spawning stock size and optimal fishing mortality using the OCOM and ASPIC approaches. Cross bars illustrate the range of uncertainty from the model runs.

WPNT05.11 (para. 263) Based on these stock status summaries (Fig. 14) and ongoing increasing catch and effort, the WPNT strongly **RECOMMENDED** that current catch levels are not increased further by constraining catch and/or effort to no more than 2013 levels.

Table 1. Status summary for species of neritic tuna and tuna-like species under the IOTC mandate: 2015

Stock	Indicators	Prev[1]	2010	2011	2012	2013	2014	2015	Advice to the Commission
Neritic tunas and mackerel: These six species 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 636,679 t being landed in 2013. They are caught primarily by coastal fisheries, including small-scale industrial and artisanal fisheries. They are almost always caught within the EEZs of coastal states. Historically, catches were often reported as aggregates of various species, making it difficult to obtain appropriate data for stock assessment analyses.									
Bullet tuna *Auxis rochei*	Catch 2013: 8,925 t Average catch 2009–2013: 8,899 t MSY (1,000 t) (80% CI): unknown F_{MSY} (80% CI): unknown B_{MSY} (1,000 t) (80% CI): unknown F_{2013}/F_{MSY} (80% CI): unknown B_{2013}/B_{MSY} (80% CI): unknown B_{2013}/B_0 (80% CI): unknown								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 status indicators can be used. Aspects of the fisheries for bullet tuna combined with the lack of data on which to base a more formal assessment, are a cause for considerable concern Stock status in relation to the Commission's B_{MSY} and F_{MSY} target reference points remains uncertain, indicating that a precautionary approach to the management of bullet tuna should be applied. Click here for full stock status summary: Appendix XXI
Frigate tuna *Auxis thazard*	Catch 2013: 98,565 t Average catch 2009–2013: 95,526 t MSY (1,000 t) (80% CI): unknown F_{MSY} (80% CI): unknown B_{MSY} (1,000 t) (80% CI): unknown F_{2013}/F_{MSY} (80% CI): unknown B_{2013}/B_{MSY} (80% CI): unknown B_{2013}/B_0 (80% CI): unknown								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 status indicators can be used. Aspects of the fisheries for frigate tuna combined with the lack of data on which to base a more formal assessment are a cause for considerable concern. Stock status in relation to the Commission's B_{MSY} and F_{MSY} target reference points remains uncertain, indicating that a precautionary approach to the management of frigate tuna should be applied. Click here for full stock status summary: Appendix XXII
Kawakawa *Euthynnus affinis*	Catch 2013: 170,181 t Average catch 2009–2013: 155,468 t MSY (1,000 t) [*]: 153 [125–188] F_{MSY} [*]: 0.56 [0.42–0.69] B_{MSY} (1,000 t) [*]: 202 [151-315] F_{2013}/F_{MSY} [*]: 0.98 [0.85–1.11] B_{2013}/B_{MSY} [*]: 1.15 [0.97–1.38] B_{2013}/B_0 [*]: 0.58 [0.33–0.86]								Analysis using a stock-reduction analysis, OCOM based approach for a second year indicates that the stock is near optimal levels of F_{MSY}, and stock biomass is near the level that would produce MSY (B_{MSY}). Due to the quality of the data being used, the simplistic approach employed in 2015, combined with the rapid increase in kawakawa catch in recent years, measures need to be taken to slow the increase in catches in the IOTC area of competence. Based on the weight-of-evidence available to the WPNT, the kawakawa stock for the whole Indian Ocean is classified as not overfished and not subject to overfishing. A separate analysis done on a sub-population (north-west Indian Ocean region) in 2014 indicated that that stock may be experiencing overfishing, although spawning biomass is likely to be above the level to produce MSY. However, further analysis of the CPUE data should be undertaken in preparation for the next WPNT meeting so that

Stock	Indicators	Prev[1]	2010	2011	2012	2013	2014	2015	Advice to the Commission
Neritic tunas and mackerel: These six species 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 636,679 t being landed in 2013. They are caught primarily by coastal fisheries, including small-scale industrial and artisanal fisheries. They are almost always caught within the EEZs of coastal states. Historically, catches were often reported as aggregates of various species, making it difficult to obtain appropriate data for stock assessment analyses.									
									more traditional approaches for assessing stock status are used. Click here for a full stock status summary: Appendix XXIII
Longtail tuna *Thunnus tonggol*	Catch 2013: 159,313 t Average catch 2009–2013: 142,457 t MSY (1,000 t) (80% CI): 122 (106-173) F_{MSY} (80% CI): 0.55 (0.48-0.78) B_{MSY} (1,000 t) (80% CI): 221 (189-323) F_{2013}/F_{MSY} (80% CI): 1.43 (0.58-3.12) B_{2013}/B_{MSY} (80% CI): 1.01 (0.53-1.71) B_{2013}/B_0 (80% CI): 0.41(n.a.)								Surplus production models **(**ASPIC) Analysis indicate that the stock is being exploited at a rate that exceed F_{MSY} in recent years. Whether a four quadrant stock structure of catches in the Indian Ocean or a one stock assumption is used in the analysis, the conclusions remain the same as far as optimal yields are concerned. In previous years, analysis conducted on the NWIO with a Surplus Production Model (ASPIC) also indicated that the stock is subject to overfishing in the NWIO, and could be overfished. The approach used here applies a more traditional method of stock assessment by using CPUE series from Oman, Thailand, and Australia. However, most of these are from fisheries accounting a small proportion of the IO catch, and this approach needs to be further improved by developing indices of abundance using catch and effort series from I.R. Iran and Indonesia, as well as length composition data from some fisheries. Based on the ASPIC runs and the OCOM results examined, the weight of evidence suggests that the estimated values of current biomass are near the estimated abundance to produce B_{MSY} in 2013, and that fishing mortality has exceeded F_{MSY} values in recent years, the stock is considered to be not overfished, but subject to overfishing. Click for a full stock status summary: Appendix XXIV
Indo-Pacific king mackerel *Scomberomorus guttatus*	Catch 2013: 46,340 t Average catch 2009–2013: 49,886 t MSY (1,000 t) [*]: 43 (36 – 53) F_{MSY} [*]: 0.42 (0.34 - 0.52) B_{MSY} (1,000 t) [*]: 83 (60-131) F_{2013}/F_{MSY} [*]: 1.05 (0.91 - 1.27) B_{2013}/B_{MSY} [*]: 1.01 (0.80 - 1.20) B_{2013}/B_0 [*]: 0.52 (0.34 - 0.74)								The first Indo-Pacific king mackerel stock assessment was run using SRA techniques (Catch-MSY and OCOM). Early indicators suggest at target yield of 43,000t, though the last few years catches have exceeded them and peaked to 49,000t in 2013. Since this is the first year that an assessment is being conducted, the WPNT did not set a stock status indicator for this stock. Stock status in relation to the Commission's B_{MSY} and F_{MSY} target reference points remains uncertain, indicating that a precautionary approach to the management of Indo-Pacific king mackerel should be applied. Based on the preliminary assessment a stock status summary is shown below which indicates that the stock is not overfished but maybe experiencing overfishing. Click for a full stock status summary: Appendix XXV
Narrow-	Catch 2013: 153 342 t Average catch 2009–2013: 144,170 t								OCOM techniques indicate that the stock is being exploited at a

Stock	Indicators	Prev[1]	2010	2011	2012	2013	2014	2015	Advice to the Commission
Neritic tunas and mackerel: These six species 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 636,679 t being landed in 2013. They are caught primarily by coastal fisheries, including small-scale industrial and artisanal fisheries. They are almost always caught within the EEZs of coastal states. Historically, catches were often reported as aggregates of various species, making it difficult to obtain appropriate data for stock assessment analyses.									
barred Spanish mackerel *Scomberomorus commerson*	MSY (1,000 t) [*]: 128 [96–184] F_{MSY} [*]: 0.33 [0.21 – 0.56] B_{MSY} (1,000 t) [*]: 321 [174–693] F_{2013}/F_{MSY} [*]: 1.21 [0.99 – 1.58] B_{2013} B_{MSY} [*]: 0.96 [0.69 - 1.22] B_{2013}/B_0 [*]: 0.53 [0.30 – 1.04]								rate exceeding F_{MSY} in recent years, and the stock appears to be below B_{MSY}. Northwest Indian Ocean (Gulf of Oman Sea countries) indicate that localised depletion may be occurring from an analysis done in 2013, and overfishing is occurring in this area, though the degree of connectivity with other stocks remains unknown. Stock structure issues remain to be clarified with this stock. Based on the weight-of-evidence available, including the two different SRA approaches pursued in 2015, the stock appears to be overfished and subject to overfishing. This is primarily because of new data reported from 2012 (India and Indonesia), that increased the total catch by 17000 tons, and the high catch levels in 2013. The updated index now indicated that 2012 was being subject to overfishing, but not overfished (as opposed to not subject to overfishing nor overfished, as was reported in 2014). The higher levels of catches in 2013 indicate that the stock has experience catches greater than estimated MSY since 2007. Click for a full stock status summary: Appendix XXVI

Colour key	Stock overfished(SB_{year}/SB_{MSY}< 1)	Stock not overfished (SB_{year}/SB_{MSY}≥ 1)
Stock subject to overfishing(F_{year}/F_{MSY}> 1)		
Stock not subject to overfishing (F_{year}/F_{MSY}≤ 1)		
Not assessed/Uncertain		

1. OPENING OF THE MEETING

1. The 5th Session of the Indian Ocean Tuna Commission's (IOTC) Working Party on Neritic Tunas (WPNT05) was held in Zanzibar, Tanzania from 26–29 May 2015. A total of 31 participants (37 in 2014, 42 in 2013, 35 in 2012) attended the Session. The list of participants is provided at Appendix I. In the absence of the Chairperson (Dr Prathibha Rohit), the meeting was opened by the acting Chairperson, Dr Farhad Kaymaram from I.R. Iran, who welcomed participants to the meeting including the Invited Expert, Dr Shijie Zhou from CSIRO, Australia.

2. The WPNT **NOTED** the address by the Deputy Secretary of the Ministry of Livestock and Fisheries, Tanzania, Dr Omary Ali Amiri, who welcomed participants to Zanzibar, Tanzania and formally opened the 5th Session of the IOTC Working Party on Neritic Tunas (WPNT05).

2. ADOPTION OF THE AGENDA AND ARRANGEMENTS FOR THE SESSION

3. The WPNT **ADOPTED** the Agenda provided at Appendix II. The documents presented to the WPNT05 are listed in Appendix III.

3. THE IOTC PROCESS: OUTCOMES, UPDATES AND PROGRESS

3.1 Outcomes of the 17th Session of the Scientific Committee

4. The WPNT **NOTED** paper IOTC–2015–WPNT06–03 which outlined the main outcomes of the 17th Session of the Scientific Committee (SC17), specifically related to the work of the WPNT and **AGREED** to consider how best to progress these issues at the present meeting.

5. The WPNT **NOTED** the progress on the stock structure research project and that this has come about as a direct outcome of the recommendation from the WPTN03 meeting which was also taken up by other working parties including WPTT, WPB and WPTmT.

6. The WPNT **NOTED** the importance of participation from a wide variety of coastal states to cover a suitable geographic range and **ENCOURAGED** applications from coastal countries.

7. The WPNT **NOTED** the need for good coordination among the different lab groups working on the project.

8. The WPNT **RECALLED** that the SC adopted revised '*Guidelines for the presentation of stock assessment models'* in 2012, which includes the minimum requirements for presenting CPUE standardisations. All participants who undertake CPUE standardisations and/or stock assessments for neritic tunas should familiarise themselves with these guidelines (provided in paper IOTC–2015–WPNT05–INF01).

3.2 Outcomes of the 19th Session of the Commission

9. The WPNT **NOTED** paper IOTC–2015–WPNT05–04 which outlined the main outcomes of the 19th Session of the Commission, specifically related to the work of the WPNT.

10. The WPNT **NOTED** the 11 Conservation and Management Measures (CMMs) adopted at the 19th Session of the Commission (consisting of 11 Resolutions and 0 Recommendations) which will come into force on 10th September 2015:

- Resolution 15/01 — *On the recording of catch and effort data by fishing vessels in the IOTC area of competence*
- Resolution 15/02 — *On mandatory statistical reporting requirements for IOTC Contracting Parties and Cooperating Non-Contracting Parties (CPCs)*
- Resolution 15/03 — *On the vessel monitoring system (VMS) programme*
- Resolution 15/04 — *Concerning the IOTC record of vessels authorised to operate in the IOTC area of competence*
- Resolution 15/05 — *On conservation measures for striped marlin, black marlin and blue marlin*

- Resolution 15/06 *On a ban on discards of bigeye tuna, skipjack tuna, yellowfin tuna, and a recommendation for non-targeted species caught by purse seine vessels in the IOTC area of competence*
- Resolution 15/07 *On the use of artificial lights to attract fish to drifting fish aggregating devices*
- Resolution 15/08 *Procedures on a fish aggregating devices (FADs) management plan, including a limitation on the number of FADs, more detailed specifications of catch reporting from FAD sets, and the development of improved FAD designs to reduce the incidence of entanglement of non-target species*
- Resolution 15/09 *On a fish aggregating devices (FADs) working group*
- Resolution 15/10 *On target and limit reference points and a decision framework*
- Resolution 15/11 *On the implementation of a limitation of fishing capacity of Contracting Parties and Cooperating Non-Contracting Parties*

11. The WPNT **AGREED** that Resolutions 15/01 and 15/02 are particularly relevant to the WPNT and **ENCOURAGED** all participants to familiarise themselves with Resolution 15/02 in particular, noting the importance of timely and complete data submissions, particularly for the WPNT where data are particularly lacking.

12. The WPNT **ACKNOWLEDGED** the continuation of the MPF and the particular importance for this meeting and **ENCOURAGED** CPCs to submit timely applications to make the most of this opportunity and to support good meeting attendance.

3.3 Review of Conservation and Management Measures relevant for neritic tunas

13. The WPNT **NOTED** paper IOTC–2015–WPNT05–05 Rev_1 which aimed to encourage participants at the WPNT05 to review some of the existing Conservation and Management Measures (CMM) relating to neritic tunas, noting that these have now been revised as described in document IOTC–2015–WPNT05–04.

14. The WPNT **NOTED** that this paper provides the Resolutions 15/01 and 15/02 in full as a reference but no other Resolutions were brought up for discussion for amendment.

15. The WPNT **NOTED** the new Resolutions will come into effect 120 days from the IOTC circular, i.e. 10 September 2015.

3.4 Progress on the Recommendations of WPNT04 and SC17

16. The WPNT **NOTED** paper IOTC–2015–WPNT05–06 which provided an update on the progress made in implementing the recommendations from the 4th Session of the WPNT, and also provided alternative recommendations for those yet to be completed, for the consideration and potential endorsement by participants.

17. The WPNT **REQUESTED** that the IOTC Secretariat continue to annually prepare a paper on the progress of the recommendations arising from the previous WPNT, incorporating the final recommendations adopted by the Scientific Committee and endorsed by the Commission.

18. The WPNT **NOTED** the progress in the translation and printing of species identification cards in Urdu by WWF-Pakistan.

19. The WPNT **NOTED** the progress WWF-Pakistan has made in developing seabird identification charts for the Indian Ocean which will also need translation on completion and **REQUESTED** other CPCs support this work.

20. The WPNT **THANKED** WWF-Pakistan for the offer to fund printing of the translated IOTC species identification cards for the north western Indian Ocean region and **ENCOURAGED** CPCs to facilitate further translations into Farsi and Arabic.

21. The WPNT **REQUESTED** CPCs continue to facilitate further translation of species identification cards, notably I.R. Iran and Malaysia which were identified as priority countries for tuna and tuna-like species identification cards by the SC in 2014 (SC17 para. 130). The WPNT **NOTED** the offer of scientists from I.R. Iran and Malaysia to assist in the process of finding experts with the relevant language skills who are willing to facilitate the translation of IOTC species identification cards.

4. New Information on Fisheries and Associated Environmental Data Relating to Neritic Tunas

4.1 Review of the statistical data available for neritic tunas: IOTC database

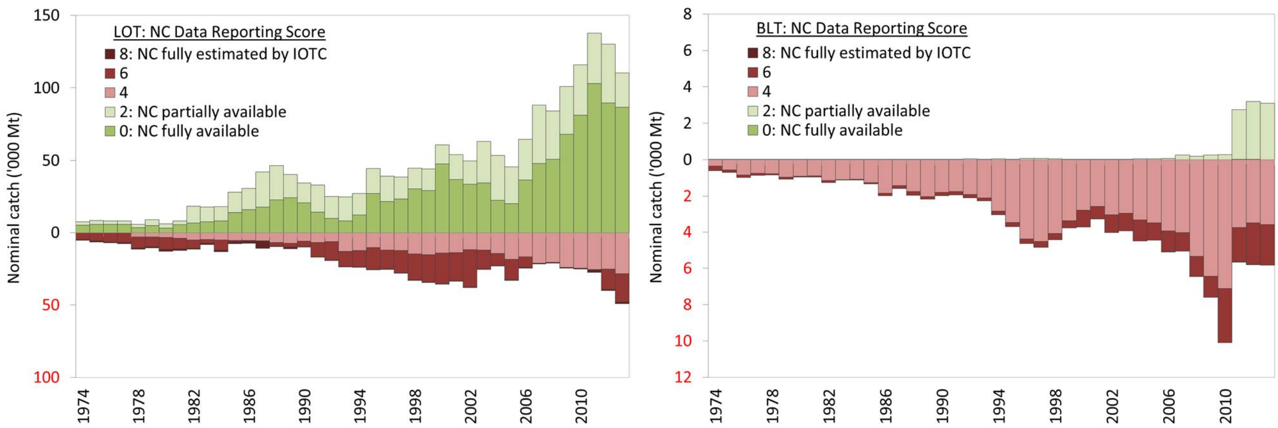
22. The WPNT **NOTED** paper IOTC–2015–WPNT05–07 Rev_1 which provided an overview of the standing of a range of information received by the IOTC Secretariat for the six species of neritic tuna and tuna-like species, in accordance with IOTC Resolution 10/02 *Mandatory statistical requirements for IOTC Members and Cooperating non-Contracting Parties (CPCs)*, for the period 1950–2013. A summary is provided at Appendix IVa–IVf.

23. The WPNT **NOTED** that data reporting is particularly low for neritic tuna species, despite the importance of scientific data for stock assessment. The WPNT **ENCOURAGED** CPCs to improve their data reporting, particularly I.R. Iran, Indonesia and India.

24. The WPNT **NOTED** that the socio-economic data presented were obtained from FAO documents due to lack of data provided by CPCs. Socio-economic data are voluntary data requested by IOTC from CPCs. There is an IOTC form for the submission of socio-economic data which has been prepared as guidance, however no data has been received through this method. The WPNT therefore **ENCOURAGED** CPCs to start submitting this information.

25. The WPNT **NOTED** that 54% of catches are reported while 46% are estimated. The estimates are generally based on data from FAO, other external sources or proxy fleets which give an indication of the likely catches. If the CPC is not reporting data or reporting incomplete data to FAO then these my still be underestimates.

26. The WPNT **NOTED** that these are average levels of uncertainty for neritic species and that this is lower for species such as kawakawa and longtail tuna where the availability of catch data is around 60%, whereas for other neritic tuna species such as bullet tuna, reported information is very low, meaning that stock assessment for bullet tuna is not possible. This is shown in Fig. 1.



(a) *(b)*

Fig. 1. Nominal catch; uncertainty of annual catch estimates (a) longtail tuna and (b) Bullet tuna (ref: paper IOTC-2015-WPNT05-07 Rev_1)

27. The WPNT **NOTED** that there may also be other issues with the data such as a lack of disaggregation by gear and by species, in which case the IOTC Secretariat then use further estimation techniques and algorithms to disaggregate the catches.

28. The WPNT **NOTED** that the catches for most smaller tuna species, in particular frigate tuna, bullet tuna and seerfish [mackerel], are reported in aggregate form and so the IOTC Secretariat estimates the breakdown by species.

29. The WPNT **ACKNOWLEDGED** the large amount of work the data section of the IOTC Secretariat is doing to refine and improve the data for use in stock assessments.

30. The WPNT **NOTED** that since 2014 the IOTC Secretariat has made some revisions to the catch series for certain fleets, the largest of which were for Indonesia.

31. The WPNT **RECALLED** that at the WPNT03 it was mentioned that there were historical data available that had not been be submitted to IOTC. The WPNT **THANKED** Malaysia for the submission of data and noted that no other CPC has submitted historical information since then, despite the identification of Indonesia as a

CPC with substantial amounts of data. The WPNT **ENCOURAGED** CPCs to continue to report historical data to IOTC wherever available, particularly for neritic tuna species.

32. The WPNT **NOTED** the offer of Thailand to provide data from their purse seine fleet and to also provide size composition data for longtail tuna.

33. The WPNT **NOTED** the poor quality data collected for Indonesia which is likely to improve as vessels are now required to collect logbook information.

34. The WPNT **NOTED** that catches in Malaysia may be underestimated as some vessels do not report catch and may land in locations prior to the final port to unload catches which are not monitored.

35. The WPNT **NOTED** the continuous increase in catches of the neritic tunas and that this may be reflecting improvements in reporting as well as increase in catches over time. More data are being reported for neritic tuna species and of better quality, including catches from countries that previously reported nothing. This is leading to a reduction in the proportion of estimated values in the database and greater reliability in the data.

36. The WPNT **NOTED** that WWF-Pakistan have established data collection systems including log book recording but are unable to report this officially to the IOTC Secretariat. At-sea transhipment from Pakistan to I.R. Iran may contribute to inaccuracy in recording, potentially leading to double-registration and double-reporting of catches by these countries.

37. The WPNT **NOTED** the sampling programme in Kenya and the efforts to improve the quality of data reported to IOTC. The WPNT **REQUESTED** that the IOTC Secretariat provide technical assistance in data collection and processing, using experiences from other areas, and assist in the evaluation and support of the Kenyan sampling program.

38. The WPNT **NOTED** the lack of size data collection by CPCs, particularly from Sri Lanka which are available but have not been submitted to IOTC which has received size data only for skipjack and yellowfin over the last five years but nothing from neritic species. **NOTING** that presentation of size frequency data in Working Party papers does not constitute a formal data submission, the WPNT **REQUESTED** Sri Lanka submit this size data in the required format and resolution where possible so that it might be used in future stock assessments.

39. **NOTING** that the neritic tuna and tuna-like species under the IOTC mandate continue to be as important or more important than the three tropical tuna species (bigeye tuna, skipjack tuna and yellowfin tuna) to most IOTC coastal states, with a total estimated catch of 636,679 t being landed in 2013 (637,221 t in 2012; 612,721 t in 2011) the WPNT **AGREED** that neritic tunas should receive appropriate management resources from the IOTC, and additional support from the IOTC Secretariat.

40. 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 V, and **ENCOURAGED** the CPCs listed in the Appendix, to make efforts to remedy the data issues identified and to report back to the WPNT at its next meeting.

41. **NOTING** that the data held by the IOTC Secretariat on neritic tuna species has improved substantially over the past few years, the WPNT **RECALLED** the current minimum data recording and reporting requirements that were adopted by the Members of the Commission under Resolution 15/01 and Resolution 15/02. All participants of the WPNT05 were asked to ensure that their national data collection and reporting organisation/s make efforts to improve their data collection and reporting for these species as per IOTC requirements detailed in Resolution 15/01 and Resolution 15/02.

42. **NOTING** that some CPCs, India in particular, have collected large data sets on neritic tuna species over long time periods, the WPNT **REQUESTED** that this data, as well as data from other CPCs, be submitted to the IOTC Secretariat as per the requirements adopted by IOTC Members in Resolution 15/02. This would allow the WPNT to develop additional or more refined stock status indicators for use in undertaking stock assessments on the neritic tuna species under the IOTC mandate.

IOTC Capacity building activities: Data

43. The WPNT **NOTED** the capacity building projects planned for 2015–16 by the IOTC Secretariat, in collaboration with BOBLME, the IOTC-OFCF Project, and national fisheries organizations, with particular emphasis on improving the collection and reporting of fisheries data to the IOTC Secretariat. A number of the activities (i.e., Sri Lanka, Thailand and Indonesia) consolidate, or are a continuation of, technical assistance provide by the Secretariat in 2014 and are likely to have implications on current and historical catch estimates of neritic tuna species:

- Sri Lanka: Collaboration of the IOTC Secretariat with BOBLME to strengthen the data collection in Sri Lanka, in particular for coastal fisheries and species of pelagic sharks. Sampling activities have been maintained following the end of project funding in early-2014. The IOTC Secretariat is currently assisting Sri Lanka with the processing and validation of 2014 data and training in the PELAGOS database; in addition a catch estimation workshop has also been provisionally planned for late-2015.
- Indonesia: Review of the coastal fisheries (joint IOTC, OFCF & BOBLME project). Continuation from 2014 of a pilot project in the Provinces of West Sumatra and North Sumatra to assess catches of neritic tuna species and juvenile tunas, by species, in commercial categories containing more than one species, in particular the categories Tongkol (Longtail tuna: *Thunnus tonggol*) and Tuna. This project addresses recommendations from the SC concerning catches of juvenile tunas in Indonesia and verification of neritic tuna species not reported by species in Indonesia. Data collection for the pilot sampling project is planned to end in October 2015, with provisional results and training in catch estimation planned for early-2016.
- Indonesia: Technical guidance and assistance to improve reporting of data at the DGCF (joint IOTC & OFCF project) (activity postponed from 2014). Provide assistance DGCF to data processing for data collected from the longline fishery, in particular length frequency data, which Indonesia has not reported since 2010. Improve the data compliance of Indonesia in terms of IOTC Resolution 10/02; submission of data to enable the Working Parties to help develop stock status indicators and increase the amount of data available for comprehensive stock assessments of IOTC species in the future.
- IOTC Data Compliance missions: A number of additional technical assistance activities have been planned for 2015 aimed at improving levels of data compliance of CPC's in the IOTC region and assessing the status of current reporting systems. At the time of writing the following activities are in the process of being finalized:
  - Thailand: size frequency data. Thailand has collected one of the longest time series of length frequency data for IOTC neritic tunas, but has not submitted data to the IOTC Secretariat since 2006. A follow-up IOTC-OFCF data mining mission has been proposed for June 2015 to assist Thailand in the processing of the length frequency data in the format requested by the IOTC Secretariat, and improve the quality and abundance of data available for future Working Party stock assessments.
  - Mozambique: A mission by the IOTC Data Section has been scheduled in June 2015 to assess the current data compliance by Mozambique, provide guidance on the IOTC data reporting requirements and training in data entry using IOTC data form templates.

4.2 Review of new information on fisheries and associated environmental data

44. The WPNT **NOTED** paper IOTC–2015–WPNT05–INF02 which provided an overview of WWF involvement in promoting sustainability in important fisheries in the South West Indian Ocean, including the following abstract provided by the authors:

    "Tuna fisheries, whether from industrial and/or small scale subsectors, are extremely important for the economies and populations from the South West Indian Ocean (SWIO) coastal states. This paper presents the relevant issues related to tuna fisheries in SWIO region, the approaches followed by WWF to address them, and the progress done up to date, in close collaboration with the SWIO governments, South West Indian Ocean Fisheries Commission (SWIOFC), Indian Ocean Tuna Commission (IOTC), Regional Economic Communities (mainly the Southern Africa Development Community) and African Union. It also presents a reflection on the lessons learned to better progress with the tuna fisheries management work and the way forward".

45. The WPNT **THANKED** WWF-Tanzania for the presentation of their extensive and ongoing work to support the tuna fisheries of the Indian Ocean.
46. The WPNT **NOTED** that WWF-Tanzania is providing technical and financial support to projects going on in the region, including a project to support the data collection systems in line with IOTC data collection and reporting requirements. This is being conducted in collaboration with other NGOs, the Deep Sea Fishing Authority and the Ministry of Livestock and Fisheries Development, Mainland, and the Ministry of Livestock and Fisheries, Zanzibar.
47. The WPNT **NOTED** the work WWF-Tanzania is conducting on IUU fishing in the Mozambican Channel and Somali waters, including non-reporting by artisanal fleets.

I.R. Iran neritic tuna fisheries

48. The WPNT **NOTED** paper IOTC–2015–WPNT05–09 which provided an overview of neritic tuna fishing in I.R. Iran, including the following abstract provided by the author:
" Iran (Islamic Republic of) is located in an area encircled with Caspian Sea in North and Persian Gulf and Oman Sea in the south. fishing activities with its related occupations are considered as one of the main activities of coastal communities, so that based on annual statistic for 2013 around 143 thousand individuals are directly engaged in fishing activities .Per capita consumption is around 8.5 kg. There are around 12,000 fishing crafts comprising of: Fishing boats, Dhows and Ships employing different types of fisheries including: Gillnet, purse seine, Angling (Hook and line, Trolling), Trawl and Wire-trap and engaged in fishing operation according to a time schedule during different fishing seasons. Total annual species production in 2013 was equivalent to 884,957 tonnes, of which around 514 thousand tonnes attributed to capture fisheries. The share of Large-pelagic species is about 240 thousand tonnes, of which 226 thousand tonnes are Tuna and Tuna-like species. Neritic tunas in Iran (Islamic Republic of) comprised of: longtail tuna, Kawakawa, frigate tuna, Narrow-barred Spanish Mackerel and indo-pacific king mackerel. All of these species have attach-importance in the livelihood of coastal communities. Total annual catch for neritic tuna in 2013 was around 127 thousand tonnes which account for 57% of total Tuna and Tuna-like species and also bycatch species". – See paper for full abstract

49. 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 moved back to the EEZ of I.R. Iran several years ago to target neritic tuna and tuna-like species. This resulted in substantial increases in the total catch and effort of neritic tuna and tuna-like species under the IOTC mandate through the mid-2000s.

50. The WPNT **NOTED** the decreasing quantity of neritic tuna catches in recent years corresponding to the increasing catches of tropical tuna catches near Somalia. Now that piracy has decreased the boats may be fishing further offshore again and this might be the cause of the recent decline in neritic tuna catches.

51. The WPNT **NOTED** that the sampling scheme for data collection in I.R. Iran covers 10% of landing sites and 10% of vessels by category. Data recording is oral and transcribed by enumerators then scaled to the total number of vessels and landing sites.

52. The WPNT **NOTED** that vessels classified as artisanal may fish within inshore or offshore areas.

53. The WPNT **NOTED** that I.R. Iran has developed a Code of Conduct for neritic tuna fisheries and made improvements to data reporting through the implementation of a mandatory logbook system.

Malaysia neritic tuna fisheries

54. The WPNT **NOTED** paper IOTC–2015–WPNT05–10 which provided an overview of catches of neritic tuna by the Malaysian fleet, including the following abstract provided by the authors:
"Annual catch of neritic tuna in the Malacca Straits showed an increasing trend but the opposite were observed in the South China Sea. The purse seine contributed about 82% of the annual catches of neritic tuna and as the most important fishing gear in neritic tuna fisheries especially 40-69.6 GRT and >70 GRT vessels size. The use of FADs were common practice by purse seines to catch small pelagic species including neritic tuna. Average catch rate of neritic tuna by purse seines were estimated at 333 kg/day at sea. Length weight measurement data of longtail and kawakawa collected monthly showed relationship equation of kawakawa as W= 0.00000843L 3.1173 and Longtail is W= 0.0000103L 3.09 . Monthly length distributions showed the larger sizes for longtail and Kawakawa is in October and November respectively. Study of gonad and stomach content of these two species just started in March 2015".

55. The WPNT05 **NOTED** that information presented is a short term short term study that took place between May 2014 and November 2014 for longtail tuna and May to January 2015 for kawakawa under a project that will last for two (2) years.

56. The WPNT **NOTED** the decline in both effort and catches for purse seine fisheries in 2014 which may be due to the change in government subsidies for large vessels or due to problems with the data reporting system and the lack of timeliness in publishing data.

57. The WPNT **NOTED** that the neritic tunas are not a major component of the purse seine fishery catches on the west coast of Malaysia where the primary target species are small pelagics such as Indian mackerels. The WPNT **NOTED** the purse seines used to catch neritic tunas in Malaysia are therefore not targeted only at neritic species but also targets small pelagics, using a mesh size of approximately 2.5 cm.

58. The WPNT **NOTED** the seasonality of the neritic tuna catches (kawakawa, longtail tuna and frigate tuna) which peaked in September and the need for further research into spawning periods and locations given the bimodal length distribution of longtail tuna, noting that it is based on a small sample size.

59. The WPNT **NOTED** the lack of historical size data, the very small amount of size data presented for 2014 and 2015 and the short timeframe of the project which is due to finish at the end of 2015 and **ENCOURAGED** the authors to seek additional funding to continue the study.

60. The WPNT **NOTED** the use of lights to target small pelagics such as sardines and mackerel. Lights used in these fisheries have a relatively low wattage of no more that 30W, but have increased in usage since the 1980s and have recently been banned by the IOTC (Resolution 15/07*, On the use of artificial lights to attract fish to drifting fish aggregating devices)*.

61. The WPNT **NOTED** the strong association of Malaysian purse seine catches with anchored FADs in Strait of Malacca which is likely due to the shallow water depth in the region (mostly 40–50m and does not exceed a depth of 100 m).

62. The WPNT **NOTED** that information is not currently collected on the total number of FADs or the size of FADs used and **REQUESTED** that Malaysia begins to collect this data and conduct an impact assessment of FAD on neritic tuna fisheries in Malaysia is required.

63. The WPNT **NOTED** that large vessels are not supposed to operate in areas closer than 30 miles from shore so the FADs are all located outside this area.

64. The WPNT **NOTED** that the spatial variability in fishing operations suggests fishers are aware of the migration patterns of neritic species based on traditional knowledge which also assists them in determining the optimum location for anchoring FADs.

Maldives neritic tuna fisheries

65. The WPNT **NOTED** paper IOTC–2015–WPNT05–11 which provided an investigation into the decline in catches of *Euthynnus affinis* and *Auxis thazard* between 2010 and 2013, including the following abstract provided by the authors:

"Two species of neritic tunas, kawakawa (KAW) and frigate tuna (FRI) are commonly caught in the Maldives. Despite inter-annual fluctuations, nominal catch of neritic tunas has seen a general rise from 1970 – 2009. However, this increase has not been in par with the rise in catch of skipjack and yellowfin tuna, resulting in their declined contribution to the national catch. Recent years (2010 – 2013), saw declines in the order of 84% for frigate tuna and 67% for kawakawa, despite the Indian Ocean catches of both species observing an increasing trend. Because the decline in Maldives catches coincided with the introduction of the logbook reporting system, Ahusan (2014) hypothesized that under/non-reporting of neritic catch could be a factor in the observed trend. This paper aimed at investigating further, the observed declines using a qualitative approach. The results showed that a segment of the PL fleet, fitting a general description, in the northern atolls do not comply with the logbook based catch and effort data collection system. Since the traditional system of reporting from island office is being discontinued, MoFA relies on the export oriented tuna purchase data to complete the national catch records. As a result, landings from vessels that sell their catch to the domestic markets and not the exporters, are excluded from national statistics. Such vessels are predominant in the North of the country where purchase of tuna for export is relatively minor compared to the South". – See paper for full abstract

66. The WPNT **NOTED** that there are two types of markets for neritic tunas, local and export, and that the local market is quite a small proportion of total catches and that exporting vessels are checked for licence validity at the point of sale and so the majority of vessels should be reporting catch and effort data. However the majority of neritic catches come from the north and are not exported which presents difficulties.

67. The WPNT **NOTED** the key location of the Maldives and the importance of these fisheries for stock assessments in terms of establishing the level of connectivity between the western and eastern Indian Ocean and **ENCOURAGED** Maldives to participate in the stock structure research project through the provision of samples or further involvement.

68. The WPNT **NOTED** that the neritic component of Maldivian catches is very likely to be underreported. The WPNT **ENCOURAGED** Maldives to report these issues to the statistics department who can take steps to address the issues.

69. The WPNT **NOTED** the relatively flat CPUE series for kawakawa which has shown more of a declining trend in recent years and the similarity between this and kawakawa CPUE series from other CPCs such as Oman, Thailand and Kenya.

70. The WPNT **NOTED** that 90% of fishers in Tanzania are artisanal fishers and so education is needed similar to the Maldivian system to increase awareness of the importance of data collection and reporting for management authorities and **ENCOURAGED** other CPCs to establish similar awareness raising programmes.

71. The WPNT **NOTED** the Beach Management Units in Tanzania which have carried out training in data collection. For neritic tuna, identification was previously undertaken only to the family level but thanks to WWF-Tanzania, species identification has been carried out and so the resolution of data has been improved.

Indonesia neritic tuna fisheries

72. The WPNT **NOTED** paper IOTC–2015–WPNT05–12 which provided an overview of troll line neritic tuna fisheries in the Alas Strait, East Lombok, including the following abstract provided by the authors:

"The potential of fish resources in the waters of the Indian Ocean in south of Java to the Nusa Tenggara amounted to 491.7 thousand tons per year which is 40.95 % of them (about 201.4 thousand tons per year) is large pelagic fish such as Tunas. The coastal area of Tanjung Luar, which located, which is located in Keruak District, East Lombok, is one of the centers of small -scale tuna fisheries in West Nusa Tenggara. One of the fishing fleet which is developed at Tanjung Luar to exploit the resources of tuna is "jukung/ketinting". The fleet has a variety of gear types. The objectives of this this study was to describe the diversity of fishing gear, fishing locations, the composition of the catch, CPUE, length distribution, length - weight relationship of neritic tuna caught and water temperature information based on data from the observer trip report in 2014. Data was collected through observation in June, August and October 2014 at the Fish Landing Base of Tanjung Luar. Observations were carried out by following the one day of fishing activity. In a total, there were 38 trips to obtain the data. Biological aspects of the collected data covering the length and weight of the fish caught. Water temperature at the location of the data collection area is obtained by using minilogger. The Jukung (small boat) fleet in Tanjung Luar had five types of troll line and three of the was used to catch neritic tuna.Bullet tuna is the highest CPUE, followed by kawakawa and frigate tuna. Most of the bullet tuna caught were allegedly had ever spawn, whereas the little and frigate were in immature size. The bullet, little and frigate tuna were negative allometric. The average temperature of Alas Strait was 26,1^{o}C".– See paper for full abstract

Pakistan neritic tuna fisheries

73. The WPNT **NOTED** paper IOTC–2015–WPNT05–25 which provided an overview of the changes in the landings of neritic tuna and tuna like species in Pakistan over last three years including the following abstract provided by the authors:

"Five species of tuna are represented in catches in the neritic waters along Pakistan coast. Of these longtail tuna (Thunnus tonggol) seems to be dominating followed by kawakawa (Euthynnus affinis) and frigate tuna (Auxis thazard). Although bullet tuna (Auxis rochei) and striped bonitos (Sarda orientalis) are also found in the landings but their combined contribution is less than 1 % of the total landings of neritic tuna. Neritic species are caught with surface gillnets which are mainly operated in the continental shelf area of Pakistan. Total landings of neritic tuna was 23,035, 22,040 and 16,690 m. tons during 2012, 2013 and 2014 respectively. Their contribution in overall tuna landing is decreasing because of decline in Somali piracy and now Pakistani tuna vessels are fishing in comparatively deeper offshore waters as well as in area beyond national jurisdiction".

74. The WPNT **NOTED** the importance of the queenfish and cobia in catches (up to 50%), despite not being included in the IOTC list of tuna and tuna-like species.

75. The WPNT **NOTED** the increasing landings of unicorn leatherjackets (*Aluterus monoceros*) which were previously extremely rare but now caught in exportable quantities. These are known as reef fish in Tanzania which are often caught in ringnet fisheries operating close to shore, however, in Pakistan there are no coral reefs and the vessels are fishing in surface oceanic waters so the catches are quite surprising.

76. The WPNT **NOTED** that while there is not much fishery independent information collected on these fisheries there are supporting studies that have been produced[1]. The WPNT **REQUESTED** that further research is carried out to investigate these results further.

