Report of the 18th Session of the IOTC Scientific Committee

Bali, Indonesia, 23–27 November 2015

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ACRONYMS

ACAP	Agreement on the Conservation of Albatrosses and Petrels
aFAD	Anchored fish aggregation device
ASPIC	A Stock-Production Model Incorporating Covariates
B	Biomass (total)
B_{MSY}	Biomass which produces MSY
CBD	Convention on Biological Diversity
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
CCSBT	Commission for the Conservation of Southern Bluefin Tuna
CE	Catch and effort
CI	Confidence interval
CMM	Conservation and Management Measure (of the IOTC; Resolutions and Recommendations)
CoC	Compliance Committee
CPCs	Contracting Parties and Cooperating Non-Contracting Parties
CPUE	catch per unit effort
current	Current period/time, i.e. $F_{current}$ means fishing mortality for the current assessment year
EEZ	Exclusive Economic Zone
ERA	ecological risk assessment
EU	European Union
F	Fishing mortality; F_{2010} is the fishing mortality estimated in the year 2010
FAD	Fish Aggretation device
FAO	Food and Agriculture Organization of the United Nations
FL	Fork length
F_{MSY}	Fishing mortality at MSY
GLM	Generalised liner model
HCR	Harvest control rule
HBF	Hooks between floats
HS	Harvest strategy
HSF	Harvest strategy framework
IATTC	Inter-American Tropical Tuna Commission
ICCAT	International Commission for the Conservation of Atlantic Tunas
IO	Indian Ocean
IOTC	Indian Ocean Tuna Commission
IOSEA	Indian Ocean - South-East Asian Marine Turtle Memorandum
IPA	International Plan of Action
IPNLF	International Pole and Line Foundation
ISSF	International Seafood Sustainability Foundation
IUCN	International Union for the Conservation of Nature
IUU	Illegal, unregulated and unreported (fishing)
LJFL	Lower-jaw fork length
LRP	Limit reference point
LL	Longline
LSTLV	Large-scale tuna longline fishing vessel
M	Natural mortality
MEY	Maximum economic yield
MFCL	Multifan-CL
MOU	Memorandum of understanding
MP	Management procedure
MPA	Marine Protected Area
MSPEA	Maldives Seafood Processors and Exporters Association
MPF	Meeting Participation Fund
MSE	Management strategy evaluation
MSY	Maximum Sustainable Yield
n.a.	Not applicable
NGO	Non-governmental organization
NPOA	National plan of action
OFCF	Overseas Fishery Cooperation Foundation of Japan
OM	Operating model
OT	Oversears Territory
PS	Purse seine
PSA	Productivity Susceptibility Analysis
q	Catchability
RBC	Recommended biological catch
RFMO	Regional fisheries management organisation
ROS	Regional Observer Scheme

RTTP-IO	Regional Tuna Tagging Project of the Indian Ocean
SB	Spawning biomass (sometimes expressed as SSB)
SB_{MSY}	Spawning stock biomass which produces MSY
SC	Scientific committee
SCAF	Standing Committee on Administration and Finance
SE	Standard error
SWIOFC	South West Indian Ocean Fisheries Commission
SWIOFP	South West Indian Ocean Fisheries Project
SS3	Stock Synthesis III
SSB	Spawning stock biomass
TAC	Total allowable catch
TAE	Total allowable effort
Taiwan,China	Taiwan, Province of China
TCAC	Technical Committee on Allocation Criteria
tRFMO	tuna Regional Fishery Management Organization
TRP	Target reference point
TrRP	Trigger reference point
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
UNGA	United Nations General Assembly
VMS	Vessel Monitoring System
WP	Working Party of the IOTC
WPB	Working Party on Billfish
WPEB	Working Party on Ecosystems and Bycatch
WPDCS	Working Party on Data Collection and Statistics
WPFC	Working Party on Fishing Capacity
WPM	Working Party on Methods
WPNT	Working Party on Neritic Tunas
WPTmT	Working Party on Temperate Tunas
WPTT	Working Party on Tropical Tunas

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 following are a subset of the complete recommendations from the 18th Session of the Scientific Committee, which are provided at Appendix XXXVII.

STATUS OF TUNA AND TUNA-LIKE RESOURCES IN THE INDIAN OCEAN AND ASSOCIATED SPECIES

Tuna – Highly migratory species

SC18.01 (para. 121) The SC **RECOMMENDED** that the Commission note the management advice developed for each tropical and temperate tuna species as provided in the Executive Summary for each species, and the combined Kobe plot for the three species assigned a stock status in 2015 (Fig. 4):

- Albacore (*Thunnus alalunga*) – Appendix VIII
- Bigeye tuna (*Thunnus obesus*) – Appendix IX
- Skipjack tuna (*Katsuwonus pelamis*) – Appendix X
- Yellowfin tuna (*Thunnus albacares*) – Appendix XI

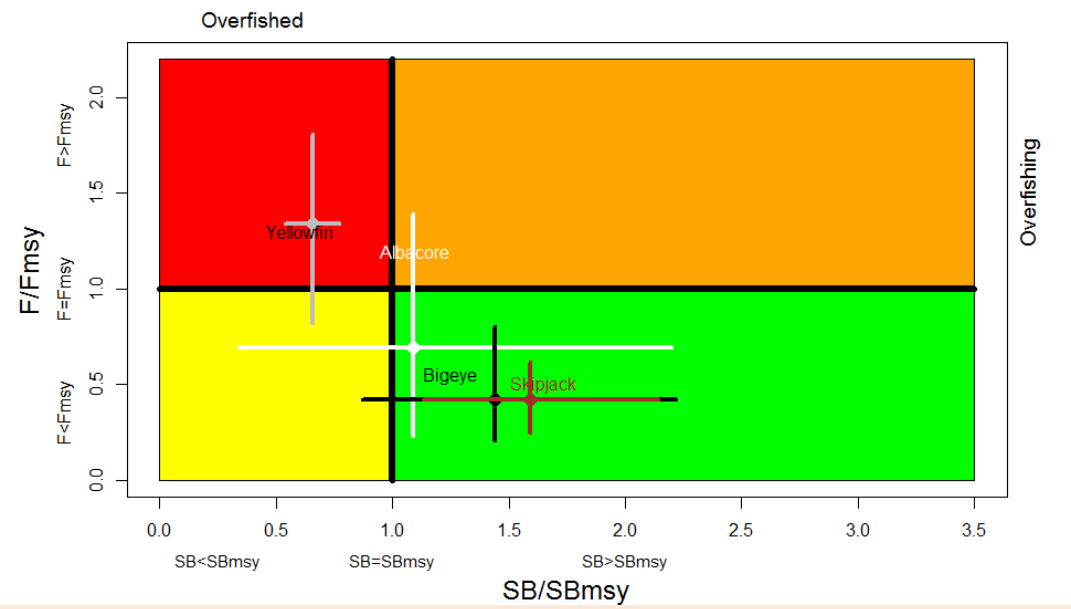


Fig. 4. Combined Kobe plot for bigeye tuna (black: 2013), skipjack tuna (brown: 2014), yellowfin tuna (grey: 2015) and albacore (white: 2014) showing the estimates of current stock size (SB) and current fishing mortality (F) in relation to the interim target spawning stock size and interim target fishing mortality. Cross bars illustrate the range of uncertainty from the model runs. Note that for skipjack tuna, the estimates are highly uncertain as F_{MSY} is poorly estimated, and as suggested for stock status advice it is better to use B_0 as a biomass reference point and C(t) relative to C_{MSY} as a fishing mortality reference point.

Billfish

SC18.02 (para. 123) The SC **RECOMMENDED** that the Commission note the management advice developed for each billfish species under the IOTC mandate, as provided in the Executive Summary for each species, and the combined Kobe plot for the three species assigned a stock status in 2015 (Fig. 5):

- Swordfish (*Xiphias gladius*) – Appendix XII
- Black marlin (*Makaira indica*) – Appendix XIII
- Blue marlin (*Makaira nigricans*) – Appendix XIV
- Striped marlin (*Tetrapturus audax*) – Appendix XV
- Indo-Pacific sailfish (*Istiophorus platypterus*) – Appendix XVI

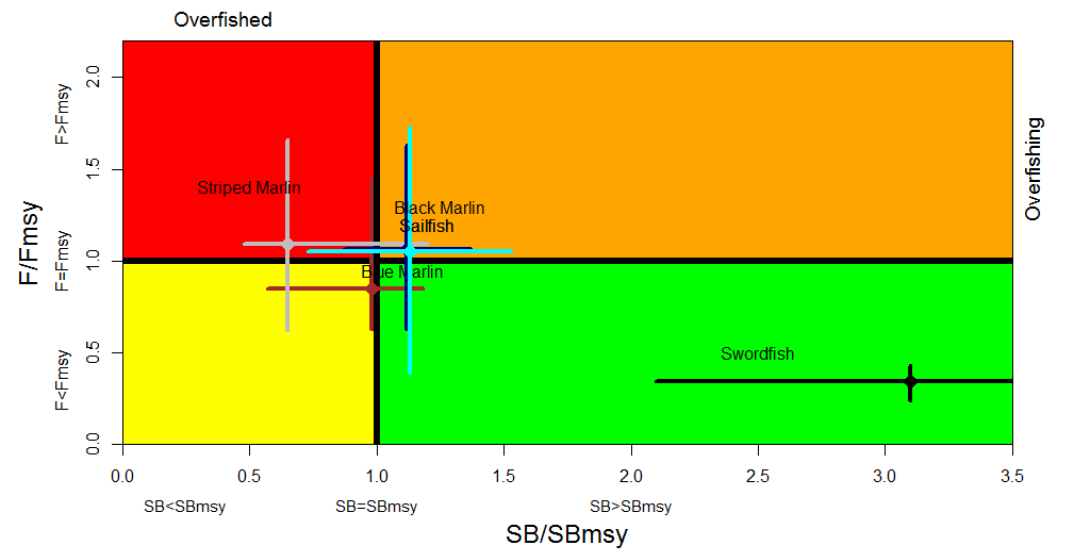


Fig. 5. Combined Kobe plot for swordfish (black: 2014), black marlin (light blue: 2014), blue marlin (brown: 2013), striped marlin (grey: 2015) and Indo-Pacific sailfish (black: 2015) showing the estimates of current stock size (SB or B, species assessment dependent) and current fishing mortality (F) in relation to the interim target spawning stock size and interim target fishing mortality. Cross bars illustrate the range of uncertainty from the model runs.

Tuna and seerfish – Neritic species

SC18.03 (para. 124) The SC **RECOMMENDED** that the Commission note the management advice developed for each neritic tuna (and mackerel) species under the IOTC mandate, as provided in the Executive Summary for each species, and the combined Kobe plot for the three species assigned a stock status in 2015 (Fig. 6):

- Bullet tuna (*Auxis rochei*) – Appendix XVII
- Frigate tuna (*Auxis thazard*) – Appendix XVIII
- Kawakawa (*Euthynnus affinis*) – Appendix XIX
- Longtail tuna (*Thunnus tonggol*) – Appendix XX
- Indo-Pacific king mackerel (*Scomberomorus guttatus*) – Appendix XXI
- Narrow-barred Spanish mackerel (*Scomberomorus commerson*) – Appendix XXII

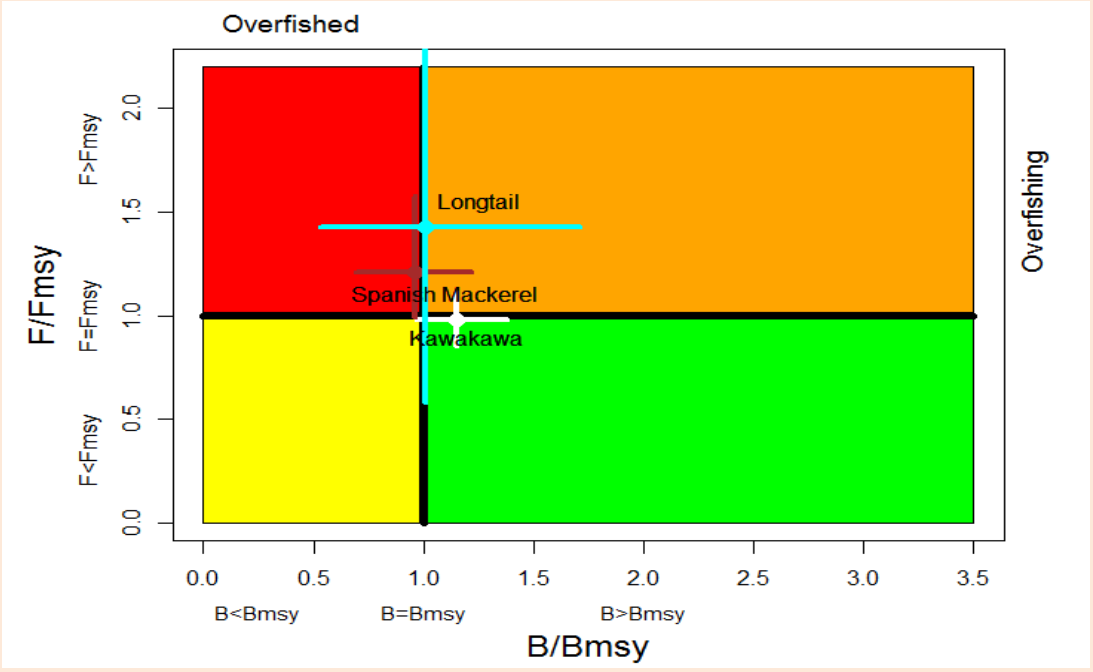


Fig. 6. Combined Kobe plot for kawakawa (white: 2015), longtail tuna (blue: 2015) and narrow-barred Spanish mackerel (brown: 2015), showing the estimates of current stock size (B) and current fishing mortality (F) in relation to interim target spawning stock size and interim target fishing mortality. Cross bars illustrate the range of uncertainty from the model runs. Status of Marine Turtles, Seabirds and Sharks in the Indian Ocean

Sharks

SC18.04 (para. 125) The SC **RECOMMENDED** that the Commission note the management advice developed for a subset of shark species commonly caught in IOTC fisheries for tuna and tuna-like species:

- Blue shark (*Prionace glauca*) – Appendix XXIII
- Oceanic whitetip shark (*Carcharhinus longimanus*) – Appendix XXIV
- Scalloped hammerhead shark (*Sphyrna lewini*) – Appendix XXV
- Shortfin mako shark (*Isurus oxyrinchus*) – Appendix XXVI
- Silky shark (*Carcharhinus falciformis*) – Appendix XXVII
- Bigeye thresher shark (*Alopias superciliosus*) – Appendix XXVIII
- Pelagic thresher shark (*Alopias pelagicus*) – Appendix XXIX

Marine turtles

SC18.05 (para. 126) The SC **RECOMMENDED** that the Commission note the management advice developed for marine turtles, as provided in the Executive Summary encompassing all six species found in the Indian Ocean:

- Marine turtles – Appendix XXX

Seabirds

SC18.06 (para. 127) The SC **RECOMMENDED** that the Commission note the management advice developed for seabirds, as provided in the Executive Summary encompassing all species commonly interacting with IOTC fisheries for tuna and tuna-like species:

- Seabirds – Appendix XXXI

GENERAL RECOMMENDATIONS TO THE COMMISSION

Pakistan shark bycatch in gillnet fisheries

SC18.12 (para. 39) **NOTING** that gillnets are regularly being used with lengths in excess of 4,000 m (and up to 7,000 m) within and occasionally beyond the EEZ of Pakistan and other IOTC CPCs in the region, and that those used within the EEZ may sometimes drift onto the high seas in contravention of Resolution 12/12, the SC **RECOMMENDED** that the Commission should consider if a ban on large scale gillnets should also apply within IOTC CPC EEZ. This would be especially important given the negative ecological impacts of large scale drifting gillnets in areas frequented by marine mammals and turtles.

Shark fin to body weight ratio and wire leaders/traces

SC18.14 (para. 47) **NOTING** that the Commission, at its 19th Session, considered a range of proposals on sharks which included matters relevant to the shark fin to body weight ratio and wire leaders/traces, the SC **RECALLED** its previous advice to the Commission as follows:

- The SC **RECOMMENDED** the Commission consider, that the best way to encourage full utilisation of sharks, to ensure accurate catch statistics, and to facilitate the collection of biological information, is to revise the IOTC Resolution 05/05 *concerning the conservation of sharks caught in association with fisheries managed by IOTC* such that all sharks must be landed with fins attached (naturally or by other means) to their respective carcass. However, the SC **NOTED** that such an action would have practical implementation and safety issues for some fleets and may degrade the quality of the product in some cases. The SC **RECOMMENDED** all CPCs to obtain and maintain the best possible data for IOTC fisheries impacting upon sharks, including improved species identification.
- On the basis of information presented to the SC in previous years, the SC **RECOGNISED** that the use of wire leaders/traces in longline fisheries may imply targeting of sharks. The SC therefore **RECOMMENDED** to the Commission that if it wishes to reduce catch rates of sharks by longliners it should prohibit the use of wire leaders/traces.

Proposal for a Technical Committee on Management Procedures

SC18.18 (para. 59) **NOTING** with concern the lack of adequate communication of the IOTC MSE process between the Scientific Committee and the Commission to date, the SC **RECOMMENDED** that the Commission consider the following draft outline to establish a formal communication channel for the science and management dialogue to enhance decision making. Possible adjustments to the mechanisms of communication between the Commission and the IOTC Scientific Committee could include the following:

- The progress of the MSE process will benefit from having communication between the Scientific Committee and the Commission more formally structured, for example, through a dedicated Technical Committee on Management Procedures (MP) that would serve as an effective two-way channel for scientists to communicate the results of the ongoing MSE work. The Technical Committee would require that specific terms of reference (in line with the priorities identified in Resolution 14/03), roles and responsibilities of both fisheries managers and scientists, and possible interactions and feedback, are developed and clarified. The Technical Committee on MP could meet in conjunction with the annual Commission Session, to facilitate full attendance by CPCs.
- The Technical Committee on MP would augment the ability of the Scientific Committee to communicate the progress of the MSE process.
- The Technical Committee on MP would focus on the presentation of results and exchange of information necessary for the Commission to consider possible adoption of harvest strategies, utilizing standard formats for the presentation of results to facilitate understanding of the material by the non-technical audience.
- It would be advisable that the agenda of the Technical Committee on MP place an emphasis on the elements of each MP that require a decision by the Commission. To facilitate such decisions, wherever necessary, interim choices should be offered to the Commission, noting that these choices can be modified at a later stage in the review. The MSE is an iterative process that allows for adjustments as the work, and the understanding of the elements involved, progresses.

Report of the 11th Session of the Working Party on Data Collection and Statistics (WPDCS11)

SC18.19 (para. 72) The SC **RECOMMENDED** the Commission develop penalty mechanisms through the IOTC Compliance Committee to improve compliance by CPCs that do not currently comply with the submission of basic fishery data requirements as stated in Resolution 15/01 and 15/02.

Capacity building activities

SC18.25 (para. 99) The SC **AGREED** that, while external funding is helping the work of the Commission, funds allocated by the Commission to capacity building are still too low, considering the range of issues identified by the SC and its Working Parties, and **RECOMMENDED** that the Commission consider allocating more funds to these activities in the future.

SC18.26 (para. 100) The SC **RECOMMENDED** that 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.

IOTC Secretariat staffing

SC18.28 (para. 106) **NOTING** the very heavy and constantly increasing workload on the IOTC Secretariat, and the current staffing capacity to respond to requests for assistance by countries, the SC strongly **RECOMMENDED** that at least three (3) additional staff (Science/Data) be hired to join the IOTC Secretariat to work on tasks including but not limited to 1) science and capacity building to improve understanding of IOTC processes; and 2) data quality/exchange improvement, to commence work by 1 January 2017. Funding for these new postions should come from both the IOTC regular budget and from external sources to reduce the direct financial burden on the IOTC membership.

Schedule of meetings for 2016 and 2017

SC18.34 (para. 160) The SC **RECOMMENDED** that the Commission discuss the merits of moving the annual Scientific Committee meeting to February each year. This would allow the species working parties to be moved later in the year, thus ensuring that the most recent data is available or assessment purposes. If the Commission were to approve a February date, it may wish to fix its own meeting date in June each year, thus allowing sufficient consultation time between the Scientific Committee and the Commission meeting.

Review of the Draft, and Adoption of the Report of the 18th Session of the Scientific Committee

SC18.36 (para. 175) The SC **RECOMMENDED** that the Commission consider the consolidated set of recommendations arising from SC18, provided at Appendix XXXVII.

Table 1. Status summary for species of tuna and tuna-like species under the IOTC mandate, as well as other species impacted by IOTC fisheries.
Temperate and tropical tuna stocks: These are the main stocks being targeted by industrial, and to a lesser extent, artisanal fisheries throughout the Indian Ocean, both on the high seas and in the EEZ of coastal states.

Stock	Indicators	Prev[1]	2010	2011	2012	2013	2014	2015	Advice to the Commission
Albacore *Thunnus alalunga*	Catch 2014: 40,981 t Average catch 2010–2014: 38,181 t MSY (1,000 t) (80% CI): 47.6 (26.7–78.8) F_{MSY} (80% CI): 0.31 (0.21–0.42) SB_{MSY} (1,000 t) (80% CI): 39.2 (25.4–50.7) F_{2012}/F_{MSY} (80% CI): 0.69 (0.23–1.39) SB_{2012}/SB_{MSY} (80% CI): 1.09 (0.34–2.20) SB_{2012}/SB_{1950} (80% CI): 0.21 (0.11–0.33)	2007							If catch remains below the estimated MSY levels, then immediate management measures are not required. However, continued monitoring and improvement in data collection, reporting and analysis is required to reduce the uncertainty in assessments. Click here for full stock status summary: Appendix VIII
Bigeye tuna *Thunnus obesus*	Catch 2014: 100,231 t Average catch 2010–2014: 102,214 t MSY (1,000 t) (range): 132 (98–207) F_{MSY} (range): n.a. (n.a.–n.a.) SB_{MSY} (1,000 t) (range): 474 (295–677) F_{2012}/F_{MSY} (range): 0.42 (0.21–0.80) SB_{2012}/SB_{MSY} (range): 1.44 (0.87–2.22) SB_{2012}/SB_{1950} (range): 0.40 (0.27–0.54)	2008							If catch remains below the estimated MSY levels, then immediate management measures are not required. However, continued monitoring and improvement in data collection, reporting and analysis is required to reduce the uncertainty in assessments. Click here for full stock status summary: Appendix IX
Skipjack tuna *Katsuwonus pelamis*	Catch 2014: 432,467 t Average catch 2010–2014: 402,229 t MSY (1,000 t) (80% CI): 684 (550–849) F_{MSY} (80% CI): 0.65 (0.51–0.79) SB_{MSY} (1,000 t) (80% CI): 875 (708–1,075) C_{2013}/C_{MSY} (80% CI): 0.62 (0.49–0.75) SB_{2013}/SB_{MSY} (80% CI): 1.59 (1.13–2.14) SB_{2013}/SB_{1950} (80% CI): 0.58 (0.53–0.62)								If catch remains below the estimated MSY levels, then immediate management measures are not required. However, continued monitoring and improvement in data collection, reporting and analysis is required to reduce the uncertainty in assessments. Click here for full stock status summary: Appendix X
Yellowfin tuna *Thunnus albacares*	Catch 2014: 430,327 t Average catch 2010–2014: 373,824 t MSY (1,000 t) (80% CI): 421 (404–439) F_{MSY} (80% CI): 0.165 (0.162–0.168) SB_{MSY} (1,000 t) (80% CI): 1,217 (1,165–1,268) F_{2014}/F_{MSY} (80% CI): 1.34 (1.02–1.67) SB_{2014}/SB_{MSY} (80% CI): 0.66 (0.58–0.74) SB_{2014}/SB_{1950} (80% CI): 0.23 (0.21–0.36)	2008						**94%** *	If the Commission wishes to recover the stock to levels above the interim target reference points with 50% probability by 2024, the Scientific Committee recommends that catches be reduced by 20% of current (2014) levels. Click here for full stock status summary: Appendix XI

Billfish: These are the billfish stocks being exploited by industrial and artisanal fisheries throughout the Indian Ocean, both on the high seas and in the EEZ of coastal states. The marlins and sailfish are not usually targeted by most fleets, but are caught and retained as byproduct by the main industrial fisheries. They are important for localised small-scale and artisanal fisheries or as targets in recreational fisheries.

Stock	Indicators	Prev[1]	2010	2011	2012	2013	2014	2015	Advice to the Commission
Swordfish *Xiphias gladius*	Catch 2014: 34,822 t Average catch 2010–2014: 28,494 t MSY (1,000 t) (80% CI): 39.40 (33.20–45.60) F_{MSY} (80% CI): 0.138 (0.137–0.138) SB_{MSY} (1,000 t) (80% CI): 61.4 (51.5–71.4) F_{2013}/F_{MSY} (80% CI): 0.34 (0.28–0.40) SB_{2013}/SB_{MSY} (80% CI): 3.10 (2.44–3.75) SB_{2013}/SB_{1950} (80% CI): 0.74 (0.58–0.89)	2007							Given current stock status, if catch remains below the estimated MSY levels, then immediate management measures to reduce catch are not required. However, continued monitoring and improvement in data collection and reporting are required to reduce the uncertainty in assessments. Click here for full stock status summary: Appendix XII
Black marlin *Makaira indica*	Catch 2014: 14,400 t Average catch 2010–2014: 11,962 t MSY (1,000 t) (80% CI): 10.2 (7.6–13.8) F_{MSY} (80% CI): 0.25 (0.08–0.45) B_{MSY} (1,000 t) (80% CI): 37.8 (14.6–62.3) F_{2013}/F_{MSY} (80% CI): 1.06 (0.39–1.73) B_{2013}/B_{MSY} (80% CI): 1.13 (0.73–1.53) B_{2013}/B_{1950} (80% CI): 0.57 (0.37–0.76)								A precautionary approach to the management of black marlin should be considered by the Commission, to reduce catches below MSY estimates (~10,000 t), thereby ensuring the stock does not fall below B_{MSY}, and become overfished.Click here for full stock status summary: Appendix XIII
Blue marlin *Makaira nigricans*	Catch 2014: 14,686 t Average catch 2010–2014: 13,190 t MSY (1,000 t) (80% CI): 11.70 (8.02–12.40) F_{MSY} (80% CI): 0.49 (n.a.) B_{MSY} (1,000 t) (80% CI): 23.70 (n.a.) F_{2011}/F_{MSY} (80% CI): 0.85 (0.63–1.45) B_{2011}/B_{MSY} (80% CI): 0.98 (0.57–1.18) B_{2011}/B_{1950} (80% CI): 0.48 (n.a.)								A precautionary approach to the management of blue marlin should be considered by the Commission, to reduce catches below MSY estimates (~11,000 t), thereby ensuring the stock does not remain below B_{MSY} (overfished). Click here for full stock status summary: Appendix XIV
Striped marlin *Tetrapturus audax*	Catch 2014: 4,001 t Average catch 2010–2014: 4,112 t MSY (1,000 t) (80% CI): 5.22 t (5.18–5.59) F_{MSY} (80% CI): 0.62 (0.59–1.04) B_{MSY} (1,000 t) (80% CI): 8.4 t (5.40–8.90) F_{2014}/F_{MSY} (80% CI): 1.09 (0.62–1.66) B_{2014}/B_{MSY} (80% CI): 0.65 (0.45–1.17) B_{2014}/B_{1950} (80% CI): 0.24 (n.a.–n.a.)							**60%** *	A precautionary approach to the management of striped marlin should be considered by the Commission. If the Commission wishes to recover the stock to a level above MSY based reference points with 50% probability by 2024, the Scientific Committee recommends that catches should not exceed 4,000 t. Click here for full stock status summary: Appendix XV
Indo-Pacific Sailfish *Istiophorus platypterus*	Catch 2014: 30,674 t Average catch 2010–2014: 29,143 t MSY (1,000 t) (80% CI): 25.00 (17.20–36.30) F_{MSY} (80% CI): 0.26 (0.15–0.39) B_{MSY} (1,000 t) (80% CI): 87.52 (56.30–121.02) F_{2014}/F_{MSY} (80% CI): 1.05 (0.63–1.63) B_{2014}/B_{MSY} (80% CI): 1.13 (0.87–1.37) B_{2014}/B_{1950} (80% CI): 0.57 (0.44–0.69)								A precautionary approach to the management of I.P sailfish should be considered by the Commission, to reduce catches below MSY estimates (~25,000 t), thereby ensuring the stock does not fall below B_{MSY}, and become overfished.Click here for full stock status summary: Appendix XVI

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 623,242 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.

Stock	Indicators	Prev[1]	2010	2011	2012	2013	2014	2015	Advice to the Commission
Bullet tuna *Auxis rochei*	Catch 2014: 8,117 t Average catch 2010–2014: 8,952 t MSY (1,000 t) (80% CI): unknown F_{MSY} (80% CI): unknown B_{MSY} (1,000 t) (80% CI): unknown F_{2014}/F_{MSY} (80% CI): unknown B_{2014}/B_{MSY} (80% CI): unknown B_{2014}/B_0 (80% CI): unknown								A precautionary approach to the management of bullet tuna should be considered by the Commission, by ensuring that future catches do not exceed current catches (average 2010-2014). The stock should be closely monitored. Mechanisms need to be developed by the Commission to improve current statistics by encouraging CPCs to comply with their recording and reporting requirements, so as to better inform scientific advice. Click here for full stock status summary: Appendix XVII
Frigate tuna *Auxis thazard*	Catch 2014: 97,980 t Average catch 2010–2014: 97,930 t MSY (1,000 t) (80% CI): unknown F_{MSY} (80% CI): unknown B_{MSY} (1,000 t) (80% CI): unknown F_{2014}/F_{MSY} (80% CI): unknown B_{2014}/B_{MSY} (80% CI): unknown B_{2014}/B_0 (80% CI): unknown								A precautionary approach to the management of frigate tuna should be considered by the Commission, by ensuring that future catches do not exceed current catches (average 2010-2014). The stock should be closely monitored. Mechanisms need to be developed by the Commission to improve current statistics by encouraging CPCs to comply with their recording and reporting requirements, so as to better inform scientific advice. Click here for full stock status summary: Appendix XVIII
Kawakawa *Euthynnus affinis*	Catch 2014: 162,854 t Average catch 2010–2014: 156,066 t MSY (1,000 t) (80% CI): 152 [125 –188]** F_{MSY} (80% CI): 0.56 [0.42–0.69]** B_{MSY} (1,000 t) (80% CI): 202 [151–315]** F_{2013}/F_{MSY} (80% CI): 0.98 [0.85–1.11]** B_{2013}/B_{MSY} (80% CI): 1.15 [0.97–1.38]** B_{2013}/B_{1950} (80% CI): 0.58 [0.33–0.86]**								Although the stock status is classified as not overfished and not subject to overfishing, the K2MSM showed that there is a 96% probability that biomass is below MSY levels and 100% probability that $F>F_{MSY}$ by 2016 and 2023 if catches are maintained at the current levels. The modelled probabilities of the stock achieving levels consistent with the MSY reference points (e.g. SB > SB_{MSY} and $F<F_{MSY}$) in 2023 are 100% for a future constant catch at 80% of current catch levels in 2014, thus if the Commission wishes to recover the stock to levels above the MSY reference points, the Scientific Committee recommends that catches should be reduced by 20% of current levels.Click for a full stock status summary: Appendix XIX
Longtail tuna *Thunnus tonggol*	Catch 2014: 147,587 t Average catch 2010–2014: 158,393 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_{1950} (80% CI): 0.41 (n.a.)							**25% ***	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 $F_{2016}>F_{MSY}$) or are reduced to 70% of the current levels (76% probability $B<B_{MSY}$ and 82% probability $F>F_{MSY}$). If the Commission wishes to recover the stock to levels above the MSY reference points, the Scientific Committee recommends catches should be reduced by 30% of current levels which corresponds to catches slightly below to MSY in order to recover the status of the stock in conformity with the decision framework described in Resolution 15/10. Click for a full stock status summary: Appendix XX

Indo-Pacific king mackerel *Scomberomorus guttatus*	Catch 2014: 45,953 t Average catch 2010–2014: 44,621 t MSY (1,000 t) (80% CI): 43 [35.8–52.9]** F_{MSY} (80% CI): 0.42 [0.34–0.52]** B_{MSY} (1,000 t) (80% CI): 82.8 [60.3–131.1]** F_{2013}/F_{MSY} (80% CI): 1.05 [0.91–1.27]** B_{2013}/B_{MSY} (80% CI): 1.01 [0.80–1.20]** B_{2013}/B_{1950} (80% CI): 0.52 [0.34–0.74]**								A precautionary approach to the management of IP king mackerel should be considered by the Commission, by ensuring that future catches do not exceed preliminary estimates of MSY. The stock should be closely monitored. Mechanisms need to be developed by the Commission to improve current statistics by encouraging CPCs to comply with their recording and reporting requirement, so as to better inform scientific advice. Click for a full stock status summary: Appendix XXI
Narrow-barred Spanish mackerel *Scomberomorus commerson*	Catch 2014: 153,425 t Average catch 2010–2014: 149,774 t MSY (1,000 t) (80% CI): 127.7 [95.8–183.6]** F_{MSY} (80% CI): 0.33 [0.21–0.56]** B_{MSY} (1,000 t) (80% CI): 321 [174–693]** F_{2013}/F_{MSY} (80% CI): 1.21 [0.99–1.58]** B_{2013}/B_{MSY} (80% CI): 0.96 [0.69–1.22]** B_{2013}/B_{1950} (80% CI): 0.53 [0.30–1.04]**								There is a continued high to very high risk of exceeding MSY-based reference points by 2023, even if catches are reduced to 80% of the current (2013) levels (67% risk that $B_{2023}<B_{MSY}$, and 99% risk that $F\ 2023>F_{MSY}$). The modeled probabilities of the stock achieving levels consistent with the MSY reference levels (e.g. $SB > SB_{MSY}$ and $F<F_{MSY}$) in 2023 are 98 and 79%, respectively, for a future constant catch at 70% of current catch level. If the Commission wishes to recover the stock to levels above the MSY reference points, the Scientific Committee recommends that catches should be reduced by 20-30% of current levels which corresponds to catches below to MSY in order to recover the status of the stock. Click for a full stock status summary: Appendix XXII

Sharks: Although sharks are not part of the 16 species directly under the IOTC mandate, sharks are frequently caught in association with fisheries targeting IOTC species. Some fleets are known to actively target both sharks and IOTC species simultaneously. As such, IOTC Contracting Parties and Cooperating Non-Contracting Parties are required to report information at the same level of detail as for the 16 IOTC species. The following are the main species caught in IOTC fisheries, although the list is not exhaustive.

Stock	Indicators	Prev[1]	2010	2011	2012	2013	2014	2015	Advice to the Commission
Blue shark *Prionace glauca*	Reported catch 2014 : 30,012 t Not elsewhere included (nei) sharks 2014: 39,820 t Average reported catch 2010–2014: 28,888 t Not elsewhere included (nei) sharks 2010–14: 46,543 t MSY (1,000 t) (80% CI): Unknown F_{MSY} (80% CI): Unknown SB_{MSY} (1,000 t) (80% CI): Unknown $F2014/F_{MSY}$ (range): (0.44–4.84) $SB2014/SB_{MSY}$ (range): (0.83–1.75) SB2014/SB0 (range): Unknown								A precautionary approach to the management of blue shark should be considered by the Commission, by ensuring that future catches do not exceed current catches. The stock should be closely monitored. Mechanisms need to be developed by the Commission to improve current statistics by encouraging CPCs to comply with their recording and reporting requirement on sharks, so as to better inform scientific advice. Click for a full stock status summary: Appendix XXIII
Oceanic whitetip shark *Carcharhinus longimanus*	Reported catch 2014 : 5,383 t Not elsewhere included (nei) sharks 2014: 39,820 t Average reported catch 2010–2014: 2,398 t Not elsewhere included (nei) sharks 2010–14: 46,543 t MSY (range): unknown								A precautionary approach to the management of these sharks should be considered by the Commission. Mechanisms need to be developed by the Commission to encourage CPCs to comply with their recording and reporting requirement on sharks, so as to better inform scientific advice. Click for a full stock status summary: o Oceanic whitetip sharks – Appendix XXIV

Scalloped hammerhead shark *Sphyrna lewini*	Reported catch 2013: Not elsewhere included (nei) sharks[2]: Average reported catch 2009–2013: Not elsewhere included (nei) sharks[2]: MSY (range):	42 t 39,820 t 89 t 46,5432 t unknown								○ Scalloped hammerhead sharks – Appendix XXV ○ Shortfin mako sharks – Appendix XXVI ○ Silky sharks – Appendix XXVII ○ Bigeye thresher sharks – Appendix XXVIII ○ Pelagic thresher sharks – Appendix XXIX
Shortfin mako *Isurus oxyrinchus*	Reported catch 2014 : Not elsewhere included (nei) sharks 2014: Average reported catch 2010–2014: Not elsewhere included (nei) sharks 2010–14: MSY (range):	1,683 t 39,820 t 1,538 t 46,543 t unknown								
Silky shark *Carcharhinus falciformis*	Reported catch 2014 : Not elsewhere included (nei) sharks 2014: Average reported catch 2010–2014: Not elsewhere included (nei) sharks 2010–14: MSY (range):	2,901 t 39,820 t 4,088 t 46,543 t unknown								
Bigeye thresher shark *Alopias superciliosus*	Reported catch 2014 : Not elsewhere included (nei) sharks 2014: Average reported catch 2010–2014: Not elsewhere included (nei) sharks 2010–14: MSY (range):	0 t 39,820 t 159 t 46,543 t unknown								
Pelagic thresher shark *Alopias pelagicus*	Reported catch 2014 : Not elsewhere included (nei) sharks 2014: Average reported catch 2010–2014: Not elsewhere included (nei) sharks 2010–14: MSY (range):	0 t 39,820 t 122 t 46,543 t unknown								

[1] This indicates the last year taken into account for assessments carried out before 2010. *Estimated probability that the stock is in the respective quadrant of the Kobe plot (shown below), derived from the confidence intervals associated with the current stock status. ** Range of plausible models.

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

1. OPENING OF THE SESSION

1. The 18th Session of the Indian Ocean Tuna Commission's (IOTC) Scientific Committee (SC) was held in Bali, Indonesia, from 23 to 27 November 2015. A total of 71 delegates and other participants (62 in 2014) attended the Session, comprised of 51 delegates (53 in 2014) from 18 Contracting Parties (22 in 2014), 3 delegates from 2 Cooperating Non-Contracting Parties (0 in 2014), and 17 observers, including 2 invited experts (11 observers in 2014). The list of participants is provided at Appendix I. The meeting was opened on 23 November 2015 by Mr Nilanto Perbowo, Acting Chairman of Agency of Marine Affairs and Fisheries Research and Development (AMAFRAD), Ministry of Marine Affairs and Fisheries, the Chairperson (Dr Tom Nishida – Japan) and the IOTC Executive Secretary (Interim) Dr David Wilson.

2. ADOPTION OF THE AGENDA AND ARRANGEMENTS FOR THE SESSION

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

3. ADMISSION OF OBSERVERS

3. The SC **NOTED** that at the 17th Session of the Commission, Members decided that its subsidiary bodies should be open to participation by observers from all those who have attended the current and/or previous sessions of the Commission. Applications by new Observers should continue to follow the procedure as outlined in Rule XIV of the IOTC Rules of Procedure (2014).

3.1 Food and Agricultulture Organisation (FAO) of the United Nations

4. In accordance with Rule VI.1 and XIV.1 of the IOTC Rules of Procedure (2014), the SC **ADMITTED** the following as an observer to the 18th Session of the SC:
    - Food and Agriculture Organisation (FAO) of the United Nations

3.2 Intergovernmental Organisations (IGO)

5. In accordance with Rule VI.1 and XIV.4 of the IOTC Rules of Procedure (2014), the SC **ADMITTED** the following Inter-governmental organisations (IGO) as observers to the 18th Session of the SC:
    - Convention on the conservation of migratory species of wild animals (UNEP/CMS)
    - WB/IOC/SWIOFC/SWIOFish1 Project

3.3 Non-governmental Organisations (NGO)

6. In accordance with Rule VI.1 and XIV.5 of the IOTC Rules of Procedure (2014), the SC **ADMITTED** the following Non-governmental organisations (NGO) as observers to the 18th Session of the SC:
    - Greenpeace International (GI)
    - International Seafood Sustainability Foundation (ISSF)
    - International pole and line foundation (IPNLF)
    - Marine Stewardship Council (MSC)
    - Overseas fishery cooperation foundation of Japan (OFCF)
    - The Manta Trust
    - The PEW Charitable Trusts (PEW)
    - World Wide Fund for Nature (a.k.a World Wildlife Fund, WWF)

3.4 Invited experts

7. In accordance with Rules VI.1 and XIV.9 of the IOTC Rules of Procedure (2014), which state that the Commission may invite experts, in their individual capacity, to enhance and broaden the expertise of the SC and of its Working Parties, the SC **ADMITTED** the invited experts from Taiwan,China to the 18th Session of the SC.

4. DECISIONS OF THE COMMISSION RELATED TO THE WORK OF THE SCIENTIFIC COMMITTEE

4.1 Outcomes of the 19th Session of the Commission

8. The SC **NOTED** paper IOTC–2015–SC18–03 which outlined the decisions and requests made by the Commission at its 19th Session, held from 27 April to 1 May 2015, specifically relating to the IOTC science process, including the 11 Conservation and Management Measures (consisting of 11 Resolutions and 0 Recommendations), as detailed below:

Resolutions

- 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*

9. The SC **NOTED** that pursuant to Article IX.4 of the IOTC Agreement, the above mentioned Conservation and Management Measures became binding on Members, 120 days from the date of the notification communicated by the IOTC Secretariat in IOTC Circular 2015–049 (i.e. **10 September 2015**) The updated *Compendium of Active Conservation and Management Measures for the Indian Ocean Tuna Commission* may be downloaded from the IOTC website at the following link, dated 10 September 2015:
   - English: http://iotc.org/cmms
   - French: http://iotc.org/fr/mcgs

10. **NOTING** that the Commission also made a number of general comments and requests on the recommendations made by the Scientific Committee in 2014 (details as follows: paragraph numbers refer to the report of the Commission (IOTC–2015–S19–R)): the SC **AGREED** that any advice to the Commission would be provided in the relevant sections of this report, below.

> Para. 10. *The Commission **CONSIDERED** the list of recommendations made by the SC17 (Appendix VI) from its 2014 report (IOTC–2014–SC17–R) that related specifically to the Commission. The Commission **ENDORSED** the list of recommendations as its own, while taking into account the range of issues outlined in this Report (S19) and incorporated within Conservation and Management Measures adopted during the Session and as adopted for implementation as detailed in the approved annual budget and Program of Work. (para. 10 of the S19 report)*

4.2 Previous decisions of the Commission

11. The SC **NOTED** paper IOTC–2015–SC18–04 which outlined a number of Commission decisions, in the form of previous Resolutions that require a response from the SC in 2015, or for the SC to include the requested elements into its Program of Work, and **AGREED** to develop advice to the Commission in response to each request during the current Session.

5. SCIENCE RELATED ACTIVITIES OF THE IOTC SECRETARIAT IN 2015

5.1 Report of the Secretariat – Activities in support of the IOTC science process in 2015

12. The SC **NOTED** paper IOTC–2015–SC18–05 Rev_1 which provided an overview of the work undertaken by the IOTC Secretariat in 2015, and thanked the IOTC Secretariat for the contributions to the science process in 2015, in particular via support to the working party and Scientiifc Committee meetings, facilitation of the IOTC Meeting Participation Fund, improvements in the quality of some of the data sets being collected and submitted to the IOTC Secretariat, and through the facilitation of consultants and invited experts to raise the standard of IOTC meetings.

13. The SC **THANKED** the IOTC Secretariat for the work carried out in 2015, despite the various staffing challenges placed upon it. In doing so, it has become clear to the SC that even if fully staffed at the current approved level, the IOTC Secretariat requires further staff to continue to ensure the successful delivery opon the many and various requests made upon its time by the Commission and its subsidiary bodies. Thus, in Section 7.7 the SC will propose additional staffing requirements to the Commission for its consideration.

6. NATIONAL REPORTS FROM CPCS

6.1 National Reporting to the Scientific Committee: overview

14. The SC **NOTED** that 26 National Reports were submitted to the IOTC Secretariat in 2015 by CPCs (24 Contracting Parties and 2 Cooperating Non-Contracting Parties), the abstracts of which are provided at Appendix IV.

15. The SC **REMINDED** CPCs that the purpose of the National Reports is to provide relevant information to the SC on fishing activities of Contracting Parties (Members) and Cooperating Non-Contracting Parties (collectively termed CPCs) operating in the IOTC area of competence. The report should include all fishing activities for species under the IOTC mandate as well as sharks and other byproduct / bycatch species as required by the IOTC Agreement and decisions by the Commission.

16. The SC **REMINDED** CPCs that the submission of a National Report is mandatory, irrespective of whether a CPC intends on attending the annual meeting of the SC or not and shall be submitted no later than 15 days prior to the SC meeting. In 2015, of the 26 National Reports submitted, 15 were submitted after the deadline. The National Report does not replace the need for submission of data according to the IOTC Mandatory Data Requirements listed in the relevant IOTC Resolution [currently Resolution 15/02 *On mandatory statistical reporting requirements for IOTC Contracting Parties and Cooperating Non-Contracting Parties (CPCs)*].

17. The SC **AGREED** that if required, interested CPCs should seek assistance from the IOTC Secretariat in the development of National Reports. Requests should be made as early as possible so that the IOTC Secertariat may be able to better coordinate the resources available.

18. **NOTING** that the Commission, at its 15th Session, expressed concern regarding the limited submission of National Reports to the SC, and stressed the importance of providing the reports by all CPCs, the SC **RECOMMENDED** that the Commission note that in 2015, 26 reports were provided by CPCs (26 in 2014, 28 in 2013) (Table 2).

19. The SC **RECOMMENDED** that the Compliance Committee and Commission note the lack of compliance by 8 Contracting Parties (Members) and 3 Cooperating Non-Contracting Parties (CNCPs), that did not submit a National Report to the Scientific Committee in 2015, noting that the Commission agreed that the submission of the annual reports to the Scientific Committee is mandatory (Table 2).

TABLE 2. CPC submission of National Reports to the SC from 2005 to 2015.

CPC	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Contracting Parties (Members)											
Australia											
Belize	n.a.	n.a.									
China											
Comoros											
Eritrea											
European Union											
France (OT)											
Guinea											
India											
Indonesia	n.a.	n.a.									
Iran, Islamic Rep. of											
Japan											
Kenya											
Korea, Republic of											
Madagascar											
Malaysia											
Maldives, Rep. of	n.a.	n.a.	n.a.	n.a.							
Mauritius											
Mozambique	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.					
Oman, Sultanate of											
Pakistan											
Philippines											
Seychelles, Rep. of											
Sierra Leone	n.a.	n.a.	n.a.								
Somalia	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.		
Sri Lanka											
Sudan											
Tanzania, United Republic of	n.a.	n.a.									
Thailand											
United Kingdom (OT)											
Vanuatu											
Yemen	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.				
Cooperting Non-Contracting Parties											
Bangladesh	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Djibouti	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.		
Liberia	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Senegal											
South Africa, Rep. of											

Green = submitted. Red = not submitted. Green hash = submitted as part of EU report, although needed to be separate. n.a. = not applicable (not a CPC in that year).

6.2 Contracting Parties (Members)

20. **NOTING** the 24 National Reports submitted to the IOTC Secretariat in 2015 by Contracting Parties (Members), the SC **EXPRESSED** concern about the difference between the catches submitted in National Reports and total catches, by fleet, in the IOTC database. The IOTC Secretariat uses the information from the National Report to update estimates of nominal catches, in the case of revisions to the data or when CPCs have not submitted any catch data; however the time available between submission of the National Reports and the Scientific Committee

makes it difficult to update the IOTC nominal database prior to the annual Session. The quality of the National Reports is highly variable and interested CPCs should contact the IOTC Secertariat prior to the report deadline to ensure their reports are compliant with the guidelines. The following matters were raised in regard to the content of specific reports:

- **Australia**: Nil comments.
- **Belize**: The SC **EXPRESSED** its disappointment that Belize did not provide a National Report and **REQUESTED** that the SC Chairperson, in conjunction with the Chairpersons of the Compliance Committee and Commission, remind Belize to fulfil its reporting obligations to the IOTC. Belize became a Contracting Party of the IOTC in 2007 and as such it is a requirement to comply with the National Report obligation to the Scientific Committee.
- **China**: Nil comments.
- **Comoros**: Nil comments.
- **Eritrea**: The SC **EXPRESSED** its disappointment that Eritrea did not provide a National Report and **REQUESTED** that the SC Chairperson, in conjunction with the Chairpersons of the Compliance Committee and Commission, remind Eritrea to fulfil its reporting obligations to the IOTC. Eritrea became a Contracting Party of the IOTC in 1994 and as such it is a requirement to comply with the National Report obligation to the Scientific Committee.
- **European Union** (EU): Nil comments.
- **France (OT)**: The SC **NOTED** thae statement from Mauritius and the associated response from France (OT) as provided in Appendix IVb.
- **Guinea**: The SC **EXPRESSED** its disappointment that Guinea did not provide a National Report and **REQUESTED** that the SC Chairperson, in conjunction with the Chairpersons of the Compliance Committee and Commission, remind Guinea to fulfil its reporting obligations to the IOTC. Guinea became a Contracting Party of the IOTC in 2005 and as such it is a requirement to comply with the National Report obligation to the Scientific Committee.
- **India**: The SC **NOTED** inconsistencies between the total catches for India reported in the National Report and current data in the IOTC database, as well as the lack of catch and effort data for its industrial longline fleet. Data were submitted late by India (i.e. after the end-June deadline), and were also incomplete and not compliant with IOTC reporting requirements and therefore could not be processed before the SC meeting.
- **Indonesia**: The SC **NOTED** the recent developments in tuna management by Indonesia, including the National Tuna Management Plan (NTMP) in 2014, new regulations which ban transhipment at sea, and a new online database which provides information on the record of vessels authorised to fish within Indonesian archipelagic waters aimed at combating illegal, unreported and unregulated (IUU) Fishing.
- **Iran, Islamic Rep.**: The SC **NOTED** the lack of catch and effort data for all I.R. Iran fleets submitted to the IOTC Secrtariat.
- **Japan**: Nil comments.
- **Kenya:** Nil comments.
- **Korea, Rep. of**: Nil comments.
- **Madagascar**: The SC **NOTED** the differences between the catches of sharks reported to the IOTC Secretariat and the actual catches of sharks for fins.
- **Malaysia**: Nil comments.
- **Maldives, Republic of**: The SC **ACKNOWLEDGED** the work of the Maldives in improving levels of compliance in terms of the collection of catch and effort data from fisheries at a 1 degree spatial scale required by the IOTC, and **ENCOURAGED** other CPCs to follow the example. The progress by Maldives in terms of implementing VMS on board vessels, in addition to the implementation of the national observer scheme programme using the interim IOTC data collection templates, was commended.
- **Mauritius**: The SC **NOTED** that catch and effort data for the purse seine fisheries of Mauritius reported in the National Report are not in the IOTC database. The data had not been processed by the IOTC Secretariat as the data were not submitted according to the reporting standards of Resolution 15/02. Mauritius and the IOTC Secretariat should liaise to improve the data reporting of the purse seine fisheries of Mauritius. The SC **NOTED** the statement made by the United Kingdom and the subsequent response from Mauritius provided in Appendix IVb.
- **Mozambique**: Nil comments.
- **Oman, Sultanate of**: Nil comments.

- **Pakistan**: The SC **EXPRESSED** its disappointment that Pakistan did not provide a National Report and **REQUESTED** that the SC Chairperson, in conjunction with the Chairpersons of the Compliance Committee and Commission, remind Pakistan to fulfil its reporting obligations to the IOTC. Pakistan became a Contracting Party of the IOTC in 1995 and as such it is a requirement to comply with the National Report obligation to the Scientific Committee.
- **Philippines**: Nil comments.
- **Seychelles, Republic of**: Nil comments.
- **Sierra Leone**: The SC **EXPRESSED** its disappointment that Sierra Leone did not provide a National Report and **REQUESTED** that the SC Chairperson, in conjunction with the Chairpersons of the Compliance Committee and Commission, remind Sierra Leone to fulfil its reporting obligations to the IOTC. Sierra Leone became a Contracting Party of the IOTC in 2008 and as such it is a requirement to comply with the National Report obligation to the Scientific Committee.
- **Somalia**: No comments.
- **Sri Lanka**: The SC **NOTED** the recent improvements by Sri Lanka in terms of the data reported to the IOTC Secretariat, in addition to the implementation on VMS on board vessels greater than 10m, and development of a pilot National observer programme in 2014.
- **Sudan**: The SC **EXPRESSED** its disappointment that Sudan did not provide a National Report and **REQUESTED** that the SC Chairperson, in conjunction with the Chairpersons of the Compliance Committee and Commission, remind Sudan to fulfil its reporting obligations to the IOTC. Sudan became a Contracting Party of the IOTC in 1996 and as such it is a requirement to comply with the National Report obligation to the Scientific Committee.
- **Tanzania, United Republic of**: Nil comments.
- **Thailand**: Nil comments.
- **United Kingdom (OT)**: The SC **NOTED** the implementation of a conservation management plan and other on-going research activities by the UK(OT), in addition to the continued threat of IUU fishing activities to the UK(OT) ecosystem that include vessels apprehended with large shark catches on board, suspected of illegally fishing within the UK(OT) EEZ. The statement made by the Republic of Mauritius is provided as Appendix IVb.
- **Vanuatu**: The SC **EXPRESSED** its disappointment that Vanuatu did not provide a National Report and **REQUESTED** that the SC Chairperson, in conjunction with the Chairpersons of the Compliance Committee and Commission, remind Vanuatu to fulfil its reporting obligations to the IOTC. Vanuatu became a Contracting Party of the IOTC in 2002 and as such it is a requirement to comply with the National Report obligation to the Scientific Committee.
- **Yemen**: The SC **EXPRESSED** its disappointment that Yemen did not provide a National Report and **REQUESTED** that the SC Chairperson, in conjunction with the Chairpersons of the Compliance Committee and Commission, remind Yemen to fulfil its reporting obligations to the IOTC. Yemen became a Contracting Party of the IOTC in 2012, and as such it is a requirement to comply with the National Report obligation to the Scientific Committee.

6.3 Cooperating Non-Contracting Parties (CNCP)

21. The SC **NOTED** the 2 National Reports submitted to the IOTC Secretariat in 2015 by Cooperating Non-Contracting Parties (CNCPs). The following matters were raised in regard to the content of specific reports:
    - **Bangladesh**: The SC **NOTED** the first National Report from Bangladesh and thanked them for their contributions to the meeting.
    - **Djibouti**: The SC **EXPRESSED** its disappointment that Djibouti did not provide a National Report and **REQUESTED** that the SC Chairperson, in conjunction with the Chairpersons of the Compliance Committee and Commission, remind Djibouti to fulfil its reporting obligations to the IOTC. Djibouti was granted Cooperating Non-Contracting Party status for the first time by the Commission at its 18th Session (2014), and as such it is a requirement of CNCP status to comply with the National Report obligation to the Scientific Committee.
    - **Liberia**: The SC **EXPRESSED** its disappointment that Liberia did not provide a National Report and **REQUESTED** that the SC Chairperson, in conjunction with the Chairpersons of the Compliance Committee and Commission, remind Liberia to fulfil its reporting obligations to the IOTC. Liberia was granted Cooperating Non-Contracting Party status for the first time by the Commission at its 19th Session

(2015), and as such it is a requirement of CNCP status to comply with the National Report obligation to the Scientific Committee.

- **Senegal**: The SC **EXPRESSED** its disappointment that Senegal did not provide a National Report and **REQUESTED** that the SC Chairperson, in conjunction with the Chairpersons of the Compliance Committee and Commission, remind Senegal to fulfil its reporting obligations to the IOTC. Senegal is a long standing CNCP and as such it is a requirement of CNCP status to comply with the National Report obligation to the Scientific Committee.
- **South Africa, Republic of**: Nil comments.

6.4 Invited Experts

22. The SC **NOTED** the information provided by the Invited Experts from Taiwan,China which outlined fishing activities in the IOTC area of competence. The report from the Invited Experts is available from the IOTC Secretariat upon request.

7. REPORTS OF THE 2015 IOTC WORKING PARTY MEETINGS

23. The SC **NOTED** the following statement from the UK (OT):

"*We note the statements made by Mauritius included in the reports of Working Parties to this Committee at which UK was not present, including the Working Party on Tropical Tunas and the Working Party on Data Collection and Statistics. The statement made by UK at this Science Committee* (Appendix IVb) *applies also to any previous statements made by Mauritius during those Working Parties. The UK does not believe that the Science Committee or its subsidiary bodies are an appropriate forum to raise sovereignty issues of any kind.*"

7.1 Report of the 5th Session of the Working Party on Neritic Tunas (WPNT05)

24. The SC **NOTED** the report of the 5th Session of the Working Party on Neritic Tunas (IOTC–2015–WPNT05–R), including the consolidated list of recommendations provided as an appendix to the report. The meeting was attended by 31 participants (37 in 2014), including 9 recipients of the MPF (13 in 2014).

25. **NOTING** that the catches of neritic tuna and tuna-like species under the IOTC mandate continue to be very important to most IOTC coastal states, the SC **AGREED** that neritic tunas should receive appropriate management resources and support from the IOTC.

26. The SC **NOTED** the intention from the Maldives to submit a draft proposal for the upcoming Commission meeting for implementing a strategic multi-year program of work for neritic tuna species under the IOTC mandate. The program of work will have as its main objective to support the ongoing scientific understanding of the stock status of neritic tuna species to enable the development of rigorous stock assessments and enhancement of coastal States' ability to implement the measures, thereby facilitating the management of fisheries targeting neritic tuna species in the Indian Ocean.

