Report of the 19th Session of the IOTC Scientific Committee

Seychelles, 1–5 December 2016

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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 19th 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

SC19.01 (para. 142) 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 2016 (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

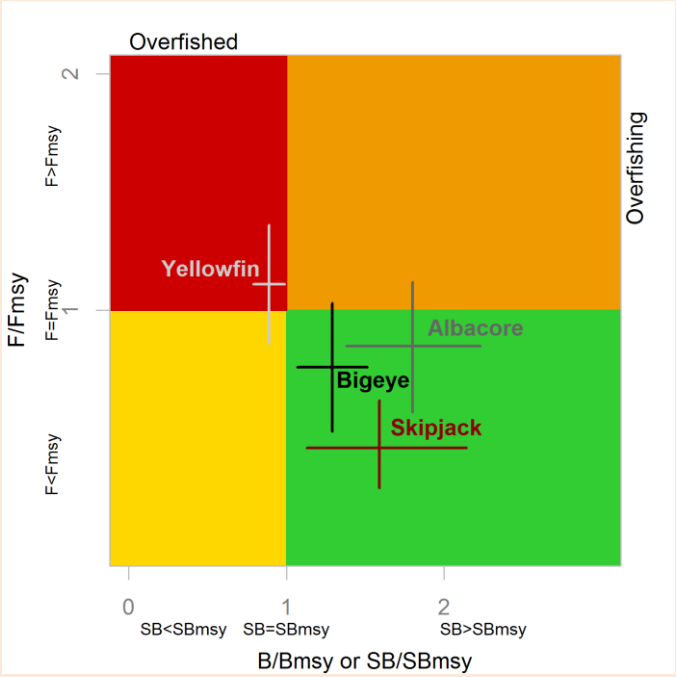


Fig. 4. Combined Kobe plot for bigeye tuna (black: 2016), skipjack tuna (brown: 2014), yellowfin tuna (grey: 2016), and albacore tuna (dark grey: 2016) showing the estimates of current stock size (SB) and current fishing mortality (F) in relation to optimal spawning stock size and optimal fishing mortality. Cross bars illustrate the range of uncertainty from the model runs with a 80% CI. 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

SC19.02 (para. 144) 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 2016 (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

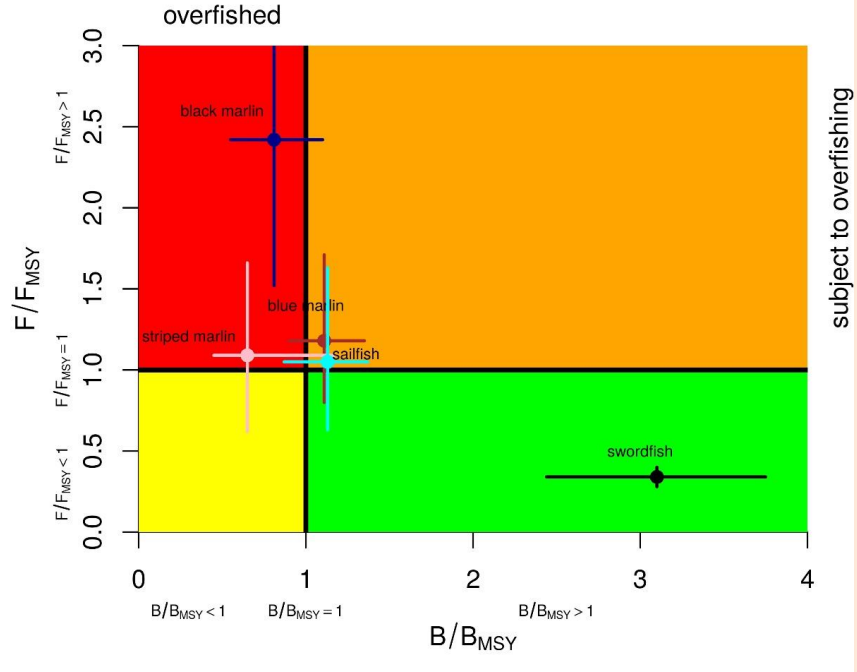


Fig. 5. Combined Kobe plot for swordfish (black), Indo-pacific sailfish (cyan), black marlin (light blue), blue marlin (brown) and striped marlin (pink) showing the 2015 and 2016 estimates of current stock size (SB or B, species assessment dependent) and current fishing mortality (F) in relation to optimal spawning stock size and optimal fishing mortality. Cross bars illustrate the range of uncertainty from the model runs.

Tuna and seerfish – Neritic species

SC19.03 (para. 145) 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 2016 (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

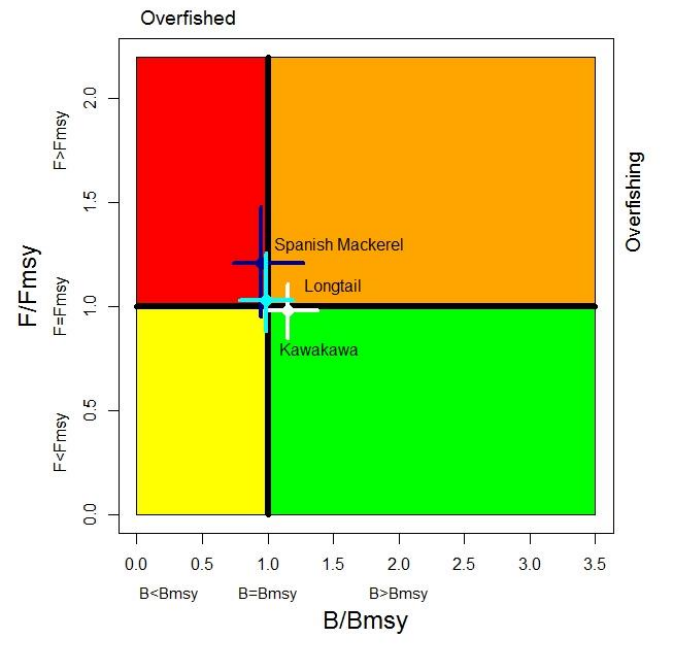


Fig. 6. Combined Kobe plot for longtail tuna (cyan: 2016), narrow-barred Spanish mackerel (dark blue: 2016), and kawakawa (white: 2015) showing the estimates of stock size (B) and current fishing mortality (F) in relation to optimal spawning stock size and optimal fishing mortality using the OCOM modelling approach. Cross bars illustrate the range of uncertainty from the model runs.

Sharks

SC19.04 (para. 146) 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

SC19.05 (para. 147) 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

SC19.06 (para. 148) 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

Report of the 6th Session of the Working Party on Temperate tunas

New information on biology, ecology, fisheries and environmental data relating to temperate tunas

SC19.12 (para. 41) **NOTING** the general paucity of biological indicators available from the Indian Ocean, and particularly the lack of age-specific maturity as a primary source of uncertainty in the stock assessment of albacore tuna, the SC **RECOMMENDED** a study on the growth curve of albacore tuna in the Indian Ocean as a high priority in the SC Program of Work.

Report of the 12th Session of the Working Party on Ecosystems and Bycatch (WPEB12)

Gillnet fisheries

SC19.20 (para. 59) **NOTING** that gillnets are regularly being used with lengths in excess of 4,000 m (and up to 7,000 m) within and occasionally into the high seas, and that those used within the EEZ may sometimes drift onto the high seas in contravention of Resolution 12/12, the SC reiterated it's previous **RECOMMENDATION** 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.

Report of the 18th Session of the Working Party on Tropical Tunas (WPTT18)

Parameters for future analyses: Yellowfin tuna CPUE standardisation and stock assessments

SC19.27 (para. 96) The SC **RECOMMENDED** that development of the next stock assessment of yellowfin tuna should include a detailed review of the existing data sources (conducted by the stock assessment consultant, in collaboration with the IOTC Secretariat and main longline and purse seine fleets), including:

i. Size frequency data: Evaluation of the reliability of length composition from the longline fisheries (including recent and historical data), review of issues with the use of the (EU) purse seine length composition data prior to 1991, and the need for a thorough review of the size frequency data held by IOTC, in collaboration with the fleets involved, to improve the utilization of these data in tropical tuna stock assessments.

ii. Collaborative longline CPUE: Further refinement of the procedures to standardize the composite longline logsheet data sets to develop the longline CPUE indices;

iii. Tagging data: Comprehensive analysis of the tag release/recovery data set;

iv. Alternative CPUE series: a review of the available data from the Indian tuna longline survey data.

Report of the 7th Session of the Working Party on Methods (WPM07)

Revision of the WPM Program of work (2017–2021)

SC19.30 (para. 102) SC **NOTED** that the next stock assessment of Indian Ocean swordfish is due to take place in 2017 and **RECOMMENDED** that the development of MSE of swordfish is considered as a high priority in the revised WPM Program of Work and that funding is allocated for this activity, to start the conditioning of an OM for this stock.

Report of the 12th Session of the Working Party on Data Collection and Statistics (WPDCS12)

Further analysis of length frequency data and likely impacts on the assessments

SC19.31 (para. 109) The SC **RECOMMENDED** that a collaborative work on longline size frequency data gathering scientists from Taiwan,China, Japan, Seychelles and Rep. of Korea should be conducted in 2017 in conjunction with the joint CPUE workshop, to compare the different data sets available and extract information useful for the future stock assessments of yellowfin, bigeye and albacore tuna.

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

IOTC Secretariat staffing

SC19.37 (para. 126) **NOTING** the very heavy workload at the IOTC Secretariat and the ever increasing demands by the Commission and the Scientific Committee, and also the capacity to respond to requests for assistance by countries, the SC **RECOMMENDED** that the recommendation from the Performance Review PRIOTC02.07(g) is implemented, and that permanent staff of the IOTC Data and Science Section be increased by two (2) (1 x P4 and 1 x P3 level positions), supplemented by additional short-term consultants, to commence work by 1 January 2018 or earlier, and that funding for these new positions should come from both the IOTC regular budget and from external sources to reduce the financial burden on the IOTC membership.

Collaborative Longline CPUE

SC19.38 (para. 127) The SC **ACNOWLEDGED** the work of the WPTT and WPTmT and especially improvements in the joint CPUE standardization work which is critical for reliably estimating the stocks. The SC **NOTED** that the joint CPUE has become a critical component for the assessments of temperate and tropical tuna species and the SC **RECOMMENDED** that this work continue under the

current framework, but that plans should be developed to formalize the process within the IOTC in the near future.

Implementation of the Regional Observer Scheme

Development of a proposal for a Pilot Project to be presented to the Commission 2017

SC19.40 (para. 160) The SC **NOTED** the substantial resourcing that the proposed framework will require and **RECOMMENDED** that the Commission provide adequate resources to enable implementation of the project.

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

SC19.44 (para. 204) The SC **RECOMMENDED** that the Commission consider the consolidated set of recommendations arising from SC19, 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: 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		2011	2012	2013	2014	2015	2016	Advice to the Commission
Albacore *Thunnus alalunga*	Catch 2015: Average catch 2011–2015: MSY (1000 t) (80% CI): F_{MSY} (80% CI): SB_{MSY} (1000 t) (80% CI): F_{2014}/F_{MSY} (80% CI): SB_{2014}/SB_{MSY} (80% CI): SB_{2014}/SB_{1950} (80% CI):	35,068 t 34,902 t 38.8 (33.9–43.6) - 30.0 (26.1–34.0) 0.85 (0.57–1.12) 1.80 (1.38–2.23) 0.37 (0.28–0.46)							Although considerable uncertainty remains in the SS3 assessment, particularly due to the lack of biological information on Indian Ocean albacore tuna stocks, a precautionary approach to the management of albacore tuna should be applied by capping total catch levels to MSY levels (approximately 40,000 t). Click here for full stock status summary: Appendix VIII
Bigeye tuna *Thunnus obesus*	Catch 2015: Average catch 2011–2015: MSY (1,000 t) (80%): F_{MSY} (80%): SB_{MSY} (1,000 t) (80%): F_{2015}/F_{MSY} (80%): SB_{2015}/SB_{MSY} (80%): SB_{2015}/SB_0 (80%):	92,736 t 101,515 t 104 (87-121) 0.17 (0.14-0.20) 525 (364-718) 0.76 (0.49-1.03) 1.29 (1.07-1.51) 0.38 (n.a. – n.a.)						83.7%	The stock status determination did not qualitatively change in 2016, but is somewhat less optimistic than in 2013. If catch remains below the estimated MSY levels estimated for the current mix of fisheries, then immediate management measures are not required. However, increased catch or increases in the mortality on immature fish will likely increase the probabilities of breaching reference levels in the future. 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 2015: Average catch 2011–2015: 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):	393,954 t 394,320 t 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)							The adoption of Resolution 16/02 requires that an estimate of SB/SB_0 from future skipjack assessments is used to parameterise the Harvest Control Rule (HCR). The next assessment for skipjack will be conducted in 2017, at which time the HCR will be applied and a total allowable catch for skipjack will be advised for 2018. No additional management measures are required at this time, however continued monitoring and improvement in data collection, reporting and analysis (including fishery indicators) is required to reduce the uncertainty in assessments. Click here for full stock status summary: Appendix X

Stock	Indicators	2011	2012	2013	2014	2015	2016	Advice to the Commission
Yellowfin tuna *Thunnus albacares*	Catch 2015: 407,575 t Average catch 2011–2015: 390,185 t MSY (1000 t) (80% CI): 422 (406-444) F_{MSY} (80% CI): 0.151 (0.148-0.154) SB_{MSY} (1,000 t) (80% CI): 947 (900-983) F_{2015}/F_{MSY} (80% CI): 1.11 (0.86-1.36) SB_{2015}/SB_{MSY} (80% CI): 0.89 (0.79-0.99) SB_{2015}/SB_0 (80% CI): 0.29 (n.a.-n.a.)					**94%**	**67.6%**	The stock status determination did not change in 2016, but does give a somewhat more optimistic estimate of stock status than the 2015 assessment as a direct result of the use of more reliable information on catch rates of longline fisheries and updated catch up to 2015. The stock status is driven by unsustainable catches of yellowfin tuna taken over the last four (4) years, and the relatively low recruitment levels estimated by the model in recent years. The Commission has an interim plan for the rebuilding of this stock (Resolution 16/01), with catch limitations beginning January 1 2017. The possible effect of this measure can only be assessed once estimates of abundance in 2018 would be available at the 2019 assessment. The projections produced to advise on future catches are, in the short term, driven by the below average recruitment estimated for in recent years since these year classes have yet to reach maturity and contribute to the spawning biomass Click here for full stock status summary: Appendix XI

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

Stock	Indicators	2010	2011	2012	2013	2014	2015	2016	Advice to the Commission
Swordfish *Xiphias gladius*	Catch 2015: 41,760 t Average catch 2011–2015: 31,900 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)								The most recent catches (41,760 t in 2015) are 2,360 t above the MSY level (39,400 t). Hence catches in 2017 should be reduced to less than MSY (39,400 t). As the updated stock assessment is scheduled in 2017, more concrete advice after 2018 should be developed next year. Click here for full stock status summary: Appendix XII
Black marlin *Makaira indica*	Catch 2015: 18,490 t Average catch 2011–2015: 15,276 t MSY (1,000 t) (80% CI): 9.932 (6.963-12.153) F_{MSY} (80% CI): 0.211 (0.089-0.430) B_{MSY} (1,000 t) (80% CI): 47.430 (27.435-100.109) F_{2015}/F_{MSY} (80% CI): 2.42 (1.52-4.06) B_{2015}/B_{MSY} (80% CI): 0.81 (0.55-1.10) B_{2015}/B_{1950} (80% CI): 0.30 (0.20-0.41)							**80%**	Current catches are considerably higher than MSY and the stock is overfished and currently subject to overfishing. Even with a 40% reduction in current catches, it is very unlikely to achieve the Commission objectives of being in the green zone of the Kobe Plot by 2025. Current catch levels are not sustainable and there is a need for urgent actions to decrease these catch levels. The SC recommends that the maximum catch limit should be lower than MSY (9,932t). Click here for full stock status summary: Appendix XIII
Blue marlin *Makaira nigricans*	Catch 2015: 15,706 t Average catch 2011–2015: 14,847 t MSY (1,000 t) (80% CI): 11.926 (9.232–16.149) F_{MSY} (80% CI): 0.109 (0.076 –0.160) B_{MSY} (1,000 t) (80% CI): 113.012 (71.721 – 161.946) F_{2015}/F_{MSY} (80% CI): 1.18 (0.80–1.71) B_{2015}/B_{MSY} (80% CI): 1.11 (0.90–1.35) B_{2015}/B_{1950} (80% CI): 0.56 (0.44 – 0.71)							**46,8%**	Current catches are higher than MSY and the stock is currently subject to overfishing. In order to achieve the Commission objectives of being in the green zone of the Kobe Plot by 2025 with at least a 50% probability, the catches of blue marlin would have to be reduced by 24% compared to the average catch of 2013-2015, to a maximum value of 11,704 t. Click here for full stock status summary: Appendix XIV
Striped marlin *Tetrapturus audax*	Catch 2015: 4,410 t Average catch 2011–2015: 4,481 t MSY (1,000 t) (80% CI): 5.22 (5.18–5.59) F_{MSY} (80% CI): 0.62 (0.59–1.04) B_{MSY} (1,000 t) (80% CI): 8.4 (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%**	**60%**	A precautionary approach to the management of striped marlin should be considered by the Commission to reduce catches below 4,000 t thereby ensuring the stock may rebuild to sustainable levels. Appendix XV

Indo-Pacific Sailfish *Istiophorus platypterus*	Catch 2015: Average catch 2011–2015: 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):	28,455 t 28,543 t 25.00 (16.18–35.17) 0.26 (0.15–0.39) 87.52 (56.30–121.02) 1.05 (0.63–1.63) 1.13 (0.87–1.37) 0.56 (0.44–0.67)								The same management advice for 2016 (catches below a MSY of 25,000 t) is kept for the next year (2017). 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. Neritic tunas and mackerels are caught primarily by coastal fisheries, including small-scale industrial and artisanal fisheries, and 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	2010	2011	2012	2013	2014	2015	2016	Advice to the Commission
Bullet tuna *Auxis rochei*	Catch 2015: 10,481 t Average catch 2011–2015: 8,987 t MSY (1,000 t) (80% CI): unknown F_{MSY} (80% CI): unknown B_{MSY} (1,000 t) (80% CI): unknown F_{2015}/F_{MSY} (80% CI): unknown B_{2015}/B_{MSY} (80% CI): unknown B_{2015}/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 2011-2015). 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 2015: 81,441 t Average catch 2011–2015: 94,657 t MSY (1,000 t) (80% CI): unknown F_{MSY} (80% CI): unknown B_{MSY} (1,000 t) (80% CI): unknown F_{2015}/F_{MSY} (80% CI): unknown B_{2015}/B_{MSY} (80% CI): unknown B_{2015}/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 2011-2015: 94,657 t). 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 2015: 152,772 t Average catch 2011–2015: 158,817 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 K2SM developed in 2015 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 2013 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 2013 catch levels, 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 2013 levels. Click for a full stock status summary: Appendix XIX

Longtail tuna *Thunnus tonggol*	Catch 2015: 135,920 t Average catch 2011–2015: 157,313 t MSY (1,000 t) (80% CI): 143 (106–194) F_{MSY} (80% CI): 0.39 (0.29–0.54) B_{MSY} (1,000 t) (80% CI): 298 (197–545) F_{2014}/F_{MSY} (80% CI): 1.03 (0.88–1.26) B_{2014}/B_{MSY} (80% CI): 0.99 (0.78–1.19) B_{2014}/B_{1950} (80% CI): 0.50 (0.39-0.60)						25%		There is a continued high risk of exceeding MSY-based reference points by 2017 if catches are maintained at current (2014) levels (69% risk that $B_{2017}<B_{MSY}$, and 81% risk that $F_{2017}>F_{MSY}$). If catches are reduced by 10% this risk is lowered to 27% probability $B_{2017}<B_{MSY}$ and 39% probability $F_{2017}>F_{MSY}$). If the Commission wishes to recover the stock to levels above the MSY reference points, the Scientific Committee recommends catches should be reduced by approximately 10% of 2014 levels which corresponds to catches somewhat below MSY in order to recover the status of the stock in line 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 2015: 45,956 t Average catch 2011–2015: 45,485 t MSY (1,000 t) (80% CI): 46 [38.9–54.4] F_{MSY} (80% CI): 0.52 [0.40–0.69] B_{MSY} (1,000 t) (80% CI): 66.0 [45.9–107.9] F_{2014}/F_{MSY} (80% CI): 0.98 [0.85–1.14] B_{2014}/B_{MSY} (80% CI): 1.10 [0.84–1.29] B_{2014}/B_{1950} (80% CI): 0.55 [0.42–0.64]								A precautionary approach to the management of IP king mackerel should be considered by the Commission, by ensuring that catches are reduced to levels below the current estimated range 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 2015: 152,798 t Average catch 2011–2015: 151,227 t MSY (1,000 t) (80% CI): 131.1 [98.7–178.8] F_{MSY} (80% CI): 0.34 [0.21–0.56] B_{MSY} (1,000 t) (80% CI): 326 [178–702] F_{2014}/F_{MSY} (80% CI): 1.21 [0.95–1.48] B_{2014}/B_{MSY} (80% CI): 0.95 [0.74–1.27] B_{2014}/B_{1950} (80% CI): 0.47 [0.37–0.63]								There is a continued high risk of exceeding MSY-based reference points by 2024, even if catches are reduced to 80% of the 2014 levels (53% risk that $B_{2024}<B_{MSY}$, and 97% risk that $F_{2024}>F_{MSY}$). The modelled probabilities of the stock achieving levels consistent with the MSY reference levels (e.g. $B > B_{MSY}$ and $F<F_{MSY}$) in 2024 are 1 and 10%, 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 at least 30% of current levels which corresponds to catches below 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	2010	2011	2012	2013	2014	2015	2016	Advice to the Commission
Blue shark *Prionace glauca*	Reported Catch 2015: 30,054 t Not elsewhere included (nei) sharks 2015: 57,125 t Average reported catch 2011–2015: 29,535 t Not elsewhere included (nei) sharks 2011–2015: 49,785 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) SB_{2014}/SB_{MSY} (range): (0.83–1.75) SB_{2014}/SB_0 (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 2015: 211 t Not elsewhere included (nei) sharks 2015: 57,125 t Average reported catch 2011–2015: 248 t Not elsewhere included (nei) sharks 2011–2015: 49,785 MSY (range): Unknown								A precautionary approach to the management of oceanic whitetip shark should be considered by the Commission, noting that recent studies suggest that longline mortality at haulback is high (50%) in the Indian Ocean, while mortality rates for interactions with other gear types such as purse seines and gillnets may be higher. 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: Appendix XXIV
Scalloped hammerhead shark *Sphyrna lewini*	Reported catch 2013: 52 t Not elsewhere included (nei) sharks 2015: 57,125 t Average reported catch 2011–2015: 75 t Not elsewhere included (nei) sharks 2011–2015: 49,785 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: • 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 2015 : 1,268 t Not elsewhere included (nei) sharks 2015: 57,125 t Average reported catch 2011–2015: 1,447 t Not elsewhere included (nei) sharks 2011–2015: 49,785 t MSY (range): unknown								

Silky shark *Carcharhinus falciformis*	Reported Catch 2015 : 3,232 t Not elsewhere included (nei) sharks 2015: 57,125 t Average reported catch 2011–2015: 3,707 t Not elsewhere included (nei) sharks 2011–2015: 49,785 MSY (range): unknown								
Bigeye thresher shark *Alopias superciliosus*	Reported Catch 2015 : 0 t Not elsewhere included (nei) sharks 2015: 57,125 t Average reported catch 2011–2015: 94 t Not elsewhere included (nei) sharks 2011–2015: 49,785 MSY (range): unknown								
Pelagic thresher shark *Alopias pelagicus*	Reported Catch 2015 : 0 t Not elsewhere included (nei) sharks 2015: 57,125 t Average reported catch 2011–2015: 69 t Not elsewhere included (nei) sharks 2011–2015: 49,785 MSY (range): unknown								

*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 19th Session of the Indian Ocean Tuna Commission's (IOTC) Scientific Committee (SC) was held in Seychelles, from 1 to 5 December 2016. A total of 65 delegates and other participants (71 in 2015) attended the Session, comprised of 51 delegates (51 in 2015) from 21 Contracting Parties (18 in 2015), 1 delegate1 from 1 Cooperating Non-Contracting Party (3 in 2015), and 13 observers, including 2 invited experts (17 observers in 2015). The list of participants is provided at Appendix I. The meeting was opened on 1 December 2016 by the Chairperson (Dr Hilario Murua – EU,Spain) and the IOTC Secretariat.

2. ADOPTION OF THE AGENDA AND ARRANGEMENTS FOR THE SESSION

2. The SC **NOTED** the first and second statements from Mauritius, and the associated responses from France (OT), and United Kingdom (OT) as provided in Appendix IVb.

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

3. ADMISSION OF OBSERVERS

4. The SC **NOTED** that the applications by new Observers should continue to follow the procedure as outlined in Rule XIV of the IOTC Rules of Procedure (2014).

3.1 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 19th Session of the SC:
   - SWIOFC
   - Agreement on the Conservation of Albatross and Petrels (ACAP)

3.2 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 19th Session of the SC:
   - Greenpeace International (GI)
   - International Seafood Sustainability Foundation (ISSF)
   - International Pole and Line Foundation (IPNLF)
   - Overseas Fishery Cooperation Foundation of Japan (OFCF)
   - The PEW Charitable Trusts (PEW)
   - World Wide Fund for Nature (a.k.a World Wildlife Fund, WWF)
   - BirdLife International (BI)

3.3 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 19th Session of the SC.

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

4.1 Outcomes of the 20th Session of the Commission

8. The SC **NOTED** paper IOTC–2016–SC19–03 which outlined the decisions and requests made by the Commission at its 20th Session, held from 23 May to 27 May 2016, specifically relating to the IOTC science process, including the 12 Conservation and Management Measures (consisting of 12 Resolutions and no Recommendations), as detailed below:

Resolutions

- Resolution 16/01 On an interim plan for rebuilding the Indian Ocean yellowfin tuna stock
- Resolution 16/02 On harvest control rules for skipjack tuna in the IOTC area of competence
- Resolution 16/03 On the second performance review follow-up
- Resolution 16/04 On the implementation of a Pilot Project in view of Promoting the Regional Observer Scheme of IOTC
- Resolution 16/05 On vessels without nationality
- Resolution 16/06 On measures applicable in case of non-fulfilment of reporting obligations in the IOTC
- Resolution 16/07 On the use of artificial lights to attract fish
- Resolution 16/08 On the prohibition of the use of aircrafts and unmanned aerial vehicles as fishing aids
- Resolution 16/09 On establishing a Technical Committee on Management Procedures
- Resolution 16/10 To promote the implementation of IOTC Conservation and Management Measures
- Resolution 16/11 On port state measures to prevent, deter and eliminate illegal, unreported and unregulated fishing
- Resolution 16/12 Working Party on the Implementation of Conservation and Management Measures (WPICMM)

9. The SC **NOTED** that pursuant to Article IX.4 of the IOTC Agreement, most of 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 2016–054 (i.e., **27 September 2016**). The exception was Resolution 16/02 that received an objection from a Member, and, therefore, a period of additional 60 days was allowed before it became binding, according to Article IX.5 of the IOTC Agreement. 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 26 November 2016:
   - 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 2015 that were listed in the first draft of the 20th Session of the Commission, the SC **AGREED** that any advice to the Commission would be provided in the relevant sections of this report, in particular on the statements below from the first draft of the report:

    *The Commission **CONSIDERED** the list of recommendations made by the SC18 (Appendix VI) from its 2015 report (IOTC–2015–SC18–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 (S20) 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.*

    *The Commission **NOTED** the substantial work underway to develop management procedures and harvest strategies for IOTC stocks and **REQUESTED** the SC to develop a work plan reflecting key elements to be agreed and developed, including roles and responsibilities of each of the Commission, Scientific Committee, Compliance Committee and other subsidiary bodies, and also including decision points on these elements for the Commission.*

    *The Commission **NOTED** the progress towards development of harvest strategies for key stocks, including the adoption of limit and target reference points for a number of stocks, and **REQUESTED** that the SC provide advice to the 21st Session of the IOTC on the feasibility of reporting stock status in relation to the agreed limit reference points.*

The SC **NOTED** the difficulty to timely respond to the guidelines and requests of the Commission in the absence of an adopted Commission Report. Two specific requests concerning the Management Strategy Evaluation process, only came to the attention of the SC through document IOTC–2016–SC19–03 based on a draft version of the report and during WPTT18 (IOTC-2016-WPTT18-04) in November 2016. Nevertheless, the SC NOTED these points, which are discussed under agenda item 7.6 below.

4.2 Previous decisions of the Commission

11. The SC **NOTED** paper IOTC–2016–SC19–04 which outlined a number of Commission decisions, in the form of previous Resolutions that require a response from the SC in 2016, 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 2016

5.1 Report of the Secretariat – Activities in support of the IOTC science process in 2016

12. The SC **NOTED** paper IOTC–2016–SC19–05 which provided an overview of the work undertaken by the IOTC Secretariat in 2016, and thanked the IOTC Secretariat for the contributions to the science process in 2016, in particular via support to the Working Parties and Scientific Committee meetings, facilitation of the IOTC Meeting Participation Fund, improvements in the quality of the data sets being collected and submitted to the IOTC Secretariat, capacity building activities, 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 2016, despite the various staffing challenges placed upon it. The SC **NOTED** that while several vacancies in the IOTC Secretariat have been filled during 2016 (notably the IOTC Data Coordinator, Stock Assessment Officer, and Administration Officer), it has become clear to the SC that even if fully staffed, the IOTC Secretariat requires further staff to continue to ensure the successful delivery of the many and various requests made upon its time by the Commission and its subsidiary bodies (e.g., implementation of the Regional Observer Scheme Pilot Project, and assistance for implementation of Resolution of 16/01 *On an interim plan for rebuilding the Indian Ocean yellowfin tuna stock in the IOTC area of competence*). Thus, in Section 7.7 the SC will propose additional staffing requirements to the Commission for its consideration.

14. The SC **NOTED** that there are still some vacancies in current positions remaining, notably the Science Manager, and that this vacancy will be advertised before the end of 2016 in order to continue to restore the level of resources available at the Secretariat.

15. **NOTING** the delays to a number of externally funded IOTC projects, including the EU stock structure project and the second phase of the yellowfin and bigeye tuna MSE development project, the SC **URGED** the IOTC Secretariat to finalise contractual arrangements required for commencement of the work, **NOTING** that in the case of the MSE work the Commission has requested the work to be completed for bigeye tuna and yellowfin tuna in 2017 (i.e., prior to the S22 meeting in 2018).

6. NATIONAL REPORTS FROM CPCS

6.1 National Reporting to the Scientific Committee: overview

16. The SC **NOTED** that 23 National Reports were submitted to the IOTC Secretariat in 2016 by CPCs (22 Contracting Parties and 1 Cooperating Non-Contracting Parties), the abstracts of which are provided at Appendix IVa.