[1] Moazzam, M., and Nawaz, R., Tuna Situation Analysis. WWF-Pakistan Report 01/2012. 62p; Moazzam, M., and Nawaz, R., 2014. By-catch of tuna gillnet fisheries of Pakistan: A serious threat to non-target, endangered and threatened species. J. Mar. Biol. Ass. India, 56: 85-90; Nawaz, R., and Moazzam, M., 2014. An assessment of cetacean mortality in the tuna fisheries of Pakistan. IOTC-2014-WPEB 10-INF25. 1-89; Moazzam, M., 2012. Status of Fisheries of Neritic Tuna in Pakistan. IOTC–2012–WPNT02–13, 11p; Moazzam, M., 2014. Update on the neritic tuna fisheries of Pakistan with special reference to frigate tuna (*Auxis thazard thazard*). IOTC–2014–WPNT04–33. 7p

5. KAWAKAWA – REVIEW OF NEW INFORMATION ON STOCK STATUS

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

Review of the statistical data available for the neritic tuna species

77. The WPNT **RECALLED** paper IOTC–2015–WPNT05–07 Rev_1 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 1950–2013. A summary is provided at Appendix IVc.

Indonesia: kawakawa population dynamics

78. The WPNT **NOTED** paper IOTC–2015–WPNT05–19 which provided an overview of the population dynamics of kawakawa in the western part of Sumatera Island, Indonesia, including the following abstract provided by the authors:

"Study on the population dynamic of kawakawa (E. affinis) was conducted in Indian Ocean based on data collected during period of survey, February 2013 to November 2013. The purpose of the study was to identify population parameters of kawakawa in this area. The result showed that the growth parameter of kawa-kawa was 0.48/year with fork length maximum (Loo) of 64.1 cm. Instantaneous total mortality (Z) and natural mortality (M) were 2.29/year and 0.92/year, respectively. While fishing mortality (F) and exploitation rate (E) respectively were 1.37/year and 0.65/year. The exploitation rate of kawakawa in Indian Ocean at western part of Sumatera waters was high. It was, therefore, recommended that fishing effort of the kawakawa in that waters is reduce about 30 %".

79. The WPNT **NOTED** that ELEFAN was developed for closed populations, where modal progression can provide better estimates of growth, and so may not provide good estimates of growth for migratory species. There is likely to be migration of fish across the entire area and so isolated studies using these techniques may not be appropriate for coastal tuna populations.

80. The WPNT **NOTED** that the results may indicate a highly exploited situation locally.

81. The WPNT **REQUESTED** that a meta-analysis be conducted on the raw data on age and length to combine all of the local area studies to get a combined picture of parameters related to growth in the Indian Ocean. This could be done with a Hierarchical Bayesian Analysis approach to estimate hyper-priors for L_∞, K and t_0 for the Indian Ocean with variations by region.

82. The WPNT **NOTED** that often the only available dataset to work with is that of the individual CPC and that only summarised data are provided. The WPNT **REQUESTED** that CPCs provide the raw data for a regional analysis **NOTING** that it is often difficult for CPCs to release these data. The WPNT **NOTED** Resolution 12/02 on data confidentiality and that the data would be useful for assessing growth in the Indian Ocean.

83. **NOTING** that capacity building in this area of work is needed with funding to enable countries to compile this raw data needed as a first step, the WPNT **RECOMMENDED** that a workshop is organised by the IOTC Secretariat in collaboration with WWF-Pakistan to analyse the data sets collaboratively using a meta-analysis based approach. WWF Pakistan have offered to provide support specifically for the north western Indian Ocean countries but that additional funding will be needed for the participation of other CPCs. This workshop would also include training for people in data poor assessment approaches, as well as possibly focus on basic data for assessments, like CPUE and how to standardise such data.

5.2 Data for input into stock assessments

Maldives: Kawakawa pole and line fishery catch rate standardisation: 2004–09

84. The WPNT **NOTED** paper IOTC-2015-WPNT05-INF03 on the Maldivian process to clean the monthly catch and effort data (2004-2009), including the following abstract provided by the authors:

"Maldives has one of the longest catch and effort time series in the Indian Ocean dating back to 1959. Vessel specific monthly aggregated catch and effort data is available in electronic format from 2004 onwards. Kolody and Adam (2011) standardized the dataset (2004-2010) and in the process, raised several irregularities, most notable being that of single day records and positive effort with zero SKJ catch. Single day efforts were found to be the result of double reporting from vessels that disposed the catch to Male'. Catch and effort data collection from Male' harbor by the Ministry of Fisheries and Agriculture (MoFA) inspector has recently been stopped. Other irregularities in the dataset were records

of positive effort with zero catch, presence of duplicate records and multiple records for the same vessel and month with total effort exceeding the days of the month. The 2004 – 2009 dataset initially consisted of almost 86 thousand records inclusive of all fishery, vessel and gear types; MM vessels with PL gear being 63 thousand records (673 thousand effort days). The final cleaned dataset has 36 thousand records representing 601 thousand days of PL effort by mechanized masdhoni vessels".

85. The WPNT **COMMENDED** the extensive work that has been undertaken by Maldives to validate and improve the estimates of about 40% of the dataset which was problematic. The WPNT **NOTED** that the newly revised data will have no effect on total catch estimates reported to the IOTC Secretariat, but will affect the data in the IOTC catch and effort database as well as CPUE data so the CPUE standardisation undertaken in 2014 will need to be updated.

5.3 Stock assessment updates

Summary of stock assessment models in 2015

86. The WPNT **NOTED** that three modelling methods, OCOM, Catch-MSY and SS3 were used to assess the status of kawakawa in 2015. Table 2 and Table 3 provide an overview of the key features of each of the stock assessments for kawakawa, while Table 4 provides a summary of all the assessment results.

87. The WPNT **NOTED** the value of comparing different modelling approaches and evaluating alternative hypotheses about the quality of the data used. Evaluating and validating the data is integral in the assessment, as fitting to alternative CPUE indices and assuming different model structures can have a large influence on the assessments.

88. The WPTT **NOTED** that the model parameters contained in Table 3 could be considered appropriate for future kawakawa tuna stock assessments preliminary base case analysis, with appropriate sensitivity runs.

Table 2. Kawakawa: Summary of final stock assessment model features as applied in 2015.

Model feature	Catch-MSY	OCOM	SS3
Population spatial structure / areas	1	1	1
Number CPUE Series	0	0	1
Uses Catch-at-length/age	No	No	Yes
Uses tagging data	No	No	No
Age-structured	No	No	Yes
Sex-structured	No	No	No
Number of Fleets	1 (aggregated catch)	1 (aggregated catch)	4
Stochastic Recruitment	No	No	Yes

Table 3. Kawakawa: Model parameters agreed by the WPNT for use in base case stock assessment runs.

Biological parameters	Value for assessments
Stock structure	1 and 2 areas
Sex ratio	1:1
Age (longevity)	7+ years
Natural mortality	M=0.8 (/year) constant over ages
Growth formula	VB curve with linf=80, and K=0.365
Weight-length allometry	$W=aL^b$ with $a= 2.54*10^{-6}$ and $b=2.89$ common to sex
Maturity	Length-specific (50% mature at length 38 cm, fully mature at 44 cm)
Fecundity	Proportional to the spawning biomass
Stock-recruitment	B&H, h=0.8 (plus sensitivity e.g. 0.7 and 0.9), sigma_R=0.6
Other parameters	**Value for assessments**
Fisheries	4 (Maldives PL, Iranian GN, Sri Lanka GN and Line, Other)
Abundance indices	Maldives PL (possibly include Oman, Kenya and Thailand in future years)
Selectivity	Fishery specific. Cubic splines

Table 4. Kawakawa: Summary of model results for 2015.

Management quantity	Catch-MSY	OCOM	SS3
Most recent catch estimate (2013)	170,181 t	170,181 t	170,181 t
Mean catch from 2009–2013	155,468 t	155,468 t	155,468 t
MSY (1000 t) [*]	138 [108–186]	153 [125–188]	186 [101–271]
Data period used in assessment	1950–2013	1950–2013	1950–2013
F_{MSY} [*]	0.41 [0.29–0.63]	0.56 [0.42–0.69]	0.55 [0.19–0.9]
B_{MSY} (1000 t) [*]	269 [146–329]	202 [152–351]	224 [53–395]**
F_{2013}/F_{MSY} [*]	1.19 [0.78–2.17]	0.98 [0.85–1.11]	0.52 [0.17–0.88]
B_{2013}/B_{MSY} [*]	0.99 [0.60–1.40]	1.15 [0.97–1.38]	n.a.
SB_{2013}/SB_{MSY} (80% CI)	n.a.	n.a.	2.08 [0.6–3.6]
B_{2013}/B_0 [*]	0.50 [0.30–0.70]	0.58 [0.33–0.86]	n.a.
SB_{2013}/SB_0 (80% CI)	n.a.	n.a.	0.58 [0.16–0.99]
$B_{2013}/B_{0, F=0}$ (80% CI)	n.a.	n.a.	n.a.
$SB_{2013}/SB_{0, F=0}$ (80% CI)	n.a.	n.a.	n.a.

n.a. not available; [*] plausible range: results from a combination of a specific catch only method assumed prior information, as well as catch data.** This is SB_{MSY}, not B_{MSY}

Indian Ocean kawakawa assessment using integrated stock assessment methods

89. The WPNT **NOTED** paper IOTC–2015–WPNT05–20 Rev_1 which included a stock assessment for kawakawa using stock synthesis, including the following abstract provided by the authors:
"An Indian Ocean kawakawa stock assessment using Stock Synthesis 3 (SS3) software is described. The approach uses a highly disaggregated model to integrate several sources of fisheries data and biological research into a unified framework. The model is a first attempt to use different sources of abundance data (derived from the Maldivian PL fleet) to assess the health of the stock incorporating key growth, and life history parameters (M, steepness, maturation) for the Indian ocean by estimating selectivity, and catchability for four different fleets (I.R. Iran GN, Sri Lanka GN and PL, Maldives pole-and-Line and all other fisheries). Alternative assumptions to a base model are tested (slow and fast growth, high and low steepness, and different values of M, and weights to CPUE data and size based data), and the current estimates of stock size and target yield levels are estimated. Stock specific trajectories are presented for the alternative model runs, and advantages of this approach over the simpler catch reduction based approaches are discussed".– see paper for full abstract

90. The WPNT **CONGRATULATED** the authors for producing this analysis which makes the most of the available data and taking forward the discussion on stock assessment of this species using the SS3 approach.

91. The WPNT **NOTED** the highly divergent estimates of MSY based on the sensitivity analyses using different fleet selectivities to model the CPUE series. Modelling the CPUE series as the Maldivian pole and line fleet selectivity provided an MSY of ~ 399,000 t while modelling the index using the Iranian gillnet fleet selectivity provided estimates ~ 186,000 t. As the gillnet fishery comprises a higher proportion of the fisheries this was used as the base case scenario.

92. The WPNT **NOTED** the uncertainties associated with using a small proportion of the fishery to produce an index of abundance which may not be representative of the total Indian Ocean fisheries abundance.

93. The WPNT **NOTED** the problems in estimating MSY along with other parameters and so when such highly divergent MSY estimates are produced, as was the case in this assessment, the results are more questionable.

94. The WPNT **AGREED** that while it is good to explore these methods and to progress the work of the group, results should be interpreted with caution due to the poor quality of the data.

95. The WPNT **NOTED** the new methods used to standardise CPUE in Australia described by the invited expert which could potentially be used the analysis.

96. The WPNT **NOTED** the importance of the CPUE series in the analysis and the abundance results reflecting the flat CPUE series of Maldives, whereas if other CPUE series were used the results are likely to reflect these more pessimistic series.

97. The WPNT **NOTED** the importance of size data in the analysis and the lack of size structure information which was therefore down-weighted in the model so that the CPUE series would drive the trends.

98. The WPNT **NOTED** that the model is not spatially disaggregated but could also be explored using sub-stock structures but at the moment there is no evidence for any stock structure so the null hypothesis of a single stock was used in this model.

99. The WPNT **AGREED** that the assessment results would be interpreted with caution due to the very limited data and many assumptions. In particular, the use of the pole and line CPUE series from Maldives has large impacts on the results whereas the fishery forms only a small component of total Indian Ocean catches. The WPNT **AGREED** on the importance of multiple CPUE series for input into stock assessment models and **NOTED** that the model setup illustrates what information is needed for SS3 assessment and provides a guide for data collection to improve the model in the future.

100. The WPNT **RECOMMENDED** that alternative methods should be explored for similar analyses in the future for other species such as longtail tuna and narrow-barred Spanish mackerel.

101. The WPNT **AGREED** that the approach presented is likely to be useful to assess stock status in the near future. Nevertheless, for the current assessment, the length-frequency and CPUE data used may not be very informative. The WPNT **REQUESTED** that further nominal and standardised CPUE data sets are assembled by CPCs which can be used for this assessment approach. Oman, Iran, Indonesia and I.R. Iran (possibly Kenya and Thailand). Are notable CPCs which may be able to provide these data. Results are shown in (Table 5, Fig. 2)

Table 5. Kawakawa: Key management quantities from the SS3 used in 2015.

Management quantity	Indian Ocean Region
Most recent catch estimate (t) (2013)	170,181 t
Mean catch over last 5 years (t) (2009–2013)	155,468 t
MSY (1000 t) [*]	186 [101–271]
Data period (catch)	1950–2013
CPUE series	Maldives PL
CPUE period	2004–2012
F_{MSY} [*]	0.55 [0.19–0.9]
SB_{MSY} (1000 t) [*]	224[53–395]
F_{2013}/F_{MSY} [*]	0.52 [0.17–0.88]
B_{2013}/B_{MSY} [*]	n.a.
SB_{2013}/SB_{MSY} [*]	2.08 [0.6–3.6]
B_{2013}/B_0 [*]	n.a.
SB_{2013}/SB_0	0.58 [0.16–0.99]

n.a. not available; [*] plausible range: results from a combination of a specific catch only method assumed prior information, as well as catch data.

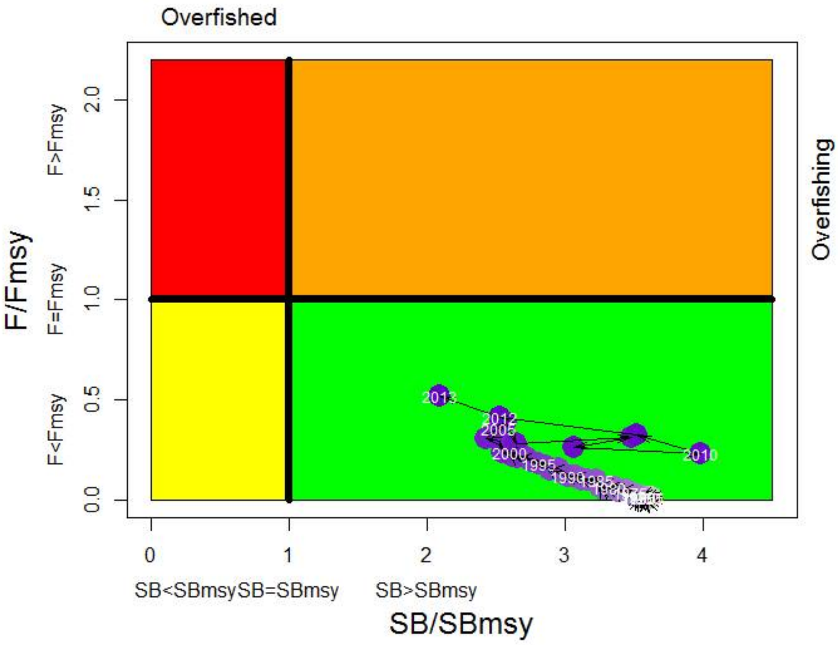


Fig 2. Kawakawa: SS3 Aggregated Indian Ocean assessment Kobe plot. The Kobe plot presents the trajectories for the base model.

102. The WPNT **NOTED** that the SS3 model is useful in terms of providing information on what information is missing and has the most influence on assessment results and **REQUESTED** CPCs use this advice to obtain improved data on CPUE and length for use in future assessments.

103. The WPNT **NOTED** that while it was a useful exercise to explore this model, it is too early to be used in projections for Kobe II. Hence no projections were presented in the analysis.

Indian Ocean kawakawa assessment using data poor methods

104. The WPNT **NOTED** paper IOTC–2015–WPNT05–21 which provided a stock assessment of kawakawa in the Indian Ocean for data ranging from 1950-2013 using Catch-MSY and OCOM methods, including the following abstract provided by the authors:

"Two data-poor methods were used to assess the status of Indian Ocean Kawakawa, (Euthynnus affinis): (i) a Catch-MSY method, based on stock reduction analysis (Kimura and Tagart 1982; Walters et. al. 2006; Martell and Froese 2012) and (ii) a recently developed posterior-focussed Optimised Catch Only Method, OCOM (Zhou et al., 2013). Parameter prior ranges were based on a recent literature review (IOTC-2015-WPTN05-DATA12). The MSY for kawakawa was estimated at 137 600 t using the Catch-MSY model and 153 000 t using the OCOM model. These OCOM results were higher than previous assessment results, likely due to the priors used on the distribution of r which were higher, suggesting a higher resilience. The model results were also somewhat conflicting in the evaluation of the final status of the stock with the OCOM model again providing a more optimistic outlook than the catch-MSY model. The Catch-MSY model indicates that kawakawa is currently both 'overfished' (B_{2013}/B_{MSY} = 0.99) and 'subject to overfishing' (F_{2013}/F_{MSY} = 1.19), while the OCOM model suggests that kawakawa is 'not overfished' (B_{2013}/B_{MSY} = 1.15) and 'not subject to overfishing' (F_{2013}/F_{MSY} = 0.98). The reason for the slightly less optimistic results from the Catch-MSY assessment compared with the previous assessment may be based on the updates to the catch series, as the catch estimates for 2012 have increased as well as catches for 2013 having increased by 10% since the previous estimate. The variation in results across models and years highlights the uncertainty associated with using data-poor methods for stock assessment and so the results should be interpreted with caution and considered in light of the integrated assessment for kawakawa (IOTC-2015-WPNT05-20)".

105. The WPNT **NOTED** the improvements to the methods used since previous years, including revised prior ranges and a set of projections based on catch rates relative to B_{MSY} rather than constant catch levels.

106. The WPNT **NOTED** that the Catch-MSY method was designed to estimate MSY rather than stock status advice and that the final depletion level is a dependent on the assumptions made about the final depletion level.

107. The WPNT therefore **AGREED** that, in terms of providing stock status advice in 2015, the OCOM method is more appropriate, although the results of this method are also highly dependent on certain key assumptions about the *r-K* range used and the depletion range specified.

108. The WPNT **NOTED** that the models are driven largely by the assumed growth rate and the studies that have been undertaken to estimate these. Natural mortality, *M*, is the most important parameter included in these estimations. Next year it may be possible to experiment with different methods of estimating r using a meta-analysis based approach.

109. The WPNT **NOTED** the assumptions about initial and final depletion levels used in the Catch-MSY approach which are solely based on the ratio of catches in that year and the maximum catch, whereas in reality this relationship is very weak. The WPNT **NOTED** that further studies have been undertaken using global data sets to investigate empirical trends in stock depletion level and that these seem to be more closely linked to the catch pattern, which is often inversely related to the predicted biomass trajectory in these catch-based models. This may provide better assumptions for the model methods.

110. The WPNT **NOTED** the different assumptions used for each of the two models as a potential reason for the differences in final results.

111. The WPNT **NOTED** that the models are both based on the Schaefer production model and that other models such as the Fox or Thompson and Bell models are alternatives that could also be explored.

112. The WPNT **NOTED** that these models have been also been used on the relatively data-rich swordfish and skipjack tuna stocks and appear to underestimate yield targets and overestimate stock depletion level, as they are largely driven by the initial assumptions used.

113. The WPNT **NOTED** that the confidence intervals provided on the KOBE plots for the catch based methods are a function of the input parameters and the assumptions used to refine these in the modelling process and that using 80% CI is inappropriate for these methods.

114. The WPNT **REQUESTED** that further methods for data poor stock assessments are explored, including approaches using different data such as size only methods, and approaches based on different underlying models.

115. The WPNT **REQUESTED** that studies on growth, standardised CPUE series and stock structure are carried out to support the assessments used and to increase the opportunity to use different methods based on different data types that move away from the data poor approaches towards more traditional approaches.

Indian Ocean kawakawa assessment using a Catch-MSY Method

116. The WPNT **NOTED** the results from the Catch-MSY assessment method (Table 6, Fig. 3).

Table 6. Kawakawa: Key management quantities from the Catch-MSY model used in 2015.

Management Quantity	Aggregate Indian Ocean
Most recent catch estimate (2013)	170,181 t
Mean catch from 2009–2013	155,468 t
MSY (1000 t) [*]	138 [108–186]
Data period used in assessment	1950–2013
F_{MSY} [*]	0.41 [0.29–0.63]
B_{MSY} (1000 t) [*]	269 [146–329]
F_{2013}/F_{MSY} [*]	1.19 [0.78–2.17]
B_{2013}/B_{MSY} [*]	0.99 [0.60–1.40]
SB_{2013}/SB_{MSY} (80% CI)	n.a.
B_{2013}/B_0 [*]	0.50 [0.30–0.70]
SB_{2013}/SB_0 (80% CI)	n.a.
$B_{2013}/B_{0,\ F=0}$ (80% CI)	n.a.
$SB_{2013}/SB_{0,\ F=0}$ (80% CI)	n.a.

n.a. not available; plausible range: results from a combination of a specific catch only method assumed prior information, as well as catch data.

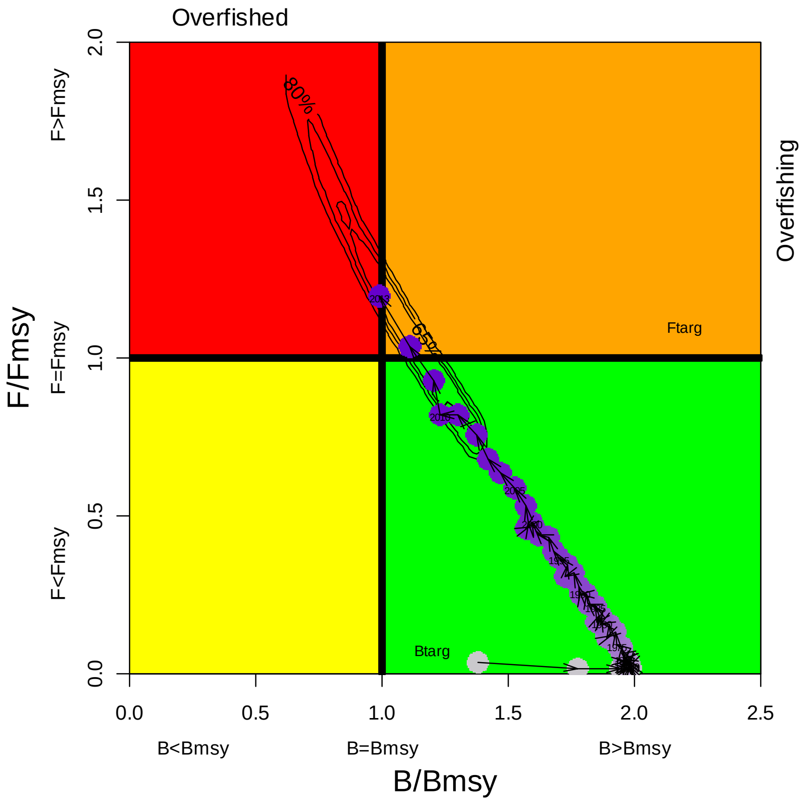


Fig 3. Kawakawa. Catch-MSY aggregated Indian Ocean assessment. The Kobe plot presents the trajectories for the range of plausible model options included in the formulation of the final management advice. The trajectory of the geometric mean of the plausible model options is also presented.

Indian Ocean kawakawa assessment using an Optimised Catch Only Method (OCOM)

117. The WPNT **NOTED** the results from the OCOM assessment method (Table 7, Fig. 4).

Table 7. Kawakawa: Key management quantities from the OCOM used in 2015.

Management Quantity	Indian Ocean
Most recent catch estimate (2013)	170,181 t
Mean catch from 2009–2013	155,468 t
MSY (1000 t) [*]	153 [125–188]
Data period used in assessment	1950–2013
F_{MSY} [*]	0.56 [0.42–0.69]
B_{MSY} (1000 t) [*]	202 [152–325]
F_{2013t}/F_{MSY} [*]	0.98 [0.85–1.11]
B_{2013}/B_{MSY} [*]	1.15 [0.97–1.38]
SB_{2013}/SB_{MSY} (80% CI)	n.a.
B_{2013}/B_0 [*]	0.58 [0.33–0.86]
SB_{2013}/SB_0 (80% CI)	n.a.
$B_{2013}/B_{0,\ F=0}$ (80% CI)	n.a.
$SB_{2013}/SB_{0,\ F=0}$ (80% CI)	n.a.

n.a. not available; plausible range: results from a combination of a specific catch only method assumed prior information, as well as catch data.

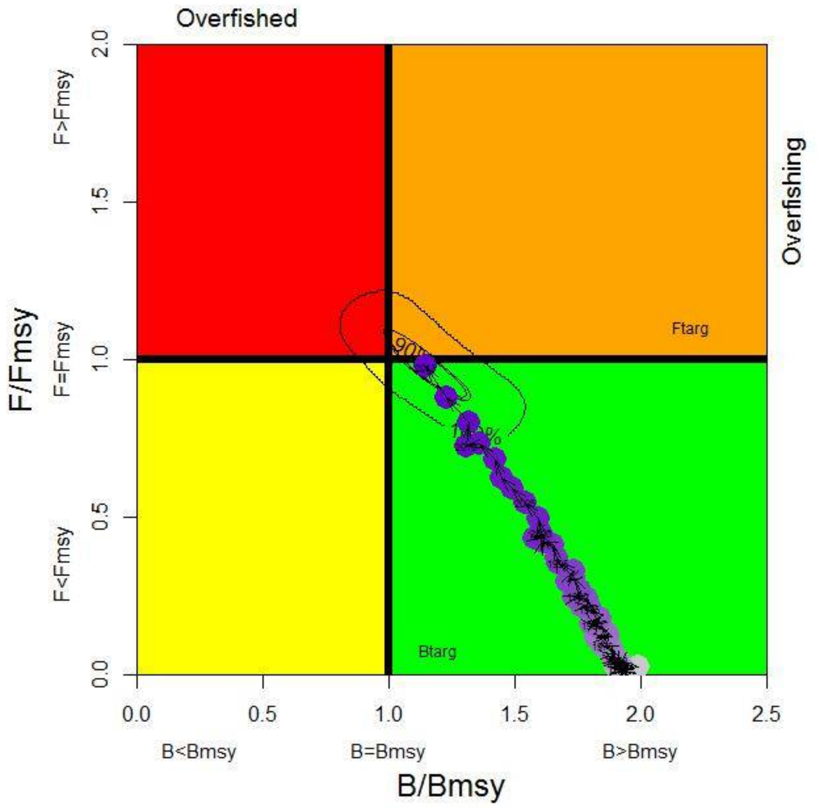


Fig. 4. Kawakawa. OCOM aggregated Indian Ocean assessment. The Kobe plot presents the trajectories for the range of plausible model options included in the formulation of the final management advice. The trajectory of the geometric mean of the plausible model options is also presented.

118. The WPNT **NOTED** that projections for this stock (Table 8) over a 10-year period may not be appropriate bearing in mind the large uncertainties in the outputs from the stock assessment model and the likelihood of increased catch and effort from areas in the northwest Indian Ocean in the near future.

Table 8. Kawakawa: 2015 OCOM Aggregated Indian Ocean assessment Kobe II Strategy Matrix. Probability (percentage) of plausible models violating the MSY-based reference points for five constant catch projections (2013 catch level, -10%, -20%, -30%, +10% and +20%) projected for 3 and 10 years. Note: from the 2015 stock assessment using catch estimates at that time.

Reference point and projection timeframe	**Alternative catch projections (relative to 2013) and weighted probability (%) scenarios that violate reference point**					
	70% (119,126 t)	**80%** (136,144 t)	**90%** (153,162 t)	**100%** (170,181 t)	**110%** (187,199 t)	**120%** (204,216 t)
$B_{2016} < B_{MSY}$	0	1	37	96	n.a.	100
$F_{2016} > F_{MSY}$	0	18	87	100	100	100
$B_{2023} < B_{MSY}$	0	0	55	100	100	100
$F_{2023} > F_{MSY}$	0	0	91	100	100	100

5.4 Selection of Stock Status indicators

119. The WPNT **NOTED** the divergence in assessment results and **AGREED** that the OCOM model results would be used for providing stock status advice.

120. The WPNT **AGREED** that the stock status management advice for kawakawa derived from data poor methods should be treated with caution. While the OCOM method presented is useful to assess stock status in the near term, the integrated stock assessment approach should be enhanced through further data collection and submission in accordance with the IOTC data recording and reporting requirements for neritic tunas.

121. The WPNT **AGREED** that in future years the integrated approach should probably be used for management advice with the addition of CPUE series, better fishery stratification and additional length-composition data.

122. The WPNT **REQUESTED** CPCs that have data for CPUE series to develop these and provide them in time for the next scheduled kawakawa stock assessment, due to take place in 2018 according to the work plan outlined in Appendix VI.

5.5 Development of technical advice on the status of kawakawa

123. The WPNT **ADOPTED** the management advice developed for kawakawa (*Euthynnus affinis*) as provided in the draft resource stock status summary – Appendix IX, and **REQUESTED** that the IOTC Secretariat update the draft stock status summary for kawakawa with the latest 2014 catch data later in the year, and for the summary to be provided to the SC as part of the draft Executive Summary, for its consideration.

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

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

Review of the statistical data available for longtail tuna

124. The WPNT **NOTED** paper IOTC–2015–WPNT05–07 Rev_1 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 (CPCs)*, for the period 1950–2012. A summary is provided at Appendix IVd.

Longtail tuna in Thai waters

125. The WPNT **NOTED** paper IOTC–2015–WPNT05–13 Rev_1 which provided the results of a study examining the status of longtail tuna in Thai waters, including the following abstract provided by the authors:

"Longtail (Thunnus tonggol) is one of the important neritic tuna resources in Thailand. Total catch production ranges from 13,545 to 81,525 tons, from Gulf of Thailand (10,012 to 79,094 tons) and Andaman Sea ranging from 1,726 to 22,036 tons. The statistics clearly show that the catch of longtail tuna obtained outside Thai waters is much greater than the catch obtained in Thai EEZs. The amount of longtail tuna caught inside Thai EEZs, has stably ranged from 6,453 to 9,974 tons during 2008 to 2012. Results of the study on biology, resource and fisheries status of longtail tuna show that biology data obtained from two study areas was slightly different. The main fishing gear is TUNA-PS, accounting 66.72% and 63.60% of total catch in the Gulf and Andaman Sea. Additionally, tunas caught by TUNA-PS are appropriate for utilization as most of them have the size larger than the size at first maturity. In terms of endanger species or rare species, they have not been found in the catch of purse seines fisheries. Subsequently, all of relevant data and information obtained will be together analyzed and used in preparing the sustainable management plan for longtail tuna of Thailand".

126. The WPNT **NOTED** the data used for this study was fisheries data rather than independently collected information.

127. The WPNT **AGREED** that the study is valuable for collecting biological and fisheries data and **REQUESTED** the work is continued, if possible, for multiple years to investigate temporal trends.

128. The WPNT **REQUESTED** that other CPCs cooperate with Thailand to conduct similar studies in other areas.

129. The WPNT **NOTED** that the government of Thailand is considering quota management for the future as well as other capacity reduction options.

130. The WPNT **NOTED** the importance of understanding the dynamics of tuna across the entire Indian Ocean as well as understanding individual country effects. Results from Indonesia and Thailand have indicated that there is high localised pressure on the stocks.

6.2 Data for input into stock assessments

Longtail tuna in Indian waters

131. The WPNT **NOTED** paper IOTC–2015–WPNT05–27 which provided an overview of the tuna fishery in India with special reference to the spatial distribution and biology of *Thunnus tonggol* along the northwest region, including the following abstract provided by the authors:

"Tunas with an estimated landing of 88,840 t during 2014 have registered an increasing trend over the years. Andhra Pradesh followed by Kerala, Tamil Nadu and Gujarat were the major coastal states contributing to the total tuna catch. Exploitation was mainly by gillnets (44.9%), seines (28.2%) and lines (15%). The neritic and oceanic tunas contributed 65.2% and 34.8% of the total tuna catch respectively. E.affinis followed by T.tonggol were the dominant species among neritic tunas. Maximum contribution to

the neritic tunas catch was by Andhra Pradesh followed by Kerala, Tamil Nadu and Gujarat. Fishing data collected from mechanised multiday gillnetters, the main gear exploiting tunas along the Saurashtra Coast of Gujarat substantiated the typical neritic nature of the long tail tuna and indicated that there are distinct areas of abundance over the seasons. The post monsoon and winter periods were the peak longtail tuna landing time". – see paper for full abstract.

6.3 Stock assessment updates – Summary

Table 9. Longtail tuna: Key management quantities from stock assessments conducted in 2015.

Management quantity	Catch-MSY	OCOM	ASPIC
Most recent catch estimate (2013)	159,312 t	159,313 t	159,000
Mean catch from 2009–2013 (5-yrs)	142,101 t	142,457 t	142,000
MSY (1000 t) [*](**)	133 [101–199]	138 [100–196]	122 (106–173)
Data period used in assessment	1950–2013	1950–2013	1950–2013
F_{MSY} [*](**)	0.41 [0.28–0.62]	0.39 [0.29–0.54]	0.55 (0.48–0.78)
B_{MSY} (1000 t) [*] (**)	262 [153–311]	288 (189–521)	221 (189–323)
F_{2013}/F_{MSY} [*] (**)	1.23 [0.64–2.17]	1.11 [0.94–1.29]	1.43 (0.58–3.12)
B_{2013}/B_{MSY} [*] (**)	0.92 [0.60–1.40]	1.02 [0.84– 1.25]	1.01 (0.53–1.71)
SB_{2013}/SB_{MSY}	n.a.	n.a.	n.a.
B_{2013}/B_0 [*] (**)	0.46 [0.30–0.70]	0.56 [0.33–0.86]	0.41(n.a.)
SB_{2013}/SB_0	n.a.	n.a.	n.a.
$B_{2013}/B_{0,\ F=0}$	n.a.	n.a.	n.a.
$SB_{2013}/SB_{0,\ F=0}$	n.a.	n.a.	n.a.

n.a. not available; R results from a combination of a specific catch only method assumed prior information, as well as catch data. [*] Square brackets indicate plausible ranges; (**) curved brackets indicate 80% CI.

Indian Ocean longtail tuna assessment using catch-based methods

132. The WPNT **NOTED** paper IOTC–2015–WPNT05–22 which included a stock assessment for longtail tuna using catch-only methods, including the following abstract provided by the authors:

"Assessing the status of the stocks of neritic tuna species in the Indian Ocean is fairly challenging due to the lack of available data. This includes limited information on stock structure, a lack of standardised CPUE series and biological information. Data poor stock assessments were conducted for longtail tuna (Thunnus tonggol) in 2013 (IOTC–2013–WPNT03–25) and again in 2014 (IOTC–2014–WPNT04–25). This paper provides an update to these assessments based on the recent new catch information. In this paper, two methods were used to assess the status of T. tonggol: (i) Stock reduction analysis or Catch MSY method (Kimura and Tagart 1982; Walters et. al. 2006; Martell and Froese 2012) and (ii) a recently developed posterior-focussed catch method OCOM (Zhou et al., 2013). Both models provided relatively robust estimates of MSY with respect to the different assumptions tested in terms of prior ranges set on key parameter values. The OCOM method resulted in a median MSY estimate of 134 000 t while the Catch-MSY method estimated MSY at 130 000 t. Although total catches decreased between 2012 and 2013 from 170 000 to 159 000 t, catches are still well above the estimated level of MSY. The stock is likely to be subject to overfishing with an F_{2013}/F_{MSY} ratio of 1.23 and 1.11 for the Catch-MSY and OCOM models respectively. These estimates also correspond well to those of the previous assessments in 2014 which were 1.08 and 1.23. Estimates of the B_{2013}/B_{MSY} ratio were slightly lower this year, however, at 0.92 and 1.02 for the Catch-MSY and OCOM models respectively compared with 1.12 and 1.05 from the previous assessments".

133. The WPNT **NOTED** the new prior range used for r, informed by paper IOTC–2015–WPNT05–DATA13.

134. The WPNT **NOTED** the similarity in the estimates of MSY between the Catch-MSY and OCOM methods, largely based on the similarity in prior ranges used for each model.

135. The WPNT **NOTED** that the biomass trajectory closely reflects the catch series trajectory for both catch-only methods.

136. The WPNT **NOTED** that the catch data used has a higher uncertainty than that for the tropical tunas which should be acknowledged when interpreting the results. The assumptions made regarding depletion level ranges also drive the analysis, so the depletion levels should also be noted when presenting advice.

Indian Ocean longtail tuna assessment using a Catch-MSY Method

137. The WPNT **NOTED** the results from the Catch-MSY assessment method (Table 10, Fig. 5).

Table 10. Longtail tuna: Key management quantities from the Catch-MSY used in 2015.

Management Quantity	Aggregate Indian Ocean
Most recent catch estimate (2013)	159,312 t
Mean catch from 2009–2013 (5-yrs)	142,101 t
MSY (1000 t) [*]	133 [101–199]
Data period used in assessment	1950–2013
F_{MSY} [*]	0.41 [0.28–0.62]
B_{MSY} (1000 t) [*]	262 [153–311]
F_{2013}/F_{MSY} [*]	1.23 [0.64–2.17]
B_{2013}/B_{MSY} [*]	0.92 [0.60–1.40]
SB_{2013}/SB_{MSY} (80% CI)	n.a.
B_{2013}/B_0 [*]	0.46 [0.30–0.70]
SB_{2013}/SB_0 (80% CI)	n.a.
$B_{2013}/B_{0,\ F=0}$ (80% CI)	n.a.
$SB_{2013}/SB_{0,\ F=0}$ (80% CI)	n.a.

n.a. not available; plausible range: results from a combination of a specific catch only method assumed prior information, as well as catch data. [*] Square brackets indicate plausible ranges used

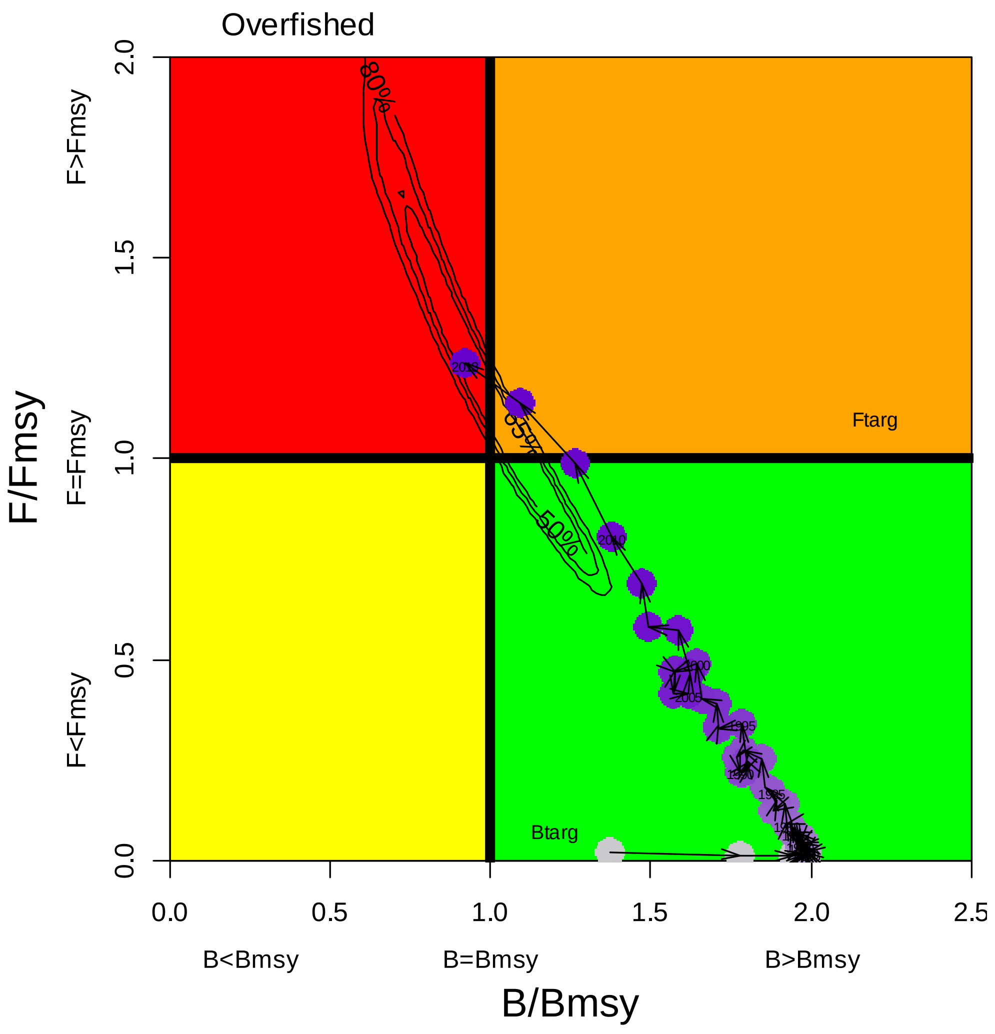


Fig. 5. Longtail tuna. Catch-MSY Indian Ocean assessment Kobe plot for longtail tuna. The Kobe plot presents the trajectories for the range of plausible model options included in the formulation of the final management advice. The trajectory of the geometric mean of the plausible model options is also presented.