7.1.1 Capacity building workshop: Neritic tunas

27. The SC **AGREED** that capacitiy building activities can be considered successful in the short-term if the objectives of the activity have been met during the time in which support was provided. The assessment of whether longer-term objectives have been met involves assessing whether the activities have been maintained beyond the lifetime of the activity which can be highly variable among recipient CPCs. In cases where there has been no continuation or follow-up on the work undertaken, then this is taken into consideration for future requests which are subsequently given lower priority. Therefore CPCs which actively continue to support and build on these activities are prioritised in future.

28. The SC **AGREED** that the continuation of stock assessment and indicator developing capacity building activities should continue to be supported by the Commission, via consultants and/or IOTC Secretariat staff, and that such activities should be closely evaluated.

29. The SC **RECOMMENDED** that a workshop is organised by the IOTC Secretariat in collaboration with WWF-Pakistan to analyse the datasets collaboratively using a meta-analysis based approach. WWF Pakistan have offered to provide support specifically for the north western Indian Ocean countries but 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.

30. The SC **AGREED** that data for Indian Ocean neritic tuna stocks needs to undergo a meta-analysis or hierarchical approach to analyse the data. This should be combined with capacity building activities in data poor stock assessment techniques.

31. The SC **THANKED** the IOTC-OFCF Project for its continued support to the enhancement of data collection and processing systems in developing countries of the IOTC and **ENCOURAGED** the OFCF to extend support into the future.

7.1.2 Data input for stock assessments

32. The SC **AGREED** on the importance of the further development of indices of abundance for future neritic tuna stock assessments, and that the development of standardised CPUE series is explored before the next assessment with the assistance of a consultant, as detailed in Section 13.1.

7.1.3 Management advice

33. **NOTING** the current stock status of several neritic tunas and the continued increase in catch and effort, the SC **RECOMMENDED** that a precautionary approach to the management of neritic tunas is taken by the Commission.

7.2 Report of the 13th Session of the Working Party on Billfish (WPB13)

34. The SC **NOTED** the report of the 13th Session of the Working Party on Billfish (IOTC–2015–WPB13–R), including the consolidated list of recommendations provided as an appendix to the report. The meeting was attended by 23 participants (21 in 2014) including 9 recipients of the MPF (4 in 2014).

7.2.1 Sports fishery data collection

35. The SC **NOTED** that the current state of data collection for most recreationl fisheries for marlin in the Indian Ocean is limited, although several key NGOs, including the African Billfish Foundation (ABF) have been working with sportsfishers for many years to encourage a willingness to collect sportfishery data.

36. The SC **RECOMMENDED** that the Chairperson and Vice-Chairperson continue to work in collaboration with the IOTC Secretariat and the African Billfish Foundation to find a suitable funding source and lead investigator to undertake the project outlined in the Report of the WPB13. The aim of the project is to enhance data recovery from sports and other recreational fisheries in the western Indian Ocean region, from which alternative abundance indicies could be developed for marlins and I.P. sailfish. The Chairperson shall circulate the concept note to potential funding bodies on behalf of the WPB. A similar concept note could be developed for other regions in the IOTC area of competence at a later date.

7.3 Report of the 11th Session of the Working Party on Ecosystems and Bycatch (WPEB11)

37. The SC **NOTED** the report of the 11th Session of the Working Party on Ecosystems and Bycatch (IOTC–2015–WPEB11–R), including the consolidated list of recommendations provided as an appendix to the report. The meeting was attended by 38 participants (37 in 2014), including 8 recipients of the MPF (5 in 2014).

7.3.1 Review of the statistical data available for ecosystems and bycatch species

38. **NOTING** the high level of uncertainty in the nominal catches of blue sharks and high proportion caught by Indonesia, the SC **AGREED** that the IOTC consultancy work that is currently taking place to improve the Indonesian nominal catch data series is extended in order to provide sufficient attention to sharks, and for this to be included in the Program of Work as a high priority (Section 13.1).

7.3.2 Pakistan shark bycatch in gillnet fisheries

39. **NOTING** that gillnets are regularly being used with lengths in excess of 4,000 m (and up to 7,000 m) within and occasionally beyond the EEZ of Pakistan and other IOTC CPCs in the region, and that those used within the EEZ may sometimes drift onto the high seas in contravention of Resolution 12/12, the SC **RECOMMENDED** that the Commission should consider if a ban on large scale gillnets should also apply within IOTC CPC EEZ. This would be especially important given the negative ecological impacts of large scale drifting gillnets in areas frequented by marine mammals and turtles.

7.3.3 Review of seabird mitigation measures in Resolution 12/06

40. The SC **REQUESTED** that CPCs with significant fishing effort south of 25°S undertake their own assessments on the levels and nature of implementation of Resolution 12/06 by their fleets, and present papers, similar to that presented in paper IOTC–2015–WPEB11–37 Rev_1, to the WPEB meeting in 2016.

41. The SC **RECOMMENDED** that CPCs bring data to the WPEB meeting in 2016, as the Commission via Resolution 12/06 required the WPEB and SC to undertake this task in 2015, which has not been possible due to insufficient data, and that a collaborative analysis of the impacts of Resolution 12/06 be undertaken during the WPEB meeting, if feasible. CPC review papers and datasets should include the following information/data from logbooks and/or observer schemes, where appropriate and should cover the period 2011 to 2015:
    - Total effort south of 25°S by area and time, at the finest scale possible
    - Observed effort south of 25°S by area and time, at the finest scale possible
    - Observed seabird mortality rates south of 25°S by area and time, at the finest scale possible
    - Descriptions of fleet structure /target species by time and area, and an indication of observer coverage per fleet/target species for effort south of 25°S
    - Data on which seabird bycatch mitigation measures were used, on a set-by-set/cruise basis if possible or per vessel, or at the finest scale possible
    - Descriptions of the specifications of seabird bycatch mitigation measures used according to the fields in the Regional Observer Scheme manual and in relation to the specifications given in Res 12/06.

7.3.4 Sharks and rays

42. The SC **NOTED** with thanks the support offered by CMS/MoU-Sharks to collaborate on capacity building activities planned by the WPEB for sharks in the coming years. The Chairperson and the IOTC Secertariat were **REQUESTED** to contact CMS and determine potential collaboration.

43. The SC **NOTED** that due to a lack of funding, the IOTC Shark Year Plan is yet to be implemented. However, the SC was informed that several funding sources have been identified for potential allocation in 2016 and 2017.

44. The SC **NOTED** a very sharp increase in the oceanic whitetip shark nominal catches in recent years, which is coming mostly from an increase in the catches reported by India. It will be important to explore the reasons for such an increase, in particular whether they are related to an actual increase in the catches or improvements in species identification, as in the past they were reported as non-identified sharks.

45. The SC **REQUESTED** additional explanations regarding the stock assessment schedule, and specifically why the blue shark that was assessed in 2015 is planned to be assessed again in two years in 2017. The Chairperson of the WPEB indicated that as blue shark is the most captured pelagic shark species, and that given the uncertainties in the current assessment, it would be important to continue the data preparatory work in 2016 and run a new assessment in 2017.

46. The SC **NOTED** that the blue shark is the least data-poor shark species, and that for other species the historical catches will have to be reconstructed to a much higher degree. The stock assessment schedules are revised by the Working Parties every year, so if needed it is possible to make changes for the following years in the stock assessment schedule depending on the requests from the SC and the Commission.

Shark fin to body weight ratio and wire leaders/traces

47. **NOTING** that the Commission, at its 19th Session, considered a range of proposals on sharks which included matters relevant to the shark fin to body weight ratio and wire leaders/traces, the SC **RECALLED** its previous advice to the Commission as follows:

    - The SC **RECOMMENDED** the Commission consider, that the best way to encourage full utilisation of sharks, to ensure accurate catch statistics, and to facilitate the collection of biological information, is to revise the IOTC Resolution 05/05 *concerning the conservation of sharks caught in association with fisheries managed by IOTC* such that all sharks must be landed with fins attached (naturally or by other means) to their respective carcass. However, the SC **NOTED** that such an action would have practical implementation and safety issues for some fleets and may degrade the quality of the product in some cases. The SC **RECOMMENDED** all CPCs to obtain and maintain the best possible data for IOTC fisheries impacting upon sharks, including improved species identification.

- On the basis of information presented to the SC in previous years, the SC **RECOGNISED** that the use of wire leaders/traces in longline fisheries may imply targeting of sharks. The SC therefore **RECOMMENDED** to the Commission that if it wishes to reduce catch rates of sharks by longliners it should prohibit the use of wire leaders/traces.

7.3.5 Marine Turtles

48. The SC **NOTED** the substantial amount of revision on the biology and ecology section of the executive summary of Marine Turtles provided to the WPEB and **ACKNOWLEDGED** the time and expertise provided by the CMS/IOSEA Marine Turtle MoU for this update.

Review of data available at the Secretariat for marine turtles

49. The SC **NOTED** that the lack of data from CPCs on interactions and mortalities of marine turtles in the Indian Ocean is a substantial concern, resulting in an inability of the WPEB to estimate levels of marine turtle bycatch. There is an urgent need to quantify the effects of fisheries for tuna and tuna-like species in the Indian Ocean on marine turtle species, and it is clear that little progress on obtaining and reporting data on interactions with marine turtles has been made. This data is necessary to allow the IOTC to respond and manage the adverse effects on marine turtles, and other bycatch species.

Review of Resolution 12/04 on the conservation of marine turtles

50. The SC reiterated its **RECOMMENDATION** from 2013 and 2014, that at the next revision of IOTC Resolution 12/04 *on the conservation of marine turtles*, the measure is strengthened to ensure that where possible, CPCs report annually on the total estimated level of incidental catches of marine turtles, by species, as provided at Table 3.

TABLE 3. Marine turtle species reported as caught in fisheries within the IOTC area of competence.

Common name	Scientific name
Flatback turtle	*Natator depressus*
Green turtle	*Chelonia mydas*
Hawksbill turtle	*Eretmochelys imbricata*
Leatherback turtle	*Dermochelys coriacea*
Loggerhead turtle	*Caretta caretta*
Olive ridley turtle	*Lepidochelys olivacea*

7.3.6 Seabirds

51. The SC **NOTED** the request to provide tables reporting seabird interactions with longline fisheries operating South of 25ºS in National Reports, and an example was provided. The tables were provided as examples only and are not mandatory.

52. The SC **RECALLED** the importance of maintaining set level data in observer reporting templates and ensuring data of sufficient resolution to reliably analyze the impact of CMMs. This is particularly relevant to enable future evaluations of the effectiveness and impact of resolutions relating to bycatch species.

7.3.7 Marine mammals

Development of technical advice for marine mammals

53. The SC reiterated its previous **RECOMMENDATION** that depredation events be incorporated into Resolution 15/01 at its next revision, so that interactions may be quantified at a range of spatial scales. Depredation events should also be quantified by the regional observer scheme.

7.3.8 Status of development and implementation of National Plans of Action for seabirds and sharks, and implementation of the FAO guidelines to reduce marine turtle mortality in fishing operations

54. The SC **NOTED** paper IOTC–2015–SC18–06 which provided the SC with the opportunity to consider, update and comment on the current status of development and implementation of national plans of action for seabirds

and sharks, and implementation of the FAO guidelines to reduce marine turtle mortality in fishing operations, by each IOTC CPC.

55. The SC **RECOMMENDED** that the Commission note the current status of development and implementation of National Plans of Action (NPOAs) for sharks and seabirds, and the implementation of the FAO guidelines to reduce marine turtle mortality in fishing operations, by each CPC as provided at Appendix V, recalling that the IPOA-Seabirds and IPOA-Sharks were adopted by the FAO in 1999 and 2000, respectively, and required the development of NPOAs. Despite the time that has elapsed since then, very few CPCs have developed NPOAs, or even carried out assessments to ascertain if the development of a Plan is warranted. Currently only 16 of the 37 IOTC CPCs have an NPOA-Sharks (8 more in development), while only 6 CPCs have an NPOA-Seabirds (2 more in development). A single CPC has determined that an NPOA-Sharks is not needed, and 5 have similarly determined that an NPOA-Seabirds is not needed. Currently only 9 of the 37 IOTC CPCs have implemented the FAO guidelines to reduce marine turtle mortality in fishing operations (2 more in progress), and two CPCs (European Union, France (OT)) have implement a full NPOA in 2015.

7.3.9 At-sea trials of line weighting options

56. The SC **NOTED** paper IOTC–2015–SC18–14 which provided an update on at-sea trials into different line-weighting options for Korean tuna longline vessels.

57. The SC **NOTED** that since 2013, the Rep. of Korea has investigated the effectiveness of seabird bycatch mitigation measures in collaboration with BirdLife International. As data collected from at-sea trials in 2013 could not be statistically analyzed due to the small sample size, it was recommended to conduct additional experiments subsequently. As a result, additional experimental tests have been conducted onboard Korean vessels in 2015. Statistical analyses for 2015 data have not been conducted yet and the authors are encouraged to continue this work and present the results at the WPEB meeting in 2016. This could give us useful information on the impact of weights on catch rates of target and non-target species, and the effectiveness of line weighting in reducing seabird bycatch.

7.4 Report of the 6th Session of the Working Party on Methods (WPM06)

58. The SC **NOTED** the report of the 6th Session of the Working Party on Methods (IOTC–2015–WPM06–R), including the consolidated list of recommendations provided as an appendix to the report. The meeting was attended by 26 participants (28 in 2014), including 6 recipient of the MPF (3 in 2014).

7.4.1 Proposal for a Technical Committee on Management Procedures

59. **NOTING** with concern the lack of adequate communication of the IOTC MSE process between the Scientific Committee and the Commission to date, the SC **RECOMMENDED** that the Commission consider the following draft outline to establish a formal communication channel for the science and management dialogue to enhance decision making. Possible adjustments to the mechanisms of communication between the Commission and the IOTC Scientific Committee could include the following:
    - The progress of the MSE process will benefit from having communication between the Scientific Committee and the Commission more formally structured, for example, through a dedicated Technical Committee on Management Procedures (MP) that would serve as an effective two-way channel for scientists to communicate the results of the ongoing MSE work. The Technical Committee would require that specific terms of reference (in line with the priorities identified in Resolution 14/03), roles and responsibilities of both fisheries managers and scientists, and possible interactions and feedback, are developed and clarified. The Technical Committee on MP could meet in conjunction with the annual Commission Session, to facilitate full attendance by CPCs.
    - The Technical Committee on MP would augment the ability of the Scientific Committee to communicate the progress of the MSE process.
    - The Technical Committee on MP would focus on the presentation of results and exchange of information necessary for the Commission to consider possible adoption of harvest strategies, utilizing standard formats for the presentation of results to facilitate understanding of the material by the non-technical audience.
    - It would be advisable that the agenda of the Technical Committee on MP place an emphasis on the elements of each MP that require a decision by the Commission. To facilitate such decisions, wherever necessary, interim choices should be offered to the Commission, noting that these choices can be

modified at a later stage in the review. The MSE is an iterative process that allows for adjustments as the work, and the understanding of the elements involved, progresses.

7.4.2 Presentation and evaluation of MSE results

60. The SC **ENDORSED** the draft list of performance statistics representing a suite of candidate management objectives, provided in Appendix VI which provides a means of measuring the performance of alternative management procedures against different objectives.

7.4.3 Albacore MSE update

61. The SC **NOTED** the progress made towards management strategy evaluation (MSE) for the Indian Ocean albacore fishery. This work was primarily led by the WPM Chair and the informal MSE working group. An operating model (OM) was presented together with an initial set of Management Procedures (MP), and the platform that could be used to explore alternative control rules for the Commission.

62. The SC **ENDORSED** the Operating Model for albacore as the basis for the provision of advice to the Commission on the performance of alternative Management Procedures, **NOTING** that external reviewers have considered the albacore MSE work and largely endorsed the approach taken, while recommending a number of improvements to be incorporated.

7.4.4 Skipjack tuna MSE update

63. The SC **NOTED** the progress made towards management strategy evaluation (MSE) for the Indian Ocean skipjack tuna fishery. This work was supported by the IPNLF, WWF, ABNJ and the Maldives' MSC client, MSPEA. An operating model (OM) was presented, together with an initial set of Management Procedures (MP), and the platform that could be used to explore alternative control rules for the Commission.

64. The SC **ENDORSED** the use of the Operating Model for skipjack tuna as the basis for the provision of advice to the Commission on the performance of alternative Management Procedure, **NOTING** that external reviewers have considered the skipjack tuna work MSE and largely endorsed the approach taken, while recommending a number of improvements to be incorporated.

65. The SC **NOTED** that Resolution 15/10 calls for completing the work on assessing the appropriateness of interm target and limit reference points and evaluating candidate harvest control rules as per the decision framework for skipjack tuna and albacore for presentation to the Commission in 2016.

7.4.5 Special session on Management Strategy Evaluation (MSE)

66. The SC **NOTED** that a special session on Management Strategy Evaluation took place during the SC meeting, following a request from the Working Party on Methods. The session gathered members of the WPM involved in the development of MSE for IOTC stocks. A presentation on Management Procedures and their evaluation and comparison through MSE explained the steps involved in this process and the roles of scientists and managers.

67. The SC **NOTED** that this was followed by a practical exercise in which participants could use a simplified Operating Model to tune a Management Procedure to achieve certain management objectives given different levels of uncertainty.

68. The SC **THANKED** the demonstrators for their work and agreed that there is a need for this kind of effort to help members understand the details and progress of the work on Management Strategy Evaluation.

7.5 Report of the 11th Session of the Working Party on Data Collection and Statistics (WPDCS11)

69. The SC **NOTED** the report of the 11th Session of the Working Party on Data Collection and Statistics (IOTC–2015–WPDCS11–R), including the consolidated list of recommendations provided as an appendix to the report. The meeting was attended by 20 participants (30 in 2014), including 4 recipients of the MPF (1 in 2014).

7.5.1 General discussion on data issues

70. The SC **NOTED** with concern the lack of information submitted by CPCs on total catches, catch and effort and size data for various IOTC species, despite their mandatory reporting status. For many IOTC stocks the IOTC Secretariat is required to estimate the level of catches, which increases the uncertainty of the stock assessment results using this data.

71. The SC **REQUESTED** that CPCs comply with IOTC data requirements as requested per Resolution 15/01 and 15/02, given the gaps in available information in the IOTC database and the importance of basic fishery data in order to assess the status of stocks and for the provision of sound management advice.

72. The SC **RECOMMENDED** the Commission develop penalty mechanisms through the IOTC Compliance Committee to improve compliance by CPCs that do not currently comply with the submission of basic fishery data requirements as stated in Resolution 15/01 and 15/02.

73. The SC **NOTED** that, given that catches of many IOTC species are accounted for by a small number of CPCs, the data gaps for major IOTC species could be addressed to some extent through data support and compliance missions, and capacity building focused on long term investments in data collection and reporting systems, particularly for coastal fisheries important for catches of IOTC species (e.g. Indonesia, Oman, Sri Lanka, India, Pakistan, Yemen, I.R. Iran). As a matter of priority, capacity building for fishery monitoring and data collection should be focused on those countries.

74. The SC **NOTED** that the willingness of CPCs to comply with IOTC mandatory data reporting requirements is also fundamental.

75. The SC **NOTED** with concern the lack of size frequency samples for gillnet (e.g. Sri Lanka, Pakistan, and I.R. Iran) and longline fisheries (e.g. Indonesia, Rep. of Korea, India, Oman, and Japan in recent years), as well as the inconsistencies between the average weights derived from catch and effort and size-frequency data available from Taiwan,China and Japan.

76. The SC **REQUESTED** those CPCs with gillnet and longline fisheries important for catches of IOTC species implement or improve the quality of size data collection systems and report the data to the IOTC Secretariat.

77. **NOTING** that total catches for Yemen have been repeated in the IOTC database since 2012, due to the lack of information available to the IOTC Secretariat, the SC **REQUESTED** that the IOTC Secretariat conduct a thorough review of alternative information available to estimate the recent catches for Yemen (for example, using information available on international trade data).

7.5.2 Resolution 15/02 Mandatory statistical requirements for IOTC Members and Cooperating Non-Contracting Parties (CPC's)

78. **NOTING** that the units of effort requested for longliners in IOTC Resolution 15/02 and 11/04 are not consistent as the former requests numbers of hooks and the latter numbers of sets, the SC **RECOMMENDED** that provisions in Resolution 15/02 are amended to include a requirement for longline fleets to report effort in terms of both number of hooks and number of sets, and that reporting of effort in terms of number of sets is also requested from surface purse seine fleets in addition to the current requirements to report effort as fishing days.

7.5.3 Further analysis of length frequency data from longline fleets and likely impacts on the assessments (Taiwan,China)

79. The SC **RECOMMENDED** further analysis to fully understand the recent changes in length composition reported by Taiwan,China – in particular whether there have been changes to the sampling protocols and selection of fish for sampling – and that the decline in the number of samples of small specimens of tropical tunas in particular may originate from high grading of catch onboard Taiwan,China longliners following the implementation of quotas on the Taiwan,China longline fleet in the Indian Ocean (i.e. only large specimens from the catch measured for length).

7.5.4 All other related fleets/issues

80. The SC **REQUESTED** joint work on the documentation of procedures for the collection, processing and reporting of size frequency data continues, based on a template to be produced by the IOTC Secretariat, in particular:
    - Full description of the type of sampling platforms used (e.g. commercial boats, research boats, training boats, etc.), and collecting sources (e.g. fishermen, researchers, scientific observers, etc.).
    - Full description of the sampling protocols used, on each (e.g. full enumeration of every set, every other set, first 30 fish from each set sampled for size, etc.), by type of sampling platform and collecting source.

- Type of measurements collected (e.g. gilled-and-gutted weight, fork length, etc.) and measurement tools used (calliper, measuring board, measuring tape, scale, etc.) by type of sampling platform, collecting source, and species.
- Type of time-area stratification used for each species (e.g. quarter and defined area) and procedures used for the estimation of sampled weights in each stratum, including all equations used for the conversion of non-standard measurements into standard measurements, by species (e.g. deterministic conversion using a single length-weight equation for all areas and time periods, etc.).
- Description of any other procedures which involve the use of length frequency data (e.g. estimation of weights from the numbers reported in logbooks and substitution scheme in the case that lengths are not available in areas where there are catches and effort recorded, etc.).

7.6 Report of the 17th Session of the Working Party on Tropical Tunas (WPTT17)

81. The SC **NOTED** the report of the 17th Session of the Working Party on Tropical Tunas (IOTC–2015–WPTT17–R), including the consolidated list of recommendations provided as an appendix to the report. The meeting was attended by 44 participants (52 in 2014), including 6 recipients of the MPF (6 in 2014).

7.6.1 Report of the 2nd CPUE workshop on longline fisheries

82. **NOTING** that the Taiwan,China longline CPUE in southern regions is affected by the rapid recent growth of the oilfish fishery, and that this is a new fishery with substantially lower catchability for tunas, it is important for CPUE indices to adjust for this change in catchability. Thus, the SC **AGREED** that future tuna CPUE standardisations should use appropriate methods to identify effort targeted at oilfish and related species, and either remove it from the dataset, or include a categorical variable for targeting method in the standardisation. The oilfish data variable should be provided to data analysts producing the CPUE index.

83. **NOTING** the advice from the WPTT that differences between the Japan and Taiwan,China longline CPUE indices were examined and attributed to either low sampling coverage of logbook data (between 1982–2000) or misreporting across oceans (Atlantic and Indian oceans) for bigeye tuna catches between 2002–04 for Taiwan,China, the SC **RECOMMENDED** the 1) development of minimum criteria (e.g. 10% using a simple random stratified sample) for logbook coverage to use data in standardisation processes; and 2) identifying vessels through exploratory analysis that were misreporting, and excluding them from the dataset in the standardisation analysis.

84. The SC **RECOMMENDED** that:
    - more credence should be given to CPUE indices based on operational data, since analyses of these data can take more factors into account, and analysts are better able to check the data for inconsistencies and errors.
    - Taiwan,China fleets provide all available logbook data to data analysts, representing the best and most complete information possible. This stems from the fact that the dataset currently used by scientists from Taiwan,China is incomplete and not updated with logbooks that arrive after finalisation.
    - that vessel identity information for the Japanese fleets for the period prior to 1979 should be obtained either from the original logbooks or from some other source, to the greatest extent possible to allow estimation of catchability change during this period and to permit cluster analysis using vessel level data. During this period there was significant technological change (e.g. deep freezers) and targeting changes (e.g. yellowfin tuna to bigeye tuna).
    - examining operation level data across all longline fleets (Rep. of Korea, Japan and Taiwan,China) will give us a better idea of what is going on with the fishery and stock especially if some datasets have low sample sizes or effort in some years, and others have higher sample sizes and effort, so we have a representative sample covering the broadest areas in the Indian Ocean. This will also avoid having no information in certain strata if a fleet were not operating there, and avoid combining two indices in that case.
    - that continued work on joint analysis of operational catch and effort data from multiple fleets be undertaken, to further develop methods and to provide indices of abundance for IOTC stock assessments.

7.6.2 Yellowfin tuna

85. The SC **NOTED** the improvement in presenting current stock status by providing the probabilities of being in different quadrants of the Kobe plot. However, this information is not provided in past assessment and alternative ways to consider how to display this information could be considered.

86. The SC **NOTED** that yellowfin tuna is overfished and subject to overfishing. Resolution 15/10 provides guidelines to recover the stock when it is assessed to be in the red zone of the Kobe plot. This resolution requires that the following actions are taken by the Commission:
    - *For a stock where the assessed status places it within the upper left quadrant (red), aim to end overfishing with a high probability and to rebuild the biomass of the stock in as short a period as possible*.

87. The SC **NOTED** that around half of the recent yellowfin tuna catch is harvested by artisanal fisheries, about which there is little information with regards to their catch, their fishing areas and the sizes of their captures. In addition, there is a lack of size frequency data for some industrial longline fleets fishing yellowfin tuna. **NOTING** that these problems contribute to increase the uncertainty in stock assessments, the SC **AGREED** that incorporating this type of uncertainty in future assessments is important to be included in the Program of Work for the WPTT. Moreover, CPCs should comply with IOTC data requirements in Resolutions 15/01 and 15/02.

88. The SC **NOTED** a series of issues identified with the SS3 stock assessment carried out in 2015 as detailed in the report of the WPTT17 (IOTC-2015-WPTT17-R). Briefly, these include, but are not limited to the following:
    a. The decline to a low spawning biomass relative to MSY was not preceded by a period of high catch relative to MSY. The model interprets the trend in biomass as originating from low recruitment.
    b. The sudden decrease in estimated recruitment in 2004 and 2005 is not observed in the nominal catch rates of purse seine fisheries using FADs, but it can be observed by other fishery indicators.
    c. The problems related to the representativeness of the Japanese CPUE series, which is localised in a southern area of the distribution of yellowfin tuna and only accounts for 1% of the total catch in recent years.
    d. The adult biomass as estimated by the longline CPUE indices has shown a sudden decline between 2007 and 2008 (piracy onset) whereas the adult yellowfin tuna nominal purse seine CPUE appears to be stable.

89. **NOTING** the difficulties with purse seine CPUE standardisation, the SC **REQUESTED** that the European Union place greater importance and effort into standardising their purse seine CPUE series on juveniles and adults, which would contribute to the next stock assessment for yellowfin tuna.

90. The SC **NOTED** the paradox between the increase in coastal catch rates and the assessment model results indicating a declining biomass. The assessed biomass has fallen by around 50% in recent years when most coastal fleests have been showing stable or increasing yellowfin tuna catches. Further research is needed linked to the estimation of artisanal fleet catches and the implication of those catches in the assessment, and will be included in the Program of Work.

91. The SC **NOTED** that all the sensitivity runs using different model setting and CPUEs as input parameters (Indian CPUE, EU PS CPUE) indicate that the stock is overfished and subject to overfishing. However, in spite of yielding comparable biomass depletion levels, alternative sensitivity runs showed moderately different estimations of relative fishing mortality (F/F_{MSY}).

7.6.3 Tropical tuna executive summaries

92. The SC **NOTED** paper IOTC–2015–SC18–13 which made proposals for alternative figures in the tropical tunas executive summaries.

93. The SC **AGREED** that a graph combining the average weight of each species of tropical tuna taken by various gears should be added to the supporting information sections.

94. The SC **AGREED** that the Working Party on Tropical Tunas should continue to review the other suggested options for new or modified graphics for potential inclusion in the supporting information for each tropical tuna species in 2016.

7.7 Summary discussion of matters common to Working Parties (capacity building activities – stock assessment course; connecting science and management, etc.)

7.7.1 Revision of the IOTC Guidelines for the presentation of CPUE standardisations and stock assessment models

95. **NOTING** that the current IOTC *Guidelines for the presentation of CPUE standardisations and stock assessment models* (IOTC–2015–SC18–INF01) may need revising, as it was felt that the current Stock Status summary table, which is the principal communication tool regarding stock status used on the IOTC website, may understate the uncertainty in stock status evaluations, the SC **AGREED** that the following should be reviewed, and presented to each Working Party meeting in 2016 for their consideration:
    - the annual status coding scheme;
    - the historic coding scheme;
    - consideration of the status coding scheme for years when no quantitative stock assessment is available.

96. The SC **AGREED** that the current Weight-of-Evidence approach used by the IOTC would be improved if there was a specific decision framework developed to assist the Working Parties when determining stock status each year. This is particulary important for years between stock assessments for particular species.

7.7.2 Meeting participation fund

97. **NOTING** the various comments made by many of the developing CPCs in attendance at the meeting, that the IOTC MPF was crucial for the success of all IOTC Working Parties, and that the benefits are clearly being seen in terms of increased active engagement at each meeting by recipients, as well as the rapidly increasing quality of the scientific papers being submitted, however, the SC **REQUESTED** that the funding of national scientists from developing Contracting Parties to attend the WPNT be considered a higher priority.

98. The SC **RECOMMENDED** that the IOTC Rules of Procedure (2014), for the administration of the Meeting Participation Fund be modified so that applications are due not later than 60 days, and that the full Draft paper be submitted no later than 45 days before the start of the relevant meeting. The aim is to allow the Selection Panel to review the full paper rather than just the abstract, and provide guidance on areas for improvement, as well as the suitability of the application to receive funding using the IOTC MPF. The earlier submission dates would also assist with Visa application procedures for candidates.

7.7.3 Capacity building activities

99. The SC **AGREED** that, while external funding is helping the work of the Commission, funds allocated by the Commission to capacity building are still too low, considering the range of issues identified by the SC and its Working Parties, and **RECOMMENDED** that the Commission consider allocating more funds to these activities in the future.

100. The SC **RECOMMENDED** that 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.

7.7.4 IOTC species identification guides: Tuna and tuna-like species

101. **NOTING** the excellent work undertaken by the IOTC Secretariat and other experts to develop and finalise the cards for the *Identification of tuna and tuna-like species in the Indian Ocean fisheries*, the SC **REQUESTED** that the cards be translated, in priority order to the following languages, according to the proportion of total catches of neritic tuna species reported by country, and that the IOTC Secretariat utilise funds from both the IOTC budget, as well as external funding sources to translate and print in hard copy, the identification cards. Funds were approved by the Commission in the 2014 budget for this purpose, however the IOTC Secretariat indicated the funds are yet to be received from Members. Number in brackets represents the recent proportion of the total neritic tuna catch in the IOTC area of competence:
    1) Bahasa-Indonesian (Indonesia 29%) and Malaysian (Malaysia 4%)
    2) Persian (Farsi-I.R. Iran 20%) and Arabic (Oman 3%)
    3) Hindi (India 18%) and Sinhala (Sri Lanka 5%)
    4) Urdu (Pakistan 7%)

7.7.5 IOTC species identification guides: Marine mammal and Best practice guidelines for the safe release and handling of encircled cetaceans

102. The SC **RECOMMENDED** that the Commission allocate funds in its 2016/2017 budget, to produce and print the IOTC best practice guidelines for the safe release and handling of encircled cetaceans. The guidelines could be incorporated into a set of IOTC cetacean identification cards: "*Cetacean identification for Indian Ocean fisheries*".

7.7.6 IOTC species Identification guides – general

103. **NOTING** that the Commission has approved US$30,000 for the printing of the species identification cards in 2016, as confirmed by the IOTC Secretariat at the 19th Session of the Commission, the SC **REQUESTED** that the species identification cards already translated into languages other than English and French, be printed in the first quarter of 2016 for dissemination.

104. The SC **REQUESTED** that the IOTC Secretariat should ensure that hard copies of the identification cards continue to be printed as many CPCs scientific observers, both on board and port, still do not have smart phone technology/hardware access and need to have hard copies. At this point in time, electronic formats, including 'applications or apps' are only suitable for larger scale vessels, and even in the case of EU purse seine vessels, the use of hard copies is relied upon due to on board fish processing and handling conditions, as well as weather conditions. Electronic versions may be developed as a complementary tools.

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

7.7.7 IOTC Secretariat staffing

106. **NOTING** the very heavy and constantly increasing workload on the IOTC Secretariat, and the current staffing capacity to respond to requests for assistance by countries, the SC strongly **RECOMMENDED** that at least three (3) additional staff (Science/Data) be hired to join the IOTC Secretariat to work on tasks including but not limited to 1) science and capacity building to improve understanding of IOTC processes; and 2) data quality/exchange improvement, to commence work by 1 January 2017. Funding for these new postions should come from both the IOTC regular budget and from external sources to reduce the direct financial burden on the IOTC membership.

7.7.8 Chairpersons and Vice-Chairpersons of the SC and its subsidiary bodies

107. The SC **RECOMMENDED** that the Commission note and endorse the Chairpersons and Vice-Chairpersons for the SC and its subsidiary bodies for the coming years, as provided in Appendix VII.

8. EXAMINATION OF THE EFFECT OF PIRACY ON FLEET OPERATIONS AND SUBSEQUENT CATCH AND EFFORT TRENDS

108. The SC **NOTED** that the Commission, at its:
- 15th Session '*recognized that piracy activities in the western Indian Ocean, have had substantial negative consequences on the activities of some fleets, as well as the level of observer coverage in these areas. The Commission requests that the Scientific Committee assess the effect of piracy on fleet operations and subsequent catch and effort trends*' (para. 40 of the S15 report).
- 16th Session, further '*recognised the severe impact of piracy acts on humanitarian, commercial and fishing vessels off the coast of Somalia and noted that the range of the attacks extended towards almost all of the western Indian Ocean, notably toward Kenya and Seychelles, with attacks being reported in their respective EEZ.*' (para. 124 of the S16 report).

109. The SC **NOTED** that although no specific analysis of the impacts of piracy on any fisheries in the Indian Ocean were presented at IOTC Working Party meetings in 2015, many papers presented demonstrated clear impacts of piracy on fishing operations in the western Indian Ocean (Somali basin) and other areas as a result of the reduction or relocation of fishing effort (Figs. 1a and 1b).

110. The SC **NOTED** that the number of active longline vessels (and associated fishing effort) in the IOTC area of competence declined substantially from 2008 until 2011 (Fig. 2a, b), as did the number of active purse seine

vessels, albeit to a lesser extent (Fig. 2c). The decline was likely due to the impact of piracy activities in the western Indian Ocean. Fishing effort by purse seine fleets shifted east by at least 100 miles during 2008–11, compared to the historic distribution of effort (Fig. 1b), although some vessels remained in the area impacted by piracy due to the presence of onboard military personnel.

111. The SC **NOTED** that the reported increase in the catches of albacore in recent years by the longline fleets was most likely related to the increasing piracy activity in the western Indian Ocean which resulted in the displacement of longline vessels towards traditional albacore fishing grounds in the southern Indian Ocean.

112. The SC **NOTED** that, since 2011, some longline vessels have returned to their traditional fishing areas in the northwest Indian Ocean, due to increased security on board vessels – with the exception of the Japanese and Korean longline fleets, which has shown no signs of vessels returning to the levels last seen before the start of piracy (Table 4). Similarly, since 2011, there has been an overall increase in the number of active purse seine vessels in the Indian Ocean for all purse seine fleets combined (Fig. 2c).

Table 4. Number of active longline and purse seine vessels, for selected fleets in the Indian Ocean (2011–14).

Longline fleets	**2011**	**2012**	**2013**	**2014**
Japan	72	75	57	53
Rep. of Korea	7	7	9	10
China	15	36	36	47
Taiwan,China	132	138	148	122
Philippines	2	14	19	4
Purse seine fleets	**2011**	**2012**	**2013**	**2014**
European Union and assimilated fleets*	34	37	33	35
All other purse seine fleets**	23	38	47	52

* EU and assimilated fleets (includes EU,Spain, EU,France, and Seychelles)
** All other purse seine fleets (includes Australia, Indonesia, I.R. Iran, Japan, Rep. of Korea, Mauritius, Malaysia, and Thailand)

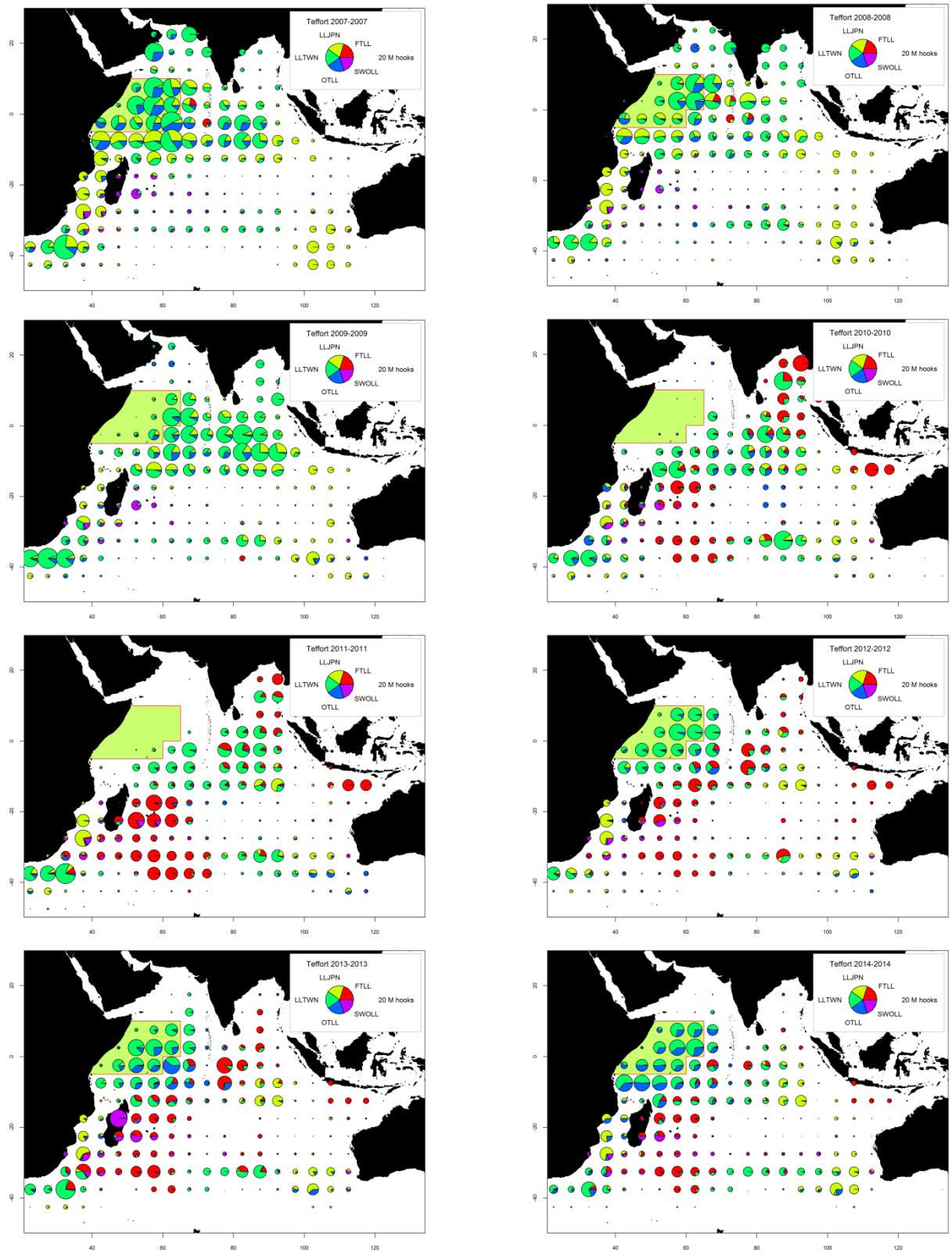


Fig. 1a. Effort exerted by longline fleets in the Indian Ocean, in millions (M) of hooks set, by main fleet and 5° grid (2007-2014): **LLJP** (light green): deep-freezing longliners from Japan; **LLTW** (dark green): deep-freezing longliners from Taiwan,China; **SWLL** (turquoise): swordfish longliners (Australia, EU, Mauritius, Seychelles and other fleets). **FTLL** (red) : fresh-tuna longliners (China, Taiwan,China and other fleets); **OTLL** (blue): Longliners from other fleets (includes Belize, China, Philippines, Seychelles, South Africa, Rep. of Korea and various other fleets). The area shaded in green is where piracy activities are considered highest. Data as of November 2015.

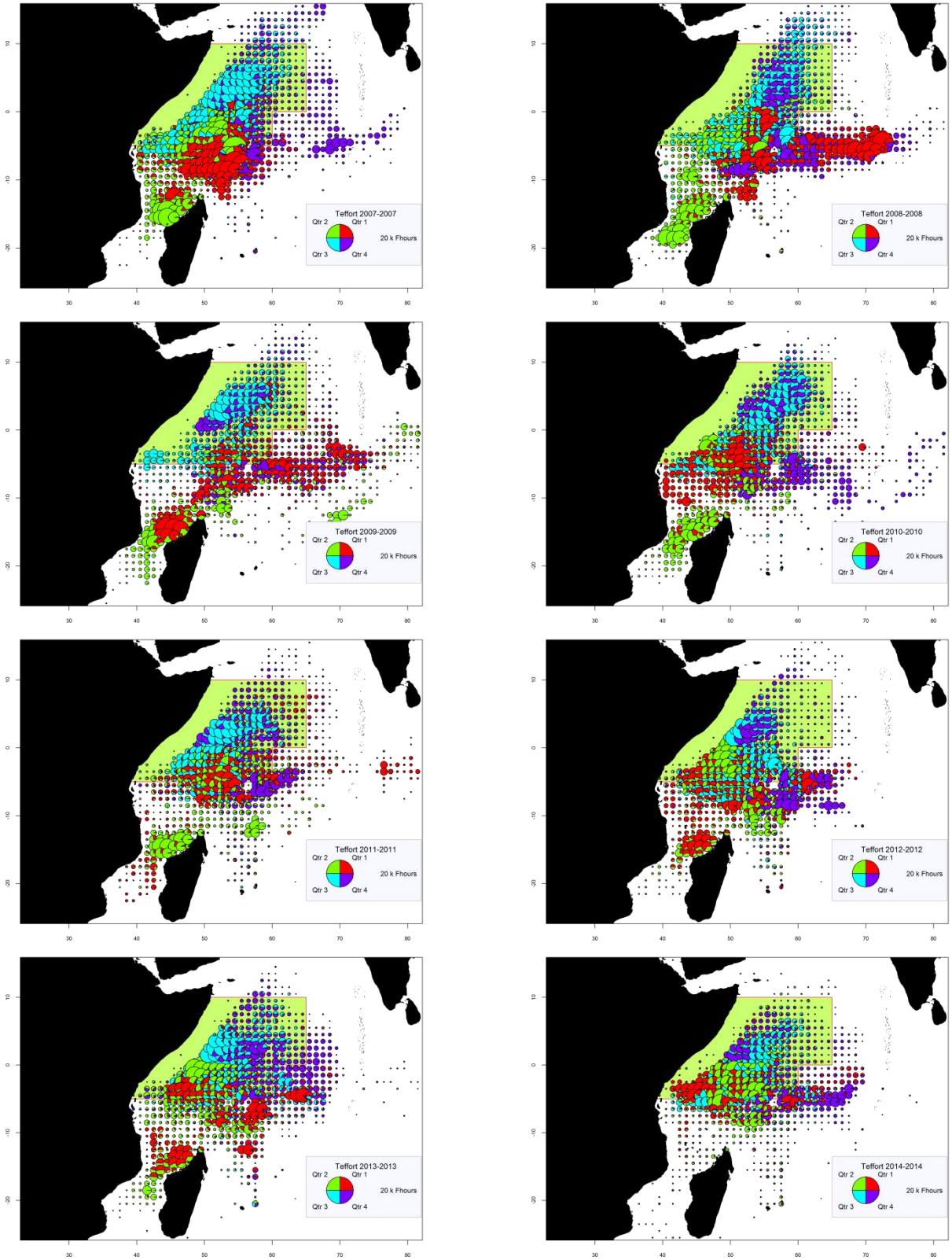
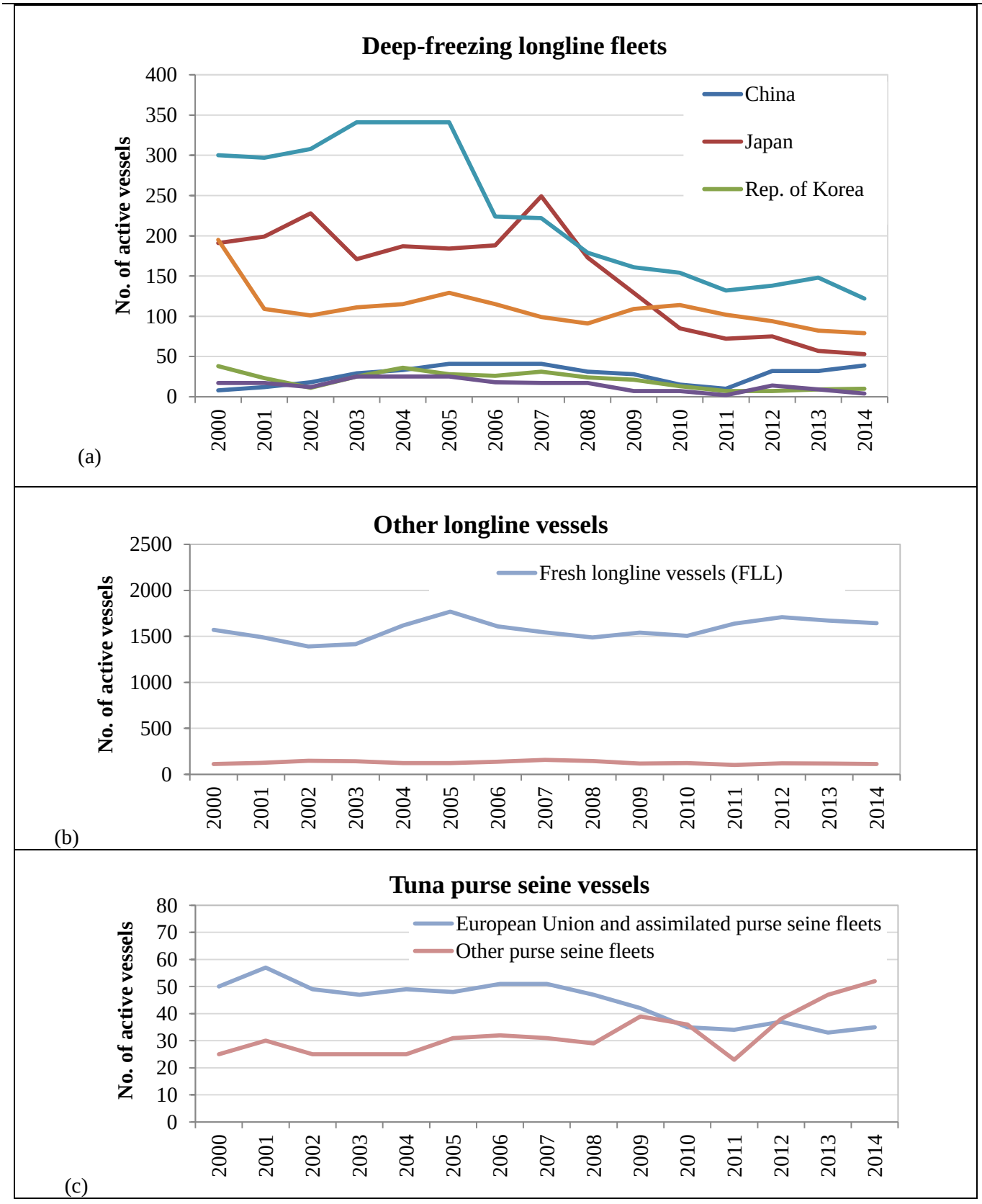


Fig. 1b. Effort exerted by purse seine fleets in the Indian Ocean, in thousands (k) of fishing hours (Fhours), by main fleet and 1° grid and quarter (for 2007-14). The area shaded in green is where piracy activities are considered highest. Data as of November 2015.

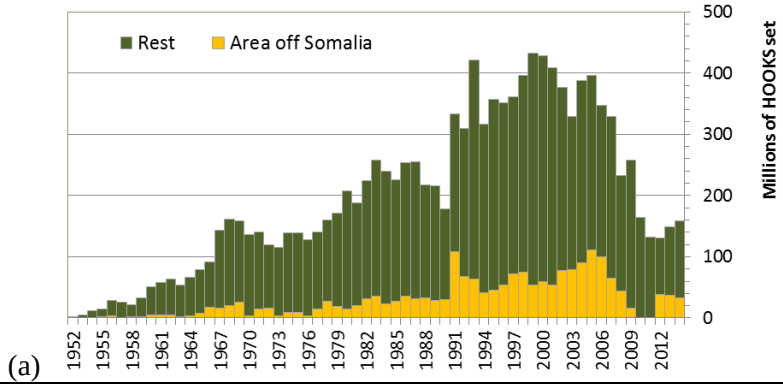


Figs. 2(a-c). Number of active vessels in the Indian Ocean 2000-14, relative to 2006 (i.e. 2006=1.00) for: a) deep-freezing longline vessels b) other longline vessels (FLL & ELL), and c) tuna purse seine (PS) fleets.

113. The SC **RECALLED** that in the first half of 2011, 11 longline vessels from Taiwan,China, moved to the Atlantic Ocean and 2 to the Pacific Ocean; while in the second half of 2011, 5 longline vessels returned from the Atlantic

Ocean, and 1 longline vessel returned from the Pacific Ocean. The departure of the vessels from the Indian Ocean is reflected in the total effort deployed throughout not only the area of the western Indian Ocean impacted by piracy, but also the entire Indian Ocean (Fig. 3a for longline and Fig. 3b for purse seine). In 2012, the trend was reversed, with a total of 15 longline vessels being transferred from the Atlantic Ocean back to the Indian Ocean, resulting in an overall increase in longline effort, particularly in the western Indian Ocean (Fig. 3a). Similarly, 6 longline vessels from Taiwan,China have been transferred from the Pacific Ocean back to the Indian Ocean in 2012. The Taiwanese fleet continues to account for the majority of longline effort in the Indian Ocean, and while total levels of effort for this fleet in the Indian Ocean have remained relatively low since 2011, fishing effort in waters off Somalia have increased markedly in the most recent years (Figs. 1a and 3a).

114. The SC **AGREED** that despite the evidence that longline and purse seine vessels from some fleets have begun to move back to the western Indian Ocean since 2011, fishing effort has still not returned to levels before the onset of piracy – particularly for the Japanese longline fleet – and fishing effort in the north-western Indian Ocean should continue be closely monitored and reported at the SC and the Working Party meetings in 2016.



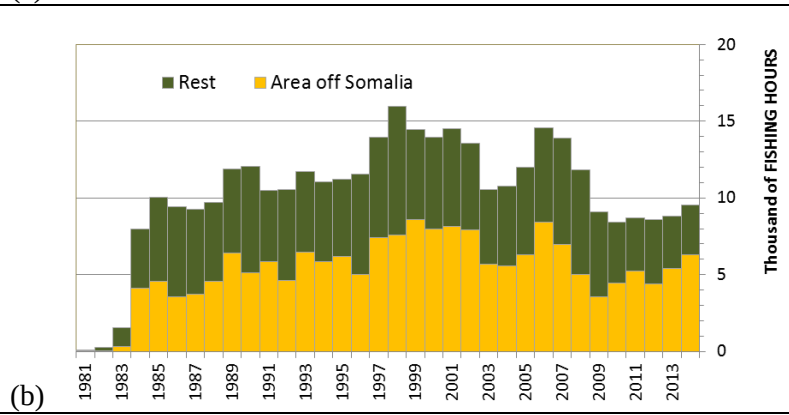


Fig. 3(a-b). Changes in total effort for a) longline vessels (number of hooks set in millions), and b) purse seine vessels (number of hours fished, in thousands) by year and geographical area: off the Somalia coastline (area shaded in green shown in Figs. 1a and 1b) and for the rest of the Indian Ocean, based on catch and effort reported to the IOTC Secretariat. Data as of November 2015.

9. STATUS OF TUNA AND TUNA-LIKE RESOURCES IN THE INDIAN OCEAN, AND ASSOCIATED SPECIES

9.1 IOTC Executive Summaries: target audience, content and resourcing

115. The SC **NOTED** paper IOTC–2015–SC18–12 which requested that the Scientific Committee consider and document the target audience, content and resourcing required to develop the current and/or alternative species executive summaries.

116. The SC **NOTED** that each year, the IOTC Secretariat, based on the management advice of the species working parties, develops Draft Executive Summaries for the IOTC Working Parties and Scientific Committee's consideration. The content is split into two components 1) the resource stock status summary, and 2) supporting information sourced from the relevant working party report, and provided as an appendix. These are collectively

called 'Executive Summaries'. The species Executive Summaries are becoming larger with 256 pages being produced for the 2015 summaries. However, the original intent was for the material to be in an 'Executive Summary' style/format, whereas in 2015 the average length is now 10.7 pages, and the tropical tuna executive summaries a maximum of 20 pages in length.

117. The SC **AGREED** that the primary audience is currently considered to be the Commission, and that as such, only the first few pages of the current Executive Summaries (containing the stock status, outlook and management advice) should be included in the annual Scientific Committee report for the Commission's consideration. However, it was considered that the supporting information, currently provided as an Appendix to the Executive Summary while useful for secondary audiences such as scientisits and science advisors, should be made available via the IOTC website instead of the annual Scientific Committee Report.

118. The SC **AGREED** that the Working Parties are responsible for reviewing the scientific materials available for each IOTC species or group, and for updating this information, if needed, in the supporting information sections for the Scientific Committee's consideration, prior to it being published.

119. The SC **AGREED** that the individual working parties should continue to propose the types of information (tables, graphs) that should be included in the supporting information.

9.2 2015 IOTC Executive Summaries

120. **NOTING** that Table 1 in this report provides an overview of the stock status and management advice for each species under the IOTC mandate as well as species directly impacted by fisheries for tuna and tuna-like species, the SC **AGREED** to an Executive Summary for each species or species group as detailed below.

9.3 Tuna – Highly migratory species

121. The SC **RECOMMENDED** that the Commission note the management advice developed for each tropical and temperate tuna species as provided in the Executive Summary for each species, and the combined Kobe plot for the three species assigned a stock status in 2015 (Fig. 4):
    - Albacore (*Thunnus alalunga*) – Appendix VIII
    - Bigeye tuna (*Thunnus obesus*) – Appendix IX
    - Skipjack tuna (*Katsuwonus pelamis*) – Appendix X
    - Yellowfin tuna (*Thunnus albacares*) – Appendix XI

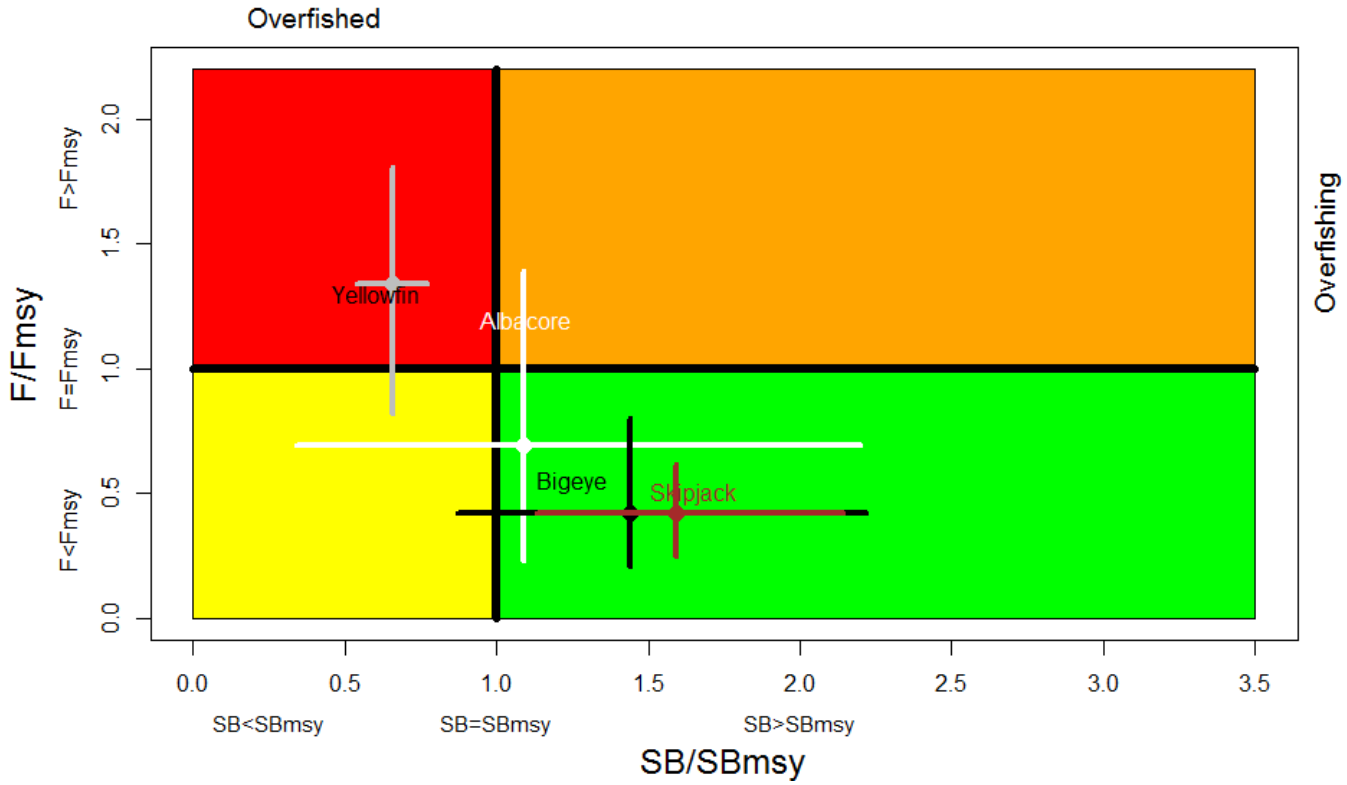


Fig. 4. Combined Kobe plot for bigeye tuna (black: 2013), skipjack tuna (brown: 2014), yellowfin tuna (grey: 2015) and albacore (white: 2014) showing the estimates of current stock size (SB) and current fishing mortality (F) in relation

to the interim target spawning stock size and interim target fishing mortality. Cross bars illustrate the range of uncertainty from the model runs. Note that for skipjack tuna, the estimates are highly uncertain as F_{MSY} is poorly estimated, and as suggested for stock status advice it is better to use B_0 as a biomass reference point and C(t) relative to C_{MSY} as a fishing mortality reference point.