17. 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.

18. 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 2016, of the 23 National Reports submitted, 3 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 Resolubtion [currently Resolution 15/02 *On mandatory statistical reporting requirements for IOTC Contracting Parties and Cooperating Non-Contracting Parties (CPCs)*].

19. The SC **NOTED** the importance of consistency and standardisation in the format of reporting on fisheries in National Reports and **REQUESTED** that CPCs follow the reporting template agreed by the Commission.

20. 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 Secretariat may be able to better coordinate the resources available.

21. **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 2016, 23 reports were provided by CPCs (26 in 2015, 26 in 2014) (Table 2).

22. The SC **RECOMMENDED** that the Compliance Committee and Commission note the lack of compliance by 9 Contracting Parties (Members) and 3 Cooperating Non-Contracting Parties (CNCPs), that did not submit a National Report to the Scientific Committee in 2016, noting that the Commission agreed that the submission of the annual reports to the Scientific Committee is mandatory.

TABLE 2. CPC submission of National Reports to the SC from 2005 to 2016.

CPC	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
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												
South Africa, Rep. of												

Sudan												
Tanzania, United Republic of	n.a.	n.a.										
Thailand												
United Kingdom (OT)												
Vanuatu												n.a.
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												

Green = submitted. Red = not submitted. n.a. = not applicable (not a CPC in that year).

6.2 Contracting Parties (Members)

23. **NOTING** the 23 National Reports submitted to the IOTC Secretariat in 2016 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 Secretariat 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**: The SC **NOTED** that Australia had a relatively low number of active vessels operating in the IOTC area in 2015 (7 longliners and 2 purse seiners), and has implemented compulsory e-monitoring on all longline vessels.
- **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:** The SC **NOTED** that Comoros has successfully implemented data collection mechanisms through smart-forms, improving the overall data collection process, although this update is not currently highlighted in the corresponding national report.
- **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):** The SC **NOTED** the changes in the presentation of the national report of European Union, using syntheses method to present the report of all its member countries. The also SC **NOTED** that EU has enhanced its cooperation with some coastal states to consolidate data related to the purse seine fisheries.
- **France (OT)**: The SC **NOTED** that the fleet flagged in Mayotte, formerly included in the France (OT) report, has joined the EU fleet since 2014 and that France(OT) no longer has any fishing fleet. The SC also **NOTED** that France has been promoting protection of Marine ecosystem in particular for iconic such as turtles and marine mammal, and that sea transhipment is forbidden for all vessels in the areas under French jurisdiction.
- **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 **EXPRESSED** its disappointment that India did not provide a National Report and **REQUESTED** that the SC Chairperson, in conjunction with the Chairpersons of the Compliance Committee and Commission, remind India to fulfil its reporting obligations to the IOTC. India 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.
- **Indonesia**: The SC **NOTED** the discrepancies between the catches by species in the National Report of Indonesia and the catches published by IOTC, and **RECALLED** that the IOTC Secretariat conducted a comprehensive historical review of Indonesia's catches for Indonesia in 2012, which include estimation of catches by species and gear, and which were endorsed as the best scientific estimates by the SC. The SC also **NOTED** that the reduction in longline fisheries catches in recent years is a consequence of the moratorium introduced aiming at regulating the number of registered longline vessels and combating IUU fishing.
- **Iran, Islamic Rep.**: The SC **NOTED** that I.R. Iran does not report catch-and-effort or size data according to reporting standards of Resolution 15/01 (i.e., by grid area), despite the implementation of VMS and logbooks, and strongly **ENCOURAGED** I.R. Iran to fulfil the IOTC mandatory data reporting requirements and **REQUESTED** the IOTC Secretariat to provide assistance as necessary.
- **Japan**: Nil comments.
- **Kenya:** The SC **NOTED** the new data collection system from Kenya for the coastal fisheries, **NOTING** that the new system shows different catch data as compare with previous data collection system. The SC **REQUESTED** that Kenya liaise with the secretariat to evaluate the process of data estimation from Kenya before making any changes.
- **Korea, Rep. of**: The SC **NOTED** the two currently ongoing research activities related to assessing the impact of seabird mitigation measures (in collaboration with Birdlife) and improving FAD designs to reduce entanglement of non-target species, whose outcomes will be presented next year to the SC.
- **Madagascar**: The SC **ACKNOWLEDGED** Madagascar efforts in improving its data collection and fisheries monitoring in the longline fishery, **NOTING** the ongoing effort of the government to monitor marine turtle from the coastal and longline fisheries
- **Malaysia**: The SC **NOTED** the decline in catches of longtail tuna from the Malaysian fisheries, with decline in overall catches of the neritic tunas from 2013. The SC NOTED that there were species mis-identification in the past and from 2013 the new data collected by species shows less longtail tuna being caught. The SC **REQUESTED** that Malaysia liaise with the secretariat to clarify and correct this matter.
- **Maldives, Republic of**: The SC **ACKNOWLEDGED** the effort of Maldives to increase the sampling effort in 2016 and expected it to be maintained in future. The SC also **NOTED** the new research activities by Maldives, including CPUE standardization work on yellowfin and skipjack tunas and new abundance indices on FAD catches, and the progress implementing a scientific observer scheme programme and **REQUESTED** Maldives to provide the observer data to the IOTC Secretariat.
- **Mauritius**: The SC **NOTED** the monitoring of Mauritius vessels and foreign vessels licenced by Mauritius through VMS, **NOTING** the deployment of observers on-board purse seine vessels through the SWIOFISH / SWIOFP project.
- **Mozambique**: The SC **NOTED** the decrease in fishing effort of foreign vessels licensed to fish in the EEZ of Mozambique is due to the effects of piracy and also the non-renewal of the fishing accord agreement with the EU. The SC **ACKNOWLEDGED** the new observer onboard programme by Mozambique, and submission of observer trip reports to the IOTC Secretatariat in electronic format. The SC also **NOTED** the lack of maps and spatial information from the national report of Mozambique and **REQUESTED** that for the next year national report Mozambique includes this information.
- **Oman, Sultanate of**: The SC **EXPRESSED** its disappointment that Oman did not provide a National Report and **REQUESTED** that the SC Chairperson, in conjunction with the Chairpersons of the Compliance Committee and Commission, remind Oman to fulfil its reporting obligations to the IOTC. Pakistan became a Contracting Party of the IOTC in 2000 and as such it is a requirement to comply with the National Report obligation to the Scientific Committee.
- **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**: The SC **EXPRESSED** its disappointment that Philippines did not provide a National Report and **REQUESTED** that the SC Chairperson, in conjunction with the Chairpersons of the Compliance Committee and Commission, remind Philippines to fulfil its reporting obligations to the IOTC. Philippines became a Contracting Party of the IOTC in 2004 and as such it is a requirement to comply with the National Report obligation to the Scientific Committee.
- **Seychelles, Republic of**: The SC **NOTED** the late submission of the national report by Seychelles and **ENCOURAGED** Seychelles to submit their national report by the deadline next year. The SC **NOTED** difficulties facing by the Seychelles semi industrial longline fishery to export the swordfish to EU market due to level of mercury found in the swordfish, **NOTING** that the ban for the same species does not apply La Réunion. The SC also **NOTED** the testing of Electronic Monitoring Systems on Seychelles purse seine vessels and which will be eventually introduced on the longline vessels.
- **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**: Nil comments.
- **South Africa**: The SC **NOTED** that 2015 was the last year for long-term rights in IOTC areas. New rights will be allocated in January 2017. The SC also **NOTED** that South Africa have lost some of its science capacity, but is expecting to restart its research activities soon.
- **Sri Lanka:** The SC **ACKNOWLEDGED** the improvement made by Sri Lanka in compliance with CMMs and improvements in the data reported to the secretariat, notably the e-logbook system being implemented by Sri Lanka to overcome the irregularities of the paper logbook.
- **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**: The SC **REQUESTED** that, where possible, fishing effort should be reported to the IOTC Secretariat as the number of hooks (as in the National Report), rather than fishing days. The SC **NOTED** none of the six tuna longline vessels flagged by Thailand are currently operating in the Indian Ocean due to a two year ban in fishing operations following malpractices from the vessel owners.
- **United Kingdom (OT)**: The SC **NOTED** the research activities of the United Kingdom territory including those related to acoustic tagging arrays which have provided information on the movement of both sharks and turtles in the region.
- **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)

24. The SC **NOTED** that only one National Report was submitted to the IOTC Secretariat in 2016 by Cooperating Non-Contracting Parties (CNCPs). The following matters were raised in regard to the content of specific reports:
    - **Bangladesh**: The SC **NOTED** the National Report from Bangladesh and thanked them for their contributions to the meeting. The SC **NOTED** that tuna are not the target species of Bangladesh fisheries and that the catches reported from the industrial and artisanal fisheries are highly aggregated by species. The SC also **NOTED** that Bangladesh have an observer scheme in place but not according to IOTC standards, in addition to a recent pilot project of installing VMS onboard Bangladesh industrial fleet over 24 LOA.

- **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.

6.4 Invited Experts

25. 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 2016 IOTC WORKING PARTY MEETINGS

7.1 Report of the 6th Session of the Working Party on Neritic Tunas (WPNT06)

26. The SC **NOTED** the report of the 6th Session of the Working Party on Neritic Tunas (IOTC–2016–WPNT06–R), including the consolidated list of recommendations provided as an appendix to the report. The meeting was attended by 20 participants (31 in 2015), including 8 recipients of the MPF (9 in 2015).

7.1.1 Working party attendance

27. The SC **NOTED** the low attendance at the WPNT in 2016 compared with previous years, possibly due to the lack of a host CPC and the end of the BOBLME project that has financed participation in previous years.

28. **ACKNOWLEDGING** that good attendance is important given that management advice is being put forward to the SC, the SC **REQUESTED** that CPCs with important fisheries for neritic species, including India, Oman and Pakistan, consider attendance at the WPNT a priority and provide better participation in future years. The SC further **NOTED** that the Maldives will be hosting the WPNT07 in 2017 and that there are plans for a workshop on meta analysis and population parameters to be held back-to-back with the meeting which should encourage better attendance at the WPNT.

7.1.2 CPUE standardisation

29. **ACKNOWLEDGING** the importance of indices of abundance for future stock assessments, the WPNT **RECOMMENDED** that the development of standardised CPUE series is explored, with priority given to fleets which account for the largest catches of neritic tuna and tuna-like species (e.g., I.R. Iran, Indonesia, India, Pakistan, and Sri Lanka).

30. Given the need for the development of CPUE series to support the stock assessment of neritic tuna species, the SC **NOTED** the request for information on data availability that was sent by the Secretariat to priority fleets with important fisheries for neritic tuna species. The SC further **NOTED** that all responses received (Malaysia, Indonesia, Iran, Oman and Thailand) in response to this request indicated very limited data availability, as the majority of logbook and observer programmes which would collect information at the required level of detail for CPUE standardisation were only implemented in the last 1 or 2 years and so no suitable datasets have been identified yet. The SC **REQUESTED** CPCs that have not yet responded to the call for information to provide this to the IOTC Secretariat.

31. The SC **NOTED** the standardised CPUE series developed for Kawakawa by Maldives in collaboration with the IOTC Secretariat in 2015 and E**NCOURAGED** the Maldives to continue to develop this further.

7.1.3 Selection of Stock Status indicators

32. The SC **NOTED** the importance of exploring alternative data poor stock assessment methods and **RECOMMENDED** that the Commission allocates funding for work to explore methods based on different data sources, such as catch curve estimation of mortality from length-frequency data. A range of data sources should be explored, including data from observer programmes, the sport fisheries project, and non-state actor (e.g. WWF) projects for suitability.

33. The SC **RECALLED** the recommendation of the WPNT05 for the SC to request the Working Party on Methods evaluate a proposed alternative methodology for presenting management advice for data poor methods in 2016. The SC **REQUESTED** that the WPM evaluate the possibility of using different colours to distinguish between stocks which have not been assessed (e.g., white) and stocks which have been assessed but the status is considered to be uncertain (e.g., grey).

7.1.4 Capacity building activities

34. The SC **THANKED** the IOTC-OFCF Project for its continued support to the enhancement of data collection and processing systems in Indonesia. **NOTING** the request of Indonesia for continuation of the sampling programme, the SC **ENCOURAGED** the OFCF to extend support into the future and also **ENCOURAGED** the Ministry of Marine Affairs and Fisheries of Indonesia to continue sampling activities in North and West Sumatra Provinces in 2017 and subsequent years to ensure that Indonesia has capacity to monitor artisanal fisheries and fulfil IOTC data reporting requirements. Indonesia has confirmed continuation of the sampling program with support and collaboration of OFCF especially in Western Sumatra.

7.2 Report of the 6th Session of the Working Party on Temperate tunas

7.2.1 Review of data available at the IOTC Secretariat for temperate tuna species

35. The SC **NOTED** the report of the 6th Session of the Working Party on Temperate tunas (IOTC–2016–WPTmT06–R), including the consolidated list of recommendations provided as an appendix to the report. The meeting was attended by 29 participants (27 in 2014) including 4 recipients of the MPF (3 in 2014).

36. The SC **CONGRATULATED** the work of the WPTmT, particularly on the development of the combined joint CPUE series which incorporates the standardized indices of abundance for Japan, Republic of Korea, and Taiwan,China.

37. The SC **NOTED** that while the combined CPUE series was made available to the WPTmT, the report of the collaborative work and CPUE workshop held in Shanghai, China, in July 2016 – which includes a description of the methodology and (aggregrated) results of the standardized CPUE series – should be published and **URGED** Japan to provide approval for publication of the IOTC-ISSF funded report which was finalized in July 2016.

38. The WTmT **NOTED** that length frequency samples for the Taiwanese driftnet fishery were collected during the 1980s and published in a former IPTP paper, and **REQUESTED** that the IOTC Secretariat process the information to ensure the data is available for future stock assessments.

39. **NOTING** changes in the length frequency distribution by the Taiwanese deep-freezing longline fleet since the early-2000s, and particularly the decline in the proportion of smaller sized fish sampled for lengths, the SC **REQUESTED** that length frequency and biological data collected by Taiwanese observers be provided to the IOTC Secretariat in order to validate and better understand recent changes in the length frequencies collected by on-board sampling – including samples collected for albacore tuna, tropical tuna species, and swordfish, **NOTING** that all observer data submitted to the IOTC Secretariat is subject to Resolution 12/02 *Data confidentiality policy and procedures*.

40. The SC **ACKNOWLEDGED** the importance of port sampling of albacore tuna unloaded in Port Louis, Mauritius, and **REQUESTED** that the IOTC Secretariat provide additional support to Mauritius on how to collect and report this information, **NOTING** that the IOTC Secretariat conducted a preliminary mission to Mauritius in August 2016 in support of this capacity building activity.

7.2.2 New information on biology, ecology, fisheries and environmental data relating to temperate tunas

41. **NOTING** the general paucity of biological indicators available from the Indian Ocean, and particularly the lack of age-specific maturity as a primary source of uncertainty in the stock assessment of albacore tuna, the SC **RECOMMENDED** a study on the growth curve of albacore tuna in the Indian Ocean as a high priority in the **SC** Program of Work.

7.2.3 Date and place of the 7th and 8th Sessions of the WPTmT

42. The SC **CONSIDERED** rescheduling future WPTmT meetings (currently held in July) to later in the year, e.g., August-early September, to enable the possibility of the latest years' data to be included in the assessment.

7.3 Report of the 14th Session of the Working Party on Billfish

43. The SC **NOTED** the report of the 14th Session of the Working Party on Billfish (IOTC–2016–WPB14–R), including the consolidated list of recommendations provided as an appendix to the report. The meeting was attended by 18 participants (23 in 2015) including 6 recipients of the MPF (9 in 2015).

44. The SC also **NOTED** that the African Billfish Foundation (ABF) has been invited to attend the next WPB meeting to discuss the status of their data and consider whether the sports fisheries information at their availability could be shared with the Secretariat.

45. The SC further **NOTED** that the IOTC Secretariat is currently implementing a pilot project to improve the acquisition of catch-and-effort and size data from sports and recreational fisheries in the western Indian Ocean in four CPCs (Kenya, EU,France (La Réunion), Mauritius and Seychelles), and that the ABF has been hired to assist delivery of the Project. A full update of the outcomes of the Project will be delivered during the 2017 Working Party on Billfish.

46. The SC **RECOMMENDED** that on the next revision of the IOTC Agreement, short billed spearfish be included as an IOTC species.

47. The SC **NOTED** that the WPB report considers that Resolution 15/05 established a catch limit for billfish, however, the SC **NOTED** that Resolution 15/05 only encourages catch restrictions:

"Contracting Parties and Cooperating Non-Contracting Parties (CPCs) to make any possible effort to reduce in 2016 the level of catches of their vessels for the following species: striped marlin (Tetrapturus audax), black marlin (Makaira indica), and blue marlin (Makaira nigricans) to the baseline level of the average catches for the period between 2009 and 2014 " and that this cannot be considered a catch limit.

7.3.1 Billfish species identification

48. The SC **AGREED** on the importance of the hard, waterproof copies of the IOTC species identification guides for observers and port samplers, and **RECOMMENDED** that funds are allocated for further printing of the species ID guides for distribution to sports fishing clubs and recreational fisheries to improve the quality of data reported, and that funds also be continued for the translation of these into the priority languages identified by the SC.

7.3.2 Review of the statistical data available for billfish

49. The SC **NOTED** that many CPCs important for catches of billfish species do not submit to Secretariat nominal catch data or catch-and-effort, particularly in the case of black marlin and Indo-Pacific sailfish. For those two species, the CPUE based assessments currently only use data covering less than 15% of the estimated nominal catches. Therefore the SC strongly **REQUESTED** CPCs to fully comply with the data reporting standards of Resolutions 15/01 and 15/02.

7.3.3 Stock structure project

50. In light of the ongoing delays in the commencement of the EU-funded Indian Ocean stock structure project, the SC **PROPOSED** that the project workplan be revised where appropriate, in light of additional reviews and evaluation of similar studies that have taken place since the original stock structure proposal.

7.3.4 Swordfish habitat and behavior

51. The SC **RECOMMENDED** that, for subsequent WPB meetings, swordfish is treated as a single stock and that references related to swordfish for the southwest Indian Ocean are removed from the Executive Summary and from the summary of available data for all billfish species.

7.4 Report of the 12th Session of the Working Party on Ecosystems and Bycatch (WPEB12)

52. The SC **NOTED** the report of the 12th Session of the Working Party on Ecosystems and Bycatch (IOTC–2016–WPEB12–R), including the consolidated list of recommendations provided as an appendix to the report. The meeting was attended by 37 participants (38 in 2015), including 8 recipients of the MPF (8 in 2015).

53. The SC **THANKED** the WPEB for their good progress in developing management advice despite dealing with a large number of species for which there is little information available.

54. The SC **NOTED** the ongoing paucity of data reported for by-catch species despite the adoption of numerous resolutions to address this issue (e.g., Resolutions 11/04, 15/01 and 15/02) and the impact of this on stock assessments and **EXPRESSED** concern about the lack of progress on this issue.

7.4.1 Identification guides for fishing gear

55. The SC **RECALLED** the recommendation made by the WPEB in 2013 and 2014: *"Noting the continued confusion in the terminology of various hook types being used in IOTC fisheries, (e.g. tuna hook vs. J-hook; definition of a circle hook), the SC **RECOMMENDED** that the Commission allocate funds in the 2014 IOTC Budget to develop an identification guide for fishing hooks and pelagic fishing gears used in IOTC fisheries. The total estimated production and printing costs for the first 1000 sets of the identification cards is around a maximum of US$16,500 (Table 6). The IOTC Secretariat shall seek funds from potential donors to print additional sets of the identification cards at US$5,500 per 1000 sets of cards."*

7.4.2 Regional observer scheme

56. **RECALLING** the SC18 (IOTC–2015–SC18–R, para. 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".*

the SC **RECOMMENDED** all CPCs to submit observer data in an electronic format that can be automatically exported and processed into a standard spreadsheet-like format (e.g. csv, xml, txt, xls, dbase, mdb etc.), avoiding formats whose processing could be time consuming and unnecessarily complex (e.g. pdf, Microsoft Word documents etc.), at the same time ensuring that all of the agreed minimum data reporting requirements are fulfilled.

57. **RECALLING** 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*", and **NOTING** that the objective of the ROS contained in Resolution 11/04, and the rules contained in Resolution 12/02 "*On data confidentiality policy and procedures*" make no reference to the data collected not being used for compliance purposes, the SC reiterated its **RECOMMENDATION** that at the next revision of Resolution 11/04, it be clearly stated that the data collected shall only be used for scientific purposes.

7.4.3 Bycatch data exchange protocol (BDEP)

58. The SC **RECOMMENDED** that, on completion of the development of the ROS database and the input of all of the historical data, the IOTC Secretariat continue to populate the BDEP template, adapting it where necessary, and present this to the WPDCS and SC for further review.

7.4.4 Gillnet fisheries

59. **NOTING** that gillnets are regularly being used with lengths in excess of 4,000 m (and up to 7,000 m) within and occasionally into the high seas, and that those used within the EEZ may sometimes drift onto the high seas

in contravention of Resolution 12/12, the SC reiterated its previous **RECOMMENDATION** 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.

7.4.5 Data collection opportunities

60. The SC **RECOGNISED** that although the IOTC Regional Observer Programme (ROP) for transhipment is primarily a mechanism for compliance monitoring, it does provide potential opportunities for gathering photographs and information for scientific purposes, including on seabird bycatch mitigation measures. Therefore, the SC **RECOMMENDED** that the collection of seabird bycatch mitigation photographs through the ROP is trialled as a pilot.

7.4.6 Answer to the Commission on the evaluation of the mitigation measures contained in Resolution 13/06 for Oeanic whitetip shark

61. The SC **NOTED** IOTC Resolution 13/06 "*On a scientific and management framework on the conservation of shark species caught in association with IOTC managed fisheries*", particularly the following paragraphs:

(Para 3): "Notwithstanding paragraphs 1 and 2, CPCs shall prohibit, as an interim pilot measure, all fishing vessels flying their flag and on the IOTC Record of Authorised Vessels, or authorised to fish for tuna or tuna-like species managed by the IOTC on the high seas to retain onboard, tranship, land or store any part or whole carcass of oceanic whitetip sharks with the exception of paragraph 7. The provisions of this measure do not apply to artisanal fisheries operating exclusively in their respective Exclusive Economic Zone (EEZ) for the purpose of local consumption".

(Para 9); "The provisional measures stipulated in this Resolution shall be evaluated in 2016 by the IOTC Scientific Committee to deliver more appropriate advice on the conservation and management of the stocks for the consideration of the Commission".

62. The SC **NOTED** that this Resolution implies a retention ban on oceanic whitetip sharks (*Carcharhinus longimanus*), with the exception of artisanal fisheries operating exclusively within their respective Exclusive Economic Zone (EEZ) for the purpose of local consumption, and India who objected to the Resolution. Oceanic whitetip sharks are vulnerable to a variety of fishing gears, particularly pelagic longlines, purse seines and gillnets.

63. Nevertheless, the SC **NOTED** that catches of oceanic whitetip sharks continue to be reported in the nominal catches for a number of fleets. There are a number of potential reasons for this such as (i) the reported catches are from artisanal fisheries operating in their EEZs; (ii) incorrect reporting as nominal catch rather than discards, (iii) a lack of awareness of the Resolution among fishers and (iv) non-compliance and enforcement issues. Given that spatial information from the catch and effort database indicates that not all of these catches are taken on coastal waters, it is likely that these are not all artisanal catches.

64. The SC **NOTED** that in general there is very limited data on the catch, retention and mortality of oceanic whitetip shark in the Indian Ocean. Data on oceanic whitetip shark in the region are limited by the lack of full compliance with the IOTC data reporting measures on reporting sharks to species level. Lack of implementation or reporting of observer programs further compound the difficulty of assessing catch rates and trends. Artisanal fisheries (within the EEZ and for domestic consumption) are exempt from Resolution 13/06, yet likely interact with the same stock as the pelagic fisheries.

65. The SC **NOTED** preliminary information indicating that the overall at-haulback mortality for oceanic whitetip sharks is around 50% in pelagic longline fisheries targeting swordfish in temperate waters of the southern Indian Ocean. However, there is still no information on post-release mortality of the sharks released alive. Discard mortality (immediate and post-release) of oceanic whitetip sharks is still unknown in other longline fisheries, in purse seines and gillnets. The relatively high immediate mortality in longline fleets, which is also likely high on purse seines and gillnets, means that fishing mortality of oceanic whitetip shark can still be high even with a retention ban in place.

66. The SC **NOTED** the IOTC-CITES workshop focused on data mining for CITES listed shark species in the Indian Ocean, that was held on November 2-4, 2016. Discussions suggested that lack of awareness was an issue and indicated that a number of CPCs are currently addressing this by incorporating a ban on the retention of oceanic whitetip sharks into national legislation. This suggests that progress in adoption of the Resolution 13/06 is occurring; however, it is currently too early for the SC to be able to evaluate impacts of the retention ban. Moreover, information presented at the workshop indicated that some commerce in oceanic whitetip shark meat and fins is likely to occur as significant regional trade occurs without documentation. Discussions regarding the ongoing retention at the recent workshop indicated that fishermen were often reluctant to discard dead oceanic whitetip sharks, as this was perceived as wasteful. The result of the data mining project and overall project report are due at the end of 2016, and the results will be reported to the WPEB and SC in 2017.

7.4.7 Review of seabird mitigation measures in Resolution 12/06

67. The SC **NOTED** paper IOTC-2016-SC19-13 including the following abstract provided by the authors:

"Both foreign and domestic pelagic longline fleets operate in South Africa's Exclusive Economic Zone (EEZ) and adjacent international waters. Roughly 360 birds are killed each year by the longline fleets operating off South Africa; this includes bycatch from observed Japanese vessels, observed South African vessels and extrapolations of observed to unobserved South African vessels, between 2010 and 2013. This rate was even higher for the entire period between and 2013 when seabird bycatch averaged c. 45o birds per year. Permit conditions apply equally to domestic and foreign longline vessels, and are aligned with IOTC Resolution 12/06. Specifically, vessels must use two of three measures: bird-scaring lines, night setting or line-weighting. The domestic fleet typically uses 60-80 g swivels and sets exclusively at night, therefore they seldom use bird-scaring lines. Japanese-flagged vessels employ line weighting (60 g within 2.8 m of the hook) and bird-scaring lines, with most sets partially conducted at night and part during daylight (in international waters only). Encouragingly, concurrent with 100% observer coverage, significant reductions in seabird bycatch rates have occurred in this fleet after 2007, and the resultant bycatch rates now approximate the national target (0.05 birds per 1000 hooks). South Africa has also encouraged significant research into new or improved seabird bycatch mitigation options. These include research into sliding leads, hook pods and smart tuna hooks. Through the FAO's Common Oceans Tuna Project (or ABNJ project), South Africa is piloting port-based outreach to foreign-flagged tuna longline vessels that offload, refuel or revictual in Cape Town harbor. The outreach is specifically to provide information to skippers on Regional Fisheries Management Organisation (RFMO) regulations and to explain available bycatch mitigation options".

7.4.8 ACAP best practice advice: update

68. The SC **RECOMMENDED** that Resolution 12/06 be reviewed and **ENCOURAGED** the line weighting specifications to be updated to conform with the latest ACAP advice: (a) 40 g or greater attached within 0.5 m of the hook; or (b) 60 g or greater attached within 1 m of the hook; or (c) 80 g or greater attached within 2 m of the hook. CPCs are **ENCOURAGED** to test the safety and practicality of the above mentioned measure as well as sliding lead devices for line weighting, and to report the results back to the WPEB or SC.

69. The SC **RECOMMENDED** that when Resolution 12/06 is reviewed, the two hook-shielding devices recommended by ACAP as best practice mitigation measures be incorporated as stand-alone mitigation options for use in IOTC fisheries operating south of 25°S, and that these measures should conform with the technical specifications and performance attributes detailed in the ACAP advice. The SC **CLARIFIED** that if used, the hook-shielding devices would not need to be combined with any other mitigation measure. In relation to the Smart Tuna Hook, the SC **NOTED** that on the basis of information provided, after release from the hook the shield sinks to the seafloor where it corrodes within 12 months, the byproduct of which is iron oxide and carbon. However, the SC **NOTED** concerns regarding pollution associated with the discarded shields of the Smart Tuna Hooks, and **REQUESTED** that further information be made available to clarify the potential effects.

70. The SC further **NOTED** that some fisheries may have relatively minor impacts on seabirds and so mitigation measures need to be proportionate to the risks posed to seabirds, while taking into consideration safety and economic concerns.

7.4.9 Answer to the Commission on the analysis of the impacts of Resolution 12/06

71. The SC **NOTED** paper IOTC-2016-SC19-INF02 which provided a review of the response to the seabird data call in IOTC circular 2016-043 and an analysis of the information available.

72. The SC **NOTED** the following request from the IOTC Commission stated in IOTC Resolution 12/06 *On reducing the incidental bycatch of seabirds in longline fisheries*:

> (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".*

73. The SC **NOTED** that following this request from the Commission, a 'call for data submissions and review papers' relevant to the upcoming review of IOTC Resolution 12/06 on reducing the incidental bycatch of seabirds in IOTC longline fisheries was sent out on behalf of the WPEB Chair and Vice-Chair persons in IOTC circular (2016-043).

74. **ACKNOWLEDGING** that key aspects of the data call, notably those relating to data on the seabird bycatch mitigation measures used in relation to the data submitted, were in general not provided in sufficient detail, the SC **NOTED** that assessments of the actual performances of various combinations of mitigation measures could not be undertaken. Also, part of the data was only submitted very close to the SC meeting. As such, the SC could only make a preliminary and qualitative analysis (shown in paper IOTC–2016–SC19–INF02).

75. The SC **NOTED** that 6 CPCs (Australia, EU,Portugal, EU,Spain, EU,France, Japan, Rep. of Korea, Taiwan,China and South Africa) of the 15 CPCs which report effort or are likely to exert longline fishing effort south of 25°S to IOTC, submitted data in response to the call for data submission on seabirds (*IOTC Circular 2016-043*). In addition, three CPCs (China, EU-Spain and Japan) submitted substantive papers on seabird bycatch to the WPEB12.

76. The SC **NOTED** that the information provided highlights some general trends in seabird bycatch rates across the Indian Ocean with higher catch rates at higher latitudes, even within the area south of 25°S, and higher catch rates in the coastal areas in the eastern and western parts of the southern Indian Ocean. These spatial trends correspond to the trends in catch rates reported by fleet which were lower for those fleets operating in more central waters and at lower latitudes (EU fleets) and higher for those fleets operating in the coastal regions at higher latitudes (Australia, Japan, and South Africa). Rep. of Korea and Taiwan,China also had relatively lower seabird bycatch rates, despite operating at high latitudes.

77. The SC **NOTED** that in terms of mitigation measures, the low bycatch rates reported by EU,France, EU,Portugal and EU,Spain suggests that night setting with line weighting or tori lines may be effective mitigation measures in these fisheries. The Rep. of Korea uses both line weighting and tori lines and low bird captures were also reported for that fleet.