Indian Ocean longtail assessment using an Optimised Catch Only Method (OCOM)

138. The WPNT **NOTED** the results from the OCOM assessment method (Table 11, Fig. 6).

Table 11. Longtail tuna: Key management quantities from the OCOM used in 2015.

Management Quantity	Indian Ocean
Most recent catch estimate (2013)	159,313 t
Mean catch from 2009–2013 (5-yrs)	142,457 t
MSY (1000 t) [*]	138 t [100–196]
Data period used in assessment	1950–2013
F_{MSY} [*]	0.39 [0.29–0.54]
B_{MSY} (1000 t) [*]	288 [189–521]
F_{2013}/F_{MSY} [*]	1.11 [0.94–1.29]
B_{2013}/B_{MSY} [*]	1.02 [0.84–1.25]
SB_{2013}/SB_{MSY} (80% CI)	n.a.
B_{2013}/B_0 [*]	0.56 [0.33–0.86]
SB_{2013}/SB_0 (80% CI)	n.a.
$B_{2013}/B_{0,\ F=0}$ (80% CI)	n.a.
$SB_{2013}/SB_{0,\ F=0}$ (80% CI)	n.a

n.a. not available; plausible range: results from a combination of a specific catch only method assumed prior information, as well as catch data. [*] Square brackets indicate plausible ranges used

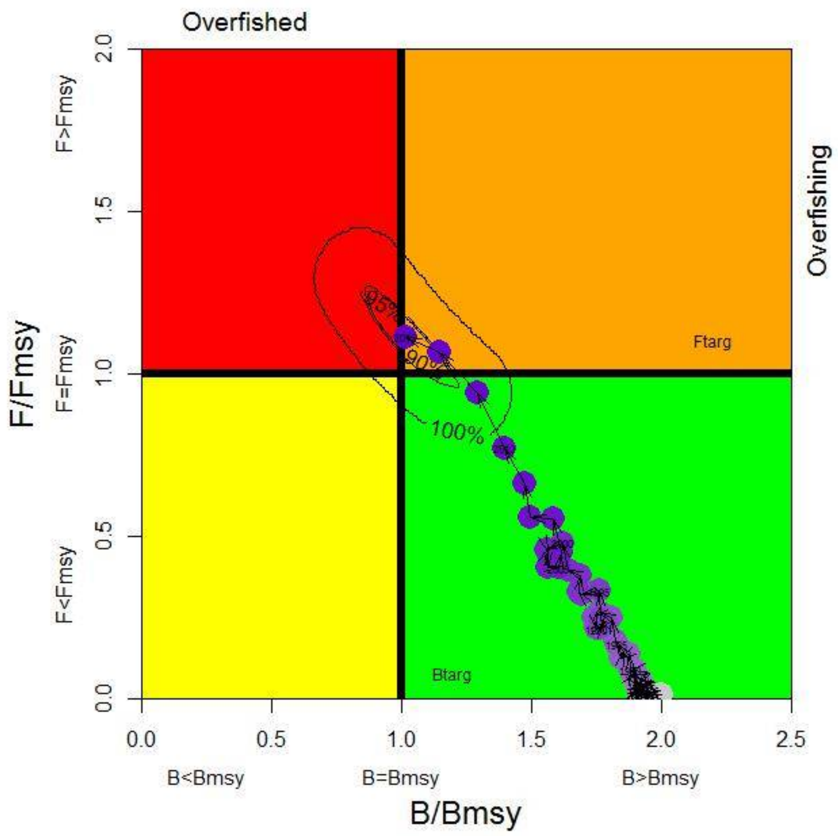


Fig. 6. Longtail tuna OCOM Indian Ocean assessment Kobe plot. The Kobe plot presents the trajectories for the range of plausible model options included in the formulation of the final management advice. The trajectory of the geometric mean of the plausible model options is also presented.

139. The WPNT **NOTED** that considering the uncertainties, the updated stock assessments carried out in 2015 were similar to the results in 2013 and 2014 which give consistency to the general perception of the stock status. The two assessments in subsequent years indicate similar stock status across years.

Assessment of longtail tuna using ASPIC methods

140. The WPNT **NOTED** paper IOTC–2015–WPNT05–28 which included a stock assessment for longtail tuna using ASPIC, including the following abstract provided by the authors:

“*We attempted the stock assessment for longtail tuna in the Indian Ocean by ASPIC using nominal catch and four available CPUE (1950-2013). We assume that longtail tuna in the Indian Ocean is a single stock. Results of the ASPIC analysis suggested that longtail tuna stock status (2013) is in the overfishing phase (orange zone in the Kobe plot) (F/Fmsy=1.43 and TB/TBmsy=1.01), i.e., high F (high fishing pressure, 43% above the Fmsy level), while the TB is about in the TBmsy level. Uncertainty around the 2013 point estimate in the Kobe plot is covered by 54% in the red zone, 25% in orange and 21% in green. In addition, the direction of the stock status trajectory vector is toward the red zone. These facts suggest that the 2013 stock status has the high probability in the red (overfished) zone. The risk assessment (Kobe II) suggests that if the current catch continues (159,313 t), there are high risks (100%) for both TB and F to violate their MSY levels. If the current catch level is reduced by 30%, then risk probabilities for both TB and F will be reduced by 50% in three years later (2016)*”.

141. The WPNT **THANKED** the authors for using a new assessment approach to assess the stock and **NOTED** the similarity in the results presented among the different approaches.

142. The WPNT **NOTED** the standardised CPUE series that has not been submitted to the IOTC Secretariat for use in analyses and **REQUESTED** that these data are submitted to the IOTC Secretariat by Oman.

143. The WPNT **NOTED** that nominal CPUE series were used for the Thailand gillnet, purse seine and Australian handline fleets due to lack of standardised series available for these fleets.

144. The WPNT **NOTED** that each year, estimates of the previous year catches (2012 here) have been increased since the previous assessment. The WPNT **NOTED** that this may be due to the complete dataset not being received in time for the assessment or due to other data revisions.

145. The WPNT **NOTED** that the contribution of the fisheries of Oman (11.1%) and Thailand (4.8%) to total Indian Ocean catches are fairly low and expressed concern about the use of a data-rich approach when the data used may be a very small component of the total for the Indian Ocean catches.

146. WPNT **NOTED** the stock is considered to be subject to overfishing using the ASPIC model. The KOBE plot indicates that the stock falls predominantly within the red zone (54% probability) followed by the orange (25%) and green (21%) zones. Furthermore, the trajectory indicates that the stock is moving towards a status of being considered as subject to overfishing and overfished.

147. The WPNT **NOTED** that while other management organisations may attempt to use consistent approaches among species and across years, it was agreed that the best approach would be used for each species on a case-by-case basis according to the amount of information available for that species and the suitability of the modelling method.

148. The WPNT **AGREED** to use the ASPIC model for management advice. The WPNT **NOTED** that, based on the data available, assessment methods and assumption of a single Indian Ocean stock in the current region, longtail tuna is exceeding the target rate of fishing mortality (F_{MSY}) and the biomass is at about B_{MSY} levels (Table 12, Fig. 7).

Table 12. Longtail tuna stock status summary in the Indian Ocean based on ASPIC model results in 2015.

Management Quantity	ASPIC model
Most recent catch estimate (1,000 t) (2013)	159
Mean catch over last 5 years (1,000 t) (2009–2013)	142
MSY (1,000 t)	122 (106–173)
Current Data Period (catch)	1950–2013
CPUE	GILL (Andaman Sea, Thailand) (1998-2010)
	GILL (Oman) (2001–2012) (2002–2013)
	PS (Andaman Sea, Thailand) (1998–2010)
	HANDLINE (Australia) (2001–2013)
F_{MSY} (80%CI)	0.55 (0.48–0.78)

Bmsy (1,000 t) (80%CI)	221 (189–323)
$F_{2013}/F_{(MSY)}$ (80% CI)	1.43 (0.58–3.12)
B_{2013}/B_{MSY} (80% CI)	1.01 (0.53–1.71)
B_{2013}/B_{1950} (80%CI)	0.41(n.a.)

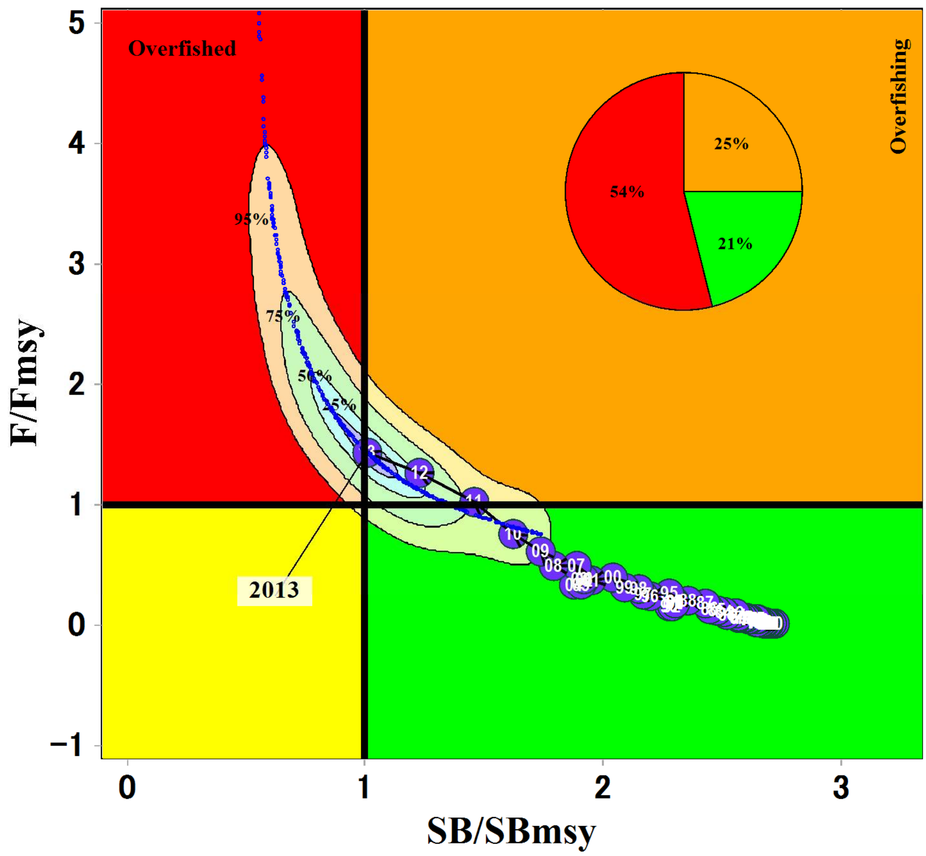


Fig. 7. Longtail tail. ASPIC Kobe plot of longtail tuna in the Indian Ocean (1950-2013) with 80%CI uncertainty around the 2013 point and compostions of uncertainties in terms of 4 phases (colours) of the Kobe plot (pie chart).

Table 13. Longtail tuna: 2015 ASPIC Aggregated Indian Ocean assessment Kobe II Strategy Matrix. Probability (percentage) of plausible models violating the MSY-based reference points for five constant catch projections (2012 catch level, -10%, -20%, - 30%, +10% and +20%) projected for 3 and 10 years. Note: from the 2015 stock assessment using catch estimates at that time.

Reference point and projection timeframe	**Alternative catch projections (relative to 2013) and weighted probability (%) scenarios that violate reference point**					
	70% (111,519 t)	**80%** (127,450 t)	**90%** (143,382 t)	**100%** (159,313 t)	**110%** (175,244 t)	**120%** (191,176 t)
$B_{2015} < B_{MSY}$	48	56	66	100	100	100
$F_{2015} > F_{MSY}$	13	53	71	87	n.a.	100
$B_{2023} < B_{MSY}$	52	76	100	100	100	100
$F_{2023} > F_{MSY}$	65	82	89	96	n.a.	100

149. The WPNT **NOTED** that projections for this stock (Table 13) over a 10-year period may not be appropriate bearing in mind the large uncertainties in the outputs from the stock assessment model and the likelihood of increased catch and effort from areas in the northwest Indian Ocean in the near future. These projections likely reflect a best case scenario based on current effort trajectories.

6.4 Selection of Stock Status indicators

150. The WPNT **NOTED** that a conservative, precautionary approach is needed for management. As it is clear that the stock is at the very least approaching limit reference points it would be advisable to be more precautionary now rather than exceed reference points further.

151. The WPNT **NOTED** that the lack of information on stock structure affects this and if there are more sub-stocks then this will require more localised rather than regional management.

152. The WPNT **NOTED** that the three stock assessment approaches gave similar estimates of MSY.

153. The WPNT **AGREED** that stock status management advice for longtail tuna should be based on the ASPIC method. The approach makes use of more of the available data, including a range of standardised and nominal CPUE series. These series need to be developed in other countries and for more species.

6.5 Development of technical advice on the status of longtail tuna

154. The WPNT **ADOPTED** the ASPIC management advice developed for longtail tuna (*Thunnus tonggol*) as provided in the draft resource stock status summary – Appendix X, and **REQUESTED** that the IOTC Secretariat update the draft stock status summary for longtail tuna with the latest 2014 catch data, and for the summary to be provided to the SC as part of the draft Executive Summary, for its consideration.

7. Indo-Pacific king Mackerel – Review of New Information on Stock Status

7.1 Review new information on the biology, ecology, stock structure, their fisheries and associated environmental data for Indo-Pacific king mackerel

Review of the statistical data available for Indo-Pacific king mackerel

155. The WPNT **NOTED** paper IOTC–2015–WPNT05–07 Rev_1 which provided an overview of the standing of a range of information received by the IOTC Secretariat for Indo-Pacific king mackerel, in accordance with IOTC Resolution 10/02 *Mandatory statistical requirements for IOTC Members and Cooperating non-Contracting Parties (CPC)*, for the period 1950–2013. A summary is provided at Appendix IVf.

7.2 Data for input into stock assessments

No papers provided.

7.3 Stock assessment

Indian Ocean Indo-Pacific king mackerel assessment using catch-based methods

156. The WPNT **NOTED** paper IOTC–2015–WPNT05–24 which included a stock assessment for Indo-Pacific king mackerel using catch-based methods, including the following abstract provided by the authors:

> "*Assessing the status of the stocks of neritic tuna species in the Indian Ocean is fairly challenging due to the lack of available data. This includes limited information on stock structure, a lack of standardised CPUE series and biological information. While a number of methods have been used to assess the stocks of some other neritic tuna species, this paper constitutes the first attempt at assessing the status of the Indo-pacific king mackerel (Scomberomorus guttatus) in the Indian Ocean. In this paper, two data-poor methods were used to assess the status of Indian Ocean Indo-pacific king mackerel: (i) a Catch-MSY method, based on stock reduction analysis (Kimura and Tagart 1982; Walters et. al. 2006; Martell and Froese 2012) and a recently developed posterior-focussed Optimised Catch Only Method, OCOM (Zhou et al., 2013). Results between the two models were very similar with MSY estimated at 44 000 t based on the Catch-MSY model and 43 000 t based on the OCOM model. Both models indicated that S. guttatus is 'not overfished' (B_{2013}/Bmsy = 1.04; 1.01), and as F_{2013}/Fmsy = 1.00 and 1.05 for the two model approaches used, the stock is considered to be 'subject to overfishing'. The catch in 2013 was reported to be 46 354 t which, while lower than the average of the previous 5 years (49 870 t), is still higher than both estimates of MSY*".

157. The WPNT **NOTED** that this is the first attempt to undertake an assessment for Indo-Pacific king mackerel and uses the same approach as in the other two data poor approaches.

158. The WPNT **NOTED** the issues with nominal catch data for Indo-Pacific king mackerel based on the estimation methods used for data which are not reported or not reported at the required level of resolution.

159. The WPNT **NOTED** that neritic species are often caught together by the same fisheries, resulting in mixed species catches and issues with differentiating between some of the neritic species mean that catches are commonly reported as aggregates. In these situations, nominal catches of each species must be estimated from the best estimates available, which is usually the proportional representation of species caught by the fleet in previous years, or based on proportional catches by similar fleets which are used as proxies. As a result, the catch statistics are often correlated across species (Fig. 8), however, this has improved over time.

160. The WPNT **NOTED** that the main areas of catch estimation for *S. guttatus* include those for Indonesia where species identification issues mean that total reported catches are multiplied by proportional catches estimated by a consultant who has been working on these issues for the IOTC. Catches reported by Myanmar are reported as seerfish aggregates so these are separated into *S. commerson* and *S. guttatus* using proxy fleet ratios. The same process is used for aggregate catches reported by Thailand, Malaysia and Bangladesh. Iran has been reporting catches by species since 1982, however, prior to this species are disaggregated using the proportional catches between 1982 and 1985. For Pakistan, and Yemen (prior to 2004) there are no reported catches of *S. guttatus* so the reported *S. commerson* are disaggregated into catches of each species.

161. The WPNT **NOTED** that the catches of *S. guttatus* are therefore highly correlated with *S. commerson.* This should be taken into consideration when considering the reliability of the assessment results, given that these methods are highly dependent on the catch series trends.

162. The WPNT also **NOTED** that the nominal catch data in the IOTC database for all of the neritic tuna species assessed shows strong positive correlations among all species, particularly for historic years, whereas they are not so highly correlation in more recent years where more disaggregated data have been provided.

163. The WPNT **NOTED** that while some correlation in the catches of nominal catches of neritic tuna species may be expected due to the mixed species nature of the fisheries, the very high correlations observed in early years are unlikely to reflect real trends but are more likely to be indicative of the estimation processes used and therefore indicative of the data quality.

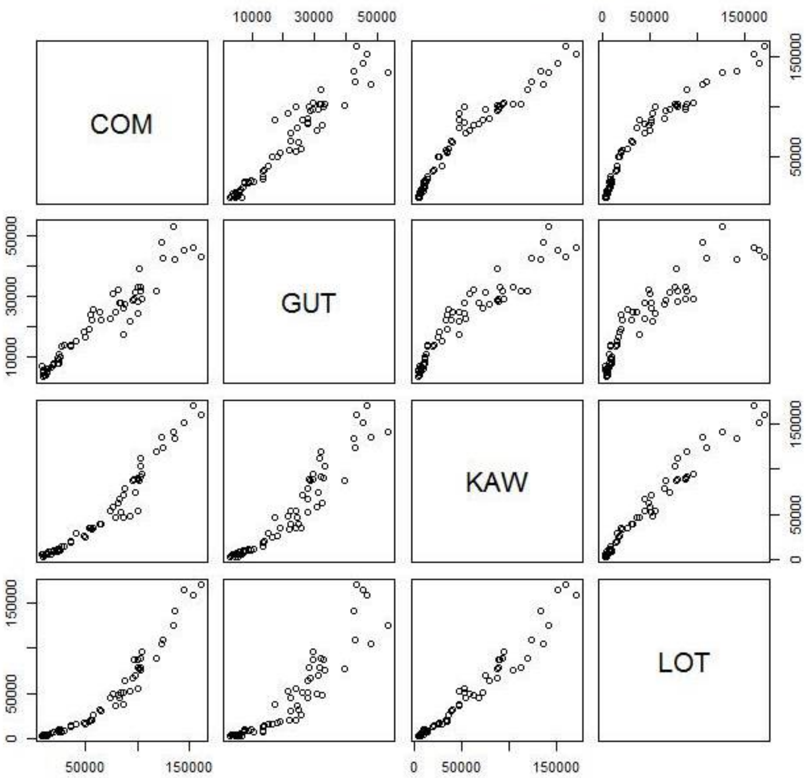


Fig. 8. Scatterplot matrix showing the relationship between the four neritic tuna species to undergo assessment in 2015: COM *(Scomberomorus commerson)*, GUT *(Scomberomorus guttatus*), KAW *(Euthynnus affinis)* and LOT *(Thunnus tonggol)* (1950–2013).

164. The WPNT **AGREED** that a set of standardised or even nominal CPUE series would increase the possibilities for assessment approaches.

165. The WPNT **NOTED** that India have a standardised CPUE series for *S. guttatus* and **REQUESTED** that they provide this data to the working party for use in time for the next assessment.

166. The WPNT **AGREED** that as the data and stock assessment approaches are uncertain and have only been carried out for one year, that no management advice would be present in terms of stock status, only in terms of the yield target.

167. The WPNT **NOTED** that the catch data used have a higher uncertainty than tropical tuna and should be acknowledged when presenting results. The assumptions made with depletion levels also drive the analysis, and the depletion levels should be noted while presenting advice.

Indian Ocean Indo-pacific king mackerel assessment using Catch-MSY

168. The WPNT **NOTED** the results from the Catch-MSY assessment method (Table 14, Fig. 9).

Table 14. Indo-Pacific king mackerel: Key management quantities from the Catch-MSY used in 2015. Geometric means and plausible ranges across all feasible model runs. n.a. = not available.

Management Quantity	Aggregate Indian Ocean
Most recent catch estimate (2013)	46,340 t
Mean catch from 2009–2013	49,886 t
MSY (1,000 t) [*]	44 [35–53]
Data period used in assessment	1950–2013
F_{MSY} [*]	0.45 [0.29–0.64]
B_{MSY} (1,000 t) [*]	78 [48–106]
F_{2013}/F_{MSY} [*]	1.00 [0.67–1.91]
B_{2013}/B_{MSY} [*]	1.04 [0.60–1.40]
SB_{2013}/SB_{MSY} (80% CI)	n.a.
B_{2013}/B_0 [*]	0.55 [0.30–0.70]
SB_{2013}/SB_0 (80% CI)	n.a.
$B_{2013}/B_{0,\ F=0}$ (80% CI)	n.a.
$SB_{2013}/SB_{0,\ F=0}$ (80% CI)	n.a.

n.a. not available; [*] plausible range: results from a combination of a specific catch only method assumed prior information, as well as catch data.

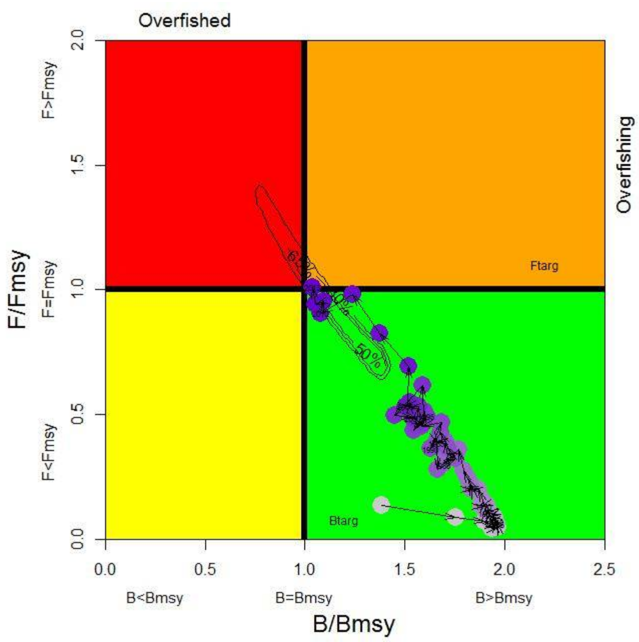


Fig. 9. Indo-Pacific king mackerel. Catch-MSY assessment for Indian Ocean *S. guttatus*. The Kobe plot presents the trajectories for the range of plausible model options included in the formulation of the final management advice. The trajectory of the geometric mean of the plausible model options is also presented.

Indian Ocean Indo-Pacific king mackerel: assessment using OCOM

169. The WPNT **NOTED** the results from the OCOM assessment method (Table 15, Fig. 10).

Table 15. Indo-Pacific king mackerel: Key management quantities from the OCOM assessment in 2015 using a base case with maximum depletion of 70%. Geometric means and plausible ranges in brackets. n.a. = not available.

Management Quantity	Indian Ocean
Most recent catch estimate (2013)	46,354 t
Mean catch from 2009–2013	49,870 t
MSY (1,000 t) [*]	43 [36–53]
Data period used in assessment	1950–2013
F_{MSY} [*]	0.42 [0.34–0.52]
B_{MSY} (1,000 t) [*]	83 [60–131]
F_{2013}/F_{MSY} [*]	1.05 [0.91–1.27]
B_{2013}/B_{MSY} [*]	1.01 [0.80–1.20]
SB_{2013}/SB_{MSY} (80% CI)	n.a.
B_{2013}/B_0 [*]	0.52 [0.34–0.74]
SB_{2013}/SB_0 (80% CI)	n.a.
$B_{2013}/B_{0,\ F=0}$ (80% CI)	n.a.
$SB_{2013}/SB_{0,\ F=0}$ (80% CI)	n.a.

n.a. not available; [*] plausible range: results from a combination of a specific catch only method assumed prior information, as well as catch data.

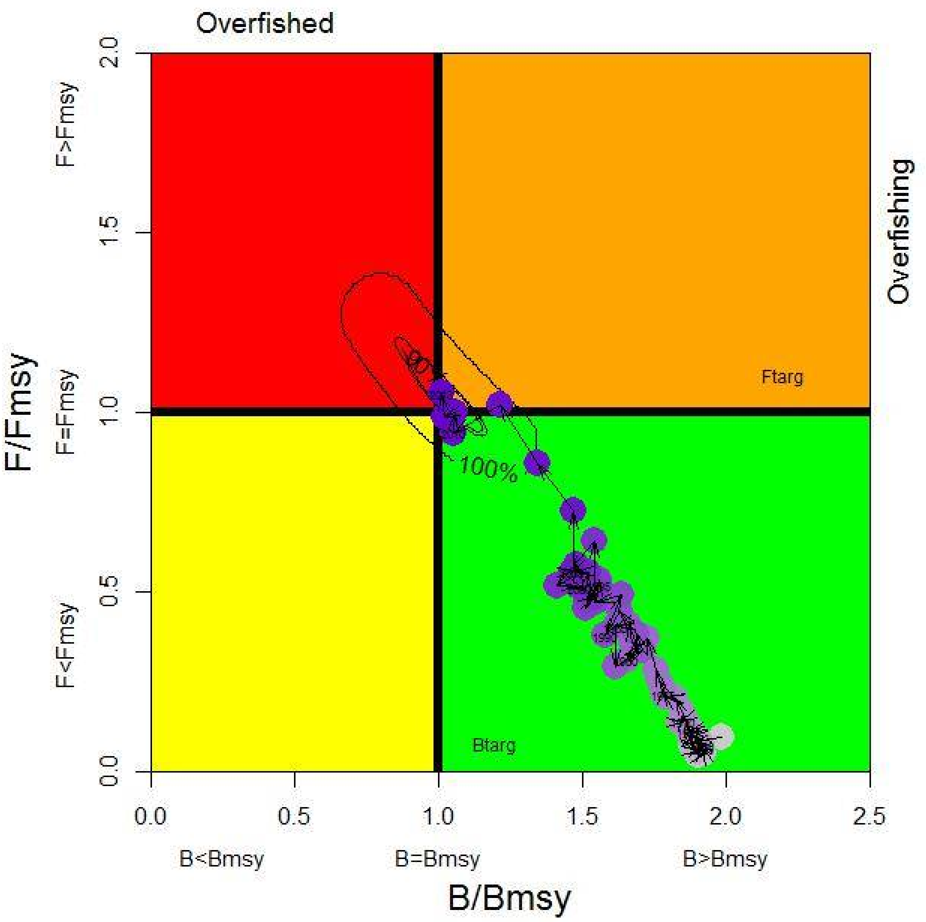


Fig. 10. Indo-Pacific king mackerel: *S. guttatus* OCOM Indian Ocean assessment Kobe plot. The Kobe plot presents the trajectories for the range of plausible model options included in the formulation of the final management advice. The trajectory of the geometric mean of the plausible model options is also presented.

7.4 Selection of Stock Status indicators

170. The WPNT **NOTED** that the approaches both gave very similar estimates of stock status and target yield. Nevertheless, The WPNT **AGREED** that stock status management advice for Indo-Pacific king mackerel should be deferred until a further assessment has been undertaken given the low reliability given to the catch data. The WPNT **REQUESTED** more data is made available so that traditional stock assessment approaches may also be attempted for this species.

9.5 Development of technical advice on the status of Indo-Pacific king mackerel

171. Based on the poor quality of the data available and the uncertainty of the model results, the WPNT **AGREED** not to provide management advice for Indo-Pacific king mackerel (*Scomberomorus guttatus*) this year in the draft resource stock status summary – Appendix XII. The WPNT **REQUESTED** that the IOTC Secretariat update the draft stock status summary for Indo-Pacific king mackerel with the latest 2014 catch data, and for the summary to be provided to the SC as part of the draft Executive Summary, for its consideration.

8. Narrow-Barred Spanish Mackerel – Review of New Information on Stock Status

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

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

172. The WPNT **NOTED** paper IOTC–2015–WPNT05–07 Rev_1 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)*, for the period 1950–2013. A summary is provided at Appendix IVf.

India: Narrow-barred Spanish mackerel

173. The WPNT **NOTED** paper IOTC–2015–WPNT05–14 which provided an overview of the status of the Indian seerfish fishery, including a review of the biology of narrow–barred Spanish mackerel, including the following abstract provided by the authors:

“*Seer fish refers to subfamily of the* Scombridae *or* Mackerel *family. These include species like* Indo-Pacific *king mackerel, Scomberomorus guttatus, (Spotted Seerfish), Streaked Spanish mackerel, S. lineolatus, (Streaked seerfish or Strooed seer fish), Narrow-barred Spanish mackerel, S. commerson (King Mackerel),Korean mackerel, Scomberomorus koreanus, (Korean seerfish) and Deep sea Seer fish, Acanthocybium solandri (Wahoo). Seer Fish resource is being mainly exploited all along the Indian coast by both mechanized and non- mechanized fishing units by employing different types of gears like drift gill net, hooks and line, trawl net, shore-seine etc. Present exploitation is limited to the near shore waters up to the depth of 50 m by trawlers and beyond 50 m by drift gill net and hooks and line units Gill nets with larger mesh size from 120-170 mm have been observed very efficient in catching seer fish. Hooks of different sizes are used in hand line, long line and troll lines*”. – see paper for full abstract

Kenya: Narrow-barred Spanish mackerel

174. The WPNT **NOTED** paper IOTC–2015–WPNT05–15 which provided an overview of the spatial and temporal distribution of kingfish catches in Kenyan waters by artisanal fishers, including the following abstract provided by the authors:

“The Kenyan coastline administratively consists of five Counties namely Kilifi, Kwale, Lamu, Mombasa and Tana River County. Records of Kingfish (Scomberomorus commerson) catches were collected from June 2013 to May 2014. Spatially, Kilifi County recorded the highest sampled landings estimated to be 10,900 kgs followed by Kwale County (6,306 kgs), Tana River County (1,321), Mombasa County (371 kgs) and Lamu (47 kgs) respectively. On temporal scale, the two peak seasons were in March to April and November to December, while the month of May recorded the lowest catch. The catches were reported throughout the year with January to February and September to October recording average catches. Gear wise, gillnets, handline and ringnets were the main fishing gears targeting kingfish contributing about 92% of the sampled catches. The recorded landings per gear were highest from handline with 246 positive trips while ringnet recorded the highest average catch per fishing trip”.

175. The WPNT **NOTED** that the sampling coverage is total during the low fishing seasons while a percentage of the fishery is sampled during the high seasons.

176. The WPNT **REQUESTED** that Kenya investigates spatial and temporal trends spanning a longer time period to evaluate whether the seasonal trends persist.

177. The WPNT **NOTED** the spatial distribution of catches along the Kenyan coastline which were higher in the south. A similar high concentration has also been reported in the northern part of the neighbouring Tanzania. The WPNT also **NOTED** that *S. commerson* is fished all year round in southern Kenyan and northern Tanzania waters, suggesting there are ecological reasons for the residency of some individuals. Therefore the WPNT **REQUESTED** the CPCs work together to investigate potential factors leading to the localised high concentrations of *S. commerson* in the area.

178. The WPNT **REQUESTED** Kenya further analyse CPUE data, particularly relating to the different gears used by the artisanal fishers to evaluate the impacts of the gears on the species. **NOTING** that the sampling has been taking place for two years, the WPNT **REQUESTED** Kenya continue this work to develop a longer time series of data and to present this to the WPTN in the future.

179. The WPNT **NOTED** that although only one species of the neritic tunas was earmarked as a priority species during the initial development of the sampling protocol, more neritic tunas were later incorporated. Addition of more neritic tuna species together with inclusion of other stock parameters in the data collection protocol will enrich the information on neritic tunas in the area and requested Kenya to report the findings in future.

8.2 Data for input into stock assessments

No papers provided.

8.3 Stock assessment updates

Indian Ocean narrow-barred Spanish mackerel assessment using catch-based methods

180. The WPNT **NOTED** paper IOTC–2015–WPNT05–23 which described two stock assessments conducted for narrow-barred Spanish mackerel using catch-only methods, including the following abstract provided by the authors:

"In 2014, two data-poor approaches using only catch information, Catch-MSY and OCOM, were used to assess the status of Indian Ocean narrow-barred Spanish mackerel (Scomberomorus commerson) (IOTC–2014–WPNT04–26). These approaches are updated here based on the recent new catch information. The assessment results for the two methods provided fairly different estimates of maximum sustainable yield. The Catch-MSY model estimated the mean MSY at 137 828 (~136k median) while the OCOM model estimated the mean MSY at 127 731 t (median ~125k). These findings were very similar to the 2014 assessment results which estimated MSY at 136 000 t and 124 000 t for the Catch-MSY and OCOM methods respectively. These results all indicate that current catch levels (153 324 t in 2013) are above the estimated maximum sustainable yield. Estimates of current stock status were, however, less positive compared with the 2014 assessments which predicted the biomass relative to optimum levels ($B_{current}/B_{MSY}$) at 1.17 and the fishing mortality relative to optimum levels ($F_{current}/F_{MSY}$) at 0.98. The current assessments predicted slightly lower biomass $B_{current}$ /B_{MSY} at 1.01 (Catch-MSY) and 0.96 (OCOM), and a higher fishing mortality, $F_{current}/F_{MSY}$ 1.07 (Catch-MSY) and 1.21 (OCOM). This is quite likely to be due to the increased estimate of the catches in 2012 and the additional catches in 2013 which were again above the MSY levels estimated by all models. Based on the weight-of-evidence currently available, and using the precautionary lower estimates, the stock is considered to be 'overfished' and 'subject to overfishing', though there are substantial uncertainties which are described throughout this paper".

181. The WPNT **NOTED** that based on the data and assumption of a single Indian Ocean stock in the current region, narrow-barred Spanish mackerel is now over the optimal rate of fishing mortality (F_{MSY}) and the biomass is below B_{MSY} levels. This is different to the assessment results from 2014 primarily due to changes to the catch series.

182. The WPNT **NOTED** the revisions to the nominal catch series since the assessment that took place in 2014, including an increase in the estimated catch for 2012 from 143,000 t to 160,000 t and a new catch estimate for 2013, resulting in 5 years of catches which were all above the estimated MSY of 125,000 t.

183. The WPNT **NOTED** that the main changes to the catch data series since the 2014 assessment were based on revised estimates of nominal catches from India and Indonesia. Data for India were estimated in 2014, and has since been updated based on reports by India. Nominal catch estimates for 2005 to 2012 for Indonesia have also been revised over the last year based on work undertaken through an IOTC funded consultancy project to improve data estimates.

184. The WPNT **NOTED** the lower r prior range used for the assessment based on the literature review in paper IOTC–2015–WPNT05–DATA14 – COM resulting in lower resiliency estimates.

185. The WPNT **NOTED** that the results of the OCOM model predict lower depletion levels than for other species.

186. The WPNT **NOTED** that in some regions (I.R. Iran) *S. commerson* commands a higher price than species such as kawakawa and that this night be a reason for more depletion of the species, however, longtail tuna is more expensive still.

187. The WPNT **AGREED** to use stock status advice based on the OCOM model.

188. The WPNT **NOTED** that the catch data used have a higher uncertainty than tropical tuna and should be acknowledged when presenting results. The assumptions made about depletion levels also drive the analysis, and the depletion levels should be noted while presenting advice.

Indian Ocean Narrow-barred Spanish mackerel: assessment using Catch-MSY

Table 16. Narrow-barred Spanish mackerel: Key management quantities from the Catch-MSY used in 2015. Geometric means and plausible ranges across all feasible model runs

Management Quantity	Aggregate Indian Ocean
Most recent catch estimate (2013)	153,341 t
Mean catch from 2009–2013	143,998 t
MSY (1,000 t) [*]	138 [107–187]
Data period used in assessment	1950–2013
F_{MSY} [*]	0.43 [0.28–0.64]
B_{MSY} (1,000 t) [*]	253 [140–328]
F_{2013}/F_{MSY} [*]	1.07 [0.66–2.02]
B_{2013}/B_{MSY} [*]	1.01 [0.60–1.40]
SB_{2013}/SB_{MSY} (80% CI)	n.a.
B_{2013}/B_0 [*]	0.51 [0.30–0.70]
SB_{2013}/SB_0 (80% CI)	n.a.
$B_{2013}/B_{0,\, F=0}$ (80% CI)	n.a.
$SB_{2013}/SB_{0,\, F=0}$ (80% CI)	n.a.

n.a. not available; plausible range: results from a combination of a specific catch only method assumed prior information, as well as catch data.