122. The SC **NOTED** paper IOTC–2015–SC18–ES05 which provided an overview of the biology, stock status and management of southern bluefin tuna (*Thunnus maccoyii*), and thanked CCSBT for providing it.

9.4 Billfish

123. The SC **RECOMMENDED** that the Commission note the management advice developed for each billfish species under the IOTC mandate, as provided in the Executive Summary for each species, and the combined Kobe plot for the three species assigned a stock status in 2015 (Fig. 5):
    - Swordfish (*Xiphias gladius*) – Appendix XII
    - Black marlin (*Makaira indica*) – Appendix XIII
    - Blue marlin (*Makaira nigricans*) – Appendix XIV
    - Striped marlin (*Tetrapturus audax*) – Appendix XV
    - Indo-Pacific sailfish (*Istiophorus platypterus*) – Appendix XVI

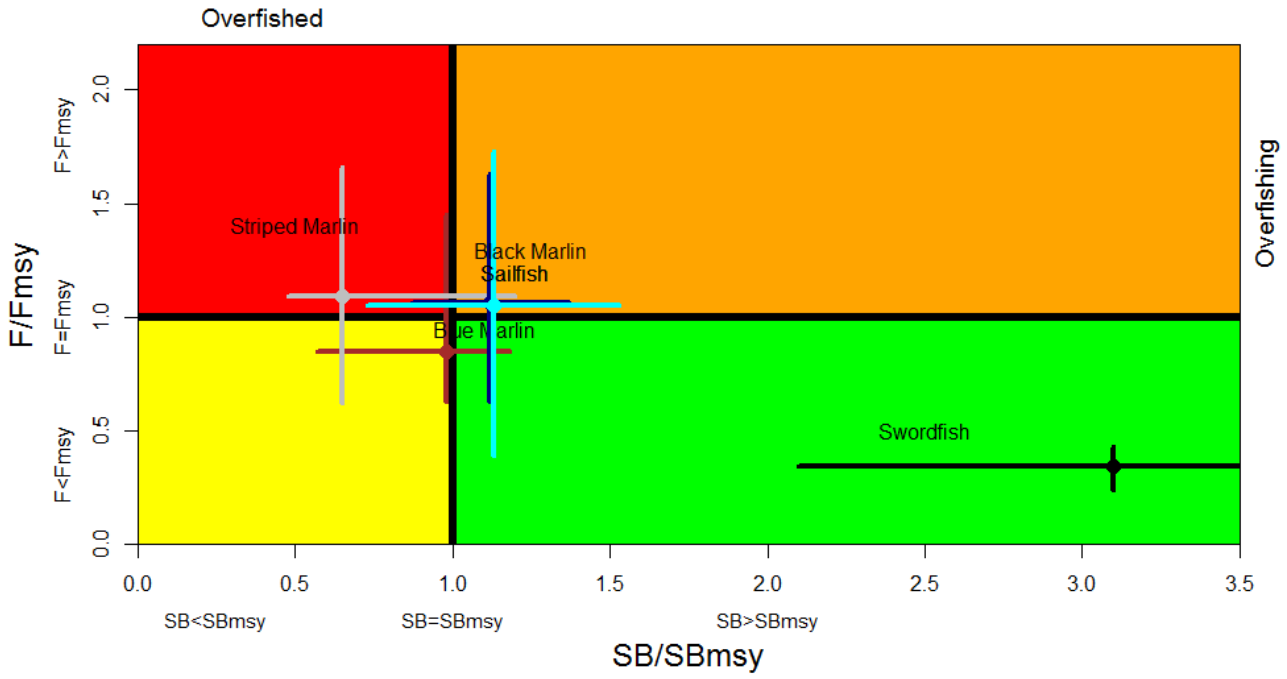


Fig. 5. Combined Kobe plot for swordfish (black: 2014), black marlin (light blue: 2014), blue marlin (brown: 2013), striped marlin (grey: 2015) and Indo-Pacific sailfish (black: 2015) showing the estimates of current stock size (SB or B, species assessment dependent) and current fishing mortality (F) in relation to the interim target spawning stock size and interim target fishing mortality. Cross bars illustrate the range of uncertainty from the model runs.

9.5 Tuna and seerfish – Neritic species

124. The SC **RECOMMENDED** that the Commission note the management advice developed for each neritic tuna (and mackerel) species under the IOTC mandate, as provided in the Executive Summary for each species, and the combined Kobe plot for the three species assigned a stock status in 2015 (Fig. 6):
    - Bullet tuna (*Auxis rochei*) – Appendix XVII
    - Frigate tuna (*Auxis thazard*) – Appendix XVIII
    - Kawakawa (*Euthynnus affinis*) – Appendix XIX
    - Longtail tuna (*Thunnus tonggol*) – Appendix XX
    - Indo-Pacific king mackerel (*Scomberomorus guttatus*) – Appendix XXI
    - Narrow-barred Spanish mackerel (*Scomberomorus commerson*) – Appendix XXII

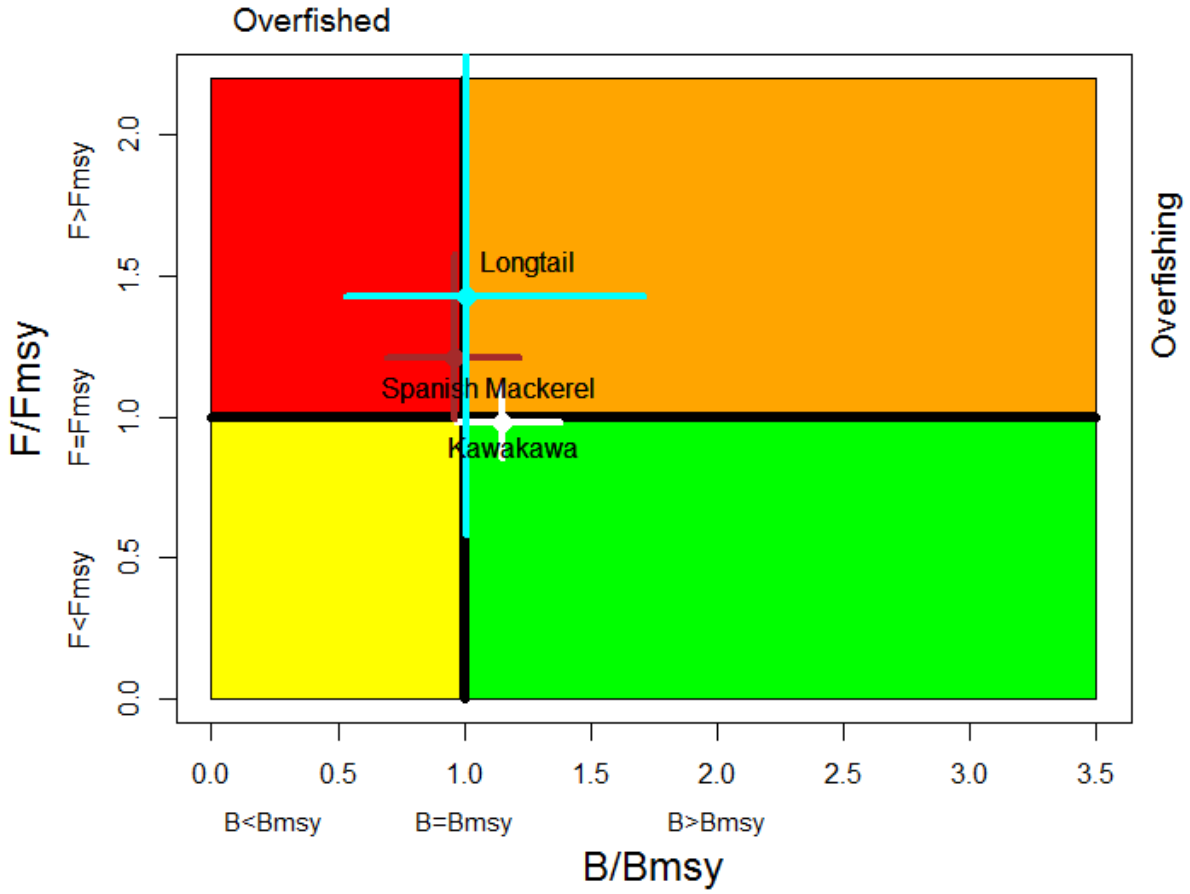


Fig. 6. Combined Kobe plot for kawakawa (white: 2015), longtail tuna (blue: 2015) and narrow-barred Spanish mackerel (brown: 2015), showing the estimates of current stock size (B) and current fishing mortality (F) in relation to interim target spawning stock size and interim target fishing mortality. Cross bars illustrate the range of uncertainty from the model runs. Status of Marine Turtles, Seabirds and Sharks in the Indian Ocean

9.6 Sharks

125. The SC **RECOMMENDED** that the Commission note the management advice developed for a subset of shark species commonly caught in IOTC fisheries for tuna and tuna-like species:
    - Blue shark (*Prionace glauca*) – Appendix XXIII
    - Oceanic whitetip shark (*Carcharhinus longimanus*) – Appendix XXIV
    - Scalloped hammerhead shark (*Sphyrna lewini*) – Appendix XXV
    - Shortfin mako shark (*Isurus oxyrinchus*) – Appendix XXVI
    - Silky shark (*Carcharhinus falciformis*) – Appendix XXVII
    - Bigeye thresher shark (*Alopias superciliosus*) – Appendix XXVIII
    - Pelagic thresher shark (*Alopias pelagicus*) – Appendix XXIX

9.7 Marine turtles

126. The SC **RECOMMENDED** that the Commission note the management advice developed for marine turtles, as provided in the Executive Summary encompassing all six species found in the Indian Ocean:
    - Marine turtles – Appendix XXX

9.8 Seabirds

127. The SC **RECOMMENDED** that the Commission note the management advice developed for seabirds, as provided in the Executive Summary encompassing all species commonly interacting with IOTC fisheries for tuna and tuna-like species:
    - Seabirds – Appendix XXXI

10. IMPLEMENTATION OF THE REGIONAL OBSERVER SCHEME

128. The SC **NOTED** paper IOTC–2015–SC18–08 Rev_1 which provided an update on the status of implementation and reporting to the IOTC Secretariat of the Regional Observer Scheme (ROS) set out by Resolution 09/04 *on a Regional Observer Scheme,* superseded by Resolution 11/04 *on a Regional Observer Scheme* at the 15th Session of the Commission (S15) in 2011 (provided in Appendix XXXII).

129. The SC **NOTED** that as of 24th November 2015, fourteen CPCs (Australia, China, Comoros, European Union (France, Spain and Portugal), Indonesia, Japan, Kenya, Rep. of Korea, Madagascar, Maldives, Mauritius, Mozambique, Seychelles and South Africa) have submitted a list of observers and have been allocated an IOTC observer registration number.

130. The SC **NOTED** that as of 27th November 2015, 284 observer trip reports have been submitted to the IOTC Secretariat by Australia, China, European Union (France, Portugal, Spain), Japan, Rep. of Korea, Madagascar, Mozambique, Sri Lanka and South Africa. The levels of coverage estimated for all combined fleets and CPCs are still very low and, especially for longline fleets, are well below the minimum levels recommended by the Commission.

131. The SC **NOTED** that due to security issues during the years of piracy in the late-2000s, observers were prohibited onboard EU,Spain flagged vessels until 2013.

132. The SC **ACKNOWLEDGED** the progress Indonesia has made in collecting scientific observer data since the mid-2000s and also the development of a national observer program, and **ENCOURAGED** Indonesia to report the data to the IOTC Secretariat, **NOTING** an IOTC-OFCF Project mission to Indonesia in November 2015 to assist Indonesia in the reporting of scientific observer data, catch and effort and size data.

133. The SC **NOTED** the gratitude expressed by Indonesia to the support provided by the IOTC-OFCF Project and their desire for this support to continue.

134. **NOTING** that many CPCs report Regional Observer data in .pdf format, or as data embedded within documents, and also in hard-copy format, the SC **ENCOURAGED** CPCs to report Regional Observer data in any non-proprietary electronic format (e.g. csv, xml, txt, etc.) or in an electronic format that can be easily exported and processed into standard spreadsheet, database or statistical software (e.g. xls, dbase, mdb, etc.). This may be in any electronically readable format as long as all of the agreed minimum data reporting requirements have been fulfilled.

135. The SC **REQUESTED** that all IOTC CPCs urgently submit, and keep up-to-date, their list of accredited observers to the IOTC Secretariat and implement the requirements of Resolution 11/04 *on a Regional Observer Scheme*, which states that:

> "*The observer shall, within 30 days of completion of each trip, provide a report to the CPCs of the vessel. The CPCs shall send within 150 days at the latest each report, as far as continuous flow of report from observer placed on the longline fleet is ensured, which is recommended to be provided with 1°x1° format to the Executive Secretary, who shall make the report available to the Scientific Committee upon request. In a case where the vessel is fishing in the EEZ of a coastal state, the report shall equally be submitted to that Coastal State."* (para. 11)

136. The SC **NOTED** that the timely submission of observer trip reports to the IOTC Secretariat is necessary to ensure that the SC is able to carry out the tasks assigned to it by the Commission, including the analysis of accurate and high resolution data, in particular for bycatch, which will allow IOTC scientists to better assess the impacts of fisheries for tuna and tuna-like species on bycatch species.

137. The SC **EXPRESSED** its strong concern regarding the low level of reporting to the IOTC Secretariat of both the observer trip reports and the list of accredited observers since the start of the ROS in July 2010. Such a low level of implementation and reporting is detrimental to the work of the SC, in particular regarding the estimation of incidental catches of non-targeted species, as requested by the Commission.

Observer data

138. **NOTING** that training of observers and crew is long-term and necessarily meticulous work that should be done in a recurrent way in order to optimise the efficiency of observers, the SC **RECOMMENDED** that the IOTC Secretariat increases its effort in training observers, including species identification. This would only be possible

if the Commission were to increase staffing at the IOTC Secretariat and allocate specific funding for the Regional Observer Scheme implementation.

139. The SC **NOTED** that Thailand is currently receiving support from the IOTC Secretariat in the initiation of their national observer scheme and that observers are due to be deployed in 2016 following the training.

140. The SC **NOTED** that Resolution 11/04 specifies 5% observer coverage by sets/operations, whereas effort data are reported to the IOTC Secretariat in hooks for longline fleets and fishing days or hours for purse seine fleets and that this is the only possible means the IOTC Secretariat has of verifying the level of coverage.

141. The SC **REQUESTED** that all CPCs also report their level of observer coverage by operation/set to the IOTC Secretariat in 2016 so that the estimated level of coverage by hooks, fishing days and operations/sets can be included in the next update on the implementation of the Regional Observer Scheme.

142. **NOTING** the upcoming projects planned to support the ROS (including the development of an electronic reporting system, and a proposal for an electronic monitoring system), the SC **AGREED** that funding from the IOTC regular budget should be allocated to support these activities over the next few years. The IOTC Secretariat has been tasked by the Commission to develop a proposal and budget for its consideration.

143. The SC **AGREED** that capacity building activities continue to be supported via the Commission's annual budget, to improve the lack of compliance with the implementation of observer schemes by CPCs for their fleets and lack of reporting to the IOTC Secretariat as per the provisions contained within Resolution 11/04 *on a Regional Observer Scheme*.

Resolution 11/04 On a regional observer scheme

144. The SC **RECALLED** the objectives of Resolution 11/04 on a regional observer scheme as follows:

> *"Para 1: The objective of the IOTC Observer Scheme shall be to collect verified catch data and other scientific data related to the fisheries for tuna and tuna-like species in the IOTC area of competence"*

145. **NOTING** that the objective of the Regional Observer Scheme contained in Resolution 11/04, and the rules contained in Resolution 12/02 *On data confidentiality policy and procedures* makes no reference to the data collected not being used for compliance purposes, the SC **RECOMMENDED** that at the next revision of Resolution 11/04, it be clearly stated that the data collected within the Regional Observer Scheme shall not be used for compliance purposes.

11. DEVELOPMENT OF OPTIONS FOR ALTERNATIVE MANAGEMENT MEASURES (INCLUDING CLOSURES) IN THE IOTC AREA OF COMPETENCE

146. The SC **NOTED** that a potential management measure involving a quota allocation has not yet been adopted by the Commission and as a result, the Commission has requested the Scientific Committee discuss alternative options for potential management measures. The presentation by the Scientific Committee Chairperson reviewed existing management measures and discussed alternatives by highlighting input (effort) and output (catch) controls.

147. The SC **NOTED** that reference to time area closures have been removed from Resolution 14/02 (previously 10/01, 12/13).

148. **NOTING** that some of the key IOTC species are being over-exploited or are now fully exploited, the SC **NOTED** that the Commission may consider options for time-area-closures as one alternative, among others presented such as fishery input and output controls. Referring to an earlier study conducted in 2012 on the effectiveness of time area closures included in previous versions of Resolution 14/02, it indicated that this closure was not effective. Further studies may be required that may complement work of the ongoing IOTC Program of Work and Management Procedures Dialogue to formulate Management Procedures for key IOTC species in relation to time/area closures.

149. The SC **NOTED** that given the data available, the current models developed by the WPM would not able to explicitely explore the effectiveness of time-area closures as management measures. Such analysis would require significant development, dependent on the availability of detailed spatio-temporal catch data for all fleets. Thus, the SC **REQUESTED** all CPCs to comply with Resolution 15/01 and 15/02 and provide such detailed spatio-temporal data.

12. PROGRESS ON THE IMPLEMENTATION OF THE RECOMMENDATIONS OF THE PERFORMANCE REVIEW PANEL

150. The SC **NOTED** paper IOTC–2015–SC18–08 which provided an update on progress regarding Resolution 09/01 *on the performance review follow–up*. The second Performance Review commenced in 2015 and the final Session will be held in mid-December 2015 to finalise a series of Recommendations for the Commission's consideration.

151. The SC **RECOMMENDED** that the Commission note the updates on progress regarding Resolution 09/01 *on the performance review follow–up*, as provided at Appendix XXXIII.

13. PROGRAM OF WORK AND SCHEDULE OF WORKING PARTY AND SCIENTIFIC COMMITTEE MEETINGS

13.1 Program of Work (2016–2020) and assessment schedule

13.1.1 Program of Work

152. The SC **NOTED** paper IOTC–2015–SC18–09 which provided the Scientific Committee (SC) with a proposed Program of Work for each of its Working Parties (WP), including preliminary prioritisation of the elements requested by each WP. The aim of is to develop an overall Program of Work Plan for 2015–19 which will deliver the information the Commission has requested to meet the objectives of the IOTC.

153. The SC **NOTED** the proposed Program of Work and priorities for the Scientific Committee and each of the Working Parties and **AGREED** to a consolidated Program of Work as outlined in Appendix XXXIV. The Chairpersons and Vice-Chairpersons of each working party shall ensure that the efforts of their working party are focused on the core areas contained within the appendix, taking into account any new research priorities identified by the Commission at its next Session.

154. The SC **REQUESTED** that during all future 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.

13.1.2 Assessment schedule

155. The SC **ADOPTED** a revised assessment schedule, ecological risk assessment and other core projects for 2016–20, for the tuna and tuna-like species under the IOTC mandate, as well as the current list of key shark species of interest, as outlined in Appendix XXXV.

13.1.3 Invited Experts

156. The SC **REQUESTED** that at least one 'Invited Expert' be brought to each of the science Working Parties in 2016 and in each subsequent year, so as to further increase the capacity of the Working Paties to undertake the work detailed in the Program of Work.

13.1.4 Consultants

157. **NOTING** the highly beneficial and relevant work done by IOTC stock assessment consultants in 2015 and in previous years, the SC **RECOMMENDED** that the engagement of consultants be continued for each coming year based on the Program of Work. Consultants will be hired to supplement the skill set available within the IOTC Secretariat and CPCs. The draft budget provided in Table 5, shall be incorporated into the overall IOTC Science budget for the consideration of the Commission.

TABLE 5. Estimated budget required to hire a consultant to carry out stock assessments on tuna and tuna-like species under the IOTC mandate, sharks frequently caught by IOTC fisheries, and capacity building, in 2017 and 2018, noting that the 2016 budget has already been approved by the Commission.

Description	Unit price	Units required	2017 Total (US$)	2018 Total (US$)
Workshops on data poor techniques for stock assessment: Develop materials for training workshops and delivery (facilitated by the IOTC stock assessment scientist) (fees)	450	15	6,750	6,750
Workshops on data poor techniques for stock assessment: Develop materials for training workshops and delivery (facilitated by the IOTC stock assessment scientist)(travel)	5,000	1	5,000	5,000
WPNT				
CPUE workshops: CPUE standardisation from the neritic tuna fleets (Indonesia, I.R. Iran and India (3 total) (fees)	450	50	22,500	22,500
CPUE workshops: CPUE standardisation from the neritic tuna fleets (Indonesia, I.R. Iran and India (3 total) (travel)	5,000	3	15,000	15,000
Neritic tuna data poor stock assessment and capacity building (fees)	450	25	11,250	11,250
Neritic tuna data poor stock assessment and capacity building (travel)	5,000	1	5,000	5,000
WPB				
Billfish data poor stock assessment, including the development of CPUE series for coastal gillnet and fisheries other than industrial longline (fees)	450	25	11, 250	11,250
Billfish data poor stock assessment (travel)	5,000	1	5,000	5,000
WPEB				
Shark stock assessment data preparation (fees)	450	20	9,000	–
Shark stock assessment data preparation (travel)	5,000	1	5,000	–
Shark stock assessment (fees)	450	25	–	11,250
Shark stock assessment (travel)	5,000	1	–	5,000
WPTT				
Tropical tuna stock assessment (fees)	500	35	17,500	17,500
Tropical tuna stock assessment (travel)	5,000	1	5,000	5,000
WPTmT				
Temperate tuna stock assessment (fees)	450	35	–	15,750
Temperate tuna stock assessment (travel)	5,000	1	–	5,000
WPM				
External peer review of the yellowfin tuna MSE	450	10	4,500	4,500
External peer review of the bigeye tuna MSE	450	10	4,500	4,500
TOTAL			**116,000**	**150,250**

13.2 Schedule of meetings for 2016 and 2017

158. The SC **NOTED** paper IOTC–2015–SC18–10 which outlined the proposed schedule for IOTC Working Parties and SC meetings for 2016 and 2017.

159. The SC **REQUESTED** that the schedule of Working Party and Scientific Committee meetings for 2016 and 2017 provided at Appendix XXXVI be communicated by the IOTC Secretariat to the Commission for its endorsement.

160. The SC **RECOMMENDED** that the Commission discuss the merits of moving the annual Scientific Committee meeting to February each year. This would allow the species working parties to be moved later in the year, thus

ensuring that the most recent data is available for assessment purposes. If the Commission were to approve a February date, it may wish to fix its own meeting date in June each year, thus allowing sufficient consultation time between the Scientific Committee and the Commission meeting.

13.3 Consideration of Resolution 15/09 On a fish aggregating devices (FADs) working group

161. The SC **RECALLED** that the Commission adopted Resolution 15/09 on a fish aggregating devices (FADs) working group and in particular that:

> Para 1. *An ad hoc working group on FADs (Annex I), drifting and anchored, is created to assess the consequences of the increasing number and technological developments of FADs in tuna fisheries and their ecosystems, in order to inform and advise on future FAD-related management options. This ad hoc working group would be of multi-sectorial nature, involving various stakeholders such as scientists, fishery managers, fishing industry representatives, administrators and fishers. The working group shall deliver its findings in time for the 2017 IOTC Scientific Committee to examine them.*
>
> Para. 2. *The IOTC Secretariat should liaise with the ICCAT Secretariat to determine if their FAD working group could work in conjunction with the IOTC working group.*

162. **NOTING** that the ICCAT and WCPFC have already approved at their 2014 sessions the establishment of such working groups, the SC **AGREED** that at least the ICCAT and IOTC working groups on FADs work jointly whenever possible. IOTC and ICCAT secretariats should liaise to check the possibility of this joint group, defining the most appropriate date and venue for a meeting in 2015. Presently, ICCAT has scheduled the second meeting of its FAD working group (March 2016).

163. The SC **NOTED** that the timing of the 2nd ICCAT FAD working group meeting may not be suitable to combine with an IOTC meeting. Thus, it was suggested that the IOTC Secertariat liaise with ICCAT to determine if experts may attend the IOTC meeting to provide advice.

164. The SC **AGREED** that the Commission should allocate sufficient resources to ensure IOTC developing coastal states with an interest in the working group may attend the IOTC FAD working group meeting.

14. OTHER BUSINESS

14.1 Review of publication deadlines for IOTC data summaries and other datasets for use by Working Parties

165. The SC **RECOMMENDED** that the reporting deadline for stock assessment inputs (index of abundance, catch reconstructions, size data, etc.) be 45 days prior to the meeting in which the species is to be assessed.

166. The SC **NOTED** that some participants expressed concern about meeting the earlier deadline, though it was explained that the provision of the datasets 15 days earlier was aimed at ensuring the necessary inputs to stock assessments are provided with sufficient time to allow stock assessment scientists sufficient time to undertake a rigorous analysis.

14.2 Development of harmonised 'Terms and Definitions' for the IOTC's compendium of Conservation and Management Measures (CMMs): Science

167. The SC **NOTED** paper IOTC–2015–SC18–11 which requested the Scientific Committee (SC) to consider the draft List of scientific terms (and their definitions) used or to be used in IOTC active Conservation and Management Measures and to provide alternatives if necessary.

168. The SC **AGREED** that CPCs would provide suggested modifications to the IOTC Secertariat intersessionally, and that if there were any major revisions suggested, that these would be circulated to Scientific Committee for agreement.

14.3 Election of a Chairperson and a Vice-Chairperson for the next biennium

Chairperson

169. The SC **NOTED** that the second term of the current Chairperson, Dr Tom Nishida (Japan) is due to expire at the closing of the current SC meeting and as per the IOTC Rules of Procedure (2014), participants are required to elect a new Chairperson for the next biennium.

170. The SC **THANKED** Dr Tom Nishida (Japan) for his Chairmanship over the past four years and looked forward to his continued engagement in the activities of the SC in the future.

171. **NOTING** the Rules of Procedure (2014), the SC **CALLED** for nominations for the newly vacated position of Chairperson of the IOTC SC for the next biennium. Dr Hilario Murua (EU,Spain) was nominated, seconded and elected as Chairperson of the SC for the next biennium.

Vice-Chairperson

172. The SC **NOTED** that during the inter-sessional period, Mr Jan Robinson (Seychelles) is due to expire at the closing of the current SC meeting and as per the IOTC Rules of Procedure (2014), participants are required to electe a new Vice-Chairperson for the next biennium.

173. The SC **THANKED** Mr Jan Robinson (Seychelles) for his role in supporting the Chairperson and the SC, over the past four years and looked forward to his continued engagement in the activities of the SC in the future.

174. **NOTING** the Rules of Procedure (2014), the SC **CALLED** for nominations for the newly vacated position of Vice-Chairperson of the IOTC SC for the next biennium. Dr M, Shiham Adam (Maldives) was nominated, seconded and elected as Vice-Chairperson of the SC for the next biennium.

15. REVIEW OF THE DRAFT, AND ADOPTION OF THE REPORT OF THE 18TH SESSION OF THE SCIENTIFIC COMMITTEE

175. The SC **RECOMMENDED** that the Commission consider the consolidated set of recommendations arising from SC18, provided at Appendix XXXVII.

176. The SC **ADOPTED** the report of the 18th Session of the Scientific Committee (IOTC–2015–SC18–R) on 27 November 2015.

APPENDIX I
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APPENDIX II
AGENDA FOR THE 18TH SESSION OF THE SCIENTIFIC COMMITTEE

Date: 23–27 November 2015
Location: Bali, Indonesia
Venue: HARRIS Hotel & Residences Sunset Road - Bali
Time: 09:00 – 17:00 daily
Chair: Dr Tsutomu Nishida; **Vice-Chair:** Mr Jan Robinson

1. **OPENING OF THE SESSION** (Chairperson)
2. **ADOPTION OF THE AGENDA AND ARRANGEMENTS FOR THE SESSION** (Chairperson)
3. **ADMISSION OF OBSERVERS** (Chairperson)
4. **DECISIONS OF THE COMMISSION RELATED TO THE WORK OF THE SCIENTIFIC COMMITTEE** (IOTC Secretariat)
   - 4.1 Outcomes of the 19th Session of the Commission,
   - 4.2 Previous decisions of the Commission
5. **SCIENCE RELATED ACTIVITES OF THE IOTC SECRETARIAT IN 2015** (IOTC Secretariat)
   - 5.1 Report of the Secretariat – Activities in support of the IOTC science process in 2015
6. **NATIONAL REPORTS FROM CPCs** (CPCs)
7. **REPORTS OF THE 2015 IOTC WORKING PARTY MEETINGS**
   - 7.1 IOTC–2015–WPNT05–R Report of the 5th Session of the Working Party on Neritic Tunas
   - 7.2 IOTC–2015–WPB13–R Report of the 13th Session of the Working Party on Billfish
   - 7.3 IOTC–2015–WPEB11–R Report of the 11th Session of the Working Party on Ecosystems and Bycatch
     - 7.3.1 Status of development and implementation of national plans of action for seabirds and sharks, and implementation of the FAO guidelines to reduce marine turtle mortality in fishing operations
     - 7.3.2 Seabird bycatch mitigation trials: Updates
   - 7.4 IOTC–2015–WPM06–R Report of the 6th Session of the Working Party on Methods
     - 7.4.1 Special session on Management Strategy Evaluation (MSE)
   - 7.5 IOTC–2015–WPDCS11–R Report of the 11th Session of the Working Party on Data Collection and Statistics
   - 7.6 IOTC–2015–WPTT17–R Report of the 17th Session of the Working Party on Tropical Tunas
   - 7.7 Summary discussion of matters common to Working Parties (capacity building activities; connecting science and management, etc.)
     - 7.7.1 Revision of the IOTC *Guidelines for the presentation of CPUE standardisations and stock assessment models*
8. **EXAMINATION OF THE EFFECTS OF PIRACY ON FLEET OPERATIONS AND SUBSEQUENT CATCH AND EFFORT TRENDS** (Chairperson)
9. **STATUS OF TUNA AND TUNA-LIKE RESOURCES IN THE INDIAN OCEAN** (Chairperson)
   - 9.1 Tuna – Highly migratory species
   - 9.2 Tuna and mackerel – Neritic species
   - 9.3 Billfish
10. **STATUS OF SHARKS, MARINE TURTLES AND SEABIRDS IN THE INDIAN OCEAN** (Chairperson)
    - 10.1 Sharks
    - 10.2 Marine turtles
    - 10.3 Seabirds
11. **IMPLEMENTATION OF THE REGIONAL OBSERVER SCHEME** (IOTC Secretariat)
12. **DEVELOPMENT OF OPTIONS FOR ALTERNATIVE MANAGEMENT MEASURES (INCLUDING CLOSURES) IN THE IOTC AREA OF COMPETENCE** (Chairperson)
13. **PROGRESS ON THE IMPLEMENTATION OF THE RECOMMENDATIONS OF THE PERFORMANCE REVIEW PANEL** (IOTC Secretariat)

14. PROGRAM OF WORK AND SCHEDULE OF WORKING PARTY AND SCIENTIFIC COMMITTEE MEETINGS (IOTC Secretariat)

14.1 Program of Work (2016–2020) and assessment schedule

14.2 Schedule of meetings for 2016 and 2017

14.3 Consideration of Resolution 15/09 *On a fish aggregating devices (FADs) working group*

15. OTHER BUSINESS (Chairperson)

15.1 Review of publication deadlines for IOTC data summaries and other datasets for use by Working Parties (IOTC Secretariat)

15.2 Development of harmonised 'Terms and Definitions' for the IOTC's compendium of Conservation and Management Measures (CMMs): Science (IOTC Secretariat)

15.3 Election of a Chairperson and a Vice-Chairperson for the next biennium (IOTC Secretariat)

16. REVIEW OF THE DRAFT, AND ADOPTION OF THE REPORT OF THE 18th SESSION OF THE SCIENTIFIC COMMITTEE (Chairperson)

APPENDIX III
LIST OF DOCUMENTS

Document	Title	Availability
IOTC–2015–SC18–01a	Agenda of the 18th Session of the Scientific Committee	✓ (26 December 2014) ✓ (8, 16 November 2015) ✓ (23 November 2015)
IOTC–2015–SC18–01b	Annotated agenda of the 18th Session of the Scientific Committee	✓ (10, 16 November 2015) ✓ (23 November 2015)
IOTC–2015–SC18–02	List of documents of the 18th Session of the Scientific Committee	✓ (3 November 2015) ✓ (10, 16 November 2015) ✓ (23 November 2015)
IOTC–2015–SC18–03	Outcomes of the 19th Session of the Commission (IOTC Secretariat)	✓ (3 November 2015)
IOTC–2015–SC18–04	Previous decisions of the Commission (IOTC Secretariat)	✓ (3 November 2015)
IOTC–2015–SC18–05 Rev_1	Report of the Secretariat – Activities in support of the IOTC science process in 2015 (IOTC Secretariat)	✓ (9, 19 November 2015)
IOTC–2015–SC18–06	Status of development and implementation of national plans of action for seabirds and sharks, and implementation of the FAO guidelines to reduce marine turtle mortality in fishing operations (IOTC Secretariat)	✓ (3 November 2015)
IOTC–2015–SC18–07 Rev_1	2015: Update on the implementation of the regional observer scheme (IOTC Secretariat)	✓ (8, 9 November 2015)
IOTC–2015–SC18–08	2015: Update on progress regarding Resolution 09/01 – on the performance review follow–up (IOTC Secretariat)	✓ (6 November 2015)
IOTC–2015–SC18–09	Revision of the program of work (2016–2020) for the IOTC science process (IOTC Secretariat)	✓ (6 November 2015)
IOTC–2015–SC18–10	Proposed schedule of Working Party and Scientific Committee meetings for 2016 and 2017 (IOTC Secretariat)	✓ (8 November 2015)
IOTC–2015–SC18–11	Development of harmonised 'Terms and Definitions' for the IOTC's compendium of Conservation and Management Measures (CMMs): Science (IOTC Secretariat)	✓ (8 November 2015)
IOTC–2015–SC18–12	IOTC species executive summaries: target audience, content and resourcing (IOTC Secretariat)	✓ (9 November 2015)
IOTC–2015–SC18–13	Proposals for improved figures in the tropical tunas executive summaries (A. Fonteneau and F. Marsac)	✓ (8 November 2015)
IOTC–2015–SC18–14	Updates on at-sea trials into different line-weighting options for Korean tuna longline vessels (Kim Y, Kim ZG, Lee SI, Choi GC, Jo GS, Jung J, Park HW, Park JY, Rollinson D & Wanless RM)	✓ (9 November 2015)
Executive Summaries		
IOTC–2015–SC18–ES01	Status of the Indian Ocean Albacore (ALB: *Thunnus alalunga*) resource	✓ (9 November 2015)
IOTC–2015–SC18–ES02	Status of the Indian Ocean bigeye tuna (BET: *Thunnus obesus*) resource	✓ (9 November 2015)
IOTC–2015–SC18–ES03	Status of the Indian Ocean skipjack tuna (SKJ: *Katsuwonus pelamis*) resource	✓ (9 November 2015)
IOTC–2015–SC18–ES04	Status of the Indian Ocean yellowfin tuna (YFT: *Thunnus albacares*) resource	✓ (9 November 2015)
IOTC–2015–SC18–ES05	Report on biology, stock status and management of southern bluefin tuna: 2013 (from CCSBT)	✓ (9 November 2015)
IOTC–2015–SC18–ES06	Status of the Indian Ocean bullet tuna (BLT: *Auxis rochei*) resource	✓ (9 November 2015)
IOTC–2015–SC18–ES07	Status of the Indian Ocean frigate tuna (FRI: *Auxis thazard*) resource	✓ (9 November 2015)
IOTC–2015–SC18–ES08	Status of the Indian Ocean kawakawa (KAW: *Euthynnus affinis*) resource	✓ (9 November 2015)

Document	Title	Availability
IOTC–2015–SC18–ES09	Status of the Indian Ocean longtail tuna (LOT: *Thunnus tonggol*) resource	✓ (9 November 2015)
IOTC–2015–SC18–ES10	Status of the Indian Ocean Indo-Pacific king mackerel (GUT: *Scomberomorus guttatus*) resource	✓ (9 November 2015)
IOTC–2015–SC18–ES11	Status of the Indian Ocean narrow-barred Spanish mackerel (COM: *Scomberomorus commerson*) resource	✓ (9 November 2015)
IOTC–2015–SC18–ES12	Status of the Indian Ocean black marlin (BLM: *Makaira indica*) resource	✓ (9 November 2015)
IOTC–2015–SC18–ES13	Status of the Indian Ocean blue marlin (BUM: *Makaira nigricans*) resource	✓ (9 November 2015)
IOTC–2015–SC18–ES14	Status of the Indian Ocean striped marlin (MLS: *Tetrapturus audax*) resource	✓ (9 November 2015)
IOTC–2015–SC18–ES15	Status of the Indian Ocean Indo-Pacific sailfish (SFA: *Istiophorus platypterus*) resource	✓ (9 November 2015)
IOTC–2015–SC18–ES16	Status of the Indian Ocean swordfish (SWO: *Xiphias gladius*) resource	✓ (9 November 2015)
IOTC–2015–SC18–ES17	Status of the Indian Ocean blue shark (BSH: *Prionace glauca*)	✓ (7 November 2015)
IOTC–2015–SC18–ES18	Status of the Indian Ocean oceanic whitetip shark (OCS: *Carcharhinus longimanus*)	✓ (9 November 2015)
IOTC–2015–SC18–ES19	Status of the Indian Ocean scalloped hammerhead shark (SPL: *Sphyrna lewini*)	✓ (9 November 2015)
IOTC–2015–SC18–ES20	Status of the Indian Ocean shortfin mako shark (SMA: *Isurus oxyrinchus*)	✓ (9 November 2015)
IOTC–2015–SC18–ES21	Status of the Indian Ocean silky shark (FAL: *Carcharhinus falciformis*)	✓ (9 November 2015)
IOTC–2015–SC18–ES22	Status of the Indian Ocean bigeye thresher shark (BTH: *Alopias superciliosus*)	✓ (9 November 2015)
IOTC–2015–SC18–ES23	Status of the Indian Ocean pelagic thresher shark (PTH: *Alopias pelagicus*)	✓ (9 November 2015)
IOTC–2015–SC18–ES24	Status of marine turtles in the Indian Ocean	✓ (9 November 2015)
IOTC–2015–SC18–ES25	Status of seabirds in the Indian Ocean	✓ (9 November 2015)
Working Party Reports		
IOTC–2015–WPNT05–R	Report of the 5th Session of the Working Party on Neritic Tunas	✓ (11 June 2015)
IOTC–2015–WPB13–R	Report of the 13th Session of the Working Party on Billfish	✓ (24 September 2015)
IOTC–2015–WPEB11–R	Report of the 11th Session of the Working Party on Ecosystems and Bycatch	✓ (24 September 2015)
IOTC–2015–WPM06–R	Report of the 6th Session of the Working Party on Methods	✓ (22 October 2015)
IOTC–2015–WPDCS11–R	Report of the 11th Session of the Working Party on Data collection and Statistics	✓ (3 November 2015)
IOTC–2015–WPTT17–R	Report of the 17th Session of the Working Party on Tropical Tunas	✓ (3 November 2015)
National Reports		
IOTC–2015–SC18–NR01	Australia	✓ (27 October 2015)
IOTC–2015–SC18–NR02	Belize	Not provided
IOTC–2015–SC18–NR03	China	✓ (27 October 2015)
IOTC–2015–SC18–NR04	Comoros	✓ (9 November 2015)
IOTC–2015–SC18–NR05	Eritrea	Not provided
IOTC–2015–SC18–NR06	European Union	✓ (20 November 2015)
IOTC–2015–SC18–NR07	France (OT)	✓ (14 November 2015)
IOTC–2015–SC18–NR08	Guinea	Not provided
IOTC–2015–SC18–NR09	India	✓ (10 November 2015)
IOTC–2015–SC18–NR10 Rev_1	Indonesia	✓ (8, 20 November 2015)

Document	Title	Availability
IOTC–2015–SC18–NR11	Iran, Islamic Republic of	✓ (4 November 2015)
IOTC–2015–SC18–NR12	Japan	✓ (10 November 2015)
IOTC–2015–SC18–NR13	Kenya	✓ (20 November 2015)
IOTC–2015–SC18–NR14 Rev_1	Korea, Republic of	✓ (10, 18 November 2015)
IOTC–2015–SC18–NR15	Madagascar	✓ (13 November 2015)
IOTC–2015–SC18–NR16	Malaysia	✓ (9 November 2015)
IOTC–2015–SC18–NR17	Maldives, Republic of	✓ (11 November 2015)
IOTC–2015–SC18–NR18	Mauritius	✓ (8 November 2015)
IOTC–2015–SC18–NR19 Rev_1	Mozambique	✓ (11, 17 November 2015)
IOTC–2015–SC18–NR20	Oman, Sultanate of	✓ (10 November 2015)
IOTC–2015–SC18–NR21	Pakistan	Not provided
IOTC–2015–SC18–NR22	Philippines	✓ (15 November 2015)
IOTC–2015–SC18–NR23	Seychelles, Republic of	✓ (9 November 2015)
IOTC–2015–SC18–NR24	Sierra Leone	Not provided
IOTC–2015–SC18–NR25	Somalia	✓ (16 November 2015)
IOTC–2015–SC18–NR26	Sri Lanka	✓ (9 November 2015)
IOTC–2015–SC18–NR27	Sudan	Not provided
IOTC–2015–SC18–NR28	Tanzania	✓ (11 November 2015)
IOTC–2015–SC18–NR29	Thailand	✓ (10 October 2015)
IOTC–2015–SC18–NR30	United Kingdom (OT)	✓ (5 November 2015)
IOTC–2015–SC18–NR31	Vanuatu	Not provided
IOTC–2015–SC18–NR32	Yemen	Not provided
Cooperating Non-Contracting Parties		
IOTC–2015–SC18–NR33	Bangladesh	✓ (20 November 2015)
IOTC–2015–SC18–NR34	Djibouti	Not provided
IOTC–2015–SC18–NR35	Liberia	Not provided
IOTC–2015–SC18–NR36	Senegal	Not provided
IOTC–2015–SC18–NR37	South Africa, Republic of	✓ (9 November 2015)
Information papers		
IOTC–2015–SC18–INF01	Guidelines for the presentation of CPUE standardisations and stock assessment models	✓ (6 November 2015)

APPENDIX IVA
NATIONAL REPORT ABSTRACTS (2015)

Australia (IOTC–2015–SC18–NR01)
Pelagic longline and purse seine are the two main fishing methods used by Australian vessels to target tuna and billfish in the Indian Ocean Tuna Commission (IOTC) Area of Competence. In 2014, four Australian longliners from the Western Tuna and Billfish Fishery and zero longliners from the Eastern Tuna and Billfish Fishery operated in the IOTC Area of Competence. They caught 16.6 t of albacore (Thunnus alalunga), 75.3 t of bigeye tuna (Thunnus obesus), 19.0 t of yellowfin tuna (Thunnus albacares), 211.6 t of swordfish (Xiphius gladius) and 0.6 t of striped marlin (Tetrapturus audax). These catches represent approximately 10 per cent of the peak catches taken by Australian vessels fishing in the IOTC Area of Competence in 2001, for these five species combined. In addition, Australian vessels using minor line methods took a small amount of catch. The number of active longliners and levels of fishing effort have declined substantially in recent years due to reduced profitability, primarily as a result of lower fish prices and higher operating costs. The catch of southern bluefin tuna (Thunnus maccoyii) in the purse seine fishery was 4168 t in 2014. There was no skipjack tuna (Katsuwonus pelamis) caught by purse seine fishing. In 2014, less than 1 t of shark was landed by the Australian longline fleet operating in the IOTC Area of Competence and 6400 sharks were discarded/released. In the 2014 calendar year, 9.1 per cent of hooks deployed in the WTBF were observed.

Belize (IOTC–2015–SC18–NR02)
National Report not provided.

China (IOTC–2015–SC18–NR03 Rev_1)
Deep-frozen longline and ice fresh-longline are the only two fishing gears used by Chinese vessels to catch tuna and tuna-like species in the IOTC waters. The number of active deep-frozen longline vessels increased from 10 in 2011 to 38 in 2014, while the number of ice-fresh longline vessels increased to 16. Chinese longline fleet caught 4940 MT of tropical tunas (BET and YFT) in 2014, which is lower than the catch in 2013(5233 MT). The albacore tuna catch in 2014 was 1430 MT, which is higher than the catch in 2013 (1011 MT). Implementation of both the logbook and observer programs is going on for the Chinese longline fleet in the Indian Ocean. Catch and effort data collection of bycatch species have been improved. Two scientific observers were dispatched in 2014.

Comoros (IOTC–2015–SC18–NR04)
Fishing in Comoros is exclusively artisanal, and operated on 3-9 m motorized or non-motorized wooden or fiberglass, non-decked vessels. Comorian fisheries exploit mainly pelagic species (*Thunnus albacares*, *Katsuwonus pelamis*, *Thunnus alalunga*, *Istiophorus platypterus*, *Thunnus obesus*, *Euthynnus affinis*) and contribute entirely to the population's diet, while providing 55% of total jobs in the agricultural sector, i.e. about 8,000 fishermen. Troll line, drop line and a few nets targeting small pelagic species are the main fishing gears used. A trip lasts between one and seven days. Since February 2011, Comoros have implemented a data collection system at landing sites. The production for 2014 was estimated by this survey at 9,656 tones for all species combined, and around 6,294 tones of tunas for a total of 5,623 fishing crafts. There is no industrial fishing at national level. This fishery is operated by a foreign fleet under a Fishing Agreement. None of the catch of this fleet is offloaded nor transshipped within the country.

Eritrea (IOTC–2015–SC18–NR05)
National Report not provided.

European Union (IOTC–2015–SC18–NR06)
Summary not provided. See individual country abstracts within the EU report.

France (OT) (IOTC–2015–SC18–NR07)
Since Mayotte moved to being a territory under European Community rules, the French tropical overseas territories are represented only by the Scattered islands that are attached to the administration of the French Southern and Antarctic Lands (TAAF). A marine park was established on February 22nd, 2012 (Decree No. 2012-245 of February 22nd, 2012): the National Marine Park of the Glorieuses, which is under the responsibility of the Scattered islands, and extends over the entire Glorieuses EEZ. The Scattered Islands are uninhabited and have no tuna fleets registered in France-Territories. Nevertheless, the TAAF issue fishing licenses to French and foreign longline and purse seine vessels wishing to fish in French waters, and an observer programme accompanies the granting of these licenses. In 2014, 9 fishing trips (9 ships) were observed on board purse seiners from France, Spain, Seychelles and Mauritius, representing a total of 392.5 days, about 292 sets and 5609 tonnes. In 2015, 18 trips were observed aboard 10 purse seiners from France, Spain, Seychelles and Italy, for a total of 518 days, 414 sets and 8,602 tonnes. The current research project on large pelagic conducted by

France (mainly IRD & Ifremer) covers observatory-type activities, the study of migration patterns of large pelagics, genetic studies for the definition of stocks, studies of reproductive biology, the development of bycatch mitigation measures and the study of the dynamics of the tropical ecosystem. Most projects are funded under international, European or national calls for tenders. This report provides the list of all projects that continued or started in 2015. Generally speaking, France has actively participated in all the working groups organized by the IOTC, including by presenting 21 scientific contributions in 2015. – *see paper for full abstract*

Guinea (IOTC–2015–SC18–NR08)
National Report not provided.

India (IOTC–2015–SC18–NR09)
Tuna and tuna like fishes are one of the components of pelagic resources. In Indian states mainly ten species of coastal and oceanic species are encountered in the tuna fishery. Tuna fishing fleet includes coastal multipurpose boats operating a number of traditional gears, oceanic pole and line boats, small longliners and industrial longliners etc. The total production of tunas and tuna-like fishes, including Neritic and Oceanic tunas, Billfishes and Seerfishes during the year 2014 was 154850 tonnes. There are no reported instances of sea bird interaction in any of the Indian Tuna Fishery. Sea turtles, Marine mammals and Whale sharks are protected in India under various national legislations. Data on tuna production is collected by different agencies in India including Fishery Survey of India (FSI), Central Marine Fisheries Research Institute (CMFRI) and Marine Export Development Authority (MPEDA). During the period 2013-14 and 2014-15 (till November), The Fishery Survey of India's longline research vessels collectively had 681 Fishing days and 670 Fishing days respectively, expending a total fishing effort of 1,711 hours and operated 155,010 hooks and 116,881 hooks respectively (MoA,2014). Tuna and allied resources called as large pelagic resources. The large pelagic resources contributed 198206 t, accounting for 5.5% of the mainland's total marine fish production. Major share of the landing was by Tunas (44.8) followed by Seerfishes (24.8%) and Barracudas (9.9%). Other major resources were Billfishes (4.7%), Dolphin fishes (4.5%), Carangids (leather jackets and rainbow runners (7.9%)), Belonids (1.6%) and Cobia (1.6%). The contribution by different states of India to the landings of each resource varied considerably. Landings recorded a steady increase over the years from 6200 t in 1985 to 198991 t in 2012 and declined marginally thereafter. The change in landings during the year was positive (11.4%) compared to mean yield of the previous five years (2009 – 2013). – *see Report for full abstract*

Indonesia (IOTC–2015–SC18–NR10 Rev_1)
For fisheries management purpose, Indonesian waters is divided into eleven Fisheries Management Areas (FMA). Three of them located within the IOTC area of competence, namely Fisheries management Areas (FMAs) 572 (Indian Ocean – West Sumatera), FMA 573 (South of Java – East Nusa Tenggara) and 571 (Malacca Strait and Andaman Sea). Indonesian fishers operate various fishing gears such as Long line, Purse seine, hand line to catch large pelagic fishes such as tuna, skipjack, marlins etc. Longline is the main fishing gear type targeting tunas which operated in those FMAs. The national catch of four main tuna species in 2014 was estimated 185,675 ton which composed of yellowfin tuna (65,686 t); bigeye tuna (34,400 t), skipjack tuna (79,999 t) and albacore (5,590 t). Port sampling and scientific observer programs are still continuing and conducting by Research Institute for Tuna fisheries (RITF) Benoa. Following the issuance of ministerial regulation of MMAF no 01 year 2013 concerning observer onboard for fishing and carrier vessel, the national tuna management plan (NTMP) was officially lunched in Bali in 2014 and legalized recently in 2015. Furthermore transshipment at sea also banned by ministry regulation no 57/Permen/2014 and implemented by 2015.

Iran, Islamic Republic of (IOTC–2015–SC18–NR11)
Iran (Islamic Republic of) fishing grounds in Northern and southern waters of the country are located in the Caspian Sea and Persian Gulf and Oman Sea. Fishery for tuna and tuna-like species is a major component in large pelagic fisheries in Iran and one of the most important activities in the Persian Gulf, Oman Sea and offshore waters. The long Iranian coastline about 193 port and landing places and about 143 thousand fishermen individuals which are directly engaged in fishing activities and Around 11500 thousand fishing crafts consist of fishing boats, Dhows and vessels using different fisheries including: Gillnet, Purse seine Trolling, Trawl and Wire-trap which are engaged in fishing operation according to a time schedule during different fishing seasons in the coastal and offshore waters. Gillnet and purse seine are two main fishing methods used by Iranian vessels to target large pelagic species (especially tuna and tuna-like) in the IOTC area competency and also some of small boats used trolling in coastal fisheries. The total production of large pelagic fishes during 2014 was 267000 Mt of which 249000 Mt belongs to tuna and tuna-like fishes in the Indian Ocean areas. Those catch with 73.7% (196,689 Mt) of Tunas, 11.5% (30505 Mt) of Seerfish, 8.0% (21,468 Mt) of Billfish, 2.8% (7,552 Mt) different species of shark and 4% (10734 Mt) other species.

Japan (IOTC–2015–SC18–NR12)
Longline and purse seine fisheries are two types of Japanese tuna fisheries currently operating in the Indian Ocean. Longline fishery started its operation in 1952 when the limitation of operational area imposed by the GHQ*, was removed. On the other hand, commercial purse seine fleet commenced fishing in the Indian Ocean in 1991 after several years of experimental fishing. The total fishing effort (the number of hooks) of Japanese longliners in the Indian Ocean had been keeping at similar level with fluctuation since 1971, i.e., around 100 million hooks, until 2007. Thereafter, it has been decreasing down to about 29 million hooks in 2011 due to piracy activities. It is slightly increasing after that and was 32 million hooks in 2014. Percentage of effort used in this Ocean in the total effort in all oceans fluctuated around 20% until 2003 after when it increased to 35% in 2006 and 2007. Thereafter it has drastically decreased to 16% in 2010 and kept in a low level after that, mainly because of increasing activity of piracy off Somalia. As for the purse seine fishery, fishing took place mainly in the tropical western Indian Ocean until 1993 after when fishing effort shifted almost completely to the eastern Indian Ocean mainly because of economic problem derived from rise of Japanese Yen during that time.

Kenya (IOTC–2015–SC18–NR13)
The Kenyan tuna fishing fleet structure consists of an artisanal commercial segment and recreational fleets which all combined target and impact species under the IOTC mandate. The commercial artisanal fishing fleet is composed of a multi-gear and multi-species fleet operating in the territorial waters. The local boats are broadly categorized as outrigger boats or dhows which come with variants depending on the construction designs. It is estimated that 850 artisanal vessels are engaged in the fishing for tuna and tuna like species in 2014 within the coastal waters. The Main gears used are artisanal long line hooks, gillnets, monofilament nets and artisanal trolling lines. Catches from artisanal tuna fisheries were 193 tons, which is a reduction from 292 tons in 2013. Other important species landed which declined were Sanish mackerel with 127 tons from the previous 162 tons. The significant increase was noted in sailfish with landings of 176 tons from the previous 140 tons. Catches for tuna are not distinguished to distinct species groups because of identification problems with the data collectors. Recreational fisheries for the current year reduced to mere 18 tons from the previous 138 tons in 2013. The main target species being marlins, sailfish (Istiophiridae), swordfish (Xiiphidae) and tuna (Scombridae).Other species caught include small pelagic species such as barracuda, Spanish mackerel, Wahoo and sharks are landed. The artisanal fisheries and recreational fishing fleets have interactions with sharks where sharks are caught and the carcass is retained and fully utilised in artisanal fisheries and recreational trolling line fisheries have a voluntary shark release policy for sharks.

Korea, Republic of (IOTC–2015–SC18–NR14 Rev_1)
The number of active vessels in 2014 was 10 for longline fishery and 4 for purse seine fishery. With this fishing capacity, Korean tuna longline fishery caught 3,191 mt in 2014, which was 31% higher than that of 2013. The fishing efforts in 2014 were 5,999 thousand hooks and distributed in the western and eastern Indian Ocean around 20°S-40°S, while the fishing efforts averaged for 5 recent years (2010-2014) were 5,480 thousand hooks and distributed in the tropical areas around 0-20°S as well as in the western and eastern areas around 20°S-40°S. It was noted that fishing efforts had not been deployed in the western Indian Ocean around 20°N-20°S in recent years. As results, the catch of bigeye tuna and yellowfin tuna significantly decreased, and albacore tuna increased in catch. Korean tuna purse seine fishery in the Indian Ocean recorded about 16 thousand mt in 2014. In 2014, 4 purse seine vessels operated mainly in the western and central tropical areas around 10°N-10°S to fish for skipjack tuna and yellowfin tuna. The fishing efforts in 2014 were 828 sets, which mainly distributed in the tropical areas around 45°E-70°E. In 2014, 2 scientific observers for longline fishery and 1 scientific observer for purse seine fishery were dispatched on board for implementing observer program and scientific data collection, which carried out 5.1% and 7.2% of observer coverage in terms of the number of hooks and sets, respectively.

Madagascar (IOTC–2015–SC18–NR15)
The national fleet targeting tuna and tuna-like species consists of small longliners, of less than 24m. The number of ships in this fishery reached 8 in 2013, but in 2014 it was reduced to 7. Between 2010 and 2014, fishing techniques and methods remained the same. Usually, ships deploy between 800-1300 hooks by set and the trips are relatively short, at 4-7 days, to keep the catches fresh when arriving at landing sites, which are the ports of Santa Maria and Toamasina. The logbook collection and sampling program at landing ports was implemented from the end of 2013 for Sainte Marie, which explain the availability of catch and size frequency data in 2014. In the recent years, the tuna fishing effort (expressed in number of hooks deployed) by domestic vessels, varied between 2010 and 2014. In addition, the annual variation in catches is somewhat proportional to the changes in fishing effort. For longline catches, data from logbooks and samplings carried out by the USTA recorded catches of other pelagic fish such as sailfish, marlin, swordfish, dolphinfish and sharks. In terms of production, landed catches declared by the fishing companies licensed to fish for tuna and tuna-like species are quite stable between 2010 and 2014, as well as the number of active fishing vessels.