78. The SC also **NOTED** more conflicting results from some other fleets, suggesting that the mitigation measures that have been implemented in recent years may not have reduced seabird bycatch rates and did not explain the patterns of seabird bycatch.

79. The SC **CONCLUDED** that overall, the preliminary information available suggests that the mitigation measures may be proving effective in some cases, but there are also some aspects that need to be explored further.

80. The SC also **NOTED** that the summary observer data provided through the data call is unlikely to be representative of the full suite of factors which potentially affect seabird bycatch rates. The lack of detailed information on the specifications of the mitigation measures used, the low resolution of the data (not set level) and lack of information on other potential covariate explanatory factors hinders the assessment of the measures and suggests that information collated at the regional level is most useful for summarising general trends while analysing the impact of specific measures would be best done with the fine scale data at the fleet level. The summary of basic information such as total effort and captures in the region is, however, best assessed at the regional level and so it is important that this information is provided to the IOTC in order for the Scientific Committee to be able to monitor and review overall trends.

7.4.10 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

81. 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.

82. 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 16 of the 36 IOTC CPCs have an NPOA-Sharks (6 more in development), while only 7 CPCs have an NPOA-Seabirds (3 more in development). A single CPC has determined that an NPOA-Sharks is not needed, and 3 have similarly determined that an NPOA-Seabirds is not needed. Currently 10 CPCs have implemented the FAO guidelines to reduce marine turtle mortality in fishing operations, and two CPCs (European Union, France (OT)) have implemented a full NPOA.

83. The SC **RECALLED** the process that should be followed by CPCs when requesting the SC approve a status of "*not applicable (n.a.)"* for an NPOA, in the *Table of progress in implementing NPOA-sharks, NPOA-seabirds and the FAO guidelines to reduce sea turtle mortality in fishing operations*', available on the IOTC website[1]:

Each CPC requesting a status of 'Not applicable (n.a.)' for the development of an NPOA shall present the following to the WPEB:

i. List of species of seabirds/sharks recorded in the area of fishing activities of the CPC;
ii. Evidence (scientific surveys/research) that clearly indicate the level of interactions of seabirds/sharks with gears used in the CPCs fisheries targeting tuna and tuna-like species in the IOTC area of competence; such surveys should cover all seasons with multiple trips to ensure that relatively rare events such as seabird bycatch can be detected, and similarly should include a high degree of spatial coverage of fishing effort by gear type; where fishing effort overlaps with marine Important Bird and Biodiversity Areas, those areas should be prioritised for survey effort.
iii. Application to WPEB to consider a recommendation to the Scientific Committee to apply a status of _not applicable (n.a.)' for the CPCs fisheries as having non-detrimental interactions with seabirds/sharks in the IOTC area of competence, and thus, an NPOA is not required at that point in time.
iv. A plan of periodic review of the need for an NPOA by the CPC, including the calendar years when periodic review should be undertaken.

The WPEB shall review (at its annual session) applications detailed in paragraph 1, and provide its advice to the Scientific Committee on whether it should 1) approve or reject the application; or 2) request additional supporting information from the CPC.

The SC should consider the advice from the WPEB and either 1) accept or reject the advice relevant to the application; or 2) request additional supporting information from the CPC be provided to the WPEB for its consideration. (IOTC-2014-WPEB10-R, para.65)

84. The SC **NOTED** the n.a. status of Malaysia for the development of a NPOA-Seabirds and **AGREED** that this should be modified, based on the fishing effort reported for the longline fleet south of 25°S.

[1] http://iotc.org/science/table-progress-implementing-npoa-sharks-npoa-seabirds-and-fao-guidelines-reduce-sea-turtle-mortality

85. The SC **AGREED** that the status 'not begun' should be applied for Sri Lanka given that the status has remained provisional for two years and yet no information has been provided on the guidelines for requesting an 'n.a.' status have not been followed and no information has been provided on the development of an NPOA-Seabirds.

86. The SC **NOTED** the differences in the status of turtles and the lack of clarity regarding whether FAO guidelines are being followed and **AGREED** that each CPC would update its status and provide supporting text as justification for review by the SC.

7.5 Report of the 18th Session of the Working Party on Tropical Tunas (WPTT18)

87. The SC **NOTED** the report of the 18th Session of the Working Party on Tropical Tunas (IOTC–2016–WPTT18–R), including the consolidated list of recommendations provided as an appendix to the report. The meeting was attended by 45 participants (44 in 2015), including 6 recipients of the MPF (6 in 2015).

88. The SC **NOTED** that from the both scenarios discussed in the WPTT for providing the management advice of yellowfin tuna, the most conservative approach was selected as the base case to provide the management advice.

89. The SC **NOTED** that the first attempt to establish a standardized CPUE series for the EU purse seine fleet was carried out in 2016 and made available to the WPTT, following results of the EU CECOFAD Project. It was **NOTED** that the series needs further work before being included in the assessment process, and therefore the SC **REQUESTED** that the EU scientisits continue refining those series in 2017.

90. The SC **NOTED** that both MSY and depletion-based (B0) reference points are reported in the key management quantity tables of the stock assessments. The SC also **REQUESTED** that estimates of current biomass in the absence of fishing (i.e. Bcurrent, F=0) are included in the management quantity tables for future stock assessments.

7.5.1 Review of the statistical data available for bigeye tuna

91. The SC **NOTED** that in the case of many coastal fisheries, juveniles of bigeye tuna often account for an appreciable amount of the total catch but are either not reported or assigned to an 'Other' species category. The SC **REQUESTED** the IOTC Secretariat and Maldives collaborate to improve reliability of catches of bigeye tuna – particularly for historical catch series prior to the introduction of logbooks in 2010.

7.5.2 Collaborative study of tropical tuna CPUE from multiple Indian Ocean longline fleets

92. The SC **REQUESTED** continued work on joint analysis of operational catch and effort data from multiple fleets, to further develop methods and to provide indices of abundance for IOTC stock assessments, and **NOTED** that ISSF would be willing to contribute support for future activities, with the aim of normalizing the process of joint analysis of the operational catch and effort data within the IOTC.

7.5.3 Bigeye tuna CPUE summary discussion

93. The SC **RECOMMENDED** that the multi-nation CPUE standardisation collaboration continue their efforts to improve the understanding of commercial CPUE as relative abundance indices, and expand future work to include other fleets, including the Seychelles longline fleet.

7.5.4 Yellowfin tuna CPUE Summary discussion

94. The SC **REQUESTED** that efforts to develop abundance indicators using purse seine data should be continued. Given the difficulty of defining effort in purse seine fisheries (particularly in FAD fisheries), and the importance of obtaining an abundance index for skipjack, alternative methods such as those based on ratio methods and standardized species composition should also be considered.

7.5.5 Stock Synthesis III (SS3) assessment of yellowfin tuna

95. **NOTING** the discussions on the tagging mixing period during previous WPTT meetings, related to the assessment of yellowfin and other tropical tuna stocks, the SC **RECOMMENDED** that additional work to be conducted to elucidate the most appropriate approach to tag modelling in IOTC stock assessments.

7.5.6 Parameters for future analyses: Yellowfin tuna CPUE standardisation and stock assessments

96. The SC **RECOMMENDED** that development of the next stock assessment of yellowfin tuna should include a detailed review of the existing data sources (conducted by the stock assessment consultant, in collaboration with the IOTC Secretariat and main longline and purse seine fleets), including:
    v. Size frequency data: Evaluation of the reliability of length composition from the longline fisheries (including recent and historical data), review of issues with the use of the (EU) purse seine length composition data prior to 1991, and the need for a thorough review of the size frequency data held by IOTC, in collaboration with the fleets involved, to improve the utilization of these data in tropical tuna stock assessments.
    vi. Collaborative longline CPUE: Further refinement of the procedures to standardize the composite longline logsheet data sets to develop the longline CPUE indices;
    vii. Tagging data: Comprehensive analysis of the tag release/recovery data set;
    viii. Alternative CPUE series: a review of the available data from the Indian tuna longline survey data.

7.6 Report of the 7th Session of the Working Party on Methods (WPM07)

97. The SC **NOTED** the report of the 7th Session of the Working Party on Methods (IOTC–2016–WPM07–R), including the consolidated list of recommendations provided as an appendix to the report. The meeting was attended by 34 participants (26 in 2015), including 9 recipients of the MPF (6 in 2016).

98. The SC **CONGRATULATED** the WPM and the new Chairperson, Dr Toshi Kitakado, for the progress made on MSE for yellowfin tuna, bigeye tuna and albacore.

7.6.1 Presentation and evaluation of MSE results

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

100. The SC **RECOMMENDED** the proposed standardised methods for the presentation of MSE results (Appendix VIb) are submitted to TCMP and S21 for discussion, revision and endorsement, as appropriate. Subsequently, this should be considered a living document that will benefit from revision based upon feedback received from the TCMP, which will first meet in 2017.

7.6.2 Operational definition of TRPs and LRPs

101. The SC **NOTED** the request for advice on the feasibility of reporting stock status in relation to limit reference points in addition to the target reference points currently used:

*"The Commission **NOTED** the progress towards development of harvest strategies for key stocks, including the adoption of limit and target reference points for a number of stocks, and **REQUESTED** that the SC provide advice to the 21st Session of the IOTC on the feasibility of reporting stock status in relation to the agreed limit reference points"* (IOTC-2016-S20-R, para. 16[2]).

The SC **NOTED** that if stock status advice changes as soon as the target reference points are exceeded, it is likely for advice to change based purely on natural fluctuations in stock abundance or other expected sources of variability. The SC **RECOMMENDED** that the operational definition of TRPs and LRPs is included for discussion at the Technical Committee on Management Procedures.

7.6.3 Revision of the WPM Program of work (2017–2021)

102. SC **NOTED** that the next stock assessment of Indian Ocean swordfish is due to take place in 2017 and **RECOMMENDED** that the development of MSE of swordfish is considered as a high priority in the revised WPM Program of Work and that funding is allocated for this activity, to start the conditioning of an OM for this stock.

[2] Provisional until approval of the final version of the S20 report by correspondence.

103. The SC **NOTED** the very ambitious schedule of work and need for prioritisation as far as possible within the timeline established by the Commission in Resolution 15/10.

7.6.4 Special session on Management Strategy Evaluation (MSE)

104. 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 in 2015. 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.

105. 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.

106. The SC **NOTED** that the MSE examples were based on the monitoring of catch limits whereas there are also other management mechanisms available such as input controls that might be preferable to managers. However, while these are theoretically possible to incorporated within the MSE framework, limited knowledge of the spatial distribution and actual effort exerted by the fleets restricts the ability to explore these management measures in a meaningful way, through an operating model.

107. The SC **NOTED** that status quo scenarios should be included within management advice to enable them to evaluate the impacts of a lack of decision, prolonged indecision as well as results from different decisions.

7.7 Report of the 12th Session of the Working Party on Data Collection and Statistics (WPDCS12)

108. The SC **NOTED** the report of the 12th Session of the Working Party on Data Collection and Statistics (IOTC–2016–WPDCS12–R), including the consolidated list of recommendations provided as an appendix to the report. The meeting was attended by 32 participants (21 in 2015), including 6 recipients of the MPF (4 in 2015).

7.7.1 Further analysis of length frequency data and likely impacts on the assessments

109. The SC **RECOMMENDED** that a collaborative work on longline size frequency data gathering scientists from Taiwan,China, Japan, Seychelles and Rep. of Korea should be conducted in 2017 in conjunction with the joint CPUE workshop, to compare the different data sets available and extract information useful for the future stock assessments of yellowfin, bigeye and albacore tuna.

110. The SC **NOTED** paper IOTC-2016-WPDCS12-INF05 that provides updates on the relationship between fork length and total weight for yellowfin, bigeye, and skipjack caught with purse seine and **NOTING** that the current length-weight relationships adopted by IOTC tend to underestimate the weight at length for the two latter species **AGREED** that the new length - weight relationships replace the existing IOTC ones.

7.7.2 Resolution 15/02 Mandatory statistical requirements for IOTC Members and Cooperating Non-Contracting Parties (CPCs)

111. The SC also **NOTED** the conceptual model adopted by ICCAT in its field manual to describe all quantities involved in the determination of retained and total catch and **AGREED** that a similar approach is adopted and used to provide clearer, more formal definitions of the depicted relevant concepts.

7.7.3 Resolution 16/01 On an interim plan for rebuilding the Indian Ocean yellowfin tuna stock

112. The SC **AGREED** that a project be included in the WPDCS program of work to support CPCs in the improvement of their national data collection systems to support the implementation of Resolution 16/01 *On an interim plan for rebuilding the Indian Ocean Yellowfin tuna stock*; specifically estimates of fleet composition, time-area catches (and associated catches on the high seas for vessels under 24 metres), and efficiencies in the time required to assess the status of yellowfin tuna catches.

7.7.4 Resolution 16/04 On the implementation of a pilot project in view of promoting the regional observer scheme

113. Resolution 11/04 *On a Regional Observer Scheme* requests the submission of a report after each trip but the SC **AGREED** that on the next revision of the Resolution, this should be amended to request the submission of electronic data (instead of the observer trip reports) with a fixed deadline so that information from multiple trips can be provided.

7.7.5 Update on the implementation of the IOTC interim ROS templates

114. Due to the difficulties in collecting detailed data on tori line specifications, the SC **AGREED** that the trip level data reporting requirements be amended to permit the reporting of this information as optional rather than mandatory, as detailed in paper IOTC-2016-WPDCS12-21_Rev_1, in the IOTC Interim observer template (Form Trip-LL).

7.7.6 ROS E-reporting and E-monitoring projects

115. The SC **NOTED** that the guidelines described in document IOTC-2016-WPDCS12-23 provide a useful starting point and **AGREED** these guidelines be adopted as a basis for defining minimum standards for tropical tuna purse seine fleets.

7.7.7 Capacity Building Activities: Data Collection and Processing in Coastal Countries, and Compliance with Minimum Requirements

116. The SC **RECOMMENDED** that a capacity building workshop on R data extraction, manipulation and data visualisation takes place in 2017, **NOTING** that funding sources have to be sought and that Sri Lanka has expressed strong interest in this type of activity.

7.7.8 Bycatch Data Exchange Protocol(BDEP) Database initiative: bycatch data collection and reporting between tuna RFMOs

117. The SC **AGREED** that the BDEP trial should continue in 2017 for the Indian Ocean and be resourced as needed, as a positive step towards improving the quality of and access to bycatch data within and across tRFMOs. The SC also **NOTED** the need to be careful that data reported in the BDEP template are not extrapolated by multiplying reported bycatch numbers in the template by total effort which may result in inflated estimates of bycatch.

7.7.9 General discussion on data issues

118. 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.

119. 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, noting the adoption of Resolution 16/06 *On measures applicable in case of non-fulfilment of reporting obligations in the IOTC* and possibility of penalty measures for non-compliance of Resolutions 15/01 and 15/02.

120. The SC **NOTED** the issues with the lack of data and problems of poor data quality that were identified throughout the Working Party reports and strongly **RECOMMENDED** that these issues are addressed through improved compliance with Resolutions 15/01 *On the recording of catch and effort data by fishing vessels in the IOTC area of competence*, and 15/02 *Mandatory statistical reporting requirements for IOTC contracting parties and cooperating non-contracting parties*.

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

7.8.1 Data collection and capacity building

121. 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, particularly in relation to the implementation of the Regional Observer Scheme and data collection and reporting for artisanal fisheries and **RECOMMENDED** that the Commission further increases the IOTC Capacity Building budget to fund these activities in the future.

7.8.2 Meeting participation fund

122. **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, the SC **REQUESTED** that the funding of national scientists from developing Contracting Parties to attend the WPNT be considered a higher priority.

123. The SC reiterated its **RECOMMENDATION** 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.

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

124. The SC **RECOMMENDED** that the Commission allocates budget towards continuing the translation and printing of the IOTC species ID guides so that hard copies of the identification cards can 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 on board.

125. 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.

7.8.4 IOTC Secretariat staffing

126. **NOTING** the very heavy workload at the IOTC Secretariat and the ever increasing demands by the Commission and the Scientific Committee, and also the capacity to respond to requests for assistance by countries, the SC **RECOMMENDED** that the recommendation from the Performance Review PRIOTC02.07(g) is implemented, and that permanent staff of the IOTC Data and Science Section be increased by two (2) (1 x P4 and 1 x P3 level positions), supplemented by additional short-term consultants, to commence work by 1 January 2018 or earlier, and that funding for these new positions should come from both the IOTC regular budget and from external sources to reduce the financial burden on the IOTC membership.

7.8.5 Collaborative Longline CPUE

127. The SC **ACNOWLEDGED** the work of the WPTT and WPTmT and especially improvements in the joint CPUE standardization work which is critical for reliably estimating the stocks. The SC **NOTED** that the joint CPUE has become a critical component for the assessments of temperate and tropical tuna species and the SC **RECOMMENDED** that this work continue under the current framework, but that plans should be developed to formalize the process within the IOTC in the near future.

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

128. 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

129. 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).

130. The SC **NOTED** the update provided on the on-going impacts of piracy on fisheries in the Indian Ocean, particularly the reduction or relocation of fishing effort in the western Indian Ocean (Somali basin) and other areas in the Indian Ocean (Figs. 1a and 1b).

131. 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), and that 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.

132. The SC **NOTED** that the reported increase in the catches of albacore in recent years by the longline fleets was 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.

133. 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 still have not returned to the levels last seen before the start of piracy (Table 3). 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 3. Number of active longline and purse seine vessels, for selected fleets in the Indian Ocean (2011–15).

Longline fleets	**2011**	**2012**	**2013**	**2014**	**2015**
Japan	72	75	57	53	52
Rep. of Korea	7	7	9	10	14
China	15	36	36	39	50
Taiwan,China	132	138	148	122	119
Philippines	2	14	19	4	
Purse seine fleets	**2011**	**2012**	**2013**	**2014**	**2015**
European Union	26	30	26	27	27
Seychelles	8	7	7	8	13
Australia	5	5	6	6	6
Indonesia	10	19	19	19	19
I.R. Iran	7	10	7	7	7
Japan	1	1	1	1	1
Rep. of Korea		3	4	4	4
Mauritius			2	7	7
Sri Lanka			8	8	

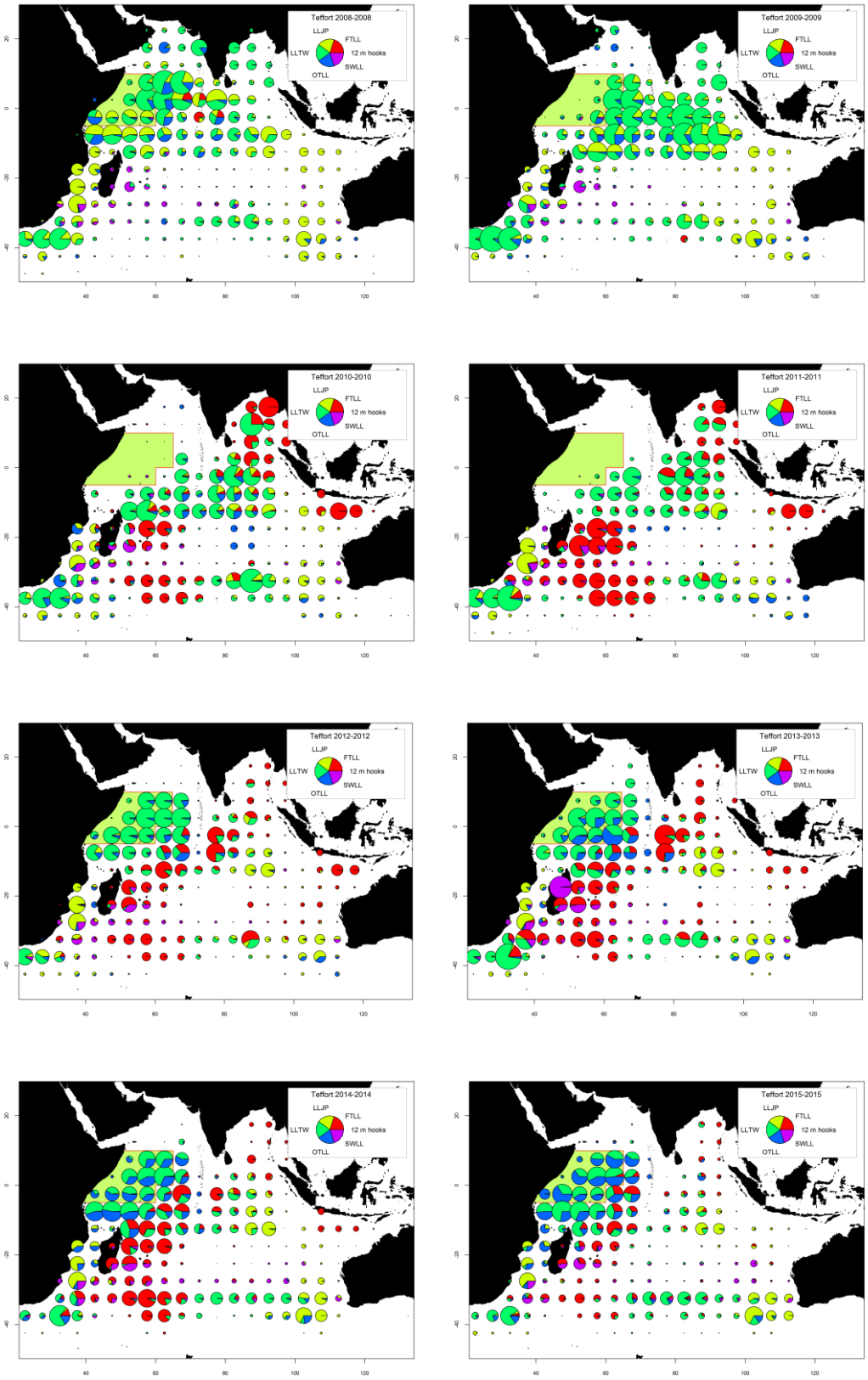


Fig. 1a. Effort exerted by longline fleets in the Indian Ocean, in millions (M) of hooks set, by main fleet and 5° grid (2008-2015): **LLJP** (light green): deep-freezing longliners from Japan; **LLTW** (dark green): deep-freezing longliners from Taiwan,China; **SWLL** (turquoise): swordfish longliners (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 September 2016.

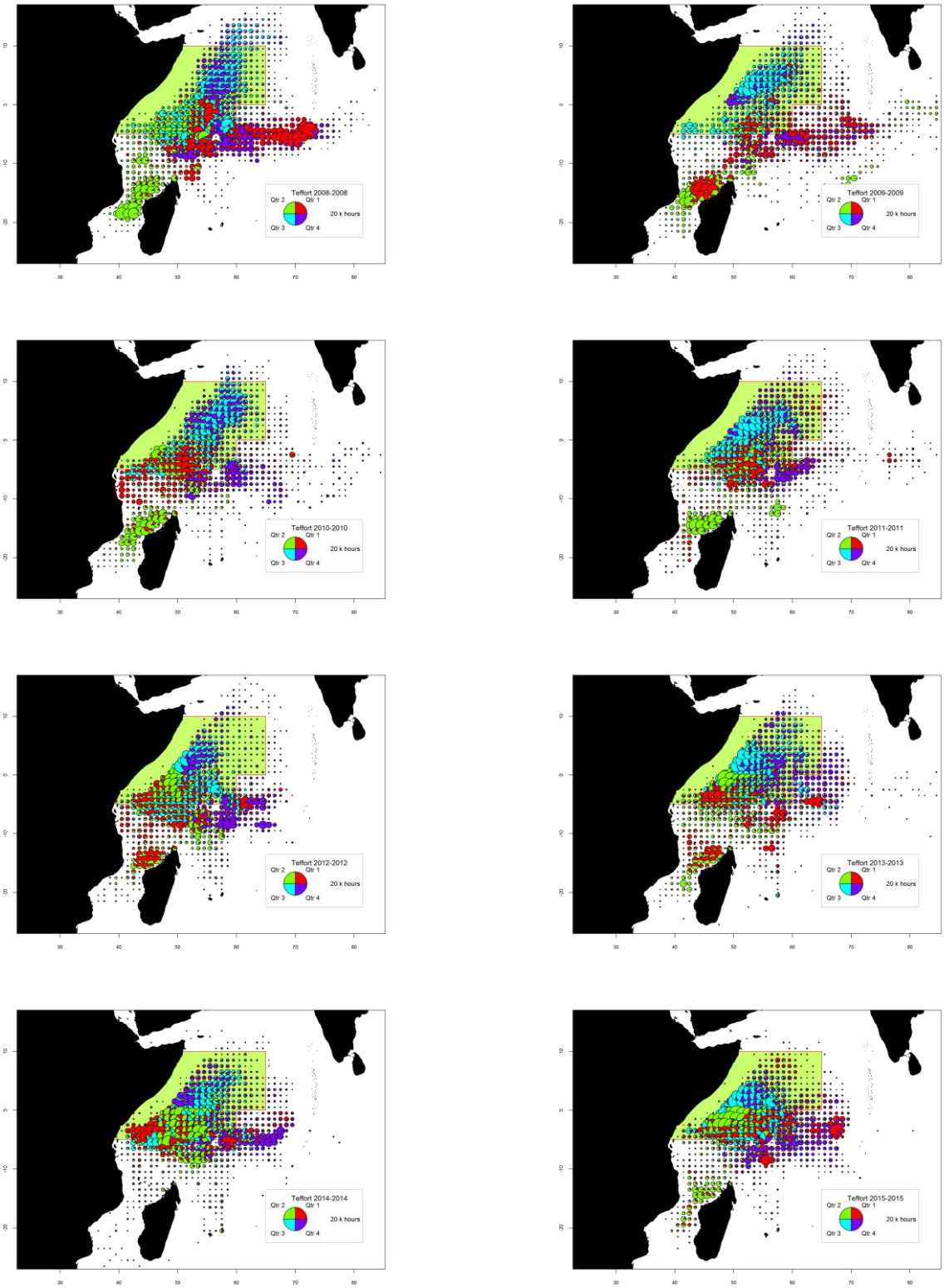
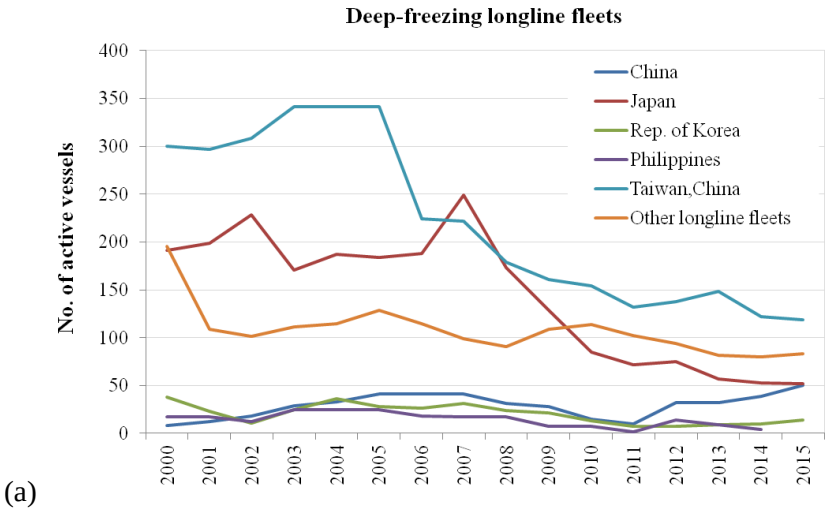
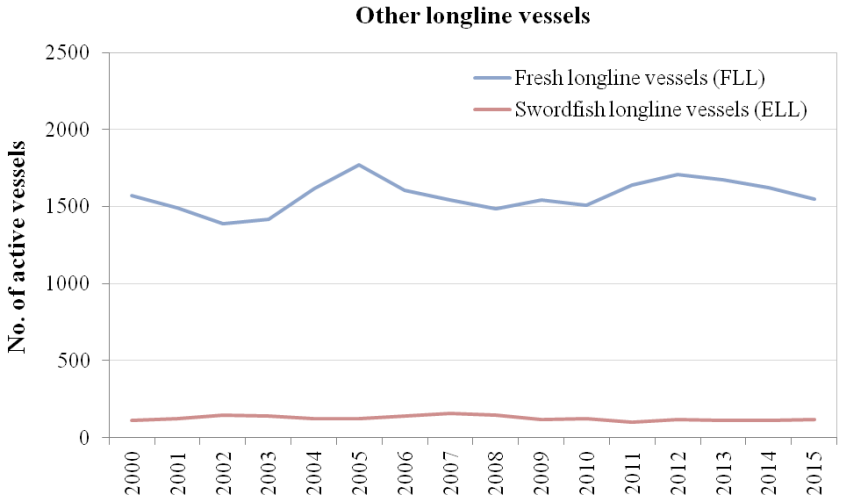


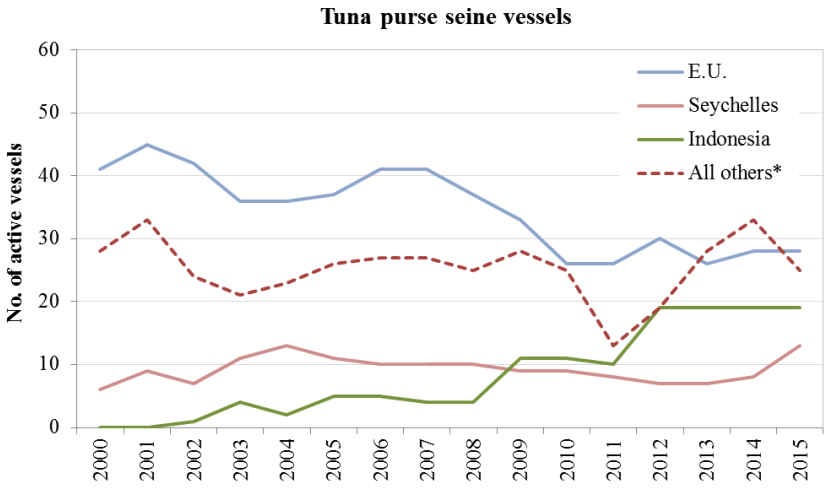
Fig. 1b. Effort exerted by purse seine fleets in the Indian Ocean, in thousands (k) of fishing hours (Fhours), by main fleet and 1° grid and quarter (for 2008-15). The area shaded in green is where piracy activities are considered highest. Data as of September 2016.