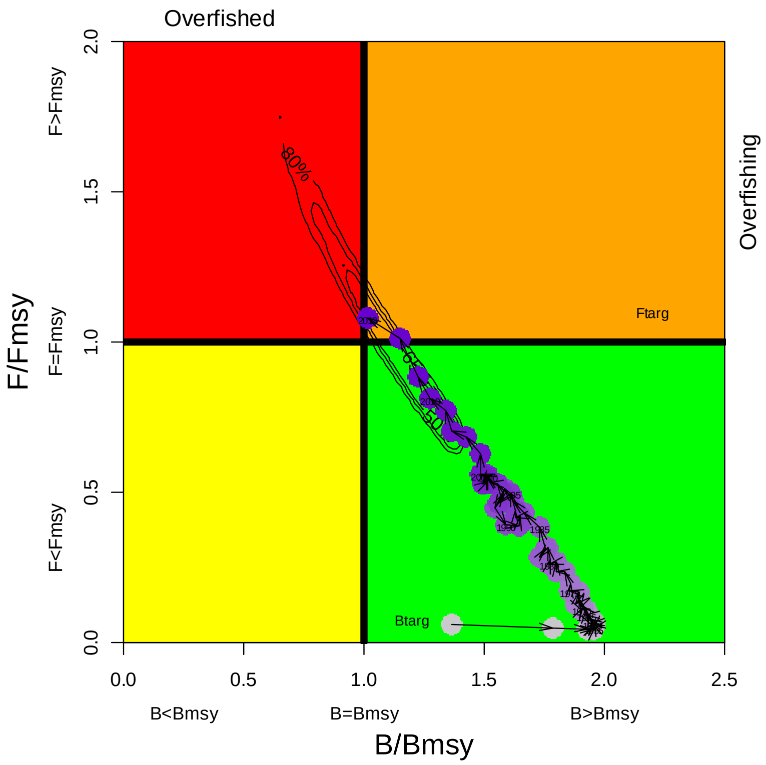


Fig. 11. Narrow-barred Spanish mackerel. Catch-MSY Indian Ocean assessment for *S. commerson*. The Kobe plot presents the trajectories for the range of plausible model options included in the formulation of the final management advice. The trajectory of the geometric mean of the plausible model options is also presented.

Indian Ocean Narrow-barred Spanish mackerel: assessment using OCOM

189. The WPNT **NOTED** that the OCOM method would be used for stock status advice (Table 17, Fig. 12).

Table 17. Narrow-barred Spanish mackerel: Key management quantities from the OCOM used in 2015.

Management quantity	Indian Ocean Region
Most recent catch estimate (2013)	153,342 t
Mean catch from 2009–2013	144,170 t
MSY (1,000 t) [*]	129 [96–184]
Data period used in assessment	1950–2013
F_{MSY} [*]	0.33 [0.21–0.56]
B_{MSY} (1,000 t) [*]	320 664 [174–693]
F_{2013}/F_{MSY} [*]	1.21 [0.99–1.58]
B_{2013}/B_{MSY} [*]	0.96 [0.69–1.22]
SB_{2013}/SB_{MSY} (80% CI)	n.a.
B_{2013}/B_0 [*]	0.53 [0.30–1.04]
SB_{2013}/SB_0 (80% CI)	n.a.
$B_{2013}/B_{0,\ F=0}$ (80% CI)	n.a.
$SB_{2013}/SB_{0,\ F=0}$ (80% CI)	n.a.

n.a. not available; plausible range: results from a combination of a specific catch only method assumed prior information, as well as catch data.

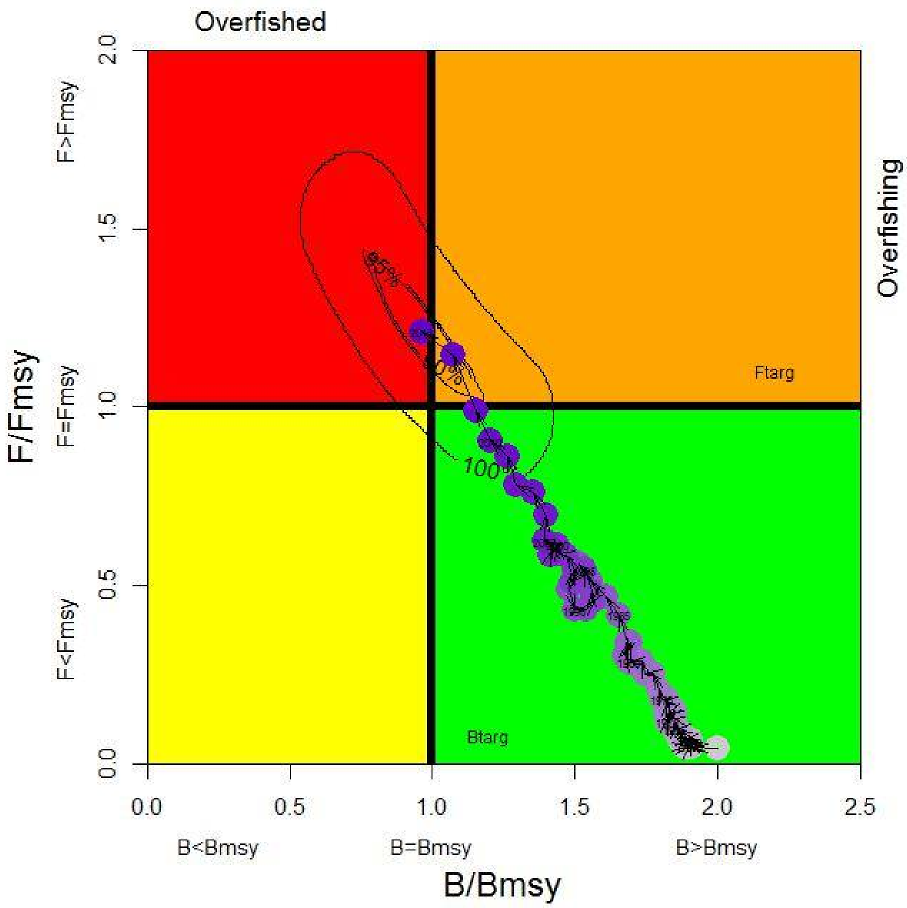


Fig. 12. *S. commerson* OCOM Indian Ocean assessment Kobe plot. The Kobe plot presents the trajectories for the range of plausible model options included in the formulation of the final management advice. The trajectory of the geometric mean of the plausible model options is also presented.

190. The WPNT **NOTED** that projections for this stock (Table 18) over a 10 year period may not be appropriate bearing in mind the large uncertainties in the outputs from the stock assessment model and the likelihood of increased catch and effort from areas in the northwest Indian Ocean in the near future.

Table 18. Narrow-barred Spanish mackerel: 2015 OCOM Indian Ocean assessment Kobe II Strategy Matrix. Probability (percentage) of plausible models violating the MSY-based reference points for five constant catch projections (2013 catch level, -10%, -20%, -30%, +10% and + 20%) projected for 3 and 10 years. Note: from the 2015 stock assessment using catch estimates at that time.

Reference point and projection timeframe	**Alternative catch projections (relative to 2013) and weighted probability (%) scenarios that violate reference point**					
	70% (107,339 t)	**80%** (122,673 t)	**90%** (138,007 t)	**100%** (153,341 t)	**110%** (168,675 t)	**120%** (184,010 t)
$SB_{2016} < SB_{MSY}$	55	74	99	100	100	100
$F_{2016} > MSY$	100	99	100	100	100	100
$SB_{2023} < SB_{MSY}$	2	67	100	100	100	100
$F_{2023} > MSY$	21	99	100	100	100	100

191. The WPNT **NOTED** paper IOTC–2015–WPNT05–26 which described a preliminary trophic model of narrow-barred Spanish mackerel in the Persian Gulf, including the following abstract provided by the authors: *"A preliminary Ecopath model was fitted to study the trophic interaction of Scomberomorus commerson in the Persian Gulf using the available data on most of the ecosystem compartments. Fifteen species were used in the present analysis. The values of Ecotrophic Efficiency (EE) in the model are high (>0.5) for most consumers of high trophic level except for S. commerson because of its high fishing mortality. The highest realized Trophic level obtained was 4.04 for S.commerson. The maximum Omnivory Index (OI) was calculated as 0.88 for Encrasicholina punctifer by feeding on a wide variety of preys and the least, 0.08 for S. commerson with highly specialized feeding. Mixed trophic analysis indicates that benthos have a positive effect on most of the fish species. Most species have a negative impact on themselves, interpreted here as reflecting increased within-group competition for resources. This preliminary model can be helpful to determine the gaps in the present knowledge about pelagic system of the Persian Gulf".*

192. The WPNT **THANKED** the authors of this study for analysing the ecosystem interactions of a neritic tuna species.

193. The WPNT **NOTED** that the data collection system might be excluding small-sized *S. commerson* from the system as the samples were collected by gillnets so selected larger sized individuals. However, the WPNT also **NOTED** the difficulties in obtaining representative samples across so many species.

194. The WPNT **REQUESTED** the authors use ECOSIM to predict future biomass as well as current levels.

195. The WPNT **NOTED** the reason for the lack of balance in the system is likely to be the relatively low biomass of primary producers and relatively high biomass of secondary consumers.

8.4 Selection of Stock Status indicators

196. **NOTING** that the Commission adopted Resolution 12/01 *On the implementation of the precautionary approach*, which effectively means that in a situation of increased uncertainty (e.g. data poor situations), a more precautionary approach should be undertaken when developing advice and possible management actions, the WPNT **AGREED** that this approach, combined with the weight-of-evidence available (stock status indicators from data poor assessment approaches, species biology, fishery indicators), should be used to determine stock status for narrow-barred Spanish mackerel.

197. The WPNT **NOTED** that the trajectories for both approaches were very similar and gave similar outcomes. The WPNT **AGREED** that stock status management advice for narrow-barred Spanish mackerel should be based on the OCOM model as the stock status outcomes relied less on the depletion level assumptions than the Catch-MSY method.

198. The WPNT **AGREED** that the approaches presented are useful to assess stock status in the near term, while more traditional stock assessment approaches in the region are deferred until more data is collected and submitted in accordance with the IOTC data recording and reporting requirements for neritic tunas.

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

199. The WPNT **ADOPTED** the management advice developed for narrow-barred Spanish mackerel (*Scomberomorus commerson*) as provided in the draft resource stock status summary – Appendix XII and **REQUESTED** that the IOTC Secretariat update the draft stock status summary for narrow-barred Spanish

mackerel with the latest 2014 catch data, and for the summary to be provided to the SC as part of the draft Executive Summary, for its consideration.

9. Other Neritic Tuna Species – Review of New Information on Stock Status

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

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

200. The WPNT **RECALLED** paper IOTC–2015–WPNT05–07 Rev_1 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 (CPCs)*, for the period 1950–2013. Summaries are provided at Appendix IVa, b and e.

201. The WPNT **NOTED** paper IOTC–2015–WPNT05–16 Rev_1 which provided an analysis of the mitochondrial DNA of Frigate tuna in the northern coastal waters of Tanzania, including the following abstract provided by the authors:

"Frigate tuna Auxis thazard is an epipelagic and migratory species of family Scombridae found in the Indo Pacific Ocean. Apart from its ecological role, the species plays an important role in terms of fishery within Indian Ocean region. The genetic structure of Frigate tuna is not documented in the Western Indian Ocean. The present study investigated the genetic diversity and structure of 35 Frigate tuna using sequence analysis of 500bp mitochondrial DNA D-loop gene from two geographically separate locations along the northern Tanzania coastal waters. The overall haplotype and nucleotide diversities were high respectively, 0.934±0.002 and 0.479±0.14. Hierarchical analysis of molecular variance (F_{ST} = 0.0035 (P = 0.3327) and pair wise differences (Φ_{ST} = 0.0014; P= 0.424) did not reveal a significant genetic differentiation between locations. Results were further corroborated by a none significant value of exact test of genetic differentiation (P = 0.437) and nearest neighbour statistic (S_{nn} = 0.291, P = 0.43). Findings of this study accepts the null hypothesis of single panmictic population of Frigate tuna in northern coastal Tanzanian waters. Further studies on the genetic stock structure of frigate tuna covering the whole western Indian Ocean is recommended".

202. The WPNT **THANKED** the authors for presenting this study on genetic diversity in frigate tuna.

203. The WPNT **NOTED** that the area for sampling falls entirely within the Zanzibar channel and so it is not surprising that this is a single stock and **REQUESTED** the authors include samples from other areas beyond this region such as Seychelles, Mozambique, Madagascar, Kenya and South Africa.

204. The WPNT **NOTED** that during the SWIOFP study results suggested that certain genes were shared between stocks in east Africa as well as Seychelles, whereas there were fewer similarities when comparing closer stocks so including a wider range for sampling would increase the probability of finding more differences.

205. The WPNT **NOTED** the difficulties in collecting samples in areas such as Kilwa and Mtwara in southern Tanzania in 2007/08 preventing the scientists from conducting this study over a wider geographical area. The WPNT **NOTED** that the results presented are only a small part of a larger study including samples from Oman and the north western Indian Ocean which will be presented in the near future when the study is complete.

206. The WPNT **NOTED** that the difficulties in data collection described here may well be potential issue for the larger stock structure project which is due to commence shortly and **NOTED** that this is something that needs to be taken into consideration by the project coordinator when planning sampling activities given that it may have serious implications for the geographic coverage achieved by the study.

207. The WPNT **NOTED** that this is a very interesting study, not just in terms of implications for stock structure, but also in terms of the impacts of fishing explored and **ACKNOWLEDGED** that this study constitutes good progress in beginning to assess stock structure.

Madagascar frigate tuna fisheries

208. The WPNT **NOTED** paper IOTC–2015–WPNT05–17 which provided an overview of the frigate tuna fisheries of Madagascar, including the following abstract provided by the author:

"By combining information on the nominal catch estimated on the species under IOTC of artisanal fisheries and sampling done by the USTA of by-products by purse seiners landings in the Port of Antsiranana, an analysis was made on the resource Frigate tuna (Auxis thazard, Lacepede, 1800). The change in nominal catch neritic tuna artisanal fisheries, including Frigate tuna, has been deducted from

the IOTC data. The spatiotemporal distribution of the purse seine catch was extracted from the catch and effort data, also, available on the IOTC website. And distribution of the size frequency of Frigate tuna of purse seiners landing is calculated from sample data made at the Port of Antsiranana. At least, seven (07) species of neritic tuna are caught by trolling in Madagascar and are about 6,000 of the 14 000 metric tons in 2011. Narrow-barred Spanish Mackerel (Scomberomerus commerson) predominates in the catch in this fishery and Kawakawa (Euthynnus affinis), Longtail tuna (Thunnus tonggol) and Frigate tuna (Auxis thazard) are moderately caught". – see paper for full abstract.

209. The WPNT **NOTED** the spatial distribution of purse seine vessels is restricted only to certain area, whereas artisanal vessels fish in all areas along the coast but there is no data available on these fisheries.

210. The WPNT **NOTED** that the Madagascan purse seine fishery is highly seasonal, taking place from February to June, so sampling was only undertaken during this period.

Sri Lanka frigate tuna fisheries

211. The WPNT **NOTED** paper IOTC–2015–WPNT05–18 which provided an overview of the frigate tuna catches in Sri Lankan waters, including the following abstract provided by the authors:

"Of the three key neritic tuna species; Auxis thazard (frigate tuna) is currently the highest contributor in the neritic tuna production and there is a great demand for this species among local consumers. Their catches are mainly confined to the shelf, shelf slope and outer fringes of offshore waters. Fishing gear employed in exploitation of the species is mainly medium mesh gillnet, ring net and lesser amount of trolline. However, over the time, relative contribution of the fishing method showed noticeable variations where in the recent coastal ring nets dominated the catch. A considerable increase in the frigate tuna production can be observed after 2010. The increase in the production could be mainly attributed to the higher fishing effort exerted by ring nets after loosening of government restrictions on ring net operations. In 2013, Auxis thazard represented around 42% of the total neritic tuna production and 5% of the total tuna production. A remarkable variation of frigate tuna catch was also noted among the different vessels". – see paper for full abstract.

212. The WPNT **NOTED** that detailed length frequency data are important for stock assessments.

213. The WPNT **NOTED** the increasing trend towards multi-day, multi-gear fishing by vessels operated by Sri Lanka, in addition to an expansion of the fishing area in recent years.

214. The WPNT **NOTED** the lack of longtail catches in the Sri Lanka fisheries in recent years despite the prevalence across the rest of the Indian Ocean.

215. The WPNT **NOTED** that disaggregating the length-frequency analysis by gear type might be more informative for management, as it could allow the identification of particular fishing methods which have a higher juvenile catch and so management strategies could be further developed based on this information. However, the WPNT also **NOTED** the difficulties in collecting information by gear types due to the prevalence of multi-gear fishing but that this information, dating from 2014, will be made available in the near future. The WPNT **NOTED** the systematic data collection system implemented during the IOTC-OFCF project, which is helping to improve data coverage.

216. The WPNT **REQUESTED** that Sri Lanka report data to the IOTC Secretariat disaggregated by individual gear type for size frequency, catch and effort and nominal catch and by IOTC standard for all neritic tuna species.

9.2 Data for input into stock assessments

217. **ACKNOWLEDGING** the importance of indices of abundance for future stock assessments, the WPNT **RECOMMENDED** that the development of standardised CPUE series is explored before the next assessment. An indicative budget is provided (Table 19).

Table 19. Estimated costs for an inter-sessional meeting to investigate CPUE standardisation from the neritic tuna fleets (Indonesia, I.R. Iran and India (3 total), possibly Kenya and Thailand (2 alternatively if this doesn't work)) operating in the IOTC area of competence

Description	**Unit price (US$)**	**Units required**	**Total (US$)**
Meeting venues across all CPCs	0	Hosts to provide	-
Consultant travel (three countries 1 week at a time) + 1 week for Final results	15,000	SA Consultant 1	15,000
Time Consultant	500/day	50 days (25 days work for CPUE standardizations + 25 days assembling datasets with CPC's help)	25,000
Time Stock Assessment Scientist (IOTC)	0 (as time donated)	10 days	0
Final Meeting with IOTC Secretariat and CPCs at WPNT		4 days + 2 day travel	3,500
Total estimate (US$)			**43,500**

9.3 Stock assessment updates

218. The WPNT **NOTED** paper IOTC–2015–WPNT05–29 which provided an overview of the Kobe I (Kobe plot) +Kobe II (risk assessment) software tool (Version 3, 2015) including the following abstract provided by the authors:

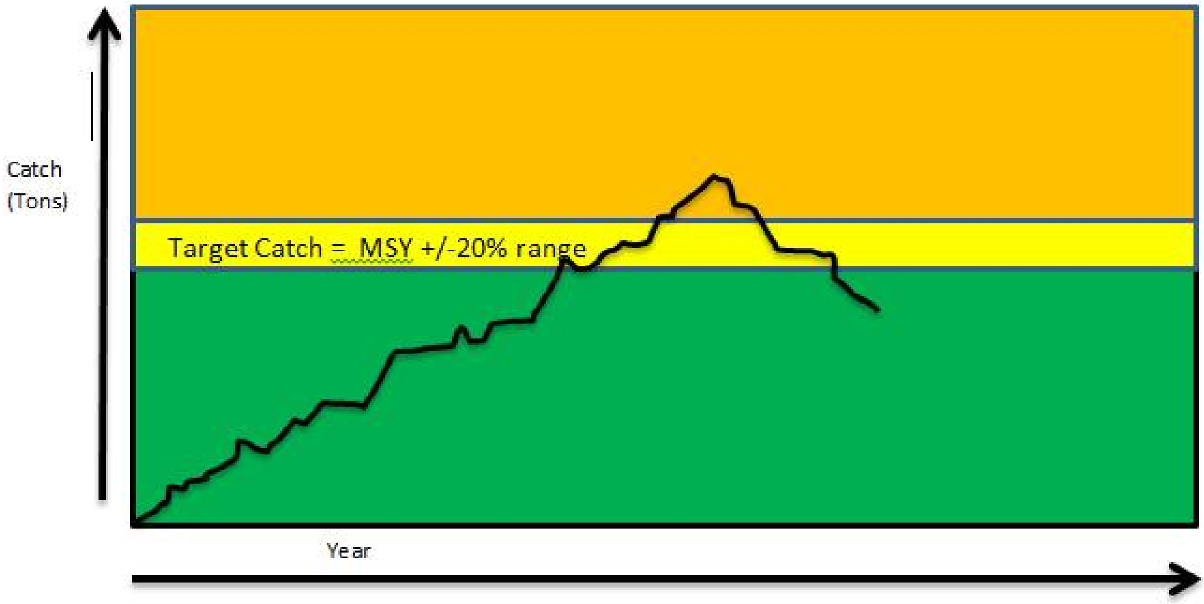
"This is the users' manual describing how to use the 3rd version of Kobe I (stock status trajectory plots) +Kobe II (risk assessment diagram) software. Kobe I and II were recommended by the 5 tuna-RFMO meeting in 2007 (Kobe, Japan) and 2009 (Barcelona, Spain) respectively. This software is free of charge available at http://ocean-info.ddo.jp/kobeaspm/kobeplot/KobePlot.zip (from Nov. 19, 2014). After users use this software and if users need improvements, please let us know. We will revise and will release more user's friendly software. As for Kobe II, the risk assessment matrix format was recommended, but the table formats have been difficult to understand its meanings often, especially for mangers and industries as it uses mathematical and technical notations. To improve this situation, we developed the visualized presentation (diagram) of the matrix for anyone to be able to understand its meanings easily. Please note that this software is suitable for those who have difficulties to make Kobe I plot and II quickly and effectively in a very short time, especially during the working meetings". – see paper for full abstract.

219. The WPNT **THANKED** the authors for the paper describing the free and openly available software tool and **ACKNOWLDGED** that this is a useful tool for CPCs.

220. The WPNT **NOTED** that while KOBE plots are useful for conservationists, the goal of fisheries management is to ensure the sustainability of stocks and ensure the fisheries have maximum benefit for society, which is fishing at the target, MSY. The centre of the KOBE plot is therefore considered to be the target but the colouring of the plot does not really reflect this. The recent stock assessments have highlighted that when stocks are close to MSY, small changes can have a big impact on the management advice provided based on a KOBE plot.

221. The WPNT **NOTED** that alternative plots have been developed, including an approach by New Zealand, which reflects the goals of fisheries managers better.

222. The WPNT **AGREED** that where data poor methods are used and stock status is highly uncertain but target yield can be estimated fairly robustly, alternative methods of providing management advice should be used such as Fig. 13.



Colour key	
Catch exceeds MSY	
Catch close to MSY	
Catch below MSY	

Fig. 13. Example plot for the communication of science advice to managers based on catch-only stock assessment methods where yield estimates are considered to be more robust than biomass estimates

223. The WPNT **NOTED** that the type of advice provided for management should be appropriate for the model used. The biomass is driven by the depletion biomass when using catch based methods, whereas the yield is no so provides a better indicator .

224. The WPNT **NOTED** that there are many possible targets and limits that could be selected. To ensure consistency among models and stocks, a fixed percentage could be most appropriate, e.g. 80–120% of MSY estimate, or catch/MSY ratio boundaries.

225. The WPNT **AGREED** that this alternative plot does not give an indication of stock status but rather should catch relative to the target. This should be clearly communicated to managers to ensure correct interpretation of the results and so terminology such as 'over-catching' rather than 'overfishing' should be used.

226. The WPNT **RECOMMENDED** that the SC ask the WPM evaluate the proposed methodology and further develop this method of presenting management advice for data poor stocks.

227. The WPNT **NOTED** the recent symposium[2] held on data poor stock assessment methods where it was decided that if no code is provided then the assessment results should not be considered. The WPNT **NOTED** that the code for the data poor methods used for IOTC assessments has been made available but that a manual is needed. The WPNT **REQUESTED** that this is considered for future capacity building workshops.

228. The WPNT **NOTED** the request for more detailed guidance to accompany the code made available following the meeting for each of the stock assessments used.

229. **NOTING** that the Commission adopted Resolution 12/01 *On the implementation of the precautionary approach*, which effectively means that in a situation of increased uncertainty (e.g. data poor situations), a precautionary approach should be undertaken when developing advice and possible management actions.

230. The WPNT **AGREED** that although no stock assessments were undertaken for Indian Ocean bullet tuna or frigate tuna fisheries in 2015, further exploratory analysis of the data available should be undertaken and presented at the next WPNT meeting to determine if a data poor approach could be applied.

9.4 Selection of stock status indicators

231. The WPNT **AGREED** that the management advice developed in 2014 shall be rolled over for 2015 with minor updates on species biology and fishery statistics.

[2] The 30th Lowell Wakefield Fisheries Symposium, "Tools and Strategies for Assessment and Management of Data-Limited Fish Stocks"

9.5 Development of technical advice for other neritic tuna species

232. The WPNT **ADOPTED** the management advice developed for bullet tuna and frigate tuna as provided in the draft resource stock status summary for each species and **REQUESTED** that the IOTC Secretariat update the draft stock status summary for bullet tuna and frigate tuna with the latest 2014 catch data, and for the summary to be provided to the SC as part of the draft Executive Summary, for its consideration:
   - Bullet tuna (*Auxis rochei*) – Appendix VII
   - Frigate tuna (*Auxis thazard*) – Appendix VIII

10. PROGRAM OF WORK (RESEARCH AND PRIORITIES)

233. The WPNT **RECALLED** that the SC, at its 17th Session, **REQUESTED** that during the 2015 Working Party meetings, each group not only develop a Draft Program of Work for the next five years containing low, medium and high priority projects, but that all High Priority projects are ranked. The intention is that the SC would then be able to review the rankings and develop a consolidated list of the highest priority projects to meet the needs of the Commission. Where possible, budget estimates should be determined, as well as the identification of potential funding sources (SC17 Para.178).

234. The WPNT **NOTED** that during WPNT04, NARA, Sri Lanka submitted a proposal for conducting biological research including stock identification of neritic tuna of Sri Lanka. WWF-Pakistan has agreed to consider this project for funding and is currently awaiting the signing of a MoU with the Government of Sri Lanka after which a decision on funding will be made. In the meantime WWF-Pakistan has asked NARA to reduce the cost of the project.

10.1 Revision of the WPNT Program of Work (2016–2020)

235. The WPNT **NOTED** paper IOTC-2105-WPNT05-08 Rev_2 providing an outline of the programme of work for 2016–2020.

236. The WPNT **NOTED** that the stock structure project will require extensive coordination among CPCs and that this should commence as soon as possible.

237. The WPNT **REQUESTED** that once the leading organisation and project coordinator have been selected a circular should be sent to all CPCs to initiate coordination of project activities.

238. The WPNT **NOTED** the incorrect information being circulated about IOTC making payments to CPCs to collect samples. The WPNT **ADVISED** all CPCs to get in touch with IOTC Secretariat directly before commencing any activities.

239. The WPNT **NOTED** the offer from I.R. Iran to provide samples from the Indian Ocean region and to work as a lead organisation or collaboratively with the stock structure project leaders.

240. The WPNT **NOTED** that only kawakawa and longtail were assessed using CPUE series this year. These data were not available for other stocks so the programme of work has been updated to include this as a high priority.

241. The WPNT **REQUESTED** scientists from CPCs develop CPUE series for input into stock assessments in 2017. The WPNT **NOTED** that CPCs in Thailand, Malaysia, Indonesia, Oman, I.R. Iran, India and Pakistan have datasets on catch and effort and length composition that have not been submitted to the IOTC and **REQUESTED** that these be provided for use in stock assessment advice.

242. The WPNT **NOTED** that previous requests of the WPNT for CPCs submit historical data have often yielded not much information and so **REQUESTED** that the IOTC Secretariat travel to individual CPCs to discuss the issues directly and obtain the data.

243. The WPNT **NOTED** that Resolution 15/02 outlines the mandatory reporting requirements and Resolution 11/04 on mandatory reporting of scientific observer data, however there is a low level of compliance with these resolutions within the IOTC.

244. The WPNT **NOTED** the issues with collecting data from artisanal fisheries and the challenges that are unlikely to be addressed through increasing regulation but are based on capacity issues.

245. The WPNT **WELCOMED** the upcoming data mining and support missions planned by the IOTC Secretariat data section to address these issues.

246. The WPNT **NOTED** the issues with lack of follow-up by CPCs after a mission by the IOTC Secretariat has been undertaken rendering it less effective than it would be if there was more follow-up and **REQUESTED** that CPCs make the most of these missions by conducting preparation and follow-up activities.

247. The WPNT **RECOMMENDED** that the SC request that the Commission further increases the IOTC Capacity Building budget line so that capacity building training on data analysis and applied stock assessment approaches, with a priority being data poor approaches, can be carried out in 2016.

248. The WPNT **RECOMMENDED** that the SC consider and endorse the WPNT Program of Work (2016–2020), as provided at Appendix VI.

11. OTHER BUSINESS

11.1 Election of a chair and vice-chair of the WPNT for the next biennium

249. The WPNT **NOTED** that both the Chairperson and Vice-Chairperson of the WPNT have come to the end of their terms this year.

250. The WPNT **THANKED** the Chairperson, Dr Prathibha Rohit, for her good work over the last four years, although she was regrettably unable to make the current meeting.

251. The WPNT **COMMENDED** the Vice-Chairperson, Dr Farhad Kaymaram, on his role as acting chairperson at the WPNT05 and **AGREED** to appoint him as Chairperson for the next biennium.

252. The WPNT also **APPOINTED** a new Vice-Chairperson, Dr Mathias Igulu for the next biennium.

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

253. The WPNT **NOTED** with thanks the outstanding contributions of the invited expert for the meeting, Dr Shijie Zhou (CSIRO – Australia). Dr Zhou has contributed to the WPNT on a voluntary basis for the past four years as the Invited Expert and his expertise has been greatly appreciated and contributed substantially to the stock status determination of the neritic tuna species under the IOTC mandate. It was agreed that his expertise on data poor approaches in determining stock status should be formalised via a consultancy contract for 2016.

254. The WPNT **RECOMMENDED** that the invited expert works with CPCs to pull together all data for Indian Ocean stocks and undertake a meta-analysis or hierarchical approach to analyse the data. This should be combined with capacity building activities in data poor stock assessment techniques. An indicative budget is provided at Table 20.

255. The WPNT **AGREED** that the success of this workshop and a meta-analysis will be fully dependent on the cooperation of CPCs in the provision of data. Therefore the WPNT **AGREED** that this would be provided prior to a workshop as a prerequisite to it taking place .

Table 20. Estimated budget required to hire a consultant to carry out a workshop for data mining and capacity building on neritic tuna and tuna-like species in 2016 and 2017.

Description	**Unit price**	**Units required**	**2016 Total (US$)**	**2017 Total (US$)**
Workshop to support neritic tuna stock assessments and/or indicator development through data-mining, meta-analysis (Longtail tuna, kawakawa, narrow-barred Spanish mackerel, Indo-Pacific king mackerel) (fees)	500	15	11,250	11,250
Neritic tuna capacity building workshop (travel)	5,000	1	5,000	5,000
		Total estimate	**16,250**	**16,250**

256. The WPNT **AGREED** to the following core areas of expertise and priority areas for contribution that need to be enhanced for the next meeting of the WPNT in 2016, by an Invited Expert:
   1) Expertise: data poor assessment approaches (i.e. catch only methods, Bayesian approaches); stock structure/connectivity; including from regions other than the Indian Ocean;
   2) Meta-analysis of Indian Ocean growth data.

11.3 Date and place of the 5th Working Party on Neritic Tunas

257. The WPNT participants were unanimous in thanking Tanzania for hosting the 5th Session of the WPNT and **COMMENDED** Tanzania on the warm welcome, the excellent facilities and assistance provided to the IOTC Secretariat in the organisation and running of the Session.

258. The WPNT **NOTED** the expression of interest from Maldives to host the 6th Session of the WPNT, in early 2016. The IOTC Secretariat shall liaise with Maldives to confirm the expression of interest. The exact dates and meeting location will be communicated to the Scientific Committee for its consideration at its next session to be held in December 2015.

259. The WPNT also **NOTED** the expression of interest from Kenya to host the 7th Session of the WPNT, to be discussed further at the WPNT06.

Meeting participation fund (MPF)

260. The WPNT participants were unanimous in their thanks for the support for their participation in the meeting due to the MPF and **RECOMMENDED** that the Scientific Committee also consider the WPNT06 as a high priority meeting for MPF.

261. The WPNT **RECOMMENDED** that the SC and Commission note the following:
    1) The participation of developing coastal state scientists to the WPNT has been consistently high following the adoption and implementation of the IOTC Meeting Participation Fund 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*), now incorporated into the IOTC Rules of Procedure (2014), as well as though the hosting of the WPNT in developing coastal State Contracting Parties (Members) of the Commission (Table 21).
    2) The continued success of the WPNT, at least in the short term, appears heavily reliant on the provision of support via the MPF which was established primarily for the purposes of supporting scientists to attend and contribute to the work of the Scientific Committee and its Working Parties.
    3) The MPF should be utilised so as to ensure that all developing Contracting Parties of the Commission are able to attend the WPNT meeting, as neritic tunas are very important resources for many of the coastal countries of the Indian Ocean.

Table 21. Working Party on Neritic Tunas participation summary.

Meeting	Host Country	Total participants	Developing CPC participants	Host country participants	MPF recipients
WPNT01	India	28	23	11	9
WPNT02	Malaysia	35	26	13	10
WPNT03	Indonesia	42	34	16	11
WPNT04	Thailand	37	28	12	13
WPNT05	Tanzania	26	26	16	9
Total		173	137	68	52

11.4 Review of the draft, and adoption of the Report of the 5th Working Party on Neritic Tunas

262. The WPNT **RECOMMENDED** that the Scientific Committee consider the consolidated set of recommendations arising from WPNT05, provided at Appendix XIII, as well as the management advice provided in the draft resource stock status summary for each of the six neritic tuna (and mackerel) species under the IOTC mandate, and the combined Kobe plot for the three species assigned a stock status in 2015 (Fig 14):
    - Bullet tuna (*Auxis rochei*) – Appendix VII
    - Frigate tuna (*Auxis thazard*) – Appendix VIII
    - Kawakawa (*Euthynnus affinis*) – Appendix IX
    - Longtail tuna (*Thunnus tonggol*) – Appendix X
    - Indo-Pacific king mackerel (*Scomberomorus guttatus*) – Appendix XI
    - Narrow-barred Spanish mackerel (*Scomberomorus commerson*) – Appendix XII

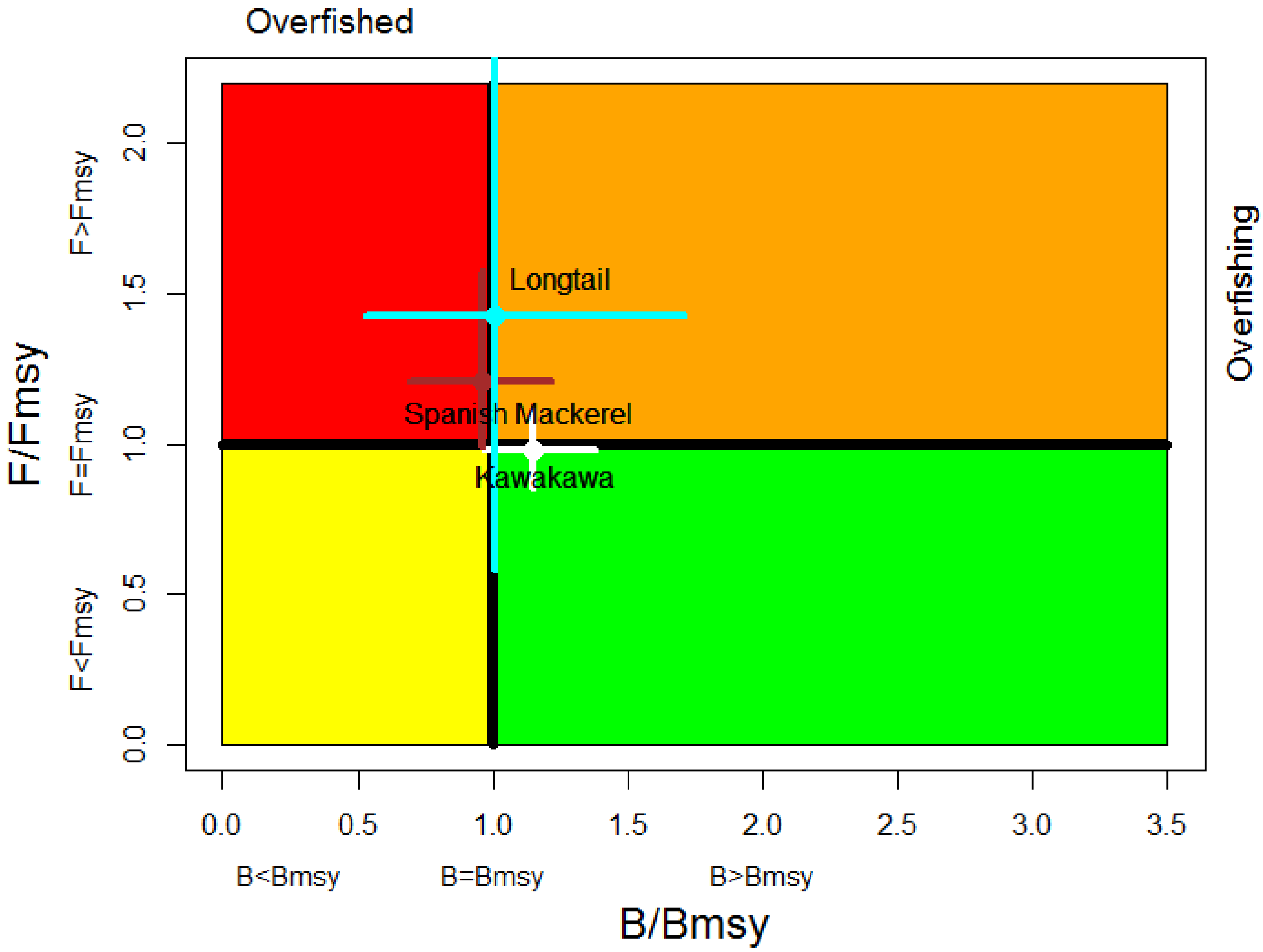


Fig. 14. Combined Kobe plot for kawakawa (white), longtail tuna (blue), and narrow-barred Spanish mackerel (brown), showing the estimates of stock size (B) and current fishing mortality (F) in 2013 in relation to optimal spawning stock size and optimal fishing mortality using the OCOM and ASPIC approaches. Cross bars illustrate the range of uncertainty from the model runs.

263. Based on these stock status summaries (Fig. 14) and ongoing increasing catch and effort, the WPNT strongly **RECOMMENDED** that current catch levels are not increased further by constraining catch and/or effort to no more than 2013 levels.

264. The WPNT **AGREED** that data should be provided in accordance with the IOTC reporting requirements in a timely manner to avoid issues with inconsistent stock assessment results due to changing catch series.

265. The report of the 5th Session of the Working Party on Neritic Tunas (IOTC–2015–WPNT05–R) was **ADOPTED** on the 29 May 2015.