Fishing vessels licensed to fish demersal species can also have incidental interactions with some species under IOTC mandate, in particular those referred as neritic species.

Malaysia (IOTC–2015–SC18–NR16)
Total marine fish productions in Malaysia were not much different for 2013 and 2014, during which 1,482,899 metric tons and 1,440,109 metric tons were respectively landed. Based on catch statistics from the Department of Fisheries Malaysia, offshore fisheries contributed only 22% of the total landings. Therefore, there is an emphasis by the government to develop tuna fisheries not only in coastal waters, but also in offshore waters within the Exclusive Economic Zone (EEZ). Tuna fisheries, which include both oceanic and neritic tuna, are targeted to be developed in the near future. The second strategic development plan for tuna fisheries was launched at the end of 2013. During the early 1980s, small tuna (as neritic tuna were called then) were only caught as by-catch by gill nets and purse seines. When tuna purse seines were introduced in 1987, the neritic tuna fisheries started to develop. A tagging experiment on neritic tuna carried out in South China Sea showed that 50% of the recaptured tuna came from the purse seine operators. Initially purse seine operators visually searched for tuna schools. Gradually, some of these operators started to use lights to aggregate fish. Following complaints from other fishermen, the use of lights were regulated and limited to less than 30 kilowatts, although there have been incidences of non- compliance. In Malaysia, neritic tuna consists of longtail tuna (*Thunnus tonggol*), kawakawa (*Euthynnus affinis*) and frigate tuna (*Auxis thazard* and *Auxis rochei*). Neritic tuna contributed 3.95% of the total marine landings. Although the contribution in weight is rather low, the value of this group of fish is still substantial at more than USD121 million in 2014 (Table 1). In the year 2014, neritic tuna landings amounted to 56,816 mt; decreasing by 1% compared to 57,345 mt in 2013. – *see Report for full abstract.*

Maldives (IOTC–2015–SC18–NR17)
The Maldivian tuna fishery comprises of four main components; pole-and-line, handline, longlining and trolling. The most important is still the traditional liveabait pole-and-line fishery. The fishery was certified by the Marine Stewardship Council (MSC) in November 2012. The main target species is skipjack tuna (*Katsuwonus pelamis*), but small amounts of juvenile yellowfin tuna (*Thunnus albacares*) are also caught in the fishery of which about 5-10% is bigeye tuna (*Thunnus obesus*). Handline fishery is still expanding which targets surface dwelling large yellowfin tuna (> 70 cm FL). A Maldivian longline fishery is being developed following the termination of the licensing scheme for foreign longliners in 2010. Trolling fishery is minor and targets mainly neritic species of kawakawa (*Euthynnus affinis*) and frigate tuna (*Auxis thazard*), but occasionally also catches skipjack and yellowfin tuna. Catches of skipjack registered a slight drop in 2014 relative to level of 2013. Recent catches have been of the order of 60,000 – 75,000 t, still much less recorded catch in 2006. Caches of yellowfin are increasing, due to the growing handline fishery which targets large yellowfin. No specialized vessel is required for handline fishing hence many pole-and-line vessels now carry both sets of gears and switch target fishery and gear depending on fishing opportunities. Many also practice multi-day fishing switching them opportunistically. Most recent catches of the yellowfin are around 50,000 t and about 60% of the catch is from handline fishery. The national data collection was based on complete enumeration system, which is now replaced by a modern logbook data collection system. A web-enabled database will become online by the end of this year to allow compilation and processing of catch and effort data. The web-enabled database will also be used to record tuna purchases by the exporters. – *see Report for full abstract*

Mauritius (IOTC–2015–SC18–NR18)
The national tuna fleet has undergone major development with an increase in capacity from 4 vessels in 2013 to 10 in 2014 mainly because of an increase in the number of purses seiners (1 purse seiner in 2013 compared to 7 in 2014). A total of 151 foreign vessels and 47 national vessels were monitored through the vessel monitoring programme (VMS) through a satellite based system. The local purse seiners operated on a large spatial scale outside the Mauritius Exclusive Economic Zone (EEZ) with fishing zones spreading between latitudes 01ºN-14ºS and longitudes 49ºE-69ºE. These vessels unloaded a total catch of 7785 tonnes of tunas and tuna like species, comprising of a high percentage of yellowfin tuna (*Thunnus albacares*, 51.7%), followed by skipjack tuna (*Katsuwonus pelamis*, 39%) and bigeye tuna (*Thunnnus obesus*, 7%). The other species caught included mackerel scads (Decapterus spp, 1.2%), albacore tuna (*Thunnus alalunga*, 0.58%) and others (marlins, sailfish and dolphin fish, 0.61%). Fishing operations were also carried out by 3 local longliners (< 24m), which undertook a total of 29 trips in 2014. The fishing effort (105,120 hooks) was mostly concentrated in zones distributed between latitudes 15°S-20°S and longitudes 55°E-61°E with a total catch of 42 tonnes of chilled fish. Swordfish remained the target species of this fishery, representing 32.9% of the total catch followed by yellowfin tuna (26.4%), bigeye tuna (18.7%), albacore tuna (15.1%) and billfishes (2.5%). Tunas can be considered as the secondary target species of the national longline fishery with an increasing yearly trend from 39% of the total catch recorded in 2012 to 60% of the total catch in 2014. A very small amount (0.2%) of shortfin mako shark (*Isurus oxyrhinchus*) was retained by the national longline vessels and the latter reported no encounter with seabirds and turtles. A total of 1608 tunas were sampled on the catch of national purses seiners and longliners with a distribution range of

40 cm to 163cm for yellowfin tuna, 42 cm to 161 cm for bigeye and 40cm to 73cm for skipjack. The length varied between 90 cm to 121 cm for albacore tuna landed by national longliners.

Mozambique (IOTC–2015–SC18–NR19)
This document is produced in order to comply with the obligation of the country as a member of IOTC of providing information whenever requested within the agreed procedures. It provides an overview of the Mozambican fisheries with emphasis to those impacting on tuna and tuna-like species. Likewise, the summary also, provides an update of ongoing actions across the country to ensure maximization of the exploitation of tuna at the country level and long term sustainable exploitation of the tuna stocks. Similar to previous years the tuna fishery in 2014 was dominated by the distant water fishing nations -DWFN- accessing the resources through fishery Partnership Access Agreement. The total catch reported by these fleets was 3,791 tons. The national industrial fleet for tuna in 2014 operated with two vessels only in December. The catch of this fleet was 7, 5 tons. The number of vessels increased in 2015 to five licensed and thus increase on catches is expected. The artisanal, semi-industrial and recreational and sport fisheries show evidences of increasing impacts on tuna and tuna-like species with increasing catches in some regions along the Mozambican coast. However, due to lack of well trained personal and insufficient financing of the monitoring schemes in place contribution and impacts of these fisheries on tuna species is currently poorly known. Detailed catch and effort available information is further presented in specific chapter of the report. Despite the above mentioned difficulties efforts were made to fund visits to two of the most important fishing provinces (Nampula and Cabo-Delgado) for technical discussions. These discussions have lead to the development of a draft action plan on how to improve the artisanal catch data and how could we increase the compliance with the IOTC requirements on reporting data. – *see Report for full abstract.*

Oman (IOTC–2015–SC18–NR20)
The total production of the Omani fishery sector amounted to around 211,000 Tons in 2014, with a slight increase of approximately 2.4% compared to 2013. Tuna species, considered as highly valuable products for Omani consumers, have experienced tremendous fluctuations in their total annual production and decreasing from 54371 mt in 2013 to 49066 mt in 2014. This fluctuation of coastal tuna activities finds its origin, in the actual reduction of the industrial pelagic fleet and probably in the modification of environmental factors, predator-prey relationship and spawning problems (Dr. AlQumi, 2011). In the industrial fleet, the number of vessels decreased from 10 vessels in 2011 to 3 vessels in 2014. This reduction in the industrial fishing capacity was initiated by the national Authorities for the purpose of restructuring the industrial fishing sector to improve its competitiveness and efficiency. Artisanal and coastal fleets have, however, increased in the number of vessels and fishermen. For the monitoring aspects of the Tuna fishery, the Omani Government has introduced the logbook data collection scheme, the Vessel Monitoring System (VMS) and Port Sampling Program (PSP), and a scheme to enhance the quality of data gathered in order to manage and sustain efficiently the Omani fisheries. At the same time, the Government started to run and monitor several other projects for other marine species such as sea birds and marine turtles but are still in their starting stages.

Pakistan (IOTC–2015–SC18–NR21)
National Report not provided.

Philippines (IOTC–2015–SC18–NR22)
The Republic of the Philippines is a distant water fishing nation within the IOTC Convention area. The Philippine fleet authorized to conduct fishing activities in the IOTC Convention area is composed of both purse seine and longline fishing vessels. However, for the year 2014, the active fishing vessels are only longline fishing vessels. There are plans of fishing vessel operators to activate their purse seine fleet in the convention area. The main target species is Bigeye tuna and the other species that are caught, retained and reported are all by-catches. As of the 2014 year end, legislation on the amendments to its Fisheries Code was pending before the National Legislature. This will introduce amendments to ensure compliance to its international commitments to international agreements that the Philippines had entered into after 1998.

Seychelles (IOTC–2015–SC18–NR23)
The Seychelles National Report summarizes activities of the Seychelles' fishing fleet targeting tuna and tuna-like species in the WIO for the year 2014 in comparison with previous years. It also summarizes research, and data collection related activities as well as actions undertaken in 2014 to implement Scientific Committee recommendations and IOTC Conservation and Management Measures. The Seychelles purse seine fleet which increased from 7 vessels in 2013 to11 vessels in 2014 .The number of supply vessels also increased from 4 to 6 vessels during the same period. In general nominal effort has been on a downward trend over the past 4 previous years. However in 2014, fishing effort increased by 300 days (17%), and this can be attributed to the increase in the number of purse seine vessel. The total annual catch reported by the purse seine fleet increased slightly by 5% from 57,324MT in 2013 to 60,225MT in 2014.This was achieved from a fishing effort of 2,109 fishing days thus giving a mean catch rate of 28.57MT/Fishing day. Skipjack

was the dominant species caught, accounting for 53% of the total catch and yellowfin accounted for 39% of the total catch. Catches of skipjack tuna increased by 23% whilst catches for yellowfin tuna decreased by 11% from 2013 to 2014. Four more fishing vessels joined the Seychelles Industrial longline fleet in 2014 making a total of 36 vessels. The total catch reported by the industrial longline fleet for 2014 is estimated at 10,487 MT representing a 8% drop in catches with 9% decreased in fishing effort when compared to 2013. In term of species composition, bigeye tuna remained as the dominant species caught by this fleet for the past five years, accounting for an average of 58% of the total catch, even though catches of this species decreased by 17% in 2014 when compared to 2013. – see Report for full abstract

Sierra Leone (IOTC–2015–SC18–NR24)
National Report not provided.

Somalia (IOTC–2015–SC18–NR25)
Thanks to an upwelling during the South-East monsoon, the Somali basin is very productive during part of the year and has been traditionally fished by longliners and purse seiners targeting tuna and tuna-like species. In 2007, fishing activities in the region reduced tremendously due to increasing piracy activities off the coastal of Somalia. However, since the Federal government took office in 2012, and with the help of the International Community, piracy has been declining, and fishing vessels are returning in the North West Indian Ocean. In late 2014, the Somali parliament adopted the new Somali Fisheries Law which was endorsed by the President. The law makes specific provisions for fisheries management, data collection, Monitoring Control and Surveillance as well as the protection of endangered species in Somali waters. Based on this new law, Somalia is working at developing new comprehensive fisheries regulations. Somalia does not currently have a fishing fleet targeting tuna and tuna-like species, except a small artisanal fleet spread on its 3,300km of maritime coast. However, there is no data collection of sampling system yet in place for this fleet. The Federal Ministry of Fisheries and Marine Resources is working with donors, International Organizations and NGOs to develop such systems in the near future, in order for Somalia to be able to collect fisheries data for management purposes, and submit fisheries statistics to IOTC. In particular, with the support from FAO, seven participants from the Federal Ministry and the Ministries responsible for fisheries in Jubbaland, Puntland and Galmudug were trained during one month at the Tanzania Fisheries Education and Training Agency in Bagamoyo in November 2014. Currently, a licensing system for foreign tuna vessels is being developed in Somalia with the support of FAO. In parallel, Somalia is working to develop Monitoring Control and Surveillance tools to monitor and control its EEZ. – *see Report for full abstract.*

Sri Lanka (IOTC–2015–SC18–NR26)
The total catch of tuna and tuna like species in Sri Lanka was 104,118t inyear 2014.75% of the catch is from EEZ and only about 25% is from the high seas. Skipjack (*Katsuwonus pelamis*) dominated the catch, and amounted to 47% (48,654t) while Yellowfin (Thunnus albacares) was the second most species representing 28% (28,775t) of the catch. Bigeye (*Thunnus obsesus*) catch was relatively low (2711t) and accounted for 2.6% of the total catch. Billfish comes as the second most group of catch in the tuna fishery. It was10% of the total catch and amounted to 10,372t. This shows2% drop compare to the catch that of 2013. Over 1/3 of the bill fish catch consisted sword fish (*Xiphias gladius*).Black marlin (*Makaira indica*) catch has increased while the blue marlin(*Makaira nigricans*), striped marlin (*Tetrapturus audax*) and sail fish catches have gone down. The identification of bill fish especially marlin species remained difficult due to nature of landing, sometimes beheaded and cut into pieces. Neritic tuna comprised of three main species, kawakawa (*Euthennus affinis*), bullet tuna (*Auxis rochei*) and frigate tuna (*Auxis thazard*) and collectively contributed 9% of the catch. The bycatch was2.6% and the main species recorded were sharks and rays. The total shark catch was 1610t showing further reduction of the catch than that of 2013 due to prohibition of catching of thresher shark. Silky shark is prominent in the catch. Around 4000 boats engaged in large pelagic fisheries within EEZ and in high seas. 99% of the boats operated were in the length range of 10m to 15m and the gears operated manually. Only 1615 boats over 10.3m length were actively operated in high seas. 1176 numbers of high seas operating vessels were fitted with VMS as at October 2015. 5or 6 inches large-mesh gillnets and gillnet - longline combination (64%) were the widely used fishing gear in tuna fisheries. The catch data collection has been improved and the log book and the observer program are being progressively implemented.

Sudan (IOTC–2015–SC18–NR27)
National Report not provided.

Tanzania, United Republic of (IOTC–2015–SC18–NR27)
Tanzania national fleets are dominated by artisanal fleets which are characterized by multi-species catch; involve the use of multi-gear and multi-cultural fisheries. Fishing activity takes place within 6 nm from shore predominantly on reef areas. However, a small number of boats are involved in the fisheries of tuna, bill fish and sharks, using manually handled drift gill nets, hooks and lines. Catch data is collected in terms of weight of major fish groups and is not based

on gear type, vessel size and duration of fishing operations. There are three commercial Tanzania flagged longline vessels that have been operating in the EEZ of contracting parties as well as the high seas under IOTC area of competence. Artisanal fishery statistics from the Fisheries Department (main land Tanzania only) for the year 2014 for indicates 2133, 1335 and 3908 tonnes of tuna and tuna like species, kingfish and sharks and rays were caught respectively. Available catch data from artisanal fishery is missing geographic position, gear and effort information. Total catch for tuna and tuna like species for longliners flagged vessels operating in IOTC area of competence was about 288 tones. Collection of log sheet data from all licensed vessels fishing in Tanzania EEZ started since 2002 and Vessel Monitoring System (mainly for licensed vessels and flagged vessels) started since 2009.There is no data from recreational fishing, however, available information is considered to be insignificant. There has been neither Observer nor Port sampling programmes because Tanzanian Ports does not have facilities for handling commercial deep sea fishing vessels. Transhipment at sea is not allowed within the EEZ of Tanzania. Currently, there is no major research programme for tuna and tuna like species. The only existing programmes are from universities and individuals from research institutes. Most of these programmes are focusing on identifying and marking of potential fishing grounds on the EEZ, the target being reducing fishing pressure on shallow water habitats.

Thailand (IOTC–2015–SC18–NR29)
Neritic tuna and king mackerel species in the Andaman Sea Coast, Thailand comprise 7 species (*Thunnus tonggol*, *Euthynnus affinis, Auxis thazard, A. rochie, Katsuwonus pelamis* and *Sarda orientalis, Scomberomorus* spp.). These species were caught from purse seine, king mackerel gill net and trawl. The trend of neritic tuna catches have been decreasing from 37,037 tons in 1998 to 8,670 tons in 2010. These production was quite stable around 11,889 and increase to 22,218 in 2012. Three Thai tuna longliners were operated in the Indian Ocean in 2007 and 2014. Fishing grounds were mainly in the western coast of Indian Ocean. Annual catches from 2009-2014 were estimated to 295.23, 607.69, 373.44, 470.41, 307.74 and 571.91 tons, respectively. The major species caught were bigeye tuna (*T. obesus*), yellowfin tuna (*T. albacares)*, billfish (Sword fish, Striped marlin, Blue marlin, and Black marlin), albacore tuna and shark (shark and Porbeagle shark). Their total catches were 1,391.47, 498.37, 335.89, 316.41 and 79.64 tons, respectively. Foreign tuna fleets unloading in Phuket, fishing effort increased steadily from 187 trips in 1995 to the peak in 1999, after that trend was continuously decreased into 241 trips in 2014. The whole figure of total landing catch during 1995 to 2014 showed the increasing trend (1,416 to 5,846 mts). The landing per trip increased continuously from 13 mts in 2009 to be 24 mts in 2014. The main species composition were yellowfin tuna, bigeye tuna, miscellaneous species (Sharks, *Lepidocybium* spp., *Coryphaena* spp., *Thunnus alalunga*, *Molar* spp., *Ruretlus pretiosus*, *Sphyraena* spp. and *Taractichtis* spp.) and bill fish (*Makaira* spp., *Tetrapturus* spp, *Istiophorus* spp.) with the average composition 62, 19, 9 and 5% of total landing, while swordfish contributed 5% of the total landing during 1995 to 2014. The total landing of yellowfin tuna, swordfish, miscellaneous species, bill fish and bigeye tuna in 2014 were 3,525, 799, 712, 656 and 154 mts. – *see Report for full abstract.*

United Kingdom (OT) (IOTC–2015–SC18–NR30)
UK (OT) waters have been a Marine Protected Area (MPA) since April 2010. Diego Garcia and its territorial waters are excluded from the MPA and include a recreational fishery. UK (OT) does not operate a flag registry and has no commercial tuna fleet or fishing port. The United Kingdom (OT) National Report summarises fishing in its recreational fishery in 2014 and provides details of research activities undertaken to date within the MPA against its Interim Conservation Management Framework. The recreational fishery landed 9.99t of tuna and tuna like species on Diego Garcia in 2014. Principle target tuna species of the industrial fisheries (yellowfin, bigeye and skipjack tunas) contributed 21% of the total catch of tuna and tuna like species of the recreational fishery. Length frequency data were recorded for a sample of 75 yellowfin tuna from this fishery. The mean length was 69cm. Sharks caught in the recreational fishery are released alive. IUU fishing remains the greatest threat to the OT ecosystem and fisheries but a range of other threats exist including invasive and pest species, climate change, coastal change, disease, and pollution. During 2015 the OT Authority appointed an Environmental Officer to take forward its Interim Conservation Management Framework and progress to date is presented. In 2015 Recommendations of the Scientific Committee and those translated into Resolutions of the Commission have been implemented as appropriate by the OT Authorities and are reported.

Vanuatu (IOTC–2015–SC18–NR31)
National Report not provided.

Yemen (IOTC–2015–SC18–NR32)
National Report not provided.

Bangladesh (IOTC–2015–SC18–NR33)
Bangladesh does not yet have a tuna fishery. Tuna are bycatch of trawlers and gill nets. There are 243 trawlers and 67,669 mechanized boats. The main catch is river shad (*Tenualosa illisa*), croakers, ribbon fish, catfish, sardines, redfish

(threadfin breams) are the major species. Tuna comprise only 2% of the industrial fisheries catch. 5% of catch is mackerel which include some mackerel included in the IOTC list.

Djibouti (IOTC–2015–SC18–NR34)
National Report not provided.

Liberia (IOTC–2015–SC18–NR35)
National Report not provided.

Senegal (IOTC–2015–SC18–NR36)
National Report not provided.

South Africa, Republic of (IOTC–2015–SC18–NR37)
South Africa has two commercial fishing sectors which either target or catch tuna and tuna-like species as bycatch in the Indian Ocean, the Large Pelagic Longline and the Tuna Pole-Line sectors. The Tuna Pole-Line sector operates mainly in the Atlantic Ocean from September to May each year to target albacore (*Thunnus alalunga*) and only occasionally crosses over into the Indian Ocean in search of yellowfin tuna (*Thunnus albacares*). In 2014, no tuna pole vessels fished in the Indian Ocean and instead targeted albacore and yellowfin tuna available inshore in the Atlantic Ocean, or opted to target tunas on the high seas at Vema and Valdivia seamounts and in Namibian waters. The South African-flagged pelagic longline vessels have traditionally used swordfish (*Xiphias gladius*) targeting methods in the Indian and Atlantic Oceans, whilst the Japanese foreign-flagged vessels target tropical tunas (yellowfin and bigeye tuna, *Thunnus obesus*) with effort focused in the Indian Ocean. Although the local South African fleet targets swordfish, their catch comprises of only 50-60% swordfish, the remainder being tropical tunas and sharks. It is concerning that swordfish catches remained low in the South West Indian Ocean in 2014. Experimental permits are available to encourage vessels to target swordfish yet the situation has not improved. The 52% reduction in longline effort (number of hooks) from 2013 to 2014 is due to the decline in the number of foreign-flagged vessels operating under joint-venture with South Africa in 2014. This reduced effort resulted in decreased catches of bigeye tuna (42% decrease), yellowfin tuna (62% decrease), swordfish (66% decrease) and albacore (84% decrease, considered bycatch in the longline sector). Blue shark (*Prionace glauca*) and shortfin mako (*Isurus oxyrinchus*) shark catches declined, though not at the scale of the tunas and swordfish, by 39% and 18%, respectively. – *see Report for full abstract.*

APPENDIX IVB

Agenda Item 6 – National Report from Mauritius

The SC **NOTED** the following statement made by the United Kingdom:

"*The UK notes that the National Report submitted to this Committee by the Republic of Mauritius indicates the inclusion of the Chagos Archipelago within the EEZ of the Republic of Mauritius in Figures 2 and 3. The UK has no doubt about its sovereignty of the Chagos Archipelago, which has been British since 1814, and which it administers as the British Indian Ocean Territory. No international tribunal, including the recent Arbitral Tribunal constituted under Annex VII to the UN Convention on the Law of the Sea has ever called the UK's sovereignty of the Territory into doubt. The UK rejects the attempt of the Republic of Mauritius to apply its National Report to the Chagos Archipelago, and does not believe this is an appropriate forum to raise sovereignty issues of any kind*."

The SC **NOTED** the following response statement made by Mauritius:

"*The Government of the Republic of Mauritius reiterates that the Chagos Archipelago, including Diego Garcia, forms an integral part of the territory of the Republic of Mauritius under both Mauritian law and international law.*

The Government of the Republic of Mauritius reaffirms that it does not recognize the so-called "British Indian Ocean Territory" ("BIOT") which the United Kingdom purported to create by illegally excising the Chagos Archipelago from the territory of Mauritius prior to its accession to independence. This excision was carried out in violation of international law and of United Nations General Assembly Resolutions 1514 (XV) of 14 December 1960, 2066 (XX) of 16 December 1965, 2232 (XXI) of 20 December 1966 and 2357 (XXII) of 19 December 1967.

The Government of the Republic of Mauritius considers that the United Kingdom is not entitled to be a member of the Indian Ocean Tuna Commission (IOTC) as it is not a "coastal State situated wholly or partly within the Area [of competence of the Commission]". Nor can the so-called "BIOT" claim to be a member of the IOTC on the basis of Article IV of the IOTC Agreement.

In the light of the foregoing, consideration of any document or information which the United Kingdom has purported to submit to this Committee in respect of the Chagos Archipelago, including Diego Garcia, or any document which purports to refer to the Chagos Archipelago as the so-called "BIOT" or as a British territory, as well as any action or decision that may be taken on the basis of such document or information, cannot and should not be construed as implying that the United Kingdom has sovereignty or analogous rights over the Chagos Archipelago or is entitled to be a member of the IOTC.

On 20 December 2010, the Republic of Mauritius initiated proceedings against the United Kingdom under Article 287 of, and Annex VII to, the United Nations Convention on the Law of the Sea (UNCLOS) to challenge the legality of the 'marine protected area' ('MPA') which the United Kingdom purported to establish on 1 April 2010 around the Chagos Archipelago. The Arbitral Tribunal constituted under Annex VII to UNCLOS to hear the dispute delivered its Award on 18 March 2015. The Tribunal ruled that in establishing the 'MPA' around the Chagos Archipelago, the United Kingdom breached its obligations under Articles 2(3), 56(2) and 194(4) of UNCLOS.

Since the 'MPA' purportedly established by the United Kingdom around the Chagos Archipelago has been held to be in breach of international law, it cannot be enforced. Any reference to or consideration given by the IOTC, including this Committee, to the purported 'MPA' in disregard of the Award will be in contradiction with the Tribunal's ruling and international law.

In this regard, the Government of the Republic of Mauritius has written on 20 April 2015 to the Executive Secretary of the IOTC to request that the purported 'MPA' should not be the subject of any discussions at the level of the IOTC. This request has been reiterated by the Government of Mauritius in a letter dated 24 April 2015 which it has addressed to the Executive Secretary of the IOTC.

The Government of the Republic of Mauritius urges the Committee to ensure compliance with the Award of the Arbitral Tribunal constituted under Annex VII to UNCLOS."

The SC **NOTED** the following subsequent statement made by the United Kingdom:

"1. The British Government has no doubt about its sovereignty of the Chagos Archipelago, which has been British since 1814, and which it administers as the British Indian Ocean Territory. No international tribunal, including the recent Arbitral Tribunal constituted under Annex VII to the UN Convention on the Law of the Sea (UNCLOS), has ever called the UK's sovereignty of the Territory into doubt.

2. Whilst the United Kingdom does not recognise the Republic of Mauritius' claim to sovereignty of the Chagos Archipelago, it has repeatedly undertaken to cede it to Mauritius, when no longer required for defence purposes. We maintain that commitment, though it is for the UK alone to determine when this condition is met. In the meantime, these defence purposes contribute significantly towards global security, and are central to efforts at countering regional threats, including those from terrorism and piracy.

3. It is clear that that the recent Arbitral Tribunal Award does not have the effect of rendering the Marine Protected Area (MPA) illegal. The Tribunal found that there had been no improper motive in its creation; and explicitly stated that it took no view on the substance of the MPA. One of our purposes in creating the MPA was to preserve the Indian Ocean's fish stocks, and safeguard their importance for the economy and food security of the region.

4. The Tribunal's finding was actually more narrow: that the United Kingdom should have consulted the Republic of Mauritius more fully about the establishment of the MPA, so as to give due regard to its rights. As the Tribunal notes in its Final Observation, it is open to both Parties to enter into such negotiations now, and to do so without reference to matters of sovereignty, under a "sovereignty umbrella". The UK has made extensive efforts to engage the Republic of Mauritius about conservation matters and is pleased that consultations are now underway. The UK has no present intent to modify the MPA, but has made clear its commitment to give due regard to Mauritius' rights as part of these consultations, which it approaches with an open mind."

The SC **NOTED** the following response statement made by Mauritius:

"The Government of the Republic of Mauritius reiterates that it does not recognize the so-called "British Indian Ocean Territory" ("BIOT") and that the Chagos Archipelago, including Diego Garcia, forms an integral part of the territory of the Republic of Mauritius.

The Government of the Republic of Mauritius reaffirms that the United Kingdom is not entitled to be a member of the Indian Ocean Tuna Commission (IOTC). Nor can the so-called "BIOT" claim to be a member of the IOTC.

The Government of the Republic of Mauritius maintains in no uncertain terms that the 'marine protected area' ('MPA') purportedly established by the United Kingdom around the Chagos Archipelago is illegal. At paragraph 547(B) of its Award, the Arbitral Tribunal constituted in the case brought by Mauritius against the United Kingdom under the United Nations Convention on the Law of the Sea to challenge the legality of the purported 'MPA' declared that in establishing the purported 'MPA' around the Chagos Archipelago, the United Kingdom breached its obligations under Articles 2(3), 56(2) and 194(4) of the Convention. During its recent discussions with the United Kingdom, the Republic of Mauritius made it clear that in view of the ruling of the Arbitral Tribunal, the purported 'MPA' cannot be enforced."

Agenda Item 6 – National Report from France

The SC **NOTED** the following statement made by Mauritius:

"The Government of the Republic of Mauritius reiterates that the Island of Tromelin forms an integral part of the territory of the Republic of Mauritius.

The Island of Tromelin is not a French territory, as claimed by France. The Government of the Republic of Mauritius rejects France's sovereignty claim over the Island of Tromelin as well as France's claim to any sovereign right or jurisdiction over the Exclusive Economic Zone adjacent to the Island of Tromelin.

Further, the Government of the Republic of Mauritius does not recognize the validity of the inclusion of the Island of Tromelin in the French Southern and Antarctic Lands (TAAF).

The Government of the Republic of Mauritius reaffirms that the Republic of Mauritius has full and complete sovereignty over the Island of Tromelin, including its maritime zones.

The agreement between the Republic of Mauritius and France on co-management of the Island of Tromelin was concluded without prejudice to the sovereignty of the Republic of Mauritius over the Island of Tromelin, and has not yet entered into force."

The SC **NOTED** the following statement made by France(OT):

"France protests against the statement by Mauritius, which ignores the fact that Tromelin Island is a French territory on which France has consistently exercised its full sovereignty.

Thus, France has sovereign rights or jurisdiction under International Law in the Exclusive Economic Zone adjacent to the island of Tromelin.

France is of the view that the Indian Ocean Tuna Commission is not the place to discuss issues of territorial sovereignty."

APPENDIX V

STATUS OF DEVELOPMENT AND IMPLEMENTATION OF NATIONAL PLANS OF ACTION (NPOA) FOR SHARKS AND SEABIRDS AND IMPLEMENTATION OF THE FAO GUIDELINES TO REDUCE MARINE TURTLE MORTALITY IN FISHING OPERATIONS: 2015

CPC	Sharks	Date of Implementation	Seabirds	Date of implementation	Marine turtles	Date of implementation	Comments
MEMBERS							
Australia		1st: April 2004 2nd: July 2012		1st: 1998 2nd: 2006 3rd: 2014		2003	**Sharks:** 2nd NPOA-Sharks (Shark-plan 2) was released in July 2012, along with an operational strategy for implementation: http://www.daff.gov.au/fisheries/environment/sharks/sharkplan2 **Seabirds:** Has implemented a Threat Abatement Plan [TAP] for the Incidental Catch (or Bycatch) of Seabirds During Oceanic Longline Fishing Operations since 1998. The present TAP took effect from 2014 and largely fulfills the role of an NPOA in terms of longline fisheries. http://www.antarctica.gov.au/__data/assets/pdf_file/0017/21509/Threat-Abatement-Plan-2014.pdf Australia is developing an NPOA to address the potential risk posed to seabirds by other fishing methods, including longline fishing in state and territory waters, which are not covered by the current threat abatement plan. **Marine turtles:** Australia's current marine turtle bycatch management and mitigation measures fulfill Australia's obligations under the FAO-Sea turtles Guidelines.
Belize							**Sharks:** No information received by the Secretariat. **Seabirds:** No information received by the Secretariat. **Marine turtles:** No information received by the Secretariat.
China **–Taiwan,China**		– 1st: May 2006 2nd: May 2012		– 1st: May 2006 2nd: Jul 2014			**Sharks:** Development has not begun. **Seabirds:** Development has not begun. **Marine turtles:** No information received by the Secretariat. **Sharks:** No revision currently planned. **Seabirds:** No revision currently planned. **Marine turtles:** Domestic laws introduced in 2013. Available on request.
Comoros		–		–			**Sharks:** At the moment, it is difficult to develop an NPOA-Sharks, taking into account that the fishery is purely artisanal. **Seabirds:** No seabirds catch is recorded by the surveyors at the landing sites. **Marine turtles:** Comorian law prohibits poaching of sea turtles; any offender is liable to imprisonment and a fine .
Eritrea							**Sharks:** No information received by the Secretariat. **Seabirds:** No information received by the Secretariat. **Marine turtles:** No information received by the Secretariat.
European Union		5 Feb 2009		16-Nov-2012		2007	**Sharks:** Approved on 05-Feb-2009 and it is currently being implemented. **Seabirds:** The EU adopted on Friday 16 November an Action Plan to address the problem of incidental catches of seabirds in fishing gears. **Marine turtles**: European Union Council Regulation (EC) No 520/2007 of 7 May 2007 lay down technical measures for the conservation of marine turtles including articles and provisions to reduce marine turtle bycatch. The regulation urges Member States to do their utmost to reduce the impact of

							fishing on sea turtles, in particular by applying the measures provided for in paragraphs 2, 3 and 4 of the resolution.
France (territories)		5 Feb 2009		2009, 2011		Pending: 2015	**Sharks:** Approved on 05-Feb-2009. **Seabirds:** Implemented in 2009 and 2011. 2009 for Barrau's petrel and 2011 for Amsterdam albatross. **Marine turtles:** To be implemented in 2015 for the five species of marine turtles that are present in the southwest Indian Ocean.
Guinea							**Sharks:** No information received by the Secretariat. **Seabirds:** No information received by the Secretariat. **Marine turtles:** No information received by the Secretariat.
India							**Sharks:** In preparation. In June 2015, India published a document entitled "Guidance on National Plan of Action for Sharks in India" which is intended as a guidance to the NPOA-Sharks, and seeks to (1) present an overview of the currents status of India's shark fishery, (2) assess the current management measures and their effectiveness, (3) identify the knowledge gaps that need to be addressed in NPOA-Sharks and (4) suggest a theme-based action plan for NPOA-Sharks. **Seabirds:** India has determined that seabird interactions are not a problem for their fleets. However, a formal evaluation has not yet taken place which the WPEB and SC require. **Marine turtles:** No information received by the Secretariat.
Indonesia		–		–			**Sharks:** NPOA guidelines developed and released for public comment among stakeholders in 2010 (funded by ACIAR Australia—DGCF). Training commenced in 2011, including data collection for sharks based on forms of statistical data to national standards (by DGCF (supported by ACIAR Australia). Implementation expected late 2011/early 2012. **Seabirds:** Development has not begun. **Marine turtles:** No information received by the Secretariat.
Iran, Islamic Republic of		–		–		_	**Sharks:** Have communicated to all fishing cooperatives the IOTC resolutions on sharks. Have in place a ban on the retention of live sharks. **Seabirds:** I.R. Iran determined that seabird interactions are not a problem for their fleet as they consist of gillnet vessels only. i.e. no longline vessels. **Marine turtles:** No information received by the Secretariat.
Japan		03-Dec-2009		03-Dec-2009			**Sharks:** NPOA–Shark assessment implementation report submitted to COFI in July 2012 **Seabirds:** NPOA–Seabird implementation report submitted to COFI in July 2012. **Marine turtles:** No information received by the Secretariat.
Kenya			n.a.	–			**Sharks:** A National Plan of Action for sharks is being developed and shall put in place a framework to ensure the conservation and management of sharks and their long-term sustainable use in Kenya. A shark assessment Report shall be developed by the end of the 2015 calendar year. **Seabirds:** Kenya does not have any flagged longline vessels on its registry. There is no evidence of any gear seabird interaction with the current fishing fleet. Kenya does not therefore consider developing NPOA seabirds as necessary for the time being. **Marine turtles:** The Kenyan fisheries law prohibits retention and landing of turtles caught incidentally in fishing operations. Public awareness efforts are

							conducted for artisanal gillnet and artisanal longline fishing fleets on the mitigations measures that enhance marine turtle conservation.
Korea, Republic of		08-Aug-11		–		–	**Sharks:** Currently being implemented. **Seabirds:** Drafted in January 2014 and on standby for approval by the minister. **Marine turtles:** All Rep. of Korea vessels fully implement Res 12/04.
Madagascar		–		–			**Sharks:** Development has not begun. **Seabirds:** Development has not begun. Note: A fisheries monitoring system is in place in order to ensure compliance by vessels with the IOTC's shark and seabird conservation and management measures. **Marine turtles:** No information received by the Secretariat.
Malaysia		2008	n.a.	–		2008	**Sharks:** A review of the NPOA-Shark (2008) is in the final stages, with stakeholder consultation due to be completed in September 2013. A revised NPOA-Sharks is expected to be published by the end of 2013. **Seabirds:** Malaysia has carried out a review and determined that an NPOA-Seabirds is not necessary as no longline vessels flagged to Malaysia fish south of 20 degrees south. **Marine turtles:** A NPOA For Conservation and Management of Sea Turtles had been published in 2008.
Maldives, Republic of		Apr 2015	n.a.	–			**Sharks:** Maldives has developed the NPOA-Sharks with the assistance of Bay of Bengal Large Marine Ecosystem (BoBLME) Project. A stakeholder consultation for the NPOA-Sharks was held in April of 2014. The NPOA-Sharks is in the finalization process and is expected to be published in November of 2014. The longline logbooks ensure the collection of shark bycatch data to genus level. Maldives would be reporting on shark bycatch to the appropriate technical Working Party meetings of IOTC. **Seabirds:** Article 12 of IPOA states that if a 'problem exists' CPCs adopt an NPOA. IOTC Resolution 05/09 suggests CPCs to report on seabirds to the IOTC Scientific Committee if the issue is appropriate'. Maldives considers that seabirds are not an issue in the Maldives fisheries, both in the pole-and-line fishery and in the longline fishery. The new longline fishing regulations has provision on mitigation measures on seabird bycatch. **Marine turtles:** Longline regulation has provisions to reduce marine turtle bycatch. The regulation urges longline vessels to have dehookers for removal of hook and a line cutter on board, to release the caught marine turtles as prescribed in Resolution 12/04.
Mauritius							**Sharks:** Mauritius does not issue national or foreign fishing licence to vessels targeting sharks in its Exclusive Economic Zone. Mauritius have submitted an abbreviated NPOA sharks. **Seabirds:** Mauritius does not have national vessels operating beyond 25^0S. However, fishing companies have been requested to implement all mitigation measures as provided in the IOTC Resolutions. **Marine turtles:** Mauritius does not have national boats operating outside its EEZ. Moreover, marine turtles are protected by the national law. Fishing companies have been **requested** to carry line cutters and de-hookers in order to facilitate the appropriate handling and prompt release of marine turtles caught or entangled.

Mozambique		–		–			**Sharks**: Drafting of new legislation is in progress which considers the issues of shark conservation in licensing requirements. The SWIOFish project within the framework of the implementation of the Linefish Management Plan is going to finance the NPOA shark from 2015. Moreover, Mozambique has developed in 2014, the Terms and Conditions of Licensing for tuna fishing to be attached to fishing license. These contain all the measures for the conservation and management of tuna fisheries and include the aspects related to conservation of sharks, seabirds and marine turtles. **Seabirds**: Mozambique is regularly briefing the Masters of their fishing vessels on the mandatory requirement to report any seabird interaction with longliner fleet. **Marine turtles**: see above.
Oman, Sultanate of							**Sharks:** No information received by the Secretariat. **Seabirds:** No information received by the Secretariat. **Marine turtles:** No information received by the Secretariat.
Pakistan							**Sharks:** Sharks are landed with the fins attached and each and every part of the body of sharks are utilised. A workshop on "Conservation and Management of Sharks was conducted on 15th September 2014. As per recommendations of the workshop, there is still a need for collection and synthesis of more compatible data to prepare Shark Assessment Report (SAR) / draft NPOA. PLAN: (i) October, 2014 to March 2015: Collection and synthesis of additional data. (ii) April, 2015 to June 2015: Preparation of SAR and draft NPOA. Circulation of draft NPOA to concerned stakeholders for comments. (iii) July, 2015 to September 2015: Holding workshop, presentations of draft NPOA / comments, recommendations and adoption of NPOA. **Seabirds:** Pakistan considers that seabird interactions are not a problem for Pakistani fishing fleet as our tuna fishing operations do not include longline vessels. **Marine turtles:** Pakistan has already framed Regulations regarding the prohibition of catching and retaining marine turtles. As regards to the reduction of marine turtle bycatch by gillnetters; presently Marine Fisheries Department (MFD) in collaboration with International Union for Conservation of Nature (IUCN) Pakistan, is undertaking an assessment. Stakeholder Coordination Committee Meeting was conducted on 10th September 2014. The "Turtle Assessment Report (TAR)" will be finalized by February 2015 and necessary guidelines / action plan will be finalized by June 2015. As per clause-5 (c) of Pakistan Fish Inspection & Quality Control Act, 1997, "Aquatic turtles, tortoises, snakes, mammals including dugongs, dolphins, porpoises and whales etc" are totally forbidden for export and domestic consumption.
Philippines		Sept. 2009		–			**Sharks:** Under periodic review. **Seabirds:** Development has not begun. No seabird interactions recorded. **Marine turtles:** No information received by the Secretariat.
Seychelles, Republic of		Apr-2007		–			**Sharks:** NPOA-sharks to currently being reviewed and a new NPOA is being developed for 2016-19. **Seabirds:** Development has not begun. The industrial longline fleet of Seychelles has been instructed to conform with the requirements of Res. 12/06. **Marine turtles:** No plan developed as the moment.

Sierra Leone							**Sharks:** No information received by the Secretariat. **Seabirds:** No information received by the Secretariat. **Marine turtles:** No information received by the Secretariat.
Somalia							**Sharks:** Somalia is currently revising its fisheries legislation (current one being from 1985) and will consider the development of NPOAs as part of this revision process. **Seabirds:** See above. **Marine turtles:** See above.
Sri Lanka			n.a. (provisional)				**Sharks:** An NPOA-sharks has been finalized and is currently being implemented. The Department of Wildlife Conservation in Sri Lanka, have submitted a proposal to list all thresher shark species under CITES Appendix II at CoP 17 next year. **Seabirds:** Sri Lanka has determined that seabird interactions are not a problem for their fleets. However a formal review has not yet taken place which the WPEB and SC have approved. **Marine turtles:** Marine turtles are legally protected in Sri Lanka. In the longline fishery only circle hooks are used (J-hooks are banned). Gillnets longer than 2.5 km are now prohibited in domestic legislation on the high-seas. Reporting of bycatch is facilitated via logbooks reserving a separated box. Under the high seas fishing regulations it is made mandatory to take dehookers and a line cutter on board, to release the caught marine turtles.
Sudan							**Sharks:** No information received by the Secretariat. **Seabirds:** No information received by the Secretariat. **Marine turtles:** No information received by the Secretariat.
Tanzania, United Republic of		–		–			**Sharks:** Initial discussions have commenced. **Seabirds:** Initial discussions have commenced. Note: Terms and conditions related to protected sharks and seabirds contained within fishing licenses. **Marine turtles:** No information received by the Secretariat.
Thailand		23-Nov-2005		–			**Sharks:** Second NPOA-sharks currently being drafted. **Seabirds:** Development has not begun. **Marine turtles:** Not yet implemented.
United Kingdom	n.a.	–	n.a.	–		–	British Indian Ocean Territory (Chagos Archipelago) waters are a Marine Protected Area closed to fishing except recreational fishing in the 3nm territorial waters around Diego Garcia. Separate NPOAs have not been developed within this context. **Sharks/Seabirds:** For sharks, UK is the 24th signatory to the Convention on Migratory Species 'Memorandum of Understanding on the Conservation of Migratory Sharks' which extends the agreement to UK Overseas Territories including British Indian Ocean Territories; Section 7 (10) (e) of the *Fisheries (Conservation and Management) Ordinance* refers to recreational fishing and requires sharks to be released alive. No seabirds are caught in the recreational fishery. **Marine turtles:** No marine turtles are captured in the recreational fishery. A monitoring programme is taking place to assess the marine turtle population in UK (OT).

Vanuatu		Aug 2014					**Sharks:** Commenced in August 2014. **Seabirds:** No information received by the Secretariat. **Marine turtles:** No information received by the Secretariat.
Yemen							**Sharks:** No information received by the Secretariat. **Seabirds:** No information received by the Secretariat. **Marine turtles:** No information received by the Secretariat.
COOPERATING NON-CONTRACTING PARTIES							
Bangladesh							**Sharks:** No information received by the Secretariat. **Seabirds:** No information received by the Secretariat. **Marine turtles:** No information received by the Secretariat.
Djibouti							**Sharks:** No information received by the Secretariat. **Seabirds:** No information received by the Secretariat. **Marine turtles:** No information received by the Secretariat.
Liberia							**Sharks:** No information received by the Secretariat. **Seabirds:** No information received by the Secretariat. **Marine turtles:** No information received by the Secretariat.
Senegal		25-Sept-2006		–			**Sharks:** The Sub-Regional Fisheries Commission supported the development of a NPOA-sharks for Senegal in 2005. Other activities conducted include the organization of consultations with industry, the investigation of shark biology and social -economics of shark fisheries). The NPOA is currently being revised. Consideration is being made to the inclusion of minimum mesh size, minimum shark size, and a ban on shark finning. **Seabirds:** The need for a NPOA-seabirds has not yet been assessed. **Marine turtles:** No information received by the Secretariat.
South Africa, Republic of		–		2008			**Sharks:** The gazetting of the draft NPOA-sharks for public comment has been approved by the Minister of the Department of Agriculture, Forestry and Fisheries (6 July 2012). **Seabirds:** Published in August 2008 and fully implemented. The NPOA-seabirds has been earmarked for review. **Marine turtles:** South Africa recently gazetted Large Pelagic Longline Policy also makes mention of the conservation of marine turtles: "12.2 Live turtles should be released according to the instructions provided in the permit conditions. Remove the hook either with a de-hooker or cut the line as close to the hook as possible." South Africa has also begun drafting a Biodiversity Management Plan for the 5 turtle species that occur in South African waters, and includes bycatch mitigation. The first draft will be available in August 2016.

Colour key	
Completed	
Drafting being finalised	
Drafting commenced	
Not begun	

APPENDIX VI
CANDIDATE PERFORMANCE STATISTICS AND TYPES OF MANAGEMENT OBJECTIVES FOR THE EVALUATION OF MANAGEMENT PROCEDURES

Candidate performance statistics	Performance measure/s	Summary statistic
Status: maximize probability of maintaining stock in the Kobe green zone		
Mean spawner biomass relative to unfished	SB/SB_0	Geometric mean over years
Minimum spawner biomass relative to unfished	SB/SB_0	Minimum over years
Mean spawner biomass relative to B_{MSY}	SB/SB_{MSY}	Geometric mean over years
Mean fishing mortality relative to target	F/F_{targ}	Geometric mean over years
Mean fishing mortality relative to F_{MSY}	F/F_{MSY}	Geometric mean over years
Probability of being in Kobe green quadrant	SB, F	Proportion of years that $SB \geq SB_{targ}$ & $F \leq F_{targ}$
Probability of being in Kobe red quadrant	SB, F	Proportion of years that $SB < SB_{targ}$ & $F > F_{targ}$
Safety: maximize the probability of the stock remaining above the biomass limit		
Probability that spawner biomass is above 20% of SB_0	SB	Proportion of years that $SB > 0.2SB_0$
Yield: maximize catches across regions and gears		
Mean catch	C	Mean over years
Mean catch by region and/or gear	C	Mean over years
Mean proportion of MSY	C/MSY	Mean over years
Abundance: maximize catch rates to enhance fishery profitability		
Mean catch rates by region and gear	A	Geometric mean over years
Stability: maximise stability in catches to reduce commercial uncertainty		
Mean absolute proportional change in catch	C	Mean over years of absolute (C_t / C_{t-1})
Variance in catch	C	Variance over years
Variance in fishing mortality	F	Variance over years
Probability of fishery shutdown	C	Proportion of years that C = 0

Note: All the candidate performance statistics are summarised using the XX^{th} percentiles (e.g. XX=5/10/50) of their distributions over multiple stochastic realisations. The summary will include short and long-term time windows (e.g. 1, 3, 5, 10 and 20 years).

APPENDIX VII
LIST OF CHAIRS, VICE-CHAIRS AND THEIR RESPECTIVE TERMS FOR ALL IOTC SCIENCE BODIES

Group	Chair/Vice-Chair	Chair	CPC/Affiliation	1st Term commencement date	Term expiration date (End date is until replacement is elected)	Comments
SC	Chair	Dr Hilario Murua	EU,Spain	27–Dec–15	End of SC in 2017	1st term
	Vice-Chair	Dr Shiham Adam	Maldives	27–Dec–15	End of SC in 2017	1st term
WPB	Chair	Dr Tsutomu Nishida	Japan	05–Sept–15	End of WPB in 2017	1st term
	Vice-Chair	Dr Evgeny Romanov	EU,France	05–Sep–15	End of WPB in 2017	1st term
WPTmT	Chair	Dr Zang Geun Kim	Korea, Rep. of	22–Sep–11	End of WPTmT in 2016	2nd term
	Vice-Chair	Dr Takayuki Matsumoto	Japan	06–Sep–12	End of WPTmT in 2016	2nd term
WPTT	Chair	Dr Shiham Adam	Maldives	19–Nov–14	End of WPTT in 2016	1st term
	Vice-Chair	Dr Gorka Merino	EU,Spain	19–Nov–14	End of WPTT in 2016	1st term
WPEB	Chair	Dr Rui Coelho	EU,Portugal	16–Sept–13	End of WPEB in 2017	2nd term
	Vice-Chair	Dr Reza Sharifar; Dr Ross Wanless	I.R. Iran / South Africa	11–Sept–15	End of WPEB in 2017	1st term
WPNT	Chair	Dr Farhad Kaymaram	I.R. Iran	29–May–15	End of WPNT in 2017	1st term
	Vice-Chair	Dr Mathias Igulu	Tanzania	29–May–15	End of WPNT in 2017	1st term
WPDCS	Chair	Dr Emmanuel Chassot	EU,France	02–Dec–14	End of WPDCS in 2017	2nd term
	Vice-Chair	Mr Stephen Ndegwa	Kenya	22–Oct–15	End of WPDCS in 2016	1st term
WPM	Chair	Dr Toshihide Kitakado	Japan	21–Oct–15	End of WPM in 2017	1st term
	Vice-Chair	Dr Iago Mosqueira	EU,Spain	21–Oct–15	End of WPM in 2017	1st term

APPENDIX VIII
EXECUTIVE SUMMARY: ALBACORE

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

Status of the Indian Ocean albacore (ALB: *Thunnus alalunga*) resource

TABLE 1. Albacore: Status of albacore (*Thunnus alalunga*) in the Indian Ocean.

Area[1]	**Indicators – 2014 assessment**			**2015 stock status determination**
				2012[2]
Indian Ocean		SS3	ASPIC	
	Catch 2014:	40,981 t	40,981 t	
	Average catch 2010–2014:	38,181 t	38,181 t	
	MSY (1,000 t) (80% CI):	47.6 (26.7–78.8)	34.7 (28.8–37.4)	
	F_{MSY} (80% CI):	0.31 (0.21–0.42)	0.50 (n.a.)	
	SB_{MSY} (1,000 t) (80% CI):	39.2 (25.4–50.7)	68.6 (n.a.)*	
	F_{2012}/F_{MSY} (80% CI):	0.69 (0.23–1.39)	0.94 (0.68–1.61)	
	SB_{2012}/SB_{MSY} (80% CI):	1.09 (0.34–2.20)	1.05 (0.73–1.35)*	
	SB_{2012}/SB_{1950} (80% CI):	0.21 (0.11–0.33)	0.43 (n.a.)*	

[1]Boundaries for the Indian Ocean stock assessment are defined as the IOTC area of competence.
[2]The stock status refers to the most recent years' data used for the assessment, in this case 2012.
*Total exploitable Biomass (B)

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. Trends in the Taiwan,China CPUE series suggest that the longline vulnerable biomass has declined to about 47% of the level observed in 1980–82. There were 20 years of moderate fishing before 1980, and the catch has more than doubled since 1980. Catches have increased substantially since 2007, attributed to the Indonesian and Taiwan,China longline fisheries although there is substantial uncertainty remaining on the catch estimates. It is considered that recent catches have been above the MSY level for one of the models (ASPIC) examined and approaching MSY levels for the other model (SS3). Fishing mortality represented as F_{2012}/F_{MSY} is between 0.70 (Median: SS3) and 0.94 (Point estimate: ASPIC). Biomass is considered to be at or very near to the SB_{MSY} level ($SB_{2012}/SB_{MSY} = 1.09$) from the SS3 model, and also for the B_{MSY} level ($B_{2012}/B_{MSY} = 1.05$) from the ASPIC model (Table 1, Fig. 1). Thus, stock status in relation to the Commission's B_{MSY} and F_{MSY} target reference points indicates that the stock is **not overfished** and **not subject to overfishing** (Table 1), although considerable uncertainty remains in the SS3 and ASPIC assessments, indicating that a precautionary approach to the management of albacore should be applied by reducing fishing mortality or capping total catch levels to 34,000 t.

Outlook. Maintaining or increasing effort in the core albacore fishing grounds is likely to result in further declines in albacore biomass, productivity and CPUE. The impacts of piracy in the western Indian Ocean has resulted in the displacement of a substantial portion of longline fishing effort into the traditional albacore fishing areas in the southern and eastern Indian Ocean. It is therefore unlikely that catch and effort on albacore will decline in the near future unless management action is taken. There is a high risk of exceeding MSY-based reference points by 2015 if catches increase further (above 2012 levels) (50% risk that $SB_{2015} < SB_{MSY}$, and 39% risk that $F_{2015} > F_{MSY}$ (Table 2).

The following should be noted:

- **Maximum Sustainable Yield (MSY)**: Current catches (40,981 t in 2014; 33,671 t in 2013) are below the current estimated MSY levels from both models (Table 1). However, maintaining or increasing effort will likely result in further declines in biomass, productivity and CPUE.
- The available evidence indicates considerable risk to the stock status at current effort levels.

- The two primary sources of data that drive the assessment, total catches and CPUE are highly uncertain and should be investigated further as a priority.
- The use of aggregated data versus fine-scale operational data in the CPUE standardisations by the main fleet (Taiwan,China) introduces substantial uncertainty.
- The preliminary catch estimates for 2013, as of 2014 WPTmT05 meeting (~43,000 t) are one of the highest catches on record, and may be a cause for concern for the long-term sustainability of the stock if it remains at these levels. Note, a preliminary ASPIC analysis accounting for the larger catches in 2013 indicated no change in stock status from 2012.
- In 2014 the IOTC Secretariat raised questions on the preliminary 2013 catches of albacore submitted by Indonesia (at around 16,000 t – the highest catches recorded) compared to alternative information, including data from exports and purchasing supply chains collected by ISSF participating companies. Following discussions with Indonesia, final catches for 2013 were submitted by Indonesia in December 2014 to around 6,000 t).
- A Kobe 2 Strategy matrix was calculated to quantify the risk of different future catch scenarios, using the projections from the SS3 model (Table 2). The projections indicated that there is a 50% chance of violating the biomass based reference point by 2015 if catches are maintain or increased up to 20% (i.e. below SB_{MSY}) (Table 2).
- **Provisional reference points:** Noting that the Commission in 2013 adopted Resolution 13/10 to *On interim target and limit reference points and a decision framework*, the following should be noted:
  - **Fishing mortality**: Current fishing mortality is considered to be below the provisional target reference point of F_{MSY}, and the provisional limit reference point of $1.4*F_{MSY}$ (Fig. 1).
  - **Biomass**: Current spawning biomass is considered to be near the target reference point of SB_{MSY}, and therefore above the limit reference point of $0.4*SB_{MSY}$ (Fig. 1).
- **Main fishing gear** (2009–13): Longline ≈93% (fresh ≈56.4%, Frozen ≈36.6%).
- **Main fleets**: Taiwan,China ≈36%; Indonesia ≈32%; Japan ≈9%; China ≈7%.

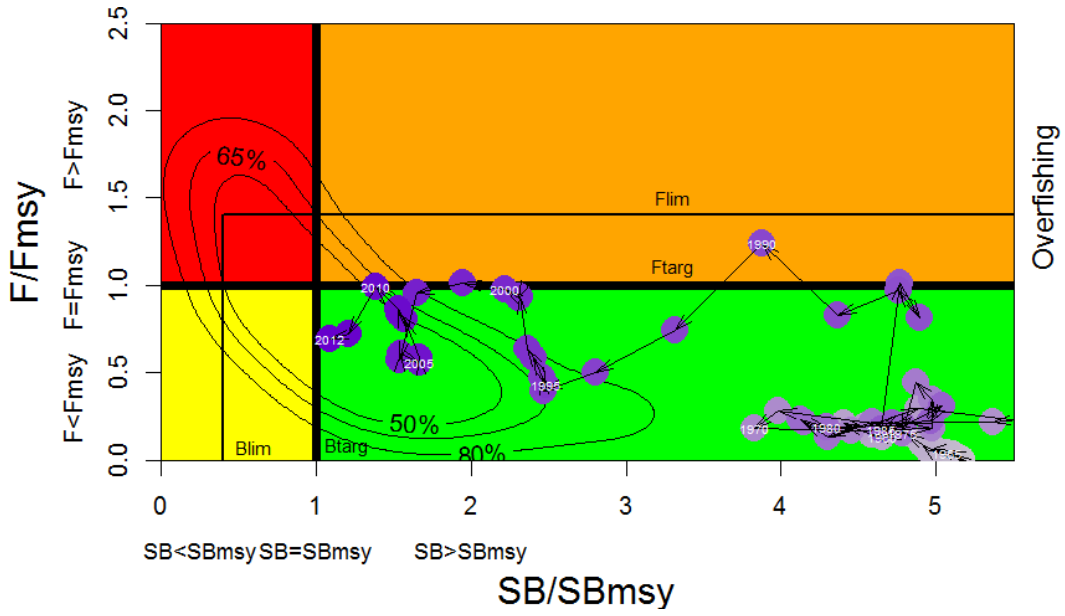


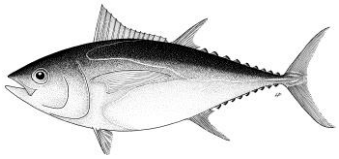
Fig. 1. Albacore: SS3 Aggregated Indian Ocean assessment Kobe plot (contours are the 50, 65 and 80 percentiles of the 2012 grid runs). Blue circles indicate the trajectory of the point estimates for the SB ratio and F ratio for each year 1950–2012. Target (Ftarg and SBtarg) and limit (Flim and SBlim) reference points are shown.