(a)



(b)



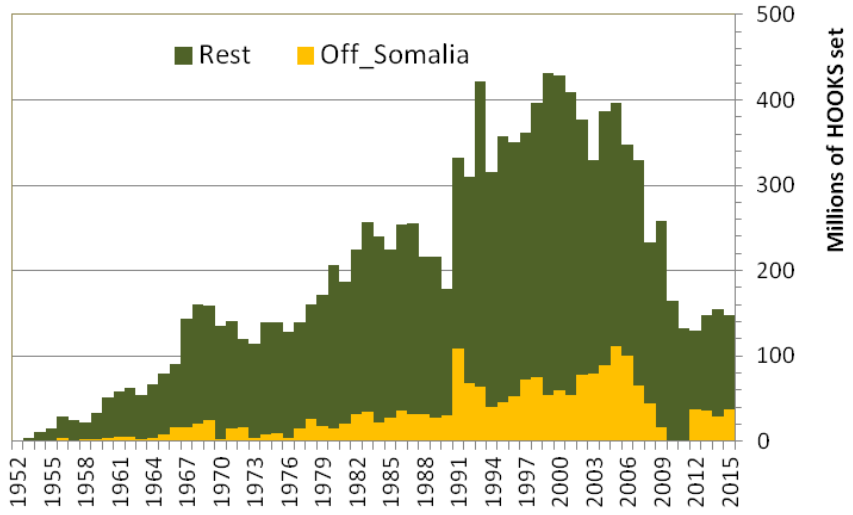
(c)

Figs. 2(a-c). Number of active vessels in the Indian Ocean 2000-2015 for: a) deep-freezing longline vessels b) other longline vessels (FLL & ELL), and c) tuna purse seine (PS) fleets.* All other purse seine fleet includes I.R. Iran, Japan, Rep. of Korea, Mauritius, Malaysia, and Thailand.

134. 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).

135. 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 2017.

(a)



(b)

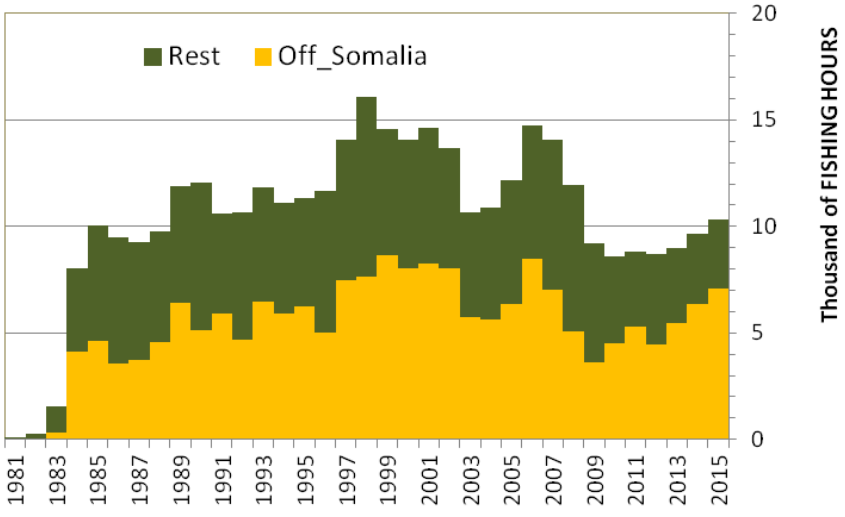


Fig. 3(a-b). Changes in total effort for a) longline vessels (number of hooks set in millions), and b) purse seine vessels (number of hours fished, in thousands) by year and geographical area: off the Somalia coastline (area shaded in green shown in Figs. 1a and 1b) and for the rest of the Indian Ocean, based on catch and effort reported to the IOTC Secretariat. Data as of September 2016.

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

136. The SC **RECALLED** 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.

137. 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.

138. The SC **REQUESTED** that the IOTC Working Parties ensure that the range of catch projections presented in the Kobe II Strategy Matrix includes catch levels which are in line with the Commission objectives, to ensure that appropriate management advice can be provided.

139. The SC **AGREED** that the following additions would be included in the species Executive Summaries provided to the SC, as of 2016:
    - chart showing catches by gear over time;
    - the proportion of catches estimated by the IOTC Secretariat, as an indication of the data quality for the most recent year data is available;.
    - the probability of being in Kobe quadrant, if possible (i.e., in Table 1).

140. The SC **NOTED** the suggestion to improve figures within the supporting information of the Executive Summaries (IOTC-2016-WPTT18-INF01) and **REQUESTED** a small inter-sessional group, including the SC Chair, the IOTC Secretariat, and any other interested CPCs, liaise via email to discuss changes to the content and develop a template which will be put forward at each Working Party for approval, to be presented at the SC20.

9.2 2016 IOTC Executive Summaries

141. **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

142. 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 2016 (Fig. 4):
    - Albacore (*Thunnus alalunga*) – Appendix IX
    - Bigeye tuna (*Thunnus obesus*) – Appendix X
    - Skipjack tuna (*Katsuwonus pelamis*) – Appendix XI
    - Yellowfin tuna (*Thunnus albacares*) – Appendix XII

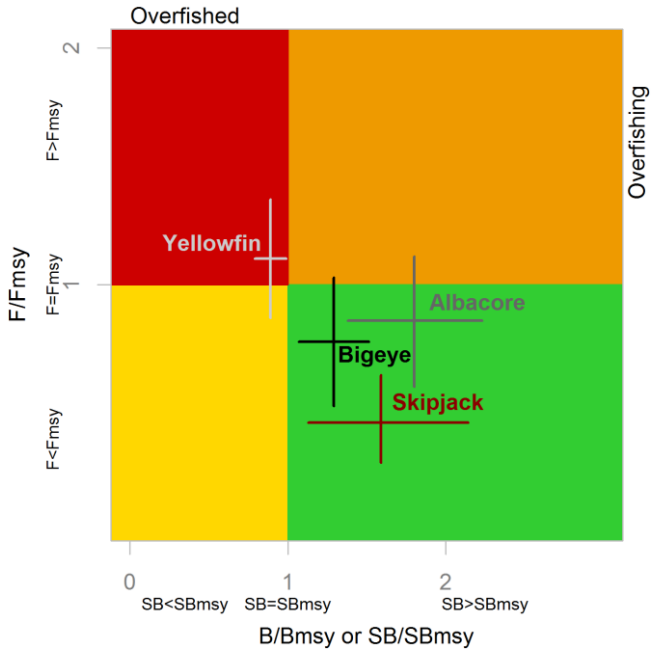


Fig. 4. Combined Kobe plot for bigeye tuna (black: 2016), skipjack tuna (brown: 2014), yellowfin tuna (grey: 2016), and albacore tuna (dark grey: 2016) showing the estimates of current stock size (SB) and current fishing mortality (F) in relation to optimal spawning stock size and optimal fishing mortality. Cross bars illustrate the range of uncertainty from the model runs with a 80% CI. 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.

143. The SC **NOTED** paper IOTC–2016–SC19–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

144. 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 2016 (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

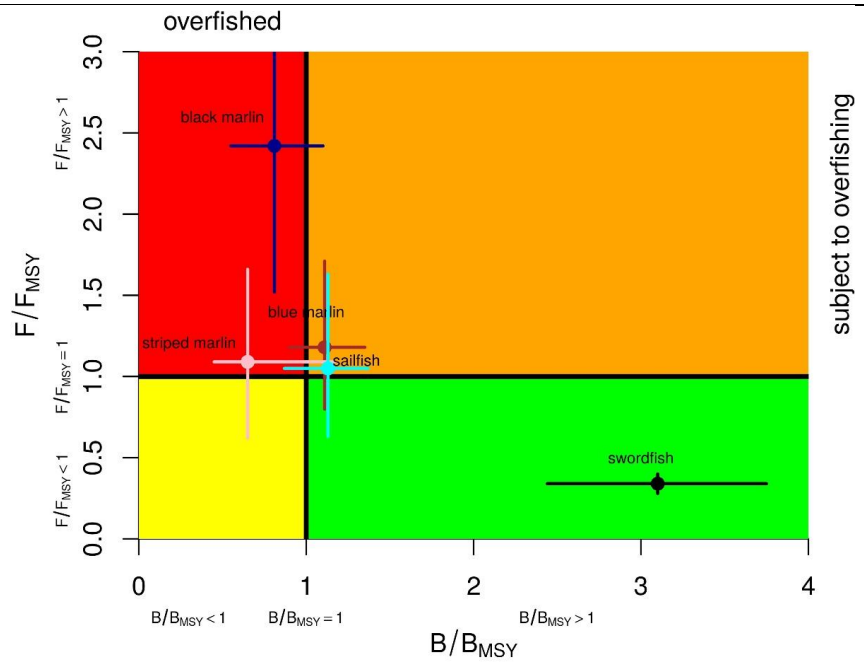


Fig. 5. Combined Kobe plot for swordfish (black), Indo-pacific sailfish (cyan), black marlin (light blue), blue marlin (brown) and striped marlin (pink) showing the 2015 and 2016 estimates of current stock size (SB or B, species assessment dependent) and current fishing mortality (F) in relation to optimal spawning stock size and optimal fishing mortality. Cross bars illustrate the range of uncertainty from the model runs.

9.5 Tuna and seerfish – Neritic species

145. 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 two species assigned a stock status in 2016 (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

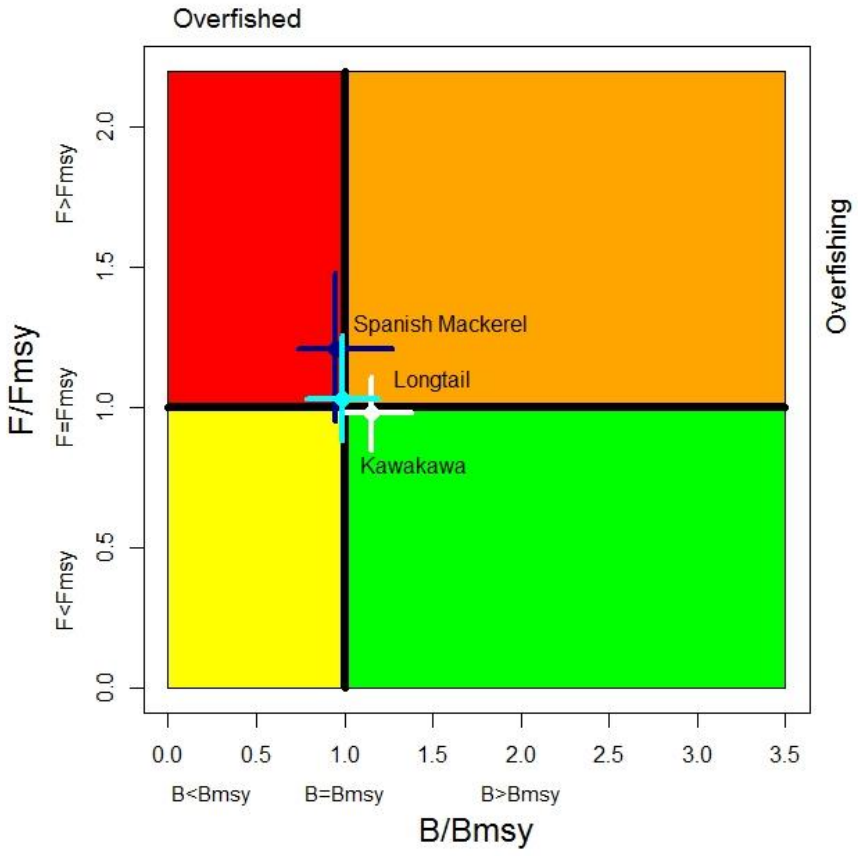


Fig. 6. Combined Kobe plot for longtail tuna (cyan: 2016), narrow-barred Spanish mackerel (dark blue: 2016), and kawakawa (white: 2015) showing the estimates of stock size (B) and current fishing mortality (F) in relation to optimal spawning stock size and optimal fishing mortality using the OCOM modelling approach. Cross bars illustrate the range of uncertainty from the model runs.

10. STATUS OF SHARKS, MARINE TURTLES AND SEABIRDS IN THE INDIAN OCEAN

10.1 Sharks

146. 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

10.2 Marine turtles

147. 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

10.3 Seabirds

148. 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

11. IMPLEMENTATION OF THE REGIONAL OBSERVER SCHEME

149. The SC **NOTED** paper_IOTC-2016-SC19-11 from Sri Lanka that proposed a port sampling scheme as an alternative to placing human observers onboard for small vessels (<24m) fishing on the high seas.

150. The SC **NOTED** the logistical, safety and financial challenges posed with the placement of observers on a large number of small vessels, but also **NOTED** the issues with the lack of information provided on discarding provided by port sampling alone and that it is not currently considered as implementation of Resolution 11/04 even for small vessels operating on the high seas.

151. The SC **NOTED** that there is currently 100% VMS coverage for all Sri Lankan flagged vessels fishing on the high seas, and that this will also be extended to vessels operating within coastal waters.

152. The SC **NOTED** paper IOTC–2015–SC18–07 that 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).

153. The SC **NOTED** that as of 2nd December 2016, fifteen CPCs (Australia, China (including Taiwan,China), Comoros, EU (France[3], Spain and Portugal), Indonesia, Japan, Kenya, Rep. of Korea, Madagascar, Maldives, Mauritius, Mozambique, Seychelles, South Africa and Thailand) have submitted a list of observers and have been allocated an IOTC observer registration number. This makes a total of 348 currently registered observers.

154. The SC **NOTED** that as of 16th November 2016, 429 observer trip reports have been submitted to the IOTC Secretariat by Australia, China (including Taiwan,China), EU(France, Portugal and Spain), France OT, Indonesia, Japan, Rep. of Korea, Madagascar, Mauritius, Mozambique, Seychelles, 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.

155. The SC **NOTED** the improvement in data submissions by CPCs, notably the new submissions by Seychelles, Mauritius and Mozambique in 2016 and **WELCOMED** the increase in the amount of data that is now being submitted electronically and **ENCOURAGED** more CPCs to continue this trend.

11.1 Development of a proposal for a Pilot Project to be presented to the Commission 2017

156. The SC **NOTED** paper IOTC-2016-SC19-14 that presented a first draft of a proposal for a pilot project for the ROS under Resolution 16/04.

157. The SC **NOTED** that the work elements described in the project proposal are critical to the future success of the ROS and **AGREED** to use the strategic framework describd in the paper. The SC further **REQUESTED** the Secretariat, in collaboration with the SC Chair and WPEB Chair, develop a more detailed and specific pilot program covering the actions mentioned in Res 16/04. This will include a detailed budget and will be circulated among CPCs for comment as detailed in Res 16/04. The SC **AGREED** to present the final version of the pilot project to the Commission as required by Res 16/04.

158. The SC **NOTED** that the EMS workstream will be focussed on the gillnet fleets, but that there are still lessons to be learned from experiences elsewhere in the Indian Ocean. The SC **WELCOMED** the offer of support from Australia and the EU in terms of sharing experiences and lessons learned from the implementation of EMS in the longline and purse seine fleets respectively.

159. The SC **AGREED** that ensuring long term viability and sustainability is critical to the success of any pilot project and so the piloting phase will involve exploring resource efficient methods and evaluating initiatives in terms of costs and benefits as well as.

160. The SC **NOTED** the substantial resourcing that the proposed framework will require and **RECOMMENDED** that the Commission provide adequate resources to enable implementation of the project.

161. The SC **AGREED** to determine a Project Steering Committee to oversee the work, and **REQUESTED** that clear Terms of Reference are drafted to define specific roles and responsibilities of the Committee. The SC

[3] Including Mayotte due to its status as a French outermost region since January 2014.

further **AGREED** that the Steering Committees should be kept small and functional while ensuring relevant expertise in all areas of work within the pilot project are covered, and that these may be source from experts beyond as well as within the Indian Ocean.

162. The Secretary of the SWIOFC **INFORMED** the SC that its members were considering setting up a regional observer programme within a Protocol that they were developing on minimum terms and conditions for fishing access in their waters. The objective of the programme was to collect both scientific and fisheries data for scientific and management purposes in line with relevant IOTC resolutions. Observer coverage will be at a level that is equitable between purse seine, longline and pole and line vessels, and in line with the relevant IOTC resolutions on observer coverage. The cost would be recovered from the fishing industry via implementation of relevant levies by the national licencing authorities.

163. The SC **NOTED** paper IOTC-2016-SC19-15 on the development of a set of minimum standards for EMS, **ACKNOWLEDGING** that this is a specific request from the Commission in Resolution 16/04.

164. The SC **NOTED** that the Commission has specifically requested the development of minimum standards for EMS through Resolution 16/04 and the need for this to be part of the Pilot Project.

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

165. The SC **NOTED** paper IOTC–2016–SC19–08 which provided an update on progress regarding Resolution 16/03 *On the second performance review follow-up*. The second Performance Review commenced in 2015 and the final Session will be held in early 2017 to finalise a series of Recommendations for the Commission's consideration.

166. **ACKNOWLEDGING** that holding data preparatory meetings prior to stock assessments is considered to be best practice, the SC **NOTED** that these will be implemented as far as possible within the current resourcing, timing and staffing constraints of the IOTC Secretariat and participating CPCs. The SC further **AGREED** to also explore other methods to overcome this issue such as using the WP meetings for data preparation in the year prior to assessment.

167. The SC **NOTED** the need to develop guiding principles for the provision of papers to ensure they are directly related to the Program of Work of the respective Working Parties and SC, as endorsed by the Commission, while still encouraging for new and emerging issues.

168. The SC **RECOMMENDED** that the Commission note the updates on progress regarding Resolution 16/03, as provided at Appendix XXXIII.

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

13.1 Program of Work (2017–2021) and assessment schedule

13.1.1 Program of Work

169. The SC **NOTED** paper IOTC–2016–SC19–09 which provided the Scientific Committee (SC) with a proposed Program of Work for each of its Working Parties (WP), including prioritisation of the elements requested by each WP.

170. 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 XXXIVa-g. 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.

171. The SC **RECALLED** the process for developing the consolidated SC PoW (IOTC–2014–SC17–R, para. 179):

• Step 1: Working Parties to identify research needs (based on the needs of the Commission), rank them by order of priority, provide cost estimates and list potential funding sources;

• Step 2: The SC and Working Party Chair and Vice-Chair, in liason with the IOTC Secretariat should develop a consolidated document taking into account the different Working Party research needs and priorities, with the objective of ranking the research needs among all Working Parties;

• Step 3: The Chair of the SC shall present these to the SC, to be discussed and endorsed as the consolidated research priorities for the IOTC Science process;

• Step 4: The IOTC Secretariat, in consultation with the Chair and Vice-Chair of the SC and Chair and Vice-Chair or relevant Working Parties, shall identify funding possibilities to undertake the consolidated research priorities;

• Step 5: Once the funding sources have been committed to a particular research priority, the panel mentioned above in Step 2 shall develop terms of reference of the 'Expression of Interest' (including tasks, timelines and deliverables) and the selection procedure/criteria;

• Step 6: IOTC Secretariat to advertise a call for 'Expression of Interest' among the IOTC Commissioner's and Science contact lists, and via the IOTC website;

• Step 7: The Chair of the SC, Chair(s) and Vice-Chair(s) of the WP(s) concerned, in liaison with the IOTC Secretariat shall determine the most appropriate project proposal, based on the criteria defined in Step 5 and in line with the financial rules of the Commission and FAO. Potential contracted candidate will be contacted by the IOTC Secretariat to confirm availability.

172. The SC **AGREED** on the consolidated table of priorities across all Working Parties, as developed by each WP Chair, and **REQUESTED** that the IOTC Secretariat, in consultation with the Chair and vice-Chair of the SC and relevant Working Parties, develop ToRs for the specific projects to be carried out (Table 4).

173. The SC **NOTED** that the consolidated table of priorities does not replace the full programme of work of each Working Party (Appendix XXXIVa-g) and that adequate attention and focus should still be allocated to those activities where possible. The SC further **NOTED** that Table 4 has been developed by the SC and WP Chairs to provide more specific direction to the IOTC Secretariat and the SC Chair as to the priorities of the SC so that if and when external funding becomes available intersessionally it is possible to clearly prioritise across all WPs based on the objectives of the SC (as agreed in IOTC-2014-SC17-R, para. 179).

174. The SC **NOTED** that the WPM has selected five species for MSE (albacore, yellowfin, bigeye, skipjack and swordfish). While these species are equally prioritised in terms of science, swordfish has been labelled as the first priority in Table 4 given that it is the only species currently lacking funding.

175. The SC **NOTED** information paper IOTC-2016-SC19-INF04 that outlines a proposed schedule of work for the development of manamgement procedures in the IOTC which will be presented to the Technical Committee on Management Procedures (TCMP) and Commission meeting (S21).

176. The SC **NOTED** Table 4 outlining the highest priorities from each WP in terms of funding requirements. The complete set of research priorities identified (and ranked according their importance) by each WP are detailed more fully in Appendix XXXIV.

TABLE 4. Priority topics for obtaining the information necessary to develop stock status indicators for all Working Parties. Numbering (in bold) represents numbers of each specific WP workplan, of which further details can be found in Appendix XXXIVa-g.

PR	WPTT Est. budget (potential source)		WPEB Est. budget (potential source)		WPN Est. budget (potential source)		WPTmT Budget (potential source)		WPB Budget (potential source)		WPDCS Est. budget (potential source)		WPM Est. budget (potential source)	
1	**5.-** Develop standardised CPUE series for each tropical tuna for the Indian Ocean (PS and Joint LL)	US$ 30K	**1.2.1.-** Connectivity, movements and habitat use including identification of hotspots, by use of conventional and electronic tagging (PSAT).	US$ 80K each species (TBD)	**1.-** Genetic research to determine the connectivity of neritic tunas throughout their distributions	1.3 m € (EU)	**2.1.-** Age and growth to construct catch at age and growth curves to use in the stock assessments.		**1.-** Genetic research to determine the connectivity of neritic tunas throughout their distributions	1.3 m € (EU)	**1.-**Data Collection Standards – ROS for IOTC Fisheries (artisanal and industrial)		**1.5.-** SWO MSE	?? (TBD)
2	**6.4.-** Size frequency data of LL/PS and spatial assumptions including potential effects of limited tag mixing on stock assessment outcomes (analysis of tagging data)	US$ 30K	**3.2.1.-** Post-release mortality, to assess the efficiency of management resolutions on no retention species (OCS and thresher), SMA ranked as the most vulnerable to LL fisheries, and BSH as the most frequent in catches.	US$170K per species (EU)	**2.-** Age and growth and maturity to use as input in the stock assessments	CPCs directly	**4.1.-** Develop standardized CPUE series for each albacore fishery for the Indian Ocean, with the aim of developing a single CPUE series.		**1.2.-** Tagging research to determine connectivity, movement rates and mortality estimates of billfish.	US$ 100 K (TBD)	**3.-** Review Size Data Longline Fisheries	US$ 40K (TBD)	**1.2.-**SKJ MSE	?? Maldives
3	**2.-** Ageing of YFT and BET to calculate age/length keys and catch at age for using in the stock assessments.	US$ 150 K	**3.2.2.-** Post-release mortality (electronic tagging), to assess the efficiency of management resolutions on no retention species (OCS) for PS fisheries	US$80 0K (TBD)	**4.-** Develop and compare multiple assessment approaches to determine stock status for longtail tuna, kawakawa and Spanish mackerel (SS3, ASPIC etc).	IOTC Regular budget	**1.1.-** Genetic research to determine the connectivity of albacore throughout its distribution and the effective population size	1.3 m € (EU)	**6.2.-** Stock assessment of billfish species in 2017 and 2018	US$ 16250 IOTC Budget	**2.-** Estimates of catch reference levels for 2014 and assistance to the CPCs in the monitoring of their coastal fisheries	US$ 40K (EU)	**1.4.-** YFT MSE	75,000 US (ABNJ)

13.1.2 Assessment schedule

177. The SC **ADOPTED** a revised assessment schedule, ecological risk assessment and other core projects for 2017–21, 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

178. The SC **REQUESTED** that at least one 'Invited Expert' be brought to each of the science Working Parties in 2017 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

179. **NOTING** the highly beneficial and relevant work done by IOTC stock assessment consultants in 2016 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.

13.2 Schedule of meetings for 2017 and 2018

180. The SC **NOTED** paper IOTC–2016–SC19–10 which outlined the proposed schedule for IOTC Working Parties and SC meetings for 2017 and 2018.

181. The SC **ENDORSED** the proposal by the WPTmT that future stock assessment cycle for albacore tuna should be conducted every three years (rather than two years), in line with the assessment of species covered by other IOTC Working Parties, and that the WPTmT should in addition convene during the year preceding the next stock assessment, starting in 2018, to focus on priority areas for improvement in the albacore assessment, such as the standardization of CPUE, or development of biological parameters (Appendix XXXVI).

182. The SC **REQUESTED** that the schedule of Working Party and Scientific Committee meetings for 2017 and 2018 provided at Appendix XXXVI be communicated by the IOTC SC Chair to the Commission for its endorsement.

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

183. 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.*

184. The SC **NOTED** paper IOTC-2016-SC19-INF05; a letter of invitation received by the IOTC from the ICCAT Executive Secretary to all t-RFMO Secretariats to initiate a process leading to the meeting of a joint WG on Fish Aggregating Devices (FADs).

185. The SC further **NOTED** that the intention of this is to hold a dialogue meeting between Commissioners as well as scientists and **RECOMMENDED** that the Commission consider holding an internal IOTC meeting in early 2017 in advance of the global meeting.

186. The SC **NOTED** that this was circulated to all members in IOTC Circular 2016-080. As only two responses have been received so far, the SC **ENCOURAGED** those CPCs who have not yet provided a response to the circular to work with their Commissioners to do so as soon as possible.

13.4 Consideration of Resolution 16/09 On establishing a Technical Committee on Management Procedures (TCMP)

187. The SC **NOTED** the plan to hold a one-day meeting (TCMP) in May 2017 ahead of the Commission meeting.

188. **NOTING** that this is a critically important meeting, especially given the good progress made by the last dialogue meetings, the SC further **NOTED** the short length of the meeting and **AGREED** that the agenda should be designed very carefully in order to compensate for the limited time available.

189. While good communication is implicit in the structure of the TCMP, which will be co-Chaired by the SC and Commission Chairs, the SC **AGREED** that the agenda should be developed and circulated early to start the communication and that an informal point will be added to the end of the agenda to ask CPCs if they are satisfied with the format of the meeting or whether another iteration of changes is required.

190. The SC **NOTED** the objectives of the meeting are to discuss the results of MSE for each species in a clear, transparent and understandable way in order to facilitate the elevation of decisions on preferred harvest strategies to the Commission.

191. **NOTING** the decision to move away from capacity building elements and to simply provide the information needed for decision-making through this meeting, the SC **WELCOMED** the initiative of the ABNJ Tuna Project, with the lead of WWF, to hold a capacity building workshop on MSE in Sri Lanka in 2017. While this will be targeted at developing states it will be an open meeting for anyone who wishes to attend.

14. IOTC Scientific Strategic Plan

192. The SC **NOTED** paper IOTC-2016-SC19-16 which provides a proposal for the development of of a Strategic Research Plan for the IOTC Scientific Committee.

193. The SC **THANKED** the authors for the work and **NOTED** the importance of developing a strategic plan to guide the future direction of the SC according to the requests of the Commission and **AGREED** to support the approach.

194. The SC **NOTED** the proposal for an additional ad hoc meeting of the SC in 2018 to speed up the process and **AGREED** that due to the difficulties in finding time for an additional meeting within participants' already tight schedules, other approaches (e.g., remote) for reviewing the plan should be explored .

195. The SC **NOTED** that the plan will aim to clarify the priorities of the SC more explicitly so that the WP have clearer guidance for developing their individual work plans.

15. Other Business

15.1 Ecosystem Based Fisheries Management (EBFM) joint meeting of tRFMOs (Chairperson)

196. The SC **NOTED** the upcoming joint t-RFMO meeting on the implementation of Ecosystem Based Fisheries Management in t-RFMOs which will be attended by the SC Chair, the WPEB Chair and the Secretariat, on behalf of IOTC (IOTC–2016–SC19–INF06).

197. The SC **NOTED** that the meeting is supported by the ABNJ Tuna Project with the intention of starting a dialogue and exchange on experiences regarding the application of the ecosystem approach to fisheries management in the different t-RFMOs, determining what is actually meant by EBFM and how far this has been developed and operationalised in each t-RFMO.

198. The objective will be to develop a framework for operationalising the implementation of EBFM in t-RFMOs by looking at the management goals and evaluating what indicators, critical values for indicators, decision rules and actions are required to achieve these goals within a consistent framework among RFMOs.

199. The SC **NOTED** paper IOTC-2016-SC19-12 presenting a potential indicator-based ecosystem report card for the IOTC area of competence including the following abstract provided by the authors:

"As an opportunity to take the lead in moving forward implementing Ecosystem-based Fisheries Management (EBFM) in the IOTC Convention Area, the Working Party on Ecosystems and Bycatch recommended the development of an indicator-based ecosystem report card with the aim of testing a new approach for linking ecosystem science to management and increasing the communication and reporting of the state of the different components of the Indian Ocean ecosystem to the Commission (IOTC–WPEB12 2016). Here, first we aim to initiate a discussion and make the case for the need to develop an indicator-based ecosystem report card in the IOTC Convention Area. Second, we provide a potential template of an indicators-based ecosystem report card which will contribute to the discussion and contribute to the process

towards its full development and use. Continuing the development and refinement of the report card with the involvement of a diverse group of experts including scientist, managers and other key stakeholders will be pivotal to improve its utility and relevance to the management of tuna and tuna-like species and associated ecosystems in the Indian Ocean".

200. The SC **THANKED** the authors for this work and **AGREED** that this would be a useful approach to explore further for the Indian Ocean tuna fisheries.

201. The SC **NOTED** that there is a need for a clear strategy to be developed, identifying temporal and spatial components, taking stock of existing sampling surveys. The SC further **NOTED** that there has been little work on ecosystem indicators by the WPEB to date and **REQUESTED** that experts on EBFM are invited to the next WPEB to discuss the development of this approach.

202. The SC **AGREED** to present this to the upcoming joint t-RFMO meeting as an idea for a proposed tool for decision-making in the context of the EBFM involving the tracking of ecosystem indicators with a set of pre-agreed mitigating actions as soon as they breach acceptable limits, according to the objectives of the Commission.

15.2 Management Strategy Evaluation joint tuna RFMO meeting (Chairperson)

203. The SC **NOTED** the presentation on the joint t-RFMO MSE workshop (IOTC–2016–SC19–INF07), **THANKED** the ABNJ Tuna Project for funding this, and **SUGGESTED** that a follow-up workshop might also be possible through further support from ABNJ in 2018.

16. REVIEW OF THE DRAFT, AND ADOPTION OF THE REPORT OF THE 19TH SESSION OF THE SCIENTIFIC COMMITTEE

204. The SC **RECOMMENDED** that the Commission consider the consolidated set of recommendations arising from SC19, provided at Appendix XXXVII.

205. The SC **ADOPTED** the report of the 19th Session of the Scientific Committee (IOTC–2016–SC19–R) on 5 December 2016.