APPENDIX I
LIST OF PARTICIPANTS

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APPENDIX II
AGENDA FOR THE 5TH WORKING PARTY ON NERITIC TUNAS

Date: 26–29 May 2015
Location: Zanzibar, Tanzania
Venue: The Double Tree, Tanzania
Time: 09:00 – 17:00 daily
Chair: Dr. Prathibha Rohit (Absent); **Vice-Chair**: Dr. Farhad Kaymaram (Acting Chair)

1. **OPENING OF THE MEETING** (Chair)

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

3. **THE IOTC PROCESS: OUTCOMES, UPDATES AND PROGRESS**
   - 3.1 Outcomes of the 17th Session of the Scientific Committee (IOTC Secretariat)
   - 3.2 Outcomes of the 19th Session of the Commission (IOTC Secretariat)
   - 3.3 Review of Conservation and Management Measures relevant to neritic tunas (IOTC Secretariat)
   - 3.4 Progress on the recommendations of WPNT04 (IOTC Secretariat)

4. **NEW INFORMATION ON FISHERIES AND ASSOCIATED ENVIRONMENTAL DATA FOR NERITIC TUNAS**
   - 4.1 Review of the statistical data available for neritic tunas (IOTC Secretariat)
   - 4.2 Review new information on fisheries and associated environmental data (general CPC papers)

5. **KAWAKAWA – REVIEW OF NEW INFORMATION ON STOCK STATUS**
   - 5.1 Review new information on the biology, ecology, stock structure, their fisheries and associated environmental data for kawakawa (CPC papers)
   - 5.2 Data for input into stock assessments:
     - o Catch and effort
     - o Catch at size
     - o Growth curves and age-length key
     - o Catch at age
     - o CPUE indices and standardised CPUE indices
     - o Tagging data
   - 5.3 Stock assessment updates
   - 5.4 Selection of Stock Status indicators
   - 5.5 Development of technical advice on the status of kawakawa

6. **LONGTAIL TUNA – REVIEW OF NEW INFORMATION ON STOCK STATUS**
   - 6.1 Review new information on the biology, ecology, stock structure, their fisheries and associated environmental data for longtail tuna (CPC papers)
   - 6.2 Data for input into stock assessments:
     - o Catch and effort
     - o Catch at size
     - o Growth curves and age-length key
     - o Catch at age
     - o CPUE indices and standardised CPUE indices
     - o Tagging data
   - 6.3 Stock assessment updates
   - 6.4 Selection of Stock Status indicators
   - 6.5 Development of technical advice on the status of longtail tuna

7. **INDO-PACIFIC KING MACKEREL – REVIEW OF NEW INFORMATION ON STOCK STATUS**
   - 7.1 Review new information on the biology, ecology, stock structure, their fisheries and associated environmental data for IP king mackerel (CPC papers)
   - 7.2 Data for input into stock assessments:
     - o Catch and effort

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

7.3 Stock assessment updates

7.4 Selection of Stock Status indicators

7.5 Development of technical advice on the status of IP king mackerel tuna

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

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

8.2 Data for input into stock assessments:

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

8.3 Stock assessment updates

8.4 Selection of Stock Status indicators

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

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

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

9.2 Data for input into stock assessments (all)

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

9.3 Stock assessment updates

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

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

10. PROGRAM OF WORK (RESEARCH AND PRIORITES)

10.1 Revision of the WPNT Program of Work 2016–2020 (Chair)

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

11. OTHER BUSINESS

11.1 Election of a Chairperson and a Vice-Chairperson of the WPNT for the next biennium

11.2 Date and place of the 6^{th} Working Party on Neritic Tunas (Chair)

11.3 Review of the draft, and adoption of the Report of the 5^{th} Working Party on Neritic Tunas (Chair)

APPENDIX III
LIST OF DOCUMENTS

Document	Title	Availability
IOTC–2015–WPNT05–01a	Draft: Agenda of the 5th Working Party on Neritic Tunas	✓(22 December 2014)
IOTC–2015–WPNT05–01b	Annotated agenda of the 5th Working Party on Neritic Tunas	✓(11 May 2015)
IOTC–2015–WPNT05–02	List of documents of the 5th Working Party on Neritic Tunas	✓(22 April 2015)
IOTC–2015–WPNT05–03	Outcomes of the 17th Session of the Scientific Committee (IOTC Secretariat)	✓(16 April 2015)
IOTC–2015–WPNT05–04	Outcomes of the 19th Session of the Commission (IOTC Secretariat)	✓(14 May 2015)
IOTC–2015–WPNT05–05 Rev_1	Review of current Conservation and Management Measures relating to neritic tuna species (IOTC Secretariat)	✓(16 April 2015) ✓(24 May 2015)
IOTC–2015–WPNT05–06 Rev_2	Progress made on the recommendations and requests of WPNT04 and SC17 (IOTC Secretariat)	✓(28 January 2015) ✓(14 May 2015) ✓(24 May 2015)
IOTC-2015-WPNT05-07 Rev_1	Review of the statistical data available for the neritic tuna species (IOTC Secretariat)	✓(11 May 2015) ✓(21 May 2015)
IOTC–2015–WPNT05–08 Rev_2	Revision of the WPNT Program of Work (2016–2020) (IOTC Secretariat)	✓(11 May 2015) ✓(28 May 2015)
IOTC–2015–WPNT05–09	Study the aspects of neritic tuna management in Iran fisheries (R. A. Naderi)	✓(11 May 2015)
IOTC–2015–WPNT05–10	Neritic Tuna Fishery and Some Biological Aspect in West Coast of Peninsular Malaysia (S. Jamon, E.M. Faizal and S. Basir)	✓(18 May 2015)
IOTC–2015–WPNT05–11	Further Investigations into the decline in neritic tuna catches (*Euthynnus affinis* and *Auxis thazard*) from 2010 to 2013 (M. Auhsan and M.S. Adam)	✓(15 May 2015)
IOTC–2015–WPNT05–12	Troll line neritic tunas fisheries in Alas Strait, East Lombok (FMA 573) (A.R.P. Prawira, Tampubolon, R.K. Sulistyaningsih and B. Nugraha)	✓(11 May 2015)
IOTC–2015–WPNT05–13 Rev_1	The status of longtail tuna (*Thunnus tonggol*) resource and fisheries in Thailand (P. Nootmorn)	✓(11 May 2015) ✓(24 May 2015)
IOTC–2015–WPNT05–14 Rev_1	Status of seer fish fishery including some biological characteristics of *Scomberomerus commerson* in Indian waters (M.K. Sinha , Premchand and A. Tibutius)	✓(13 May 2015) ✓(23 May 2015)
IOTC–2015–WPNT05–15	Spatial and temporal distribution of kingfish (*Scomberomorus commerson)* catches in Kenyan waters by artisanal fishers (S. Ndegwa, B. Macharia)	✓(15 May 2015)
IOTC–2015–WPNT05–16 Rev_1	Mitochondrial DNA analysis reveals a single stocks of Frigate tuna *Auxis thazard* (Lacepède, 1800) in the northern coastal waters of Tanzania (M.G. Johnson, Y.D. Mgaya and Y.W. Shaghude)	✓(11 May 2015) ✓(26 May 2015)
IOTC–2015–WPNT05–17	Few knowledge on Frigate tuna (*Auxis thazard*, Lacepede, 1800) resource in the Madagascar EEZ (R. Fanazava)	✓(11 May 2015)
IOTC–2015–WPNT05–18 Rev_1	*Auxis thazard*; major contributor in Sri Lankan Neritic tuna fishery (K.H.K. Bandaranayake, R. Maldeniya and H.A.C.C. Perera)	✓(11 May 2015) ✓(20 May 2015)
IOTC–2015–WPNT05–19	Population Dynamic of Kawakawa (*Euthynnus affinis*) in Indian Ocean at Western Part of Sumatera Island, Indonesia	✓(11 May 2015)
IOTC–2015–WPNT05–20 Rev_1	An age structured stock assessment of the Indian Ocean kawakawa fishery 1950–2013, using Stock Synthesis (IOTC Secretariat)	✓(11 May 2015) ✓(21 May 2015)
IOTC–2015–WPNT05–21 Rev_1	Assessment of Indian Ocean kawakawa *(Euthynnus affinis)* using data poor catch-based methods (IOTC Secretariat)	✓(11 May 2015) ✓(26 May 2015)
IOTC–2015–WPNT05–22	Assessment of Indian Ocean longtail tuna *(Thunnus tonggol)* using data poor catch-based methods (IOTC Secretariat)	✓(11 May 2015)
IOTC–2015–WPNT05–23	Assessment of Indian Ocean narrow-barred Spanish mackerel *(Scomberomorus commerson)* using data poor catch-based methods (IOTC Secretariat)	✓(11 May 2015)

Document	**Title**	**Availability**
IOTC–2015–WPNT05–24	Assessment of Indian Ocean Indo-pacific king mackerel *(Scomberomorus guttatus)* using data poor catch-based methods (IOTC Secretariat)	✓(11 May 2015)
IOTC–2015–WPNT05–25	Changes in the landings of neritic tuna and tuna like species in Pakistan during last three years (M. Khan and S. Ayub)	✓(11 May 2015)
IOTC–2015–WPNT05–26	A preliminary trophic model of *Scomberomorus commerson* in the Persian Gulf (A. Vahabnezhad, F. Kaymaram, N. Niamaimandi and Sh. Ghasemi)	✓(18 May 2015)
IOTC–2015–WPNT05–27	An overview of the tuna fishery in India with special reference to the spatial distribution and biology of *Thunnus tonggol* along the northwest region (P. Rohit, M. Koya and E.M.Abdussamad)	✓(18 May 2015)
IOTC–2015–WPNT05–28	Longtail tuna (*Thunnus tonggol*) stock assessment in the Indian Ocean by ASPIC (A Stock–Production model Incorporating Covariates) using available CPUE information (T.Nishida and K. Iwasaki)	✓(22 May 2015)
IOTC–2015–WPNT05–29	Kobe I (Kobe plot) +Kobe II (risk assessment) software (T. Nishida, T. Kitakado, K. Iwasaki and K. Itoh)	✓(22 May 2015)
Information papers		
IOTC–2015–WPNT05–INF01	Guidelines for the presentation of CPUE standardisations and stock assessment models (IOTC Scientific Committee)	✓(22 December 2014)
IOTC–2015–WPNT05–INF02	WWF involvement in promoting sustainability in important fisheries in the South West Indian Ocean (SWIO): The case of tuna fisheries (D. Gove and E. Kimakwa)	✓(22 May 2015)
IOTC–2015–WPNT05–INF03	Cleaning the Maldives catch and effort dataset (2004-2009) (M. Ahusan, R.Sharma and M.S.Adam)	✓(28 May 2015)
Data Sets		
IOTC–2015–WPNT05–DATA01	IOTC Neritic tuna datasets available	✓(21 April 2015)
IOTC–2015–WPNT05–DATA02	IOTC Species data catalogues – availability of data	✓(16 April 2015)
IOTC–2015–WPNT05–DATA03 Rev_1	Nominal catches per Fleet, Year, Gear, IOTC Area and species	✓(16 April 2015) ✓ (11 May 2015)
IOTC–2015–WPNT05–DATA04	Catch and effort data - vessels using drifting longlines	✓(16 April 2015)
IOTC–2015–WPNT05–DATA05	Catch and effort data - vessels using pole and lines or purse seines	✓(16 April 2015)
IOTC–2015–WPNT05–DATA06	Catch and effort data - vessels using other gears (e.g., gillnets, lines and unclassified gears)	✓(16 April 2015)
IOTC–2015–WPNT05–DATA07	Catch and effort data - all gears	✓(16 April 2015)
IOTC–2015–WPNT05–DATA08	Catch and effort – reference file	✓(16 April 2015)
IOTC–2015–WPNT05–DATA09	Size frequency data - neritic tunas	✓(16 April 2015)
IOTC–2015–WPNT05–DATA10	Size frequency – reference file	✓(16 April 2015)
IOTC–2015–WPNT05–DATA11	Equations used to convert from fork length to round weight for neritic tuna species	✓(16 April 2015)
IOTC–2015–WPNT05–DATA12	Population parameters for kawakawa	✓(28 April 2015)
IOTC–2015–WPNT05–DATA13	Population parameters for longtail	✓(28 April 2015)
IOTC–2015–WPNT05–DATA14 Rev_1	Population parameters for Narrow-barred Spanish mackerel	✓(28 April 2015) ✓(11 May 2015)

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

Extract from IOTC–2015–WPNT05–07 Rev_1

Fisheries and main catch trends

- Main fisheries: bullet tuna is mainly caught using gillnets, handlines and trolling, across the broader Indian Ocean area. This species is also an important catch for coastal purse seiners (Table 4; Fig.19).
- Main fleets (i.e., in terms of highest catches in recent years):
  Catches are highly concentrated: in recent years over 90% of catches in the Indian Ocean have been accounted for by fisheries in Sri Lanka, Indonesia and India (Fig.20).
- Retained catch trends

  Estimated catches of bullet tuna reached around 2,000 t in the early 1990's, increasing markedly in the following years to reach a peak in 1997, at around 4,900 t. The catches decreased slightly in the following years and remained at values of between 3,700 t and 4,000 t until the late-2000's, increasing sharply again up to the 10,000 t recorded in 2010, the highest catch ever recorded for this species in the Indian Ocean.
- 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*:** No major changes to the catch series of bullet tuna since the WPNT meeting in 2014.

Bullet tuna – estimation of catches: data related issues

Retained catches for bullet tuna were derived from incomplete information, and are therefore uncertain[3] (Fig.21), due to:

- Aggregation: Bullet tunas are usually not reported by species, but are instead aggregated with frigate tunas or, less frequently, other small tuna species.
- Mislabelling: Bullet tunas are usually mislabelled as frigate tuna, with 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 be highly uncertain and represent only a small fraction of the total catches of this species in the Indian Ocean.

[3] 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 non-reporting fisheries for which catches had to be estimated.

TABLE 4. Bullet tuna: scientific estimates of catches of bullet tuna by type of fishery for the period 1950–2013 (in metric tonnes).

Fishery	By decade (average)						By year (last ten years)									
	1950s	1960s	1970s	1980s	1990s	2000s	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Purse seine	-	-	28	278	552	655	603	625	650	581	908	1,055	1,372	635	549	513
Gillnet	41	153	296	531	1,222	1,741	1,699	1,631	1,872	1,692	2,236	2,587	3,347	2,692	2,830	2,759
Line	113	193	325	393	780	1,190	1,004	1,052	1,165	1,141	1,858	2,182	2,903	1,162	1,078	1,056
Other	5	13	44	242	755	1,322	1,239	1,188	1,465	1,908	1,638	2,022	2,748	3,905	4,503	4,597
Total	**159**	**360**	**693**	**1,444**	**3,309**	**4,907**	**4,545**	**4,496**	**5,152**	**5,323**	**6,640**	**7,847**	**10,370**	**8,394**	**8,960**	**8,925**

Definition of fishery: Gillnet: gillnet, including offshore gillnet; Line: coastal longline, hand line, troll line; Purse seine: coastal purse seine, purse seine, ring net; Other gears: baitboat, danish seine, liftnet, longline, longline fresh, trawling.

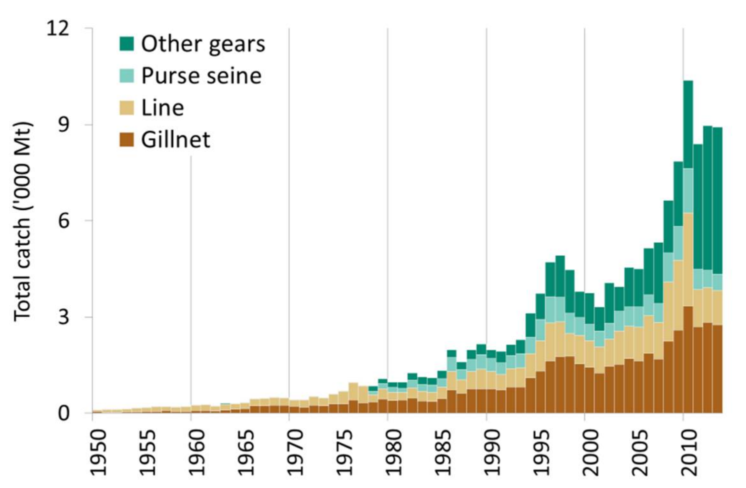


Fig.19. Bullet tuna: Annual catches by gear recorded in the IOTC Database (1950–2013).

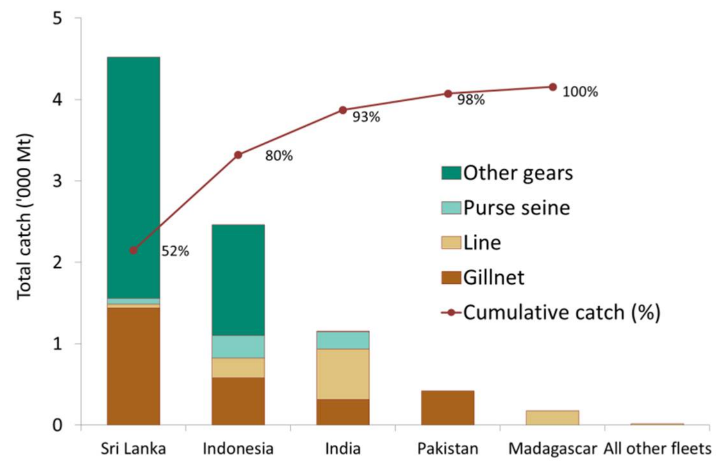
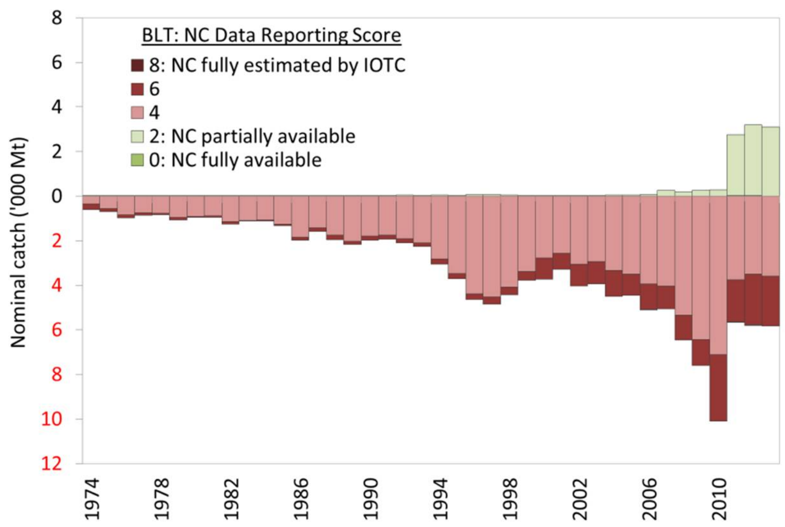


Fig.20. Bullet tuna: Average catches in the Indian Ocean over the period 2011–13, by country[4].



[4] Countries are ordered from left to right, according to the importance of catches of longtail reported for 2011-2013. The red line indicates the (cumulative) proportion of catches of longtail tuna for the countries concerned, over the total combined catches of this species reported from all countries and fisheries for 2011-2013.

Fig. 21. Bullet tuna: nominal catch; uncertainty of annual catch estimates (1974–2013).

Catches are assessed against IOTC reporting standards, where a score of 0 indicates catches that are fully reported according to IOTC standards; catches assigned a score of between 2 – 6 do not report catch data fully by gear and/or species (i.e., partially adjusted by gear and species by the IOTC Secretariat) or any of the other reasons provided in the document; catches with a score of 8 refer to fleets that do not report catch data to the IOTC (estimated by the IOTC Secretariat). Data as of May 2015.

Bullet tuna – Effort trends

- Availability: Effort trends are unknown for bullet tuna in the Indian Ocean, due to a lack of catch-and-effort data.

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

- Availability: highly incomplete, and, when available, are considered to be of poor quality for the fisheries having reasonably long catch-and-effort data series – as is the case with the gillnet fisheries of Sri Lanka (Fig. 22).
- Main CPUE series available: Sri Lanka (gillnets) (Fig.23).

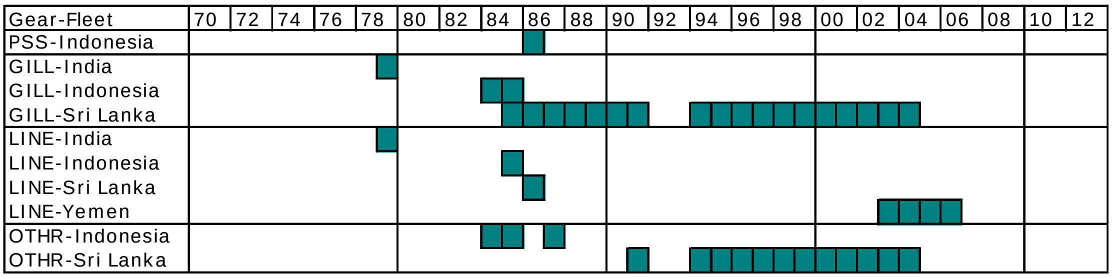


Fig. 22. Bullet tuna: Availability of catches and effort series, by fishery and year (1970–2013)[5]. Note that no catches and effort are available at all for 1950–78.

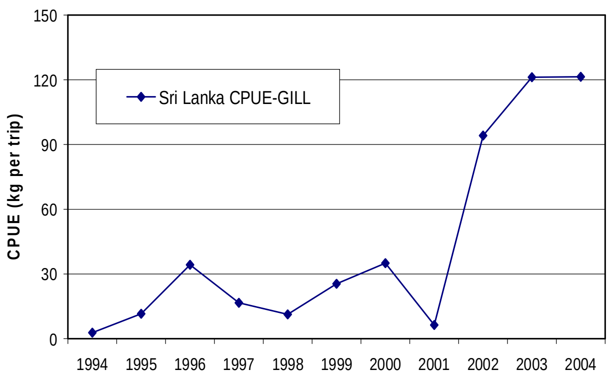


Fig. 23. Bullet tuna: Nominal CPUE series for the gillnet fishery of Sri Lanka derived from the available catches and effort data (1994–2004).

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

- Sizes: Fisheries catching bullet tuna in the Indian Ocean tend to catch specimens ranging between 15 and 35 cm.
- Size frequency data: highly incomplete, with data only available for selected years and/or fisheries (Fig.24).

  Main sources for size samples: Sri Lanka (gillnet and trolling).

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[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

Total numbers of samples, across all years, are also well below the minimum sampling standard of 1 fish per tonne of catch recommended by the IOTC Secretariat to reliably assess changes in average weight.

- Catch-at-Size(Age) table: Not available due to lack of size samples and uncertainty over the reliability of retained catch estimates.
- Sex ratio data: have not been provided to the Secretariat by CPCs.

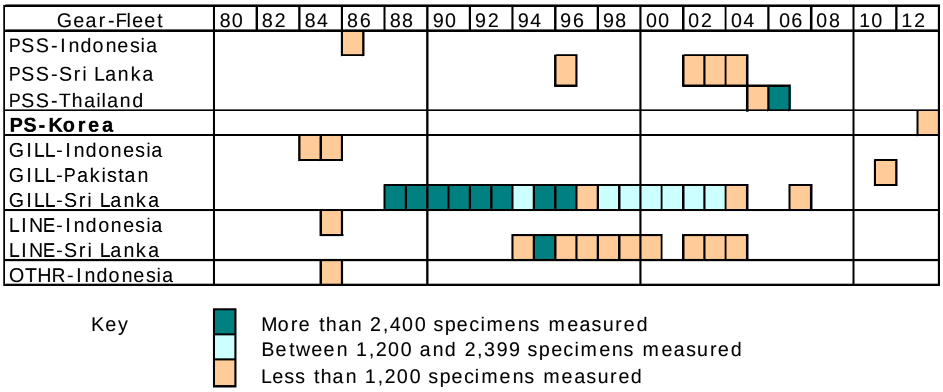


Fig. 24. Bullet tuna: Availability of length frequency data, by fishery and year (1980–2013)[6]. Note that no length frequency data are available at all for 1950–83.

Other biological data: Equations available for bullet tuna are shown below:

Species	*From type measurement – To type measurement*	*Equation*	*Parameters*	*Sample size*	*Length*
Bullet tuna	*Fork length – Round WeightA*	*RND=a*L^b*	*a= 0.00001700 b= 3.0*		*Min:10 Max:40*

[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

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

Extract from IOTC–2015–WPNT05–07 Rev_1

Fisheries and main catch trends

- Main fisheries: mainly caught using gillnets, coastal longline and trolling, handlines and trolling, and to a lesser extent coastal purse seine nets (Table 3; Fig. 12). The species is also an important bycatch for industrial purse seine vessels and is the target of some ring net fisheries (recorded as purse seine in Table 3).
- Main fleets (i.e., highest catches in recent years):

  Catches of frigate tuna are highly concentrated: Indonesia accounts for around two-thirds of catches, while 90% of catches are accounted for by four countries (Indonesia, India, Sri Lanka and I.R. Iran) (Fig.13).
- Retained catch trends:
  Estimated catches have increased steadily since the late-1970's, reaching around 30,000 t in the late-1980's, to between 55,000 and 60,000 t by the mid-1990's, and remaining at the same level in the following ten years. Since 2006 catches have increased, rising to the highest levels recorded at nearly 100,000 t in 2010 and 2011, with current catches at around 83,000 t.
- 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**:** no major changes to the catch series of frigate tuna since WPNT in 2014.

Frigate tuna: estimation of catches – data related issues

Retained catches for frigate tuna were derived from incomplete information, and are therefore uncertain[7] (Fig.14), 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. In the past, the IOTC Secretariat used the catches reported since 2005 to break the aggregates for 1950–2004, by gear and species. However, in a recent review by the IOTC Secretariat conducted by an independent consultant in 2012 he indicated that the catches of frigate tuna had been underestimated by Indonesia. While the new catches estimated for the frigate tuna in Indonesia remain uncertain, the new figures are considered more reliable than those existing in the past.
- Artisanal fisheries of India and Sri Lanka: Although these countries report catches of frigate tuna until recently the catches have not been reported by gear. The catches of both countries were also reviewed by an independent consultant in 2012 and assigned by gear on the basis of official reports and information from various other alternative sources. The new catch series was previously presented to the WPNT in 2013, in which the new catches estimated for Sri Lanka are as much as three times higher than previous estimates.
- 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 they are reported by species, usually refer to both species (due to misidentification, 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.

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

TABLE 3. Frigate tuna: Best scientific estimates of the catches of frigate tuna by type of fishery for the period 1950–2012 (in metric tonnes). Data as of May 2014.

Fishery	By decade (average)						By year (last ten years)									
	1950s	1960s	1970s	1980s	1990s	2000s	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Purse seine	-	15	824	4,664	7,550	10,021	10,341	11,384	11,320	10,337	9,501	9,663	12,044	10,935	10,328	10,566
Gillnet	483	1,238	2,837	6,948	14,519	20,189	19,484	21,189	22,181	23,322	24,082	23,750	30,908	30,410	30,382	29,834
Line	1,266	2,409	4,419	7,432	13,753	27,151	25,640	29,987	27,813	31,820	30,806	34,923	38,209	37,688	36,579	39,400
Other	1,441	2,007	2,349	3,683	9,276	13,670	12,229	15,253	12,715	15,382	15,193	18,112	18,550	18,934	17,649	18,766
Total	**3,191**	**5,670**	**10,428**	**22,728**	**45,098**	**71,031**	**67,693**	**77,812**	**74,030**	**80,862**	**79,582**	**86,448**	**99,710**	**97,966**	**94,938**	**98,565**

Definition of fishery: Gillnet: gillnet, including offshore gillnet; Line: coastal longline, hand line, troll line; Purse seine: coastal purse seine, purse seine, ring net; Other gears: baitboat, danish seine, liftnet, longline, longline fresh, trawling.

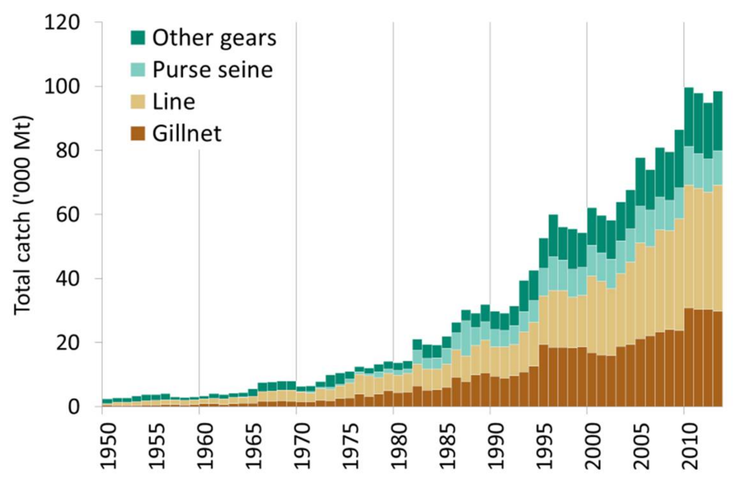


Fig.12. Frigate tuna: Annual catches by gear recorded in the IOTC Database (1950–2013).

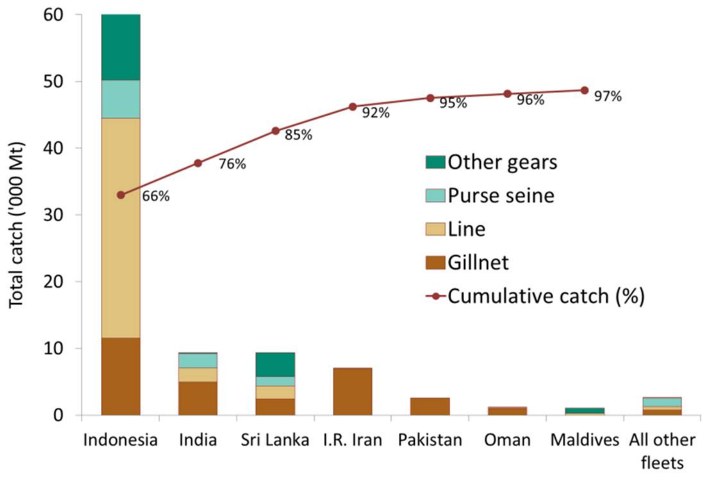
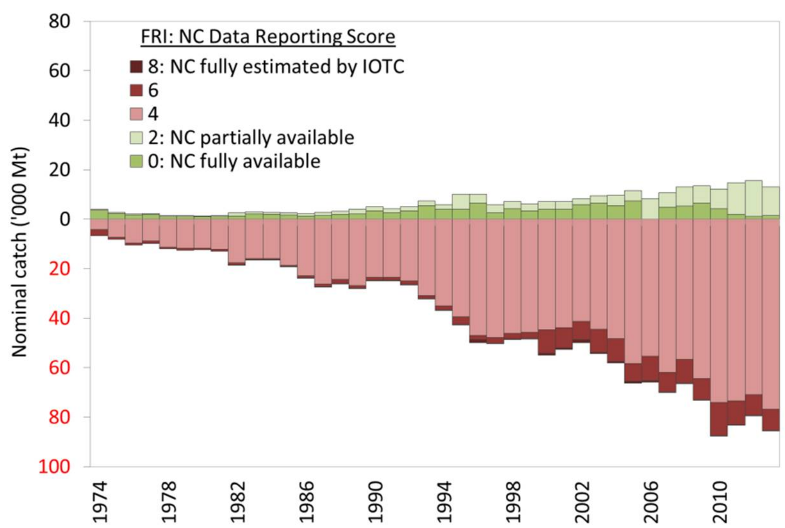


Fig.13. Frigate tuna: Average catches in the Indian Ocean over the period 2011–13, by country[8].



[8] Countries are ordered from left to right, according to the importance of catches of longtail reported for 2011-2013. The red line indicates the (cumulative) proportion of catches of longtail tuna for the countries concerned, over the total combined catches of this species reported from all countries and fisheries for 2011-2013.

Fig. 14. Frigate tuna: nominal catch; uncertainty of annual catch estimates (1974–2013).

Catches are assessed against IOTC reporting standards, where a score of 0 indicates catches that are fully reported according to IOTC standards; catches assigned a score of between 2 – 6 do not report catch data fully by gear and/or species (i.e., partially adjusted by gear and species by the IOTC Secretariat) or any of the other reasons provided in the document; catches with a score of 8 refer to fleets that do not report catch data to the IOTC (estimated by the IOTC Secretariat). Data as of May 2015.

Frigate tuna – Effort trends

- Availability: Effort trends are unknown for frigate tuna in the Indian Ocean, due to a lack of catch-and-effort data.

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

- Availability: highly incomplete, although data are available for short periods of time (i.e., more than 10 years) for selected fisheries (Fig.15).
- Main CPUE series available: Sri Lanka (gillnets), and Maldives (pole and line, hand and troll lines) (Fig.16). However the quality of catch-and-effort recorded for Sri Lankan gillnets are thought to be low due to dramatic changes in the CPUE between consecutive years.

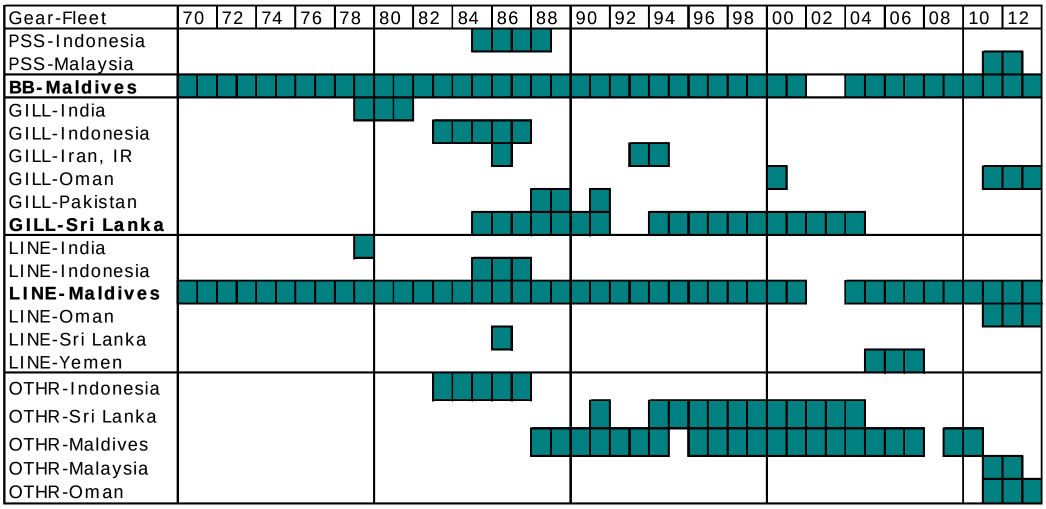


Fig. 15: Frigate tuna: Availability of catches and effort series, by selected fishery and year (1970–2013)[9]. Note that no catch-and-effort data are available for 1950–69.

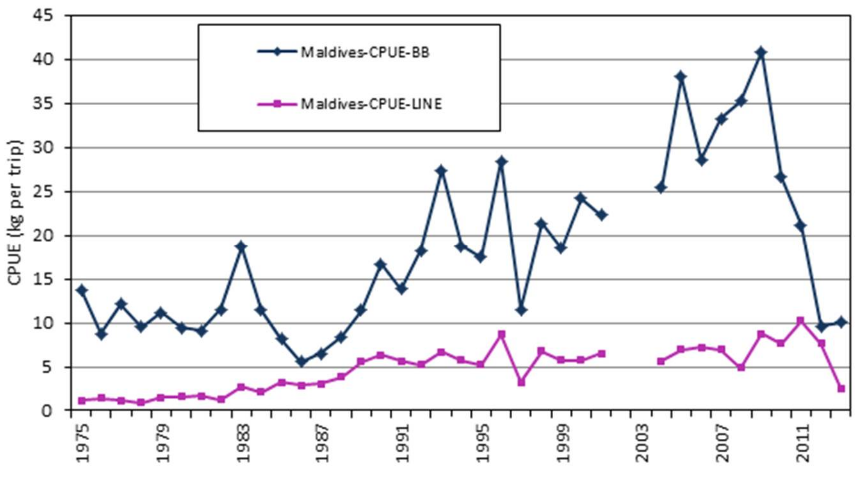


Fig. 16. *Frigate tuna: Nominal CPUE series for the baitboat (BB using mechanized boats) and line (LINE, including handlines and trolling using mechanized boats) fisheries of Maldives derived from the available catches and effort data (1975–2013).*

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

- Sizes: the sizes of frigate tunas taken by Indian Ocean fisheries typically range between 20 – 50 cm depending on the type of gear used, season and location. 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).

[9] 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

- Size frequency data: highly incomplete, with data only available for selected years and/or fisheries (Fig.17).

  Main sources for size samples: Sri Lanka (gillnet), and Maldives (pole-and-line).
  Length distributions derived from data available for gillnet fisheries are shown in Fig.18. Generally speaking total numbers of samples are below the minimum sampling standard of 1 fish per tonne of catch recommended by the IOTC Secretariat to reliably assess changes in average weight – with the exception of samples recorded for Sri Lanka gillnets during the mid-1980s to early-1990 which were obtained with the support of IPTP funding.
- Catch-at-Size (Age) table: Not available, due to lack of size samples and uncertainty over the reliability of retained catch estimates.

- Sex ratio data: have not been provided to the Secretariat by CPCs.

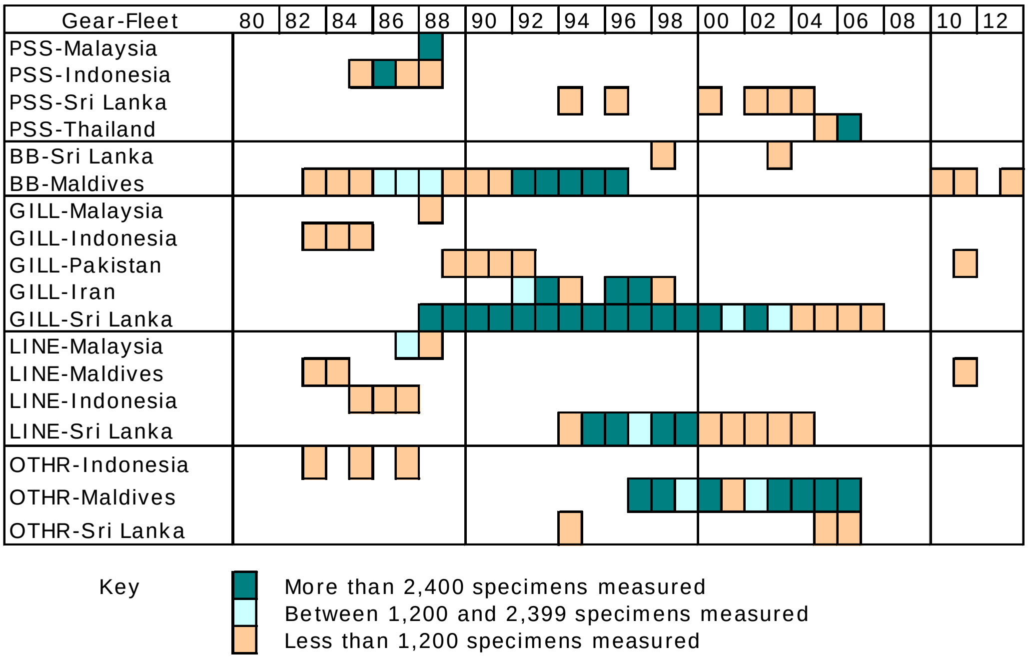


Fig. 17. Frigate tuna: Availability of length frequency data, by fishery and year (1980–2013)[10]. Note that no length frequency data are available at all for 1950–82.

Other biological data: Equations available for frigate tuna are shown below:

Species	*From type measurement – To type measurement*	*Equation*	*Parameters*	*Sample size*	*Length*
Frigate tuna	*Fork length – Round WeightA*	*RND=a*L^b*	*a= 0.00001700 b= 3.0*		*Min:20 Max:45*

[10] 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

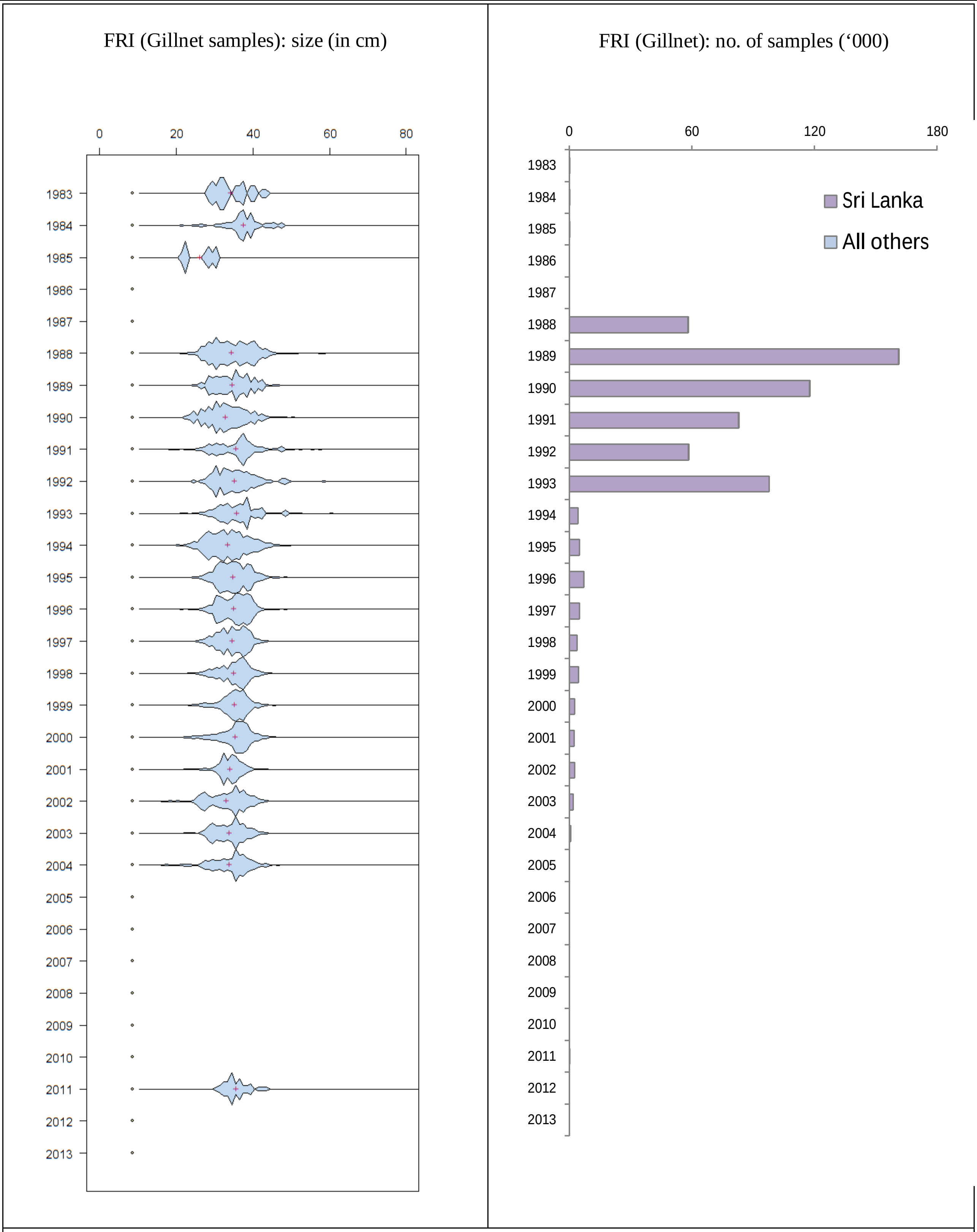


Fig. 18a-b. Left: Frigate tuna (gillnet fisheries): Length frequency distributions (by 1cm length class) derived from data available at the IOTC Secretariat.