TABLE 2. Albacore: SS3 aggregated Indian Ocean assessment Kobe II Strategy Matrix. Probability (percentage) of violating the MSY-based target (top) and limit (bottom) reference points for nine constant catch projections (average catch level from 2011–013, ± 10%, ± 20%, ± 30% ± 40%) projected for 3 and 10 years.

Reference point and projection timeframe	**Alternative catch projections (relative to the average catch level from 2011–13) and probability (%) of violating MSY-based target reference points ($SB_{targ} = SB_{MSY}$; $F_{targ} = F_{MSY}$)**								
	60% (22,084 t)	**70%** (25,764 t)	**80%** (29,445 t)	**90%** (33,125 t)	**100%** (36,806 t)	**110%** (40,487 t)	**120%** (44,167 t)	**130%** (47,848 t)	**140%** (51,528 t)
$SB_{2015} < SB_{MSY}$	31	33	39	42	50	50	50	53	61
$F_{2015} > F_{MSY}$	11	19	22	36	39	44	50	53	56
$SB_{2022} < SB_{MSY}$	11	19	22	33	39	44	47	53	56
$F_{2022} > F_{MSY}$	6	11	22	31	36	44	47	53	56
Reference point and projection timeframe	**Alternative catch projections (relative to the average catch level from 2011–13) and probability (%) of violating MSY-based limit reference points ($SB_{lim} = 0.4\ B_{MSY}$; $F_{Lim} = 1.4\ F_{MSY}$)**								
	60% (22,084 t)	**70%** (25,764 t)	**80%** (29,445 t)	**90%** (33,125 t)	**100%** (36,806 t)	**110%** (40,487 t)	**120%** (44,167 t)	**130%** (47,848 t)	**140%** (51,528 t)
$SB_{2015} < SB_{Lim}$	0	0	6	8	17	22	28	33	33
$F_{2015} > F_{Lim}$	0	6	14	19	25	31	39	42	44
$SB_{2022} < SB_{Lim}$	0	6	14	19	28	33	36	42	47
$F_{2022} > F_{Lim}$	0	6	14	22	31	36	42	44	50

APPENDIX IX
EXECUTIVE SUMMARY: BIGEYE TUNA

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



Status of the Indian Ocean bigeye tuna (BET: *Thunnus obesus*) resource

TABLE 1. Bigeye tuna: Status of bigeye tuna (*Thunnus obesus*) in the Indian Ocean.

Area[1]	Indicators		2015 stock status[2] determination
Indian Ocean	Catch in 2014: Average catch 2010–2014:	100,231 t 102,214 t	
	MSY (1,000 t) (plausible range): F_{MSY} (plausible range): SB_{MSY} (1,000 t) (plausible range): F_{2012}/F_{MSY} (plausible range): SB_{2012}/SB_{MSY} (plausible range): SB_{2012}/SB_0 (plausible range):	132 (98–207)[3] n.a. (n.a.–n.a.)[3] 474 (295–677)[3] 0.42 (0.21–0.80)[3] 1.44 (0.87–2.22)[3] 0.40 (0.27–0.54)[3]	

[1]Boundaries for the Indian Ocean stock assessment are defined as the IOTC area of competence.
[2]The stock status refers to the most recent years' data used in the SS3 assessment.
[3]The point estimate is the median of the plausible models investigated in the 2013 SS3 assessment.

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 new stock assessment was carried out for bigeye tuna in 2014 or 2015, thus, stock status is determined on the basis of the 2013 SS3 assessment and other indicators presented in 2015. The 2013 stock assessment model results did not differ substantively from the previous (2010 and 2011) assessments; however, the final overall estimates of stock status differ somewhat due to the revision of the catch history and updated standardised CPUE indices. All the runs (except 2 extremes) carried out in 2013 indicate the stock is above a biomass level that would produce MSY in the long term (i.e. $SB_{2012}/SB_{MSY} > 1$) and in all runs that current fishing mortality is below the MSY-based reference level (i.e. $F_{2012}/F_{MSY} < 1$) (Table 1 and Fig. 1). The median value of MSY from the model runs investigated was 132,000 t with a range between 98,000 and 207,000 t. Current spawning stock biomass was estimated to be 40% (Table 1) of the unfished levels. Catches in 2013 (≈109,000 t) remain lower than the estimated MSY values from the 2013 stock assessments (Table 1). The average catch over the previous five years (2010–14; ≈102,000 t) also remains below the estimated MSY. In 2012 catch levels (≈120,000 t) of bigeye tuna increased markedly (≈29% over values in 2011: ≈92,000 t), but have declined to ≈102,000 t in 2014. Thus, on the weight-of-evidence available in 2015, the bigeye tuna stock is determined to be **not overfished** and is **not subject to overfishing** (Table 1).

Outlook. Declines in longline effort since 2007, particularly from the Japanese, Taiwan,China and Rep. of Korea longline fleets, as well as purse seine effort have lowered the pressure on the Indian Ocean bigeye tuna stock, indicating that current fishing mortality would not reduce the population to an overfished state in the near future. The Kobe strategy matrix based on all plausible model runs from SS3 in 2013 illustrates the levels of risk associated with varying catch levels over time and could be used to inform future management actions (Table 2). The SS3 projections from the 2013 assessment show that there is a low risk of exceeding MSY-based reference points by 2015 and 2022 if catches are maintained at catch levels of 115,800 t at the time of the last assessment (0% risk that $B_{2022} < B_{MSY}$ and 0% risk that $F_{2022} > F_{MSY}$) (Table 2).

Management advice. If catch remains below the estimated MSY levels, then immediate management measures are not required. However, continued monitoring and improvement in data collection, reporting and analysis is required to reduce the uncertainty in assessments.

The following key points should also be noted:

- **Maximum Sustainable Yield (MSY)**: The median value of MSY from the model runs investigated was 132,000 t with a range between 98,000 and 207,000 t (range expressed as the different runs of SS3 done in 2013 using steepness values of 0.7, 0.8 and 0.9; different natural mortality values; and catchability increase for longline CPUE) (see Table 1 for further description). Current stock size is above SB_{MSY} and predicted to increase on the short term. Catches at the level of 132,000 t have a low probability of reducing the stock below SB_{MSY} in the short term (3–5 years) and medium term (10 years). Therefore, the annual catches of bigeye tuna should not exceed the median value of MSY. However, for lower productivity model options, catches at the median MSY level will reduce stock biomass over the long-term (10–15 years).
- **Interim reference points**: Noting that the Commission has agreed to Resolution 15/10 *on target and limit reference points and a decision framework*, the following should be noted:
  - **Fishing mortality**: Current fishing mortality is considered to be below the interim target reference point of F_{MSY}, and therefore below the interim limit reference point of $1.4*F_{MSY}$ (Fig. 1).
  - **Biomass**: Current spawning biomass is considered to be above the interim target reference point of SB_{MSY}, and therefore above the interim limit reference point of $0.4*SB_{MSY}$ (Fig. 1).
- **Main fishing gear** (Average catch 2011–14): Longline ≈56.0% (frozen ≈43.5%, fresh ≈12.5%); Purse seine ≈21.2% (FAD associated school ≈16.1%; free swimming school ≈5.1%); Line other ≈9.6%; Other ≈6.8%.
- **Main fleets** (Average catch 2011–14): Indonesia ≈27%; Taiwan,China ≈22%; European Union ≈16% (EU,Spain: ≈10%; EU,France: ≈6%); Seychelles ≈11; Japan ≈5%; All other fleets ≈19%.

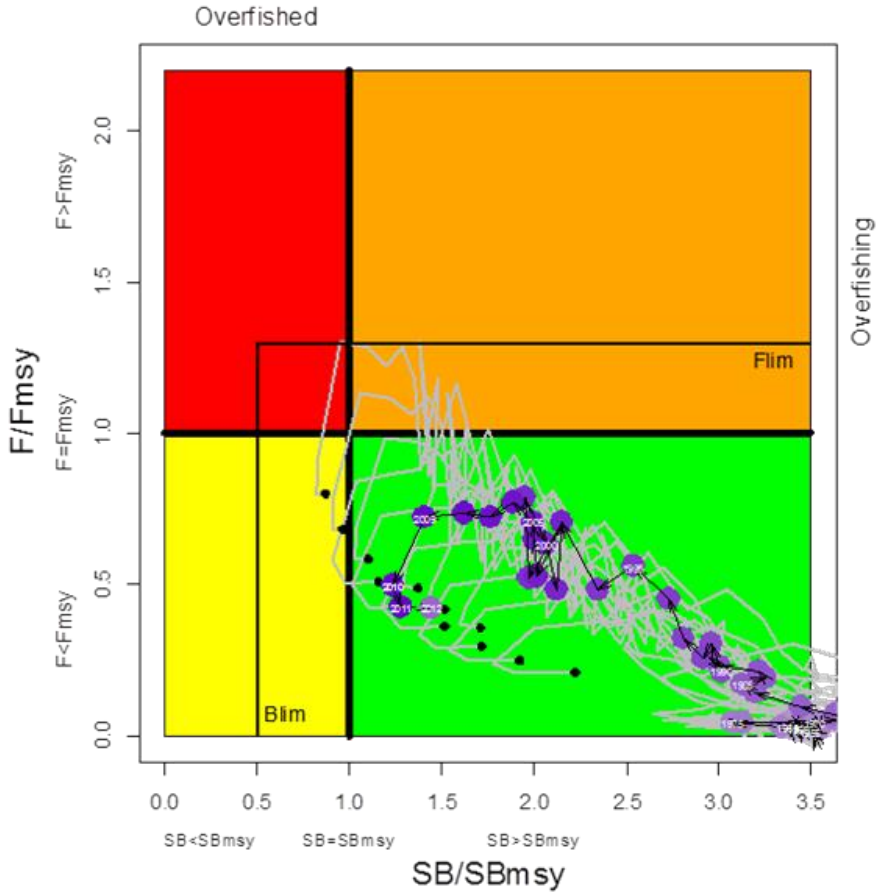


Fig. 1. Bigeye tuna: SS3 Aggregated Indian Ocean assessment Kobe plot. The Kobe plot presents the trajectories for the range of 12 plausible model options included in the formulation of the final management advice (grey lines with the black point representing the terminal year of 2012). The trajectory of the median of the 12 plausible model options (purple points) is also presented. The biomass (B_{lim}) and fishing mortality limit (F_{lim}) reference points are also presented.

Table 2. Bigeye tuna: 2013 SS3 aggregated Indian Ocean assessment Kobe II Strategy Matrix. Probability (percentage) of weighted distribution of models violating the MSY-based reference points for five constant catch projections (2012 catch level, ± 10%, ± 20%, ± 30% and ± 40%) projected for 3 and 10 years. Note: from the 2013 stock assessment using catch estimates at that time.

Reference point and projection timeframe	**Alternative catch projections (relative to the average catch level for 2012) and probability (%) of violating MSY-based target reference points ($SB_{targ} = SB_{MSY}$; $F_{targ} = F_{MSY}$)**								
	60% (69,480 t)	**70%** (81,060 t)	**80%** (92,640 t)	**90%** (104,220 t)	**100%** (115,800 t)	**110%** (127,400 t)	**120%** (139,000 t)	**130%** (150,500 t)	**140%** (162,100 t)
$SB_{2015} < SB_{MSY}$	n.a.	n.a.	n.a.	n.a.	0	0	0	0	0
$F_{2015} > F_{MSY}$	n.a.	n.a.	n.a.	n.a.	0	0	0	8	17
$SB_{2022} < SB_{MSY}$	n.a.	n.a.	n.a.	n.a.	0	0	8	17	25
$F_{2022} > F_{MSY}$	n.a.	n.a.	n.a.	n.a.	0	0	8	17	25
Reference point and projection timeframe	**Alternative catch projections (relative to the average catch level for 2012) and probability (%) of violating MSY-based limit reference points ($SB_{lim} = 0.5\ SB_{MSY}$; $F_{Lim} = 1.3\ F_{MSY}$)**								
	60% (69,480 t)	**70%** (81,060 t)	**80%** (92,640 t)	**90%** (104,220 t)	**100%** (115,800 t)	**110%** (127,400 t)	**120%** (139,000 t)	**130%** (150,500 t)	**140%** (162,100 t)
$SB_{2016} < SB_{Lim}$	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
$F_{2016} > F_{Lim}$	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
$SB_{2023} < SB_{Lim}$	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
$F_{2023} > F_{Lim}$	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

APPENDIX X
EXECUTIVE SUMMARY: SKIPJACK TUNA

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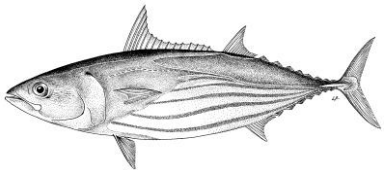

Status of the Indian Ocean skipjack tuna (SKJ: *Katsuwonus pelamis*) resource

TABLE 1. Skipjack tuna: Status of skipjack tuna (*Katsuwonus pelamis*) in the Indian Ocean.

Area[1]	Indicators		2015 stock status determination
Indian Ocean	Catch 2014: Average catch 2010–2014:	432,467 t 402,229 t	
	MSY (1,000 t) (80% CI): F_{MSY} (80% CI): SB_{MSY} (1,000 t) (80% CI): C_{2013}/C_{MSY} (80% CI): SB_{2013}/SB_{MSY} (80% CI): SB_{2013}/SB_0 (80% CI):	684 (550–849) 0.65 (0.51–0.79) 875 (708–1,075) 0.62 (0.49–0.75) 1.59 (1.13–2.14) 0.58 (0.53–0.62)	

[1]Boundaries for the Indian Ocean stock assessment are defined as the IOTC area of competence.

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 new stock assessment was carried out for skipjack tuna in 2015, thus, stock status is determined on the basis of the 2014 SS3 assessment and other indicators presented in 2015. The 2014 stock assessment model results did not differ substantively from the previous (2012 and 2011) assessments; however, the final overall estimates of stock status differ somewhat due to the revision of the input parameters and updated standardised CPUE indices. All the runs carried out in 2014 indicate the stock is above a biomass level that would produce MSY in the long term (i.e. $SB_{2013}/SB_{MSY} > 1$) and in all runs that the current proxy for fishing mortality is below the MSY-based reference level (i.e. $C_{current}/C_{MSY} < 1$) (Table 1 and Fig. 1). The median value of MSY from the model runs investigated was 684,000 t with a range between 550,000 and 849,000 t. Current spawning stock biomass was estimated to be 57% (Table 1) of the unfished levels. Catches in 2014 (≈432,500 t) remain lower than the estimated MSY values from the 2014 stock assessments (Table 1). The average catch over the previous five years (2010–14; ≈402,000 t) also remains below the estimated MSY. Thus, on the weight-of-evidence available in 2014, the skipjack tuna stock is determined to be **not overfished** and is **not subject to overfishing** (Table 1).

Outlook. The recent declines in catch/sets on FADs (in parallel to the increased number of FADs deployed by the purse seine fleet) as well as the large decrease on free school skipjack tuna are thought to be of some concern as the WPTT does not fully understand the cause of those declines. There remains considerable uncertainty in the assessment, and the range of runs analysed illustrate a range of stock status to be between 0.73–4.31 of SB_{2013}/SB_{MSY} based on all runs examined. The Kobe strategy matrix illustrates the levels of risk associated with varying catch levels over time and could be used to inform management actions. Based on the SS3 assessment conducted in 2013, there is a low risk of exceeding MSY-based reference points by 2016 and 2023 if catches are maintained at the current levels of ≈425,000 t (< 1 % risk that $B_{2016} < B_{MSY}$ and 1 % risk that C_{2023}>MSY as proxy of $F > F_{MSY}$).

Management advice. If catch remains below the estimated MSY levels, then immediate management measures are not required. However, continued monitoring and improvement in data collection, reporting and analysis is required to reduce the uncertainty in assessments.

The following key points should also be noted:

- Maximum Sustainable Yield (MSY): The median MSY value from the model runs investigated was 684,000 t with a range between ≈550,000 and ≈849,000 t (Table 1); However, MSY reference levels from these models

were not well determined. Historically, catches in excess of 600,000 t were estimated to coincide with the time that the stock fell below 40% of the unfished level, which maybe a more robust proxy for MSY in this case. Considering the average catch level from 2010–2014 was ≈402,000 t, the stock appears to be in no immediate threat of breaching target and limit reference points. Current stock size is above $SB_{40\%}$ and predicted to increase on the short term. Catches at the level of ≈432,500 t have a low probability of reducing the stock below $SB_{40\%}$ in the short term (3–5 years) and medium term (10 years). However, taking into account the uncertainty related to current skipjack assessment as well as other indicators such the low catch rates of FADs and increased effort, it is recommended that annual catches of skipjack tuna should not exceed the lower value of MSY of the range (≈550,000 t) in order to ensure that stock biomass levels could sustain catches at the MSY level in the long term.

- The Kobe strategy matrix (Table 2) illustrates the levels of risk associated with varying catch levels over time and could be used to inform management actions.
- **Interim reference points:** Noting that the Commission in 2015 agreed to Resolution 15/10 *on target and limit reference points and a decision framework*, the following should be noted:
    - **Fishing mortality**: Current fishing mortality is considered to be below the interim target reference point of F_{MSY}, and therefore below the interim limit reference point of $1.5*F_{MSY}$ (Fig. 1). Based on the current assessment there is a very low probability that the interim limit reference points of $1.5*F_{MSY}$ at the current catch levels will be exceeded in 3 or 10 years.
    - **Biomass**: Current spawning biomass is considered to be above the interim target reference point of SB_{MSY}, and therefore above the interim limit reference point of $0.4*SB_{MSY}$ (Fig. 1). Based on the current assessment, there is a low probability that the spawning stock biomass, at the current catch levels, will be below the interim limit reference point of $0.4*SB_{MSY}$ in 3 or 10 years.
- **Main fishing gear** (Average catch 2011–14): Purse seine ≈30.2% (FAD associated school ≈28.7% and free swimming school ≈1.5%); Gillnet ≈26.1%; Pole-and-line ≈20.1%; Other ≈23.6%.
- **Main fleets** (Average catch 2011–14): Indonesia ≈22%; European Union ≈21% (EU,Spain: ≈15%; EU,France: ≈6%); Sri Lanka ≈16%; ≈Maldives 16%; ≈I.R. Iran 7%; Seychelles ≈7%; India ≈7%.

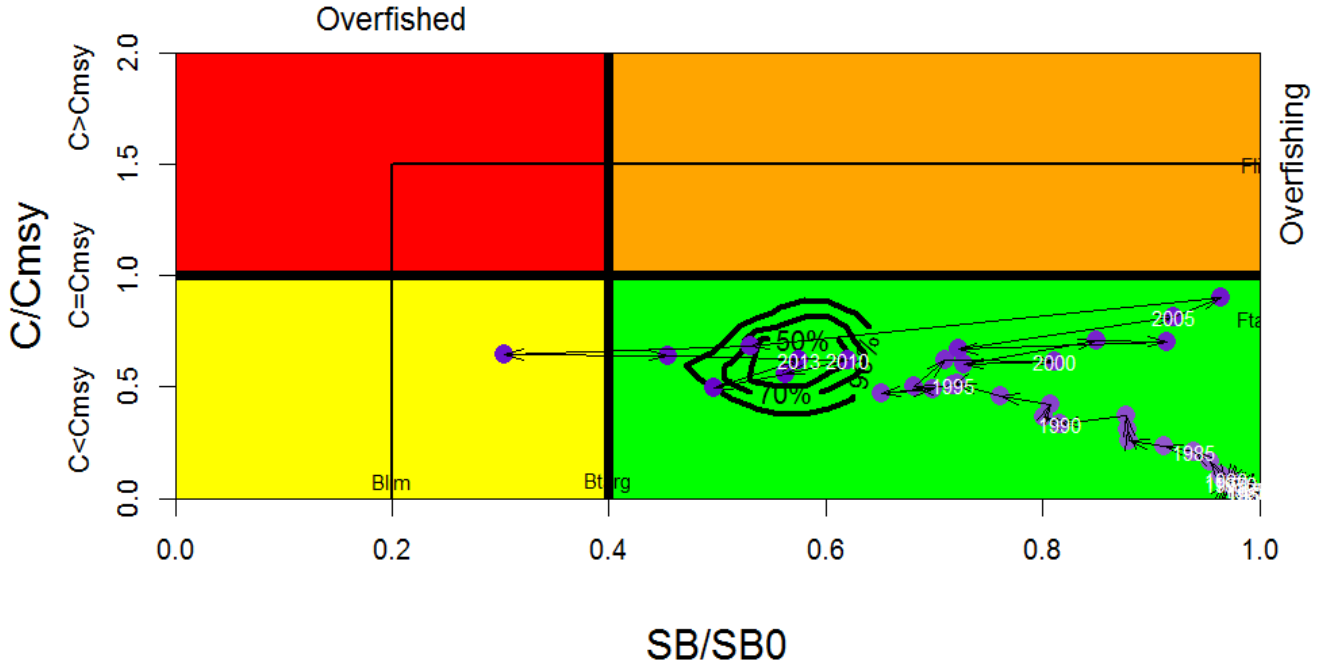

Fig. 1. Skipjack tuna: SS3 Aggregated Indian Ocean assessment Kobe plot (contours are the 50, 70 and 90 percentiles of the 2013 estimate). Blue circles indicate the trajectory of the point estimates for the SB/SB0 ratio and F proxy ratio for each year 1950–2013 estimated as C/C_{MSY}. Interim target (Ftarg and SBtarg) and limit (Flim and SBlim) reference points, are based on 0.4 (0.2) B_0 and $C//C_{MSY}$=1 (1.5) as suggested by WPTT.

TABLE 2. Skipjack tuna: SS3 aggregated Indian Ocean assessment Kobe II Strategy Matrix. Probability (percentage) of violating the MSY-based target (top) and limit (bottom) reference points for nine constant catch projections (average catch level from 2013 (424,580 t), ± 10%, ± 20%, ± 30% ± 40%) projected for 3 and 10 years.

Reference point and projection timeframe	**Alternative catch projections (relative to the average catch level from 2013) and probability (%) of violating MSY-based target reference points (SB_{targ} = SB_{MSY}; F_{targ} = F_{MSY})**								
	60% (254,748 t)	**70%** (297,206 t)	**80%** (339,664 t)	**90%** (382,122 t)	**100%** (424,580 t)	**110%** (467,038 t)	**120%** (509,496 t)	**130%** (551,954 t)	**140%** (594,412 t)
$SB_{2016} < SB_{MSY}$	0	n.a.	1	n.a.	1	n.a.	1	n.a.	9
$F_{2016} > F_{MSY}$	0	n.a.	1	n.a.	1	n.a.	5	n.a.	12
$SB_{2023} < SB_{MSY}$	0	n.a.	1	n.a.	1	n.a.	6	n.a.	25
$F_{2023} > F_{MSY}$	0	n.a.	1	n.a.	1	n.a.	5	n.a.	20

Reference point and projection timeframe	**Alternative catch projections (relative to the average catch level from 2013) and probability (%) of violating MSY-based limit reference points (SB_{lim} = 0.4 SB_{MSY}; F_{Lim} = 1.4 F_{MSY})**								
	60% (254,748 t)	**70%** (297,206 t)	**80%** (339,664 t)	**90%** (382,122 t)	**100%** (424,580 t)	**110%** (467,038 t)	**120%** (509,496 t)	**130%** (551,954 t)	**140%** (594,412 t)
$SB_{2016} < SB_{Lim}$	0	n.a.	0	n.a.	0	n.a.	0	n.a.	0
$F_{2016} > F_{Lim}$	1	n.a.	1	n.a.	1	n.a.	1	n.a.	1
$SB_{2023} < SB_{Lim}$	0	n.a.	0	n.a.	0	n.a.	0	n.a.	0
$F_{2023} > F_{Lim}$	0	n.a.	1	n.a.	1	n.a.	1	n.a.	6

APPENDIX XI
EXECUTIVE SUMMARY: YELLOWFIN TUNA

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

Status of the Indian Ocean yellowfin tuna (YFT: *Thunnus albacares*) resource

TABLE 1. Yellowfin tuna: Status of yellowfin tuna (*Thunnus albacares*) in the Indian Ocean.

Area[1]	Indicators		2015 stock status determination
Indian Ocean	Catch 2014: Average catch 2010–2014:	430,327 t 373,824 t	**94%***
	MSY (1000 t) (80% CI): F_{MSY} (80% CI): SB_{MSY} (1,000 t) (80% CI): F_{2014}/F_{MSY} (80% CI): SB_{2014}/SB_{MSY} (80% CI): SB_{2014}/SB_0 (80% CI):	421 (404–439) 0.165 (0.162–0.168) 1,217 (1,165–1,268) 1.34 (1.02–1.67) 0.66 (0.58–0.74) 0.23 (0.21–0.36)	

[1]Boundaries for the Indian Ocean stock assessment are defined as the IOTC area of competence.
*Estimated probability that the stock is in the respective quadrant of the Kobe plot (shown below), derived from the confidence intervals associated with the current stock status (SS3 stock assessment model).

Colour key	Stock overfished ($SB_{year}/SB_{MSY} < 1$)	Stock not overfished ($SB_{year}/SB_{MSY} \geq 1$)
Stock subject to overfishing ($F_{year}/F_{MSY} > 1$)	94%	0%
Stock not subject to overfishing ($F_{year}/F_{MSY} \leq 1$)	6%	0%
Not assessed/Uncertain		

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. In 2015, three models were applied to the yellowfin tuna stock in the IOTC area of competence, a BBPM, SCAA and SS3model, all of which give qualitatively similar results. Stock status is based on the SS3 model formulation. Spawning stock biomass in 2014 was estimated to be 23% (21–36%) of the unfished levels (Table 1) and 66% (58–74%) of the level which can support MSY. The low level of stock biomass in 2014 is consistent with the long-term decline in the primary stock abundance indices (longline CPUE indices) and recent trends are attributable to increased catch levels. Total catch has continued to increase with 430,327 t taken in 2014, up from 407,633 t in 2013 and 400,322 t in 2012, in comparison to 329,184 t landed in 2011, 301,655 in 2010 and 266,848 t landed in 2009. The assessment is more pessimistic than the 2012 assessment due to the increase in catches and the changes in assessment assumptions regarding the recruitment processes. Fishing mortality estimates for 2014 was 34% (2–67%) higher than the corresponding fishing mortality rate that would produce MSY. Thus, on the weight-of-evidence available in 2015, the yellowfin tuna stock is determined to be **overfished** and **subject to overfishing** (Table 1 and Fig. 1).

Outlook. The substantial increase in longline, gillnet, handline and purse seine effort and associated catches in recent years has substantially increased the pressure on the Indian Ocean stock as a whole, with recent fishing mortality exceeding the MSY-related levels. The current assessment estimates that the stock biomass is below the level that will support the MSY. There is a very high risk of continuing to exceed the biomass MSY-based reference point if catches increase further or are maintained at current levels (2014) until 2017 (>99% risk that $SB_{2017} < SB_{MSY}$), and similarly a very high risk that $F_{2017} > F_{MSY}$ (≈100%) (Table 2). The modeled probabilities of the stock achieving levels consistent with the Commission's current management objective (e.g. $SB > SB_{MSY}$) are 50% for a future constant catch at 80% of current catch levels by 2024. Higher probabilities of rebuilding require longer timeframes and/or larger reduction of current catches (Table 2). The K2MSM provides the Commission with a range of options for reducing catches and the probabilities of the yellowfin tuna stock recovering to the MSY target levels (Table 2).

Management advice. The stock status determination changed in 2015 as a direct result of the large and unsustainable catches of yellowfin tuna taken over the last three (3) years, and the relatively low recruitment levels estimated by the model in recent years. The Commission does not currently have any Conservation and Management Measures in place, other than the FAD limitation measure (Resolution 15/08, which is yet to be evaluated) to regulate the fisheries for yellowfin tuna. Projections show that current levels of catch would exacerbate the decline of this stock in the short term. The modelled probabilities of the stock achieving levels consistent with the interim target reference points (i.e. SB >

SB_{MSY} and $F<F_{MSY}$) in 2024 are 50% for a future constant catch at 80% of the catch levels in 2014. If the Commission wishes to recover the stock to levels above the interim target reference points with 50% probability by 2024, the Scientific Committee recommends that catches be reduced by 20% of current levels.

The recovery of this stock should be driven by an agreed Management Procedure, including Harvest Control Rules, and based on the agreed Target Reference Points. This would allow the effectiveness of any management measures implemented to recover the stock of yellowfin tuna to be evaluated. The program of work for the Scientific Committee and Working Party on Methods includes analyses of alternative Management Procedures for yellowfin tuna through Management Strategy Evaluation to be presented to the Commission by 2018, as requested in Resolution 15/10. Given the situation of the stock, the Scientific Committee recommends that the catches and other status indicators for this species should be closely monitored. Improvements in data collection and reporting are required from those fisheries that currently fail to comply with Resolutions 15/01 and 15/02 on data collection and reporting, in order to meet this objective.

The following key points should also be noted:

- **Maximum Sustainable Yield (MSY):** estimate for the whole Indian Ocean is 421,000 t with a range between 404,000–439,000 t for SS3 (Table 1). The average catches (357,000 t) since 2006 were below the MSY level.
- **Interim reference points**: Noting that the Commission in 2015 agreed to Resolution 15/10 *on target and limit reference points and a decision framework*, the following should be noted:
    - **Fishing mortality**: Current fishing mortality is considered to be well above the interim target reference point of F_{MSY}, and under (F_{2014}/F_{MSY} 1.34) the interim limit reference point of $1.4*F_{MSY}$ (Fig. 1).
    - **Biomass**: Current spawning biomass is considered to be well below the interim target reference point of SB_{MSY}, however above the interim limit reference point of $0.4*SB_{MSY}$ (Fig. 1).
- **Main fishing gear** (Average catch 2011–14): Purse seine ≈33.8% (FAD associated school ≈21.7%; free swimming school ≈12.1%); Longline ≈18.7% (frozen ≈4.6%, fresh ≈14.1%); Handline ≈18.6%; Gillnet ≈15.1%; Trolling ≈6.8%; Pole-and-line ≈4.9%; ≈Other 2.1%).
- **Main fleets** (Average catch 2011–14): European Union ≈26% (EU,Spain ≈15%; EU,France ≈11%); Maldives ≈11%; Indonesia ≈10%; I.R. Iran ≈9%; Sri Lanka ≈9%; Yemen ≈8%; India ≈8%.

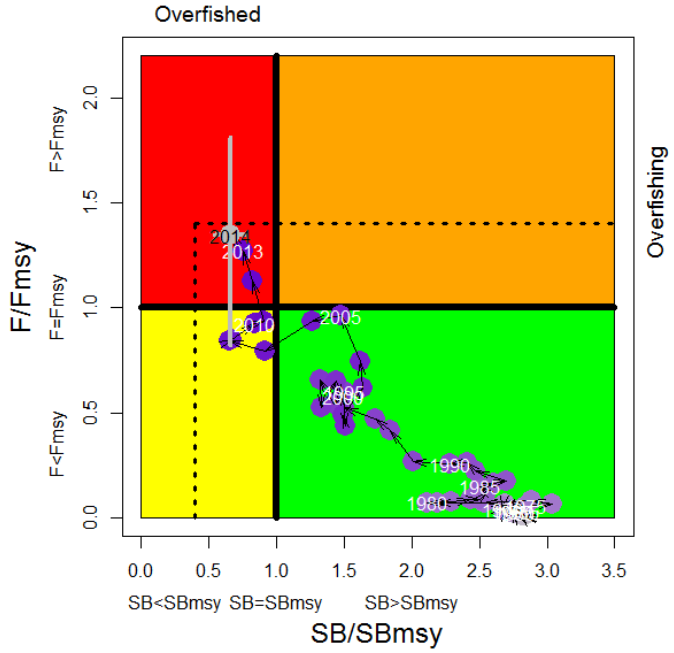

Fig. 1. Yellowfin tuna: SS3 Aggregated Indian Ocean assessment Kobe plot. Blue circles indicate the trajectory of the point estimates for the SB/SB_0 ratio and F proxy ratio for each year 1950–2014 for the base model. The grey lines represent the 95% confidence interval associated with the 2014 stock status. Dotted black lines are the interim limit reference points adopted by the Commission via Resolution 15/10.

Table 2. Yellowfin tuna: SS3 base case aggregated Indian Ocean assessment Kobe II Strategy Matrix. Probability (percentage) of violating the MSY-based target (top) and limit (bottom) reference points for nine constant catch projections (average catch level from 2014 (427,440 t), ± 10%, ± 20%, ± 30% ± 40%) projected for 3 and 10 years.

Reference point and projection timeframe	**Alternative catch projections (relative to the average catch level from 2014) and probability (%) of violating MSY-based target reference points ($SB_{targ} = SB_{MSY}$; $F_{targ} = F_{MSY}$)**								
	60% (256,464t)	**70%** (299,208)	**80%** (341,952t)	**90%** (384,696t)	**100%** (427,440t)	**110%** (470,184t)	**120%** (512,928t)	**130%** (555,672t)	**140%** (598,416)
$SB_{2017} < SB_{MSY}$	69	95	91	99	99	100	100	100	100
$F_{2017} > F_{MSY}$	2	54	60	79	100	100	100	100	100
$SB_{2024} < SB_{MSY}$	4	36	50	100	100	100	100	100	100
$F_{2024} > F_{MSY}$	0	22	49	100	100	100	100	100	100
Reference point and projection timeframe	**Alternative catch projections (relative to the average catch level from 2014) and probability (%) of violating MSY-based limit reference points ($SB_{lim} = 0.4\ SB_{MSY}$; $F_{Lim} = 1.4\ F_{MSY}$)**								
	60% (256,464t)	**70%** (299,208)	**80%** (341,952t)	**90%** (384,696t)	**100%** (427,440t)	**110%** (470,184t)	**120%** (512,928t)	**130%** (555,672t)	**140%** (598,416)
$SB_{2017} < SB_{Lim}$	2	15	12	44	33	n.a.	n.a.	n.a.	n.a.
$F_{2017} > F_{Lim}$	0	13	19	70	100	100	100	100	100
$SB_{2024} < SB_{Lim}$	<1	8	15	51	100	100	100	100	100
$F_{2024} > F_{Lim}$	0	2	21	100	100	100	100	100	100

APPENDIX XII
EXECUTIVE SUMMARY: SWORDFISH

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

Status of the Indian Ocean swordfish (SWO: *Xiphias gladius*) resource

TABLE 1. Swordfish: Status of swordfish (*Xiphias gladius*) in the Indian Ocean.

Area[1]	Indicators		2015 stock status determination
Indian Ocean	Catch 2014: Average catch 2010–2014:	34,822 t 28,494 t	
	MSY (1,000 t) (80% CI): F_{MSY} (80% CI): SB_{MSY} (1,000 t) (80% CI): F_{2013}/F_{MSY} (80% CI): SB_{2013}/SB_{MSY} (80% CI): SB_{2013}/SB_{1950} (80% CI):	39.40 (33.20–45.60) 0.138 (0.137–0.138) 61.4 (51.5–71.4) 0.34 (0.28–0.40) 3.10 (2.44–3.75) 0.74 (0.58–0.89)	

[1]Boundaries for the Indian Ocean stock assessment are defined as the IOTC area of competence.
[1]Boundaries for southwest Indian Ocean stock assessment are defined in IOTC–2014–WPB12–07 Rev_2.

Colour key	Stock overfished(B_{year}/B_{MSY}< 1)	Stock not overfished (B_{year}/B_{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 stock assessment undertaken in 2015. Thus, the SS3 model used in 2014 (using data up until the end of 2013) is used for stock status advice, as well as indicators available in 2015. The SS3 model indicated that MSY-based reference points were not exceeded for the Indian Ocean population as a whole ($F_{2013}/F_{MSY} < 1$; $SB_{2013}/SB_{MSY} > 1$). All other models applied to swordfish also indicated that the stock is above a biomass level that would produce MSY and current catches are below the MSY level. Spawning stock biomass in 2013 was estimated to be 58–89% (from Table 1; Fig. 1) of the unfished levels. The most recent catch estimate of 34,822 t for 2014 (an increase from 2013 catches of 30,844 t), remains below the MSY estimate of 38,400 t, which suggests that the stock status is unlikely to have changed. Thus, the stock remains **not overfished** and **not subject to overfishing**.

Outlook. The decrease in longline catch and effort from 2005 to 2011 lowered the pressure on the Indian Ocean stock as a whole, and despite the recent increase in total recorded catches, current fishing mortality is not expected to reduce the population to an overfished state over the next decade. There is a very low risk of exceeding MSY-based reference points by 2022 if catches are maintained at current levels (<1% risk that $SB_{2022} < SB_{MSY}$, and <1% risk that $F_{2022} > F_{MSY}$) (Table 2).

***Management advice*.** Given current stock status, if catch remains below the estimated MSY levels, then immediate management measures to reduce catch are not required. However, continued monitoring and improvement in data collection and reporting are required to reduce the uncertainty in assessments.

The following key points should be noted:

- **Maximum Sustainable Yield (MSY)**: estimate for the whole Indian Ocean is 39,400 t.
- **Provisional reference points**: Noting that the Commission in 2015 agreed to Resolution 15/10 *on target and limit reference points and a decision framework*, the following should be noted:
    a. **Fishing mortality**: Current fishing mortality is considered to be below the provisional target reference point of F_{MSY} and below the provisional limit reference point of $1.4*F_{MSY}$ (Fig. 1).
    b. **Biomass**: Current spawning biomass is considered to be above the target reference point of SB_{MSY}, and therefore above the limit reference point of $0.4*SB_{MSY}$ (Fig. 1).
- **Main fishing gear** (2011–14): Longline catches are currently estimated to comprise approximately 76% of the total estimated swordfish catch in the Indian Ocean (take of the total estimated swordfish catch).
- **Main fleets** (2011–14): EU (longline): 20% (Spain: 14%; Portugal: 3%; La Reunion 3%; Indonesia (longline/other): 18%; Taiwan,China (longline): 18%; Sri Lanka (longline/gillnet): 15%; India: 6%.

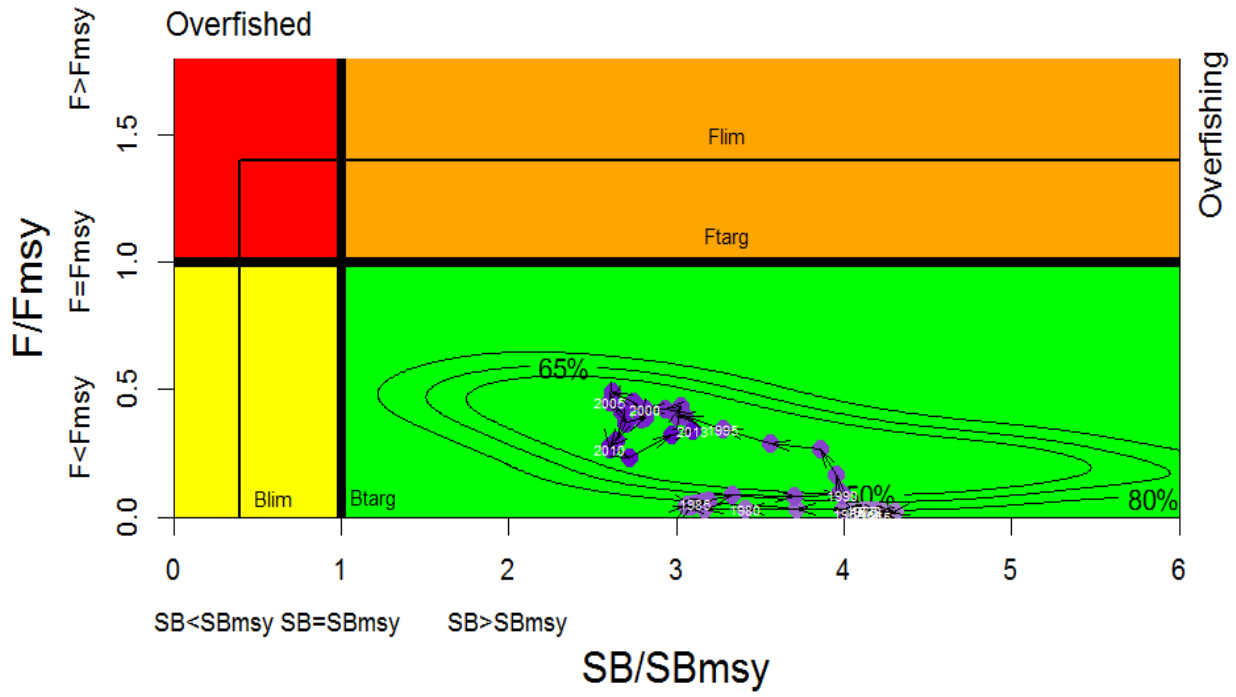

Fig. 1. Swordfish: SS3 Aggregated Indian Ocean assessment Kobe plot (contours are the 50, 65 and 80 percentiles of the 2013 estimate). Blue circles indicate the trajectory of the point estimates for the SB ratio and F ratio for each year 1950–2013. Interim target (F_{targ} and SB_{targ}) and limit (F_{lim} and SB_{lim}) reference points, as set by the Commission, are shown.

TABLE 2. Swordfish: SS3 aggregated Indian Ocean assessment Kobe II Strategy Matrix. Probability (percentage) of violating the MSY-based target (top) and limit (bottom) reference points for nine constant catch projections (average catch level from 2011–13 (27,809 t), ± 10%, ± 20%, ± 30% ± 40%) projected for 3 and 10 years.

Reference point and projection timeframe	**Alternative catch projections (relative to the average catch level from 2011–13) and probability (%) of violating MSY-based target reference points ($SB_{targ} = SB_{MSY}$; $F_{targ} = F_{MSY}$)**								
	60% (16,685 t)	**70%** (19,466 t)	**80%** (22,247 t)	**90%** (25,028 t)	**100%** (27,809 t)	**110%** (30,590 t)	**120%** (33,371 t)	**130%** (36,152 t)	**140%** (38,933 t)
$SB_{2016} < SB_{MSY}$	0	0	0	0	0	0	0	0	0
$F_{2016} > F_{MSY}$	0	0	0	0	0	0	0	0	2
$SB_{2023} < SB_{MSY}$	0	0	0	0	0	0	0	0	0
$F_{2023} > F_{MSY}$	0	0	0	0	0	0	0	0	4
Reference point and projection timeframe	**Alternative catch projections (relative to the average catch level from 2011–13) and probability (%) of violating MSY-based limit reference points ($SB_{lim} = 0.4\ SB_{MSY}$; $F_{Lim} = 1.4\ F_{MSY}$)**								
	60% (16,685 t)	**70%** (19,466 t)	**80%** (22,247 t)	**90%** (25,028 t)	**100%** (27,809 t)	**110%** (30,590 t)	**120%** (33,371 t)	**130%** (36,152 t)	**140%** (38,933 t)
$SB_{2016} < SB_{Lim}$	0	0	0	0	0	0	0	0	0
$F_{2016} > F_{Lim}$	0	0	0	0	0	0	0	0	4
$SB_{2023} < SB_{Lim}$	0	0	0	0	0	0	0	0	0
$F_{2023} > F_{Lim}$	0	0	0	0	0	0	0	0	4

Status of the southwest Indian Ocean swordfish (SWO: *Xiphias gladius*) resource

TABLE 3. Swordfish: Status of swordfish (*Xiphias gladius*) in the southwest Indian Ocean.

Area[1]	Indicators		2015 sub-regional status determination
Southwest Indian Ocean	Catch 2014: Average catch 2010–2014:	8,276 t 7,661 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_{1950} (80% CI):	9.86 (9.11–10.57) 0.63 (0.59–0.70) 12.68 (12.52–12.78) 0.89 (0.61–1.14) 0.94 (0.68–1.23) 0.16 (n.a.)	

[1]Boundaries for southwest Indian Ocean stock assessment are defined in IOTC–2014–WPB12–07 Rev_2.

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

SOUTHWEST INDIAN OCEAN – MANAGEMENT ADVICE

Sub-regional status. No assessment undertaken in 2015 as the Commission has agreed that no further stock assessment needs to be undertaken until the completion of the IOTC stock structure project. Thus, the models used in 2014 (using data up until the end of 2013) are used for sub-regional status advice, as well as indicators available in 2015. The assessments carried out in 2014 produced conflicting results (ASIA, BBDM and ASPIC). ASPIC is presented here for consistency with the previous advice. The southwest Indian Ocean region has been subject to localised depletion over the past decade and biomass remains below the level that would produce MSY (B_{MSY}). Declines in catch and effort brought fishing mortality rates to levels below F_{MSY}. In 2014, 8,276 t of swordfish were recorded caught from this region, which equals 123% of the recommended maximum catch of 6,678 t agreed to by the SC in 2011 (Table 3). However, the resource remains **not subject to overfishing** but **overfished**.

Outlook. The decrease in catch and effort over the last few years in the southwest region has reduced pressure on this resource. However, from 2010 to 2014 catches exceeded the maximum recommended by the WPB09 and SC14 in 2011 (6,678 t). If catches are maintained at 2011–13 levels, the probabilities of violating target reference points in 2016 are ≈ 81% for F_{MSY} and ≈ 40% for B_{MSY} (Table 4). There is however a high risk of reversing the rebuilding trend if there is any increase in catch in this region (Table 4).

Management advice. A precautionary approach to the management of swordfish in the southwest Indian Ocean should be considered by the Commission, to reduce catches below 6,000 t to ensure the population in this area may rebuild.

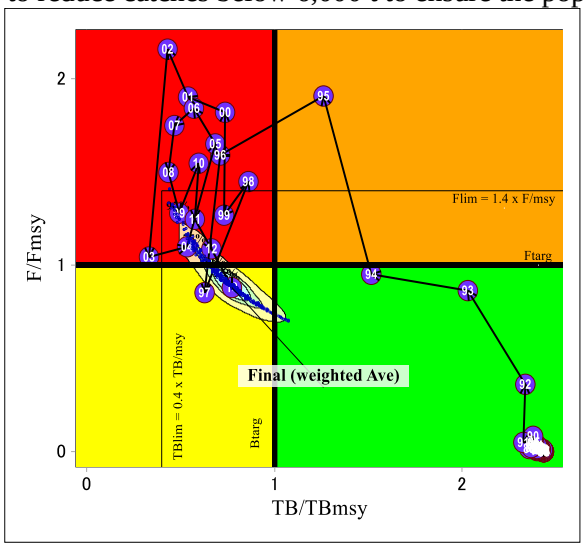

Fig. 2. Swordfish: ASPIC southwest Indian Ocean assessment Kobe plot (The horizontal blue line represents F_{LIM} and the vertical blue line represents B_{LIM}). The results are from a preferred model option: Model weighted average using the inverse of the Root Mean Square errors across models (scenario) 2 and 4 (IOTC–2014–WPB12–24 Rev_2).

TABLE 4. Swordfish: ASPIC **southwest** Indian Ocean assessment Kobe II Strategy Matrix. Probability (percentage) of violating the MSY-based reference points for nine constant catch projections (average catch level from 2011–13 (7,236 t), ± 10%, ± 20%, ± 30% and ± 40%) projected for 3 and 10 years.

Reference point and projection timeframe	**Alternative catch projections (relative to the average catch level from 2011–13) and probability (%) of violating MSY-based target reference points ($B_{targ} = B_{MSY}$; $F_{targ} = F_{MSY}$)**								
	60% (4,342 t)	**70%** (5,065 t)	**80%** (5,789 t)	**90%** (6,512 t)	**100%** (7,236 t)	**110%** (7,960 t)	**120%** (8,683 t)	**130%** (9,407 t)	**140%** (10,130 t)
$B_{2016} < B_{MSY}$	9	13	19	28	40	53	65	82	86
$F_{2016} > F_{MSY}$	3	6	30	56	81	91	98	99	100
$B_{2023} < B_{MSY}$	0	0	1	3	14	41	87	100	100
$F_{2023} > F_{MSY}$	0	0	5	67	92	98	99	100	100
Reference point and projection timeframe	**Alternative catch projections (relative to the average catch level from 2011–13) and probability (%) of violating MSY-based limit reference points ($B_{lim} = 0.4\ B_{MSY}$; $F_{Lim} = 1.4\ F_{MSY}$)**								
	60% (4,342 t)	**70%** (5,065 t)	**80%** (5,789 t)	**90%** (6,512 t)	**100%** (7,236 t)	**110%** (7,960 t)	**120%** (8,683 t)	**130%** (9,407 t)	**140%** (10,130 t)
$B_{2016} < B_{Lim}$	4	6	8	14	20	23	40	45	65
$F_{2016} > F_{Lim}$	3	6	15	15	20	33	45	67	100
$B_{2023} < B_{Lim}$	0	0	0	6	24	26	49	74	100
$F_{2023} > F_{Lim}$	0	0	0	10	22	45	67	96	100

APPENDIX XIII
EXECUTIVE SUMMARY: BLACK MARLIN

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

Status of the Indian Ocean black marlin (BLM: *Makaira indica*) resource

TABLE 1. Black marlin: Status of black marlin (*Makaira indica*) in the Indian Ocean.

Area[1]	Indicators		2015 stock status determination
Indian Ocean	Catch 2014: Average catch 2010–2014:	17,966 t 13,539 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_{1950} (80% CI):	10.2 (7.6–13.8) 0.25 (0.08–0.45) 37.8 (14.6–62.3) 1.06 (0.39–1.73) 1.13 (0.73–1.53) 0.57 (0.37–0.76)	

[1]Boundaries for the Indian Ocean = IOTC area of competence;

Colour key	Stock overfished ($B_{year}/B_{MSY} < 1$)	Stock not overfished ($B_{year}/B_{MSY} \geq 1$)
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 stock assessment undertaken in 2015. Thus, the models used in 2014 (using data up until the end of 2013) is used for stock status advice, as well as indicators available in 2015. A Stock reduction analysis (SRA) technique (data poor method) was used for the second time in 2014 on black marlin. The assessment is the best information currently available and as such, is used to determine stock status, with the intention that alternative techniques be applied to further validate the results in 2016. Total catches have continued to increase, with 17,966 t landed in 2014, up by almost 22% from 2013 levels (14,776 t). Thus, the stock status for black marlin in the Indian Ocean is **not overfished** but **subject to overfishing** (Table 1, Fig. 1). The fishery appears to show an increase in catch rates which is a substantial cause of concern, indicating that fishing mortality levels are unsustainable (Fig. 1). Aspects of the biology, productivity and fisheries for this species combined with the data poor status on which to base a more formal assessment are a major cause for concern. Research emphasis on developing possible CPUE indicators and further exploration of alternative stock assessment approaches for data poor fisheries are warranted to validate these findings. Given the limited data being reported for coastal gillnet fisheries, and the importance of sports fisheries for this species, efforts must be made to rectify these information gaps.

Outlook. Total catch for black marlin in recent years has continued to increase substantially to a total of 17,966 t in 2014 (Note: MSY estimate ~10,000 t). There is a high to very high risk of exceeding MSY-based reference points by 2016 if catches remain at 2014 levels (≈ 56% risk that $B_{2016} < B_{MSY}$, and ≈ 99% risk that $F_{2016} > F_{MSY}$) (Table 2).

Management advice. A precautionary approach to the management of black marlin should be considered by the Commission, to reduce catches below MSY estimates (~10,000 t), thereby ensuring the stock does not fall below B_{MSY}, and become overfished.

The following key points should be noted:

- **Maximum Sustainable Yield (MSY)**: estimate for the whole Indian Ocean is 10,200 t.
- **Provisional reference points**: Although the Commission adopted reference points for swordfish in Resolution 15/10 *on target and limit reference points and a decision framework*, no such interim reference points, nor harvest control rules have been established for black marlin.
- **Main fishing gear** (2011–14): gillnet: ~59%; Longline: ~19% (take of the total estimated black marlin catch).

- **Main fleets** (2011–14): I.R. Iran: 24%; Sri Lanka: 23%; India: 23%; Indonesia: 18% (take of the total estimated black marlin catch).

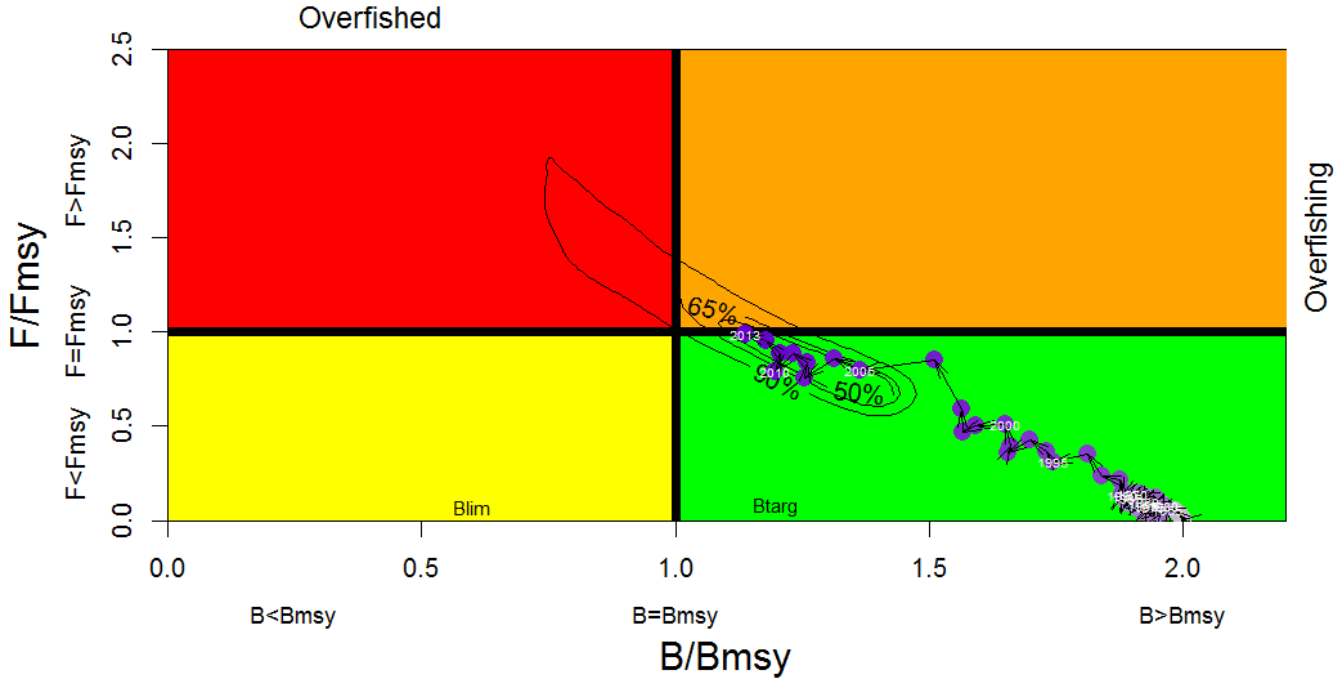

Fig. 1. Black marlin: Stock reduction analysis (Catch MSY Method) aggregated Indian Ocean assessment Kobe plots for black marlin (contours are the 50, 65 and 90 percentiles of the 2013 estimate). Black line indicates the trajectory of the point estimates (blue circles) for the spawning biomass (B) ratio and F ratio for each year 1950–2013.

TABLE 2. Black Marlin: Indian Ocean stock reduction analysis (SRA) Kobe II Strategy Matrix. Probability (percentage) of violating the MSY-based target reference points for nine constant catch projections (average catch level from 2011–13 (12,940 t), ± 10%, ± 20%, ± 30% ± 40%) projected for 3 and 10 years.

Reference point and projection timeframe	**Alternative catch projections (relative to the average catch level from 2011–13) and probability (%) of violating MSY-based target reference points (B_{targ} = B_{MSY}; F_{targ} = F_{MSY})**								
	60% (7,764 t)	**70%** (9,058 t)	**80%** (10,352 t)	**90%** (11,646 t)	**100%** (12,940 t)	**110%** (14,234 t)	**120%** (15,528 t)	**130%** (16,822 t)	**140%** (18,116 t)
$SB_{2016} < SB_{MSY}$	17	n.a.	24	n.a.	33	n.a.	44	n.a.	56
$F_{2016} > F_{MSY}$	12	n.a.	30	n.a.	53	n.a.	78	n.a.	99
$SB_{2023} < SB_{MSY}$	10	n.a.	28	n.a.	60	n.a.	95	n.a.	100
$F_{2023} > F_{MSY}$	7	n.a.	28	n.a.	63	n.a.	100	n.a.	100

APPENDIX XIV
EXECUTIVE SUMMARY: BLUE MARLIN

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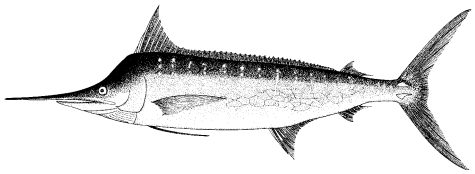

Status of the Indian Ocean blue marlin (BUM: *Makaira nigricans*) resource

TABLE 1. Blue marlin: Status of blue marlin (*Makaira nigricans*) in the Indian Ocean.