APPENDIX I
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APPENDIX II
AGENDA FOR THE 19TH SESSION OF THE SCIENTIFIC COMMITTEE

Date: 1–5 December 2016

Location: Seychelles

Venue: Eden Blue Hotel conference room, Eden Island

Time: 09:00 – 17:00 daily

Chair: Dr Hilario Murua (EU,Spain); **Vice-Chair:** Dr M. Shiham Adam (Maldives)

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 20th Session of the Commission,
   - 4.2 Previous decisions of the Commission
5. **SCIENCE RELATED ACTIVITES OF THE IOTC SECRETARIAT IN 2016** (IOTC Secretariat)
   - 5.1 Report of the Secretariat – Activities in support of the IOTC science process in 2016
6. **NATIONAL REPORTS FROM CPCs** (CPCs)
7. **REPORTS OF THE 2016 IOTC WORKING PARTY MEETINGS**
   - 7.1 IOTC–2016–WPNT06–R Report of the 6th Session of the Working Party on Neritic Tunas
   - 7.2 IOTC–2016–WPTmT06–R Report of the 6th Session of the Working Party on Temperate Tunas
   - 7.3 IOTC–2016–WPB14–R Report of the 14th Session of the Working Party on Billfish
   - 7.4 IOTC–2016–WPEB12–R Report of the 12th Session of the Working Party on Ecosystems and Bycatch
     - 7.4.1 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
     - 7.4.2 Review of mitigation measures contained in Resolution 13/06 for Oceanic whitetip shark
     - 7.4.3 Revision of mitigation measures contained in Resolution 12/06 for Seabirds
   - 7.5 IOTC–2016–WPTT18–R Report of the 18th Session of the Working Party on Tropical Tunas
   - 7.6 IOTC–2016–WPM07–R Report of the 7th Session of the Working Party on Methods
     - 7.6.1 Special session on Management Strategy Evaluation (MSE)
   - 7.7 IOTC–2016–WPDCS12–R Report of the 12th Session of the Working Party on Data Collection and Statistics
   - 7.8 Summary discussion of matters common to Working Parties (capacity building activities; connecting science and management, etc.)
     - 7.8.1 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)
    - 11.1 Consideration of Resolution 16/04 On implementation of a Pilot Project in view of promoting the Regional Observer Scheme of IOTC

11.1.1 Development of a proposal for a Pilot Project to be presented to the Commission 2017

11.1.2 Minimum Standards for the implementation of Electronic Monitoring Systems**.**

12 PROGRESS ON THE IMPLEMENTATION OF THE RECOMMENDATIONS OF THE PERFORMANCE REVIEW PANEL (IOTC Secretariat)

13 PROGRAM OF WORK AND SCHEDULE OF WORKING PARTY AND SCIENTIFIC COMMITTEE MEETINGS (IOTC Secretariat and Chairperson)

13.1 Program of Work (2017–2021) and assessment schedule

13.2 Schedule of meetings for 2017 and 2018

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

13.4 Consideration of Resolution 16/09 *On establishing a Technical Committee on Management Procedures (TCMP)*

14 IOTC SCIENTIFIC STRATEGIC RESEARCH PLAN (Chairperson)

15 OTHER BUSINESS (Chairperson)

15.1 Ecosystem Based Fisheries Management (EBFM) joint meeting of tRFMOs (Chairperson)

15.2 Management Strategy Evaluation joint tuna RFMO meeting (Chairperson)

16 REVIEW OF THE DRAFT, AND ADOPTION OF THE REPORT OF THE 19th SESSION OF THE SCIENTIFIC COMMITTEE (Chairperson)

APPENDIX III
LIST OF DOCUMENTS

Document	Title	Availability
IOTC–2016–SC19–01a	Draft: Agenda of the 19th Session of the Scientific Committee	✓ 10 October
IOTC–2016–SC19–01b	Draft: Annotated agenda of the 19th Session of the Scientific Committee	✓ 5 November ✓ 30 November
IOTC–2016–SC19–02	Draft: List of documents of the 19th Session of the Scientific Committee	✓ 5 November ✓ 30 November
IOTC–2016–SC19–03	Outcomes of the 20th Session of the Commission (IOTC Secretariat)	✓ 16 November
IOTC–2016–SC19–04	Previous decisions of the Commission (IOTC Secretariat)	✓ 21 November
IOTC–2016–SC19–05	Report of the Secretariat – Activities in support of the IOTC science process in 2016 (IOTC Secretariat)	✓ 16 November
IOTC–2016–SC19–06	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)	✓ 16 November
IOTC–2016–SC19–07	Update on the implementation of the regional observer scheme (IOTC Secretariat)	✓ 16 November
IOTC–2016–SC19–08 Rev_1	Update on progress regarding Resolution 09/01 – on the performance review follow–up (IOTC Secretariat)	✓ 16 November ✓ 21 November
IOTC–2016–SC19–09	Revision of the program of work (2016–2020) for the IOTC science process (IOTC Secretariat)	✓ 16 November
IOTC–2016–SC19–10	Proposed schedule of Working Party and Scientific Committee meetings for 2017 and 2018 (IOTC Secretariat)	✓ 16 November
IOTC–2016–SC19–11	An alternative solution to collect verified catch data and other scientific data related to the fishing operations carried out by the vessels less than 24m beyond Exclusive Economic Zone of Sri Lanka without observers on board (IOTC Resolution 11/04) (DFARD)	✓ 27 October
IOTC–2016–SC19–12	A Potential Indicator-based Ecosystem Report Card for the IOTC Convention Area (María José Juan Jordá, Hilario Murua and Haritz Arrizabalaga)	✓ 15 November
IOTC–2016–SC19–13 Rev_1	A review of seabird bycatch mitigation measures, including experimental work, within South Africa's tuna longline fishery (authors tbc)[UPDATE WITH AUTHORS]	✓ 22 November ✓ 24 November
IOTC–2016–SC19–14	Development of a pilot project for the ROS (IOTC Secretariat)	✓ 24 November
IOTC–2016–SC19–15	Minimum standards for the implementation of electronic monitoring systems for the tropical tuna purse seine fleet (Jon Ruiz, Iñigo Krug, Ana Justel-Rubio, Víctor Restrepo, Greg Hammann, Oscar Gonzalez, Gonzalo Legorburu, Pedro José Pascual Alayon, Pascal Bach, Paul Bannerman and Tomás Galán)	✓ 28 November
IOTC–2016–SC19–16	Proposal for the development of a Strategic Research Plan for the IOTC Scientific Committee (Chairperson)	✓ 30 November
Executive Summaries		
IOTC–2016–SC19–ES01	Status of the Indian Ocean Albacore (ALB: *Thunnus alalunga*) resource	✓ 25 November
IOTC–2016–SC19–ES02	Status of the Indian Ocean bigeye tuna (BET: *Thunnus obesus*) resource	✓ 25 November
IOTC–2016–SC19–ES03	Status of the Indian Ocean skipjack tuna (SKJ: *Katsuwonus pelamis*) resource	✓ 24 November
IOTC–2016–SC19–ES04	Status of the Indian Ocean yellowfin tuna (YFT: *Thunnus albacares*) resource	✓ 25 November

Document	Title	Availability
IOTC–2016–SC19–ES05	Report on biology, stock status and management of southern bluefin tuna: 2016 (from CCSBT)	✓ 25 November
IOTC–2016–SC19–ES06	Status of the Indian Ocean bullet tuna (BLT: *Auxis rochei*) resource	✓ 17 November
IOTC–2016–SC19–ES07	Status of the Indian Ocean frigate tuna (FRI: *Auxis thazard*) resource	✓ 17 November
IOTC–2016–SC19–ES08	Status of the Indian Ocean kawakawa (KAW: *Euthynnus affinis*) resource	✓ 21 November
IOTC–2016–SC19–ES09	Status of the Indian Ocean longtail tuna (LOT: *Thunnus tonggol*) resource	✓ 25 November
IOTC–2016–SC19–ES10	Status of the Indian Ocean Indo-Pacific king mackerel (GUT: *Scomberomorus guttatus*) resource	✓ 25 November
IOTC–2016–SC19–ES11	Status of the Indian Ocean narrow-barred Spanish mackerel (COM: *Scomberomorus commerson*) resource	✓ 25 November
IOTC–2016–SC19–ES12	Status of the Indian Ocean black marlin (BLM: *Makaira indica*) resource	✓ 23 November
IOTC–2016–SC19–ES13	Status of the Indian Ocean blue marlin (BUM: *Makaira nigricans*) resource	✓ 22 November
IOTC–2016–SC19–ES14	Status of the Indian Ocean striped marlin (MLS: *Tetrapturus audax*) resource	✓ 22 November
IOTC–2016–SC19–ES15	Status of the Indian Ocean Indo-Pacific sailfish (SFA: *Istiophorus platypterus*) resource	✓ 23 November
IOTC–2016–SC19–ES16	Status of the Indian Ocean swordfish (SWO: *Xiphias gladius*) resource	✓ 22 November
IOTC–2016–SC19–ES17	Status of the Indian Ocean blue shark (BSH: *Prionace glauca*)	✓ 23 November
IOTC–2016–SC19–ES18	Status of the Indian Ocean oceanic whitetip shark (OCS: *Carcharhinus longimanus*)	✓ 23 November
IOTC–2016–SC19–ES19	Status of the Indian Ocean scalloped hammerhead shark (SPL: *Sphyrna lewini*)	✓ 23 November
IOTC–2016–SC19–ES20	Status of the Indian Ocean shortfin mako shark (SMA: *Isurus oxyrinchus*)	✓ 23 November
IOTC–2016–SC19–ES21	Status of the Indian Ocean silky shark (FAL: *Carcharhinus falciformis*)	✓ 25 November
IOTC–2016–SC19–ES22	Status of the Indian Ocean bigeye thresher shark (BTH: *Alopias superciliosus*)	✓ 23 November
IOTC–2016–SC19–ES23	Status of the Indian Ocean pelagic thresher shark (PTH: *Alopias pelagicus*)	✓ 23 November
IOTC–2016–SC19–ES24	Status of marine turtles in the Indian Ocean	✓ 25 November
IOTC–2016–SC19–ES25	Status of seabirds in the Indian Ocean	✓ 25 November
Working Party Reports		
IOTC–2016–WPNT06–R	Report of the 6th Session of the Working Party on Neritic Tunas	✓ 28 October
IOTC–2016–WPTmT06–R	Report of the 6th Session of the Working Party on Temperate Tunas	✓ 28 October
IOTC–2016–WPB14–R	Report of the 14th Session of the Working Party on Billfish	✓ 7 November
IOTC–2016–WPEB12–R	Report of the 12th Session of the Working Party on Ecosystems and Bycatch	✓ 7 November
IOTC–2016–WPM07–R	Report of the 7th Session of the Working Party on Methods	✓ 22 November
IOTC–2016–WPDCS12–R	Report of the 12th Session of the Working Party on Data collection and Statistics	✓ 2 December
IOTC–2016–WPTT18–R	Report of the 18th Session of the Working Party on Tropical Tunas	✓ 23 November
National Reports		
IOTC–2016–SC19–NR01	Australia	✓ 2 November
IOTC–2016–SC19–NR02	Belize	

Document	Title	Availability
IOTC–2016–SC19–NR03	China	✓ 30 October
IOTC–2016–SC19–NR04	Comoros	✓ 17 November
IOTC–2016–SC19–NR05	Eritrea	
IOTC–2016–SC19–NR06	European Union	✓ 26 November ✓ 29 November
IOTC–2016–SC19–NR07	France (OT)	✓ 18 November
IOTC–2016–SC19–NR08	Guinea	
IOTC–2016–SC19–NR09	India	
IOTC–2016–SC19–NR10	Indonesia	✓ 14 November
IOTC–2016–SC19–NR11	Iran, Islamic Republic of	✓ 16 November
IOTC–2016–SC19–NR12	Japan	✓ 28 November
IOTC–2016–SC19–NR13	Kenya	✓ 18 October
IOTC–2016–SC19–NR14	Korea, Republic of	✓ 16 November
IOTC–2016–SC19–NR15	Madagascar	✓ 18 October
IOTC–2016–SC19–NR16	Malaysia	✓ 7 November
IOTC–2016–SC19–NR17	Maldives, Republic of	✓ 10 November ✓ 16 November
IOTC–2016–SC19–NR18	Mauritius	✓ 17 October
IOTC–2016–SC19–NR19	Mozambique	✓ 16 November
IOTC–2016–SC19–NR20	Oman, Sultanate of	
IOTC–2016–SC19–NR21	Pakistan	
IOTC–2016–SC19–NR22	Philippines	
IOTC–2016–SC19–NR23	Seychelles, Republic of	✓ 1 December
IOTC–2016–SC19–NR24	Sierra Leone	
IOTC–2016–SC19–NR25	Somalia	✓ 31 October
IOTC–2016–SC19–NR26	Sri Lanka	✓ 12 November
IOTC–2016–SC19–NR27	South Africa, Republic of	✓ 16 November
IOTC–2016–SC19–NR28	Sudan	
IOTC–2016–SC19–NR29	Tanzania	✓ 16 November
IOTC–2016–SC19–NR30	Thailand	✓ 1 November ✓ 24 November ✓ 26 November
IOTC–2016–SC19–NR31	United Kingdom (OT)	✓ 16 November
IOTC–2016–SC19–NR32	Yemen	
Cooperating Non-Contracting Parties		
IOTC–2016–SC19–NR33	Bangladesh	✓ 3 November
IOTC–2016–SC19–NR34	Djibouti	
IOTC–2016–SC19–NR35	Liberia	
IOTC–2016–SC19–NR36	Senegal	
Information papers		
IOTC–2016–SC19–INF01	Preliminary results of data mining for oceanic whitetip sharks with respect to IOTC Resolution 13/06 (J. Rice)	✓ 24 November
IOTC–2016–SC19–INF02	A review of the response to the seabird data call in IOTC circular 2016-043 (IOTC Secretariat)	✓ 30 November
IOTC–2016–SC19–INF03	First announcement and Call for papers: 7th International Symposium on GIS/Spatial Analyses in Fishery and Aquatic Sciences (International Fishery GIS Society)	✓ 15 November
IOTC–2016–SC19–INF04	Schedule of work for the development of management procedures for key species in the IOTC (A.Williams, J.Larcombe and H.M.Patterson)	✓ 22 November

Document	Title	Availability
IOTC–2016–SC19–INF05	IOTC Circular 2016-080: on a joint tRFMO working group on FADs	✓ 24 November
IOTC–2016–SC19–INF06	Announcement of a joint tRFMO meeting on Ecosystem Based Fisheries Management	✓ 24 November
IOTC–2016–SC19–INF07	Report of the Management Strategy Evaluation joint tRFMO meeting	

APPENDIX IVA
NATIONAL REPORT ABSTRACTS (2016)

Australia (IOTC-2016-SC19-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 2015, two Australian longliners from the Western Tuna and Billfish Fishery and five longliners from the Eastern Tuna and Billfish Fishery operated in the IOTC Area of Competence. They caught 19.3 t of albacore (*Thunnus alalunga*), 94.3 t of bigeye tuna (*Thunnus obesus*), 72.6 t of yellowfin tuna (*Thunnus albacares*), 200.6 t of swordfish (*Xiphius gladius*) and 1.5 t of striped marlin (*Tetrapturus audax*). These catches represent approximately 12 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 4789 t in 2015. There was no skipjack tuna (*Katsuwonus pelamis*) caught by purse seine fishing. In 2015, less than 1 t of shark was landed by the Australian longline fleet operating in the IOTC Area of Competence and 5553 sharks were discarded/released. In the 2015 calendar year, 7.1 per cent of hooks deployed in the WTBF were observed.

Belize (IOTC-2016-SC19-NR02)

National report not submitted.

China (IOTC-2016-SC19-NR03)

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 46 in 2015, while the number of ice-fresh longline vessels increased to 7. Chinese longline fleet caught 6522 MT of tropical tunas (BET and YFT) in 2015, which is higher than the catch in 2014(4940 MT). The albacore tuna catch in 2015 was 1843 MT, which is higher than the catch in 2014 (1430 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. One scientific observer was dispatched in 2015.

Comoros (IOTC-2016-SC19-NR04)

Fishing in the Comoros is exclusively artisanal, practiced on unbridged boats made of wood or fiberglass, motorized or non-motorized, of a length between 3 m and 9 m. It mainly exploits pelagic species (Thunnus albacares, Katsuwonus pelamis, Thunnus alalunga, Istiophorus platypterus, Thunnus obesus, Euthynnus affinis) and also benthic species. It contributes in its entirety to the Comorian population food security, while providing 55% of the total employment in the agricultural sector, i.e. about 7000 fishermen. The fishing techniques used are basically the troll line, the handline and small nets for the small pelagics. The duration of the trips ranges from one day to seven days. Since February 2011, Comoros has set up a data collection system at the landing sites. In 2016 we are introducing the use of smartphone for data collection. For 2015, the annual production estimated from this survey is 12,656 tonnes for all species combined, i.e. approximately 8,938 tonnes of tuna for a total of 5006 boats.

For the moment, industrial fishing is non-existent at the national level. This fishing activity is carried out by a foreign fleet which operates under a fishing agreement, but this fleet sends a copy of their logbook to Comoros. The catches of this fleet are neither landed nor transhipped in the country.

Eritrea (IOTC-2016-SC19-NR05)

National report not submitted.

European Union (IOTC-2016-SC19-NR06)

The European Union fleet frequenting the waters of the Indian Ocean is composed of two main segments.

The first is an offshore segment including

- purse seine fishing targeting all three species of tropical tunas
  - 2014 data:
    - 28 active vessels
    - 33,725 m^3.j of carrying capacity
    - 6,640 days of searching and 7,941 days of fishing
    - 192,160 metric tons of catches
      - YFT 48 %
      - SKJ 45 %
      - BET 7 %
  - 2015 data:
    - 30 vessels
    - 35,191 m^3.j of carrying capacity
    - 179,657 metric tons of catches
      - YFT 48 %
      - SKJ 43 %
      - BET 8 %
- longline fishing targeting swordfish with significant bycatch of some pelagic shark species
  - 2014 data
    - 30 active vessels
    - $7.665x10^6$ hooks set
    - 12,574 metric tons of catches
      - SWO 42 %
      - BSH 46 %
  - 2015 data
    - 26 active vessels
    - $6.312x10^6$ hooks set
    - 11,696 metric tons of catches
      - SWO 45 %
      - BSH 44 %
- longline fishing targeting swordfish with significant tuna bycatch.
  - 2014 data
    - 20 active vessels
    - $3.570x10^6$ hooks set
    - 2,028 metric tons of catches
      - SWO 39 %
      - YFT & BET 32%
      - ALB 15 %
  - 2015 data
    - 20 active vessels
    - $3.530x10^6$ hooks set
    - 1,812 metric tons of catches
      - SWO 38 %
      - YFT & BET 37%
      - ALB 15 %

The second is a coastal segment, consisting of ships less than 12 m using line fishing and capturing large pelagics and associated species, some using anchored fish aggregation devices as fishing aids around the two Outermost Regions Of the European Union in the Indian Ocean, Mayotte and the island of La Réunion. This coastal segment includes

- Longline fishing
  - 2014 data
    - 36 units in la Réunion
      - $0.281x10^6$ hooks
      - 175 metric tons of catches
    - 6 units in Mayotte
      - 150 trips
      - 94 metric tons of catches
  - 2015 data

        - 39 units in la Réunion
            - $0.663x10^6$ hooks
            - 428 metric tons of catches
        - 4 units in Mayotte
            - 60 trips
            - 26 metric tons of catches
- troll line or handline
    - 2014 data
        - 152 units in la Réunion
            - about 7,700 trips
            - 432 metric tons of catches
        - 150 yawls in the formal sector in Mayotte, 300 boats and 700 pirogues in the informal sector, estimated at 2,050 metric tons (2006 estimate)
    - 2015 data
        - 117 units in la Réunion
            - about 7,700 trips
            - 516 metric tons of catches
        - 150 yawls in the formal sector in Mayotte, 300 boats and 700 pirogues in the informal sector, estimated at 2,050 metric tons (2006 estimate)

The fishing capacity of the European Union fleet authorized to develop an activity in the fisheries targeting large pelagic species located in the IOTC Area is governed by provisions concerning the limits of capacity laid down in the IOTC Resolutions and by EU legislation.

In addition, the conditions for access to certain fishing areas in waters under the jurisdiction of coastal States in the southwest Indian Ocean are covered by specific provisions set out in public agreements involving the European Union called Sustainable Fisheries Partnership Agreements (SFPA).

In accordance with IOTC Resolution 10/02, Flag Member States (Spain, France, Italy, Portugal and the United Kingdom) submitted the scientific data characterizing the activity of the European Union fleet that exerted some fishing effort in 2014 and 2015 in the IOTC Area, enabling the IOTC Scientific Committee to conduct its work.

France-territories (IOTC-2016-SC19-NR07)

Since Mayotte's transition to the status of outermost region of the European Union as of January 1, 2014, tropical French overseas territories in the Indian Ocean are now limited to only Iles Eparses that are attached to the superior administration of the Terres Australes et Antarctiques françaises (TAAF). A marine park was created on February 22, 2012 (Decree No. 2012-245): it is the PNM des Glorieuses, which depends on Iles Eparses and extends over the whole EEZ of the Glorieuses.

Iles Eparses (France Territories) do not have any tuna fleet registered for this territory. Nevertheless, the TAAF administration issues fishing licenses to French and foreign longliners and purse seiners wishing to fish in the waters (EEZs) administered by France Territories, and an onboard observer program is a condition of the granting of these licenses. In 2015, the administration of the TAAFs carried out 568 on-board observations of which 414 sets were carried out. Of these sets, only 19 have been made in 2 EEZs of Iles Eparses : Juan de Nova (12 sets) and Les Glorieuses (7 sets). During these settlements 431 tonnes of tuna were caught and brought on board.

The current large-pelagic research framework of France (IRD & Ifremer mainly) covers observatory-type activities, study of the migratory behavior of large pelagics, genetic studies for stock delineation, studies on the reproductive biology, development of bycatch mitigation measures, and study of the tropical ecosystem dynamics. Most projects are financed through international, European or national tenders. The report contains a list of the various projects that have continued or have begun in 2015. Overall, France has participated actively in all the working parties organized by IOTC, notably by presenting 26 scientific contributions in 2015.

Guinea (IOTC-2016-SC19-NR08)

National report not submitted.

India (IOTC-2016-SC19-NR09)

National report not submitted.

Indonesia (IOTC-2016-SC19-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 2015[4] was estimated 135,799 tons which composed of yellowfin tuna (35,060 t), bigeye tuna (22,433 t), skipjack tuna (70,206 t) and albacore (8,080 t). Port sampling and scientific observer programs are still continuing and conducting by Research Institute for Tuna fisheries (RITF). Following the issuance of ministerial regulation No. 1/2013 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-2016-SC19-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 encompassing 140 thousand fishermen and 11300 fishing crafts consist of fishing boat, dhows and vessel which are engaged in fishing 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 2015 was 271000 Mt of which 232000 Mt belongs to tuna and tuna-like fishes in the Indian Ocean areas. Those catches consist of Big eye tuna 2444Mt,Yellowfin tuna 42599 Mt, Longtail tuna 59647Mt, Skipjack 38720Mt, Frigate tuna 10655Mt, Kawakawa 28392Mt, Indo-pacific king mackerel 7242Mt, Narrow- barred Spanish mackerel 22798Mt and Billfish 19531Mt. Ttotal catch for purse seine, Gillnet and trolling was estimated 5308 Mt, 241121Mt and 5122 Mt respectively. Gillnet with 95.9% of Catch is the dominant fishing gear followed by Purse seiners 2.1%, and around 2 % comes from Trolling vessels.

In this paper, the status of tuna resources in Iran, Fishing effort, Fleet composition, fishing methods, catch amount by species and gear, length frequency of the tuna and like-Tuna species, Ecosystem and bycatch issues, Observer program, VMS system and challenges we are facing to implement some resolutions and so on.

Japan (IOTC-2016-SC19-NR12)

This Japanese national report describes following 8 issues in recent five years (2011-2015), i.e., (1) tuna fisheries (longline fishery and purse seine fishery) (2) fleet information, (3) catch and effort by species and gear, (4) ecosystem and bycatch, (5) national data collection and processing systems including “logbook data collection and verification”, “vessel monitoring system”, “scientific observer program”, “port sampling program” and “unloading and transshipment”, (6) national research programs and (7) Implementation of Scientific Committee recommendations & resolutions of the IOTC relevant to the Scientific Committee and (8) working documents.

Kenya (IOTC-2016-SC19-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

[4] Current estimation from DGCF (unvalidated)

tuna fisheries were 322 tons, which is an increase from 193 tons recorded in 2014. Other important species landed which increased in catch were spanish mackerel with 249 tons up from the previous 127 tons. The slight decrease was noted in sailfish with landings of 162 tons down from the previous 176 tons. Catches for tuna are not identified to species groups though with the current sampling on-going, the reporting of catches at species level will be possible. The main target species from the recreational fisheries are marlins and 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.

Republic of Korea (IOTC-2016-SC19-NR14)

The number of active vessels in 2015 was 14 for longline fishery and 5 for purse seine fishery. With this fishing capacity, Korean tuna longline fishery caught 3,364 mt in 2015, which was 5% higher than that of 2014. The fishing efforts in 2015 were 7,365 thousand hooks and mainly distributed in the western Indian Ocean, while the fishing efforts averaged for 5 recent years (2011-2015) were 5,689 thousand hooks and distributed in the western tropical areas around 0-20°S as well as in the western and eastern areas around 20°S-40°S. In 2015, some vessels moved to the western tropical area between 5°N-5°S to fish for bigeye tuna and yellowfin tuna. As results, the catch of bigeye tuna increased, while the catch of albacore tuna decreased. Korean tuna purse seine fishery in the Indian Ocean recorded about 14,559 mt in 2015. In 2015, 5 vessels of Korean tuna purse seine fishery 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 2015 were 922 sets, which mainly distributed in the western and central tropical areas around 45°E-70°E. In 2015, 4 scientific observers for longline fishery and 1 scientific observer for purse seine fishery were dispatched onboard for implementing observer program and scientific data collection, which carried out 4.3% and 2.5% of observer coverage in terms of the number of hooks and sets, respectively.

Madagascar (IOTC-2016-SC19-NR15)

The national fleet targeting tuna and assimilated species consists of small longliners less than 24 m long. The number of vessels put at the disposal of this fishery has reached 8 in 2013, but since 2014 it has been reduced to 7. From 2010 to 2015, the techniques and methods remained the same. In general, vessels deploy between 800 and 1,300 hooks by set and carry out relatively short trips lasting from 4 to 7 days in order to keep catches fresh when arriving at the ports of unloading which are the port of Sainte Marie and the port of Toamasina. The fishing logbook collection and sampling program in the port of unloading was implemented towards the end of 2013 for Sainte Marie, hence the availability of catch and size data since 2014. In the case of Toamasina, the data collection unit has been only operational since August 2016.

In recent years, the tuna fishing effort (expressed in number of hooks set) by national vessels varied between 2010 and 2015. In addition, the annual variation in catches is slightly proportional to the variation in fishing effort.

Amongst longline catches, data from fishing logs and USTA samplings recorded catches of other pelagic fishes such as sailfish, marlins, swordfish, *dorades* and also sharks.

In terms of production, landings declared by fishing companies licensed for tuna and tuna-like species do not differ significantly from 2010 to 2015, as does the number of fishing vessels deployed.

Fishing vessels licensed for demersal fishes may also have accidental interactions with some species under IOTC mandate, including those referred to as neritic fishes. These fisheries are longliners, longline and multipurpose trawlers exploiting the benthic part of the West and East sides of the Exclusive Economic Zone of Madagascar.

In addition, since 2015, USTA has initiated monitoring of landings of pelagic fishes from traditional and artisanal fisheries in two pilot villages around the town of Diego-Suarez. Following this, a network of investigators scattered in 12 potential villages (2 regions) has been set up recently, since August 2016. A third data collection point will also start before the end of 2016 in order to cover all the northern part of the island. Data on this sector will be detailed at the next IOTC Working Parties in 2017.

Malaysia (IOTC-2016-SC19-NR16)

Total marine fish productions in Malaysia were not much different for 2014 and 2015, during which 1,440,109 metric tons and 1,486.051 metric tons were respectively landed. The large barge of the catches attributed by the coastal

fisheries, only 22% of the total marine landings contributed by the offshore fishing. Tuna fisheries is considered to be future contribution toward the increase in fisheries production as well as the main factor to accelerate and develop deep-sea fishing industries. The Malaysian government has taken steps to develop tuna fishing industries from coastal waters, offshore waters within the Exclusive Economic Zone (EEZ) and open sea especially in the Indian Ocean by joining as a member of the IOTC RFMO.

During early 1980s, small tuna (as neritic tuna were called then) were only caught as by-catch by gill nets and handlines. When tuna purse seines were introduced in 1987, the neritic tuna fisheries started to develop. High demands from processing and canning industries from Thailand have resulted the rapid increase in tuna catch in Malaysian waters (from the South China Sea and Malacca Straits). During the early stage of purse seine operations, the fishermen used to hunt wild tuna schools. When the FADs technology was introduced, FADs then were widely used by the purse seine operators. Currently, the purse seines are the major contributor (> 85%) to the neritic tunas landing

In Malaysia, main neritic tuna species are longtail tuna (*Thunnus tonggol*), kawakawa (*Euthynnus affinis*) and frigate tuna (*Auxis thazard* and bullet tuna (*Auxis rochei*). Overall, 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. In the year 2015, neritic tuna landings amounted to 54,901 mt; decreasing by 3% compared to 56,816 mt in 2014. Landings in Malaysia ranged from 40,000 mt to 65,000 mt. The highest catch was recorded in 2008 and 2002 with 65,000 mt and 62,000 mt respectively. There was a decreasing trend in landings from 2002 to 2005 before an increasing trend until 2008. Landings of neritic tune in Malaysia appear to have stabilised from 2010 to 2015.

The catch of oceanic tuna from the Indian Ocean in 2015 increased significantly by 419.43% from 851.35 tons in 2014 to 1,270.78 tons in 2015. Albacore showed most apparent increasing from 713.92 tons in 2014 to 1,049.1 tons in 2015. The fleet which only consisted of 5 fishing vessels and one carrier, unloaded and exported the catches at the Port Louis, Mauritius. Albacore tuna formed nearly 70% of the catches in the form of frozen tuna. On observer program, it will only be implemented accordingly when the size of Malaysian fleet increase to 20 units. However, for domestic vessels operating beyond 30 nm offshore, there are plan by the DoF to implement observer on board and logbook system by 2017. The revised NPOA- Sharks is already complete and gazetted and will be published in 2014. On sea turtle, 2 sanctuary and information centres have regularly implementing awareness program for student and fishermen communities. Hatching program at these centres managed to release over 65,000 baby turtles back to the sea. There are several research programs on sea turtle been carried out at different areas in Malaysian waters and the ongoing projects are c-hook and satellite tracking.

Maldives (IOTC-2016-SC19-NR17)

The Maldivian tuna fishery comprises of four main components; pole-and-line, handline, longline and troll line. The most important is still the traditional liveabait pole-and-line tuna fishery. 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 large yellowfin tuna (> 70 cm FL) from the surface (<10m). Following termination of joint venture licencing in 2010, a fully Maldivian-flagged longline fishery is now established. Troll 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 increase in 2015 relative to level of 2014. Recent catches have been of the order of 60,000 – 75,000 t, still much less than the catch recorded in 2006. Caches of yellowfin are increasing, due to the growing handline fishery. 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 52,400 t and about 69% of the catch is from handline fishery.