Right: Number of frigate tuna specimens (gillnet fisheries) sampled for lengths, by fleet and year.

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

Extract from IOTC–2015–WPNT05–07 Rev_1

Fisheries and main catch trends

- Main fisheries: Kawakawa are caught mainly by coastal purse seines, gillnets, handlines and trolling (Table 6 and Fig. 30), and may be also an important bycatch of the industrial purse seiners (Table 5; Fig.25).
- Main fleets (i.e., highest catches in recent years): Indonesia, India, I.R. Iran, and Pakistan (Fig.26).
- Retained catch trends:
  Annual estimates of catches for the kawakawa increased markedly from around 20,000 t in the mid-1970's to reach the 45,000 t mark in the mid-1980's and 156,000 t in 2012, the highest catches ever recorded for this species.
- 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.

Changes to the catch series**:** No major revisions to the catch series since the WPNT meeting in 2014 (Fig. 43).

Kawakawa tuna – estimation of catches: data related issues

Retained catches for kawakawa were derived from incomplete information, and are therefore uncertain[11] (Fig.27), 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. In the past, the IOTC Secretariat used the catches reported since 2005 to break the aggregates for 1950–2004, by gear and species. However, a review by the IOTC Secretariat conducted by an independent consultant in 2012 indicated that the catches of kawakawa had been overestimated by Indonesia. While the new catches estimated for kawakawa in Indonesia remain uncertain, the new figures are considered more reliable than those previously recorded in the IOTC database.
- Artisanal fisheries of India: Although India reports catches of kawakawa they are not always reported by gear. The catches of kawakawa in India were also reviewed by the IOTC Secretariat in 2012 and assigned by gear on the basis of official reports and information from various other alternative sources.
- 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 Thailand, and until recently Malaysia).
- 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.

[11] 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 non-reporting fisheries for which catches had to be estimated.

TABLE 5. Kawakawa: Best scientific estimates of the catches of kawakawa by type of fishery for the period 1950–2012 (in metric tonnes). Data as of May 2015.

Fishery	By decade (average)						By year (last ten years)									
	1950s	1960s	1970s	1980s	1990s	2000s	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Purse seine	100	385	2,616	12,070	21,396	28,613	27,812	32,393	34,785	32,586	32,441	37,051	35,064	40,582	42,492	43,984
Gillnet	2,575	4,485	9,691	17,958	30,709	53,547	48,413	50,443	55,651	59,138	70,971	69,772	64,713	75,074	74,523	87,165
Line	1,715	3,264	6,642	9,867	15,673	19,874	19,952	21,154	20,409	22,299	22,524	23,804	23,356	25,707	32,443	28,774
Other	295	719	1,357	2,690	5,127	7,819	7,511	8,383	8,027	9,629	9,015	10,129	9,994	10,007	9,974	10,257
Total	**4,685**	**8,853**	**20,306**	**42,585**	**72,905**	**109,853**	**103,687**	**112,374**	**118,871**	**123,652**	**134,952**	**140,756**	**133,127**	**151,370**	**159,433**	**170,181**

Definition of fishery: Gillnet: gillnet, including offshore gillnet; Line: coastal longline, hand line, troll line; Purse seine: coastal purse seine, purse seine, ring net; Other gears: baitboat, danish seine, liftnet, longline, longline fresh, trawling.

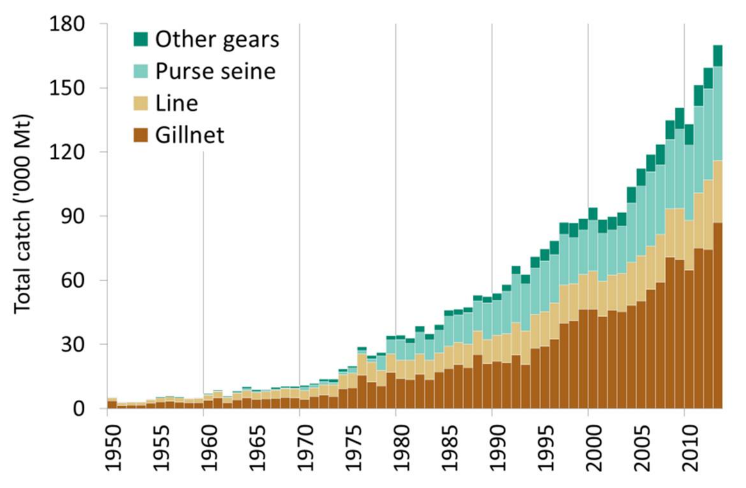


Fig.25. Kawakawa: Annual catches by gear recorded in the IOTC Database (1950–2013).

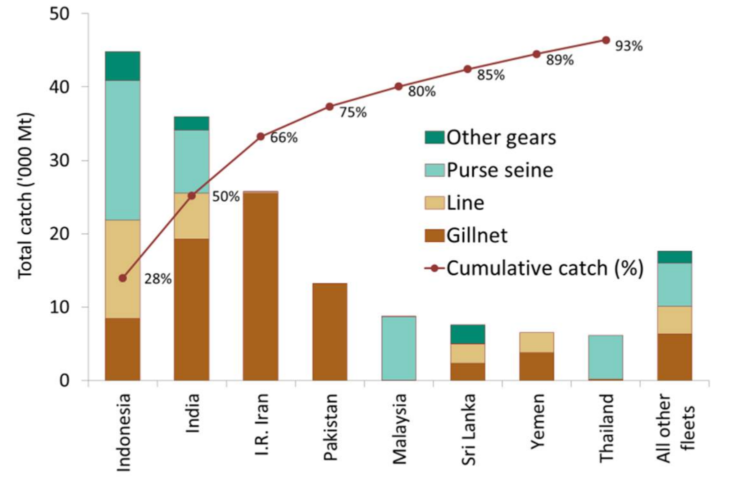
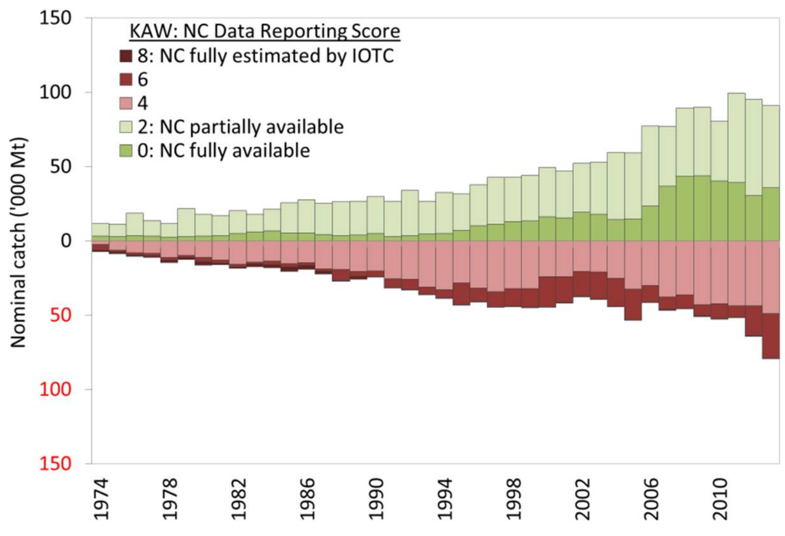


Fig.26. Kawakawa: Average catches in the Indian Ocean over the period 2011–13, by country[12].



[12] Countries are ordered from left to right, according to the importance of catches of longtail reported for 2011-2013. The red line indicates the (cumulative) proportion of catches of longtail tuna for the countries concerned, over the total combined catches of this species reported from all countries and fisheries for 2011-2013.

Fig.27. Kawakawa: nominal catch; uncertainty of annual catch estimates (1974–2013).

Catches are assessed against IOTC reporting standards, where a score of 0 indicates catches that are fully reported according to IOTC standards; catches assigned a score of between 2 – 6 do not report catch data fully by gear and/or species (i.e., partially adjusted by gear and species by the IOTC Secretariat) or any of the other reasons provided in the document; catches with a score of 8 refer to fleets that do not report catch data to the IOTC (estimated by the IOTC Secretariat). Data as of May 2015.

Kawakawa tuna – Effort trends

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

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

- Availability: highly incomplete, with data available for only short periods of time and selected fisheries (Fig.28).
- Main CPUE series available: Maldives (baitboats and troll lines) (Fig.29), and Sri Lanka (gillnets). However the catch-and-effort data recorded for Sri Lankan gillnets are thought to be unreliable, due to the dramatic changes in CPUE recorded between consecutive years.

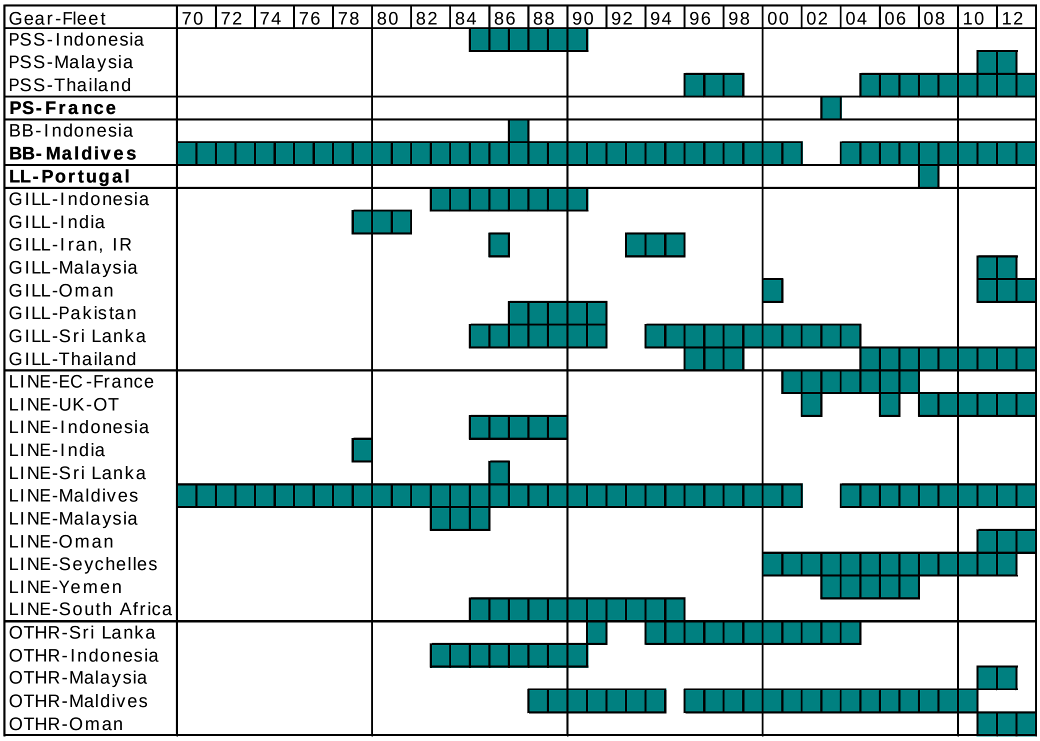


Fig. 28. Kawakawa: Availability of catches and effort series, by fishery and year (1970-2013)[13]. Note that no catches and effort are available at all for 1950–69.

[13] 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

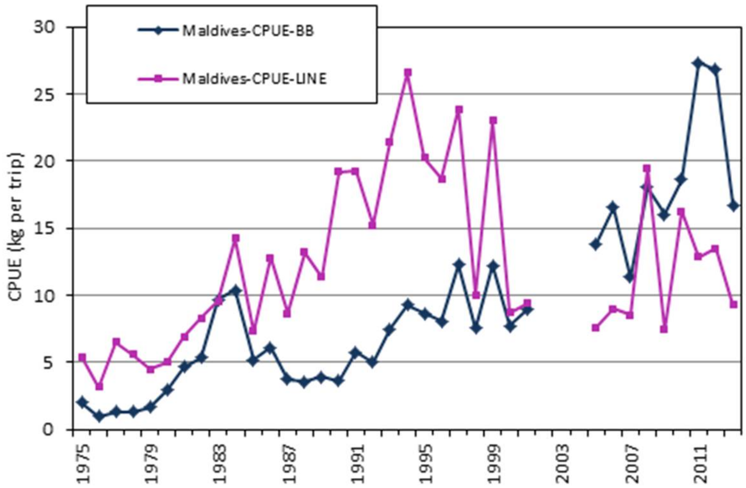
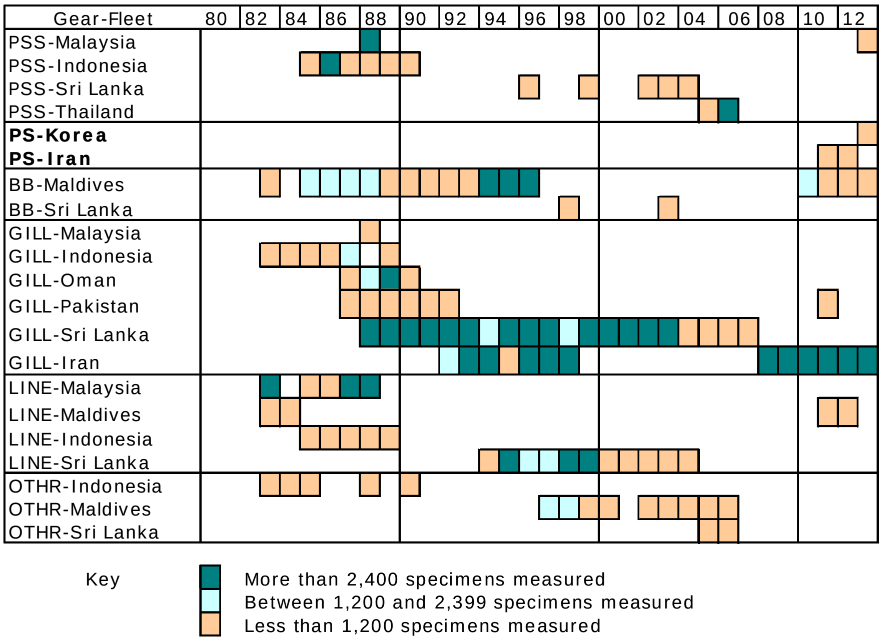


Fig. 29. Kawakawa: Nominal CPUE series for baitboat (BB) and troll line (TROL) fisheries of Maldives (1975–2013) derived from the available catch-and-effort data.

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

- Sizes: 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. 38). The coastal purse seine fisheries operating 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).
- Size frequency data: overall highly incomplete, with data only available for selected years and/or fisheries (Fig.30).

  Main sources for size samples: Sri Lanka (gillnet), and I.R. Iran (gillnets).
  Trends in average weight can be assessed for Sri Lankan gillnets from the mid-1980s to early-1990s, but the amount of specimens measured has been very low in recent years (Fig. 37). Since 1998 there has also been some sampling of lengths from Iranian gillnets – although average lengths are significantly larger than specimens reported by other fleets which reflect differences in the selectivity of offshore gillnets operating in the Arabian Sea, rather than an actual change in average sizes in the underlying population.
  Length distributions derived from the data available for gillnet fisheries are shown in Fig.31. No data are available in sufficient numbers for all other fisheries.
- Catch-at-Size (Age) table: Not available, due to lack of size samples and uncertainty over the reliability of retained catch estimates.
- Sex ratio data: have not been provided to the Secretariat by CPCs.

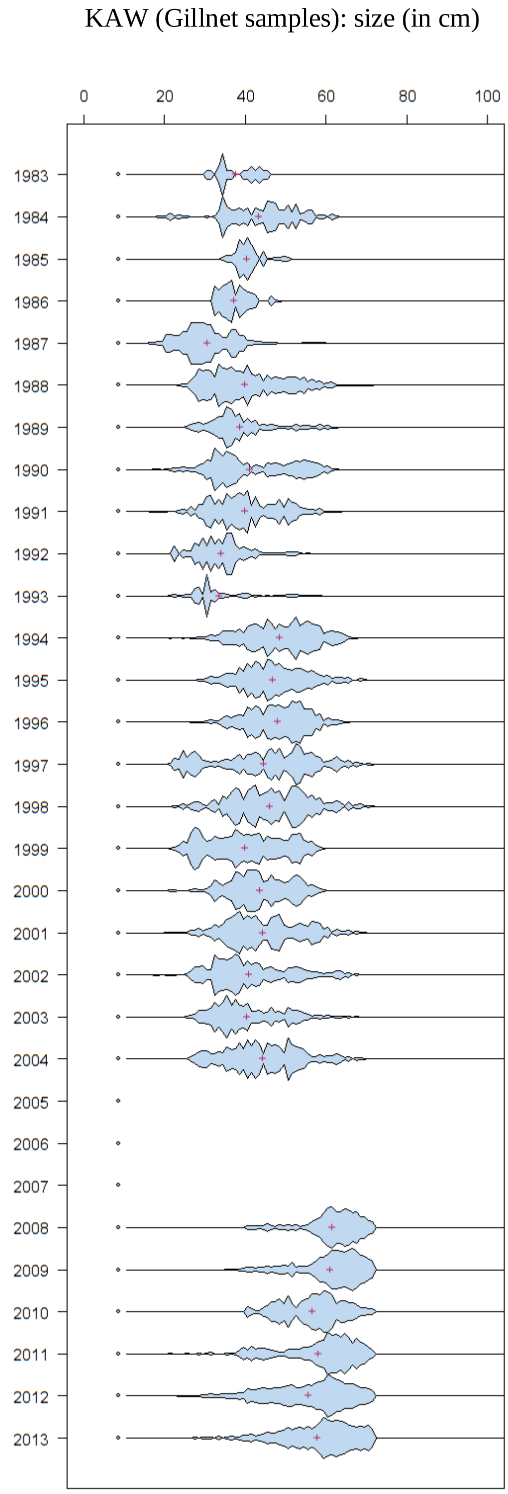


- **Fig. 30.** Kawakawa: Availability of length frequency data, by fishery and year (1980-2013)[14]. Note that no length frequency data are available for 1950–82.

Other biological data: Equations available for kawakawa are shown below

Species	From type measurement – To type measurement	Equation	Parameters	Sample size	Length
Kawakawa	*Fork length – Round WeightA*	*RND=a*L^b*	*a= 0.0000260* *b= 2.9*		*Min: 20* *Max: 65*

[14] 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



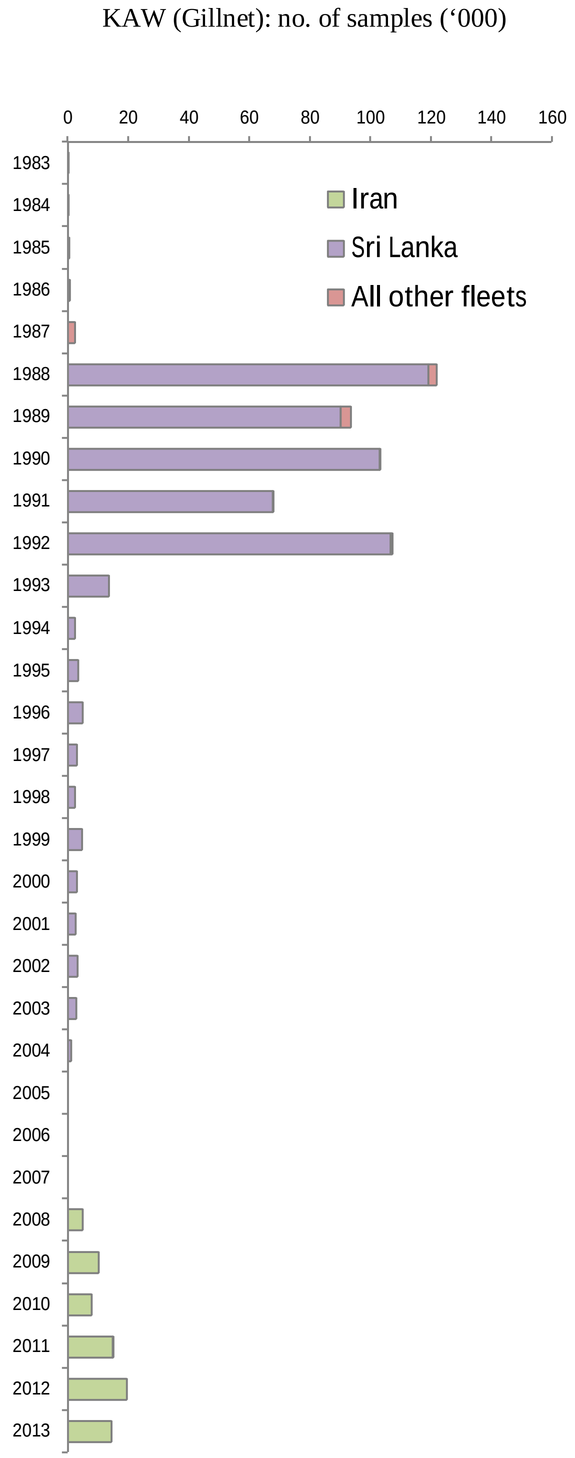


Fig. 31a-b. Left: Kawakawa (gillnet fisheries): Length frequency distributions (by 1cm length class) derived from data available at the IOTC Secretariat.

Right: Number of kawakawa specimens (gillnet fisheries) sampled for lengths, by fleet and year.

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

Extract from IOTC–2015–WPNT05–07 Rev_1

Fisheries and main catch trends

- Main fisheries: longtail tuna are caught mainly using gillnets and, to a lesser extent, coastal purse seine nets and trolling (Table 2; Fig. 5).
- Main fleets (i.e., highest catches in recent years):
  Nearly half of catches of longtail in the Indian Ocean are accounted for by I.R. Iran (gillnet), followed by Indonesia (gillnet, trolling), Malaysia (coastal purse seine) and Pakistan (gillnet) (Fig.6).
- Retained catch trends:
  Estimates catches of longtail tuna have increased steadily from the mid-1950s, reaching around 15,000t in the mid-1970's, over 35,000t by the mid-1980's, and more than 96,000 t in 2000. Between 2000 and 2005, catches declined, but have since recovered and reached the highest levels recorded – over 170,000 t in 2011.

  Since 2009 I.R. Iran has reported large increases catches of longtail tuna in coastal waters in the Arabian Sea, as a result of the threat of piracy and displacement of fishing effort (and change of targeting) by gillnet vessels formerly operating in the North-West Indian Ocean.
- Discard levels**:** are thought to be very low, although estimates of discards are unknown for most fisheries.

***Changes to the catch series*:** no major changes to the catch series of longtail tuna since WPNT in 2014.

Longtail tuna: estimation of catches – data related issues

Retained catches for longtail tuna were derived from incomplete information, and are therefore uncertain[15] (Fig.7), 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 as aggregated for this period. In the past, the IOTC Secretariat used the catches reported since 2005 to break the aggregates for 1950–2004, by gear and species. However, a recent review by the IOTC Secretariat conducted by an independent consultant in 2012 indicated that catches of longtail tuna had been severely overestimated by Indonesia. While the new catches estimated for the longtail tuna in Indonesia remain uncertain, the new figures are considered more reliable than those existing in the past.
- 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 assign the catches reported by Oman by gear. The catches of India were also reviewed by the independent consultant in 2012 and assigned by gear on the basis of official reports and information from various alternative sources.
- Artisanal fisheries of Myanmar and Somalia: None of these countries have ever reported catches of longtail tuna to the IOTC Secretariat. While catch levels are unknown they are unlikely to be 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 until recently Malaysia (with catches of the main neritic tunas aggregated and reported as longtail).

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[15] 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 non-reporting fisheries for which catches had to be estimated.

TABLE 2. Longtail tuna: latest scientific estimates of the catches of longtail tuna by type of fishery for the period 1950–2013 (in metric tonnes). Data as of May 2015.

Fishery	By decade (average)						By year (last ten years)									
	1950s	1960s	1970s	1980s	1990s	2000s	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Purse seine	41	204	1,012	4,862	10,933	17,719	13,313	12,388	16,128	23,838	18,885	20,649	16,531	19,771	21,114	19,739
Gillnet	2,985	6,229	10,026	25,839	41,648	63,485	51,413	52,092	59,802	68,398	69,708	87,159	105,094	121,801	114,402	113,080
Line	548	807	1,560	4,323	5,016	9,502	8,754	10,268	9,514	11,929	11,206	12,494	12,977	15,288	25,759	20,706
Other	0	0	125	1,090	1,992	3,732	2,912	3,751	3,638	5,686	5,460	5,300	6,513	8,467	9,073	5,787
Total	**3,574**	**7,240**	**12,723**	**36,115**	**59,590**	**94,437**	**76,392**	**78,498**	**89,081**	**109,851**	**105,260**	**125,601**	**141,115**	**165,327**	**170,348**	**159,313**

Definition of fishery: Gillnet: gillnet, including offshore gillnet; Line: coastal longline, hand line, troll line; Purse seine: coastal purse seine, purse seine, ring net; Other gears: baitboat, danish seine, liftnet, longline, longline fresh, trawling.

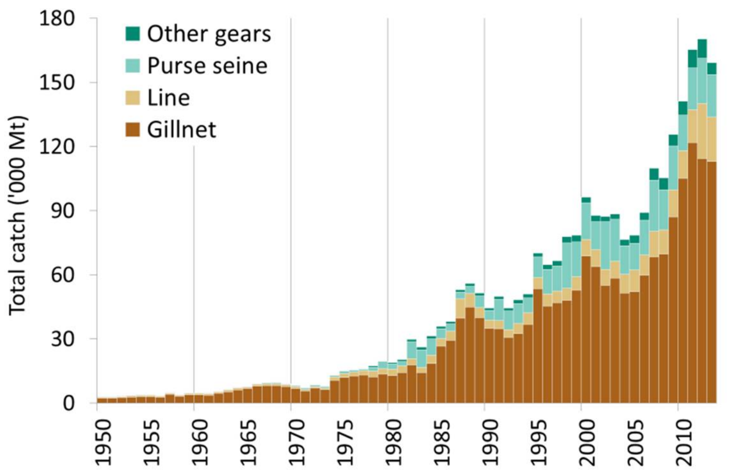


Fig.5. Longtail tuna: Annual catches by gear recorded in the IOTC Database (1950–2013).

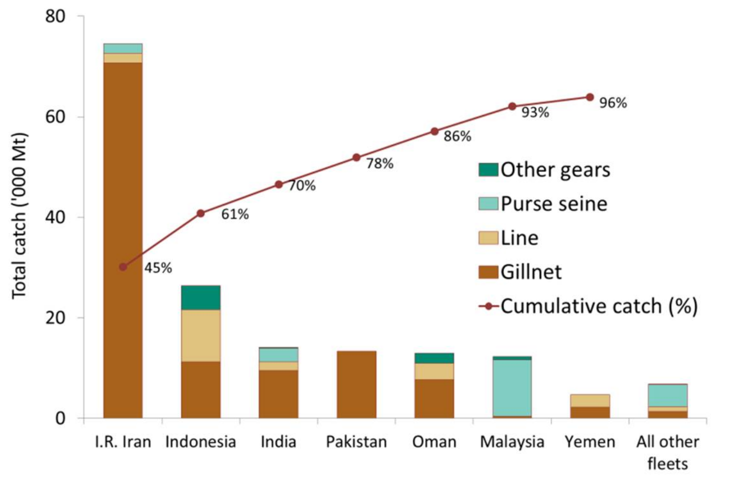
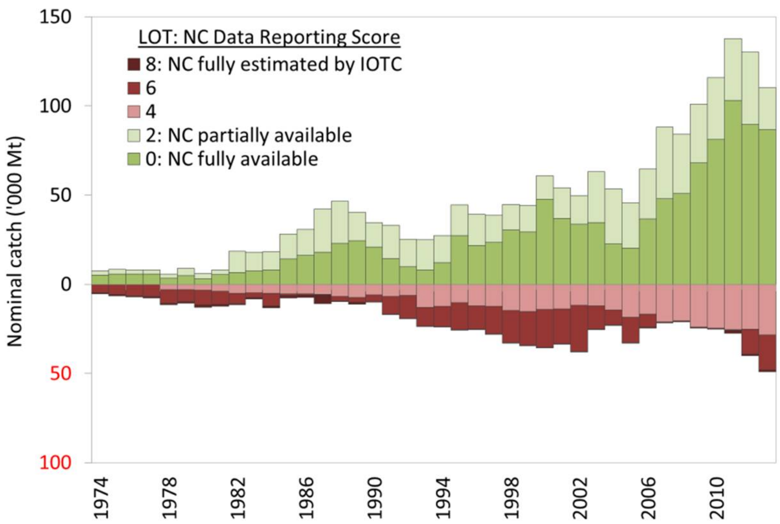


Fig.6. Longtail tuna: Average catches in the Indian Ocean over the period 2011–13, by country[16].



[16] Countries are ordered from left to right, according to the importance of catches of longtail reported for 2011-2013. The red line indicates the (cumulative) proportion of catches of longtail tuna for the countries concerned, over the total combined catches of this species reported from all countries and fisheries for 2011-2013.

Fig. 7. Longtail tuna: nominal catch; uncertainty of annual catch estimates (1974–2013).

Catches are assessed against IOTC reporting standards, where a score of 0 indicates catches that are fully reported according to IOTC standards; catches assigned a score of between 2 – 6 do not report catch data fully by gear and/or species (i.e., partially adjusted by gear and species by the IOTC Secretariat) or any of the other reasons provided in the document; catches with a score of 8 refer to fleets that do not report catch data to the IOTC (estimated by the IOTC Secretariat). Data as of May 2015.

Longtail tuna – Effort trends

- Availability: Effort trends are unknown for longtail tuna in the Indian Ocean due to a lack of catch-and-effort data.

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

- Availability: highly incomplete, with data available for only short periods of time and selected fisheries (Fig.8).
- Main CPUE series available: Thailand coastal purse seine and gillnet vessels (i.e., available over 10 years) (Fig.9).

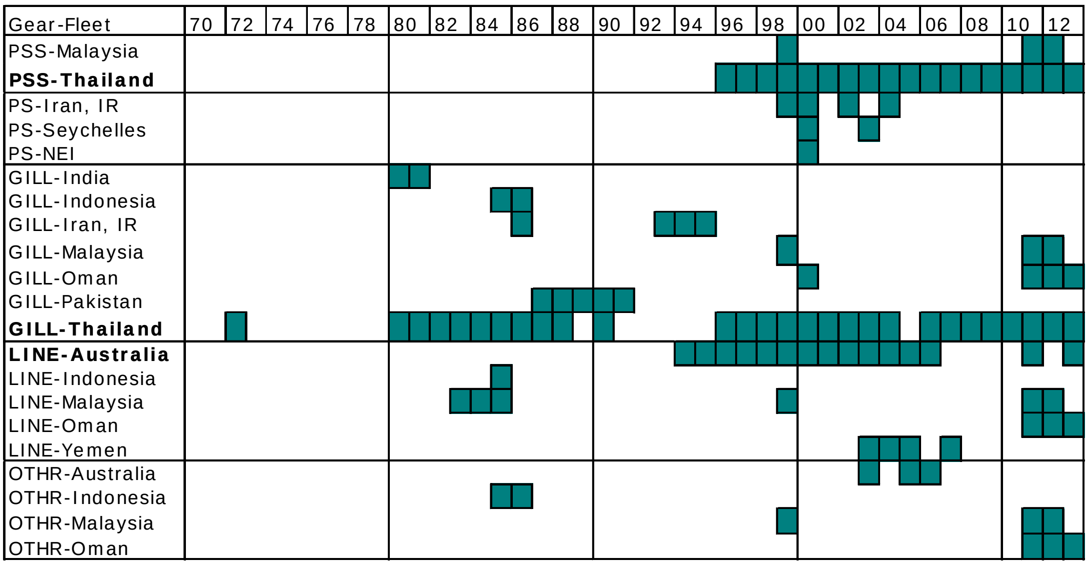


Fig. 8. Longtail tuna: Availability of catches and effort series, by fishery and year (1970–2013)[17]. No catch-and-effort is available for 1950–1971.

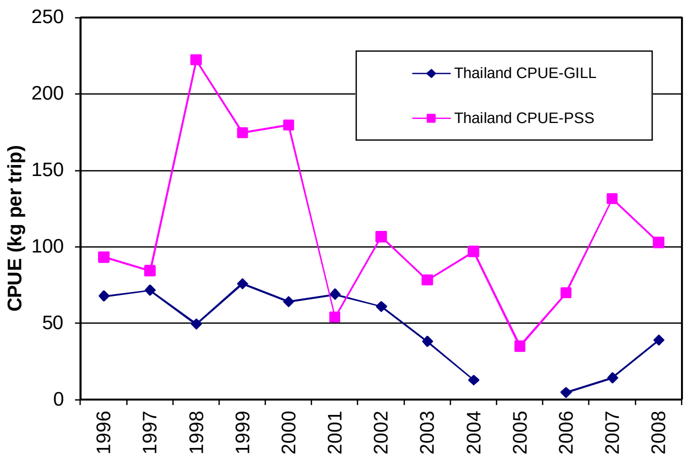


Fig. 9. Longtail tuna: Nominal CPUE series for gillnet (GILL) and coastal purse seine (PSS) fisheries of Thailand derived from available catch-and-effort data (1996–2013).

[17] 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.

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

- Sizes: longtail tunas taken by Indian Ocean fisheries typically range between 20 – 100 cm depending on the type of gear used, season and location (Fig.10). Fisheries operating in the Andaman Sea (coastal purse seines and trolling) tend to catch smaller sized longtail tuna (e.g., 20–45cm), while gillnet fisheries of I.R. Iran and Pakistan (Arabian Sea) catch larger specimens (e.g., 50–100cm).

- Size frequency data**:** highly incomplete, with data available only for selected fisheries.

  Main sources for size samples: I.R. Iran (gillnet) and Oman (gillnet).
  Length distributions derived from data available for gillnet fisheries are shown in Fig.11. Total numbers of samples, across all years, are also well below the minimum sampling standard of 1 fish per tonne of catch recommended by the IOTC Secretariat to reliably assess changes in average weight.
- Catch-at-Size (Age) table: Not available, due to lack of size samples and uncertainty over the reliability of retained catch estimates.

- Sex ratio data: have not been provided to the Secretariat by CPCs.

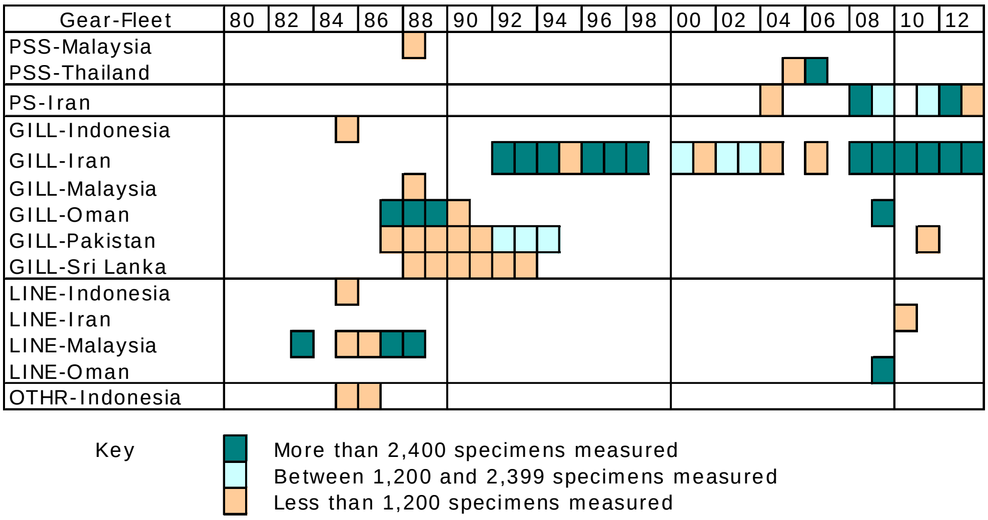


Fig. 10. Longtail tuna: Availability of length frequency data, by fishery and year (1980–2013)[18]. Note that no length frequency data are available at all for 1950–1982.

Other biological data: Equations available for longtail tuna are shown below:

Species	*From type measurement – To type measurement*	*Equation*	*Parameters*	*Sample size*	*Length*
Longtail tuna	Fork length – Round Weight[c]	RND=a*L^b	a= 0.00002 b= 2.83		Min:29 Max:128

[18] 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

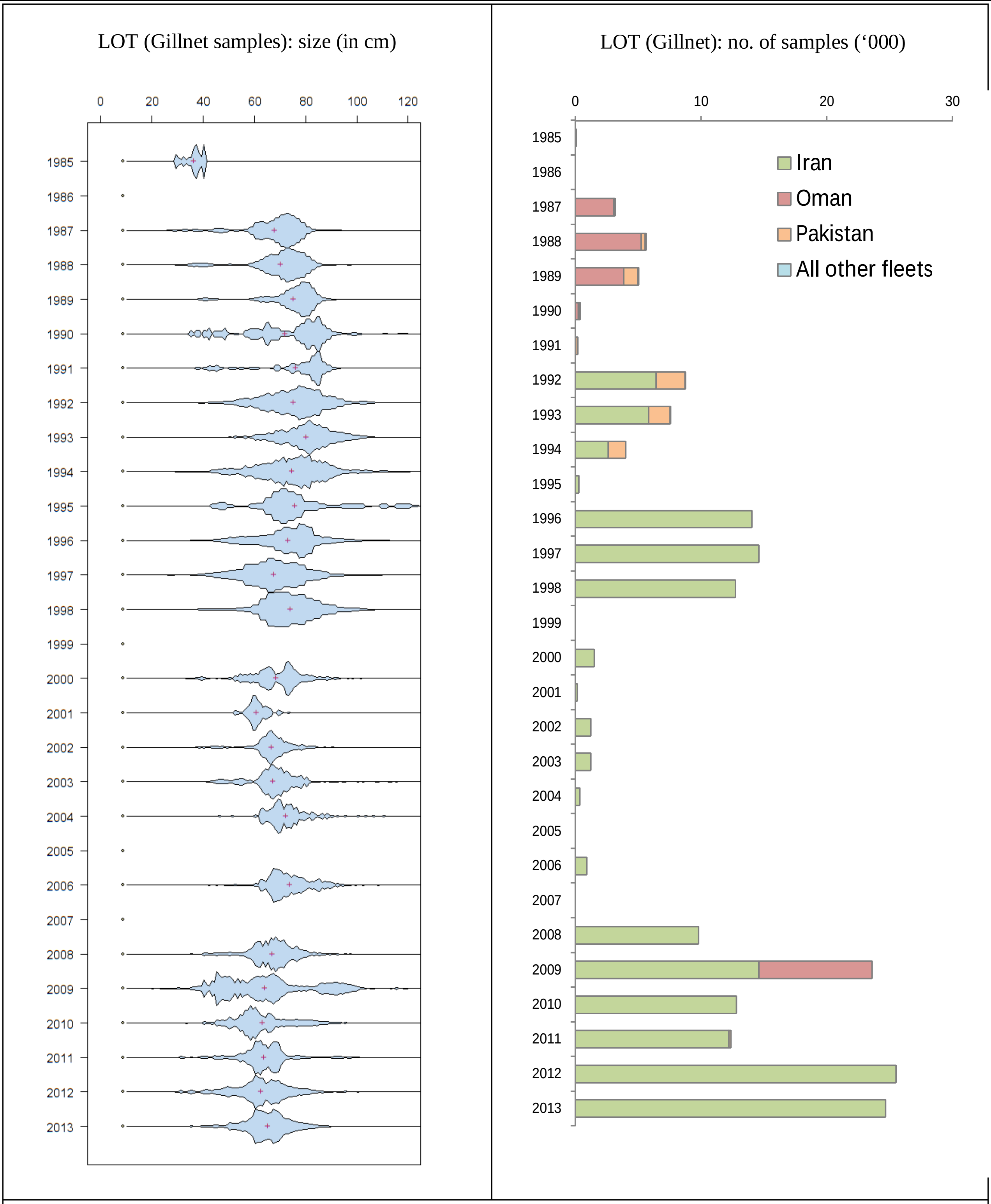


Fig. 11a-b. Left: Longtail tuna (gillnet fisheries): Length frequency distributions (by 1cm length class) derived from data available at the IOTC Secretariat.