Area[1]	Indicators		2015 stock status determination
Indian Ocean	Catch 2014: Average catch 2010–2014:	14,686 t 13,190 t	
	MSY (1,000 t) (80% CI): F_{MSY} (80% CI): B_{MSY} (1,000 t) (80% CI): F_{2011}/F_{MSY} (80% CI): B_{2011}/B_{MSY} (80% CI): B_{2011}/B_{1950} (80% CI):	11.70 (8.02–12.40) 0.49 (n.a.) 23.70 (n.a.) 0.85 (0.63–1.45) 0.98 (0.57–1.18) 0.48 (n.a.)	

[1]Boundaries for the Indian Ocean = IOTC area of competence; n.a. = not available

Colour key	Stock overfished ($B_{year}/B_{MSY} < 1$)	Stock not overfished ($B_{year}/B_{MSY} \geq 1$)
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 stock assessment undertaken in 2015. Thus, the models used in 2013 (using data up until the end of 2011) are used for stock status advice, as well as indicators available in 2015. The standardised longline CPUE series indicate a decline in abundance in the early 1980s, followed by a constant or slightly increasing abundance over the last 20 years. In 2013, an ASPIC stock assessment confirmed the preliminary assessment results from 2012 that indicated that the stock was subject to overfishing in the past which reduced the stock biomass to below the B_{MSY} level (Fig. 1). Two other approaches examined in 2013 came to similar conclusions, namely a Bayesian State Space model, and a data poor stock assessment method: Stock Reduction Analysis using only catch data. In the recent past, the stock experienced reduced fishing pressure and as a result, the stock biomass recovered to the B_{MSY} level (Fig. 1). Total reported landings increased substantially in 2012 to 16,969 t, well above the MSY estimate of 11,690 t. In 2013 and 2014 reported catches declined slightly to 14,521 t and 14,686 t respectively, still above the MSY level. The high catches over the last three years, that are well above the MSY level-have not yet been assessed. Thus, on the weight-of-evidence available, the stock status remains **overfished** but **not subject to overfishing** (Table 1; Fig. 1).

Outlook. The uncertainty in the data available for assessment purposes and the CPUE series suggests that the advice should be interpreted with caution as the stock may be in an overfished state (biomass less than B_{MSY}) and given that reported catches over the last two years have been well in excess of the MSY levels recommended, fishing effort is likely to be a serious concern, suggesting the stock may have moved back to a subject to overfishing status. The limited data being reported for gillnet fisheries, and the importance of sports fisheries for this species, require efforts to be made to rectify these information gaps urgently. It is likely that there is a low risk of exceeding MSY-based reference points by 2015 if catches are maintained at 2011 levels, although projections are not provided as per Table 2. These will be calculated during the next assessment of blue marlin.

Management advice. A precautionary approach to the management of blue marlin should be considered by the Commission, to reduce catches below MSY estimates (~11,000 t), thereby ensuring the stock does not remain below B_{MSY} (overfished).

The following key points should be noted:

- **Maximum Sustainable Yield (MSY)**: estimate for the whole Indian Ocean is 11,700 t (estimated range 8,023–12,400 t).

- **Provisional reference points**: Although the Commission adopted reference points for swordfish in Resolution 15/10 *on target and limit reference points and a decision framework*, no such interim reference points, nor harvest control rules have been established for blue marlin.
- **Main fishing gear** (2011–14): Longline: 69%; Gillnet: 28% (of the total estimated blue marlin catch).
- **Main fleets** (2011–14): Taiwan,China: 33%; Indonesia: 28%; Pakistan: 14%; I.R. Iran 7%; Sri Lanka: 7% (of the total estimated blue marlin catch).

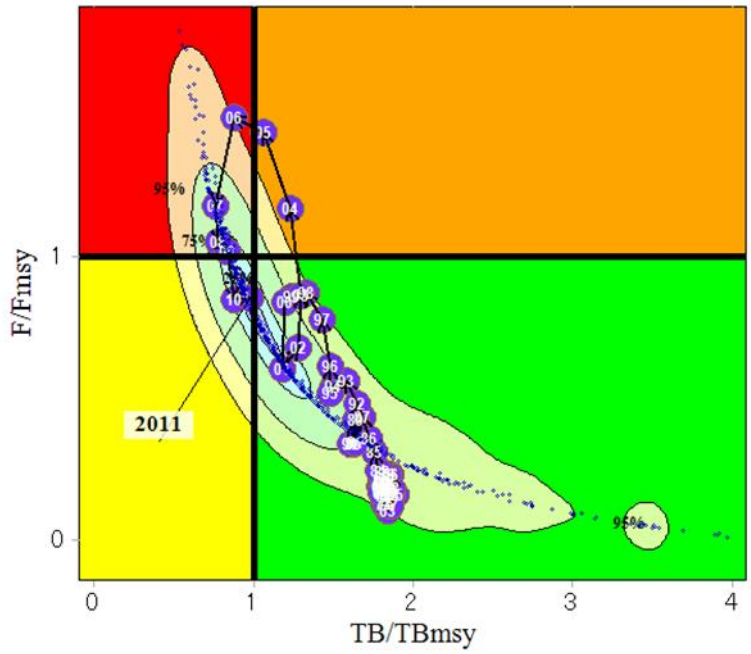

Fig. 1. Blue marlin: ASPIC Aggregated Indian Ocean assessment Kobe plot for blue marlin (90% bootstrap confidence surfaces shown around 2011 estimate). Blue line indicates the trajectory of the point estimates for the biomass (B) ratio (shown as TB) and F ratio for each year 1950–2011.

TABLE 2. Blue Marlin: Indian Ocean ASPIC Kobe II Strategy Matrix. Probability (percentage) of violating the MSY-based target reference points for nine constant catch projections (average catch level from 2011–2013 (13,539 t), ± 10%, ± 20%, ± 30% ± 40%) projected for 3 and 10 years. These will be calculated during the next assessment of blue marlin.

Reference point and projection timeframe	**Alternative catch projections (relative to the average catch level from 2009–2011) and probability (%) of violating MSY-based target reference points ($B_{targ} = B_{MSY}$; $F_{targ} = F_{MSY}$)**								
	60% (8,123 t)	**70%** (9,477 t)	**80%** (10,831 t)	**90%** (12,185 t)	**100%** (13,539 t)	**110%** (14,892 t)	**120%** (16,247 t)	**130%** (17,601 t)	**140%** (18,955 t)
$B_{2015} < B_{MSY}$	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
$F_{2015} > F_{MSY}$	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
$B_{2022} < B_{MSY}$	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
$F_{2022} > F_{MSY}$	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

APPENDIX XV
EXECUTIVE SUMMARY: STRIPED MARLIN

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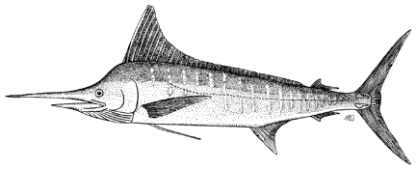


Status of the Indian Ocean striped marlin (MLS: *Tetrapturus audax*) resource

TABLE 1. Striped marlin: Status of striped marlin (*Tetrapturus audax*) in the Indian Ocean.

Area[1]	Indicators		2015 stock status determination
Indian Ocean	Catch 2014: Average catch 2010–2014:	4,001 t 4,112 t	**60%**
	MSY (1,000 t) (80% CI): F_{MSY} (80% CI): B_{MSY} (1,000 t) (80% CI): F_{2014}/F_{MSY} (80% CI): B_{2014}/B_{MSY} (80% CI): B_{2014}/B_{1950} (80% CI):	5.22 t (5.18–5.59) 0.62 (0.59–1.04) 8.4 t (5.40–8.90) 1.09 (0.62–1.66) 0.65 (0.45–1.17) 0.24 (n.a.–n.a.)	

[1]Boundaries for the Indian Ocean = IOTC area of competence; n.a. = not available. Percentage of times the stock status from plausible model runs is in each respective quadrant of the Kobe plot shown below.

Colour key	Stock overfished($B_{year}/B_{MSY}< 1$)	Stock not overfished ($B_{year}/B_{MSY}\geq 1$)
Stock subject to overfishing($F_{year}/F_{MSY}> 1$)	**60%**	**0%**
Stock not subject to overfishing ($F_{year}/F_{MSY}\leq 1$)	**36%**	**4%**
Not assessed/Uncertain		

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. Stock status is based on the new assessments undertaken in 2015. The standardised CPUE series suggest that there was a sharp decline in the early 1980s, followed by slower decline since 1990. In 2015 an ASPIC stock assessment confirmed the assessment results from 2012 and 2013 that indicated the stock is currently subject to overfishing and that biomass is below the level which would produce MSY, using catch data up until 2014. Two other approaches examined in 2015 came to similar conclusions, namely a Bayesian Surplus Production Model, and a data poor stock assessment method, Stock Reduction Analysis using only catch data. The Kobe plot (Fig. 1) from the ASPIC model indicated that the stock has been subject to overfishing for some years, and that as a result, the stock biomass is well below the B_{MSY} level and shows little signs of rebuilding despite the declining effort trend. Thus, on the weight-of-evidence available the stock is determined to remain as **overfished** and **subject to overfishing** (Table 1; Fig. 1).

Outlook. The decrease in longline catch and effort in the years 2009–11 lowered the pressure on the Indian Ocean stock as a whole, however, the increased catches reported in 2012, 2013 and 2014, combined with the concerning results obtained from the stock assessments carried out in 2012, 2013 and 2015, the outlook is pessimistic for the stock as a whole and a precautionary approach to the management of striped marlin should be considered by the Commission, to reduce catches well below MSY estimates to enable the stock to rebuild.

The K2MSM provides the Commission with a range of options for reducing catches and probabilities of the striped marlin stock recovering to MSY reference levels (Table 2).

Management advice. A precautionary approach to the management of striped marlin should be considered by the Commission. If the Commission wishes to recover the stock to a level above MSY based reference points with 50% probability by 2024, the Scientific Committee recommends that catches should not exceed 4,000 t.

The following key points should be noted:

- **Maximum Sustainable Yield (MSY)**: estimate for the whole Indian Ocean is 5,220 t (5,180–5,590). However, the biomass is well below the B_{MSY} reference point and fishing mortality is in excess of F_{MSY} at recent catch levels, of around 4,401 t.
- **Provisional reference points**: Although the Commission adopted reference points for swordfish in Resolution 15/10 *on target and limit reference points and a decision framework*, no such interim reference points, nor harvest control rules have been established for striped marlin.

- **Main fishing gear** (2011–14): Longline: 69%; Gillnet: 28% (of the total estimated striped marlin catch).
- **Main fleets** (2011–14): Indonesia: 32%; Taiwan,China: 26%; I.R. Iran 11%; Pakistan: 9% (of the total estimated striped marlin catch).

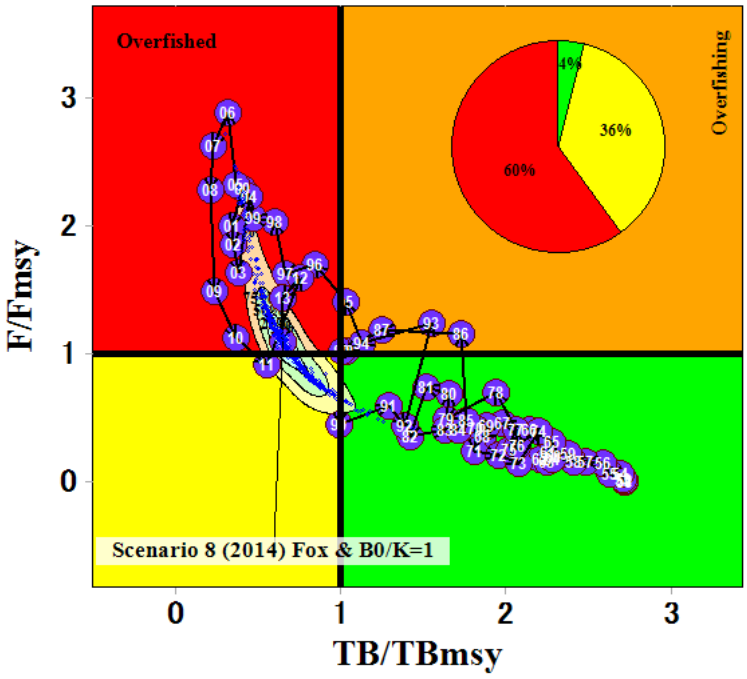


Fig. 1. Striped marlin: ASPIC aggregated Indian Ocean assessment Kobe plot with the confidence surface and compositions of its uncertainties in terms of 4 phases (pie chart).

TABLE 2. Striped marlin: ASPIC aggregated Indian Ocean assessment Kobe II Strategy Matrix. Probability (percentage) of violating the MSY-based reference points for nine constant catch projections (average catch level from 2012–14 (4,915 t), ± 10%, ± 20%, ± 30% and ± 40%) projected for 3 and 10 years.

Reference point and projection timeframe	**Alternative catch projections (relative to the average catch level from 2012–2014, 4,915 t) and probability (%) of violating MSY-based target reference points ($B_{targ} = B_{MSY}$; $F_{targ} = F_{MSY}$)**								
	60% (2,949 t)	**70%** (3,441 t)	**80%** (3,932 t)	**90%** (4,424 t)	**100%** (4,915 t)	**110%** (5,407 t)	**120%** (5,898 t)	**130%** (6,390 t)	**140%** (6,881 t)
$B_{2017} < B_{MSY}$	41	57	59	70	75	82	90	95	97
$F_{2017} > F_{MSY}$	10	19	23	41	68	90	98	100	100
$B_{2024} < B_{MSY}$	7	12	15	29	60	98	100	100	100
$F_{2024} > F_{MSY}$	7	12	14	26	53	99	100	100	100

APPENDIX XVI
EXECUTIVE SUMMARY: INDO-PACIFIC SAILFISH

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

Status of the Indian Ocean Indo-Pacific sailfish (SFA: *Istiophorus platypterus*) resource

TABLE 1. Indo-Pacific sailfish: Status of Indo-Pacific sailfish (*Istiophorus platypterus*) in the Indian Ocean.

Area[1]	Indicators		2015 stock status determination
Indian Ocean	Catch 2014: Average catch 2010–2014:	30,674 t 29,143 t	
	MSY (1,000 t) (80% CI): F_{MSY} (80% CI): B_{MSY} (1,000 t) (80% CI): F_{2014}/F_{MSY} (80% CI): B_{2014}/B_{MSY} (80% CI): B_{2014}/B_0 (80% CI):	25.00 (17.20–36.30) 0.26 (0.15–0.39) 87.52 (56.30–121.02) 1.05 (0.63–1.63) 1.13 (0.87–1.37) 0.57 (0.44–0.69)	

[1]Boundaries for the Indian Ocean = IOTC area of competence

Colour key	Stock overfished($B_{year}/B_{MSY}< 1$)	Stock not overfished ($B_{year}/B_{MSY}\geq 1$)
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. Data poor methods for stock assessment using Stock reduction analysis (SRA) techniques indicate that the stock is not yet overfished, but is subject to overfishing (Table 1). In using the SRA method for comparative purposes with other stocks, the use of the target reference points may be possible for the approach. In addition, a Bayesian Surplus Production Model indicated that the stock could be severely overfished so this is a less pessimistic outlook on the stock status. The stock appears to show a continued increase in catch rates which is a cause of concern, indicating that fishing mortality levels may be becoming too high (Fig. 1). Aspects of the biology, productivity and fisheries for this species combined with the data poor status on which to base a more formal assessment are a cause for concern. Research emphasis on further developing possible CPUE indicators from gillnet fisheries, and further exploration of stock assessment approaches for data poor fisheries are warranted. Given the limited data being reported for coastal gillnet fisheries, and the importance of sports fisheries for this species, efforts must be made to rectify these information gaps. Records of stock extirpation in the Gulf should also be examined to examine the degree of localised depletion in Indian Ocean coastal areas. On the weight-of-evidence available in 2015, the stock is determined to be **not overfished** but **subject to overfishing**.

Outlook. The estimated increase in coastal gillnet catch and effort in recent years is a substantial cause for concern for the Indian Ocean stock as a whole, however there is not sufficient information to evaluate the effect this will have on the resource. The K2MSM provides the Commission with a range of options for reducing catches and probabilities of the stock recovering to MSY reference levels (Table 2).

Management advice. A precautionary approach to the management of I.P sailfish should be considered by the Commission, to reduce catches below MSY estimates (~25,000 t), thereby ensuring the stock does not fall below B_{MSY}, and become overfished.

The following key points should be noted:

- **Maximum Sustainable Yield (MSY)**: estimate for the whole Indian Ocean is 25,000 t.
- **Provisional reference points**: Although the Commission adopted reference points for swordfish in Resolution 15/10 *on target and limit reference points and a decision framework*, no such interim reference points, nor harvest control rules have been established for I.P. sailfish.
- **Main fishing gear** (2011–14): Gillnet: 78%; Troll and handlines: 17% (of the total estimated I.P. sailfish catch).
- **Main fleets** (2011–14): I.R. Iran: 28%; Pakistan: 19%; India: 16%; Sri Lanka: 12% (of the total estimated I.P. sailfish catch).

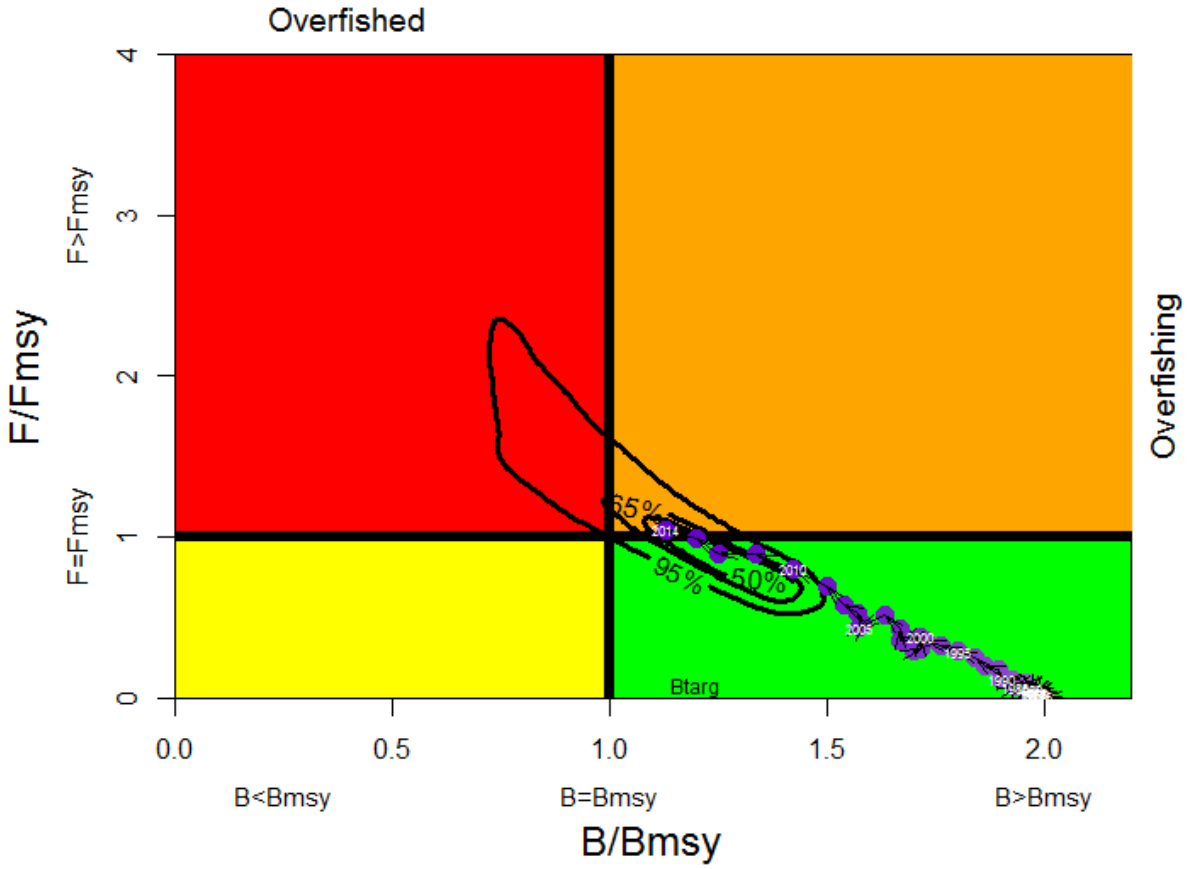


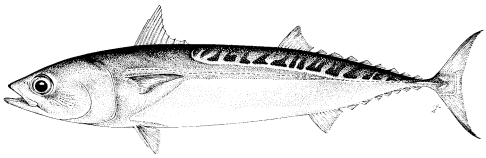
Fig. 1. Indo-Pacific sailfish: Stock reduction analysis (Catch MSY Method) of aggregated Indian Ocean assessment Kobe plot (contours are the 50, 65 and 90 percentiles of the 2014 estimate). Black lines indicate the trajectory of the point estimates (blue circles) for the B ratio and F ratio for each year 1950–2014.

TABLE 2. Indo-Pacific sailfish: Indian Ocean stock reduction analysis Kobe II Strategy Matrix. Probability (percentage) of violating the MSY-based target reference points for nine constant catch projections (average catch level from 2012–2014 (29,164 t), ± 10%, ± 20%, ± 30% ± 40%) projected for 3 and 10 years.

Reference point and projection timeframe	**Alternative catch projections (relative to the average catch level from 2012–14; 29,164 t) and probability (%) of violating MSY-based target reference points ($B_{targ} = B_{MSY}$; $F_{targ} = F_{MSY}$)**								
	60% (17,498 t)	**70%** (20,415 t)	**80%** (23,331 t)	**90%** (26,248 t)	**100%** (29,164 t)	**110%** (32,080 t)	**120%** (34,997 t)	**130%** (37,913 t)	**140%** (40,830 t)
$B_{2017} < B_{MSY}$	10	15	20	25	30	35	41	47	53
$F_{2017} > F_{MSY}$	16	27	38	49	61	72	83	94	99
$B_{2024} < B_{MSY}$	6	16	28	41	55	68	81	91	97
$F_{2024} > F_{MSY}$	12	23	36	52	68	84	97	100	100

APPENDIX XVII
EXECUTIVE SUMMARY: BULLET TUNA

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



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] 2014: Average catch[2] 2010–201:	8,117 t 8,952 t	
	MSY (1,000 t) (80% CI): F_{MSY} (80% CI): B_{MSY} (1,000 t) (80% CI): F_{2014}/F_{MSY} (80% CI): B_{2014}/B_{MSY} (80% CI): B_{2014}/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.

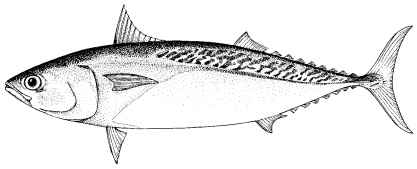
The following should be noted:

- 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.

Management advice. A precautionary approach to the management of bullet tuna should be considered by the Commission, by ensuring that future catches do not exceed current catches (average 2010-2014). The stock should be closely monitored. Mechanisms need to be developed by the Commission to improve current statistics by encouraging CPCs to comply with their recording and reporting requirements, so as to better inform scientific advice.

APPENDIX XVIII
EXECUTIVE SUMMARY: FRIGATE TUNA

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



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] 2014: Average catch[2] 2010–2014:	97,980 t 97,930 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_{2032}/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 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 2010 (~99,710 t). 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.

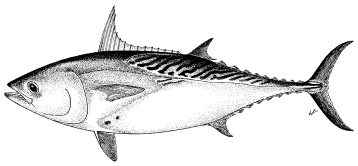
The following should be noted:

- 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.

Management advice. A precautionary approach to the management of frigate tuna should be considered by the Commission, by ensuring that future catches do not exceed current catches (average 2010-2014). The stock should be closely monitored. Mechanisms need to be developed by the Commission to improve current statistics by encouraging CPCs to comply with their recording and reporting requirements, so as to better inform scientific advice.

APPENDIX XIX
EXECUTIVE SUMMARY: KAWAKAWA

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] 2014: Average catch[2] 2010–2014:	162,854 t 156,066 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]	

[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. Analysis using an Optimised Catch Only Method (OCOM) approach for the second time 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 simple modelling 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 undertaken 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. 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 may be 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).

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 reduce the catches in the Indian Ocean.
- Limit reference points: The Commission has not adopted limit reference points for any of the neritic tunas under its mandate

Management Advice. Although the stock status is classified as not overfished and not subject to overfishing, the K2MSM showed that there is a 96% probability that biomass is below MSY levels and 100% probability that $F>F_{MSY}$ by 2016 and 2023 if catches are maintained at the current levels. The modelled probabilities of the stock achieving levels consistent with the MSY reference points (e.g. $SB > SB_{MSY}$ and $F<F_{MSY}$) in 2023 are 100% for a future constant catch at 80% of current catch levels in 2014, thus if the Commission wishes to recover the stock to levels above the MSY reference points, the Scientific Committee recommends that catches should be reduced by 20% of current levels.

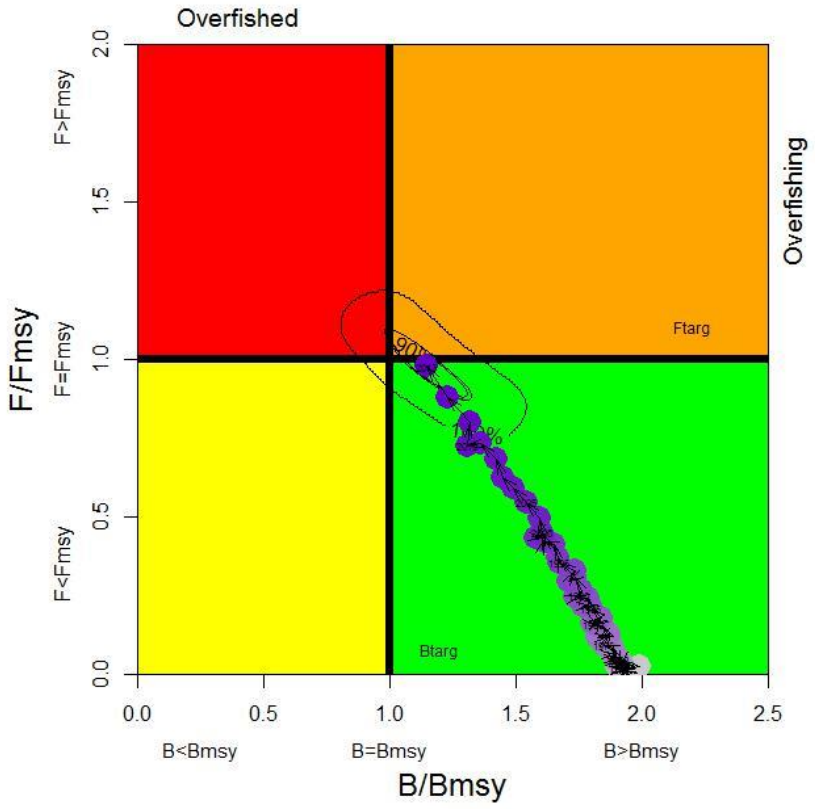


Fig. 1. Kawakawa. OCOM aggregated Indian Ocean assessment. The Kobe plot presents the trajectories for the range of plausible model options included in the formulation of the final management advice. The trajectory of the geometric mean of the plausible model options is also presented (1950–2013).

Table 2. Kawakawa: 2015 OCOM Aggregated Indian Ocean assessment Kobe II Management 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

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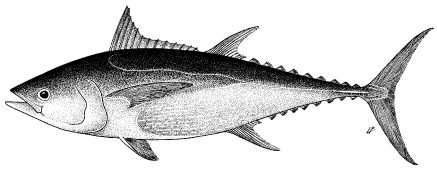
APPENDIX XX
EXECUTIVE SUMMARY: LONGTAIL TUNA

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



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] 2014: Average catch[2] 2010–2014:	147,587 t 158,393 t	25%*
	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.
*Estimated probability that the stock is in the respective quadrant of the Kobe plot (shown below), derived from the confidence intervals associated with the current stock status (SS3 stock assessment model).

Colour key	Stock overfished($SB_{year}/SB_{MSY}< 1$)	Stock not overfished ($SB_{year}/SB_{MSY}\geq 1$)
Stock subject to overfishing($F_{year}/F_{MSY}> 1$)	54%	25%
Stock not subject to overfishing ($F_{year}/F_{MSY}\leq 1$)	0%	21%
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 exceeded 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).

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.

Management advice. 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 $F_{2016}>F_{MSY}$) or are reduced to 70% of the current levels (76% probability $B<B_{MSY}$ and 82% probability $F>F_{MSY}$). If the Commission wishes to recover the stock to levels above the MSY reference points, the Scientific Committee recommends catches should be reduced by 30% of current levels which corresponds to catches slightly below to MSY in order to recover the status of the stock in conformity with the decision framework described in Resolution 15/10.

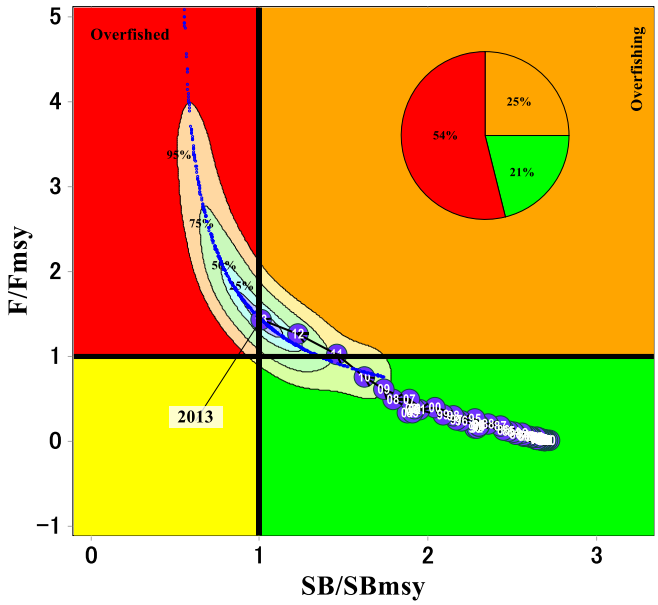


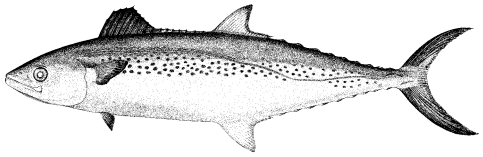
Fig. 1. Longtail tuna. Kobe plot of the longtail tuna in the Indian Ocean (1950–2013) with uncertinty around the 2013 point and compostions of uncertainties in terms of 4 phases (colours) of the Kobe plots (pie chart).

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

APPENDIX XXI
EXECUTIVE SUMMARY: INDO-PACIFIC KING MACKEREL

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



Status of the Indian Ocean Indo-Pacific king mackerel (GUT: *Scomberomorus guttatus*) resource

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

Area[1]	Indicators		2015 stock status determination
Indian Ocean	Catch[2] 2014: Average catch[2] 2010–2014:	45,953 t 44,621 t	
	MSY (1,000 t) [*]: F_{MSY} [*]: B_{MSY} (1,000 t) [*]: F_{2013}/F_{MSY} [*]: B_{2013}/B_{MSY} [*]: B_{2013}/B_0 [*]:	43 [35.8–52.9] 0.42 [0.34–0.52] 82.8 [60.3–131.1] 1.05 [0.91–1.27] 1.01 [0.80–1.20] 0.52 [0.34–0.74]	

[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. 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.

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.

Management advice. A precautionary approach to the management of IP king mackerel should be considered by the Commission, by ensuring that future catches do not exceed preliminary estimates of MSY. The stock should be closely monitored. Mechanisms need to be developed by the Commission to improve current statistics by encouraging CPCs to comply with their recording and reporting requirement, so as to better inform scientific advice.

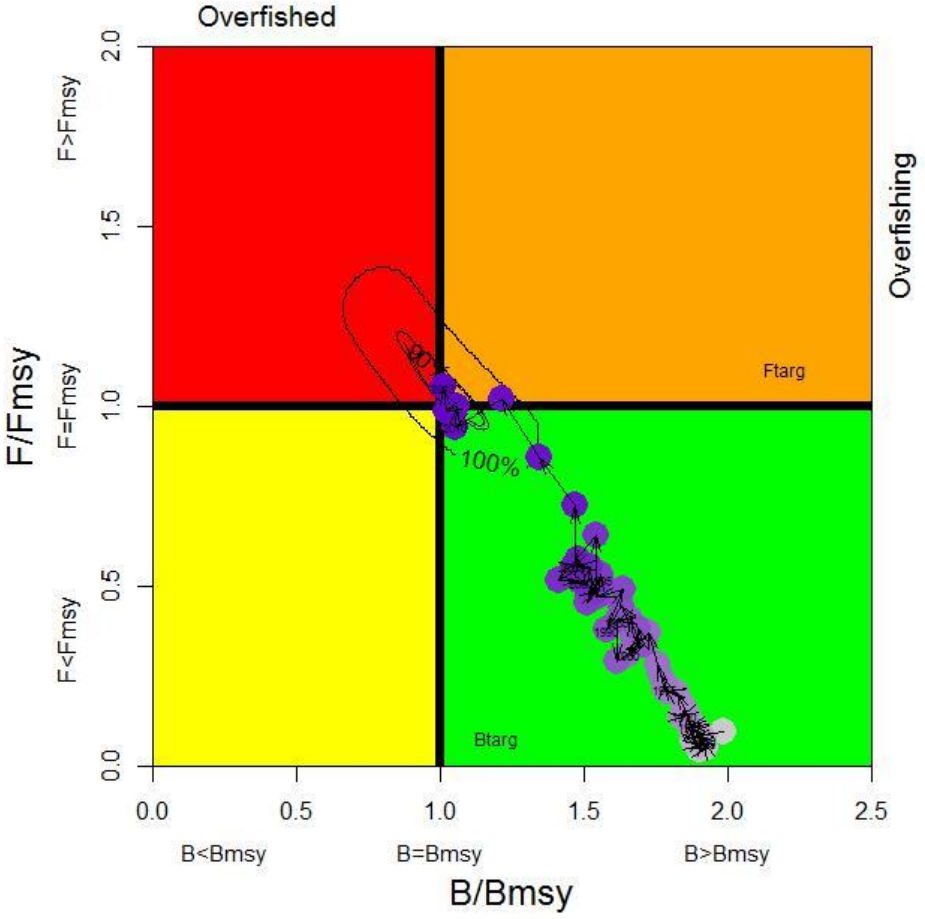
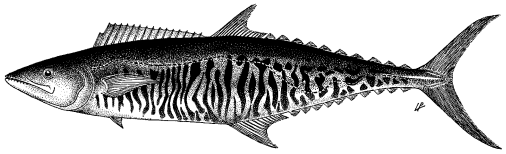


Fig. 1. Indo-Pacific king mackerel: *S. guttatus* OCOM Indian Ocean assessment Kobe plot. The Kobe plot presents the trajectories for the range of plausible model options included in the formulation of the final management advice. The trajectory of the geometric mean of the plausible model options is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

APPENDIX XXII
EXECUTIVE SUMMARY: NARROW-BARRED SPANISH MACKEREL

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



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] 2014: Average catch[2] 2010–2014:	153,425 t 149,774 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]	

[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 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 and 2023 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.
- 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.

Management advice. There is a continued high to very high risk of exceeding MSY-based reference points by 2023, even if catches are reduced to 80% of the current (2013) levels (67% risk that $B_{2023}<B_{MSY}$, and 99% risk that F 2023>F_{MSY}). The modeled probabilities of the stock achieving levels consistent with the MSY reference levels (e.g. SB > SB_{MSY} and F<F_{MSY}) in 2023 are 98 and 79%, respectively, for a future constant catch at 70% of current catch level. If the Commission wishes to recover the stock to levels above the MSY reference points, the Scientific Committee recommends that catches should be reduced by 20-30% of current levels which corresponds to catches below to MSY in order to recover the status of the stock.

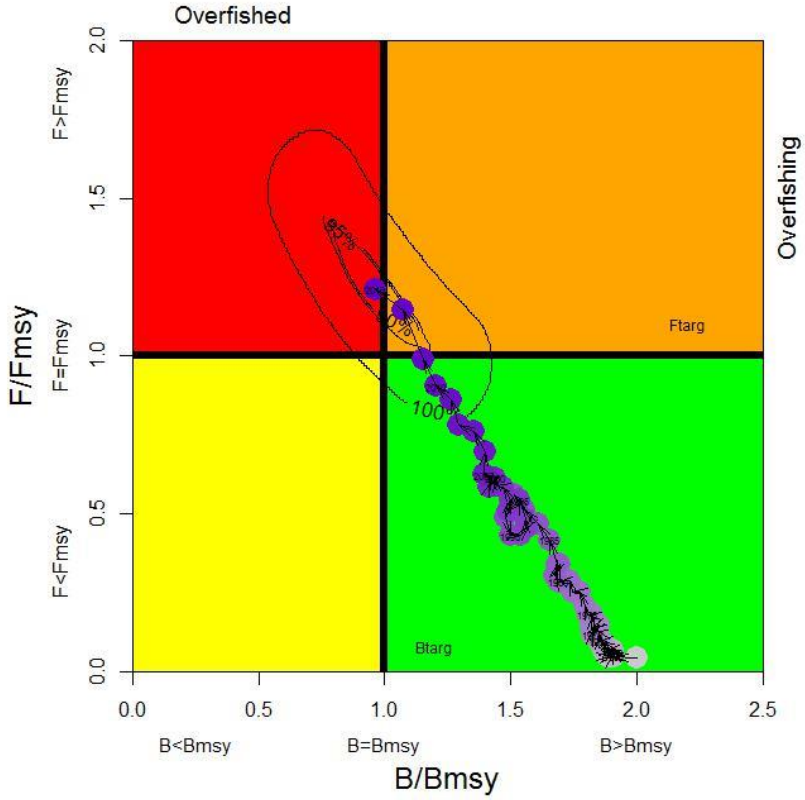


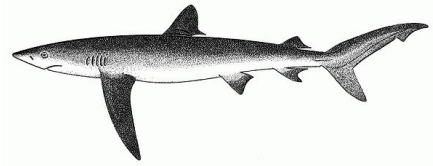
Fig. 1. Narrow-barred Spanish mackerel. Indian Ocean assessment Kobe plot. The Kobe plot presents the trajectories for the range of plausible model options included in the formulation of the final management advice. The trajectory of the geometric mean of the plausible model options is also presented.

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} > F_{MSY}	100	99	100	100	100	100
SB_{2023} < SB_{MSY}	2	67	100	100	100	100
F_{2023} > F_{MSY}	21	99	100	100	100	100

APPENDIX XXIII
EXECUTIVE SUMMARY: BLUE SHARK

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



Status of the Indian Ocean blue shark (BSH: *Prionace glauca*)

TABLE 1. Blue shark: Status of blue shark (*Prionace glauca*) in the Indian Ocean.

Area[1]	Indicators		2015 stock status determination
Indian Ocean	Reported catch 2014[1]:	30,012 t	
	Not elsewhere included (nei) sharks[2] 2014:	39,820 t	
	Average reported catch 2010–14:	28,888 t	
	Ave. not elsewhere included (nei) sharks[2] 2010–14:	46,543 t	
	MSY (1,000 t) (80% CI):	Unknown	
	F_{MSY} (80% CI):	Unknown	
	SB_{MSY} (1,000 t) (80% CI):	Unknown	
	F_{2014}/F_{MSY} (range):	(0.44–4.84)[3]	
	SB_{2014}/SB_{MSY} (range):	(0.83–1.75)[3]	
	SB_{2014}/SB_0 (range):	Unknown	

[1]Boundaries for the Indian Ocean = IOTC area of competence
[2]Includes all other shark catches reported to the IOTC Secretariat, which may contain this species.

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		

TABLE 2. Blue shark: IUCN threat status of blue shark (*Prionace glauca*) in the Indian Ocean.

Common name	Scientific name	IUCN threat status[2]		
		Global status	WIO	EIO
Blue shark	*Prionace glauca*	Near Threatened	–	–

IUCN = International Union for Conservation of Nature; WIO = Western Indian Ocean; EIO = Eastern Indian Ocean
Sources: IUCN 2007, Stevens 2009

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. There remains considerable uncertainty about the relationship between abundance, CPUE series and total catches over the past decade (Table 1). Three stock assessment models were applied to the blue shark resource in 2015 (Fig. 1). Two models (SS3 and SRA) produced similar results suggesting the stock is currently subject to overfishing, but not yet overfished, while a third model (BSSPM) suggest the stock was close to MSY levels, but not yet subject to overfishing A best case model could not be selected and so the results represented the range of plausible model runs. The ecological risk assessment (ERA) conducted for the Indian Ocean by the WPEB and SC in 2012 (IOTC–2012–SC15–INF10 Rev_1) consisted of a semi-quantitative risk assessment analysis to evaluate the resilience of shark species to the impact of a given fishery, by combining the biological productivity of the species and its susceptibility to each fishing gear type. Blue sharks received a medium vulnerability ranking (No. 10) in the ERA rank for longline gear because it was estimated as the most productive shark species, but was also characterised by the second highest susceptibility to longline gear. Blue shark was estimated as not being susceptible thus not vulnerable to purse seine gear. The current IUCN threat status of 'Near Threatened' applies to blue sharks globally (Table 2). Information available on this species has been improving in recent years. Blue sharks are commonly taken by a range of fisheries in the Indian Ocean and in some areas they are fished in their nursery grounds. Because of their life history characteristics – they are relatively long lived (20–25 years), mature relatively late (at 4–6 years), and have relativity few offspring (25–50 pups every year), the blue shark is vulnerable to overfishing. However, blue shark assessments in the Atlantic and Pacific

[1] Nominal catch numbers have been updated since the working party meeting
[2] The process of the threat assessment from IUCN is independent from the IOTC and is presented for information purpose only

oceans seem to indicate that blue shark stocks can sustain relatively high fishing pressure. On the weight-of-evidence available in 2015, the stock status is determined to be **uncertain** (Table 1). However, total catches of this species should not exceed 2014 levels, while efforts are made to further evaluate stock status.

Outlook. Increasing effort could result in declines in biomass. The impact of piracy in the western Indian Ocean has resulted in the displacement and subsequent concentration of a substantial portion of longline fishing effort into certain areas in the southern and eastern Indian Ocean. It is therefore unlikely that catch and effort on blue shark will decline in these areas in the near future, and may result in localised depletion.

Management advice. A precautionary approach to the management of blue shark should be considered by the Commission, by ensuring that future catches do not exceed current catches. The stock should be closely monitored. Mechanisms need to be developed by the Commission to improve current statistics by encouraging CPCs to comply with their recording and reporting requirement on sharks, so as to better inform scientific advice.
The following key points should be noted:

- **Maximum Sustainable Yield (MSY)**: estimate for the whole Indian Ocean is unknown.
- **Reference points**: The Commission has not adopted reference points or harvest control rules for any shark species.
- **Main fishing gear** (2011–14): Longline
- **Main fleets** (2011–14): Indonesia; EU,Spain; Japan, Sri Lanka; Taiwan,China; EU,Portugal.

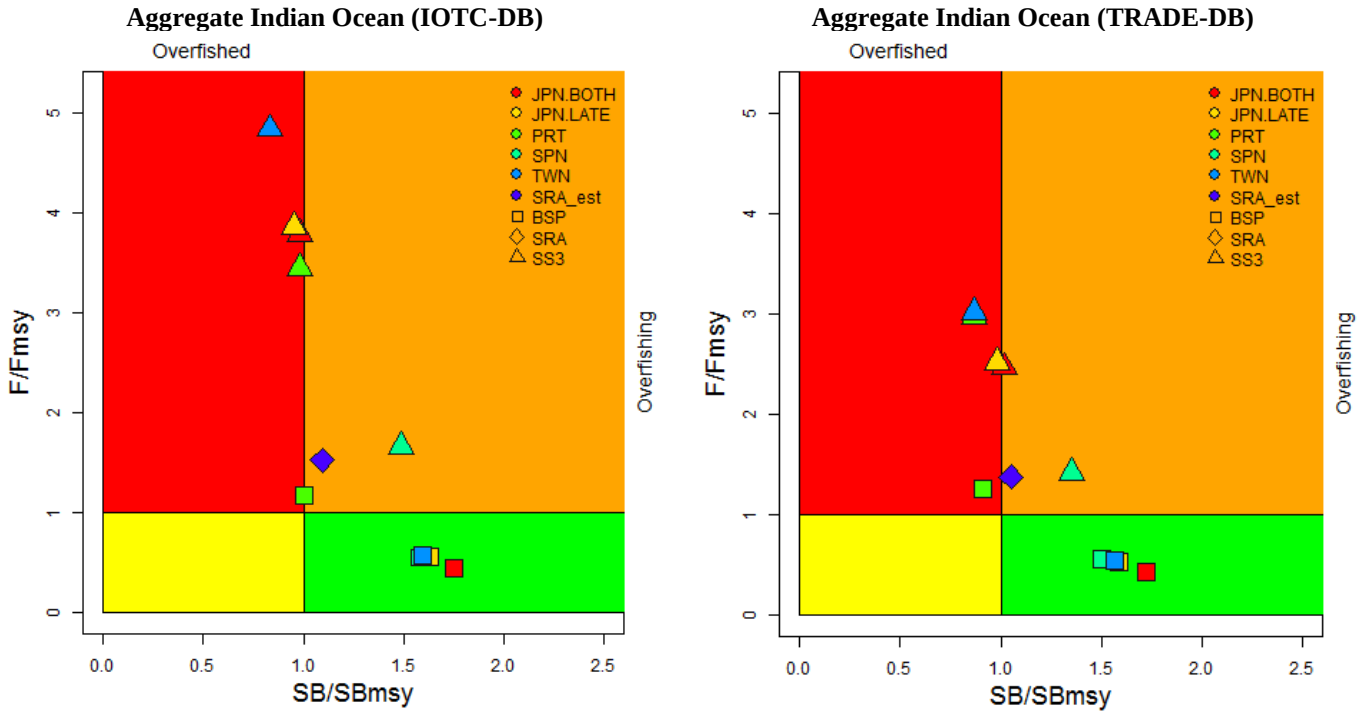


Fig. 1. Blue shark: Aggregated Indian Ocean stock assessment Kobe plot for the 2014 estimate based on a range of models explored with steepness = 0.5, and fits to CPUE series. Note that these are for different datasets, namely the IOTC DB and Trade based datasets (IOTC DB: left panel and TRADE DB: right panel). SS3: Stock Synthesis III; SRA: Stock Reduction Analysis; BSP: Bayesian State-Space Production Model.

Table 3a. Blue shark: Aggregated Indian Ocean assessment Kobe II Strategy Matrix. Probability (percentage) of violating the MSY-based reference points for nine constant catch projections using IOTC DB (average catch level from 2012–14 (31,759 t), ± 10%, ± 20%, ± 30% and ± 40%) projected for 3 and 10 years. **Note:** K2MSM projections were not run due to large uncertainty in catch estimates.

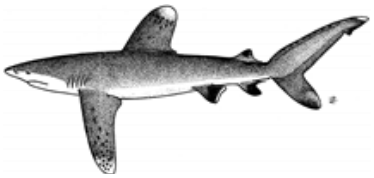
Reference point and projection timeframe	**Alternative catch projections (relative to the average catch level from 2012–2014, 31,759 t) and probability (%) of violating MSY-based target reference points ($B_{targ} = B_{MSY}$; $F_{targ} = F_{MSY}$)**								
	60% (19,055t)	**70%** (22,231 t)	**80%** (25,407 t)	**90%** (28,583 t)	**100%** (31,759 t)	**110%** (34,935 t)	**120%** (38,110 t)	**130%** (41,286 t)	**140%** (44,462 t)
$B_{2017} < B_{MSY}$	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
$F_{2017} > F_{MSY}$	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
$B_{2024} < B_{MSY}$	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
$F_{2024} > F_{MSY}$	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Table 3b. Blue shark: Aggregated Indian Ocean assessment Kobe II Strategy Matrix. Probability (percentage) of violating the MSY-based reference points for nine constant catch projections using TRADE DB (average catch level from 2012–14 (134,212 t), ± 10%, ± 20%, ± 30% and ± 40%) projected for 3 and 10 years. **Note: K2MSM projections were not run due to large uncertainty in catch estimates.**

Reference point and projection timeframe	**Alternative catch projections (relative to the average catch level from 2012–2014, 134,212 t) and probability (%) of violating MSY-based target reference points ($B_{targ} = B_{MSY}$; $F_{targ} = F_{MSY}$)**								
	60% (80,527 t)	**70%** (93,948 t)	**80%** (107,369 t)	**90%** (120,790 t)	**100%** (134,212 t)	**110%** (147,663 t)	**120%** (161,054 t)	**130%** (174,475 t)	**140%** (187,896 t)
$B_{2017} < B_{MSY}$	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
$F_{2017} > F_{MSY}$	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
$B_{2024} < B_{MSY}$	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
$F_{2024} > F_{MSY}$	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

APPENDIX XXIV
EXECUTIVE SUMMARY: OCEANIC WHITETIP SHARK

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



tatus of the Indian Ocean oceanic whitetip shark (OCS: *Carcharhinus longimanus*)

CITES APPENDIX II species

TABLE 1. Oceanic whitetip shark: Status of oceanic whitetip shark (*Carcharhinus longimanus*) in the Indian Ocean.

Area[1]	Indicators		2015 stock status determination
Indian Ocean	Reported catch 2014: Not elsewhere included (nei) sharks[2] 2014: Average reported catch 2010–2014: Av. not elsewhere included 2010-2014 (nei) sharks[2]:	5,383 t 39,820 t 2,398 t 46,543 t	
	MSY (1,000 t) (80% CI): F_{MSY} (80% CI): SB_{MSY} (1,000 t) (80% CI): F_{2014}/F_{MSY} (80% CI): SB_{2014}/SB_{MSY} (80% CI): SB_{2014}/SB_0 (80% CI):	unknown	

[1]Boundaries for the Indian Ocean = IOTC area of competence
[2]Includes all other shark catches reported to the IOTC Secretariat, which may contain this species.

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		

NOTE: IOTC Resolution 13/06 *on a scientific and management framework on the conservation of shark species caught in association with IOTC managed fisheries*, prohibits retention onboard, transhipping, landing or storing any part or whole carcass of oceanic whitetip sharks.

TABLE 2. Oceanic whitetip shark: IUCN threat status of oceanic whitetip shark (*Carcharhinus longimanus*) in the Indian Ocean.

Common name	Scientific name	IUCN threat status[3]		
		Global status	WIO	EIO
Oceanic whitetip shark	*Carcharhinus longimanus*	Vulnerable	–	–

IUCN = International Union for Conservation of Nature; WIO = Western Indian Ocean; EIO = Eastern Indian Ocean
Sources: IUCN 2007, Baum et al. 2006
CITES - In March 2013, CITES agreed to include oceanic whitetip shark to Appendix II to provide further protections prohibiting the international trade; which will become effective on September 14, 2014.

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. There remains considerable uncertainty about the relationship between abundance, standardised CPUE series and total catches over the past decade (Table 1). The ecological risk assessment (ERA) conducted for the Indian Ocean by the WPEB and SC in 2012 (IOTC–2012–SC15–INF10 Rev_1) consisted of a semi-quantitative risk assessment analysis to evaluate the resilience of shark species to the impact of a given fishery, by combining the biological productivity of the species and its susceptibility to each fishing gear type. Oceanic whitetip shark received a high vulnerability ranking (No. 5) in the ERA rank for longline gear because it was estimated as one of the least productive shark species, and was also characterised by a high susceptibility to longline gear. Oceanic whitetip shark

[3] The process of the threat assessment from IUCN is independent from the IOTC and is presented for information purpose only

was estimated as being the most vulnerable shark species to purse seine gear, as it was characterised as having a relatively low productive rate, and high susceptibility. The current IUCN threat status of 'Vulnerable' applies to oceanic whitetip sharks globally (Table 2). There is a paucity of information available on this species in the Indian Ocean and this situation is not expected to improve in the short to medium term. Oceanic whitetip sharks are commonly taken by a range of fisheries in the Indian Ocean. Because of their life history characteristics – they are relatively long lived, mature at 4–5 years, and have relativity few offspring (<20 pups every two years), the oceanic whitetip shark is likely vulnerable to overfishing. Despite the lack of data, there is anecdotal information suggesting that oceanic whitetip shark abundance has declined over recent decades. Available standardised CPUE indices from Japan and EU,Spain indicate conflicting trends as discussed in the full Executive Summary for oceanic whitetip sharks. There is no quantitative stock assessment and limited basic fishery indicators currently available for oceanic whitetip sharks in the Indian Ocean therefore the stock status is **uncertain** (Table 1).

Outlook. Maintaining or increasing effort with associated fishing mortality can result in declines in biomass, productivity and CPUE. The impact of piracy in the western Indian Ocean has resulted in the displacement and subsequent concentration of a substantial portion of longline fishing effort into certain areas in the southern and eastern Indian Ocean. It is therefore unlikely that catch and effort on oceanic whitetip sharks will decline in these areas in the near future, and may result in localised depletion.

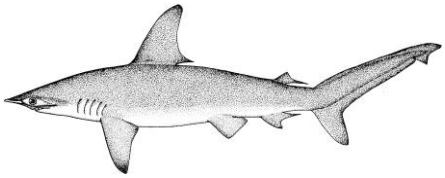
Management advice. A precautionary approach to the management of oceanic whitetip shark should be considered by the Commission. Mechanisms need to be developed by the Commission to encourage CPCs to comply with their recording and reporting requirement on sharks, so as to better inform scientific advice.

The following key points should be noted:

- **Maximum Sustainable Yield (MSY)**: Not applicable. Retention prohibited.
- **Reference points**: Not applicable.
- **Main fishing gear** (2011–14): Longline; purse seine.
- **Main fleets** (2011–14): Indonesia; Sri Lanka; I.R. Iran; EU,Spain; China; Madagascar; Seychelles.

APPENDIX XXV
EXECUTIVE SUMMARY: SCALLOPED HAMMERHEAD SHARK

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



Status of the Indian Ocean Scalloped Hammerhead Shark (SPL: *Sphyrna lewini*)

CITES APPENDIX II species

TABLE 1. Status of scalloped hammerhead shark (*Sphyrna lewini*) in the Indian Ocean.

Area[1]	Indicators		2015 stock status determination
Indian Ocean	Reported catch 2014: Not elsewhere included (nei) sharks[2]2014: Average reported catch 2010–2014: Av. not elsewhere included (nei) sharks[2] 2010–14:	42 t 39,820 t 89 t 46,5432 t	
	MSY (1,000 t) (80% CI): F_{MSY} (80% CI): SB_{MSY} (1,000 t) (80% CI): F_{2014}/F_{MSY} (80% CI): SB_{2014}/SB_{MSY} (80% CI): SB_{2014}/SB_0 (80% CI):	unknown	

[1]Boundaries for the Indian Ocean = IOTC area of competence
[2]Includes all other shark catches reported to the IOTC Secretariat, which may contain this species.

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		

TABLE 2. IUCN threat status of scalloped hammerhead shark (*Sphyrna lewini*) in the Indian Ocean.

Common name	Scientific name	IUCN threat status[4]		
		Global status	WIO	EIO
Scalloped hammerhead	*Sphyrna lewini*	Endangered	Endangered	–

IUCN = International Union for Conservation of Nature; WIO = Western Indian Ocean; EIO = Eastern Indian Ocean
Sources: IUCN 2007, Baum 2007

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. The current IUCN threat status of 'Endangered' applies to scalloped hammerhead sharks globally and specifically for the western Indian Ocean (Table 2). The ecological risk assessment (ERA) conducted for the Indian Ocean by the WPEB and SC in 2012 (IOTC–2012–SC15–INF10 Rev_1) consisted of a semi-quantitative risk assessment analysis to evaluate the resilience of shark species to the impact of a given fishery, by combining the biological productivity of the species and its susceptibility to each fishing gear type. Scalloped hammerhead shark received a low vulnerability ranking (No. 14) in the ERA rank for longline gear because it was estimated as one of the least productive shark species, but was also characterised by a lower susceptibility to longline gear. Scalloped hammerhead shark was estimated as the sixth most vulnerable shark species in the ERA ranking for purse seine gear, but with lower levels of vulnerability compared to longline gear, because the susceptibility was lower for purse seine gear. There is a paucity of information available on this species and this situation is not expected to improve in the short to medium term. Scalloped hammerhead sharks are commonly taken by a range of fisheries in the Indian Ocean. They are extremely vulnerable to gillnet fisheries. Furthermore, pups occupy shallow coastal nursery grounds, often heavily exploited by inshore fisheries. Because of their life history characteristics – they are relatively long lived (over 30 years), and have relativity few offspring (<31 pups each year), the scalloped hammerhead shark is vulnerable to overfishing.

[4] The process of the threat assessment from IUCN is independent from the IOTC and is presented for information purpose only

There is no quantitative stock assessment or basic fishery indicators currently available for scalloped hammerhead shark in the Indian Ocean therefore the stock status is **uncertain** (Table 1).

Outlook. Maintaining or increasing effort can result in declines in biomass and productivity. The impact of piracy in the western Indian Ocean has resulted in the displacement and subsequent concentration of a substantial portion of longline fishing effort into certain areas in the southern and eastern Indian Ocean. It is therefore unlikely that catch and effort on scalloped hammerhead shark will decline in these areas in the near future.

Management advice. A precautionary approach to the management of scalloped hammerhead shark should be considered by the Commission. Mechanisms need to be developed by the Commission to encourage CPCs to comply with their recording and reporting requirement on sharks, so as to better inform scientific advice.
The following key points should be noted:

- **Maximum Sustainable Yield (MSY)**: Unknown.
- **Reference points**: Not applicable.
- **Main fishing gear** (2011–14): Gillnet; Handline; Trolling; longline.
- **Main fleets** (2011–14): Indonesia; EU,Spain.