Maldives pole-and-line and handline tuna fishery have minimal impact on the ecosystem. Catch and interactions with Endangered, Threatened and Protected (ETP) species and other species of ecological importance is virtually non-existent. Sharks bycatch and turtles are reported from the longline fishery, which has strict measures to report and release those that are caught. In addition, measures to mitigate bird entanglement in the longline gear are mandated by law. Logbooks for all the tuna fisheries have provisions to report catch and interactions of ETP species. Marine Research Centre currently conducts scientific observations of fishing trips that allow verification of logbook reported data.

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 is now online to allow compilation and processing of catch and effort data. The web-enabled database is also used to record tuna purchases by the exporters. The database will also help maintain records of active fishing vessel and fishing licenses. Vessel monitoring system covers 100% of the longline vessels and trips and a number of PL and HL vessels. In addition, the observer data collected from pole-and-line and handline fisheries enable verification of fishermen reported data.

A number of research programs funded by the Government and NGOs are currently being implemented. The programs are geared towards improving national reporting and compliance to IOTC conservation and management measures and towards understanding and minimising impacts of fisheries on the ecosystem. Recently started activities are bycatch monitoring and collaborative work with ISSF and IRD (France) on biodegradable FADs and studies on association of tunas around anchored FADs.

Maldives's compliance are improving year by year; catch-and-effort data, size frequency and other biological and fishery data as required by relevant resolutions were submitted on time.

Mauritius (IOTC-2016-SC19-NR18)

There were seven purse seiners registered under the national flag in 2015. However, only four purse seiners were in operation during that year with a catch of 9670.9 tonnes of tuna comprising of yellowfin tuna as the predominant species (56.0%) followed by skipjack tuna (29.30%) and bigeye tuna (14.70%).The zones of operation of the purse seiners were spread between quadrant 1 (latitudes 0°-5N° and longitudes 48°E -67°E) and quadrant 2 (latitudes 0°-9 S° and longitudes 40°E -69°E) with a total deployment of 490 sets. 5 longliners undertook 23 trips in 2015 and their fishing operations extended from latitudes 15°S-20°S and longitudes 55°E -61°E. These vessels unloaded a total catch of 102.9 tonnes out of which 27.40 % and 12.91% was represented by yellowfin and bigeye respectively). The proportion of sharks in the total catch has been very low varying between 0.21% -1.26 % for the five year period. Only one species of shark namely the shortfin mako *(Isurus oxyrhinchus*) is obtained in this fishery. A total of 195850 hooks were deployed by the semi industrial longliners in 2015. Sampling exercises were undertaken on the catch unloaded by the foreign flagged and local flagged purse seiners and longliners. The fork lengths of a total of 1625 yellowfin, 2318 albacore, 618 bigeye and 613 skipjack tuna were measured. The operculum to keel length of 1007 swordfish was also measured. The observer programme was not implemented for the longliners as the latter are less than 24m and operate only inside the EEZ. However, a total of 3 observers were deployed on the purse seiners in 2015. The zone of operation of the longliners does not include area south of 25 degrees South latitude since it is restricted between latitude 15-20 and longitude 55-61; therefore the probability of encounter with seabirds is nil.

Mozambique (IOTC-2016-SC19-NR19 Rev_1)

This document represent an update of all related fishing activities in Mozambique for species under the IOTC mandate in order to comply with the IOTC rules of providing information whenever requested within the agreed procedures. The summary also, provides an update of ongoing actions across the country to ensure a long term sustainable exploitation management of species under the IOTC mandate.

Similar to previous years the tuna fishery in 2015 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 3,079 tons. The national industrial fleet for tuna in 2015 operated with a total of nine longline vessels, although some vessels exhibited low operationally. The total catch of this fleet was 270.5 tons. Compared with the previous year, which only two vessels operated in December producing only 7.5 tons, it can be stated that 2015 marked the establishment of a national industrial fleet for tuna in Mozambique.

The recreational and sport fisheries which also target on IOTC primary species show evidences of increasing impacts traduced on the rapid increase of number of licences in the last years. While fishing competitions events takes place episodically on predefined location and time sites, the recreational fishing occur routinely from different sites along the cost and data collection of this segment still very deficient.

The artisanal sector is the major and most complex fishing sector in Mozambique. Catches of IOTC species by this sector is relatively low when compared with small pelagic and demersal fishes catches. The estimated total catch of IOTC primary species by the artisanal coastal fisheries in 2015 was 4236 tons, a figure not different from 2014. However, due to lack of well trained personal and insufficient financing of the monitoring schemes in place (SNAPA), it is suspected that the real contribution and impacts of these fisheries on tuna species is currently poorly known.

Despite the above mentioned difficulties there is in place efforts to improve the quality of data collection and reporting to the IOTC for full compliance with the resolution 10/02.

In 2015, a pilot assessment of SNAPA, was conducted in two provinces (Cabo Delgado and Nampula) where comparatively with other coastal provinces, artisanal fisheries shows significant catches of tuna species and billfishes. Based on findings of this assessment, it was proposed recommendations and an action plan to improve the level of data collection and reporting according to IOTC Standards, on the view to expand the same initiative to other coastal provinces.

Furthermore, Mozambique started an internal reflection in regard to its institutional arrangement under the MIMAIP to better address the issues of fisheries statistics data. Within this process it was identified that the actual master plan of fisheries statistics needs to be revised and this task was planned to 2016.

Currently Mozambique is fully implementing the Vessel Monitoring Scheme – VMS to monitor all licensed tuna vessels (both national and foreign).

On Part State Measures, Mozambique is making efforts to follow all the steps required and has updated its inspection report form and advance request to enter into port – AREP which are being used during the pre-inspection of foreign tuna vessels.

The pre-fishing briefing for all licensed vessels is also one of the areas where Mozambique is keen to move to in order to help in combating IUU fishing in the region.

Finally, Mozambique is internally making efforts to improve monitoring and control of the tuna fisheries through internal initiatives involving different stakeholders (management, research and surveillance) and is willing to enhance dialog between them and operators.

Oman (IOTC-2016-SC19-NR20)

National report not submitted.

Pakistan (IOTC-2016-SC19-NR21)

National report not submitted.

Philippines (IOTC-2016-SC19-NR22)

National report not submitted.

Seychelles (IOTC-2016-SC19-NR23)

The Seychelles National Report summarizes activities of the Seychelles' fishing fleet targeting tuna and tuna-like species in the WIO for the year 2015 in comparison with previous years. It also summarizes research, and data collection related activities as well as actions undertaken in 2015 to implement Scientific Committee recommendations and IOTC Conservation and Management Measures.

The Seychelles purse seine fleet which increased from 8 vessels in 2011 to 13 vessels in 2015 .The number of supply vessels also increased from 6 to 7 vessels during the same period. The annual trend in fishing effort in term of fishing days has been on an overall downward trend over the 2011 to 2013 period, and has since then been on an increasing trend. In 2015 the nominal effort increased by 1,155 days (55%) when compared to the previous year.

The total annual catch reported by the purse seine fleet increased slightly by 47% from 60,225MT in 2014 to 88,740MT in 2015.This was achieved from a fishing effort of 3,264 fishing days thus giving a mean catch rate of 27.19MT/Fishing day .Skipjack was the dominant species caught, accounting for 48% of the total catch and yellowfin accounted for 44% of the total catch. Catches of skipjack tuna increased by 32% when compared to the previous year.

Seven more fishing vessels joined the Seychelles Industrial longline fleet in 2015 making a total of 45 vessels. The total catch reported by the industrial longline fleet for 2015 is estimated at 12,255 MT representing a 15% increase in catches with 3% increased in fishing effort when compared to 2014.

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 56% of the total catch.The estimated catch rate increase to 0.55 MT/1000 hooks in 2015.

The semi industrial longline fleet reported a total catch of 195MT in 2015, representing an increase of 137% over the 82 MT reported in 2014.The fishing effort also increase by 73% from 118,973 hooks set to 205,505 hooks. The catch

rate also increased from 0.69 MT/1000 hooks to 0.95 MT/1000 hooks .

SFA is implementing various actions to improve the quantity and quality of data collected from its fleet targeting tuna and tuna-like species in the Indian Ocean. Actions include improved logbook, review and upgrade of data collection, verification, validation and management system and implementation of National Scientific Observer Programme.

Somalia (IOTC-2016-SC19-NR24)

Somalia has the longest coastline in mainland Africa covering over 3,300 Km of which 2000 Km is facing the Indian Ocean. The fishery resources in Somali waters are said to be one of the richest in the African continent. Marine researches and a number of fishing expeditions carried out jointly with the Somali government and other international organisations in mid1970s revealed abundance of marine resources.

Large pelagic species including tuna and tuna-like species such as yellow fin, big-eye, skipjack, mackerel etc are the most highly priced species locally. Although they are highly migratory, the traditional fishing grounds for these

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species are found along the Indian Ocean from latitude 05 to 10 N due to upwelling that occurs twice annually in the period of southwest monsoons. It is also known that there are good fishing opportunities in the Gulf of Aden and Indian Ocean for tuna during the Southwest monsoon in the deeper waters.

The fishing seasons of Somali waters is governed by the monsoon winds that occur in the calendar year between May and September. In this period, high waves and strong winds compel small and medium size commercial boats not to call at Somali ports. In this period, coastal fishing of the artisanal fishery is limited but it does not have much effect on the industrial fishery as it is engaged mainly on larger fishing vessels. The fishing days of the artisanal fishery varies between 220 to 240 days per year while the offshore fishing vessels were forced to change their fishing ground, gear or target species.

During the last 25 years or so, civil war and anarchy caused the destruction of all fishery infrastructures through looting and vandalism. To revive the fishery sector, there is a need to rehabilitate the sector by providing inputs and capacity building to the coastal communities. The sector currently contributes 2% national economy (GNP) but if fully developed it would contribute much more than that.

Besides, there is no Monitoring, Control and Surveillance (MCS) of the marine resources and data collection system on marine products on both inshore and offshore fisheries. The sector has also experienced collapse of maritime and other technical educational institutes, hence, limiting attainment of knowledge to manage the activities in the fishing communities.

Sri Lanka (IOTC-2016-SC19-NR26)

The total production of tuna and tuna like species in Lanka in for year 2015 was 89,878t . The catch shows 14% decline than that of 2014. 78% of the catch was from EEZ and 22% was from the high seas. Skipjack tuna dominated the catch amounting to 45% (40,340t) while yellow fin tuna(28%) was the second most dominating species. The bigeye tuna catch was relatively low (3%). Bill fish were the second most group of fish which contributed 12% to the catch where sword fish was the dominating species. More than 25% drop in frigate tuna catch has been observed. The total shark catch was 1248t showing further decline than that of in 2014 and silky sharks are prominent in the catch. Over 4000 multi day boats were engaged in tuna fishing, of where 1388 boats were operated at high seas. 98% of the offshore and high seas operating multi day boats are in the length range of 10- 15m in length. Long line and the gill net are the major fishing gears used. 34% of High seas operating boats use only the long line while rest of the boats use Long line gillnet combination. 1538 numbers of high seas operating vessels were fitted with VMS as at October 2016. The catch data collection has been improved and the log books has already been made legally mandatory for all multiday boats. *The VMS data are being used to crosscheck the accuracy of data provided in the logbooks.* Capacity building program for enumerators and awareness for fishers to improve the data collection and reporting has been continuously carried out during the year 2015. All endangered shark species are protected under regulations and NPOA-Sharks is under implementation. It was impossible to *deploy observers on majority of the fleet due to the space constraints and safety.*

South Africa (IOTC-2016-SC19-NR27)

South Africa has two commercial fishing sectors which either target, or catch as bycatch, tuna and tuna-like species in the Indian Ocean – the Large Pelagic Longline and the Tuna Pole- line. The Tuna Pole-line sector, which operates mainly in the Atlantic Ocean from September – May each year, only occasionally crosses over into the Indian Ocean

in search of yellowfin tuna. In 2015, only three tuna pole-line vessels fished in the Indian Ocean and the majority targeted albacore (*Thunnus alalunga*) and yellowfin tuna (*Thunnus albacares*) available inshore in the Atlantic Ocean, or opted to target tunas on the high seas at Vema and Valdivia seamounts and in Namibia. The South African-flagged large 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. Despite an increase in catches for 2015, swordfish catches remained comparatively low in the South West 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. The 11.7% reduction in longline effort from 2014 to 2015 resulted in decreased catches of bigeye tuna (-24.5%), southern bluefin tuna (-30.1%), albacore (-34.4%) and skipjack (-62.5%). Both albacore and skipjack are considered bycatch in the longline sector. In contrast, yellowfin tuna and swordfish catches increased by 10.2% and 19.4%, respectively. Blue shark (*Prionace glauca)* and shortfin mako (*Isurus oxyrinchus*) shark catches increased in 2015 by 25.3% and 16.6% respectively. Research into the stock origin and intermixing of tuna, swordfish and large pelagic shark populations at the boundary between the Atlantic and Indian Oceans is a priority in South Africa.

Sudan (IOTC-2016-SC19-NR28)

National report not submitted.

Tanzania (IOTC-2016-SC19-NR29)

Tanzania national fleets are dominated by artisanal fleets which are characterized by multi-species catch which involve the use of multi-gear and multi-cultural fisheries. However, a small number of boats are involved in the fisheries of tuna, bill fish and sharks, using manually handled small-scale drift gillnets, trolling and longlines. 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 the IOTC area of competence.

Artisanal fishery statistics from the Fisheries Division (mainland Tanzania only) for the year 2015 shows that 5410.2, 2226.3 and 6459.6 tonnes of tuna and tuna-like species, kingfish and sharks and rays were caught respectively. Available catch data from artisanal fishery is missing for geographic position, gear and effort information. Total catch for tuna and tuna-like species for long-liners flagged vessels operating in the IOTC area of competence was about 698.4 tonnes. 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 in 2009.

There is still no data recorded from recreational fishing, however, available information is considered to be insignificant. There has been neither Observer nor Port sampling programmes but efforts are now underway to enable Tanzania to have facilities for handling commercial deep sea fishing vessels. Transhipment at sea is not allowed within the EEZ of Tanzania. 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-2016-SC19-NR30)

Neritic tuna in the Andaman Sea, Thailand comprise 5 species in 2014. Neritic tuna consists of longtail tuna (*Thunnus tonggol*), kawakawa (*Euthynnus affinis*) and frigate tuna (*Auxis thazard)* and bullet tuna (*Auxis rochei*) and skipjack tuna*(Katsuwonus pelamis)*. These species were caught from purse seine. The major species caught were kawakawa, bullet tuna, Longtail tuna, frigate tuna and skipjack tuna which 86.11 , 52.85 , 37.93 , 34.78 and 5.28 tonnes respectively.

During 2011-2015, Six Thai tuna longliners operated in the Western coast of the Indian Ocean. Their declared logbook to Department of Fisheries, Thailand. Data from logbook displayed important information of their fishing operation and effort. Then summarized and calculated the hook rate in Catch Per Unit Effort. fishing operations were recorded 2,070 fishing days. The highest total catch was in 2015 with 599.72 tonnes followed by 2014, 2012, 2011 and 2013 respectively (571.90, 470.40, 373.44 and 307.74 tonnes). The highest CPUE was found in 2014 with 13.68 fish/1,000 hooks followed by 2015 and 2012, respectively (12.38 and 10.83 fish/1,000 hooks).

The major species caught during 5 years were tuna group, billfish group, shark group and other species group which 1,856.65, 295.31, 138.55 and 32.71 tonnes, respectively. The average percentage composition by weight of tuna group, billfish group, shark group and other species group which 79.92%, 12.71%, 5.96% and 1.41%, respectively.

The CPUE have ranged between 9.13 and 13.28 fish/1,000 hooks, and the average CPUE was 11.39 fish/1,000 hooks. The lowest CPUE was in 2011, and the highest CPUE was in 2014. In 2015, bigeye tuna and yellowfin tuna were 33.44% and 18.25% by weight of the total catch composition.

Foreign tuna fleets unloading in Phuket, fishing effort increased steadily from 187 trips in 1995 to the peak in1999, after that trend was continuously decreased into 241 trips in 2014 and 139 trips in 2015. In 2015, annual catches were estimated 13,768.97 tonnes. The main species composition were tuna group, billfish group and other species group which 10,526.40, 2,728.35 and 514.22 tonnes. The average percentage composition by weight of tuna group, billfish group and other species group which 76.45 %, 19.82 % and 3.73 %, respectively. From January – June in 2016, The whole figure of total landing catch was 4,359.69 tons. The main species composition were yellowfin tuna, bigeye tuna, albacore tuna, other species (Sharks, *Lepidocybium spp., Coryphaena spp., Molar spp., Ruretlus pretiosus, Sphyraena spp.* and *Taractichtis spp.)* and bill fish *(Makaira spp., Tetrapturus spp, Istiophorus spp.)*

United Kingdom(OT) (IOTC-2016-SC19-NR31)

UK (BIOT) 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 (BIOT) does not operate a flag registry and has no commercial tuna fleet or fishing port. The United Kingdom (BIOT) National Report summarises fishing in its recreational fishery in 2015 and provides details of research activities undertaken to date within the MPA against its Interim Conservation Management Framework.

The recreational fishery landed 12.35 tonnes of tuna and tuna like species on Diego Garcia in 2015. Principle target tuna species of the industrial fisheries (yellowfin, bigeye and skipjack tunas) contributed 17% of the total catch of tuna and tuna like species of the recreational fishery. Recognising that yellowfin tuna are currently overfished and subject to overfishing in the Indian Ocean and that Resolution 16/01 seeks to address this, UK(BIOT) will require the live-release of all yellowfin tuna caught in the recreational fishery. It is anticipated that this will be effective from 2017. Length frequency data were recorded for a sample of 165 yellowfin tuna from this fishery. The mean length was 70cm. Sharks caught in the recreational fishery are released alive.

IUU fishing remains one of the greatest threats to the BIOT ecosystem but a range of other threats exist including invasive and pest species, climate change, coastal change, disease, and pollution. During 2016 the BIOT Environment Officer continued to take forward the BIOT Interim Conservation Management Framework and progress to date is presented. In 2016 Recommendations of the Scientific Committee and those translated into Resolutions of the Commission have been implemented as appropriate by the BIOT Authorities and are reported.

Yemen (IOTC-2016-SC19-NR32)

National report not submitted.

Bangladesh (IOTC-2016-SC19-NR33)

Bangladesh is favoured by large coastal and marine water resources with highly productive ecosystem of the world due to her geographical apposition and prevailing climatic factors. Bangladesh is enriched not only in terms of its water areas but also with rich biological diversity including 475 fish and 36 shrimp species. One of the unique features of the coastal areas is the influence of the mangrove forests, which support a high number of fishes and other commercially important aquatic organisms. The biological and ecological values of the Bay of Bengal have been pointed out by many authors. The coastal and marine fisheries have been playing significant roles not only in the social and economic development of the country but also in the regional ecological balance. A large number of commercially important fishes have long been exploited which are of high export values and also consumed as delicacy in their diets. Tuna and tuna like other highly migratory species have become high pace in the priority list to the government of Bangladesh for a couple of years especially after demarcated sea boundary with the neighbour that lead to the access of Bangladeshi fishers to the Area Beyond National Jurisdiction (ABNJ) of high seas. Simultaneously, tuna and tuna like fishes of Bangladesh marine waters are not adequately assessed and studied its potentiality. Yet no tune long liner been introduced despite of its high potential to supplement superior protein and export market. Proper attention is needed in every aspect of exploitation, handling and processing, export and marketing as well as in biological and institutional management strategies. Basically, there is no specific tuna fishery in Bangladesh. Tuna are by catch of industrial trawlers and artisanal gill netters. In quantity, tuna comprises about 2% of the industrial catch and 11% of catch comprised small mackerel in the year 2015-16. The coastal and marine fisheries of Bangladesh are briefly reviewed in this report to provide a salient feature of the available information of

marine fisheries with a view to identify sustainable conservation and management of the resources.

Djibouti (IOTC-2016-SC19-NR34)

National report not submitted.

Liberia (IOTC-2016-SC19-NR35)

National report not submitted.

Senegal (IOTC-2016-SC19-NR36)

National report not submitted.

APPENDIX IVB

Agenda Item 2: Adoption of the Agenda and Arrangements for the Session

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

"The Government of the Republic of Mauritius reiterates that the Chagos Archipelago, including Diego Garcia, and the Island of Tromelin form an integral part of the territory of the Republic of Mauritius.

The Government of the Republic of Mauritius reaffirms that it does not recognize the so-called "British Indian Ocean Territory" which the United Kingdom purported to create by illegally excising the Chagos Archipelago from the territory of Mauritius prior to its accession to independence, 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 further reiterates 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.

Moreover, the Government of the Republic of Mauritius reaffirms that it does not recognize the validity of the inclusion of the Island of Tromelin in the French Southern and Antarctic Lands (TAAF) or the Scattered Islands/Iles Eparses.

The Government of the Republic of Mauritius strongly objects to the use of terms such as "United Kingdom (OT)", "UK (OT)" and "UK (territories) in documents which have been circulated for this meeting, in so far as these terms purport to refer to the Chagos Archipelago as a British territory or to imply that the United Kingdom or the so-called "BIOT" is entitled to be a member of the IOTC.

The Government of the Republic of Mauritius also objects to the use of terms such as "France (OT)" and "France (territories)" in the documents which have been circulated for this meeting, in so far as these terms purport to refer to the Island of Tromelin as a French territory.

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. 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.

In the light of the foregoing, the delegation of the Republic of Mauritius has no objection to the adoption of the draft agenda, subject to:

(a) there being no discussions at this meeting on the 'MPA' purportedly established by the United Kingdom around the Chagos Archipelago which has been held to be illegal under international law; and

(b) the Republic of Mauritius reserving its right to object to the consideration of any documents purportedly submitted by the United Kingdom, including in respect of the so-called "BIOT" which is not recognized by the Government of the Republic of Mauritius, and any other documents submitted by the Secretariat or any other party in relation to the so-called "BIOT".

Should any document which purports to refer to the Chagos Archipelago as the so-called "BIOT" or as a British territory be considered, such consideration as well as any action or decision that may be taken on the basis of any such document cannot and should not be construed in any way whatsoever as implying that the United Kingdom has sovereignty or analogous rights over the Chagos Archipelago or that the United Kingdom or the so-called "BIOT" is entitled to be a member of the IOTC.

Further, any consideration of any document which purports to use terms such as "France (OT)" and "France (territories)" as well as any action or decision that may be taken on the basis of any such document, cannot and should not be construed in any way whatsoever as implying that the Island of Tromelin is part of the French Southern and Antarctic Lands (TAAF) or the Scattered Islands/Iles Eparses or is a French territory.

The Republic of Mauritius also reserves all its rights under international law, including under Article XXIII of the Agreement for the Establishment of the Indian Ocean Tuna Commission.

This statement is applicable to all Agenda items where cross-reference is being made to the "so called BIOT" and Tromelin by the delegates from "UK" and France during the tenure of the Scientific Committee Meeting (1-5 December 2016)."

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

"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.

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

The SC **NOTED** the following statement made by the United Kindgom (Overseas Territories):

"The Government of the United Kingdom has no doubt about its sovereignty of the Chagos Archipelago, which it administers as the British Indian Ocean Territory. Whilst the United Kingdom does not recognise the Republic of Mauritius' claim to sovereignty of that Territory, it has given, and continues to give, repeated undertakings to cede it to Mauritius, when no longer required for defence purposes. These defence purposes contribute significantly towards global security, and are central to efforts at countering regional threats, including those from terrorism and piracy.

The UK strongly refutes Mauritius' claim that the Chagos Archipelago is part of Mauritius. No international tribunal, including the March 2015 United Nations Convention on the Law of the Sea (UNCLOS) as hoc arbitral tribunal, has ever called our sovereignty into doubt.

In respect to membership of IOTC, the Agreement for the Establishment of the Indian Ocean Tuna Commission provides that IOTC membership shall be open, inter alia, to FAO members that are situated wholly or partly within the IOTC's Area of Competence. The British Indian Ocean Territory is situated wholly within the IOTC's Area of Competence, and there can therefore be no doubt that the United Kingdom, as the State with sovereignty over BIOT as shown by what is said above, is thereby entitled to be a member of IOTC.

Regarding the Marine Protected Area, the UNCLOS Tribunal was clear that it took no view on the substantive quality or nature of the MPA. It's concern was confined to the manner in which it was established. The Tribunal found that the UK needed to have further consultation with Mauritius about the establishment of the MPA in order to have due regard to its rights and interests. We have begun implementation of the Tribunal's Award with a series of bilateral talks, the latest of which took place in August.

The BIOT Marine Protected Area (MPA), which the UK declared in 2010, is highly valued by scientists from many countries. They consider it a global reference site for marine conservation in an ocean which is heavily overfished.

Like France, the United Kingdom regrets the continued use of this important multilateral forum by the Republic of Mauritius to address a bilateral matter, which only serves to distract from the important work of IOTC members towards Conservation and Management of resources in the IOTC Area and other matters considered by this Committee."

The SC **NOTED** the following statement made by the Republic of Mauritius in response to UK's and France's Exercise of Right of Reply (2nd statement):

"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 and that it does not recognize the validity of the inclusion of the Island of Tromelin in the French Southern and Antarctic Lands (TAAF) or the Scattered Islands/Iles Eparses. The Government of the Republic of Mauritius reaffirms that it has full and complete sovereignty over the Island of Tromelin, including its maritime zones.

Since the United Kingdom and France purport to assert under the Agreement for the Establishment of the Indian Ocean Tuna Commission and in this multilateral forum rights which they does not have over the Chagos Archipelago and the Island of Tromelin respectively, the Republic of Mauritius considers that it is entitled to raise issues relating to the Chagos Archipelago and the Island of Tromelin in this forum. These are no doubt multilateral and not bilateral matters. All the more so that item 87 of the agenda of the current session of the United Nations General Assembly relates to the Chagos Archipelago."

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: 2016

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		–		–			**Sharks:** Development has not begun. **Seabirds:** Development has not begun. **Marine turtles:** No information received by the Secretariat.
–Taiwan,China		1st: May 2006 2nd: May 2012		1st: May 2006 2nd: Jul 2014			**Sharks:** No revision currently planned. **Seabirds:** No revision currently planned. **Marine turtles:** Wildlife Protection Act introduced in 2013, Protected Wildlife shall not be disturbed, abused, hunted, killed, traded, exhibited, displayed, owned, imported, exported, raised or bred, unless under special circumstances recognized in this or related legislation. *Cheloniidae spp*., *Caretta Caretta*, *Chelonia mydas*, *Eretmochelys imbricate*, *Lepidochelys olivacea* and *Dermochelys coriacea* are listed into List of Protected Species. Domestic Fisheries Management Regulation on Far Sea Fisheries request all fishing vessels have to carry line cutters ,de-hookers and hauling net in order to facilitate the appropriate handling and prompt release of marine turtles caught or entangled.
Comoros		–		–			**Sharks:** Shark fishing is prohibited **Seabirds:** There is no fleet in operation south of 25 degrees south. **Marine turtles:** According to the Comoros Fisheries Code Article 78, fishing, capture, possession and marketing of turtle and marine mammals or of protected aquatic organisms is strictly forbidden in accordance with national legislation in force and International Conventions applicable to the Comoros.
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		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:** 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:** Indonesia has established an NPOA for sharks and rays in 2015-2019 **Seabirds:** An NPOA was finalized in 2016 **Marine turtles:** Indonesia has established an NPOA for Marine Turtle but does not fully conform with FAO guidelines, Indonesia had been implementing Ministerial Regulation 12/2012 regarding captured fishing business on high seas to reduce turtle bycatch.
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:** All Japanese fleets fully implement Resolution 12/04.
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. Preliminary meetings have been held and there are plans to finalise the NPOA by 2017. **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		2014 – domestic fisheries		–	**Sharks:** Currently being implemented. **Seabirds:** This has already been applied in domestic fisheries and there are plans to submit an IPOA-seabirds to FAO by the end of 2016. **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:** There is zero capture of marine turtle within the logbook. All the longliners use the circular hooks since. Declaration confirmed by the onboard observers and the on-landing samplers.
Malaysia		2008 2014		–		2008	**Sharks:** A revised NPOA-sharks was published in 2014. **Seabirds:** To be developed **Marine turtles:** A NPOA For Conservation and Management of Sea Turtles had been published in 2008. A revision will be published in 2017.
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		2016					**Sharks:** The NPOA-sharks has been finalised; it focuses on actions needed to exercise influence on foreign fishing through the IOTC process and licence conditions, as well as improving the national legislation and the skills and data handling systems available for managing 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:** 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 the NPOA-Shark started in 2016. At this stage, a baseline assessment was performed and the relevant information of coastal, pelagic and demersal shark species along the Mozambican coast was gathered. The ongoing process is expected to be completed by the end of 2017. **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:** An NPOA-sharks is currently being drafted and is due to be finalized in 2017 **Seabirds:** Not yet initiated **Marine turtles:** The law does not allow the catch of sea turtles, and the fishermen are requested to release any hooked or entangled turtle. The longline fleet are required to carry out the line cutters and de-hookers.
Pakistan							**Sharks:** Sharks are landed with the fins attached and each and every part of the body of sharks are utilised. A stakeholder consultation workshop was conducted from 28-30 March 2016 to review the actions of the draft NPOA - Sharks. The draft NPOA was circulated to the key stakeholders and comments were received with an end-date of 30 June 2016. The final version of the NPOA - Sharks has been submitted to the provincial fisheries departments for endorsement. Meanwhile, the provincial fisheries departments have passed notification on catch, trade and/or retention of sharks including Thresher sharks, hammerheads, oceanic whitetip, whale sharks, guitarfishes, sawfishes, wedgefishes and mobulids. **Seabirds:** Pakistan considers that seabird interactions are not a problem for the Pakistani fishing fleet as the 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. **Marine turtles:** No information received by the Secretariat.
Seychelles, Republic of		Apr-2007		–			**Sharks:** NPOA-sharks has been reviewed and a new NPOA has now been

							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 plans 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:** The Somali national fisheries law and legislation was reviewed and approved in 2014. This incudes Articles on the protection of marine turtles. Further review of the National Law is underway to harmonize this with IOTC Resolutions and is expected to be presented to the new parliament for endorsement in 2017.
South Africa, Republic of		–		2008			**Sharks**: The NPOA-sharks was approved and published in 2013. **Seabirds**: Published in August 2008 and fully implemented. The NPOA-seabirds has been earmarked for review. **Marine turtles**: The permit conditions for the longline fishery prohibits landing of turtles. Vessels have to carry a de-hooker on board and instructions on turtle handling and release in line with the FAO guidelines are included in the permit conditions. Trained observers are present on 100% of the trips of foreign vessels that fish under South African jurisdiction and all turtle interactions on these trips are recorded. Since 2013 recording of turtle interactions in the log books is mandatory and each vessel is provided with a species identification guide.
Sri Lanka							**Sharks:** An NPOA-sharks has been finalized and is currently being implemented. **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:** Implementation of the FAO Guideline to Reduce Sea Turtle Mortality in Fishing Operation in 2015 was submitted to IOTC in January 2016. Marine turtles are legally protected in Sri Lanka. Longliner vessels are required to have dehookers for removal of hooks and a line cutter on board, to release the caught marine turtles. Gillnets longer than 2.5 km are now prohibited in domestic legislation. Reporting of bycatch has made legally mandatory and facilitated via logbooks.
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: Sea turtles are protected by law. However as there is a national turtle and Dugong conservation committee that oversee all issues related to sea turtles and dugongs. There is no information so far with regards to interaction between sea turtles and long line fishery.
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).
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.