Right: Number of longtail tuna specimens (gillnet fisheries) sampled for lengths, by fleet and year.

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

Extract from IOTC–2015–WPNT05–07 Rev_1

Fisheries and main catch trends

- Main fisheries: Indo-Pacific king mackerel[19] are caught mainly by gillnet fisheries in the Indian Ocean, however significant numbers are also caught trolling (Table7; Fig.39).
- Main fleets (i.e., in terms of highest catches in recent years):
  Fisheries in India, Indonesia, and, to a lesser extent, Myanmar, I.R. Iran and Pakistan (Fig.40).
- Retained catch trends:
  Estimated catches have increased steadily since the mid 1960's, reaching around 24,000 t in the late 1970's and over 30,000 t by the mid-1990's, when catches remained stable until around 2006. Since the late-2000s catches have increased sharply, to over 40,000 t, with the highest catches recorded in 2009 at around 53,000 t.
- Discard levels**:** are thought to be very low, although estimates of discards are unknown for most fisheries.

Changes to the catch series**:** there have been no major revisions to the catch series for King mackerel since the WPNT meeting in 2014.

Indo-Pacific King mackerel: estimation of catches – data related issues

Retained catches for King mackerel were derived from incomplete information, and are therefore uncertain[20] (Fig.41), notably for the following fisheries:

- Species aggregation: Indo-Pacific king mackerels are often not reported by species but are aggregated with narrow-barred Spanish mackerel or, less frequently, other small tuna species.
- Mislabelling: Indo-Pacific king mackerels are often 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.

[19] Hereinafter referred to as King mackerel.

[20] 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 non-reporting fisheries for which catches had to be estimated.

TABLE 7. *Indo-Pacific king mackerel: Best scientific estimates of the catches of Indo-Pacific king mackerel by type of fishery for the period 1950–2013 (in metric tonnes). Data as of May 2015.*

Fishery	By decade (average)						By year (last ten years)									
	1950s	1960s	1970s	1980s	1990s	2000s	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Purse seine	-	-	34	584	772	938	786	768	720	1,109	1,239	1,605	1,122	1,241	1,092	1,243
Gillnet	4,367	6,898	13,948	17,097	21,709	23,628	22,143	20,347	20,915	27,450	31,193	32,007	26,252	28,300	27,593	29,268
Line	250	349	768	1,333	1,834	2,504	2,056	2,240	2,046	3,493	3,520	4,041	3,215	3,362	3,345	3,429
Other	13	21	48	3,879	5,101	9,353	8,159	8,334	8,208	10,872	11,929	15,733	11,578	12,371	11,024	12,413
Total	**4,630**	**7,268**	**14,798**	**22,893**	**29,416**	**36,422**	**33,144**	**31,689**	**31,889**	**42,923**	**47,881**	**53,386**	**42,166**	**45,274**	**43,054**	**46,354**

Definition of fishery: Gillnet: gillnet, including offshore gillnet; Line: coastal longline, hand line, troll line; Purse seine: coastal purse seine, purse seine, ring net; Other gears: baitboat, danish seine, liftnet, longline, longline fresh, trawling.

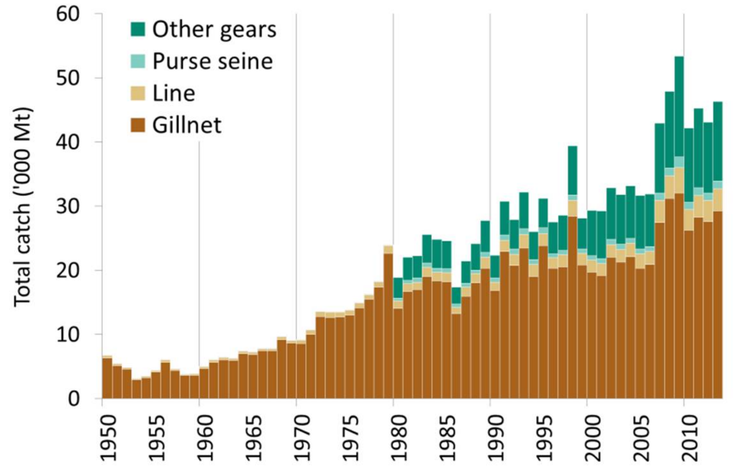


Fig.39. Indo-Pacific king mackerel: Annual catches by gear recorded in the IOTC Database (1950–2013).

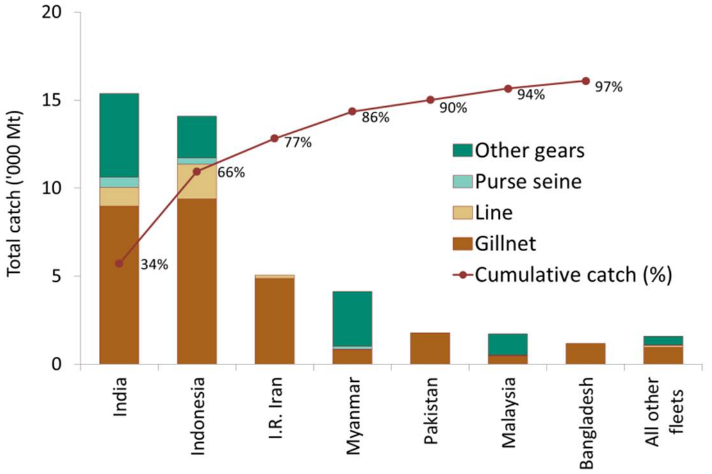
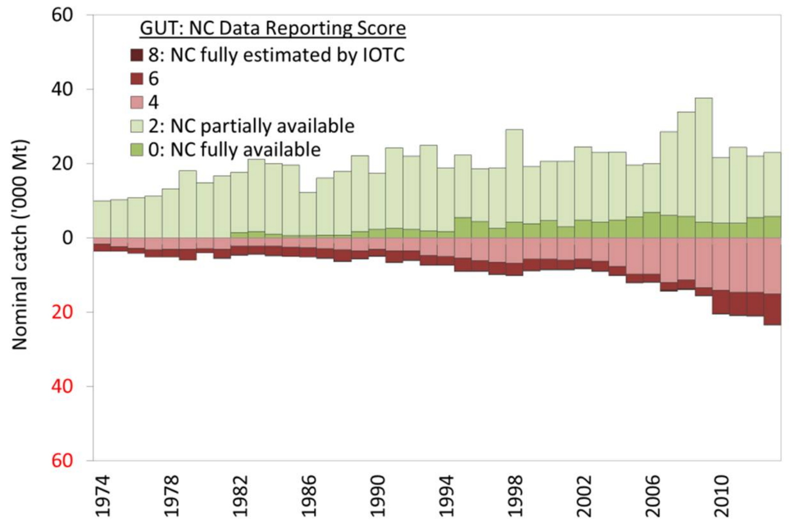


Fig.40. Indo-Pacific king mackerel: Average catches in the Indian Ocean over the period 2011–13, by country[21].



[21] Countries are ordered from left to right, according to the importance of catches of longtail reported for 2011-2013. The red line indicates the (cumulative) proportion of catches of longtail tuna for the countries concerned, over the total combined catches of this species reported from all countries and fisheries for 2011-2013.

Fig. 41. Indo-Pacific king mackerel: nominal catch; uncertainty of annual catch estimates (1974–2013).

Catches are assessed against IOTC reporting standards, where a score of 0 indicates catches that are fully reported according to IOTC standards; catches assigned a score of between 2 – 6 do not report catch data fully by gear and/or species (i.e., partially adjusted by gear and species by the IOTC Secretariat) or any of the other reasons provided in the document; catches with a score of 8 refer to fleets that do not report catch data to the IOTC (estimated by the IOTC Secretariat). Data as of May 2015.

Indo-Pacific King Mackerel – Effort trends

- Availability: Effort trends are unknown for King Mackerel in the Indian Ocean, due to a lack of catch-and-effort data.

Indo-Pacific King Mackerel – Catch-per-unit-effort (CPUE) trends

- Availability: no data available for most fisheries, and where available, data refer to very short periods (Fig. 42). This makes it impossible to derive any meaningful CPUE from the existing data.

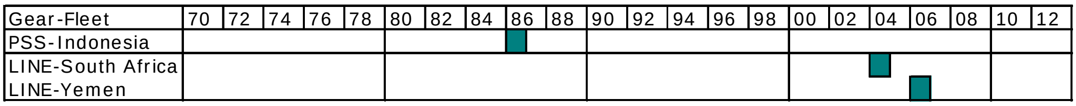


Fig. 42. Indo-Pacific king mackerel: Availability of catches and effort series, by fishery and year (1970–2013)[22]. Note that no catches and effort are available at all for 1950–85

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

- Size frequency data: trends in average weight cannot be assessed for most fisheries due to lack of data.

  Main sources for size samples: Thailand (coastal purse seiner) and Sri Lankan (gillnet) – however the number of samples is very small and the data refer to very short periods (Fig.43).
- Catch-at-Size (Age) table: Not available, due to lack of size samples and uncertainty over the reliability of retained catch estimates.
- Sex ratio data: have not been provided to the Secretariat by CPCs.

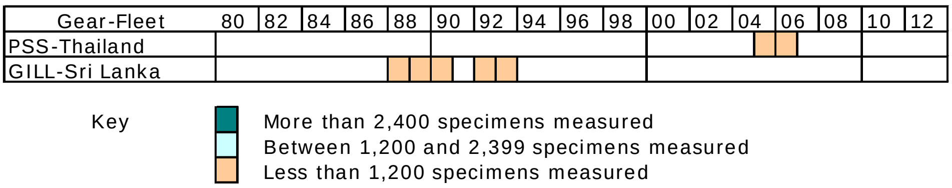


Fig. 43. Indo-Pacific king mackerel: Availability of length frequency data, by fishery and year (1980–2013)[23]. Note that no length frequency data are available for 1950–82.

Other biological data: The equations available for King mackerel are shown below

Species	*From type measurement – To type measurement*	*Equation*	*Parameters*	*Sample size*	*Length*
Indo-pacific king mackerel	*Fork length – Round WeightA*	*RND=a*L^b*	*a= 0.00001176* *b= 2.9002*		*Min:20* *Max:80*

[22] 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.

[23] 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 IVF
MAIN STATISTICS FOR NARROW-BARRED SPANISH MACKEREL (*SCOMBEROMORUS COMMERSON*)

Extract from IOTC–2015–WPNT05–07 Rev_1

Fisheries and main catch trends

- Main fisheries: Narrow-barred Spanish mackerel[24] are caught mainly using gillnet, however significant numbers are also caught using troll lines (Table 6; Fig.32).
- Main fleets (i.e., highest catches in recent years):
  Fisheries in Indonesia, India, and to a lesser extent I.R. Iran, Myanmar, the UAE and Pakistan (Fig.33). Spanish mackerel is also targeted throughout the Indian Ocean by artisanal and recreational fisheries.
- Retained catch trends:
  Catches of Spanish mackerel increased from around 50,000 t in the late-1970's to over 100,000 t by the late-1990's. The highest catches of Spanish mackerel have been recorded in recent years, at 145,000 t in 2011.
- Discard levels**:** are thought to be very low, although estimates of discards are unknown for most fisheries.

***Changes to the catch series*:** No major revisions to the catch series since the WPNT meeting in 2014 (Fig.34).

Narrow-barred Spanish mackerel: estimation of catches – data related issues

Retained catches for Spanish mackerel were derived from incomplete information, and are therefore uncertain[25] (Fig.42), notably for the following fisheries:

- Artisanal fisheries of Indonesia and India: Indonesia and India have only recently reported catches of Spanish mackerel by gear, including catches by gear for the years 2005–08 and 2007–08, respectively. In the past, the IOTC Secretariat used the catches reported in recent years to break the aggregates for previous years, by gear and species. However, in a review conducted by the IOTC Secretariat by an independent consultant in 2012 the catches of narrow-barred Spanish mackerel were reassigned by gear. In recent years, the catches of narrow-barred Spanish mackerel estimated for Indonesia and India component represent around 50% 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 2012 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 tunas and tuna-like species had been combined under this name (the review used data from various sources including a reconstruction of the total marine fisheries catches of Madagascar (1950–2008), undertaken by the Sea Around Us Project). However the new catches timated are thought to be very uncertain.
- Artisanal fisheries of Somalia: Catch levels are unknown.
- Other artisanal fisheries 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. In addition, Thailand 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 narrow-barred 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.

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[24] Hereinafter referred to as Spanish mackerel

[25] 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 non-reporting fisheries for which catches had to be estimated.

TABLE 6. Narrow-barred Spanish mackerel: Best scientific estimates of the catches of narrow-barred Spanish mackerel by type of fishery for the period 1950–2013 (in metric tonnes). Data as of May 2015.

Fishery	By decade (average)						By year (last ten years)									
	1950s	**1960s**	**1970s**	**1980s**	**1990s**	**2000s**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Purse seine	-	0	285	2,355	4,145	5,611	4,567	5,877	7,631	6,588	6,133	8,459	8,929	8,895	8,809	9,407
Gillnet	9,532	17,706	32,168	54,918	62,712	67,281	63,735	59,611	67,804	73,041	75,700	77,041	80,499	80,345	90,554	88,286
Line	1,729	2,475	4,672	11,334	12,071	17,139	15,681	17,392	18,259	19,755	18,747	21,328	20,767	27,539	30,057	26,981
Other	57	96	468	5,603	9,741	21,351	19,568	20,523	23,915	25,530	22,741	28,170	25,672	27,611	31,067	28,668
Total	**11,318**	**20,277**	**37,593**	**74,210**	**88,669**	**111,382**	**103,551**	**103,404**	**117,609**	**124,914**	**123,322**	**134,998**	**135,868**	**144,390**	**160,487**	**153,342**

Definition of fishery: Gillnet: gillnet, including offshore gillnet; Line: coastal longline, hand line, troll line; Purse seine: coastal purse seine, purse seine, ring net; Other gears: baitboat, danish seine, liftnet, longline, longline fresh, trawling.

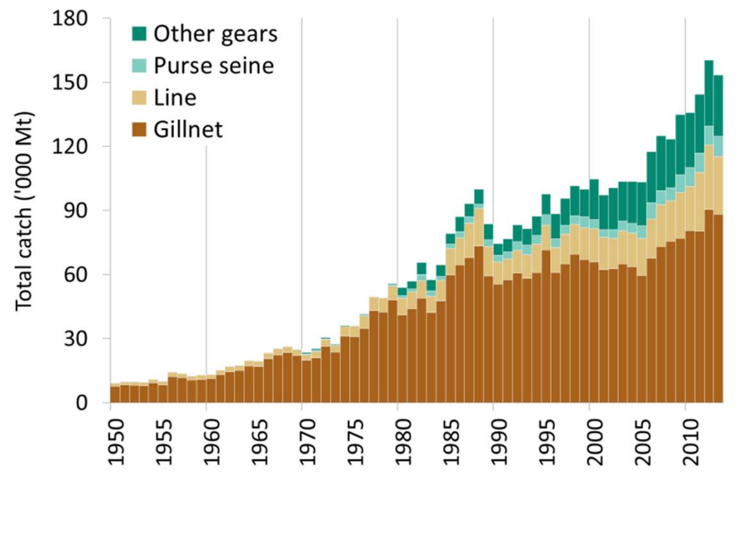


Fig.32. Narrow-barred spanish mackerel: Annual catches by gear recorded in the IOTC Database (1950–2013).

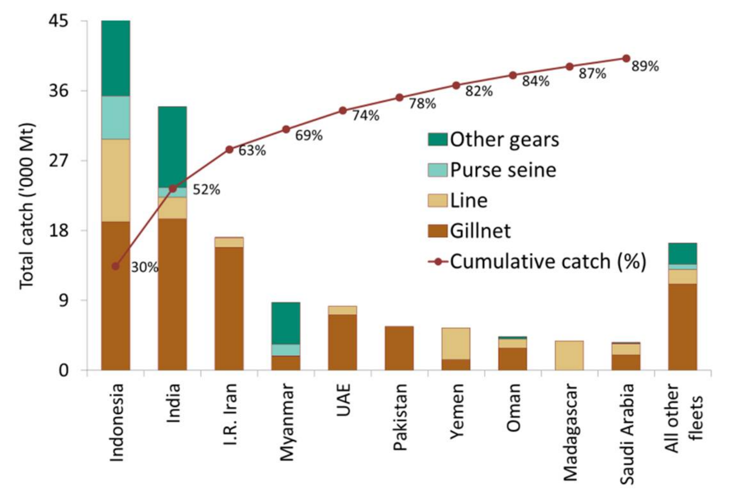
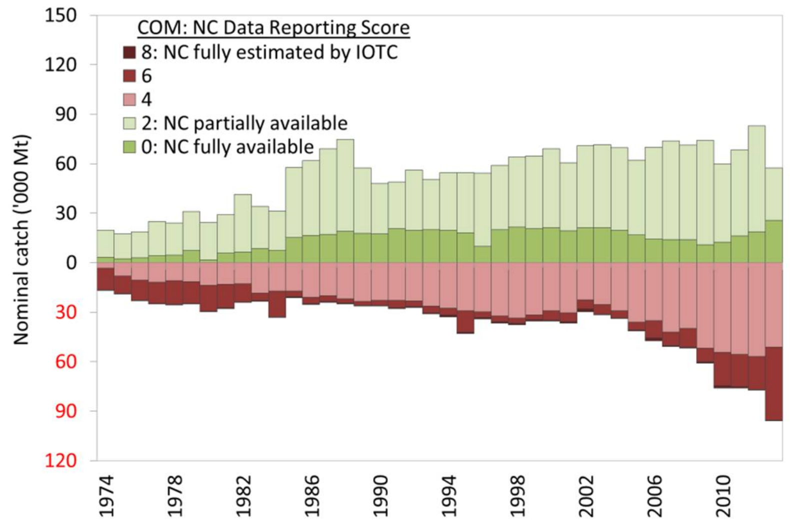


Fig.33. Narrow-barred spanish mackerel: Average catches in the Indian Ocean over the period 2011–13, by country[26].



[26] Countries are ordered from left to right, according to the importance of catches of longtail reported for 2011-2013. The red line indicates the (cumulative) proportion of catches of longtail tuna for the countries concerned, over the total combined catches of this species reported from all countries and fisheries for 2011-2013.

Fig. 34. Narrow-barred spanish mackerel: nominal catch; uncertainty of annual catch estimates (1974–2013).

Catches are assessed against IOTC reporting standards, where a score of 0 indicates catches that are fully reported according to IOTC standards; catches assigned a score of between 2 – 6 do not report catch data fully by gear and/or species (i.e., partially adjusted by gear and species by the IOTC Secretariat) or any of the other reasons provided in the document; catches with a score of 8 refer to fleets that do not report catch data to the IOTC (estimated by the IOTC Secretariat). Data as of May 2015.

Narrow-barred Spanish mackerel – Effort trends

- Availability: Effort trends are unknown for Spanish mackerel in the Indian Ocean, due to a lack of catch-and-effort data.

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

- Availability: highly incomplete data, available only for selected years and/or fisheries (Fig.35).
- Main CPUE series available (i.e., over 10 years or more):
  Sri Lanka (gillnets) – however the catches and effort recorded are thought to be unreliable due to the dramatic changes in CPUE recorded in 2003 and 2004 (Fig.36).

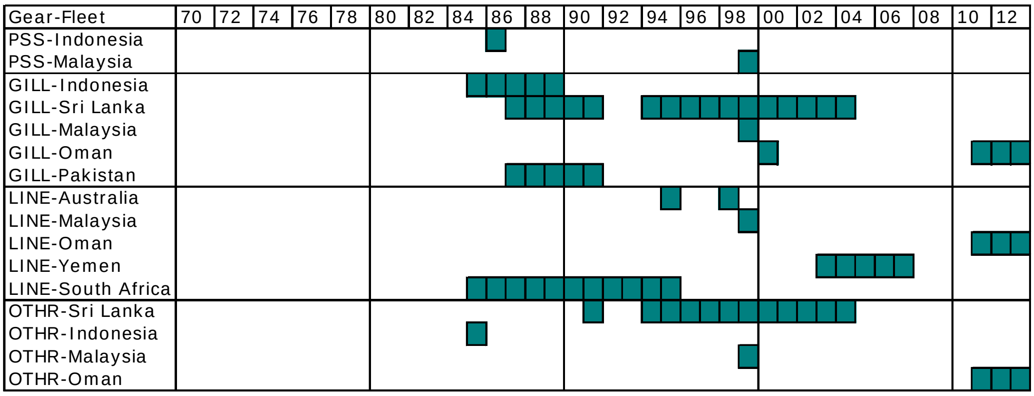


Fig.35. Narrow-barred Spanish mackerel: Availability of catches and effort series, by fishery and year (1970–2013)[27]. No catches and effort are available at for 1950–84, and 2008–10.

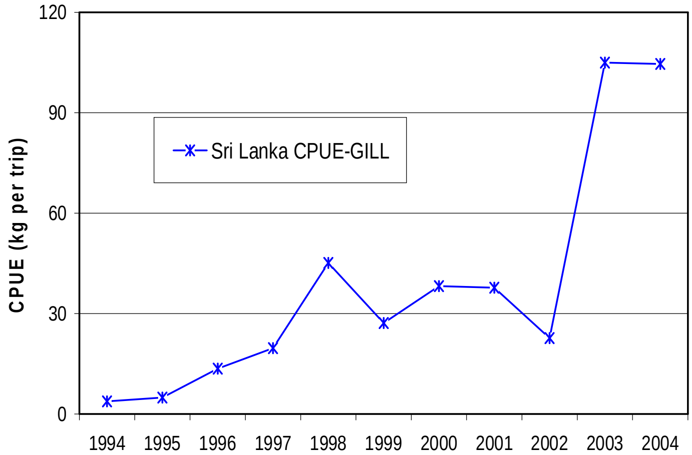


Fig.36. Narrow-barred Spanish mackerel: Nominal CPUE series for the gillnet fishery of Sri Lanka derived from the available catches and effort data (1994–2004).

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

- Sizes: the sizes 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 – with 32–119 cm fish taken in the Eastern

[27] 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

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.[28]

- Size frequency data: highly incomplete data, available only for selected years and/or fisheries (Fig.37).

  Total numbers of samples, across all years, are also well below the minimum sampling standard of 1 fish per tonne of catch recommended by the IOTC Secretariat to reliably assess changes in average weight.
  Main sources for size samples: Sri Lankan (gillnet) (from late-1980s until early-1990s), and I.R. Iran (gillnet) (from the late-2000s). Length distributions derived from the data available for gillnet fisheries are shown in Fig.38. No data are available in sufficient numbers for all other fisheries.
- Catch-at-Size (Age) table: Not available, due to lack of size samples and uncertainty over the reliability of retained catch estimates.
- Sex ratio data: have not been provided to the Secretariat by CPCs.

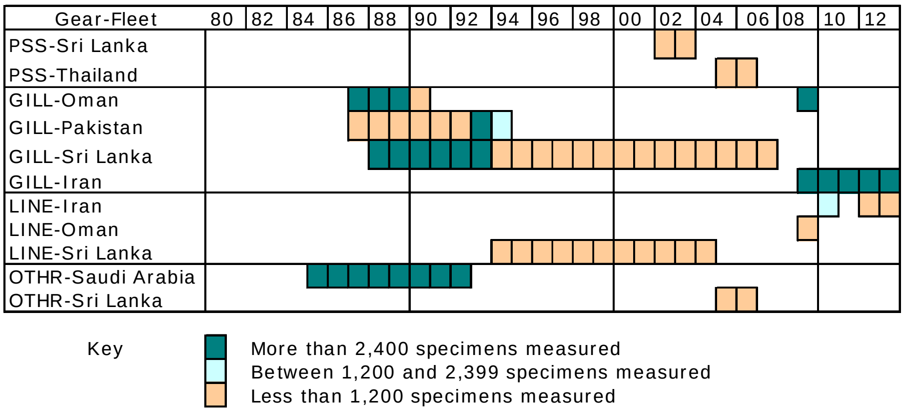


Fig. 37: Narrow-barred Spanish mackerel: Availability of length frequency data, by fishery and year (1980–2013)[29]. Note that no length frequency data are available prior to 1984.

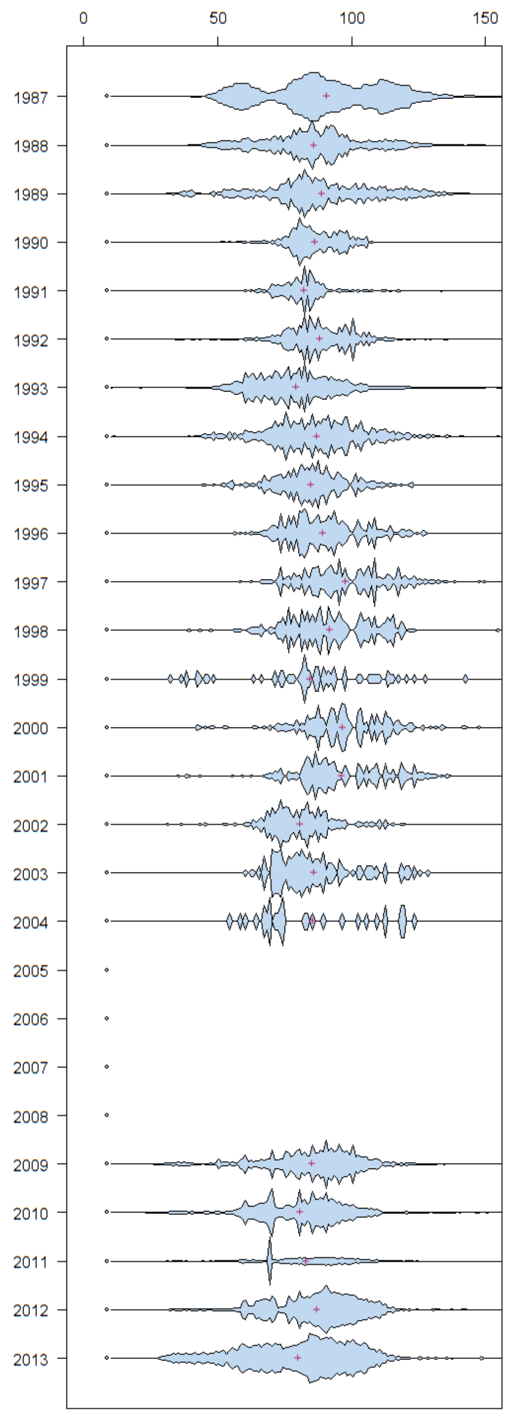
Other biological data: Equations available for Spanish mackerel are shown below:

Species	From type measurement – To type measurement	Equation	Parameters	Sample size	Length
Spanish mackerel	Fork length – Round WeightA	RND=a*L^b	a= 0.00001176 b= 2.9002		Min:20 Max:200

[28] The IOTC Secretariat did not find any data in support of this statement.

[29] 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

COM (Gillnet samples): size (in cm)



COM (Gillnet): no. of samples ('000)

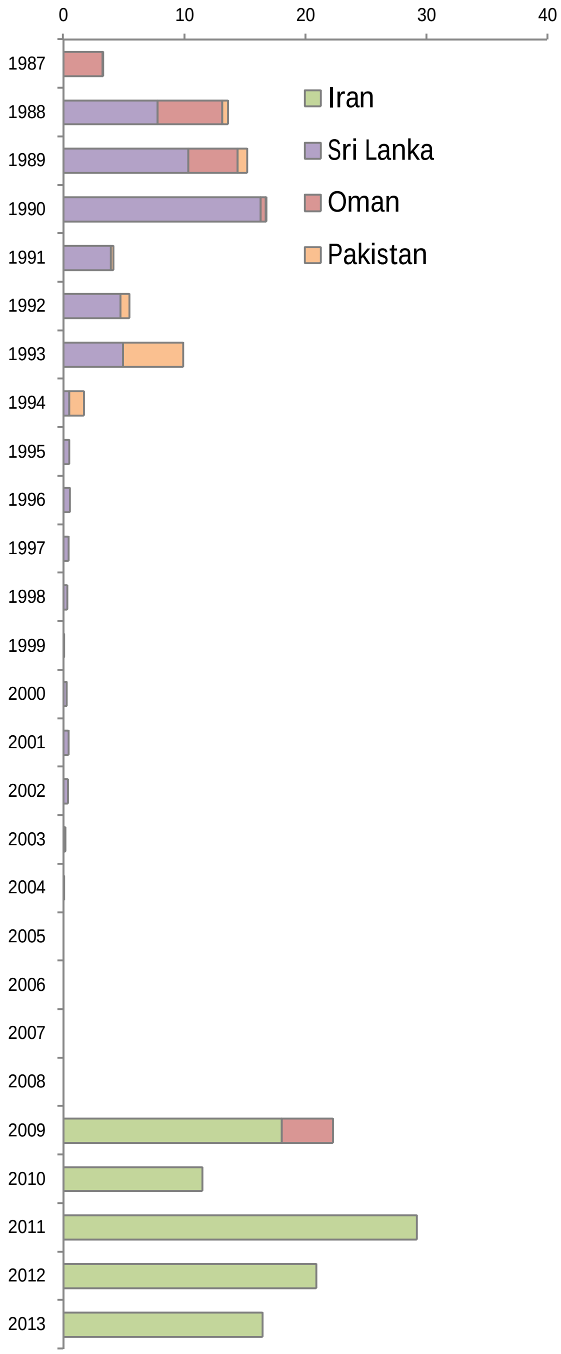


Fig. 38a-b. Left: Narrow-barred Spanish Mackerel (gillnet fisheries): Length frequency distributions (by 1cm length class) derived from data available at the IOTC Secretariat.

Right: Number of narrow-barred Spanish Mackerel specimens (gillnet fisheries) sampled for lengths, by fleet and year.

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

Extract from IOTC–2015–WPNT05–07 Rev_1

Data type(s)	Fisheries	Issue	Progress
Nominal catch, catch-and-effort, size data	Coastal fisheries of Madagascar, Myanmar, and Yemen	Non-reporting countries Catches of neritic tunas for these fisheries have been entirely estimated by the IOTC Secretariat in recent years – however the quality of estimates is thought to be poor due to a lack of reliable information on the fisheries operating in these countries.	• Madagascar: no regular data collection system exists for recording catches from coastal fisheries. Pilot sampling, funded by COI-SmartFish and assistance from the IOTC Secretariat, was conducted in selected provinces in 2013. Since then Smartfish have agreed to provide Madagascar with additional support for data collection and management. • Myanmar (non-reporting, non-member): no update. Catches based on estimates published by SEAFDEC. • Yemen: no update. No catch information provided; catches estimated based on FAO FishStat.
Nominal catch, catch-and-effort, size data	Coastal fisheries of India, Indonesia, I.R. Iran, Kenya, Malaysia, Mozambique; Oman, Tanzania, and Thailand	Partially-reported data These fisheries do not fully report catches of neritic tunas by species and/or gear, as per IOTC Res.10/02 standards. Nominal catches have been partially allocated by gear and species by the IOTC Secretariat, where necessary. Catch and-effort and size data may also be missing.	• India: no update. No catch-and-effort, or size data, reported for coastal fisheries. • Indonesia: no update. No catch-and-effort, or size data, reported for coastal fisheries. • Kenya: data based on National Report submitted to SC. Kenya has recently undertaken a Catch Assessment Survey to improve catch estimates for artisanal fisheries, and has requested support for technical assistance from the IOTC Secretariat in 2015 (TBC). • Mozambique: data based on National Report submitted to SC. A Data Compliance mission is planned by the IOTC Secretariat in June 2014 to assess current levels of reporting and the status of fisheries data collection. • Oman: no update. No size data submitted, although data has been collected. • Sri Lanka: no update. No catch-and-effort submitted for coastal fisheries (offshore only). • Tanzania: no update. Catch data (aggregated by species) based on data from the National Report submitted to SC. • Thailand: has collected one of the longest time series of size data for neritic tunas (coastal purse seiners) (from 1980s; data in electronic format from 1994 onwards). However size data have only been reported to the IOTC Secretariat for 2005 and 2006. A follow-up data mining mission, funded by the IOTC-OFCF Project has been proposed for 2015 to assist Thailand with the processing of the historical size data.
	Coastal fisheries of Indonesia, Malaysia, and Thailand	Reliability of catch estimates The a number of issues following fisheries have been identified	• Indonesia (nominal catch): catch estimates for neritic tunas are considered highly uncertain due to issues of species misidentification and aggregation of juvenile neritic and tropical tunas species reported as commercial category *tongkol*. The IOTC Secretariat is currently coordinating a pilot sampling project of artisanal fisheries in North and West Sumatra to improve estimates of neritic tunas and juvenile tuna species in particular – with results expected end-2015. • Malaysia (catch-and-effort): issues regarding the reliability of catch-and-effort reported in recent years have been raised by the IOTC Secretariat and, to date, remain unresolved (e.g., large fluctuations in the derived CPUE, and inconsistencies between different units of effort recorded in recent years). The catch-and-effort data remaining pending upload to the IOTC database until inconsistencies in the data are satisfactorily resolved.

			• <u>Thailand (catch-and-effort)</u>: catch-and-effort shows large increases for longtail in recent years, despite a *decrease* in effort. Clarification has been requested from Thailand by the IOTC Secretariat, but no response has been received as yet. The catch-and-effort data remain pending upload to the IOTC database until the inconsistencies with the level of fishing effort have been resolved.
Catch and effort, size data	<u>(Offshore) Surface and longline fisheries</u>: I.R. Iran and Pakistan	<u>Non-reporting or partially-reported data</u> A substantial component of these fisheries operates in offshore waters, including waters beyond the EEZs of the flag countries concerned. Although the fleets have reported total catches of neritic tunas, they have not reported catch-and-effort data as per IOTC Res.10/02 standards.	• <u>I.R. Iran – drifting gillnets</u>: no update. Catch-and-effort is not fully reported (i.e., no effort, only monthly catches by landing site). • <u>Pakistan – drifting gillnets</u>: no update. No catch-and-effort or size data reported.
Nominal catch, catch-and-effort, size data	<u>All industrial purse seine fisheries</u>	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 or include amounts of neritic tunas discarded. The same applies to catch-and-effort data.	No update. There is a general lack of information on retained catches, catch-and-effort, and size data for neritic tunas retained by all purse seine fleets – in particular frigate tuna, bullet tuna, and kawakawa. Discard levels of neritic tunas by purse seiners are also only available for the EU purse seine fisheries during 2003-07.
Discards	<u>All fisheries</u>	Although discard levels of neritic species are believed to be low for most fisheries, with the exception of industrial purse seiners, very little information is available on the level of discards.	No update. The total amount of neritic tunas discarded at sea remains unknown for most fisheries and time periods, other than EU purse seine fisheries during 2003–07.
Biological data	<u>All fisheries</u>	There is a general lack of biological data for neritic tuna species in the Indian Ocean, in particular basic data that can be used to establish length-weight-age keys, non-standard measurements-fork length keys and processed weight-live weight keys.	No update. Collection of biological information, including size data, remains very low for most neritic species.

APPENDIX VI
WORKING PARTY ON NERITIC TUNAS PROGRAM OF WORK (2016–2020)

The following is the Draft WPNT Program of Work (2016 to 2020) and is based on the specific requests of the Commission and Scientific Committee as well as topics identified during the WPNT05. The Program of Work consists of the following, noting that a timeline for implementation would be developed by the SC once it has agreed to the priority projects across all of its Working Parties:

- **Table 1**: Priority topics for obtaining the information necessary to develop stock status indicators for neritic tunas in the Indian Ocean;
- **Table 2**: Stock assessment schedule.

In selecting the priority projects, the SC is **REQUESTED** to take into consideration the data poor nature of the neritic tuna species and the potentially already fully exploited status of the species. Improved length frequency as well as improved abundance time series would improve stock assessments for these stocks so is a high priority.

Table 1. Priority topics for obtaining the information necessary to develop stock status indicators for neritic tuna in the Indian Ocean

Topic	Sub-topic and project	Priority	Est. budget and/or potential source	Timing 2016	2017	2018	2019	2020
1. Stock structure (connectivity)	Genetic research to determine the connectivity of neritic tunas throughout their distributions	High	1.3 m Euro: European Union					
	➢ 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 unit stocks delineated by geographic distribution and connectivity. ➢ Genetic research to determine the connectivity of neritic tunas throughout their distributions: Table 2b should be used as a starting point for research project development to delineate potential stock structure for neritic tunas in the Indian Ocean. ➢ The IOTC Secretariat to coordinate a review of the available literature on neritic tuna stock structure across the Indian Ocean to assess the data already available such as the location of spawning grounds to identify potential sub-stocks.		TBD					
2. Biological information (parameters for stock assessment)	Age and growth research; Age-at-Maturity	High	CPCs directly					
	➢ 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, which will be fed into future stock assessments.

Table 1. Estimated budget required to hire a consultant to carry out a workshop for data mining and capacity building on neritic tuna and tuna-like species in 2016 and 2017.