APPENDIX XXVI
EXECUTIVE SUMMARY: SHORTFIN MAKO SHARK

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

Status of the Indian Ocean shortfin mako shark (SMA: *Isurus oxyrinchus*)

TABLE 1. Shortfin mako shark: Status of shortfin mako shark (*Isurus oxyrinchus*) in the Indian Ocean.

Area[1]	Indicators		2015 stock status determination
Indian Ocean	Reported catch 2014: Not elsewhere included (nei) sharks[2] 2014: Average reported catch 2010–14: Av. not elsewhere included (nei) sharks[2] 2010–14:	1,683 t 39,820 t 1,538 t 46,543 t	
	MSY (1,000 t) (80% CI): F_{MSY} (80% CI): SB_{MSY} (1,000 t) (80% CI): F_{2014}/F_{MSY} (80% CI): SB_{2014}/SB_{MSY} (80% CI): SB_{2014}/SB_0 (80% CI):	unknown	

[1]Boundaries for the Indian Ocean = IOTC area of competence
[2]Includes all other shark catches reported to the IOTC Secretariat, which may contain this species.

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		

TABLE 2. Shortfin mako shark: IUCN threat status of shortfin mako shark (*Isurus oxyrinchus*) in the Indian Ocean.

Common name	Scientific name	IUCN threat status[5]		
		Global status	WIO	EIO
Shortfin mako shark	*Isurus oxyrinchus*	Vulnerable	–	–

IUCN = International Union for Conservation of Nature; WIO = Western Indian Ocean; EIO = Eastern Indian Ocean
SOURCES: IUCN 2007, Cailliet 2009

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. There remains considerable uncertainty about the relationship between abundance, the standardised CPUE series, and total catches over the past decade (Table 1). The ecological risk assessment (ERA) conducted for the Indian Ocean by the WPEB and SC in 2012 (IOTC–2012–SC15–INF10 Rev_1) consisted of a semi-quantitative risk assessment analysis to evaluate the resilience of shark species to the impact of a given fishery, by combining the biological productivity of the species and its susceptibility to each fishing gear type. Shortfin mako sharks received the highest vulnerability ranking (No. 1) in the ERA rank for longline gear because it was characterised as one of the least productive shark species, and with a high susceptibility to longline gear. Shortfin mako shark was estimated as the third most vulnerable shark species in the ERA ranking for purse seine gear, but with lower levels of vulnerability compared to longline gear, because the susceptibility was lower for purse seine gear. The current IUCN threat status of 'Vulnerable' applies to shortfin mako sharks globally (Table 2). Trends in the Japanese standardised CPUE series from its longline fleet suggest that the biomass has declined from 1994 to 2003, and has been increasing since then. Trends in EU,Portugal longline standardised CPUE series suggest that the biomass has declined from 1999 to 2004, and has been increasing since then. There is a paucity of information available on this species, but this situation has been improving in recent years. Shortfin mako sharks are commonly taken by a range of fisheries in the Indian Ocean. Because of their life history characteristics – they are relatively long lived (over 30 years), females mature at 18–21 years, and have relativity few offspring (<25 pups every two or three years), the shortfin mako shark can be vulnerable

[5] The process of the threat assessment from IUCN is independent from the IOTC and is presented for information purpose only

to overfishing. There is no quantitative stock assessment currently available for shortfin mako shark in the Indian Ocean therefore the stock status is **uncertain**.

Outlook. Maintaining or increasing effort can result in declines in biomass, productivity and CPUE. The impact of piracy in the western Indian Ocean has resulted in the displacement and subsequent concentration of a substantial portion of longline fishing effort into certain areas in the southern and eastern Indian Ocean. It is therefore unlikely that catch and effort on shortfin mako shark will decline in these areas in the near future, and may result in localised depletion.

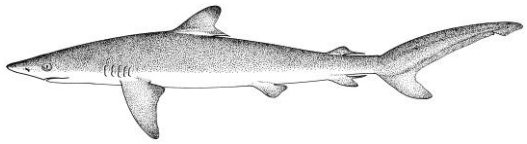
Management advice. A precautionary approach to the management of shortfin mako shark should be considered by the Commission. Mechanisms need to be developed by the Commission to encourage CPCs to comply with their recording and reporting requirement on sharks, so as to better inform scientific advice.

The following key points should also be noted:

- **Maximum Sustainable Yield (MSY)**: Unknown.
- **Reference points**: Not applicable.
- **Main fishing gear** (2011–14): Longline; Handline.
- **Main fleets** (2011–14): Madagascar; Indonesia; Taiwan,China; EU,UK; India.

APPENDIX XXVII
EXECUTIVE SUMMARY: SILKY SHARK

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



Status of the Indian Ocean silky shark (FAL: *Carcharhinus falciformis*)

TABLE 1. Silky shark: Status of silky shark (*Carcharhinus falciformis*) in the Indian Ocean.

Area[1]	Indicators		2015 stock status determination
Indian Ocean	Reported catch 2014: Not elsewhere included (nei) sharks[2] 2014: Average reported catch 2010–14: Av. not elsewhere included (nei) sharks[2] 2010–14:	2,901 t 39,820 t 4,088 t 46,543 t	
	MSY (1,000 t) (80% CI): F_{MSY} (80% CI): SB_{MSY} (1,000 t) (80% CI): F_{2014}/F_{MSY} (80% CI): SB_{2014}/SB_{MSY} (80% CI): SB_{2014}/SB_0 (80% CI):	unknown	

[1]Boundaries for the Indian Ocean = IOTC area of competence
[2]Includes all other shark catches reported to the IOTC Secretariat, which may contain this species.

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		

TABLE 2. Silky shark: IUCN threat status of silky shark (*Carcharhinus falciformis*) in the Indian Ocean.

Common name	Scientific name	IUCN threat status[6]		
		Global status	WIO	EIO
Silky shark	*Carcharhinus falciformis*	Near Threatened	Near Threatened	Near Threatened

IUCN = International Union for Conservation of Nature; WIO = Western Indian Ocean; EIO = Eastern Indian Ocean
Sources: IUCN 2007, 2012

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. There remains considerable uncertainty about the relationship between abundance and the nominal CPUE series from the main longline fleets, and about the total catches over the past decade (Table 1). The ecological risk assessment (ERA) conducted for the Indian Ocean by the WPEB and SC in 2012 (IOTC–2012–SC15–INF10 Rev_1) consisted of a semi-quantitative risk assessment analysis to evaluate the resilience of shark species to the impact of a given fishery, by combining the biological productivity of the species and its susceptibility to each fishing gear type. Silky shark received a high vulnerability ranking (No. 4) in the ERA rank for longline gear because it was estimated as one of the least productive shark species, and with a high susceptibility to longline gear. Silky shark was estimated as the second most vulnerable shark species in the ERA ranking for purse seine gear, due to its low productivity and high susceptibility for purse seine gear. The current IUCN threat status of 'Near Threatened' applies to silky sharks in the western and eastern Indian Ocean and globally (Table 2). There is a paucity of information available on this species but several recent studies have been carried out for this species in the recent years. Silky sharks are commonly taken by a range of fisheries in the Indian Ocean. Because of their life history characteristics – they are relatively long lived (over 20 years), mature relatively late (at 6–12 years), and have relativity few offspring (<20 pups every two years), the silky shark can be vulnerable to overfishing. Despite the lack of data, there is some anecdotal information suggesting that silky shark abundance has declined over recent decades, including from Indian longline research surveys, which is described in the full Executive Summary for silky shark sharks. There is no quantitative stock assessment or basic fishery indicators currently available for silky shark in the Indian Ocean therefore the stock status is **uncertain**.

[6] The process of the threat assessment from IUCN is independent from the IOTC and is presented for information purpose only

Outlook. Maintaining or increasing effort can probably result in declines in biomass, productivity and CPUE. The impact of piracy in the western Indian Ocean has resulted in the displacement and subsequent concentration of a substantial portion of longline fishing effort into certain areas in the southern and eastern Indian Ocean. It is therefore unlikely that catch and effort on silky shark will decline in these areas in the near future, and may result in localised depletion.

Management advice. A precautionary approach to the management of silky shark should be considered by the Commission. Mechanisms need to be developed by the Commission to encourage CPCs to comply with their recording and reporting requirement on sharks, so as to better inform scientific advice.

The following key points should also be noted:

- **Maximum Sustainable Yield (MSY)**: Unknown.
- **Reference points**: Not applicable.
- **Main fishing gear** (2011–14): Purse seine; Longline; Gillnet.
- **Main fleets** (2011–14): Sri Lanka; I.R. Iran; Madagascar; Taiwan,China; Indonesia.

APPENDIX XXVIII
EXECUTIVE SUMMARY: BIGEYE THRESHER SHARK

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

Status of the Indian Ocean bigeye thresher shark (BTH: *Alopias superciliosus*)

TABLE 1. Bigeye thresher shark: Status bigeye thresher shark (*Alopias superciliosus*) in the Indian Ocean.

Area[1]	Indicators		2015 stock status determination
Indian Ocean	Reported catch 2014: Not elsewhere included (nei) sharks[2] 2014: Average reported catch 2010–14: Av. not elsewhere included (nei) sharks[2] 2010–14:	0 t 39,820 t 159 t 46,543 t	
	MSY (1,000 t) (80% CI): F_{MSY} (80% CI): SB_{MSY} (1,000 t) (80% CI): F_{2014}/F_{MSY} (80% CI): SB_{2014}/SB_{MSY} (80% CI): SB_{2014}/SB_0 (80% CI):	unknown	

[1]Boundaries for the Indian Ocean = IOTC area of competence
[2]Includes all other shark catches reported to the IOTC Secretariat, which may contain this species.

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		

TABLE 2. Bigeye thresher shark: IUCN threat status of bigeye thresher shark (*Alopias superciliosus*) in the Indian Ocean.

Common name	Scientific name	IUCN threat status[7]		
		Global status	WIO	EIO
Bigeye thresher shark	*Alopias superciliosus*	Vulnerable	–	–

IUCN = International Union for Conservation of Nature; WIO = Western Indian Ocean; EIO = Eastern Indian Ocean
Sources: IUCN 2007, Amorim et al. 2009

NOTE: IOTC Resolution 12/09 *On the conservation of thresher sharks (family Alopiidae) caught in association with fisheries in the IOTC area of competence*, prohibits retention onboard, transhipping, landing, storing, selling or offering for sale any part or whole carcass of thresher sharks of all the species of the family Alopiidae[8].

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. There remains considerable uncertainty in the stock status due to lack of information necessary for assessment or for the development of other indicators of the stock (Table 1). The ecological risk assessment (ERA) conducted for the Indian Ocean by the WPEB and SC in 2012 (IOTC–2012–SC15–INF10 Rev_1) consisted of a semi-quantitative risk assessment analysis to evaluate the resilience of shark species to the impact of a given fishery, by combining the biological productivity of the species and its susceptibility to each fishing gear type. Bigeye thresher shark received a high vulnerability ranking (No. 2) in the ERA rank for longline gear because it was characterised as one of the least productive shark species, and highly susceptible to longline gear. Despite its low productivity, bigeye thresher shark has a low vulnerability ranking to purse seine gear due to its low susceptibility for this particular gear. The current IUCN threat status of 'Vulnerable' applies to bigeye thresher shark globally (Table 2). There is a paucity of

[7] The process of the threat assessment from IUCN is independent from the IOTC and is presented for information purpose only
[8] Scientific observers shall be allowed to collect biological samples from thresher sharks that are dead at haulback, provided that the samples are part of the research project approved by the Scientific Committee (or the Working Party on Ecosystems and Bycatch).

information available on this species and this situation is not expected to improve in the short to medium term. Bigeye thresher sharks are commonly taken by a range of fisheries in the Indian Ocean. Because of their life history characteristics – they are relatively long lived (+20 years), mature at 9–3 years, and have few offspring (2–4 pups every year), the bigeye thresher shark is vulnerable to overfishing. There is no quantitative stock assessment and limited basic fishery indicators currently available for bigeye thresher shark in the Indian Ocean therefore the stock status is **uncertain**.

Outlook. Current longline fishing effort is directed to other species, however bigeye thresher sharks is a common bycatch in these fisheries. Hooking mortality is apparently very high, therefore IOTC regulation 10/12 prohibiting retaining of any part of thresher sharks onboard and promoting life release of thresher shark may be largely ineffective for species conservation. Maintaining or increasing effort, with associated fishing mortality, can result in declines in biomass, productivity and CPUE. However there are few data to estimate CPUE trends, in view of IOTC Resolution 12/09 and reluctance of fishing fleet to report information on discards/non-retained catch. The impact of piracy in the western Indian Ocean has resulted in the displacement and subsequent concentration of a substantial portion of longline fishing effort into other areas in the southern and eastern Indian Ocean. It is therefore unlikely that catch and effort on bigeye thresher shark will decline in these areas in the near future, which may result in localised depletion.

Management advice. The prohibition on retention of bigeye thresher shark should be maintain. Mechanisms need to be developed by the Commission to encourage CPCs to comply with their reporting requirement on sharks, so as to better inform scientific advice.

The following key points should also be noted:

- **Maximum Sustainable Yield (MSY)**: Not applicable. Retention prohibited.
- **Reference points**: Not applicable.
- **Main fishing gear** (2011–14): Handline; Trolling; Longline.
- **Main fleets** (2011–14): Indonesia; Madagascar; Philippines; EU,UK.

APPENDIX XXIX
EXECUTIVE SUMMARY: PELAGIC THRESHER SHARK

Indian Ocean Tuna Commission
Commission des Thons de l'Océan Indien
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Status of the Indian Ocean pelagic thresher shark (PTH: *Alopias pelagicus*)

TABLE 1. Pelagic thresher shark: Status pelagic thresher shark (*Alopias pelagicus*) in the Indian Ocean.

Area[1]	Indicators		2015 stock status determination
Indian Ocean	Reported catch 2014: Not elsewhere included (nei) sharks[2] 2014: Average reported catch 2010–14: Av. not elsewhere included (nei) sharks[2] 2010-14:	0 t 39,820 t 122 t 46,543 t	
	MSY (1,000 t) (80% CI): F_{MSY} (80% CI): SB_{MSY} (1,000 t) (80% CI): F_{2014}/F_{MSY} (80% CI): SB_{2014}/SB_{MSY} (80% CI): SB_{2014}/SB_0 (80% CI):	unknown	

[1]Boundaries for the Indian Ocean = IOTC area of competence
[2]Includes all other shark catches reported to the IOTC Secretariat, which may contain this species.

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		

TABLE 2. Pelagic thresher shark: IUCN threat status of pelagic thresher shark (*Alopias pelagicus*) in the Indian Ocean.

Common name	Scientific name	IUCN threat status[9]		
		Global status	WIO	EIO
Pelagic thresher shark	*Alopias pelagicus*	Vulnerable	–	–

IUCN = International Union for Conservation of Nature; WIO = Western Indian Ocean; EIO = Eastern Indian Ocean

Sources: IUCN 2007, Reardon et al. 2009

NOTE: IOTC Resolution 12/09 *On the conservation of thresher sharks (family Alopiidae) caught in association with fisheries in the IOTC area of competence*, prohibits retention onboard, transhipping, landing, storing, selling or offering for sale any part or whole carcass of thresher sharks of all the species of the family Alopiidae[10].

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. There remains considerable uncertainty in the stock status due to lack of information necessary for assessment or to for the development of other indicators of the stock (Table 1). The ecological risk assessment (ERA) conducted for the Indian Ocean by the WPEB and SC in 2012 (IOTC–2012–SC15–INF10 Rev_1) consisted of a semi-quantitative risk assessment analysis to evaluate the resilience of shark species to the impact of a given fishery, by combining the biological productivity of the species and its susceptibility to each fishing gear type. Pelagic thresher shark received a high vulnerability ranking (No. 3) in the ERA rank for longline gear because it was characterised as one of the least productive shark species, and with a high susceptibility to longline gear. Despite its low productivity, pelagic thresher shark has a low vulnerability ranking to purse seine gear due to its low susceptibility for this particular

[9] The process of the threat assessment from IUCN is independent from the IOTC and is presented for information purpose only
[10] Scientific observers shall be allowed to collect biological samples from thresher sharks that are dead at haulback, provided that the samples are part of the research project approved by the Scientific Committee (or the Working Party on Ecosystems and Bycatch).

gear. The current IUCN threat status of 'Vulnerable' applies to pelagic thresher shark globally (Table 2). There is a paucity of information available on this species and this situation is not expected to improve in the short to medium term. Pelagic thresher sharks are commonly taken by a range of fisheries in the Indian Ocean. Because of their life history characteristics – they are relatively long lived (+ 20 years), mature at 8–9 years, and have few offspring (2 pups every year), the pelagic thresher shark is vulnerable to overfishing. There is no quantitative stock assessment and limited basic fishery indicators currently available for pelagic thresher shark in the Indian Ocean therefore the stock status is **uncertain.**

Outlook. Current longline fishing effort is directed to other species, however pelagic thresher sharks is a common bycatch these fisheries. Hooking mortality is apparently very high, therefore IOTC regulation 10/12 prohibiting retaining of any part of thresher sharks onboard and promoting life release of thresher shark may be largely ineffective for species conservation. Maintaining or increasing effort can result in declines in biomass, productivity and CPUE. However there are few data to estimate CPUE trends, in view of IOTC regulation 10/12 and reluctance of fishing fleet to report information on discards/non-retained catch. The impact of piracy in the western Indian Ocean has resulted in the displacement and subsequent concentration of a substantial portion of longline fishing effort into other areas in the southern and eastern Indian Ocean. It is therefore unlikely that catch and effort on pelagic thresher shark will decline in these areas in the near future, which may result in localised depletion.

Management advice. The prohibition on retention of pelagic thresher shark should be maintain. Mechanisms need to be developed by the Commission to encourage CPCs to comply with their reporting requirement on sharks, so as to better inform scientific advice.

The following key points should also be noted:

- **Maximum Sustainable Yield (MSY)**: Not applicable. Retention prohibited.
- **Reference points**: Not applicable.
- **Main fishing gear** (2011–14): Handline; Trolling; Longline.
- **Main fleets** (2011–14): Indonesia; Madagascar; Philippines; EU,UK.

APPENDIX XXX
EXECUTIVE SUMMARY: MARINE TURTLES

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

Status of marine turtles in the Indian Ocean

TABLE 1. Marine turtles: IUCN threat status for all marine turtle species reported as caught in fisheries within the IOTC area of competence.

Common name	Scientific name	IUCN threat status[11]
Flatback turtle	*Natator depressus*	Data deficient
Green turtle	*Chelonia mydas*	Endangered
Hawksbill turtle	*Eretmochelys imbricata*	Critically Endangered
Leatherback turtle	*Dermochelys coriacea*	Vulnerable
Loggerhead turtle	*Caretta caretta*	Endangered
Olive Ridley turtle	*Lepidochelys olivacea*	Vulnerable

Sources: Marine Turtle Specialist Group 1996, Red List Standards & Petitions Subcommittee 1996, Sarti Martinez (Marine Turtle Specialist Group) 2000, Seminoff 2004, Abreu-Grobois & Plotkin 2008, Mortimer et al. 2008, IUCN 2014, The IUCN Red List of Threatened species. Version 2015.2 <www.iucnredlist.org>. Downloaded on 15 July 2015.

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. No assessment has been undertaken by the IOTC WPEB for marine turtles due to the lack of data being submitted by CPCs. However, the current International Union for Conservation of Nature (IUCN) threat status for each of the marine turtle species reported as caught in IOTC fisheries to date is provided in Table 1. It is important to note that a number of international global environmental accords (e.g. Convention on Migratory Species (CMS), Convention on Biological Diversity (CBD)), as well as numerous fisheries agreements obligate States to provide protection for these species. In particular, there are now 35 Signatories to the Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia (IOSEA MoU). Of the 35 Signatories to the IOSEA MoU, 23 are also members of the IOTC. While the status of marine turtles is affected by a range of factors such as degradation of marine turtle natural habitats and targeted harvesting of eggs and turtles, the level of mortality of marine turtles due to capture by gillnets is likely to be substantial as shown by the Ecological Risk Assessment undertaken in 2012/13, and an order of magnitude higher than longline and purse seine gears for which mitigation measures are in place.

Outlook. Resolution 12/04 *On the conservation of marine turtles* includes an annual evaluation requirement (para. 17) by the Scientific Committee (SC). However, given the lack of reporting of marine turtle interactions by CPCs to date, such an evaluation cannot be undertaken. Unless IOTC CPCs become compliant with the data collection and reporting requirements for marine turtles, the WPEB and the SC will continue to be unable to address this issue. Notwithstanding this, it is acknowledged that the impact on marine turtle populations from fishing for tuna and tuna-like species may increase if fishing pressure increases, or if the status of the marine turtle populations worsens due to other factors such as an increase in fishing pressure from other fisheries or anthropological or climatic impacts.

The following should be noted:

- The available evidence indicates considerable risk to marine turtles in the Indian Ocean.
- The primary source of data that drive the ability of the WPEB to determine a status for the Indian Ocean, total interactions by fishing vessels, is highly uncertain and should be addressed as a matter of priority.
- Current reported interactions are known to be a severe underestimate.
- From the limited data received, longlining posed the greater apparent risk to marine turtles. The ERA estimated that ~3,500 marine turtles are caught by longline vessels annually, while it was estimated that ~250 marine turtles p.a. are observed in purse seine operations, 75% being released alive (Bourjea et al. 2014). The Ecological Risk Assessment conducted by Nel et al. (2013) set out two separate approaches to estimate gillnet impacts on marine turtles, based on very limited data. The first calculated that 52,425

[11] The process of the threat assessment from IUCN is independent from the IOTC and is presented for information purpose only

marine turtles p.a. and the second that 11,400–47,500 turtles p.a. are caught in gillnets (with a mean of the two methods being 29,488 marine turtles p.a.). Anecdotal/published studies reported values of >5000–16,000 marine turtles p.a. for each of India, Sri Lanka and Madagascar. Of these reports, green turtles are under the greatest pressure from gillnet fishing, constituting 50–88% of catches for Madagascar. Loggerhead, hawksbill and olive Ridley turtles are caught in varying proportions depending on the region.

- Maintaining or increasing fishing effort in the Indian Ocean without appropriate mitigation measures in place, will likely result in further declines in the number of individuals.
- That appropriate mechanisms are developed by the Compliance Committee to ensure CPCs comply with their data collection and reporting requirements for marine turtles.

APPENDIX XXXI
EXECUTIVE SUMMARY: SEABIRDS

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

Status of seabirds in the Indian Ocean

TABLE 1. IUCN threat status for all seabird species reported as caught in fisheries within the IOTC area of competence.

Common name	Scientific name	IUCN threat status[12]
Albatross		
Atlantic Yellow-nosed Albatross	*Thalassarche chlororynchos*	Endangered
Black-browed albatross	*Thalassarche melanophrys*	Near Threatened
Indian yellow-nosed albatross	*Thalassarche car teri*	Endangered
Shy albatross	*Thalassarche cauta*	Near Threatened
Sooty albatross	*Phoebetria fusca*	Endangered
Light-mantled albatross	*Phoebetria palpebrata*	Near Threatened
Amsterdam albatross	*Diomedea amsterdamensis*	Critically Endangered
Tristan albatross	*Diomedea dabbenena*	Critically Endangered
Wandering albatross	*Diomedia exulans*	Vulnerable
White-capped albatross	*Thalassarche steadi*	Near Threatened
Grey-headed albatross	*Thalassarche chrysostoma*	Endangered
Petrels		
Cape/Pintado petrel	*Daption capense*	Least Concern
Great-winged petrel	*Pterodroma macroptera*	Least Concern
Grey petrel	*Procellaria cinerea*	Near Threatened
Southern giant petrel	*Macronectes giganteus*	Least Concern
Northern giant-petrel	*Macronectes halli*	Least Concern
White-chinned petrel	*Procellaria aequinoctialis*	Vulnerable
Others		
Cape gannet	*Morus capensis*	Vulnerable
Flesh-footed shearwater	*Puffinus carneipes*	Least Concern

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. No assessment has been undertaken by the IOTC WPEB for seabirds due to the lack of data being submitted by CPCs. However, the current International Union for Conservation of Nature (IUCN) threat status for each of the seabird species reported as caught in IOTC fisheries to date is provided in Table 1. It is important to note that a number of international global environmental accords (e.g. Convention on Migratory Species (CMS), the Agreement on the Conservation of Albatrosses and Petrels (ACAP), Convention on Biological Diversity (CBD)), as well as numerous fisheries agreements obligate States to provide protection for these species. While the status of seabirds is affected by a range of factors such as degradation of nesting habitats and targeted harvesting of eggs, for albatrosses and large petrels, fisheries bycatch is generally considered to be the primary threat. The level of mortality of seabirds due to fishing gear in the Indian Ocean is poorly known, although where there has been rigorous assessment of impacts in areas south of 25 degrees (e.g. in South Africa), very high seabird incidental catches rates have been recorded in the absence of a suite of proven incidental catches mitigation measures.

Outlook. Resolution 12/06 *On Reducing the Incidental Bycatch of Seabirds in Longline Fisheries* includes an evaluation requirement (para. 8) by the Scientific Committee in time for the 2016 meeting of the Commission. The level of compliance with 12/06 and the frequency of use of each of the 3 measures (because vessels can chose two out of three

[12] The process of the threat assessment from IUCN is independent from the IOTC and is presented for information purpose only

possible options) are currently unknown. Methods to evaluate the effectiveness of the incidental catches mitigation measures prescribed in Res 12/06 need to be developed. Observer reports and logbook data should be analysed to support assessments of the effectiveness of mitigation measures used and relative impacts on seabird mortality rates. Information regarding seabird interactions reported in National Reports should be stratified by season, broad area, and in the form of catch per unit effort. Unless IOTC CPCs become compliant with the data collection, Regional Observer Scheme and reporting requirements for seabirds, the WPEB will continue to be unable to address this issue.

The following should be noted:

- The available evidence indicates considerable risk from longline fishing to the status of seabirds in the Indian Ocean, where the best practice seabird incidental catches mitigation measures outlined in Resolution 12/06 are not implemented.
- CPCs that have not fully implemented the provisions of the IOTC Regional Observer Scheme outlined in paragraph 2 of Resolution 11/04 shall report seabird incidental catches through logbooks, including details of species, if possible.
- Appropriate mechanisms should be developed by the Compliance Committee to assess levels of compliance by CPCs with the Regional Observer Scheme requirements and the mandatory measures described in Res 12/06.

APPENDIX XXXII
2015 UPDATE ON THE IMPLEMENTATION OF THE IOTC REGIONAL OBSERVER SCHEME

CPCs	Active Vessels LOA≥24m or High Seas vessels[13]				Progress	List of accredited observers submitted	Number of observer reports provided[14]					
	LL	PS	GN	BB			2010	2011	2012	2013	2014	2015
MEMBERS												
Australia	3	5			Australia has implemented an observer programme for the longline fleet	**YES: 21**	**2(O)**	**1(O)**	**3(O)**	**No**	**2(O) + 3(E)**	**No**
Belize	4				No information received by the Secretariat.	**No**	**No**	**No**	**No**	**No**	**No**	**No**
China –Taiwan,China	47 241				China has implemented an observer programme	**YES: 3** **YES: 54**	**1(O)** **No**	**No** **No**	**1(O)** **No**	**1(O)** **No**	**No** **No**	**No** **No**
Comoros					Comoros does not have vessels ≥ 24m. Two observers were trained under the IOC Regional Monitoring Project, and 5 by SWIOFP.	**YES: 7**	N/A	N/A	N/A	N/A	N/A	N/A
Eritrea	No information received				No information received by the Secretariat.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
European Union	15 6 22 2	13 0 15 0			EU has an observer programme on-board its purse seine and longline fleets. To date, no information has been received from EU,UK.	Partial: **EU,France: 52** **EU,Portugal: 4** **EU,Spain : 9** **EU,UK : No**	EU, France: 6**(O)** **No** **No** **No**	EU, France: 13+9**(O)** EU, Portugal: 1**(O)** **No** **No**	EU, France: 17+7**(O)** EU, Portugal: 1**(O)** **No** **No**	EU, France: 15+7**(O)** EU, Portugal: 1**(O)** EU, Spain: 1**(O)** **No**	EU, France: 32(O) EU, Portugal: 1**(O)** EU, Spain: 2**(O)** **No**	EU, France: 26(O) EU, Portugal: 1**(O)** **No** **No**
Guinea					Guinea has had no vessels operating in the Indian Ocean since 2006	N/A	N/A	N/A	N/A	N/A	N/A	N/A
India					India has not yet developed an observer programme.	**No**	**No**	**No**	**No**	**No**	**No**	**No**
Indonesia	458				Indonesia has 13 registered IOTC observers and a number of initiatives, however, no data have been submitted to the IOTC Secretariat	**YES:13**	**No**	**No**	**No**	**No**	**No**	**No**
Iran, Isl. Rep. of		5	1223		30 observers have been selected and are due to be deployed in 2016. IOTC observer training took place in 2015.	**No**	**No**	**No**	**No**	**No**	**No**	**No**
Japan	53				Japan started its observer programme on the 1st of July 2010, and currently deploys 19 observers in the Indian Ocean.	**YES: 19**	**8(E)**	**8(E)**	**10(E)**	**7(E)**	**No**	**No**

[13] The number of active vessels is given for 2014
[14] Year in which the observed trip has started (E: Electronic; O: Other)

CPCs	Active Vessels LOA≥24m or High Seas vessels[13]				Progress	List of accredited observers submitted	Number of observer reports provided[14]					
	LL	PS	GN	BB			2010	2011	2012	2013	2014	2015
Kenya					Kenya is developing an observer programme and 5 observers have been trained by SWIOFP. Kenya has had no vessels listed in the active vessel registry since 2010.	YES: 5	No	N/A	N/A	N/A	N/A	N/A
Korea, Rep. of	10	4			Korea has had an observer programme since 2002 and has 28 observers registered in the Indian Ocean.	YES: 28	2(O)	No	2(O)	3(O)	3(O)	No
Madagascar	7				Madagascar has developed an observer programme. Five and three observers have been trained through SWIOFP and IOC respectively.	YES: 7	No	No	5(O) [15]	8(O)	7(O)	No
Malaysia	11				Malaysia is developing plans for the implementation of an observer programme.	No	No	No	No	No	No	No
Maldives	27			317	Maldivian vessel landings are monitored by field samplers at landing sites. Maldives is currently developing an at-sea observer programme, however no data have yet been received by the IOTC Secretariat.	YES: 4	No	No	No	No	No	No
Mauritius		7			Mauritius is developing an observer programme. Five observers have been trained through SWIOFP and three through the IOC.	YES: 8	No	No	No	No	No	No
Mozambique	2				Mozambique has an observer programme and has submitted one trip report, but did not have any active vessels ≥24m in 2013.	YES: 11	No	No	1(O)	N/A	No	No
Oman	3				No onboard observers have yet been deployed, however IOTC training took place in 2015.	No	No	No	No	No	No	No
Pakistan					Onboard observers have been deployed through WWF-Pakistan, however no data has yet been submitted to the IOTC Secretariat. IOTC observer training for Ministry staff took place in 2015.	No	No	No	No	No	No	No
Philippines	4				No information received by the Secretariat.	No	No	No	No	No	No	No
Seychelles	31	8			Seychelles is developing an observer programme. Four observers have been trained through SWIOFP and three through the IOC.	YES: 7	No	No	No	No	No	No
Sierra Leone	No information received				No information received by the Secretariat.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Somalia	No information received				No information received by the Secretariat.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sri Lanka	13	7	1589		Sri Lanka has begun an observer initiative and submitted observer data from pilot trips in 2014 and 2015.	No	No	No	No	No	2(O)	1(O)

[15] Reports from Madagascar include observers onboard foreign vessels

CPCs	Active Vessels LOA≥24m or High Seas vessels[13]				Progress	List of accredited observers submitted	Number of observer reports provided[14]					
	LL	PS	GN	BB			2010	2011	2012	2013	2014	2015
Sudan	No information received				No information received by the Secretariat.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tanzania, United Rep.of	3				Tanzania does not currently have an observer programme in place.	**No**	**No**	**No**	**No**	**No**	**No**	**No**
Thailand	6				Thailand has initiated an observer training programme and observers are due to be deployed in 2016	**No**	**No**	**No**	**No**	**No**	**No**	**No**
United Kingdom (OT)					The UK(OT) does not have any active vessels in the Indian Ocean.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vanuatu					Vanuatu does not currently have an observer programme in place.	**No**	**No**	N/A	**No**	**No**	**No**	**No**
Yemen	No information received				No information received by the Secretariat.	**No**	**No**	**No**	**No**	**No**	**No**	**No**
COOPERATING NON-CONTRACTING PARTIES												
Bangladesh					No information received by the Secretariat.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Djibouti					No information received by the Secretariat.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Liberia					No information received by the Secretariat.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Senegal					Senegal has not had any active vessels in the Indian Ocean since 2007.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
South Africa	6				South Africa operates an observer programme for foreign vessels operating within the EEZ as well as national vessels.	**YES: 16**	**No**	**13(O)**	**10(O)**	**13(O)**	**8+2(O)** [16]	**7+10(O)**

[16] Reports submitted for foreign vessels operating in the EEZ of South Africa between 2011 and 2013, and foreign + national flagged vessels for 2014 and 2015.

APPENDIX XXXIII
2015: UPDATE ON PROGRESS REGARDING RESOLUTION 09/01 – ON THE PERFORMANCE REVIEW FOLLOW–UP

(NOTE: NUMBERING AND RECOMMENDATIONS AS PER APPENDIX I OF RESOLUTION 09/01)

ON CONSERVATION AND MANAGEMENT	RESPONSIBILITY	UPDATE/STATUS	WORKPLAN/TIMELINE	PRIORITY
Data collection and sharing				
The Panel identified a poor level of compliance by many IOTC Members. with their obligations, notably those related to the statistical requirements on artisanal fisheries and sharks, and recommends that:				
[3] The timing of data reporting be modified to ensure that the most recent data are available to the working parties and the Scientific Committee.	*Scientific Committee*	**Completed:** Currently CPCs are required to submit information on their flag vessels by 30th June every year. The timeline for coastal CPCs who license foreign vessels has been brought forward to 15th February every year. The timing of the Working Parties will be reviewed annually to ensure that assessments can be completed and results reported to the Scientific Committee each year.	Review annually at IOTC WP and SC meetings.	Medium
[5] The scheduling of meetings of the working parties and Scientific Committee be investigated based on the experience of other RFMOs. This should bear in mind the optimal delivery of scientific advice to the Commission.	*Scientific Committee*	**Completed:** Given the large number of meetings of other RFMOs, it is becoming increasingly difficult to find a schedule of meetings that would be better than the one currently in practice. However, the Working Parties and the Scientific Committee will annually review the timing of the Working Parties.	Review annually at IOTC WP and SC meetings.	Low
[6] The Commission task the Scientific Committee with exploring alternative means of communicating data to improve timeliness of data provision.	*Scientific Committee*	**Partially Completed & Ongoing**: The Secretariat encourages members to utilise electronic means to expedite reporting. A study was commissioned for 2011 to determine the feasibility of reporting near real–time for various fleets. Outcome: Real time reporting not currently possible for most CPCs.	Review annually at IOTC WP and SC meetings.	Medium
[10] There is a need to improve the quality and quantity of the data collected and reported by the Members, including the information necessary for implementing the ecosystem approach. The most immediate emphasis should be placed on catch, effort and size frequency. The Panel also recommends that:	*Scientific Committee*	**Ongoing**: See below recommendation 11. Other sources and cooperative arrangements will continue (e.g. IOTC-OFCF Project) or might be available in the future (e.g. SWIOFC, COI, etc.). The Secretariat continues to collaborate with these initiatives.	Review annually at IOTC WP and SC meetings.	High

[12] A regional scientific observer programme to enhance data collection (also for non–target species) and ensure a unified approach be established, building on the experience of other RFMOs, Regional standards on data collection, data exchanged and training should be developed.	*Scientific Committee*	**Partially completed**: Resolution 11/04 (superseding Res.09/04 and Res. 10/04) provides CPCs with the necessary framework for putting in place national scientific observer programmes. The Regional Observers Scheme commenced July 1st 2010, and is based on national implementation. The Secretariat coordinated the preparation of standards for data requirements, training and forms. Implementation by CPCs has been limited to date. The IOTC Secretariat will commence training workshops in 2015 in several key CPCs requesting assistance (i.e. I.R. Iran and Sri Lanka). Workshop held in Muscat, Oman in October 2015	Review annually at IOTC WP and SC meetings.	High
[15] The Secretariat's capacity for data dissemination and quality assurance be enhanced, including through the employment of a fisheries statistician.	*Standing Committee on Administration and Finance via Scientific Committee* *Commission*	**Partially Completed & Ongoing**: The existing post of Data Analyst was converted to a Fisheries Statistician to join the Data Section of the Secretariat. The position was filled in September 2012. Further efforts continue to be made to improve data dissemination, including through an online data atlas, planned for 2014/15 which will be launched in early-2015, in addition to general improvements in the dissemination and access to IOTC datasets via the new IOTC website.	Staffing needs to be assessed annually at IOTC meetings.	Medium
[16] A statistical working party be established to provide a more efficient way to identify and solve the technical statistical questions.	*Scientific Committee*	**Completed:** The Working Party on Data Collection and Statistics (WPDCS) has been formed and held its 11th Session in October 2015.	Annual meeting.	High
[21] Innovative or alternative means of data collection (e.g. port sampling) should be explored and, as appropriate, implemented.	*Scientific Committee*	**Ongoing**: The Secretariat has been implementing sampling programmes since 1999. The IOTC, in collaboration with others (i.e. OFCF, COI, BOBLME) has supported sampling programmes and other means of data collection since 2002. The Secretariat continues to work with CPCs to improve their data collection programs.	Review annually at IOTC WP and SC meetings.	Medium
Quality and provision of scientific advice				
[23] For species with little data available, the Scientific Committee should be tasked with making use of more qualitative scientific methods that are less data intensive.	*Scientific Committee*	**In progress**: The species Working Parties have been using informal analyses of stock status indicators when data are considered insufficient to conduct full assessments for some time. However, a formal system that reviews those qualitative indicators and provides a recommendation on the current status, based on the weight–of–evidence is currently being implemented.	To be considered at the WPM and others. Review annually at IOTC WP and SC meetings.	High

		In 2013, 2014 and 2015, data poor approaches to determining stock status was applied to a range of billfish and neritic tuna species. The SC will consider in 2015, options to rank stock status determination using a 'tier' approach, which will assist in the interpretation of the level of uncertainty present in assessment methods applied.		
[25] Confidentiality provisions and issues of accessibility to data by the scientists concerned needs to be clearly delineated, and/or amended, so that analysis can be replicated.	*Scientific Committee*	**Ongoing**: Input, output and executable files for the assessment of major stocks are archived with the Secretariat to allow replication of analyses. Access to operational data under cooperative arrangements, and those subject to confidentiality rules is still limited. In some cases the Secretariat is bound by the domestic data confidentiality rules of Members and Cooperating Non–Contracting Parties. The SC recommended to include observer data under the confidentiality policy of IOTC, which was Adopted by the Commission in 2012 as Resolution 12/02.	Review annually at IOTC WP and SC meetings.	Medium
[27] To enhance the quality of scientific advice and the technical soundness of the papers being considered by the Scientific Committee and its working parties, and to encourage publication of IOTC scientific papers in relevant journals, future consideration should be given to the establishment of a scientific editorial board within the Scientific Committee	*Scientific Committee*	**Partially Completed & Ongoing**: Guidelines for the presentation of stock assessment papers were revised and agreed to by the Scientific Committee in 2010,2012 and 2014. The SC will again consider revising the guidelines in 2015, as a result of the Commission adoption Recommendation 14/07 *To standardise the presentation of scientific information in the annual Scientific Committee report and in Working Party reports.* The SC actively encourages national scientists to publish in peer reviewed journals, as is the case following the Tuna tagging Symposium held in 2012.	Review annually at IOTC WP and SC meetings.	Medium
[29] Ongoing peer review by external experts should be incorporated as standard business practice of working parties and the Scientific Committee.	*Scientific Committee*	**Pending**: External experts (Invited Experts) are regularly invited to provide additional expertise at Working Party meetings, although this does not constitute a formal process of peer review. The Scientific Committee in 2010 and 2011, agreed that once stock assessment models were considered robust, that peer review would be advantageous and funds will be requested to undertake peer reviews of stock assessments. The Scientific Committee reviewed the processes for Invited Experts, Consultants and Peer review at its 14th Session in 2011.	Review annually at IOTC WP and SC meetings.	Medium
[30] New guidelines for the presentation of more user friendly scientific reports in terms of stock assessments should be developed. In this respect,	*Scientific Committee*	**Pending**: External experts (Invited Experts) are regularly invited to provide additional expertise at Working Party meetings, although	Review annually at IOTC WP and SC meetings.	Medium

Kobe plots are considered to be the most desirable method of graphical presentation, especially to non–technical audience.		this does not constitute a formal process of peer review. The Scientific Committee, in 2010 and 2011, agreed that once stock assessment models were considered robust, that peer review would be advantageous and funds will be requested to undertake peer reviews of stock assessments. The Scientific Committee reviewed the processes for Invited Experts, Consultants and Peer review at its 14th Session in 2011.		
Adoption of conservation and management measures				
[35] IOTC should consider developing a framework to take action in the face of uncertainty in scientific advice.	*Scientific Committee and Commission*	**In progress**: The Scientific Committee has agreed that the development of a Management Strategy Evaluation process be initiated to provide better advice that would incorporate explicit consideration of uncertainty. Other ways of describing uncertainty were incorporated into the *Guidelines for the presentation of CPUE standardisations and stock assessment models*.	Progress at WPM annual meeting.	High
Capacity management				
[42] IOTC should establish a stronger policy on fishing capacity to prevent or eliminate excess fishing capacity.	*Working Party on Fishing Capacity* *Scientific Committee* *Commission*	**Ongoing**: The Commission has since 2003 adopted a series of Resolutions (03/01, 06/05, 07/05, 09/02, 12/11) with the objective of addressing the issue of fishing capacity. However, to date these resolutions have not resulted in a strong control on fishing capacity, and the concern remains that overcapacity might result from this lack of control. The Secretariat is actively involved in developing the global vessels record for vessels fishing for tuna and tuna–like species that would contribute to the assessment of existing fishing capacity.	See Recommendation 33, which has been agreed as the priority path in this regard.	Medium
[43] Loopholes in the current systems of fishing capacity limitation, such as the establishment of fleet development plans and exemptions for vessels less than 24 meters, should be closed.	*Working Party on Fishing Capacity* *Commission*	**Partially Completed & Ongoing**: Resolution 09/02, superseded by Resolution 12/11, and the decisions made at IOTC 14, establishing a new deadline to file fleet developments plans, aim at establishing firm capacity targets. The IOTC Scientific Committee has indicated that IOTC fisheries should not be managed via fishing capacity limitations, as they are inherently difficult to manage and highly uncertain due to variations in fishing power over time and among vessels.	See Recommendation 33, which has been agreed as the priority path in this regard.	Medium

APPENDIX XXXIVA
PROGRAM OF WORK (2016–2020) FOR THE SCIENTIFIC COMMITTEE AND ITS SUBSIDIARY BODIES

Highest priority projects for the Scientific Committee

Working Party	Sub-topic and project	Budget (source)	Timing
WPB, WPEB, WPNT, WPTT, WPTmT	Stock structure (connectivity and diversity)	1,300,000 Euro (EU)	2016-2018
WPB	Sports/recreational fisheries (Fishery trends)	Consultant US$54,000	2016-2020
WPEB	Connectivity, movements, and habitat use, making use of conventional and electronic tagging (PSAT) (3 shark species)	US$80,000 x 3 spp.	2016-2020
WPEB	Post-release mortality (electronic tagging), to assess the efficiency of management resolutions on no retention species (4 shark species)	US$170,000 x 4 spp.	2016-2017
WPEB, WPDCS	Data requirements and data collection protocols, including ROS (Artisanal and Industrial fisheries)	IOTC & external funding	2016-2020
WPDCS	Compliance with IOTC Data Requirements (Data support missions)	External funding	2016-2018
WPM, WPTT	MSE (Yellowfin tuna)	$75,000 (IOTC)	2016
WPM, WPTT	MSE (Bigeye tuna)	$75,000 (IOTC)	2016
WPNT	Data mining and capacity building on neritic tuna and tuna-like species	Consultant US$16,250 / yr	2016-2017
WPTT	Standardisations of purse seine CPUE be made where possible using the operational data on the fishery.		2016-2020
WPTT	Longline CPUE standardisation using the combined data from multiple fleets, and to further develop and validate the methods used in these analyses.	US$40,000 / yr (IOTC)	
WPTmT	Develop standardised CPUE series for each albacore fishery for the Indian Ocean, with the aim of developing a single CPUE series for stock assessment purposes.		2016 and 2018
WPTmT	Capacity building among the WPTmT participants by supplementing the skill set available within IOTC CPCs to further develop the SS3 model. An indicative budget is provided below:	Consultant US$26,000 / yr (IOTC)	

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

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)	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 ➢ 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.	High (2)	CPCs directly					
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 (4)	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					
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).	High (3)	IOTC Regular Budget					

APPENDIX XXXIVC
WORKING PARTY ON TEMPERATE TUNAS PROGRAM OF WORK (2016–2020)

Table 1. Priority topics for obtaining the information necessary to develop stock status indicators for albacore 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 and diversity)	1.1 Genetic research to determine the connectivity of albacore throughout its distribution and the effective population size.	High (5)	1.3 m Euro: European Union					
		1.1.1 Determine albacore stock structure, migratory range and movement rates in the Indian Ocean.		TBD					
		1.1.2 Determine the degree of shared stocks for albacore in the Indian Ocean with the southern Atlantic Ocean.		Ifremer					
		1.1.3 Population genetic analyses to decipher inter- and intraspecific evolutionary relationships, levels of gene flow (genetic exchange rate), genetic divergence, and effective population sizes.		TBD					
2.	Biological information (parameters for stock assessment)	2.1 Age and growth research (collaborative research to estimate ages across research facilities; stratification of sampling across fishery and stock)	High (3)	CPCs directly					
		2.1.1 China and other CPCs to provide further research reports on albacore biology, including through the use of fish otolith studies, either from data collected through observer programs or other research programs, at the next WPTmT meeting.		CPCs directly					
		2.1.2 Growth curve analysis: Uncertainty about the growth curve is a primary source of uncertainty in the stock assessment. Depending on the shape of the growth curve, it is likely that only limited information about total mortality can be obtained from catch-at-size data. As an additional information source, data on the age structure of the catch may be very informative about total mortality and may considerably reduce uncertainty in the assessment. Research needs to be undertaken to investigate the potential and the best approaches to be used. MSE process to look at improvement in precision of estimates given different amounts		CPCs directly					

		of age structure data, depending on fishery, growth curve, and effective sample sizes.							
		2.2 Natural mortality (M)	High (3)						
		2.2.1 Examine the impacts of a range of M values on stock assessments, from constant rates of 0.2, 0.3. and 0.4 over time, to M values which change with age, from 0.4 to 0.2.		CPCs directly					
		2.2.2 Review evidence of currently available estimates are realistic, and whether more recent data is available on this key parameter.		CPCs directly					
		2.3 Age-at-Maturity	High (3)						
		2.3.1 Quantitative biological studies are necessary for albacore throughout its 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.		CPCs directly					
3.	Ecological information	3.1 Spawning time and locations	High (4)						
		3.1.1 Collect gonad samples from albacore to confirm the spawning time and location of the spawning area that are presently hypothesised for albacore.		CPCs directly					
4.	CPUE standardisation	4.1 Develop standardised CPUE series for each albacore fishery for the Indian Ocean, with the aim of developing a single CPUE series for stock assessment purposes (either a combined or single fleet series approved by the WPTmT).	High (1)	CPUE Workshop (TBD)					
		4.1.1 Changes in species targeting is the most important issue to address in CPUE standardisations.		CPCs directly					
		4.1.2 Appropriate spatial structure needs to be considered carefully as fish density (and targeting practices) can be highly variable on a fine spatial scale, and it can be misleading to assume that large areas are homogenous when there are large shifts in the spatial distribution of effort.		CPCs directly					
		4.1.3 If there are many observations with positive effort and zero catch, it is worth considering models which explicitly model the processes that lead to the zero observations (e.g. negative binomial, zero-inflated or delta-lognormal models). Adding a small constant to the lognormal model may be fine if there are few zero's, but may not be appropriate for areas with many zero		CPCs directly					

		catches (e.g. north of 10oS). Sensitivity to the choice of constant should be tested.							
		4.1.4 The appropriate inclusion of environmental variables in CPUE standardisation is an ongoing research topic. Often these variables do not have as much explanatory power as, or may be confounded with, fixed spatial effects. This may indicate that model-derived environmental fields are not accurate enough at this time, or there may need to be careful consideration of the mechanisms of interaction to include the variable in the most informative way.		CPCs directly					
		4.1.5 It is difficult to prescribe analyses in advance, and model building should be undertaken as an iterative process to investigate the processes in the fishery that affect the relationship between CPUE and abundance.		CPCs directly					
5.	Stock assessment / Stock indicators	5.1 Develop and compare multiple assessment approaches to determining stock status for albacore (SS3, ASPIC etc).	High (2)						
		5.1.1 A consultant be hired to assist in building capacity among the WPTmT participants by supplementing the skill set available within IOTC CPCs to further develop the SS3 model. An indicative budget is provided below:		US$26,000 in 2016 and 2018 IOTC Regular Budget	*		*		
		Estimated budget (US$) required to hire a consultant to further develop the SS3 stock assessment model on albacore tuna in 2016 and 2018.							
		Description / **Unit price** / **Units required** / **2016 Total (US$)** / **2018 Total (US$)**							
		SS3 Stock assessment for albacore (fees) / 550 / 40 / 22,000 / 22,000							
		SS3 Stock assessment for albacore (travel) / 4,000 / 1 / 4,000 / 4,000							
		Total estimate / **26,000** / **26,000**							
6.	Target and Limit reference points	6.1 To advise the Commission, by end of 2014 at the latest on Target Reference Points (TRPs) and Limit Reference Points (LRPs).	High (WPM)						
		6.1.1 Assessment of the interim reference points as well as alternatives: Used when assessing the albacore stock status and when establishing the Kobe plot and Kobe matrices.							

	Agreed to pass this task temporarily to WPM.					
7. Management measure options	7.1 To advise the Commission, by end of 2014 at the latest, on potential management measures having been examined through the Management Strategy Evaluation (MSE) process. Agreed to pass this task temporarily to WPM.					