Colour key	
Completed	
Drafting being finalised	
Drafting commenced	
Not begun	

APPENDIX VIA
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	Arithmetic 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}	Arithmetic mean over years
Mean fishing mortality relative to target	F/F_{targ}	Arithmetic mean over years
Mean fishing mortality relative to F_{MSY}	F/F_{MSY}	Arithmetic 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: m*aximize 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	Arithmetic mean over years
Stability: maximise stability in catches to reduce commercial uncertainty		

Candidate performance statistics	*Performance measure/s*	*Summary statistic*
Mean absolute proportional change in catch	C	Mean over years of absolute (C_t / C_{t-1})
Variance in catch	C	CV 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 VIB
PROPOSED STANDARDISED METHODS FOR THE PRESENTATION OF MSE RESULTS

Proposed standardised methods for the presentation of MSE results

Introduction

The Indian Ocean Tuna Commission (IOTC) management strategy evaluation (MSE) work program was initiated following adoption of the proposal to implement the precautionary approach for managing IOTC species in 2012 (Resolution 12/01). From this Resolution, the IOTC Scientific Committee (SC) was instructed to assess the performance of candidate management procedures (MP) through MSE, and provide the Commission with advice on their performance against Commission objectives. The IOTC Working Party on Methods (WPM) leads the technical development of MSEs for key IOTC species.

Effective and consistent communication of MSE results is important to ensure that decision makers are clearly informed about the likely consequences of implementing different MPs or harvest control rules (HCR). The use of standardised terminology and presentation formats for MSE results would facilitate a better understanding and maximise the engagement of all partners in the MP dialogue. This proposal outlines some guidelines for standardising the communication of MSE results to the Technical Committee on Management Procedures (TCMP) and Commission.
Proposal for presenting MSE results

It is important that decision makers are presented with a selection of candidate MPs (or HCRs) from which to evaluate the relative performance against the Commission objectives. However, consideration needs to be given to limit the number of MPs (or HCRs) and performance measures that are presented to avoid saturation and confusion. As a guide, a maximum of 6 candidate MPs (or HCRs) and 6 performance measures would seem to allow sufficient coverage of the range of potential MPs of interest whilst limiting the amount of information to communicate.

The key elements of the presentation material are as follows:
Illustrate the MPs that have been evaluated in a figure and/or briefly define them in text.
Present the results for the performance of each MP in:
Boxplots for a representative subset of performance measures
A summary table that ranks the performance of each MP against a subset of performance measures
Trade-off plots for a representative subset of performance measures
A Kobe plot for the B/BMSY and F/FMSY performance measures
Time series plots for stock size and fishing intensity performance measures.
Provide a clear and succinct summary of the performance of each MP.
Provide the numerical results for each MP across all 16 performance measures endorsed by the SC in a table in an appendix.

Illustrate the Management Procedures
It will be important that decision makers have a clear understanding of the MPs (or HCRs) that have been evaluated. To achieve this, a clear description of each MP (or HCR) should be presented prior to the MSE results, along with an explanation of the relevant decision steps involved. Example figures are illustrated in Figures 1 and 2.

Performance of Management Procedures
Boxplots
The key plots for communicating MSE results should clearly indicate the relative performance of each MP (or HCR) against a representative subset of performance measures from the categories of status, safety, yield, abundance and stability. These plots should clearly indicate the uncertainties in the MSE

using error bars to represent percentiles. Example boxplots are illustrated in Figure 3. The summary period(s) which were used to generate the results should be clearly indicated.

Summary table

A summary table that ranks the performance of each MP against the key performance measures is shown in Table 1. The numbers in the table indicate the performance of each MP while the colours represent the relative ranking.

Trade-off plots

Trade-off plots provide useful information for evaluating the trade-off between different performance measures, particularly between yield (catch) and other performance measures. Example trade-off plots are illustrated in Figure 4. The summary period(s) which were used to generate the results should be clearly indicated.

Kobe plot

An example Kobe plot indicating the performance of MPs is illustrated in Figure 5. Consistent with the adopted guidelines for presenting stock assessment results, the Kobe plot indicates target and limit reference points. The summary period(s) which were used to generate the results should be clearly indicated.

Time series plots

Example time series plots are illustrated in Figure 6 for the stock size performance measure and in Figure 7 for the fishing intensity performance measure. Time series plots for additional performance measures may also be relevant. The key elements depicted in these figures are the median of all runs and the 75th and 90th percentiles and the target and limit reference points. A sample of individual realizations should be included in the projections to illustrate the typically erratic nature of individual trajectories.

Summary performance of Management Procedures and management advice

To assist with decisions on adopting candidate MPs, the Commission will require some guidance on the performance of each candidate MP, in addition to the figures and tables provided. A clear and succinct summary statement comparing the relative performance of each MP against the performance measures would allow the Commission to evaluate the trade-offs among alternative MPs when making such decisions.

The following statement provides an example summary of the performance for a hypothetical MP. MP1 performed very well for maintaining high catches, and performed average for maintaining low catch variability. However, MP1 performed very poorly at maintaining biomass and fishing mortality away from limit reference points and close to target reference points. There is a 20% risk that MP1 will cause the spawning biomass to fall below the limit reference point and a 50% risk that MP1 will cause the fishing mortality to exceed the limit reference point over the next 20 years.

Full set of results for each Management Procedure

While the main presentation of MSE results should focus on a selection of key performance measures summarised for a single time period, it is possible that the Commission will have interest in seeing the results for other performance measures or the same performance measures for a different summary time period. Therefore, the numerical results for each MP across all 16 performance measures and for the different time periods evaluated should be provided for reference in a table in an appendix, but not reported or presented in the main results. Table 2 provides an example table of MSE outputs comparing the performance of 6 MPs against all IOTC performance measures for 4 time periods (1, 5, 10, and 20 years). Additional information, such as percentiles ranges, could be added in parentheses for each value.

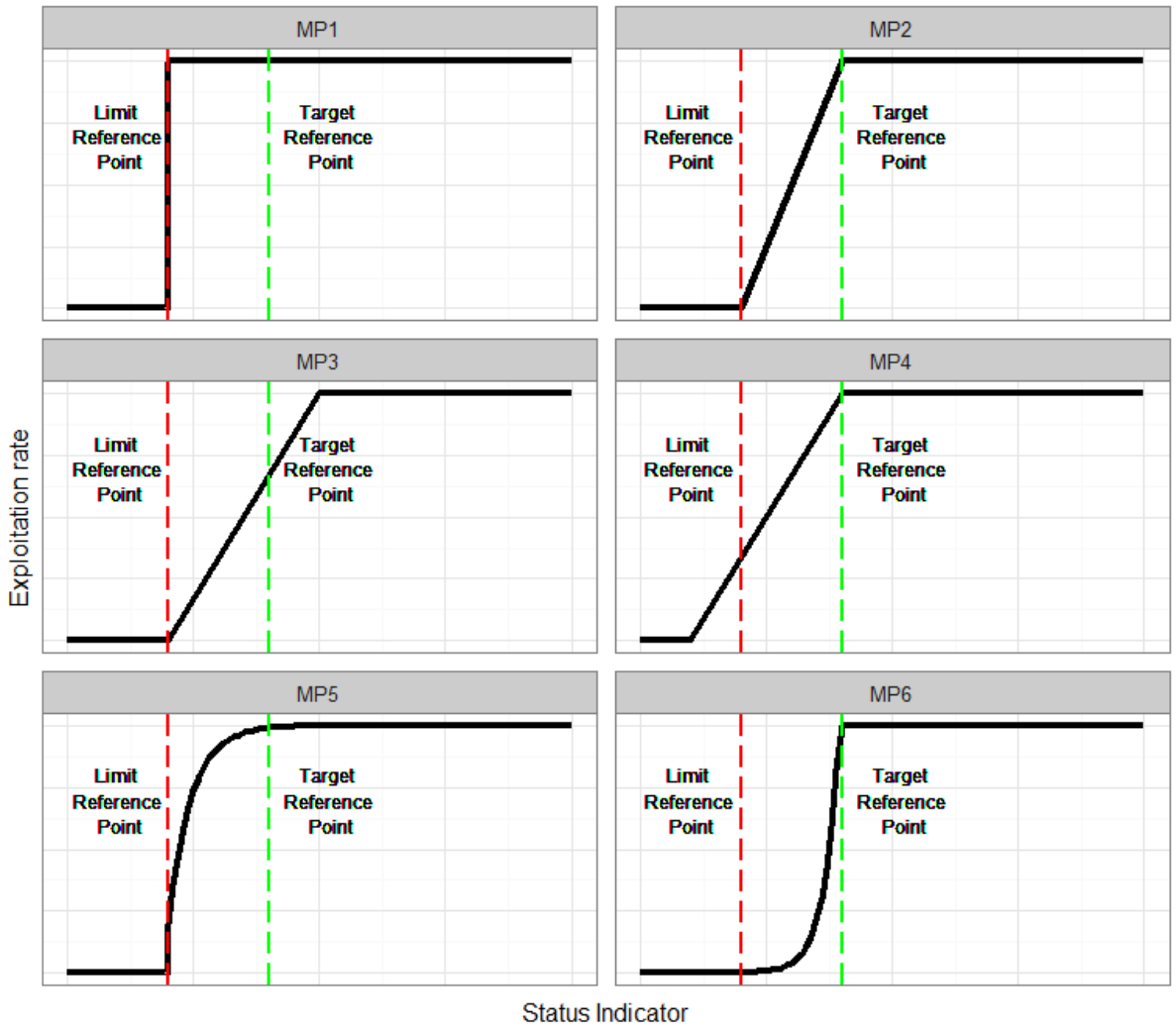


Figure 1. Illustration of six hypothetical example management procedures (MPs) relating the recommended exploitation rate to status indicator. The limit and target reference points are indicated by red and green dashed lines respectively.

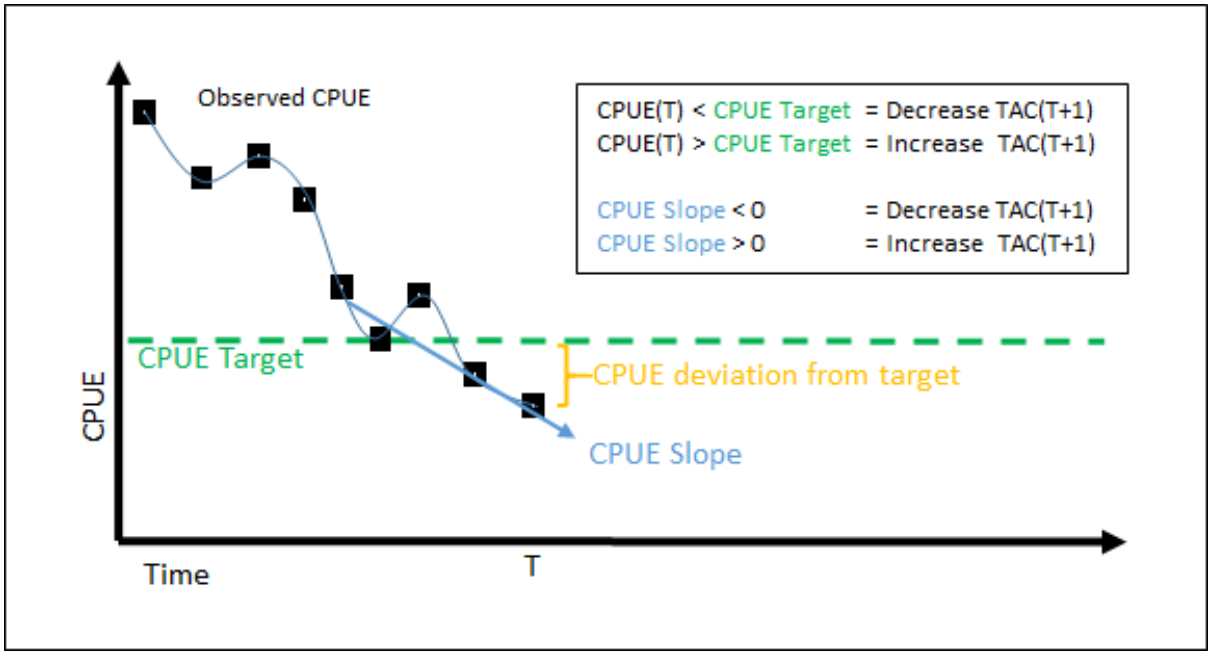


Figure 2. Illustration of an example catch per unit effort (CPUE) management procedure (MP) relating changes in the recommended TAC to changes in the CPUE over time. The target CPUE reference point are indicated by the green dashed line.

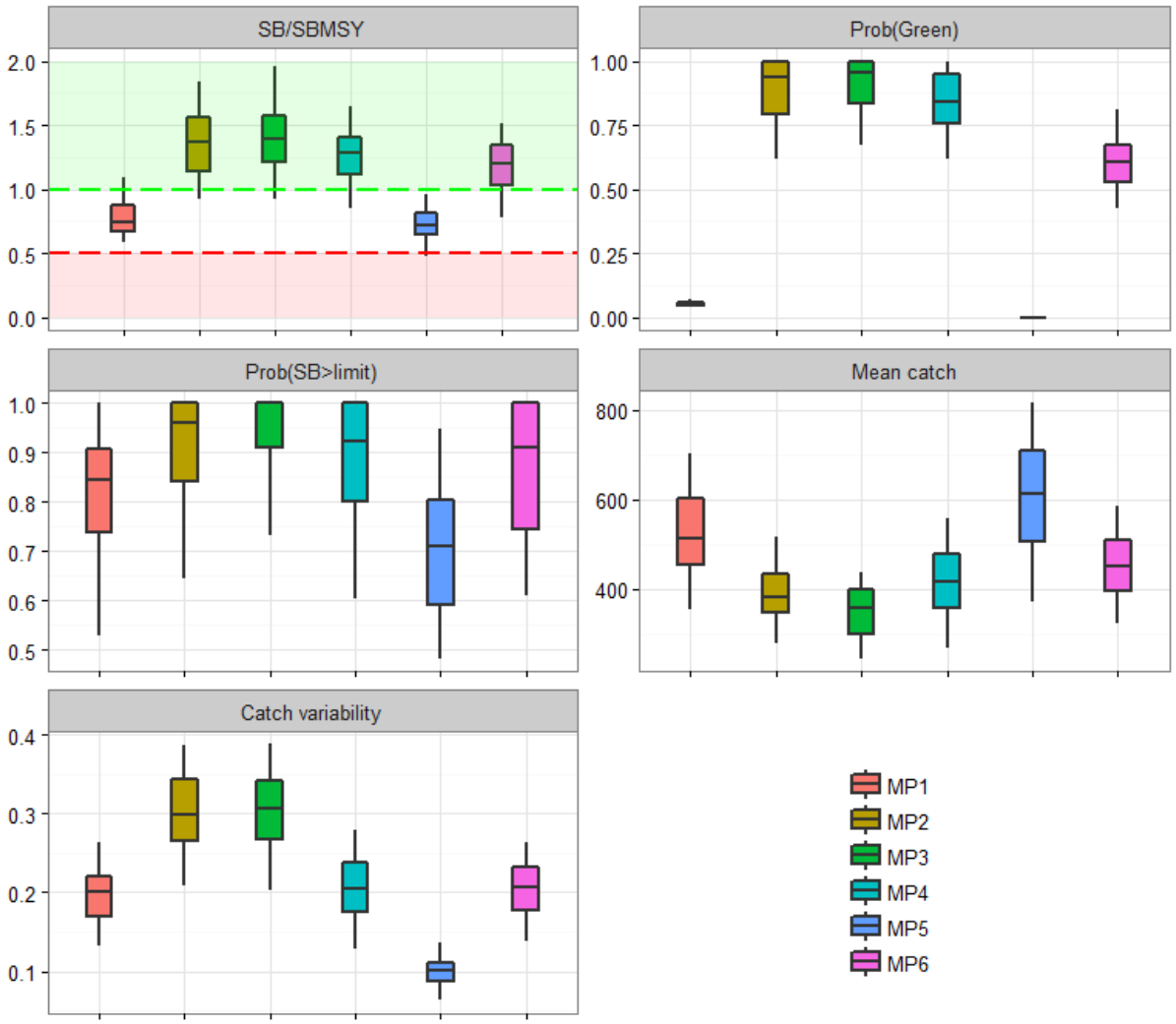


Figure 3. Example of MSE outputs comparing the performance of 6 management procedures (MPs) against 5 performance measures. Each data point represents the median over the last 20 years of the projection period as the horizontal line, 25th -75th percentiles as coloured bars, and 5th -95th percentiles as thin lines. Limit and target reference points for the biomass performance measure are indicated by red and green dashed lines respectively.

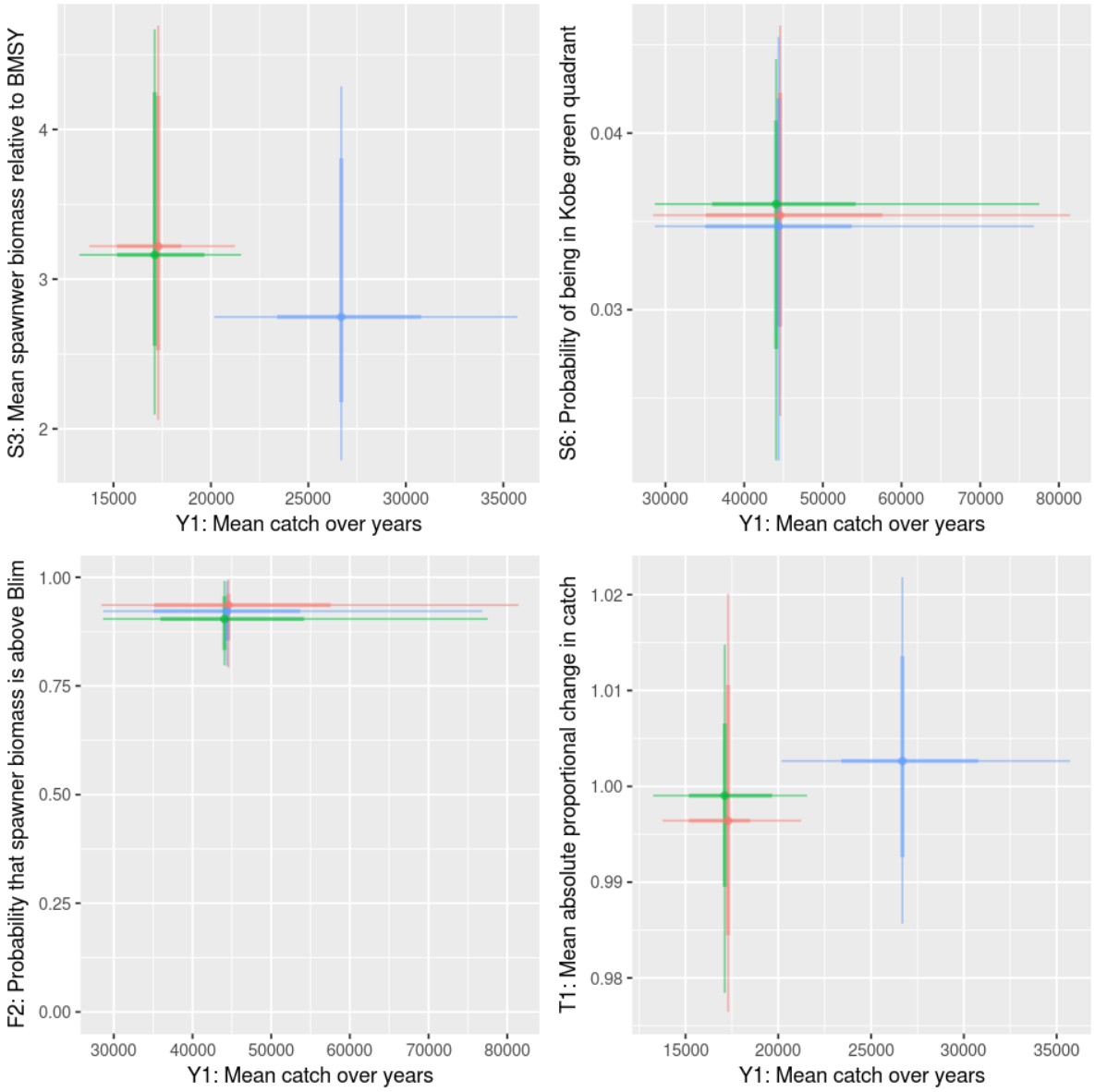


Figure 4. Example trade-off plots indicating the trade-offs in performance of 3 management procedures (MPs) between yield (catch) and 4 performance measures. Each data point represents the median over the last 20 years of the projection period and the errors bars represent the 25th -75th percentiles as thick lines, and 5th -95th percentiles as thin lines.

Table 1. Performance of six hypothetical example MPs against five key performance measures averaged over the last 20 years of the projection period. Colours indicate the relative performance for each MP (light = highest, dark = lowest). See Figures 2 and 3 for more detail on performance of each MP.

Management Procedure	Performance Measure				
	SB/SBMSY	Prob(Green)	Prob(SB>limit)	Mean Catch	Catch variability
MP1	0.82	0.05	0.8	520	0.2
MP2	1.36	0.95	0.98	390	0.3
MP3	1.42	1	0.99	350	0.3
MP4	1.24	0.85	0.95	430	0.2
MP5	0.71	0	0.7	600	0.1
MP6	1.15	0.6	0.9	460	0.2

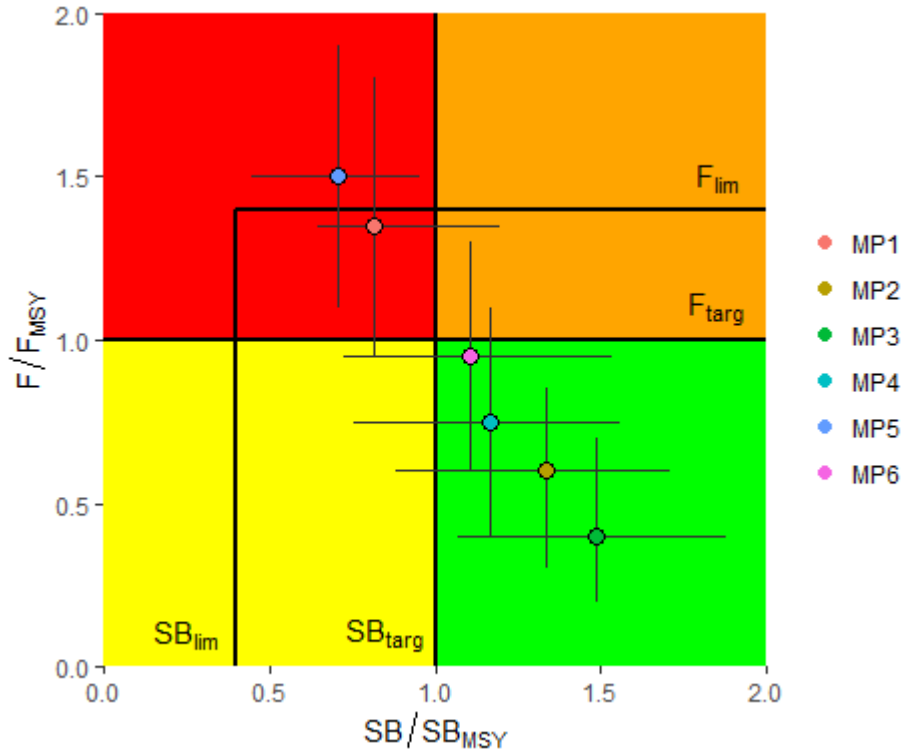


Figure 5. Kobe plot for hypothetical example of MSE outputs comparing 6 management procedures (MPs) against performance measures for SB/SBMSY and F/FMSY. Each data point represents the median in the final year of the projection period and the error bars represent the 95th percentiles. Target (SBtarg and Ftarg) and limit (SBlim and Flim) reference points are indicated by black lines.

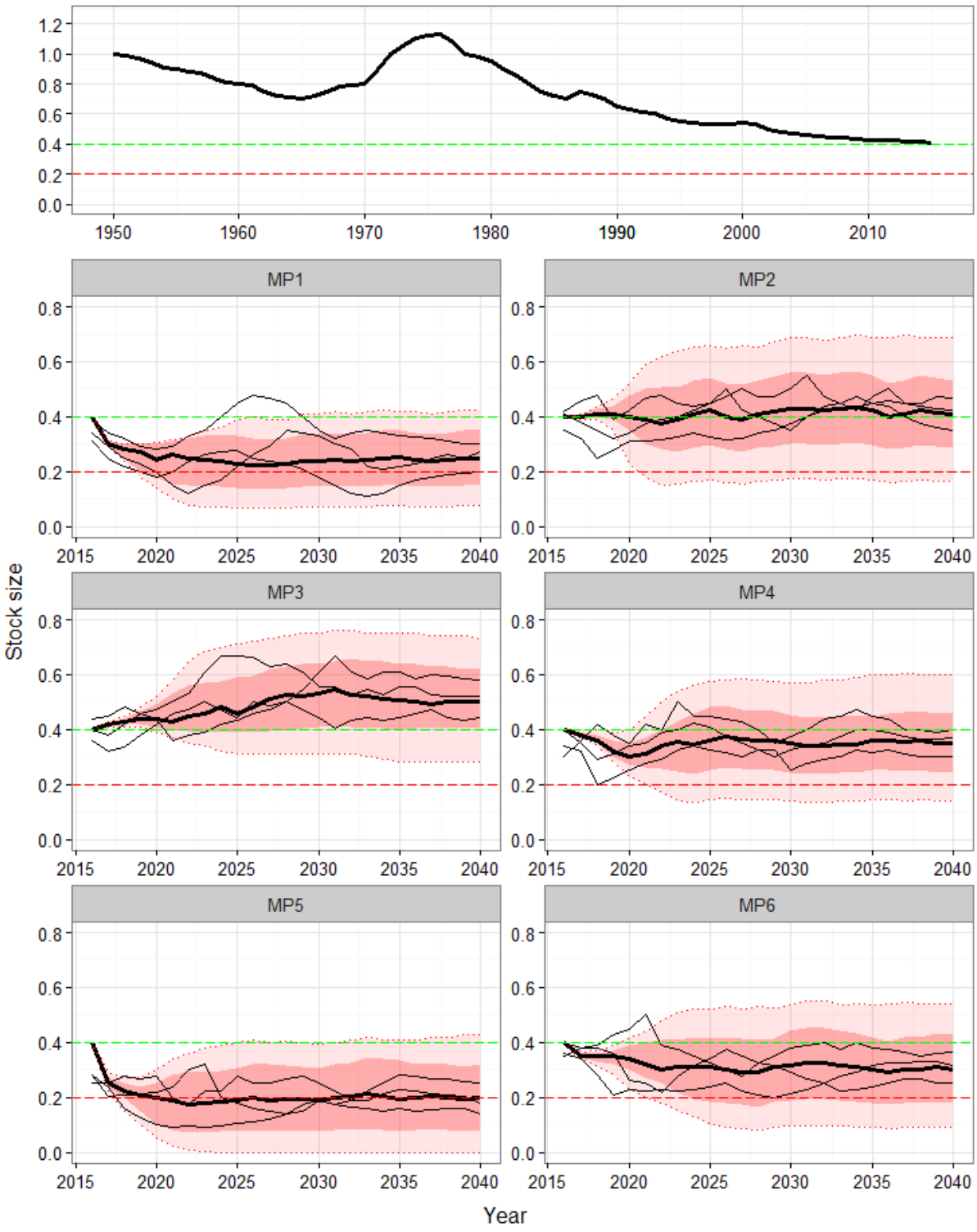


Figure 6. Time series plots for a hypothetical example of the performance of 6 MPs against the stock size performance measure. The top panel represents the historical period (1950-2015) and the bottom 6 panels represent the projection years (2016-2040). The median for each MP is represented by the bold black lines, a dark ribbon shades the 25th-75th percentile region and a light ribbon shades the 10th-90th percentile region. Three additional thin black lines show individual realizations. Horizontal lines indicate depletion-based target (green) and limit (red) reference points.

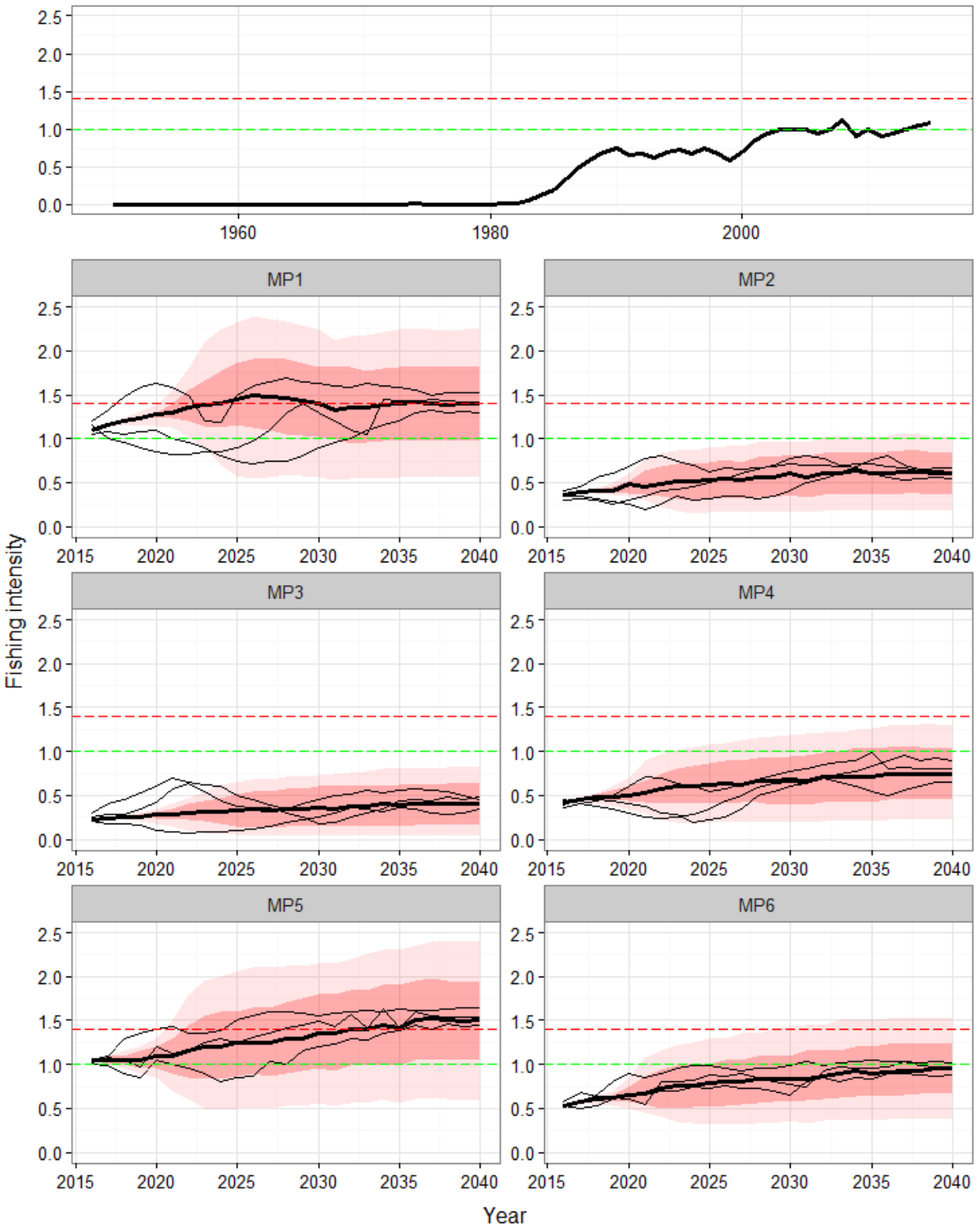


Figure 7. Time series plots for a hypothetical example of the performance of 6 MPs against the fishing intensity performance measure. The top panel represents the historical period (1950-2015) and the bottom 6 panels represent the projection years (2016-2040). The median for each MP is represented by the bold black lines, a dark ribbon shades the 25th-75th percentile region and a light ribbon shades the 10th-90th percentile region. Three additional thin black lines show individual realizations. Horizontal lines indicate depletion-based target (green) and limit (red) reference points.