Description	**Unit price**	**Units required**	**2016 Total (US$)**	**2017 Total (US$)**
Workshop to support neritic tuna stock assessments and/or indicator development through data-mining, meta-analysis (Longtail tuna, kawakawa, narrow-barred Spanish mackerel, Indo-Pacific king mackerel) (fees)	500	15	11,250	11,250
Neritic tuna capacity building workshop (travel)	5,000	1	5,000	5,000
		Total estimate	**16,250**	**16,250**

3. CPUE standardisation	Develop standardised CPUE series for the main fisheries for longtail, kawakawa and Spanish mackerel in the Indian Ocean, with the aim of developing CPUE series for stock assessment purposes.	High	CPUE Workshop (TBD)	
	➢ Longtail tuna. Priority fleets: Iran (gillnet), Indonesia (line and gillnet), Malaysia (purse seine), Pakistan, Oman and India (all gillnet).		CPCs directly	
	➢ Spanish mackerel. Priority fleets: Gillnet fisheries of Indonesia, India, Iran and Oman.		CPCs directly	
	➢ Kawakawa. Priority fleets: Indonesia (purse seine/ line), India (gillnet), Iran (gillnet) and Pakistan (gillnet).		CPCs directly	
	➢ Indo-Pacific king mackerel. Priority fleets: Gillnet fisheries of India, Indonesia and Iran.		CPCs directly	

Table 1. Estimated costs for an inter-sessional meeting to investigate CPUE standardisation from the neritic tuna fleets (Indonesia, Iran and India (3 total), or alternatively Kenya and Thailand (2 total) operating in the IOTC area of competence

Description	**Unit price (US$)**	**Units required**	**Total (US$)**
Meeting venues across all CPCs	0	Hosts to provide	-

Consultant travel (three countries 1 week at a time) + 1 week for Final results	15,000	SA Consultant 1	15,000
Time Consultant	500/day	50 days (25 days work for CPUE standardizations + 25 days assembling datasets with CPC's help)	25,000
Time Stock Assessment Scientist (IOTC)	0 (as time donated)	10 days	0
Final Meeting with Secretariat and CPCs at WPNT		4 days + 2 day travel	3,500
Total estimate (US$)			**43,500**

4.	Stock assessment / Stock indicators	Develop and compare multiple assessment approaches to determine stock status for longtail tuna, kawakawa and Spanish mackerel (SS3, ASPIC etc). ➢ The Weight-of-Evidence approach should be used 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, as well as the use of data poor assessment approaches. ➢ The following data should be collated and made available for collaborative analysis: 1) catch and effort by species and gear by landing site; 2) operational data: stratify this by vessel, month, and year for the development as an indicator of CPUE over time; and 3) operational data: collate other information on fishing techniques (i.e. area fished, gear specifics, depth, environmental condition (near shore, open ocean, etc.) and vessel size (length/horsepower). **Table 2.** Hiring of a consultant to assist in building capacity among WPNT participants by supplementing the skill set available within IOTC CPCs to further develop the CPUE and alternate assessment approaches for longtail, kawakawa and Spanish mackerel. An indicative budget is provided below:	High	IOTC Regular Budget	

Description	**Unit price**	**Units required**	**2016 Total (US$)**	**2017 Total (US$)**

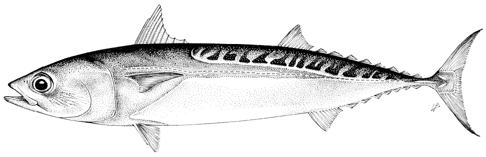
SS3 Stock assessment for LOT (fees)	550	30	16,500	
SS3 Stock assessment for LOT (travel)	4,000	1	4,000	
SS3 Stock assessment for COM (travel)	550	30		16,500
SS3 Stock assessment for COM (travel)	4,000	1		4,000
		Total estimate	20,500	20,500

Table 2. Assessment schedule for the IOTC Working Party on 2016–2020

	Working Party on Neritic Tunas				
Species	**2016**	**2017**	**2018**	**2019**	**2020**
Bullet tuna	Indicators	Indicators	Data-poor assessment	Indicators	Data-poor assessment
Frigate tuna	Indicators	Indicators	Data-poor assessment	Indicators	Data-poor assessment
Indo-Pacific king mackerel	Indicators	Indicators	**Integrated assessment**	Indicators	Data-poor assessment
Kawakawa	Indicators	Data-poor assessment	**Integrated assessment**	Data-poor assessment	Indicators
Longtail tuna	**Integrated assessment**	Data-poor assessment	Indicators	**Integrated assessment**	Indicators
Narrow-barred Spanish mackerel	Data-poor assessment	**Integrated assessment**	Indicators	Data-poor assessment	**Integrated assessment**

APPENDIX VII
BULLET TUNA – DRAFT RESOURCE STOCK STATUS SUMMARY

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



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		2015 stock status determination
Indian Ocean	Catch[2] 2013: Average catch[2] 2009–2013:	8,925 t 8,899 t	
	MSY (1,000 t) (80% CI): F_{MSY} (80% CI): B_{MSY} (1,000 t) (80% CI): F_{2013}/F_{MSY} (80% CI): B_{2013}/B_{MSY} (80% CI): B_{2013}/B_0 (80% CI):	unknown unknown unknown unknown unknown 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

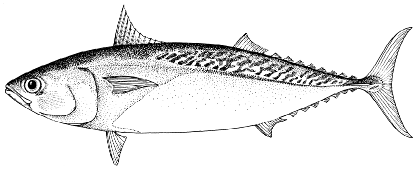
Stock status. No quantitative stock assessment is currently available for bullet tuna in the Indian Ocean, and due to a lack of fishery data for several gears, only preliminary stock status indicators can be used. Aspects of the fisheries for bullet tuna combined with the lack of data on which to base a more formal assessment, are a cause for considerable concern Stock status in relation to the Commission's B_{MSY} and F_{MSY} target reference points remains **uncertain** (Table 1), indicating that a precautionary approach to the management of bullet tuna should be applied.

Outlook. Total annual catches for bullet tuna over the past three years have ranged between 8,400 t and 9,000 t. There is insufficient information to evaluate the effect that this level of catch, or an increase in catch may have on the resource. Research emphasis on improving indicators and exploration of stock structure and stock assessment approaches for data poor fisheries should be considered a high priority for this species. The following should be noted:

- The Maximum Sustainable Yield estimate for the whole Indian Ocean is unknown.
- Species identification, data collection and reporting urgently need to be improved.
- Reconstruction of the catch history needs to occur before a reliable assessment can be attempted.
- Limit reference points: The Commission has not adopted limit reference points for any of the neritic tunas under its mandate.

APPENDIX VIII
FRIGATE TUNA – DRAFT RESOURCE STOCK STATUS SUMMARY

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



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		2015 stock status determination
Indian Ocean	Catch[2] 2013: Average catch[2] 2009–2013:	98,565 t 95,526 t	
	MSY (1,000 t) (80% CI): F_{MSY} (80% CI): B_{MSY} (1,000 t) (80% CI): F_{2013}/F_{MSY} (80% CI): B_{2013}/B_{MSY} (80% CI): B_{2013}/B_0 (80% CI):	unknown unknown unknown unknown unknown 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}≥ 1)
Stock subject to overfishing(F_{year}/F_{MSY}> 1)		
Stock not subject to overfishing (F_{year}/F_{MSY}≤ 1)		
Not assessed/Uncertain		

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

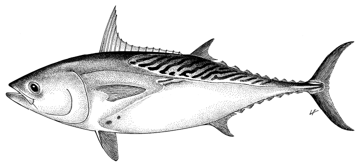
Stock status. No quantitative stock assessment is currently available for frigate tuna in the Indian Ocean, and due to a lack of fishery data for several gears, only preliminary stock status indicators can be used. Aspects of the fisheries for frigate tuna combined with the lack of data on which to base a more formal assessment are a cause for considerable concern. Stock status in relation to the Commission's B_{MSY} and F_{MSY} target reference points remains **uncertain** (Table 1), indicating that a precautionary approach to the management of frigate tuna should be applied.

Outlook. Total annual catches for frigate tuna have increased substantially in recent years with peak catches taken in 2013 (~98,565 t) (Table 1). There is insufficient information to evaluate the effect that this level of catch, or a further increase in catch may have on the resource. Research emphasis on improving indicators and exploration of stock structure and stock assessment approaches for data poor fisheries should be considered a high priority for this species. The following should be noted:

- The Maximum Sustainable Yield estimate for the whole Indian Ocean is unknown.
- Species identification, data collection and reporting urgently need to be improved.
- Reconstruction of the catch history needs to occur before a reliable assessment can be attempted.
- Limit reference points: The Commission has not adopted limit reference points for any of the neritic tunas under its mandate.

APPENDIX IX
KAWAKAWA – DRAFT RESOURCE STOCK STATUS SUMMARY

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



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		2015 stock status determination
Indian Ocean	Catch[2] 2013: Average catch[2] 2009–2013:	170,181 t 155,468 t	
	MSY (1,000 t) [*]: F_{MSY} [*] B_{MSY} (1,000 t) [*] F_{2013}/F_{MSY} [*] B_{2013}/B_{MSY} [*] B_{2013}/B_0 [*]	152 [125 –188] 0.56 [0.42–0.69] 202 [151–315] 0.98 [0.85–1.11] 1.15 [0.97–1.38] 0.58 [0.33–0.86]	

*Plausible Models
[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}≥ 1)
Stock subject to overfishing(F_{year}/F_{MSY}> 1)		
Stock not subject to overfishing (F_{year}/F_{MSY}≤ 1)		
Not assessed/Uncertain		

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. Analysis using a stock-reduction analysis, OCOM based approach for a second year indicates that the stock is near optimal levels of F_{MSY}, and stock biomass is near the level that would produce MSY (B_{MSY}). Due to the quality of the data being used, the simplistic approach employed in 2015, combined with the rapid increase in kawakawa catch in recent years, measures need to be taken to slow the increase in catches in the IOTC area of competence. Based on the weight-of-evidence available to the WPNT, the kawakawa stock for the whole Indian Ocean is classified as **not overfished** and **not subject to overfishing** (Table 1, Fig. 1). A separate analysis done on a sub-population (north-west Indian Ocean region) in 2014 indicated that that stock may be experiencing overfishing, although spawning biomass is likely to be above the level to produce MSY. However, further analysis of the CPUE data should be undertaken in preparation for the next WPNT meeting so that more traditional approaches for assessing stock status are used.

Outlook. There remains considerable uncertainty about stock structure and about the total catches. Due to a lack of fishery data for several gears, only data poor assessment approaches can currently be used. 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. In the interim until more traditional approaches are developed the data-poor approaches will be used to assess stock status. The continued increase of annual catches for kawakawa is likely to have further increased the pressure on the Indian Ocean stock as a whole resource. Research emphasis on improving indicators and exploration of stock structure and stock assessment approaches for data poor fisheries should be undertaken. There is a high risk of exceeding MSY-based reference points by 2016 if catches are maintained at current (2013) levels (96% risk that $B_{2016}<B_{MSY}$, and 100% risk that $F_{2016}>F_{MSY}$) or an even higher high risk if catches are increased further (120% of 2013 levels) (100% risk that $SB_{2016}<SB_{MSY}$, and 100% risk that $F_{2016}>F_{MSY}$) (Table 2).

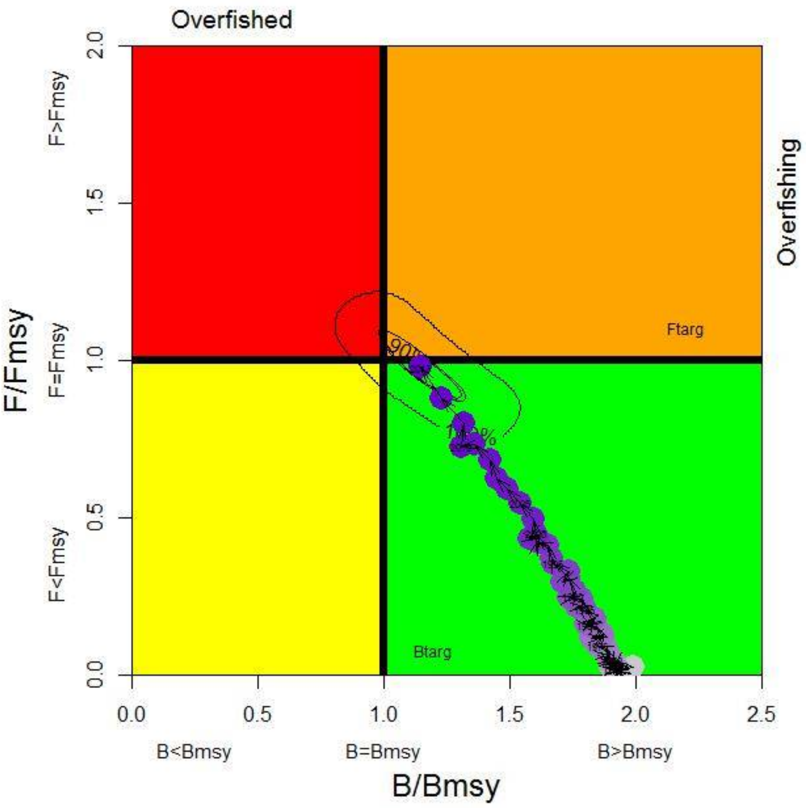


Fig. 1. Kawakawa. OCOM aggregated Indian Ocean assessment. The Kobe plot presents the trajectories for the range of plausible model options included in the formulation of the final management advice. The trajectory of the geometric mean of the plausible model options is also presented (1950–2013).

Table 2. Kawakawa: 2015 OCOM Aggregated Indian Ocean assessment Kobe II Strategy Matrix. Probability (percentage) of plausible models violating the MSY-based reference points for five constant catch projections (2013 catch level, -10%, -20%, -30%, +10% and +20%) projected for 3 and 10 years. Note: from the 2015 stock assessment using catch estimates at that time.

Reference point and projection timeframe	**Alternative catch projections (relative to 2013) and weighted probability (%) scenarios that violate reference point**					
	70% (119,126 t)	80% (136,144 t)	**90%** (153,162 t)	**100%** (170,181 t)	**110%** (187,199 t)	**120%** (204,216 t)
$B_{2016} < B_{MSY}$	0	1	37	96	n.a.	100
$F_{2016} > F_{MSY}$	0	18	87	100	100	100
$B_{2023} < B_{MSY}$	0	0	55	100	100	100
$F_{2023} > F_{MSY}$	0	0	91	100	100	100

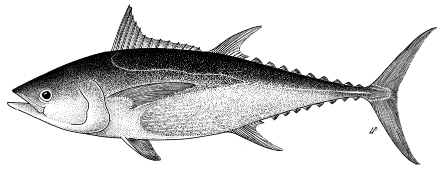
The following should be noted:

- The Maximum Sustainable Yield estimate for the whole Indian Ocean is estimated to be between 125,000 and 188,000 t and so catch levels should be stabilised or reduced in future to prevent the stocks becoming overfished.
- Reconstruction of the catch history needs to occur, as do annual catches submitted to the Secretariat.
- Improvement in data collection and reporting is required to assess the stock using more traditional stock assessment techniques.
- Given the rapid increase in kawakawa catch in recent years, some measures need to be taken to decrease the catches in the Indian Ocean (Table 2).

Limit reference points: The Commission has not adopted limit reference points for any of the neritic tunas under its mandate.

APPENDIX X
LONGTAIL TUNA – DRAFT RESOURCE STOCK STATUS SUMMARY

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



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		2015 stock status determination
Indian Ocean	Catch[2] 2013: Average catch[2] 2009–2013:	159,313 t 142,457 t	
	MSY (1,000 t) (80% CI): F_{MSY} (80% CI): B_{MSY} (1,000 t) (80% CI): F_{2013}/F_{MSY} (80% CI): B_{2013}/B_{MSY} (80% CI): B_{2013}/B_0 (80% CI):	122 (106–173) 0.55 (0.48–0.78) 221 (189–323) 1.43 (0.58–3.12) 1.01 (0.53–1.71) 0.41(n.a.)	

[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}≥ 1)
Stock subject to overfishing(F_{year}/F_{MSY}> 1)		
Stock not subject to overfishing (F_{year}/F_{MSY}≤ 1)		
Not assessed/Uncertain		

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. **Surplus production models (**ASPIC) Analysis indicate that the stock is being exploited at a rate that exceed F_{MSY} in recent years (Fig. 1). Whether a four quadrant stock structure of catches in the Indian Ocean or a one stock assumption is used in the analysis, the conclusions remain the same as far as optimal yields are concerned. In previous years, analysis conducted on the NWIO with a Surplus Production Model (ASPIC) also indicated that the stock is subject to overfishing in the NWIO, and could be overfished. The approach used here applies a more traditional method of stock assessment by using CPUE series from Oman, Thailand, and Australia. However, most of these are from fisheries accounting a small proportion of the IO catch, and this approach needs to be further improved by developing indices of abundance using catch and effort series from I.R. Iran and Indonesia, as well as length composition data from some fisheries. Based on the ASPIC runs and the OCOM results examined, the weight of evidence suggests that the estimated values of current biomass are near the estimated abundance to produce B_{MSY} in 2013, and that fishing mortality has exceeded F_{MSY} values in recent years, the stock is considered to be **not overfished**, but **subject to overfishing** (Table 1; Fig. 1).

Outlook. There remains considerable uncertainty about stock structure and about the total catches in the Indian Ocean. 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. 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 more traditional models for fisheries management are warranted. There is a continued high to very high risk of exceeding MSY-based reference points by 2016, even if catches are reduced to 90% of the current (2013) levels (100% risk that $B_{2016}<B_{MSY}$, and 87% risk that $F_{2016}>F_{MSY}$) (Table 2).

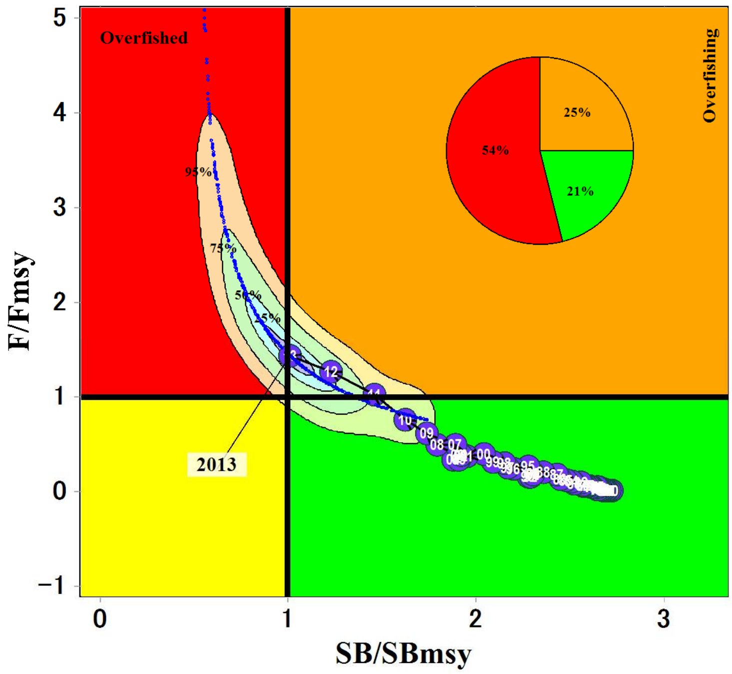


Fig. 1. Longtail tuna. Kobe plot of the longtail tuna in the Indian Ocean (1950–2013) with uncertinty around the 2013 point and compostions of uncertainties in terms of 4 phases (colours) of the Kobe plots (pie chart).

Table 2. Longtail tuna ASPIC aggregated Indian Ocean assessment Kobe II Strategy Matrix. Probability (percentage) of violating the MSY-based target for nine constant catch projections (2013 +20%,+10%, -10%, - 20%, -30% projected for 3 and 10 years).

Reference point and projection timeframe	**Alternative catch projections (relative to 2013) and weighted probability (%) scenarios that violate reference points**					
	70% (111,519 t)	80% (127,450 t)	90% (143,382 t)	100% (159,313 t)	110% (175,244 t	120% (191,176 t)
$B_{2016} < B_{MSY}$	56	66	100	100	100	100
$F_{2016} > F_{MSY}$	53	71	87	100	n.a.	100
$B_{2023} < B_{MSY}$	76	100	100	100	100	100
$F_{2023} > F_{MSY}$	82	89	96	100	n.a.	100

The following should be noted:

- The Maximum Sustainable Yield estimate of 122,000 t is likely being exceeded in recent years and so catch levels should be stabilised or reduced in future to prevent the stocks becoming overfished.
- Reconstruction of the catch history needs to occur, as do annual catches submitted to the IOTC Secretariat.
- Improvement in data collection and reporting is required to assess the stock using more traditional stock assessment techniques.
- Given the rapid increase in longtail tuna catch in recent years, some measures need to be taken to slow or reduce catches in the Indian Ocean (Table 2).
- Improvement in data collection and reporting is required to assess the stock status, primarily abundance index series from I.R. Iran, Oman and Indonesia.
- Limit reference points: The Commission has not adopted limit reference points for any of the neritic tunas under its mandate.

APPENDIX XI

INDO-PACIFIC KING MACKEREL – DRAFT RESOURCE STOCK STATUS SUMMARY

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

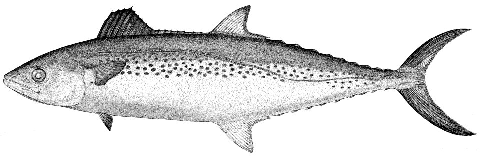


TABLE 1. Indo-Pacific king mackerel: Status of Indo-Pacific king mackerel (*Scomberomorus guttatus*) in the Indian Ocean.

Area[1]	Indicators		2015 stock status determination
Indian Ocean	Catch[2] 2013:	46,340 t	
	Average catch[2] 2009–2013:	49,886 t	
	MSY (1,000 t) [*]:	43 [35.8–52.9]	
	F_{MSY} [*]:	0.42 [0.34–0.52]	
	B_{MSY} (1,000 t) [*]:	82.8 [60.3–131.1]	
	F_{2013}/F_{MSY} [*]:	1.05 [0.91–1.27]	
	B_{2013}/B_{MSY} [*]:	1.01 [0.80–1.20]	
	B_{2013}/B_0 [*]:	0.52 [0.34–0.74]	

*Plausible Models

[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}≥ 1)
Stock subject to overfishing(F_{year}/F_{MSY}> 1)		
Stock not subject to overfishing (F_{year}/F_{MSY}≤ 1)		
Not assessed/Uncertain		

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. The first Indo-Pacific king mackerel stock assessment was run using SRA techniques (Catch-MSY and OCOM). Early indicators suggest at target yield of 43,000 t, though the last few years catches have exceeded them and peaked to 49,000 t in 2013. Since this is the first year that an assessment is being conducted, the WPNT did not set a stock status indicator for this stock. Stock status in relation to the Commission's B_{MSY} and F_{MSY} target reference points remains **uncertain** (Table 1), indicating that a precautionary approach to the management of Indo-Pacific king mackerel should be applied. Based on the preliminary assessment a stock status summary is shown below (Fig. 1) which indicates that the stock is not overfished but maybe experiencing overfishing.

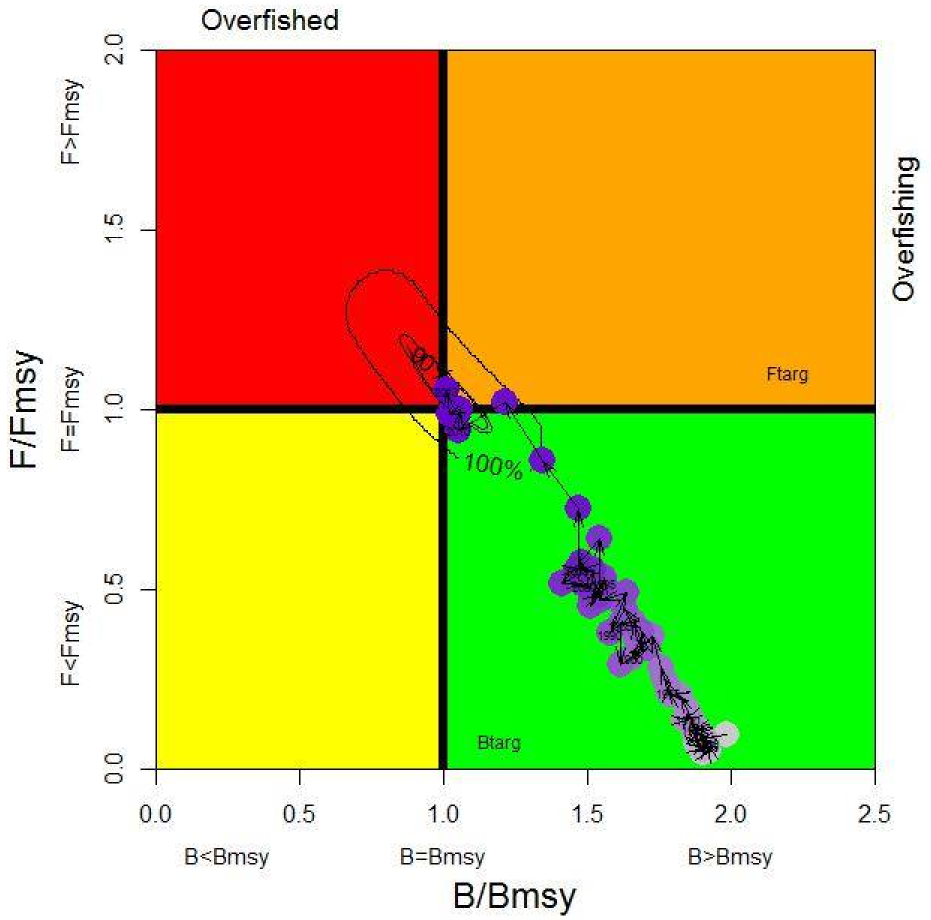


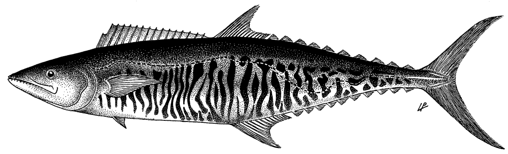
Fig. 1. Indo-Pacific king mackerel: *S. guttatus* OCOM Indian Ocean assessment Kobe plot. The Kobe plot presents the trajectories for the range of plausible model options included in the formulation of the final management advice. The trajectory of the geometric mean of the plausible model options is also presented.

Outlook. Total annual catches for Indo-Pacific king mackerel have stabilised over the past five years at around 46,300 t. There remains considerable uncertainty about stock structure and about the total catches. Due to a lack of fishery data for several gears, only data poor assessment approaches can currently be used. 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. In the interim until more traditional approaches are developed the data-poor approaches will be used to assess stock status, and although not used in this year to provide stock status advice will be used as an indicator and developed further in subsequent years. 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 resource. The following should be noted:

- The Maximum Sustainable Yield estimate for the whole Indian Ocean is probably 43,000 t, and catches in recent years have exceeded this target.
- Data collection and reporting urgently need to be improved.
- Reconstruction of the catch history needs to occur before a reliable assessment can be attempted.
- Limit reference points: The Commission has not adopted limit reference points for any of the neritic tunas under its mandate.

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

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



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		2015 stock status determination
Indian Ocean	Catch[2] 2013: Average catch[2] 2009–2013:	153,342 t 144,170 t	
	MSY (1,000 t) [*]: F_{MSY} [*]: B_{MSY} (1,000 t) [*]: F_{2013}/F_{MSY} [*]: B_{2013} B_{MSY} [*]: B_{2013}/B_0 [*]:	127.7 [95.8–183.6] 0.33 [0.21–0.56] 321 [174–693] 1.21 [0.99–1.58] 0.96 [0.69–1.22] 0.53 [0.30–1.04]	

- Plausible range

[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. OCOM techniques indicate that the stock is being exploited at a rate exceeding F_{MSY} in recent years, and the stock appears to be below B_{MSY}. Northwest Indian Ocean (Gulf of Oman Sea countries) indicate that localised depletion may be occurring from an analysis done in 2013, and overfishing is occurring in this area, though the degree of connectivity with other stocks remains unknown. Stock structure issues remain to be clarified with this stock. Based on the weight-of-evidence available, including the two different SRA approaches pursued in 2015, the stock appears to be **overfished** and **subject to overfishing** (Table 1, Fig. 1). This is primarily because of new data reported from 2012 (India and Indonesia), that increased the total catch by 17000 tons, and the high catch levels in 2013. The updated index now indicated that 2012 was being subject to overfishing, but not overfished (as opposed to not subject to overfishing nor overfished, as was reported in 2014). The higher levels of catches in 2013 indicate that the stock has experience catches greater than estimated MSY since 2007.

Outlook. There remains considerable uncertainty about stock structure and the total catches. 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, and the stock is overfished and subject to overfishing. 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, as was presented at a previous meeting (IOTC-2015-WPNT03-27). Research emphasis on improving indicators and exploration of stock structure and stock assessment approaches for data poor fisheries are warranted. There is a high to very high risk of exceeding MSY-based reference points by 2016 if catches are maintained at current (2013) levels (100% risk that $B_{2016}<B_{MSY}$, and 100% risk that $F_{2016}>F_{MSY}$) (Table 2).

The following should be noted:

- Maximum Sustainable Yield estimate for the whole Indian Ocean is 127,700 (range 95,800 t–183,600 t) while current catches (153,342 t) are exceeding this. Therefore catch levels should be stabilised or reduced in future to prevent the stocks becoming overfished..
- Reconstruction of the catch history needs to occur, as do annual catches submitted to the Secretariat.
- Improvement in data collection and reporting is required to assess the stock using more traditional stock assessment techniques.
- Given the rapid increase in narrow-barred Spanish mackerel catch in recent years, some measures need to be taken to slow or reduce catches in the Indian Ocean (Table 2).
- Limit reference points: The Commission has not adopted limit reference points for any of the neritic tunas under its mandate.

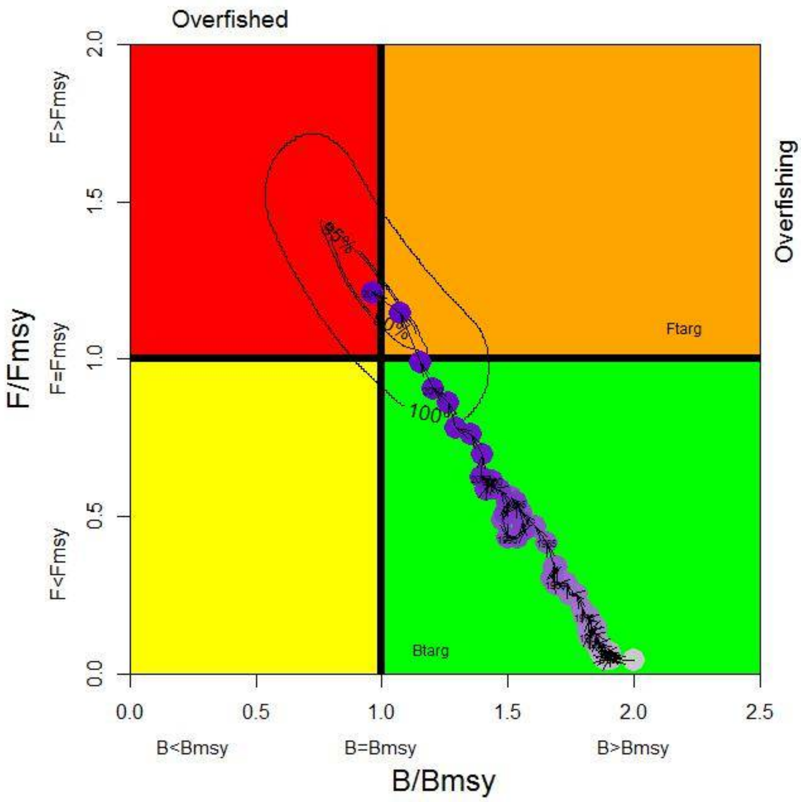


Fig. 1. *S. commerson* OCOM Indian Ocean assessment Kobe plot. The Kobe plot presents the trajectories for the range of plausible model options included in the formulation of the final management advice. The trajectory of the geometric mean of the plausible model options is also presented.

Table 2. Narrow-barred Spanish mackerel: 2015 OCOM Indian Ocean assessment Kobe II Strategy Matrix. Probability (percentage) of plausible models violating the MSY-based reference points for five constant catch projections (2013 catch level, -10%, -20%, -30%, +10% and + 20%) projected for 3 and 10 years. Note: from the 2015 stock assessment using catch estimates at that time.

Reference point and projection timeframe	**Alternative catch projections (relative to 2013) and weighted probability (%) scenarios that violate reference point**					
	70% (107,339 t)	**80%** (122,673 t)	**90%** (138,007 t)	**100%** (153,341 t)	**110%** (168,675 t)	**120%** (184,010 t)
$SB_{2016} < SB_{MSY}$	55	74	99	100	100	100
$F_{2016} > MSY$	100	99	100	100	100	100
$SB_{2023} < SB_{MSY}$	2	67	100	100	100	100
$F_{2023} > MSY$	21	99	100	100	100	100

APPENDIX XIII
CONSOLIDATED RECOMMENDATIONS OF THE 5TH SESSION OF THE WORKING PARTY ON NERITIC TUNAS

Note: Appendix references refer to the Report of the 4th Session of the Working Party on Neritic Tunas (IOTC–2015–WPNT05–R)

Capacity building workshop

WPNT05.01 (para. 83) **NOTING** that capacity building in this area of work is needed with funding to enable countries to compile this raw data needed as a first step, the WPNT **RECOMMENDED** that a workshop is organised by the IOTC Secretariat in collaboration with WWF-Pakistan to analyse the data sets collaboratively using a meta-analysis based approach. WWF Pakistan have offered to provide support specifically for the north western Indian Ocean countries but that additional funding will be needed for the participation of other CPCs. This workshop would also include training for people in data poor assessment approaches, as well as possibly focus on basic data for assessments, like CPUE and how to standardise such data.

Integrated stock assessment methods

WPNT05.02 (para. 100) The WPNT **RECOMMENDED** that alternative methods should be explored for similar analyses in the future for other species such as longtail tuna and narrow-barred Spanish mackerel.

Data input for stock assessments

WPNT05.03 (para. 217) **ACKNOWLEDGING** the importance of indices of abundance for future stock assessments, the WPNT **RECOMMENDED** that the development of standardised CPUE series is explored before the next assessment. An indicative budget is provided (Table 19).

Table 22. Estimated costs for an inter-sessional meeting to investigate CPUE standardisation from the neritic tuna fleets (Indonesia, I.R. Iran and India (3 total), possibly Kenya and Thailand (2 alternatively if this doesn't work)) operating in the IOTC area of competence

Description	**Unit price (US$)**	**Units required**	**Total (US$)**
Meeting venues across all CPCs	0	Hosts to provide	-
Consultant travel (three countries 1 week at a time) + 1 week for Final results	15,000	SA Consultant 1	15,000
Time Consultant	500/day	50 days (25 days work for CPUE standardizations + 25 days assembling datasets with CPC's help)	25,000
Time Stock Assessment Scientist (IOTC)	0 (as time donated)	10 days	0
Final Meeting with IOTC Secretariat and CPCs at WPNT		4 days + 2 day travel	3,500
Total estimate (US$)			**43,500**

Presentation of results for management advice

WPNT05.04 (para. 226) The WPNT **RECOMMENDED** that the SC ask the WPM evaluate the proposed methodology and further develop this method of presenting management advice for data poor stocks.

Capacity building budget

WPNT05.05 (para. 247) The WPNT **RECOMMENDED** that the SC request that the Commission further increases the IOTC Capacity Building budget line so that capacity building training on data analysis and applied stock assessment approaches, with a priority being data poor approaches, can be carried out in 2016.

Revision of the WPNT Program of Work (2016-2018)

WPNT05.06 (para. 248) The WPNT **RECOMMENDED** that the SC consider and endorse the WPNT Program of Work (2016–2020), as provided at Appendix VI.

WPNT05.07 (para. 254) The WPNT **RECOMMENDED** that the invited expert works with CPCs to pull together all data for Indian Ocean stocks and undertake a meta-analysis or hierarchical approach to analyse the data. This should be combined with capacity building activities in data poor stock assessment techniques. An indicative budget is provided at Table 20.

Table 23. Estimated budget required to hire a consultant to carry out a workshop for data mining and capacity building on neritic tuna and tuna-like species in 2016 and 2017.

Description	Unit price	Units required	2016 Total (US$)	2017 Total (US$)
Workshop to support neritic tuna stock assessments and/or indicator development through data-mining, meta-analysis (Longtail tuna, kawakawa, narrow-barred Spanish mackerel, Indo-Pacific king mackerel) (fees)	500	15	11,250	11,250
Neritic tuna capacity building workshop (travel)	5,000	1	5,000	5,000
		Total estimate	**16,250**	**16,250**

Meeting participation fund (MPF)

WPNT05.08 (para. 260) The WPNT participants were unanimous in their thanks for the support for their participation in the meeting due to the MPF and **RECOMMENDED** that the Scientific Committee also consider the WPNT06 as a high priority meeting for MPF.

WPNT05.09 (para. 261) The WPNT **RECOMMENDED** that the SC and Commission note the following:

1) The participation of developing coastal state scientists to the WPNT has been consistently high following the adoption and implementation of the IOTC Meeting Participation Fund 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*), now incorporated into the IOTC Rules of Procedure (2014), as well as though the hosting of the WPNT in developing coastal State Contracting Parties (Members) of the Commission (Table 21).
2) The continued success of the WPNT, at least in the short term, appears heavily reliant on the provision of support via the MPF which was established primarily for the purposes of supporting scientists to attend and contribute to the work of the Scientific Committee and its Working Parties.
3) The MPF should be utilised so as to ensure that all developing Contracting Parties of the Commission are able to attend the WPNT meeting, as neritic tunas are very important resources for many of the coastal countries of the Indian Ocean.

Table 24. Working Party on Neritic Tunas participation summary.

Meeting	Host Country	Total participants	Developing CPC participants	Host country participants	MPF recipients
WPNT01	India	28	23	11	9
WPNT02	Malaysia	35	26	13	10
WPNT03	Indonesia	42	34	16	11
WPNT04	Thailand	37	28	12	13
WPNT05	Tanzania	26	26	16	9
Total		173	137	68	52

Review of the draft, and adoption of the Report of the 5th Working Party on Neritic Tunas

WPNT05.10 (para. 262) The WPNT **RECOMMENDED** that the Scientific Committee consider the consolidated set of recommendations arising from WPNT05, provided at Appendix XIII, as well as the management advice provided in the draft resource stock status summary for each of the six neritic tuna (and mackerel) species under the IOTC mandate, and the combined Kobe plot for the three species assigned a stock status in 2015 (Fig. 14):

- bullet tuna (*Auxis rochei*) – Appendix VII
- frigate tuna (*Auxis thazard*) – Appendix VIII
- kawakawa (*Euthynnus affinis*) – Appendix IX
- longtail tuna (*Thunnus tonggol*) – Appendix X
- Indo-Pacific king mackerel (*Scomberomorus guttatus*) – Appendix XI
- narrow-barred Spanish mackerel (*Scomberomorus commerson*) – Appendix XII

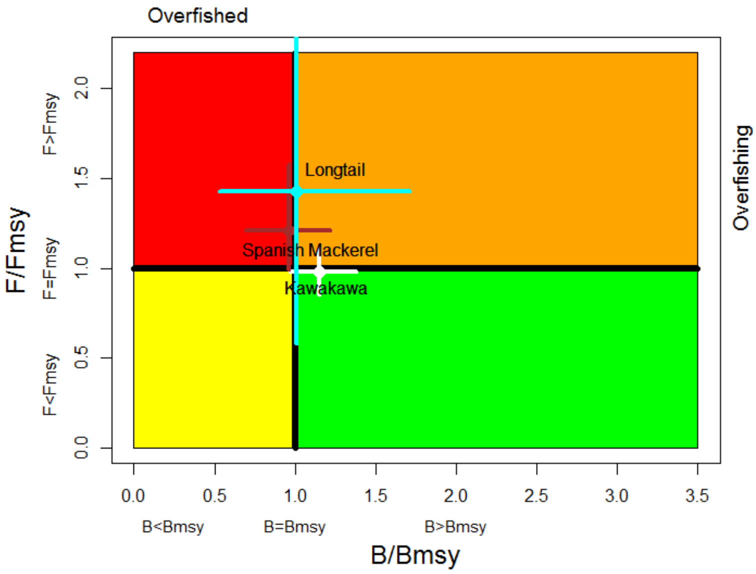


Figure 15. Combined Kobe plot for kawakawa (white), longtail tuna (blue), and narrow-barred Spanish mackerel (brown), showing the estimates of stock size (B) and current fishing mortality (F) in 2013 in relation to optimal spawning stock size and optimal fishing mortality using the OCOM and ASPIC approaches. Cross bars illustrate the range of uncertainty from the model runs.

WPNT05.11 (para. 263) Based on these stock status summaries (Fig. 14) and ongoing increasing catch and effort, the WPNT strongly **RECOMMENDED** that current catch levels are not increased further by constraining catch and/or effort to no more than 2013 levels.