APPENDIX XXXIVD
WORKING PARTY ON BILLFISH PROGRAM OF WORK (2016–2020)

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

Topic	Sub-topic and project	Priority ranking	Est. budget and/or potential source	Timing				
				2016	2017	2018	2019	2020
1. Stock structure (connectivity and diversity)	1.1 Genetic research to determine the connectivity of billfish throughout their distribution (including in adjacent Pacific and Atlantic waters as appropriate) and the effective population size.	High (1)	1.3 m Euro: (European Union)					
	1.1.1 Next Generation Sequencing (NGS) to determine the degree of shared stocks for billfish in the Indian Ocean with the southern Atlantic Ocean and Pacific Ocean, as appropriate. Population genetic analyses to decipher inter- and intraspecific evolutionary relationships, levels of gene flow (genetic exchange rate), genetic divergence, and effective population sizes.	High (1)						
	1.1.2 Nuclear markers (i.e. microsatellite) to determine the degree of shared stocks for billfish (highest priority species: blue, black, striped marlin and sailfish) in the Indian Ocean with the southern Atlantic Ocean and Pacific Ocean, as appropriate.	High (1)						
	1.2 Tagging research to determine connectivity, movement rates and mortality estimates of billfish.	High (4)	US$50,000 by Chair WPB					
	1.2.1 Tagging studies (PSAT)		(TBD)					
2. Biological and ecological information (incl. parameters for stock assessment)	2.1 Age and growth research	High (8)						
	2.1.1 CPCs to provide further research reports on billfish biology, namely age and growth studies including through the use of fish otolith or other hard parts, either from data collected through observer programs or other research programs.		CPCs directly					
	2.2 Age-at-Maturity	High (9)						
	2.2.1 Quantitative biological studies are necessary for billfish throughout its range to determine key biological parameters including age-at-maturity and fecundity-at-age/length		(CPCs directly)					

		relationships, age-length keys, age and growth, which will be fed into future stock assessments.								
		2.3 Spawning time and locations	High (10)							
		2.3.1 Collect gonad samples from billfish to confirm the spawning time and location of the spawning area that are presently hypothesized for each billfish species.		(CPCs directly)						
3.	Historical data review	3.1 Changes in fleet dynamics								
		3.1.1 Japan and Taiwan,China to undertake an historical review of their longline fleets and to document the changes in fleet dynamics. The historical review should include as much explanatory information as possible regarding changes in fishing areas, species targeting, gear changes and other fleet characteristics to assist the WPB understand the current fluctuations observed in the data.	High (7)	(CPCs directly)						
		3.2 Species identification								
		3.2.1 The quality of the data available at the IOTC Secretariat on marlins (by species) is likely to be compromised by species miss-identification. Thus, CPCs should review their historical data in order to identify, report and correct (if possible) potential identification problems that are detrimental to any analysis of the status of the stocks.	High (6)	(CPCs directly)						
4.	Sports/recreational fisheries	4.1 Fishery trends								
		4.1.1 The catch and effort data for sports/recreational fisheries targeting marlins and sailfish in the Indian Ocean should be submitted to the IOTC Secretariat to assist in future assessments for these species. CPCs with active sports/recreational fisheries targeting marlins and sailfish should undertake a comprehensive analysis for provision to the WPB.	High (2)	Consultant US$54,000						
5.	CPUE standardisation	5.1 Develop and/or revise standardised CPUE series for each billfish species and major fisheries/fleets for the Indian Ocean.								
		5.1.1 Swordfish: Priority LL fleets: Taiwan,China, EU(Spain, Portugal, France), Japan, Indonesia	High (11)	(CPCs directly)						

		5.1.2 Striped marlin: Priority fleets: Japan, Taiwan,China	High (12)	(CPCs directly)					
		5.1.3 Black marlin: Priority fleets: Longline: Taiwan,China; Gillnet: I.R. Iran, Sri Lanka)	High (14)	(CPCs directly)					
		5.1.4 Blue marlin: Priority fleets: Taiwan,China	High (15)	(CPCs directly)					
		5.1.5 I.P. Sailfish: Priority fleets: Priority gillnet fleets: I.R. Iran and Sri Lanka; Priority longline fleets: EU(Spain, Portugal, France), Japan, Indonesia;	High (13)	(CPCs directly)					
6.	Stock assessment / Stock indicators	6.1 Develop and compare multiple assessment approaches to determining stock status for swordfish (SS3, ASPIC, etc.).	High (16)	US$??					
		6.2 Data poor stock assessment on billfish species in 2016 and 2017	High (3)	Consultant / US$16,250					
		6.3 Workshops on data poor techniques for assessment including CPUE estimations for billfish species from gillnet fisheries in 2016 and 2017.	High (5)	Consultant US$11,750					
7	Target and Limit reference points	7.1 To advise the Commission, by end of 2016 at the latest on Target Reference Points (TRPs) and Limit Reference Points (LRPs).	High (17)						
		7.1.1 Assessment of the interim reference points as well as alternatives: Used when assessing the Swordfish stock status and when establishing the Kobe plot and Kobe matrices. = Agreed to pass this task temporarily to WPM.		WPM					
8	Management measure options	8.1 To advise the Commission, by end of 2016 at the latest, on potential management measures having been examined through the Management Strategy Evaluation (MSE) process.	High (18)						
		8.1.1 These management measures will therefore have to ensure the achievement of the conservation and optimal utilisation of stocks as laid down in article V of the Agreement for the establishment of the IOTC and more particularly to ensure that, in as short a period as possible and no later than 2020, (i) the fishing mortality rate does not exceed the fishing mortality rate allowing the stock to deliver MSY and (ii) the spawning biomass is maintained at or above its MSY level. = Agreed to pass this task temporarily to WPM.		WPM					

APPENDIX XXXIVE
WORKING PARTY ON ECOSYSTEMS AND BYCATCH PROGRAM OF WORK (2016–2020)

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

Topic	Sub-topic and project	Priority ranking	Lead	Est. budget (potential source)	Timing				
					2016	2017	2018	2019	2020
	SHARKS								
1. Stock structure (connectivity and diversity)	1.1 Genetic research to determine the connectivity of select shark species throughout their distribution (including in adjacent Pacific and Atlantic waters as appropriate) and the effective population size.	High (13)	CSIRO/AZTI /IRD/RITF	1.3 m Euro: (European Union; 20% additional co-financing)					
	1.1.3 Next Generation Sequencing (NGS) to determine the degree of shared stocks for select shark species (highest priority species: blue shark, scalloped hammerhead shark, oceanic whitetip shark and shortfin mako shark) in the Indian Ocean with the southern Atlantic Ocean and Pacific Ocean, as appropriate. Population genetic analyses to decipher inter- and intraspecific evolutionary relationships, levels of gene flow (genetic exchange rate), genetic divergence, and effective population sizes.								
	1.1.4 Nuclear markers (i.e. microsatellite) to determine the degree of shared stocks for select shark species (highest priority species: blue shark, scalloped hammerhead shark and oceanic whitetip shark) in the Indian Ocean with the southern Atlantic Ocean and Pacific Ocean, as appropriate.								
	1.2 Connectivity, movements and habitat use								
	1.2.1 Connectivity, movements, and habitat use, including identification of hotspots and investigate associated environmental conditions affecting the sharks	High (1)	AZTI, IRD, Others	US$80K each species (TBD)	BSH SMA	BSH SMA OCS	SMA OCS		

Topic	Sub-topic and project		Priority ranking	Lead	Est. budget (potential source)	Timing				
						2016	2017	2018	2019	2020
		distribution, making use of conventional and electronic tagging (PSAT).								
	1.2.2	Whale sharks (RHN): Connectivity, movements, and habitat use, including identification of hotspots and investigate associated environmental conditions affecting distribution, making use of conventional and electronic tagging (P-SAT).	High (24)	IRD	US$50,000 (available from IRD)	RHN	RHN			
2. Fisheries data collection	2.1 Historical data mining for the key species and IOTC fleets (e.g. as artisanal gillnet and longline coastal fisheries) and implementation of Regional Observer Schemes, including:									
	2.1.1	Capacity building of fisheries observers (including the provision of ID guides, training, etc.)	High (20)		US$?? (TBD)					
	2.1.2	Define observer scheme (including minimum requirements) for fleets which are believed to have large catches on pelagic sharks (i.e. various longline and gillnet coastal fisheries) and where those statistics are mostly absent	High (21)		US$?? (TBD)					
	2.1.3	Historical data mining for the key species, including the collection of information about catch, effort and spatial distribution of those species and fleets catching them	High (5)	TBD	US$80K (CITES)	OCS SPL				
	2.1.4	Integration of data mining with observer programs to reconstruct species composition and catches of sharks	Medium (26)		US$?? (TBD)					
	2.1.5	Electronic monitoring (NOTING the recommendation from the Scientific Committee (SC17.43) that the Commission considers assigning the IOTC Secretariat, in consultation with interested IOTC scientists, to develop a project on electronic monitoring in the IOTC area of competence, the Commission NOTED that a concept note/proposal should be developed to allow an evaluation of the efficacy of electronic monitoring in	High (12)		US$?? (TBD)					

Topic	Sub-topic and project	Priority ranking	Lead	Est. budget (potential source)	Timing				
					2016	2017	2018	2019	2020
	the collection of information on catch, discards and fishing effort as a means to supplement scientific observer coverage for large-scale gillnet vessels. The concept note should include a detailed budget and be communicated to a range of potential funding organisations. (para. 41 of the S19 report))								
3. Biological and ecological information (incl. parameters for stock assessment)	3.1 Age and growth research (Priority species: blue shark (BSH), shortfin mako shark (SMA) and oceanic whitetip shark (OCS); Silky shark (FAL))			US$?? (TBD)					
	3.1.1 CPCs to provide further research reports on shark biology, namely age and growth studies including through the use of vertebrae or other means, either from data collected through observer programs or other research programs.	High (4)	CPCs directly	US$?? (TBD)	BSH SMA OCS	SMA OCS	OCS		
	3.2 Post-release mortality								
	3.2.1 Post-release mortality (electronic tagging), to assess the efficiency of management resolutions on no retention species (i.e. oceanic whitetip shark (OCS) and thresher sharks), shortfin mako shark SMA) ranked as the most vulnerable species to longline fisheries, and blue shark as the most frequent in catches.	High (2)	IRD/ NRIFSF	US$170K per species (TBD)	THR, OCS	BSH, SMK			
	3.2.2 Post-release mortality (electronic tagging), to assess the efficiency of management resolutions on no retention species (i.e. oceanic whitetip shark (OCS) for purse seine fisheries	High (3)	IRD/AZTI	US$80K (TBD)	OCS				
	3.2.3 Post-release survivorship (electronic tagging) on whale shark to assess the effect of unintended interaction and efficiency of management resolution of non-intentioned encirclement on purse seine	High (23)	IRD/AZTI	US$50,000 IRD (commenced)	RHN	RHN			

Topic	Sub-topic and project	Priority ranking	Lead	Est. budget (potential source)	Timing				
					2016	2017	2018	2019	2020
	3.3 Reproduction research Priority species: blue shark (BSH), shortfin mako shark (SMA) and oceanic whitetip shark (OCS), and silky shark (FAL))	High (11)	CPCs directly	US$?? (TBD)	BSH SMA OCS FAL	SMA OCS FAL	OCS		
4. Shark bycatch mitigation measures	4.1 Develop studies on shark mitigation measures (operational, technological aspects and best practices)								
	4.1.1 Longline selectivity, to assess the effects of hooks styles, bait types and trace materials on shark catch rates, hooking-mortality, bite-offs and fishing yield (socio-economics)	High (14)		US$?? (TBD)					
	4.1.2 Gillnet selectivity, to assess the effect of mesh size, hanging ratio and net twine on sharks catches composition (i.e. species and size), and fishing yield (socio-economics)	High (15)	WWF-Pakistan	US$?? (WWF)					
	4.1.3 Develop guidelines and protocols for safe handling and release of sharks caught on longlines and gillnets fisheries	Med (25)							
5. CPUE standardisation / Stock Assessment / Other indicators	5.1 Develop standardised CPUE series for each key shark species and fishery in the Indian Ocean			US$?? (TBD)					
	5.1.1 Blue shark: Priority fleets: TWN,CHN LL, EU,Spain LL, Japan LL; Indonesia LL; EU,Portugal LL	High (17)	CPCs directly	US$?? (TBD)					
	5.1.2 Shortfin mako shark: Priority fleets: Longline and Gillnet fleets	High (19)	CPCs directly	US$?? (TBD)					
	5.1.3 Oceanic whitetip shark: Priority fleets: Longline fleets; purse seine fleets	High (18)	CPCs directly	US$?? (TBD)					

Topic	Sub-topic and project	Priority ranking	Lead	Est. budget (potential source)	Timing				
					2016	2017	2018	2019	2020
	5.1.4 Silky shark: Priority fleets: Purse seine fleets	Med (27)	CPCs directly	US$?? (TBD)					
	5.2 Stock assessment and other indicators								
	5.2.1 Develop and compare multiple assessment approaches to determining stock status for key shark species (see Table 2)	High (22)	TBD	Part of: 600K Euro (European Union)					
	MARINE TURTLES								
6. Marine turtle bycatch mitigation measures	6.1 Review of bycatch mitigation measures								
	6.1.1 Res. 12/04 (para. 11) Part I. The IOTC Scientific Committee shall request the IOTC Working Party on Ecosystems and Bycatch to: a) Develop recommendations on appropriate mitigation measures for gillnet, longline and purse seine fisheries in the IOTC area; [mostly completed for LL and PS] b) Develop regional standards covering data collection, data exchange and training; c) Develop improved FAD designs to reduce the incidence of entanglement of marine turtles, including the use of biodegradable materials. [partially completed for non-entangling FADS; ongoing or biodegradable FADs)]	High (9)	CPCs directly	US$?? (TBD)					
	6.1.2 Res. 12/04 (para. 11) Part II. The recommendations of the IOTC Working Party on Ecosystems and Bycatch shall be provided to the IOTC Scientific Committee for consideration at its annual session in 2012. In developing its recommendations, the IOTC Working Party on Ecosystems and Bycatch shall examine and	Low (28)	CPCs directly	US$?? (TBD)					

Topic	Sub-topic and project	Priority ranking	Lead	Est. budget (potential source)	Timing				
					2016	2017	2018	2019	2020
	take into account the information provided by CPCs in accordance with paragraph 10 of this measure, other research available on the effectiveness of various mitigation methods in the IOTC area, mitigation measures and guidelines adopted by other relevant organizations and, in particular, those of the Western and Central Pacific Fisheries Commission. The IOTC Working Party on Ecosystems and Bycatch will specifically consider the effects of circle hooks on target species catch rates, marine turtle mortalities and other bycatch species.								
	6.1.3 Res. 12/04 (para. 17) The IOTC Scientific Committee shall annually review the information reported by CPCs pursuant to this measure and, as necessary, provide recommendations to the Commission on ways to strengthen efforts to reduce marine turtle interactions with IOTC fisheries.	High (10)	CPCs directly	Nil					
	SEABIRDS								
7. Seabird bycatch mitigation measures	7.1 Review of bycatch mitigation measures								
	7.1.1 Res. 12/06 (para. 8) The IOTC Scientific Committee, based notably on the work of the WPEB and information from CPCs, will analyse the impact of this Resolution on seabird bycatch no later than for the 2016 meeting of the Commission. It shall advise the Commission on any modifications that are required, based on experience to date of the operation of the Resolution and/or further international studies, research or advice on best practice on the issue, in order to make the Resolution more effective.	High (6)	Rep. of Korea, Japan, Birdlife International	US$?? (TBD)					

Topic	Sub-topic and project	Priority ranking	Lead	Est. budget (potential source)	Timing				
					2016	2017	2018	2019	2020
	DISCARDS								
8. Bycatch mitigation measures	8.1 Review proposal on retention of non-targeted species								
	8.1.1 The Commission requested that the Scientific Committee review proposal IOTC–2014– S18–PropL Rev_1, and to make recommendations on the benefits of retaining non-targeted species catches, other than those prohibited via IOTC Resolutions, for consideration at the 19th Session of the Commission. (S18 Report, para. 143). Noting the lack of expertise and resources at the WPEB and the short timeframe to fulfil this task, the SC RECOMMENDED that a consultant be hired to conduct this work and present the results at the next WPEB meeting. The following tasks, necessary to address this issue, should be considered for the terms of reference, taking into account all species that are usually discarded on all major gears (i.e., purse-seines, longlines and gillnets), and fisheries that take place on the high seas and in coastal countries EEZs: i) Estimate species-specific quantities of discards to assess the importance and potential of this new product supply, integrating data available at the Secretariat from the regional observer programs, ii) Assess the species-specific percentage of discards that is captured dead versus alive, as well as the post-release mortality of species that are discarded alive, in order to estimate what will be the added fishing mortality to the populations, based on the best current information, iii) Assess the feasibility of full retention, taking into account the specificities of the fleets that operate with different gears and their fishing practices (e.g., transhipment, onboard storage capacity).	High (8)	Consultant	US$?? (TBD)					

Topic	Sub-topic and project	Priority ranking	Lead	Est. budget (potential source)	Timing				
					2016	2017	2018	2019	2020
	iv) Assess the capacity of the landing port facilities to handle and process this catch. v) Assess the socio-economic impacts of retaining non-target species, including the feasibility to market those species that are usually not retained by those gears, vi) Assess the benefits in terms of improving the catch statistics through port-sampling programmes, vii) Evaluate the impacts of full retention on the conditions of work and data quality collected by onboard scientific observers, making sure that there is a strict distinction between scientific observer tasks and compliance issues.								
9. Ecosystems	9.1 Develop a plan for Ecosystem Based Fisheries Management (EBFM) approaches in the IOTC	High (16)	WPEB	US$?? (TBD)					
	9.2 Create an ecosystem model (SEAPODYM) for the main shark species (BSH)	High (7)	Consultant CLS)	43,000€					

APPENDIX XXXIVF
WORKING PARTY ON TROPICAL TUNAS PROGRAM OF WORK (2016–2020)

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

Topic	Sub-topic and project	Priority ranking	Lead	Est. budget (potential source)	Timing				
					2016	2017	2018	2019	2020
1. Stock structure (connectivity and diversity)	1.1 Genetic research to determine the connectivity of tropical tuna species throughout their distribution (including in adjacent Pacific Ocean waters as appropriate) and the effective population size.	Funded	CSIRO/AZTI /IRD/RITF	1.3 m Euro: (European Union; 20% additional co-financing)					
	1.1.5 Next Generation Sequencing (NGS) to determine the degree of shared stocks for tropical tuna species in the Indian Ocean. Population genetic analyses to decipher inter- and intraspecific evolutionary relationships, levels of gene flow (genetic exchange rate), genetic divergence, and effective population sizes.								
	1.1.6 Nuclear markers (i.e. microsatellite) to determine the degree of shared stocks for tropical tuna species in the Indian Ocean with the Pacific Ocean, as appropriate.								
	1.2 Connectivity, movements and habitat use								
	1.2.1 Connectivity, movements, and habitat use, including identification of hotspots and investigate associated environmental conditions affecting the tropical tuna species distribution, making use of conventional and electronic tagging (P-SAT).	(4)		US$?? (TBD)					
2. Biological and ecological information (incl. parameters for stock assessment)	2.1 Age and growth								
	2.1.1 Design and develop a plan for a biological sampling program to support research on tropical tuna biology. The plan would consider the need for the sampling program to provide representative coverage of the distribution of the different tropical tuna species within the Indian Ocean and make use of samples and data collected through observer programs, port sampling and/or other research programs.	(3)	CPCs directly	US$?? (TBD)					

Topic	Sub-topic and project	Priority ranking	Lead	Est. budget (potential source)	Timing				
					2016	2017	2018	2019	2020
	The plan would also consider the types of biological samples that could be collected (e.g. otoliths, spines, gonads, stomachs, muscle and liver tissue, fin clips etc), the sample sizes required for estimating biological parameters, and the logistics involved in collecting, transporting and processing biological samples. The specific biological parameters that could be estimated include, but are not limited to, estimates of growth, age at maturity, fecundity, sex ratio, spawning season, spawning fraction and stock structure.								
	2.2 Age-at-Maturity								
	2.2.1 CPCs to provide further research reports on tropical tuna biology, namely age and growth studies including using through the use of fish otoliths, either from data collected through observer programs or other research programs.	(6)	CPCs directly	US$?? (TBD)					
3. Ecological information	3.1 Spawning time and locations								
	3.1.1 Collect gonad samples from tropical tunas to confirm the spawning time and location of the spawning area that are presently hypothesised for each tropical tuna species.	(7)		US$?? (TBD)					
4. Historical data review	4.1 Changes in fleet dynamics need to be documented by fleet								
	4.1.1 Provide an evaluation of fleet-specific fishery impacts on the stock of bigeye tuna, skipjack tuna and yellowfin tuna. Project potential impact of realizing fleet development plans on the status of tropical tunas based upon most recent stock assessments.	(8)	Consultant	US$30K					
5. CPUE standardisation	5.1 Develop standardised CPUE series for each tropical tuna fleet/fishery for the Indian Ocean								

Topic		Sub-topic and project	Priority ranking	Lead	Est. budget (potential source)	Timing				
						2016	2017	2018	2019	2020
	5.1.1	There is an urgent need to establish procedures for annually developing longline CPUE indices using the combined data from multiple fleets, and to further develop and validate the methods used in these analyses.	(1)	Scientific Committee and consultants	US$40K (IOTC)					
	5.1.2	Development of minimum criteria (e.g. 10% using a simple random stratified sample) for logbook coverage to use data in standardisation processes; and 2) identifying vessels through exploratory analysis that were misreporting, and excluding them from the dataset in the standardisation analysis.		CPCs directly	US$?? (TBD)					
	5.1.3	Vessel identity information for the Japanese fleets for the period prior to 1979 should be obtained either from the original logbooks or from some other source, to the greatest extent possible to allow estimation of catchability change during this period and to permit cluster analysis using vessel level data.		Japan	US$?? (TBD)					
	5.1.4	The standardisation of purse seine CPUE be made where possible using the operational data on the fishery.	(2)	CPCs directly	US$?? (TBD)					
		Bigeye tuna: High priority fleets		CPCs directly	US$?? (TBD)					
		Skipjack tuna: High priority fleets		CPCs directly	US$?? (TBD)					
		Yellowfin tuna: High priority fleets		CPCs directly	US$?? (TBD)					
	5.1.5	That methods be developed for standardising purse seine catch species composition using operational data, so as to provide alternative indices of relative abundance.	(10)	Consultant and CPCs directly	US$?? (TBD)					
	5.1.6	Investigate the potential to use the Indian longline survey as a fishery-independent index of abundance for tropical tunas.		Consultant And CPCs directly	US$30K (TBD)					
6. Stock assessment /	6.1	Develop and compare multiple assessment approaches to determine stock status for tropical tunas		CPCs directly	US$??					

	Topic	Sub-topic and project	Priority ranking	Lead	Est. budget (potential source)	Timing				
						2016	2017	2018	2019	2020
	stock indicators				(TBD)					
7.	Fishery independent monitoring	7.1 All of the tropical tuna stock assessments are highly dependent on relative abundance estimates derived from commercial fishery catch rates, and these could be substantially biased despite efforts to standardise for operational variability (e.g. spatio-temporal variability in operations, improved efficiency from new technology, changes in species targeting). Accordingly, the IOTC should continue to explore fisheries independent monitoring options which may be viable through new technologies. Possibilities include: • Aerial surveys, potentially using remotely operated or autonomous drones • Acoustic FAD monitoring • Genetics-based tagging techniques using recaptured individuals or identification of closely-related pairs • Longline-based surveys (expanding on the Indian model) or "sentinel surveys" in which a small number of commercial sets follow a standardised scientific protocol		CPCs directly	US$?? (TBD)					
8	Target and Limit reference points	8.1 To advise the Commission, by end of 2016 at the latest on Target Reference Points (TRPs) and Limit Reference Points (LRPs).								
		8.1.1 Used when assessing tropical tuna stock status and when establishing the Kobe plot and Kobe matrices		CPCs directly	US$?? (TBD)					
9	Management measure options	9.1 To advise the Commission, by end of 2016 at the latest, on potential management measures having been examined through the Management Strategy Evaluation (MSE) process.								
		9.1.1 These management measures will therefore have to ensure the achievement of the conservation and optimal utilisation of stocks as		CPCs directly	US$?? (TBD)					

Topic	Sub-topic and project	Priority ranking	Lead	Est. budget (potential source)	Timing				
					2016	2017	2018	2019	2020
	laid down in article V of the Agreement for the establishment of the IOTC and more particularly to ensure that, in as short a period as possible (i) the fishing mortality rate does not exceed the fishing mortality rate allowing the stock to deliver MSY and (ii) the spawning biomass is maintained at or above its MSY level.								

APPENDIX XXXIVG
WORKING PARTY ON DATA COLLECTION AND STATISTICS PROGRAM OF WORK (2016–2020)

Table 1. Priority topics for obtaining the information necessary to deliver the necessary advice to the Commission.

Topic	Sub-topic and project	Priority	Lead	Est. budget (potential source)	Timing				
					2016	2017	2018	2019	2020
1. Data requirements and data collection protocols, including ROS	1.1 Artisanal fisheries	1 (High)	IOTC Secretariat (plus external consultants)	IOTC budget & external funding					
	1.1.1 Develop minima data requirements for the routine collection of data at the landing place, through sampling by enumerators			US$?? (TBD)					
	1.1.2 Develop General Guidelines for data collection from artisanal fisheries; including development of a set of indicators to be used to assess the quality of data collection and management systems for artisanal fisheries			US$?? (TBD)					
	1.1.3 Develop/Amend Fisheries specific data collection protocols, by country, where necessary			US$?? (TBD)					
	1.1.4 Assist implementation of pilot sampling activities in countries/fisheries not/insufficiently sampled in the past; priority to be given to the following fisheries: Coastal fisheries of Indonesia Coastal fisheries of India Coastal fisheries of Pakistan Coastal fisheries of Sri Lanka Coastal fisheries of Yemen Coastal fisheries of Madagascar Coastal fisheries of Comoros Coastal fisheries of Tanzania			US$?? (TBD)					

	Coastal fisheries of Thailand Coastal fisheries of Malaysia								
1.1.5	Feasibility study of electronic monitoring for coastal fisheries. Priority to be given to the following fisheries: I.R. Iran Thailand (coastal purse seine) Indonesia								
1.2 Industrial fisheries		1 (High)	IOTC budget & external funding						
1.2.1	Develop General Guidelines for data collection by at-sea observers; including development of a set of indicators to be used to assess the quality of data collection and management systems for industrial fisheries		US$?? (TBD)						
1.2.2	Organize a Regional Workshop on the Implementation of the IOTC Regional Observer Scheme (all IOTC CPCs having industrial fisheries)		US$100K (TBD)						
1.2.3	Develop/Amend fisheries specific at-sea observer data collection protocols, by country, where necessary		US$?? (TBD)						
1.2.4	Assist implementation of at-sea observer schemes in countries/fisheries not/insufficiently monitored in the past; including: • Evaluation of existing observer schemes and arrangements • Coordination of country/fishery specific Training Sessions and Workshops on the ROS • Assistance to data management and reporting Priority to be given to the following fisheries: 1. I.R. Iran (driftnet; purse seine) 2. Sri Lanka (purse seine; drifting gillnet & longline)		US$?? (TBD)						

		3. Indonesia (longline)								
		4. Pakistan (driftnet)								
		5. India (longline)								
		6. Mauritius (purse seine; longline)								
2. Compliance with IOTC Data Requirements	2.1 Data support missions		2 (High)	IOTC Secretariat	External funding					
	Identification of indicators to assess performance of IOTC CPCs against IOTC Data Requirements; evaluation of performance of IOTC CPCs with those Requirements; development of plans of action to address the issues identified, including timeframe of implementation and follow-up activities required. Priority to be given to the following fisheries:				US$?? (TBD)					
		1. I.R. Iran								
		2. Indonesia								
		3. Pakistan								
		4. Yemen								
		5. Tanzania								
		6. Madagascar								
		7. Mauritius								
		8. Sri Lanka								
		9. Indonesia								
3 Review Size Data Longline Fisheries	3.1 Assistance to historical review of length frequency data for longline fisheries, in particular longliners from Taiwan,China and Japan.		3 (High)	IOTC Secretariat, Japan, & Taiwan,China	External funding: US$50K (TBD)					

4	Yemen catch data review	4.1 Review the historical catch series, and catches for most recent years, for Yemeni fisheries, particularly in relation to catches of tropical tuna and neritic tuna species.	4 (Medium)	IOTC Secretariat	External funding: US$20K (TBD)					
5	Mauritius albacore size frequency sampling	5.1 Port Louis in Mauritius is one of the main landing places for albacore in the Indian Ocean. This activity addresses previous concerns from the IOTC Scientific Committee regarding the quality of size data for albacore available for the longline fleet of Taiwan,China. The main objective of this activity is to provide alternative length frequency data through sampling of lengths of albacore at the landing place. The feasibility and usefulness of sampling will be assessed at the end of the pilot-project.	5 (Medium)	IOTC Secretariat	External funding: US$60K (TBD)					
6	Implementation Data Collection Sport Fisheries	6.1 Produce a catalogue of sport fisheries in the Indian Ocean; facilitate collection and reporting of data from sport clubs; training of local staff (TORs Appendix VI)	6 (Low)	IOTC Secretariat	US$54K (TBD)					
7	IOTC Data Summary	7.1 Further development of Web Based online querying procedures for the dissemination of IOTC datasets, including graphical representation of that information through charts and maps, etc. (Phase II)	7 (Low)	IOTC Secretariat	US$40K (TBD)					

APPENDIX XXXIVH
WORKING PARTY ON METHODS PROGRAM OF WORK (2016–2020)

Table 1. Priority topics for obtaining the information necessary to deliver the necessary advice to the Commission. Resolution 15/10 elements have been incorporated as required by the Commission.

Topic	Sub-topic and project	Priority ranking	Lead	Est. budget (potential source)	Timing				
					2016	2017	2018	2019	2020
1. Management Strategy Evaluation	1.1 Albacore	5	EU (JRC)						
	1.1.1 Implementation of initial set of simulation runs and results			$25,000 (TBD)					
	1.1.2 Revision of Operating Models based on WPM and SC feedback, including possible robustness tests			$25,000 (TBD)					
	1.1.3 Revision of Management Procedures and Indicators after presentation of initial set to MPD03 and Commission			$30,000 (TBD)					
	1.1.4 Evaluation of new set of Management Procedures (if required)			$?? (TBD)					
	1.2 Skipjack tuna	6	Maldives						
	1.2.1 Implementation of initial set of simulation runs and results			$?? (TBD)					
	1.2.2 Revision of Operating Models based on WPM and SC feedback, including possible robustness tests			$?? (TBD)					
	1.2.3 Revision of Management Procedures and Indicators after presentation of initial set to MPD03			$?? (TBD)					
	1.2.4 Evaluation of new set of Management Procedures (if required)			$?? (TBD)					
	1.3 Bigeye tuna	2	Australia (CSIRO)	$75,000 (IOC)					

1.3.1	Software tools for model conditioning and evaluation of MPs								
1.3.2	Demonstration of initial OMs and first set of candidate MPs								
1.3.3	Development of Bigeye OM based on new spatial structure				May				
1.3.4	Revision of Operating Models based on WPM and SC feedback, including possible robustness tests			$?? (TBD)	Dec				
1.4 Yellowfin tuna		1	Australia (CSIRO)	$75,000 (IOC)					
1.4.1	Software tools for model conditioning and evaluation of MPs								
1.4.2	Demonstration of initial OMs and first set of candidate MPs								
1.4.3	Revision of Operating Models based on WPM and SC feedback, including possible robustness tests				May				
1.4.4	Final Model with MP's			$?? (TBD)	Dec				
1.5 Effective communication of Management Strategy Evaluation		3	Chair						
1.5.1	Exploration of tools for effective presentation of MSE results			Nil					
1.5.2	Implementation and adaptation of those tools for IOTC needs			$8,000 (COI)					
1.6 Swordfish		4	TBD	$?? (TBD)					
1.6.1	Initial OM								
1.6.2	Conditioning and OM set up								
1.6.3	Generic MP tests								
1.6.4	Final Model with MP's								

2.	Tier approach for providing stock status advice	2.1 Develop a 'Tier' approach for providing stock status advice, based on the type of indictors used to determine stock status (e.g. CPUE series, stock assessment model)		7	Consult.					
		2.1.1	Review of current practices and recommendation for the consideration at WPM07 and SC19.			$10,000 (TBD)				

Note that Resolution 14/03 has certain hard deadlines and to achieve them this work needs to be completed. These are noted below.

From Resolution 14/03:

Para. 2 (Point 2): "These Science and Management Dialogue Workshops shall be held in 2015, 2016 and 2017, as needed, prior to the respective Commission Annual Sessions"
Para. 4: The effectiveness of the Science and Management Dialogue Workshops shall be reviewed no later than at the Annual Session of the Commission in 2018

APPENDIX XXXV
SCHEDULE OF STOCK ASSESSMENTS FOR IOTC SPECIES AND SPECIES OF INTEREST FROM 2016–2020, AND FOR OTHER WORKING PARTY PRIORITIES

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	**Full assessment***	Indicators	Data-poor assessment
Kawakawa	Indicators	Data-poor assessment	**Full assessment***	Data-poor assessment	Indicators
Longtail tuna	**Full assessment***	Data-poor assessment	Indicators	**Full assessment***	Indicators
Narrow-barred Spanish mackerel	Data-poor assessment	**Full assessment***	Indicators	Data-poor assessment	**Full assessment***
Working Party on Temperate Tunas					
Species	**2016**	**2017**	**2018**	**2019**	**2020**
Albacore	**Full assessment**	–	**Full assessment**	–	**Full assessment**

Working Party on Billfish					
Species	**2016**	**2017**	**2018**	**2019**	**2020**
Black marlin	**Full assessment***			**Full assessment***	
Blue marlin	**Full assessment***			**Full assessment***	
Striped marlin		Indicators	**Full assessment***		
Swordfish	Indicators	**Full assessment**			**Full assessment**
Indo-Pacific sailfish		Indicators	**Full assessment***		

Working Party on Tropical Tunas					
Species	**2016**	**2017**	**2018**	**2019**	**2020**
Bigeye tuna	**Full assessment**	Indicators	Indicators	**Full assessment**	Indicators
Skipjack tuna	Indicators	**Full assessment**	Indicators	Indicators	**Full assessment**
Yellowfin tuna	Indicators	TBD	**Full assessment**	Indicators	Indicators
Working Party on Ecosystems and Bycatch					
Species	**2016**	**2017**	**2018**	**2019**	**2020**
Blue shark	Data prep.	**Full assessment***	Indicators; Revisit ERA	**Full assessment***	Indicators
Oceanic whitetip shark	Indicators; Review of mitigation measures in Res. 13/06	Indicators	Revisit ERA	Indicators	**Full assessment***
Scalloped hammerhead shark	–	Indicators	Revisit ERA	Indicators	–
Shortfin mako shark	–	Indicators	Revisit ERA	–	–
Silky shark	–	Indicators	Indicators; Revisit ERA	**Full assessment***	–

Bigeye thresher shark	–		Revisit ERA	–	–
Pelagic thresher shark	–	Indicators	Revisit ERA	–	–
Porbeagle shark	–	tRFMO assessment	–	–	–
Marine turtles	–	Review of mitigation measures in Res. 12/04	Revisit ERA	–	Review of mitigation measures in Res. 12/04
Seabirds	Review of mitigation measures in Res. 12/06	–	–	Review of mitigation measures in Res. 12/06	–
Marine Mammals	–	–	–	–	–
Ecosystem Based Fisheries Management (EBFM) approaches	tRFMO approaches: workshop				

*Including data poor stock assessment methods; Note: the assessment schedule may be changed dependant on the annual review of fishery indicators, or SC and Commission requests.

APPENDIX XXXVI
SCHEDULE OF IOTC SCIENCE MEETINGS IN 2016 AND 2017

	2016			2017		
Meeting	**No.**	**Date**	**Location**	**No.**	**Date**	**Location**
Working Party on **Neritic Tunas**	6th	3–6 March (4d)	Maldives	7th	3–6 March (4d)	TBD
Working Party on **Temperate Tunas**	6th	18–21 July (4d)	China	-	-	-
Working Party on **Ecosystems and Bycatch** (WPEB)	12th	6–10 September (5d)	Sri Lanka	13th	6-10 September (5d)	Kenya
Working Party on **Billfish** (WPB)	14th	12–16 September (5d)	Sri Lanka	15th	12–16 September (5d)	Kenya
Working Party on **Tropical Tunas**	18th	30 October – 3 November (5d)	TBD or Seychelles	19th	30 October – 3 November (5d)	TBD
Working Party on **Methods**	12th	5–7 November (3d)	TBD or Seychelles	13th	5–7 November (3d)	TBD
Working Party on **Data Collection and Statistics**	12th	28–30 November (3d)	Seychelles or Philippines	12th	28–30 November (3d)	Seychelles
Scientific Committee	19th	1–5 December (5d)	Seychelles or Philippines	20th	1–5 December (5d)	Seychelles

APPENDIX XXXVII
CONSOLIDATED SET OF RECOMMENDATIONS OF THE 18TH SESSION OF THE SCIENTIFIC COMMITTEE (23–27 NOVEMBER 2015) TO THE COMMISSION

STATUS OF TUNA AND TUNA-LIKE RESOURCES IN THE INDIAN OCEAN AND ASSOCIATED SPECIES

Tuna – Highly migratory species

SC18.01 (para. 121) The SC **RECOMMENDED** that the Commission note the management advice developed for each tropical and temperate tuna species as provided in the Executive Summary for each species, and the combined Kobe plot for the three species assigned a stock status in 2015 (Fig. 4):

- Albacore (*Thunnus alalunga*) – Appendix VIII
- Bigeye tuna (*Thunnus obesus*) – Appendix IX
- Skipjack tuna (*Katsuwonus pelamis*) – Appendix X
- Yellowfin tuna (*Thunnus albacares*) – Appendix XI

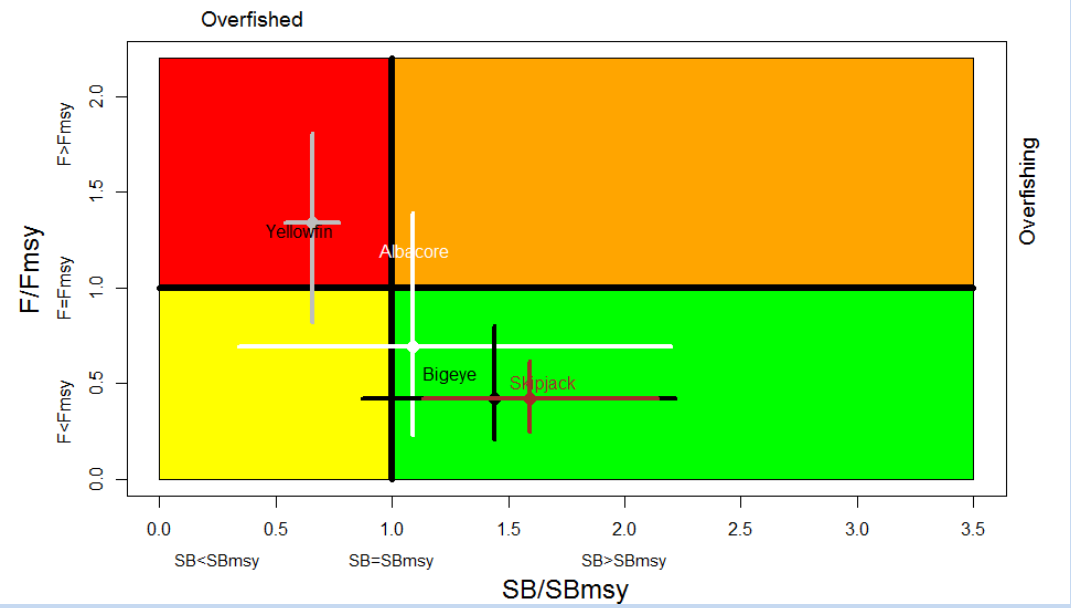

Fig. 4. Combined Kobe plot for bigeye tuna (black: 2013), skipjack tuna (brown: 2014), yellowfin tuna (grey: 2015) and albacore (white: 2014) showing the estimates of current stock size (SB) and current fishing mortality (F) in relation to the interim target spawning stock size and interim target fishing mortality. Cross bars illustrate the range of uncertainty from the model runs. Note that for skipjack tuna, the estimates are highly uncertain as F_{MSY} is poorly estimated, and as suggested for stock status advice it is better to use B_0 as a biomass reference point and C(t) relative to C_{MSY} as a fishing mortality reference point.

Billfish

SC18.02 (para. 123) The SC **RECOMMENDED** that the Commission note the management advice developed for each billfish species under the IOTC mandate, as provided in the Executive Summary for each species, and the combined Kobe plot for the three species assigned a stock status in 2015 (Fig. 5):

- Swordfish (*Xiphias gladius*) – Appendix XII
- Black marlin (*Makaira indica*) – Appendix XIII
- Blue marlin (*Makaira nigricans*) – Appendix XIV
- Striped marlin (*Tetrapturus audax*) – Appendix XV
- Indo-Pacific sailfish (*Istiophorus platypterus*) – Appendix XVI

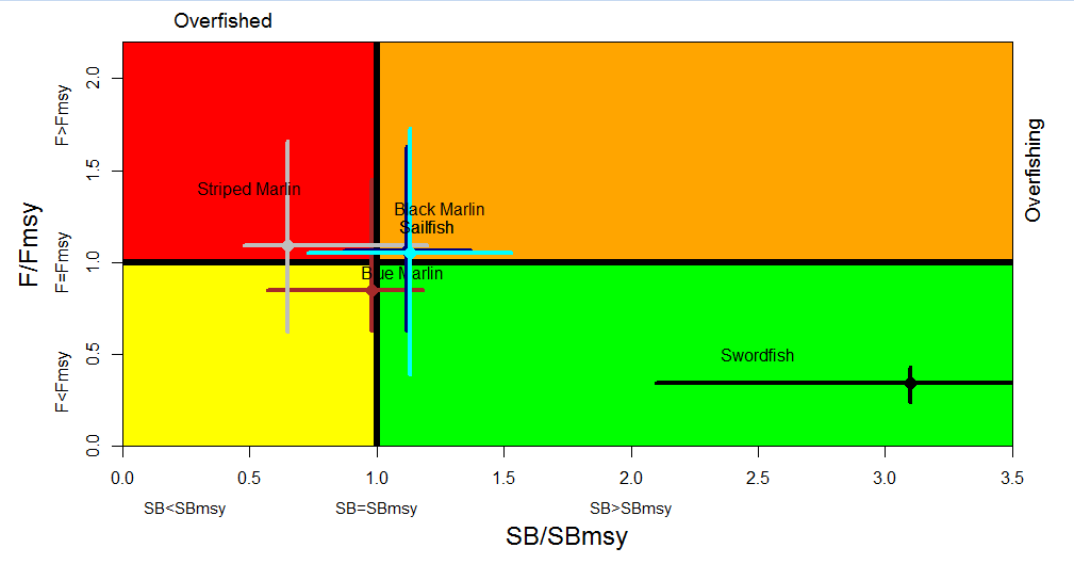

Fig. 5. Combined Kobe plot for swordfish (black: 2014), black marlin (light blue: 2014), blue marlin (brown: 2013), striped marlin (grey: 2015) and Indo-Pacific sailfish (black: 2015) showing the estimates of current stock size (SB or B, species assessment dependent) and current fishing mortality (F) in relation to the interim target spawning stock size and interim target fishing mortality. Cross bars illustrate the range of uncertainty from the model runs.

Tuna and seerfish – Neritic species

SC18.03 (para. 124) The SC **RECOMMENDED** that the Commission note the management advice developed for each neritic tuna (and mackerel) species under the IOTC mandate, as provided in the Executive Summary for each species, and the combined Kobe plot for the three species assigned a stock status in 2015 (Fig. 6):

- Bullet tuna (*Auxis rochei*) – Appendix XVII
- Frigate tuna (*Auxis thazard*) – Appendix XVIII
- Kawakawa (*Euthynnus affinis*) – Appendix XIX
- Longtail tuna (*Thunnus tonggol*) – Appendix XX
- Indo-Pacific king mackerel (*Scomberomorus guttatus*) – Appendix XXI
- Narrow-barred Spanish mackerel (*Scomberomorus commerson*) – Appendix XXII

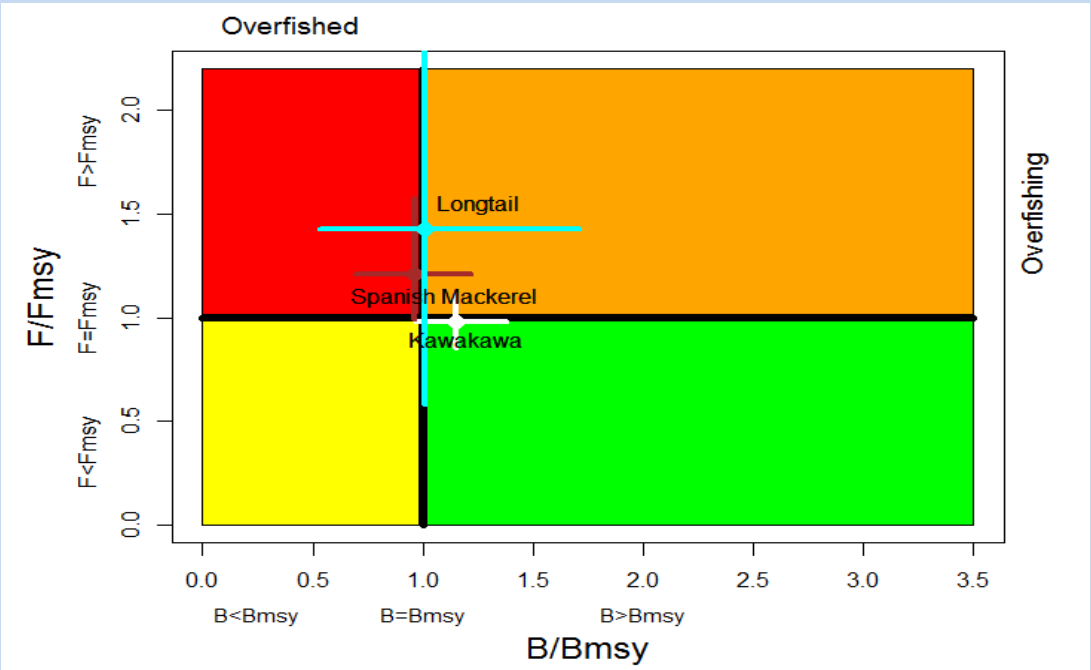

Fig. 6. Combined Kobe plot for kawakawa (white: 2015), longtail tuna (blue: 2015) and narrow-barred Spanish mackerel (brown: 2015), showing the estimates of current stock size (B) and current fishing mortality (F) in relation to interim target spawning stock size and interim target fishing mortality. Cross bars illustrate the range of uncertainty from the model runs. Status of Marine Turtles, Seabirds and Sharks in the Indian Ocean

Sharks

SC18.04 (para. 125) The SC **RECOMMENDED** that the Commission note the management advice developed for a subset of shark species commonly caught in IOTC fisheries for tuna and tuna-like species:

- Blue shark (*Prionace glauca*) – Appendix XXIII
- Oceanic whitetip shark (*Carcharhinus longimanus*) – Appendix XXIV
- Scalloped hammerhead shark (*Sphyrna lewini*) – Appendix XXV
- Shortfin mako shark (*Isurus oxyrinchus*) – Appendix XXVI
- Silky shark (*Carcharhinus falciformis*) – Appendix XXVII
- Bigeye thresher shark (*Alopias superciliosus*) – Appendix XXVIII
- Pelagic thresher shark (*Alopias pelagicus*) – Appendix XXIX

Marine turtles

SC18.05 (para. 126) The SC **RECOMMENDED** that the Commission note the management advice developed for marine turtles, as provided in the Executive Summary encompassing all six species found in the Indian Ocean:

- Marine turtles – Appendix XXX

Seabirds

SC18.06 (para. 127) The SC **RECOMMENDED** that the Commission note the management advice developed for seabirds, as provided in the Executive Summary encompassing all species commonly interacting with IOTC fisheries for tuna and tuna-like species:

- Seabirds – Appendix XXXI

GENERAL RECOMMENDATIONS TO THE COMMISSION

National Reports from CPCs

SC18.07 (para. 18) **NOTING** that the Commission, at its 15th Session, expressed concern regarding the limited submission of National Reports to the SC, and stressed the importance of providing the reports by all CPCs, the SC **RECOMMENDED** that the Commission note that in 2015, 26 reports were provided by CPCs (26 in 2014, 28 in 2013) (Table 2).

SC18.08 (para. 19) The SC **RECOMMENDED** that the Compliance Committee and Commission note the lack of compliance by 8 Contracting Parties (Members) and 3 Cooperating Non-Contracting Parties (CNCPs), that did not submit a National Report to the Scientific Committee in 2015, noting that the Commission agreed that the submission of the annual reports to the Scientific Committee is mandatory (Table 2).

Report of the 5th Session of the Working Party on Neritic Tunas (WPNT05)

SC18.09 (para. 29) The SC **RECOMMENDED** that a workshop is organised by the IOTC Secretariat in collaboration with WWF-Pakistan to analyse the datasets collaboratively using a meta-analysis based approach. WWF Pakistan have offered to provide support specifically for the north western Indian Ocean countries but 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.

SC18.10 (para. 33) **NOTING** the current stock status of several neritic tunas and the continued increase in catch and effort, the SC **RECOMMENDED** that a precautionary approach to the management of neritic tunas is taken by the Commission.

Report of the 13th Session of the Working Party on Billfish (WPB13)

SC18.11 (para. 36) The SC **RECOMMENDED** that the Chairperson and Vice-Chairperson continue to work in collaboration with the IOTC Secretariat and the African Billfish Foundation to find a suitable funding source and lead investigator to undertake the project outlined in the Report of the WPB13. The aim of the project is to enhance data recovery from sports and other recreational fisheries in the western Indian Ocean region, from which alternative abundance indicies could be developed for marlins and I.P. sailfish. The Chairperson shall circulate the concept note to potential funding bodies on behalf of the WPB. A similar concept note could be developed for other regions in the IOTC area of competence at a later date.

Report of the 11th Session of the Working Party on Ecosystems and Bycatch (WPEB11)

Pakistan shark bycatch in gillnet fisheries

SC18.12 (para. 39) **NOTING** that gillnets are regularly being used with lengths in excess of 4,000 m (and up to 7,000 m) within and occasionally beyond the EEZ of Pakistan and other IOTC CPCs in the region, and that those used within the EEZ may sometimes drift onto the high seas in contravention of Resolution 12/12, the SC **RECOMMENDED** that the Commission should consider if a ban on large scale gillnets should also apply within IOTC CPC EEZ. This would be especially important given the negative ecological impacts of large scale drifting gillnets in areas frequented by marine mammals and turtles.

Review of seabird mitigation measures in Resolution 12/06

SC18.13 (para. 41) The SC **RECOMMENDED** that CPCs bring data to the WPEB meeting in 2016, as the Commission via Resolution 12/06 required the WPEB and SC to undertake this task in 2015, which has not been possible due to insufficient data, and that a collaborative analysis of the impacts of Resolution 12/06 be undertaken during the WPEB meeting, if feasible. CPC review papers and datasets should include the following information/data from logbooks and/or observer schemes, where appropriate and should cover the period 2011 to 2015:

- Total effort south of 25°S by area and time, at the finest scale possible
- Observed effort south of 25°S by area and time, at the finest scale possible
- Observed seabird mortality rates south of 25°S by area and time, at the finest scale possible
- Descriptions of fleet structure /target species by time and area, and an indication of observer coverage per fleet/target species for effort south of 25°S
- Data on which seabird bycatch mitigation measures were used, on a set-by-set/cruise basis if possible or per vessel, or at the finest scale possible
- Descriptions of the specifications of seabird bycatch mitigation measures used according to the fields in the Regional Observer Scheme manual and in relation to the specifications given in Res 12/06

Shark fin to body weight ratio and wire leaders/traces

SC18.14 (para. 47) **NOTING** that the Commission, at its 19th Session, considered a range of proposals on sharks which included matters relevant to the shark fin to body weight ratio and wire leaders/traces, the SC **RECALLED** its previous advice to the Commission as follows:

- The SC **RECOMMENDED** the Commission consider, that the best way to encourage full utilisation of sharks, to ensure accurate catch statistics, and to facilitate the collection of biological information, is to revise the IOTC Resolution 05/05 *concerning the conservation of sharks caught in association with fisheries managed by IOTC* such that all sharks must be landed with fins attached (naturally or by other means) to their respective carcass. However, the SC **NOTED** that such an action would have practical implementation and safety issues for some fleets and may degrade the quality of the product in some cases. The SC **RECOMMENDED** all CPCs to obtain and maintain the best possible data for IOTC fisheries impacting upon sharks, including improved species identification.
- On the basis of information presented to the SC in previous years, the SC **RECOGNISED** that the use of wire leaders/traces in longline fisheries may imply targeting of sharks. The SC therefore **RECOMMENDED** to the Commission that if it wishes to reduce catch rates of sharks by longliners it should prohibit the use of wire leaders/traces.

Marine Turtles: Review of Resolution 12/04 on the conservation of marine turtles

SC18.15 (para. 50) The SC reiterated its **RECOMMENDATION** from 2013 and 2014, that at the next revision of IOTC Resolution 12/04 *on the conservation of marine turtles*, the measure is strengthened to ensure that where possible, CPCs report annually on the total estimated level of incidental catches of marine turtles, by species, as provided at Table 3.

TABLE 3. Marine turtle species reported as caught in fisheries within the IOTC area of competence.

Common name	Scientific name
Flatback turtle	*Natator depressus*
Green turtle	*Chelonia mydas*
Hawksbill turtle	*Eretmochelys imbricata*

Leatherback turtle	*Dermochelys coriacea*
Loggerhead turtle	*Caretta caretta*
Olive ridley turtle	*Lepidochelys olivacea*

Marine mammals

SC18.16 (para. 53) The SC reiterated its previous **RECOMMENDATION** that depredation events be incorporated into Resolution 15/01 at its next revision, so that interactions may be quantified at a range of spatial scales. Depredation events should also be quantified by the regional observer scheme.

Status of development and implementation of National Plans of Action for seabirds and sharks, and implementation of the FAO guidelines to reduce marine turtle mortality in fishing operations

SC18.17 (para. 55) The SC **RECOMMENDED** that the Commission note the current status of development and implementation of National Plans of Action (NPOAs) for sharks and seabirds, and the implementation of the FAO guidelines to reduce marine turtle mortality in fishing operations, by each CPC as provided at Appendix V, recalling that the IPOA-Seabirds and IPOA-Sharks were adopted by the FAO in 1999 and 2000, respectively, and required the development of NPOAs. Despite the time that has elapsed since then, very few CPCs have developed NPOAs, or even carried out assessments to ascertain if the development of a Plan is warranted. Currently only 16 of the 37 IOTC CPCs have an NPOA-Sharks (8 more in development), while only 6 CPCs have an NPOA-Seabirds (2 more in development). A single CPC has determined that an NPOA-Sharks is not needed, and 5 have similarly determined that an NPOA-Seabirds is not needed. Currently only 9 of the 37 IOTC CPCs have implemented the FAO guidelines to reduce marine turtle mortality in fishing operations (2 more in progress), and two CPCs (European Union, France (OT)) have implement a full NPOA in 2015.

Report of the 6th Session of the Working Party on Methods (WPM06)

Proposal for a Technical Committee on Management Procedures

SC18.18 (para. 59) **NOTING** with concern the lack of adequate communication of the IOTC MSE process between the Scientific Committee and the Commission to date, the SC **RECOMMENDED** that the Commission consider the following draft outline to establish a formal communication channel for the science and management dialogue to enhance decision making. Possible adjustments to the mechanisms of communication between the Commission and the IOTC Scientific Committee could include the following:

- The progress of the MSE process will benefit from having communication between the Scientific Committee and the Commission more formally structured, for example, through a dedicated Technical Committee on Management Procedures (MP) that would serve as an effective two-way channel for scientists to communicate the results of the ongoing MSE work. The Technical Committee would require that specific terms of reference (in line with the priorities identified in Resolution 14/03), roles and responsibilities of both fisheries managers and scientists, and possible interactions and feedback, are developed and clarified. The Technical Committee on MP could meet in conjunction with the annual Commission Session, to facilitate full attendance by CPCs.
- The Technical Committee on MP would augment the ability of the Scientific Committee to communicate the progress of the MSE process.
- The Technical Committee on MP would focus on the presentation of results and exchange of information necessary for the Commission to consider possible adoption of harvest strategies, utilizing standard formats for the presentation of results to facilitate understanding of the material by the non-technical audience.
- It would be advisable that the agenda of the Technical Committee on MP place an emphasis on the elements of each MP that require a decision by the Commission. To facilitate such decisions, wherever necessary, interim choices should be offered to the Commission, noting that these choices can be modified at a later stage in the review. The MSE is an iterative process that allows for adjustments as the work, and the understanding of the elements involved, progresses.

Report of the 11th Session of the Working Party on Data Collection and Statistics (WPDCS11)

SC18.19 (para. 72) The SC **RECOMMENDED** the Commission develop penalty mechanisms through the IOTC Compliance Committee to improve compliance by CPCs that do not currently comply with the submission of basic fishery data requirements as stated in Resolution 15/01 and 15/02.

Resolution 15/02 Mandatory statistical requirements for IOTC Members and Cooperating Non-Contracting Parties (CPC's)

SC18.20 (para. 78) **NOTING** that the units of effort requested for longliners in IOTC Resolution 15/02 and 11/04 are not consistent as the former requests numbers of hooks and the latter numbers of sets, the SC **RECOMMENDED** that provisions in Resolution 15/02 are amended to include a requirement for longline fleets to report effort in terms of both number of hooks and number of sets, and that reporting of effort in terms of number of sets is also requested from surface purse seine fleets in addition to the current requirements to report effort as fishing days.

Further analysis of length frequency data from longline fleets and likely impacts on the assessments (Taiwan,China)

SC18.21 (para. 79) The SC **RECOMMENDED** further analysis to fully understand the recent changes in length composition reported by Taiwan,China – in particular whether there have been changes to the sampling protocols and selection of fish for sampling – and that the decline in the number of samples of small specimens of tropical tunas in particular may originate from high grading of catch onboard Taiwan,China longliners following the implementation of quotas on the Taiwan,China longline fleet in the Indian Ocean (i.e. only large specimens from the catch measured for length).

Report of the 17th Session of the Working Party on Tropical Tunas (WPTT17)

Report of the 2nd CPUE workshop on longline fisheries

SC18.22 (para. 83) **NOTING** the advice from the WPTT that differences between the Japan and Taiwan,China longline CPUE indices were examined and attributed to either low sampling coverage of logbook data (between 1982–2000) or misreporting across oceans (Atlantic and Indian oceans) for bigeye tuna catches between 2002–04 for Taiwan,China, the SC **RECOMMENDED** the 1) development of minimum criteria (e.g. 10% using a simple random stratified sample) for logbook coverage to use data in standardisation processes; and 2) identifying vessels through exploratory analysis that were misreporting, and excluding them from the dataset in the standardisation analysis.

SC18.23 (para. 84) The SC **RECOMMENDED** that:

- more credence should be given to CPUE indices based on operational data, since analyses of these data can take more factors into account, and analysts are better able to check the data for inconsistencies and errors.
- Taiwan,China fleets provide all available logbook data to data analysts, representing the best and most complete information possible. This stems from the fact that the dataset currently used by scientists from Taiwan,China is incomplete and not updated with logbooks that arrive after finalisation.
- that vessel identity information for the Japanese fleets for the period prior to 1979 should be obtained either from the original logbooks or from some other source, to the greatest extent possible to allow estimation of catchability change during this period and to permit cluster analysis using vessel level data. During this period there was significant technological change (e.g. deep freezers) and targeting changes (e.g. yellowfin tuna to bigeye tuna).
- examining operation level data across all longline fleets (Rep. of Korea, Japan and Taiwan,China) will give us a better idea of what is going on with the fishery and stock especially if some datasets have low sample sizes or effort in some years, and others have higher sample sizes and effort, so we have a representative sample covering the broadest areas in the Indian Ocean. This will also avoid having no information in certain strata if a fleet were not operating there, and avoid combining two indices in that case.
- that continued work on joint analysis of operational catch and effort data from multiple fleets be undertaken, to further develop methods and to provide indices of abundance for IOTC stock assessments.

Summary discussion of matters common to Working Parties (capacity building activities – stock assessment course; connecting science and management, etc.)

Meeting participation fund

SC18.24 (para. 98) The SC **RECOMMENDED** that the IOTC Rules of Procedure (2014), for the administration of the Meeting Participation Fund be modified so that applications are due not later than 60 days, and that the full Draft paper be submitted no later than 45 days before the start of the relevant meeting. The

aim is to allow the Selection Panel to review the full paper rather than just the abstract, and provide guidance on areas for improvement, as well as the suitability of the application to receive funding using the IOTC MPF. The earlier submission dates would also assist with Visa application procedures for candidates.

Capacity building activities

SC18.25 (para. 99) The SC **AGREED** that, while external funding is helping the work of the Commission, funds allocated by the Commission to capacity building are still too low, considering the range of issues identified by the SC and its Working Parties, and **RECOMMENDED** that the Commission consider allocating more funds to these activities in the future.

SC18.26 (para. 100) The SC **RECOMMENDED** that 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.

IOTC species identification guides: Marine mammal and Best practice guidelines for the safe release and handling of encircled cetaceans

SC18.27 (para. 102) The SC **RECOMMENDED** that the Commission allocate funds in its 2016/2017 budget, to produce and print the IOTC best practice guidelines for the safe release and handling of encircled cetaceans. The guidelines could be incorporated into a set of IOTC cetacean identification cards: "*Cetacean identification for Indian Ocean fisheries*".

IOTC Secretariat staffing

SC18.28 (para. 106) **NOTING** the very heavy and constantly increasing workload on the IOTC Secretariat, and the current staffing capacity to respond to requests for assistance by countries, the SC strongly **RECOMMENDED** that at least three (3) additional staff (Science/Data) be hired to join the IOTC Secretariat to work on tasks including but not limited to 1) science and capacity building to improve understanding of IOTC processes; and 2) data quality/exchange improvement, to commence work by 1 January 2017. Funding for these new postions should come from both the IOTC regular budget and from external sources to reduce the direct financial burden on the IOTC membership.

Chairpersons and Vice-Chairpersons of the SC and its subsidiary bodies

SC18.29 (para. 107) The SC **RECOMMENDED** that the Commission note and endorse the Chairpersons and Vice-Chairpersons for the SC and its subsidiary bodies for the coming years, as provided in Appendix VII.

Implementation of the Regional Observer Scheme

SC18.30 (para. 138) **NOTING** that training of observers and crew is long-term and necessarily meticulous work that should be done in a recurrent way in order to optimise the efficiency of observers, the SC **RECOMMENDED** that the IOTC Secretariat increases its effort in training observers, including species identification. This would only be possible if the Commission were to increase staffing at the IOTC Secretariat and allocate specific funding for the Regional Observer Scheme implementation.

Resolution 11/04 On a regional observer scheme

SC18.31 (para. 145) **NOTING** that the objective of the Regional Observer Scheme contained in Resolution 11/04, and the rules contained in Resolution 12/02 *On data confidentiality policy and procedures* makes no reference to the data collected not being used for compliance purposes, the SC **RECOMMENDED** that at the next revision of Resolution 11/04, it be clearly stated that the data collected within the Regional Observer Scheme shall not be used for compliance purposes.

Progress on the Implementation of the Recommendations of the Performance Review Panel

SC18.32 (para. 151) The SC **RECOMMENDED** that the Commission note the updates on progress regarding Resolution 09/01 *on the performance review follow–up*, as provided at Appendix XXXIII.

Program of work and schedule of Working Party and Scientific Committee meetings

Consultants

SC18.33 (para. 157) **NOTING** the highly beneficial and relevant work done by IOTC stock assessment consultants in 2015 and in previous years, the SC **RECOMMENDED** that the engagement of consultants be

continued for each coming year based on the Program of Work. Consultants will be hired to supplement the skill set available within the IOTC Secretariat and CPCs. The draft budget provided in Table 5, shall be incorporated into the overall IOTC Science budget for the consideration of the Commission.

Schedule of meetings for 2016 and 2017

SC18.34 (para. 160) The SC **RECOMMENDED** that the Commission discuss the merits of moving the annual Scientific Committee meeting to February each year. This would allow the species working parties to be moved later in the year, thus ensuring that the most recent data is available for assessment purposes. If the Commission were to approve a February date, it may wish to fix its own meeting date in June each year, thus allowing sufficient consultation time between the Scientific Committee and the Commission meeting.

Review of publication deadlines for IOTC data summaries and other datasets for use by Working Parties

SC18.35 (para. 165) The SC **RECOMMENDED** that the reporting deadline for stock assessment inputs (index of abundance, catch reconstructions, size data, etc.) be 45 days prior to the meeting in which the species is to be assessed.

Review of the Draft, and Adoption of the Report of the 18th Session of the Scientific Committee

SC18.36 (para. 175) The SC **RECOMMENDED** that the Commission consider the consolidated set of recommendations arising from SC18, provided at Appendix XXXVII.