Table 2. Hypothetical example of MSE outputs comparing the performance of 6 management procedures (MPs) against all IOTC performance measures for 2 time periods (1 years and 5 years).

Status : maximize stock status		1 year						5 years					
		MP1	MP2	MP3	MP4	MP5	MP6	MP1	MP2	MP3	MP4	MP5	MP6
1. Mean spawner biomass relative to pristine	SB/SB0	0.5	0.8	0.9	0.7	0.4	0.6	0.5	0.8	1.0	0.7	0.4	0.6
2. Minimum spawner biomass relative to pristine	SB/SB0	0.3	0.6	0.6	0.5	0.2	0.4	0.3	0.5	0.6	0.5	0.2	0.4
3. Mean spawner biomass relative to SBMSY	SB/SBMSY	0.8	1.3	1.4	1.2	0.7	1.1	0.9	1.2	1.3	1.1	0.7	1.2
4. Mean fishing mortality relative to target	F/Ftar	1.4	0.6	0.4	0.8	1.5	0.9	1.4	0.6	0.4	0.8	1.5	0.9
5. Mean fishing mortality relative to FMSY	F/FMSY	1.4	0.6	0.4	0.8	1.5	0.9	1.5	0.5	0.4	0.8	1.6	0.9
6. Probability of being in Kobe green quadrant	SB,F	0.5	0.9	1	0.8	0.3	0.7	0.5	0.9	0.9	0.8	0.3	0.7
7. Probability of being in Kobe red quadrant	SB,F	0.3	0.1	0	0.1	0.5	0.2	0.3	0.1	0.0	0.1	0.5	0.2
Safety : maximize the probability of remaining above low stock status (i.e. minimize risk)													
8. Probability of spawner biomass being above 20% of SB0	SB	0.8	0.9	0.9	0.8	0.7	0.8	0.8	0.8	0.9	0.8	0.7	0.8
9. Probability of spawner biomass being above BLim	SB	0.8	1.0	1.0	0.9	0.7	0.9	0.8	1.0	1.0	0.9	0.7	0.8
Yield : maximize catches across regions and gears													
10. Mean catch (1’000 t)	C	520	390	350	430	600	460	551	417	378	434	600	460
11. Mean catch by region and/or gear (1’000 t)	C	250	200	180	210	310	220	248	194	176	229	335	218
12. Mean catch	C/MSY	1.1	0.7	0.6	0.8	1.2	0.9	1.2	0.6	0.6	0.8	1.3	1.0

relative to MSY													
Abundance: maximize catch rates to enhance fishery profitability													
13. Mean catch rates (by region and gear) (for fisheries with meaningful catch-effort relationship)	I	3.2	3.8	3.9	2.7	2.5	2.6	3.0	3.8	4.0	2.6	2.3	2.8
Stability: maximize stability in catches to reduce commercial uncertainty													
14. Mean absolute proportional change in catch	C	0.2	0.3	0.3	0.2	0.1	0.2	0.2	0.3	0.3	0.2	0.1	0.2
15. % Catch co-efficient of variation	C	20	25	24	18	12	21	19.4	27.3	26.2	17.6	11.5	21.0
16. Probability of shutdown	C	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

Table 2. cont. Hypothetical example of MSE outputs comparing the performance of 6 management procedures (MPs) against all IOTC performance measures for 2 time periods (10 years and 20 years).

Status : maximize stock status		10 years						20 years					
		MP1	MP2	MP3	MP4	MP5	MP6	MP1	MP2	MP3	MP4	MP5	MP6
1. Mean spawner biomass relative to pristine	SB/SB0	0.5	0.8	0.9	0.7	0.4	0.6	0.5	0.8	1.0	0.7	0.4	0.6
2. Minimum spawner biomass relative to pristine	SB/SB0	0.3	0.6	0.6	0.5	0.2	0.4	0.3	0.5	0.6	0.5	0.2	0.4
3. Mean spawner biomass relative to SBMSY	SB/SBMSY	0.8	1.3	1.4	1.2	0.7	1.1	0.9	1.2	1.3	1.1	0.7	1.2
4. Mean fishing mortality relative to target	F/Ftar	1.4	0.6	0.4	0.8	1.5	0.9	1.4	0.6	0.4	0.8	1.5	0.9
5. Mean fishing mortality relative to FMSY	F/FMSY	1.4	0.6	0.4	0.8	1.5	0.9	1.5	0.5	0.4	0.8	1.6	0.9
6. Probability of being in Kobe green quadrant	SB,F	0.5	0.9	1	0.8	0.3	0.7	0.5	0.9	0.9	0.8	0.3	0.7

7. Probability of being in Kobe red quadrant	SB,F	0.3	0.1	0	0.1	0.5	0.2	0.3	0.1	0.0	0.1	0.5	0.2
Safety : maximize the probability of remaining above low stock status (i.e. minimize risk)													
8. Probability of spawner biomass being above 20% of SB0	SB	0.8	0.9	0.9	0.8	0.7	0.8	0.8	0.8	0.9	0.8	0.7	0.8
9. Probability of spawner biomass being above BLim	SB	0.8	1.0	1.0	0.9	0.7	0.9	0.8	1.0	1.0	0.9	0.7	0.8
Yield : maximize catches across regions and gears													
10. Mean catch (1’000 t)	C	520	390	350	430	600	460	551	417	378	434	600	460
11. Mean catch by region and/or gear (1’000 t)	C	250	200	180	210	310	220	248	194	176	229	335	218
12. Mean catch relative to MSY	C/MSY	1.1	0.7	0.6	0.8	1.2	0.9	1.2	0.6	0.6	0.8	1.3	1.0
Abundance: maximize catch rates to enhance fishery profitability													
13. Mean catch rates (by region and gear) (for fisheries with meaningful catch-effort relationship)	I	3.2	3.8	3.9	2.7	2.5	2.6	3.0	3.8	4.0	2.6	2.3	2.8
Stability: maximize stability in catches to reduce commercial uncertainty													
14. Mean absolute proportional change in catch	C	0.2	0.3	0.3	0.2	0.1	0.2	0.2	0.3	0.3	0.2	0.1	0.2
15. % Catch co-efficient of variation	C	20	25	24	18	12	21	19.4	27.3	26.2	17.6	11.5	21.0

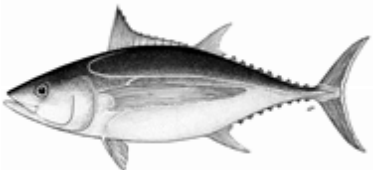
16. Probability of shutdown	C	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

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 Jiangfeng Zhu	China	21–Jul–16	End of WPTmT in 2018	1st term
	Vice-Chair	Dr Toshihide Kitakado	Japan	21–Jul–16	End of WPTmT in 2018	1st term
WPTT	Chair	Dr Shiham Adam	Maldives	19–Nov–14	End of WPTT in 2018	2nd term
	Vice-Chair	Dr Gorka Merino	EU,Spain	19–Nov–14	End of WPTT in 2018	2nd 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 / BirdLife	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–14	End of WPDCS in 2017	2nd term
WPM	Chair	Dr Toshihide Kitakado	Japan	21–Oct–15	End of WPM in 2017	1st term
	Vice-Chair	Dr Iago Mosqueira	EU	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 – 2016 assessment		2016 stock status determination (2014)[2]
Indian Ocean		SS3	
	Catch 2015[3]:	35,068 t	
	Average catch 2011–2015:	34,902 t	
	MSY (1000 t) (80% CI):	38.8 (33.9–43.6)	
	F_{MSY} (80% CI):	-	
	SB_{MSY} (1000 t) (80% CI):	30.0 (26.1–34.0)	
	F_{2014}/F_{MSY} (80% CI):	0.85 (0.57–1.12)	
	SB_{2014}/SB_{MSY} (80% CI):	1.80 (1.38–2.23)	
	SB_{2014}/SB_{1950} (80% CI):	0.37 (0.28–0.46)	

[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 data year used for the assessment.
[3] Proportion of catch estimated or partially estimated by IOTC Secretariat in 2015: 27%

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

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. Trends in the CPUE series suggest that the longline vulnerable biomass has declined to around 65% of the levels observed in 1980–82. Prior to 1980 there was 20 years of moderate fishing, after which total catches of albacore tuna in the Indian Ocean have more than doubled in subsequent years (**Fig. 1**). Catches have also increased substantially since 2007, mostly attributed to Indonesian and Taiwan,China longline fisheries, although there is substantial uncertainty regarding the reliability of the catch estimates. Catches in 2014 have been marginally above the MSY level of the SS3 model. Fishing mortality represented as F_{2014}/F_{MSY} is 0.85 (0.57–1.12). Biomass is considered to be above the SB_{MSY} level (SB_{2014}/SB_{MSY} = 1.80 (1.38–2.23)) from the SS3 model (**Table 1**, **Fig. 2**). The results from the other model options were also generally consistent with these estimates of stock status. Thus, the 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**).

Outlook. Maintaining or increasing effort in the core albacore fishing grounds is likely to result in further decline in the albacore tuna biomass, productivity and CPUE. The impacts of piracy in the western Indian Ocean have 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. With the reduction of the effects of piracy in recent years, due to increased security on-board vessels of some longline fleets (e.g., Taiwan,China, and China), it is unlikely that catch and effort on albacore will increase in the near future. There is a moderate probability of exceeding MSY-based reference points by 2017 if catches are maintained at 2014 levels (14% probability that $SB_{2017}<SB_{MSY}$, and 33% probability that $F_{2017}>F_{MSY}$) (**Table 2**).

Management advice. Although considerable uncertainty remains in the SS3 assessment, particularly due to the lack of biological information on Indian Ocean albacore tuna stocks, a precautionary approach to the management of albacore tuna should be applied by capping total catch levels to MSY levels (approximately 40,000 t; **Table 2**).

The following should be noted:

- The two primary sources of data that drive the assessment, total catches and CPUE, are highly uncertain and should be developed further as a priority.
- Current catches (**35,068** t in 2015) approximate current estimated MSY levels (**Table 1**).
- The preliminary catch estimates for 2015 (~35,000 t) are below the current estimated MSY levels.
- 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**).
- Provisional reference points: Noting that the Commission in 2015 adopted Resolution 15/10 *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. 2**).
  - **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. 2**).

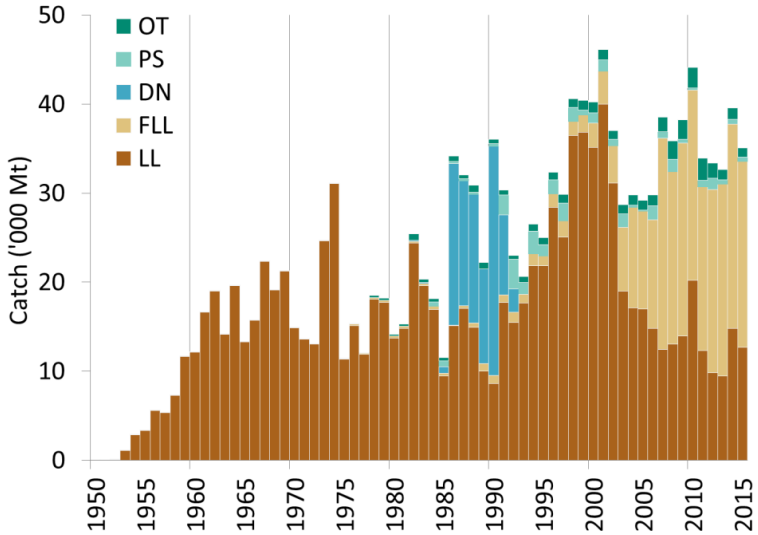


Fig. 1. Albacore: Catches of albacore by gear (data as of September 2016).
Fisheries: Driftnet (DN; Taiwan,China); Freezing-longline (LL); Fresh-tuna longline (FLL); Purse seine (PS); Other gears nei (OT).

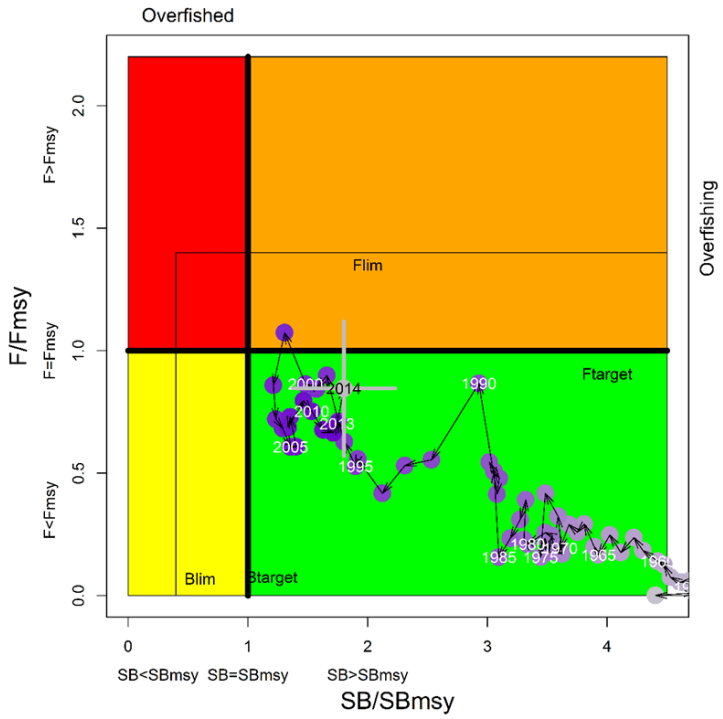


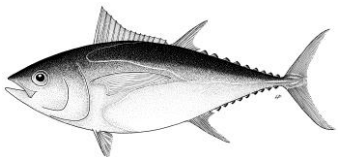
Fig. 2. Albacore: SS3 Aggregated Indian Ocean assessment Kobe plot. Blue circles indicate the trajectory of the point estimates for the SB ratio and F ratio for each year 1950–2014 (the grey lines represent the 80 percentiles of the 2014 estimate). Target (F_{targ} and SB_{targ}) and limit (F_{lim} and SB_{lim}) 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 constant catch projections (2014 catch levels, ± 10%, ± 20%, ± 30%, and ± 40%) projected for 3 and 10 years.

Reference point and projection timeframe	**Alternative catch projections (relative to the catch level for 2014) and probability (%) of violating MSY-based target reference points (SB_{targ} = SB_{MSY}; F_{targ} = F_{MSY})**								
	60% (23,821)	**70% (27,791)**	**80% (31,761)**	**90% (35,731)**	**100% (39,701)**	**110% (43,671)**	**120% (47,641)**	**130% (51,611)**	**140% (55,581)**
$SB_{2017} < SB_{MSY}$	1	2	4	7	14	19	24	33	44
$F_{2017} > F_{MSY}$	0	1	5	18	33	47	59	71	77
$SB_{2024} < SB_{MSY}$	4	8	9	31	42	50	62	NA	92
$F_{2024} > F_{MSY}$	0	0	3	NA	39	56	66	70	100
Reference point and projection timeframe	**Alternative catch projections (relative to the catch level for 2014) and probability (%) of violating MSY-based limit reference points (SB_{lim} = 0.4 SB_{MSY}; F_{Lim} = 1.4 F_{MSY})**								
	60% (23,821)	**70% (27,791)**	**80% (31,761)**	**90% (35,731)**	**100% (39,701)**	**110% (43,671)**	**120% (47,641)**	**130% (51,611)**	**140% (55,581)**
$SB_{2017} < SB_{Lim}$	0	0	0	0	0	0	1	1	4
$F_{2017} > F_{Lim}$	0	0	0	0	2	10	20	34	46
$SB_{2024} < SB_{Lim}$	0	0	1	13	20	24	30	NA	65
$F_{2024} > F_{Lim}$	0	0	0	NA	10	27	48	60	100

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		2016 stock status determination
Indian Ocean	Catch in 2015[2]: Average catch 2011–2015:	92,736 t 101,515 t	**83.7 %***
	MSY (1,000 t) (80%): F_{MSY} (80%): SB_{MSY} (1,000 t) (80%): F_{2015}/F_{MSY} (80%): SB_{2015}/SB_{MSY} (80%): SB_{2015}/SB_0 (80%):	104 (87-121) 0.17 (0.14-0.20) 525 (364-718) 0.76 (0.49-1.03) 1.29 (1.07-1.51) 0.38 (n.a. – n.a.)	

[1]Boundaries for the Indian Ocean stock assessment are defined as the IOTC area of competence.
[2]Proportion of catch estimated or partially estimated by IOTC Secretariat in 2015: 30%
* 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.

Colour key	Stock overfished ($SB_{year}/SB_{MSY}< 1$)	Stock not overfished ($SB_{year}/SB_{MSY}\geq 1$)
Stock subject to overfishing($F_{year}/F_{MSY}> 1$)	**2.1%**	13.8%
Stock not subject to overfishing ($F_{year}/F_{MSY}\leq 1$)	0.4%	83.7%
Not assessed/Uncertain		

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. In 2016, six models were applied to the bigeye tuna stock in the IOTC area of competence (ASAP, BDM, ASPIC, SCAA, BSPM and SS3). The reported stock status is based on the SS3 model formulation using a grid designed to capture the uncertainty on stock recruitment relationship and the influence of tagging information. Spawning stock biomass in 2015 was estimated to be 38% of the unfished levels (Table 1) and 129% (107–151%) of the level that can support MSY. The assessment is qualitatively similar to the 2013 stock assessment but with a lower relative biomass (from 144 to 129% SB/SB_{MSY}) and higher relative fishing mortality (from 42 to 76% F/F_{MSY}). Considering the quantified uncertainty, which is conservative, the assessment indicates that, with high likelihood, SB_{2015} is above SB_{MSY} and F_{2015} is below F_{MSY}. The median value of MSY from the model runs presented with SS3 was 104,000 t with a range between 87,000 and 121,000 t (a median level 22% lower than the estimate in 2013). Catches in 2015 (≈92,736 t) remain lower than the estimated MSY values from the 2015 stock assessments (Table 1, Fig. 1). The average catch over the previous five years (2011–15; ≈101,515 t) also remains below the estimated MSY. Thus, on the weight-of-evidence available in 2016, 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 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 the plausible model runs from SS3 in 2016 illustrates the levels of quantified risk associated with varying catch levels over time and could be used to inform future management actions (Table 2). The SS3 projections from the 2016 assessment show that there is a low risk of exceeding MSY-based reference points by 2018, and 2025 if catches are maintained at current catch levels of 92,736 t (Table 2).

Management advice. The stock status determination did not qualitatively change in 2016, but is somewhat less optimistic than in 2013. If catch remains below the estimated MSY levels estimated for the current mix of fisheries, then immediate management measures are not required. However, increased catch or increases in the mortality on immature fish will likely increase the probabilities of breaching reference levels in the future. Continued monitoring and improvement in data collection, reporting and analysis is required to reduce the uncertainty in assessments (Table 2).

The following key points should also be noted:

- **Maximum Sustainable Yield (MSY):** estimate for the whole Indian Ocean is 104,101 t with a range between 87,000–121,000 t for SS3 (Table 1). The average 2011-2015 catches ≈101,515 (t) since 2011 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 at 76% of the interim target reference point of F_{MSY}, and 54% of the interim limit reference point of 1.3*F_{MSY} (Fig. 2).
    - **Biomass**: Current spawning biomass is considered to at 129% of the interim target reference point of SB_{MSY} and well above the interim limit reference point of 0.5*SB_{MSY} (Fig. 2).
- **Main fishing gear** (Average catch 2012–15): Longline ≈57.0% (frozen ≈43%, fresh ≈14%); Purse seine ≈19% (FAD associated school ≈13%; free swimming school ≈6%); Line other ≈8%; Other ≈16%.
- **Main fleets** (Average catch 2012–15): Indonesia ≈26%; Taiwan,China ≈22%; European Union ≈14% (EU,Spain: ≈10%; EU,France: ≈4%); Seychelles ≈11; Japan ≈5%; All other fleets ≈18%.

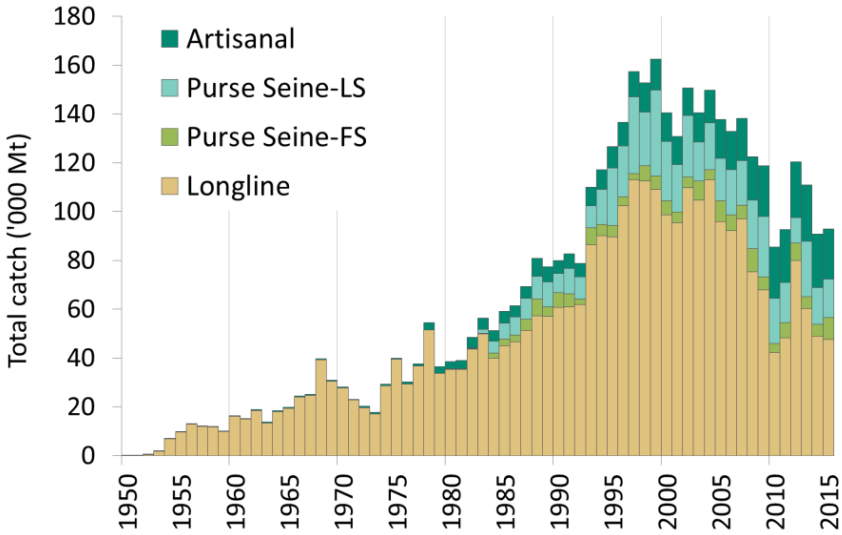


Fig. 1. Annual catches of bigeye tuna by gear (1950–2015) (data as of November 2016).

Gears: Longline **(including Taiwan,China, Japan and other associated fleets);** Purse seine free-school (**FS**); Purse seine associated school (**LS**); Other gears nei (pole-and-Line, handline, small longlines, gillnet, trolling & other minor artisanal gears) (**Artisanal**).

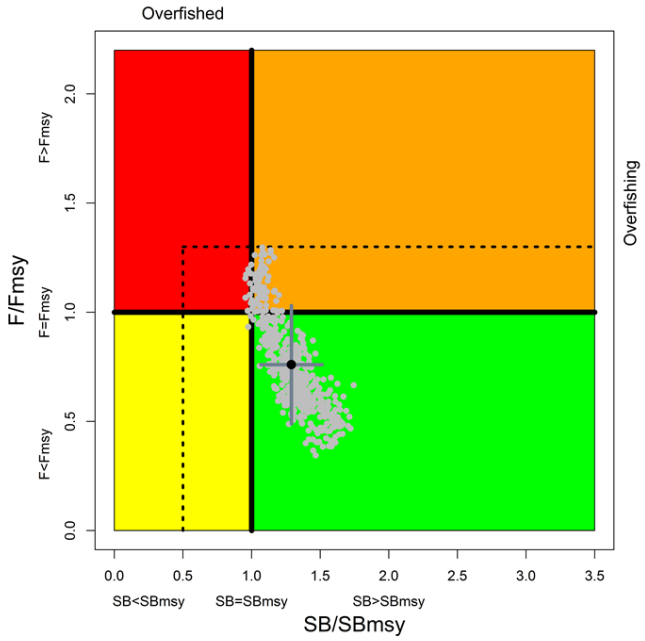


Fig. 2. Bigeye tuna: SS3 Aggregated Indian Ocean assessment Kobe plot. Dotted black lines are the interim limit reference points adopted by the Commission via Resolution 15/10. The grey points represent 500 estimates of 2015 stock status from the six model options. The black point represents the average of the six model options with associated 80% confidence interval.

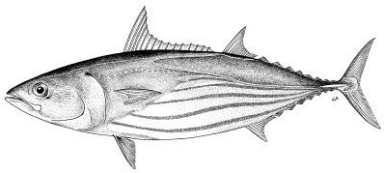
TABLE 2. Bigeye tuna: Stock Synthesis base case Indian Ocean assessment Kobe II Strategy Matrix. Probability (percentage) of violating the MSY-based target (top) and limit (bottom) reference points for constant catch projections (relative to catches from 2015 (93,040t), ± 20%, + 40%) projected for 3 and 10 years.

Reference point and projection timeframe	**Alternative catch projections (relative to the catch level from 2015) and weighted probability (%) scenarios that violate reference point**			
	80% (74,432t)	**100%** (93,040t)	**120%** (111,648t)	**140%** (130,256t)
$B_{2018} < B_{MSY}$	11	20	30	40
$F_{2018} > F_{MSY}$	2	19	40	61
$B_{2025} < B_{MSY}$	6	25	49	60
$F_{2025} > F_{MSY}$	1	19	42	53
Reference point and projection timeframe	**Alternative catch projections (relative to the catch level from 2015) and probability (%) of violating MSY-based limit reference points (B_{lim} = 0.5 B_{MSY}; F_{Lim} = 1.3 F_{MSY})**			
	80% (74,432t)	**100%** (93,040t)	**120%** (111,648t)	**140%** (130,256t)
$B_{2018} < B_{LIM}$	0	0	0	0
$F_{2018} > F_{LIM}$	0	4	18	37
$B_{2025} < B_{LIM}$	0	1	12	33
$F_{2025} > F_{LIM}$	0	9	30	48

** Minor differences in the 2015 catch estimates between the Kobe II Strategy Matrix and management quantities in Table 1, are due to updates in the nominal catch published prior to the Working Party on Tropical Tunas.*

APPENDIX X
EXECUTIVE SUMMARY: SKIPJACK TUNA

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



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		2016 stock status determination
			2014[2]
Indian Ocean	Catch 2015[3]:	393,954 t	
	Average catch 2011–2015:	394,320 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_0 (80% CI):	0.58 (0.53–0.62)	

[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.
[3]Proportion of catch estimated or partially estimated by IOTC Secretariat in 2015: 35%

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 2016, thus, stock status is determined on the basis of the 2014 assessment and other indicators presented in 2016. 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. 2). 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 2015 (≈393,954 t) remain lower than the estimated MSY values from the 2014 stock assessments (Table 1). The average catch over the previous five years (2011–15; ≈394,320 t) also remains below the estimated MSY. Thus, on the weight-of-evidence available in 2016, the skipjack tuna stock is determined to be **not overfished** and is **not subject to overfishing** (Table 1).

Outlook. The recent declines in total overall catch of skipjack for both BB and PS (Fig. 1), the decline in catch per set on drifting FADs (Fish Aggregating Devices), in parallel to the overall increase in number of drifting FADs deployed at sea and number of supply vessels, and the decrease on free school catches of skipjack tuna are thought to be of some concern, particularly as the causes of these indicators are currently not fully understood. These indicators may suggest some increase in fishing mortality or a process of school fragmentation caused by the large number of drifting FADs. In addition, the marked decline in the relative proportion of skipjack in drifting FAD catches, should be further investigated and explained.

These indicators should be updated and at least considered in parallel, or whenever possible, incorporated to the formal SKJ stock assessment that will be conducted in 2017.

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 2014, there is a low risk of exceeding MSY‑based reference points by 2016 and 2023 if catches are maintained at 2013 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. The adoption of Resolution 16/02 requires that an estimate of SB/SB_0 from future skipjack assessments is used to parameterise the Harvest Control Rule (HCR). The next assessment for skipjack will be conducted in 2017, at which time the HCR will be applied and a total allowable catch for skipjack will be advised for 2018. No additional management measures are required at this time, however continued monitoring and improvement in data collection, reporting and analysis (including fishery indicators) 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 2011–2015 was ≈ 394,320 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 ≈400,000 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. 2). 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. 2). 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 2012–15): Purse seine ≈30% (FAD associated school ≈28% and free swimming school ≈2%); Gillnet ≈26%; Pole-and-line ≈21%; Other ≈24%.
- **Main fleets** (Average catch 2012–15): Indonesia ≈21%; European Union ≈19% (EU,Spain: ≈15%; EU,France: ≈4%); ≈Maldives 17%; Sri Lanka ≈15%; ≈I.R. Iran 9%; Seychelles ≈8%; India ≈7%.

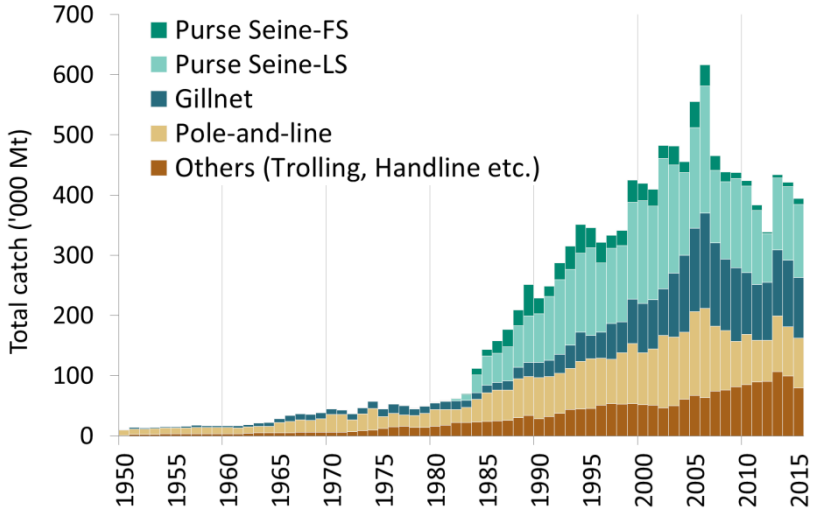


Fig. 1. Annual catches of skipjack tuna by gear (1950–2015). Data as of October 2016.

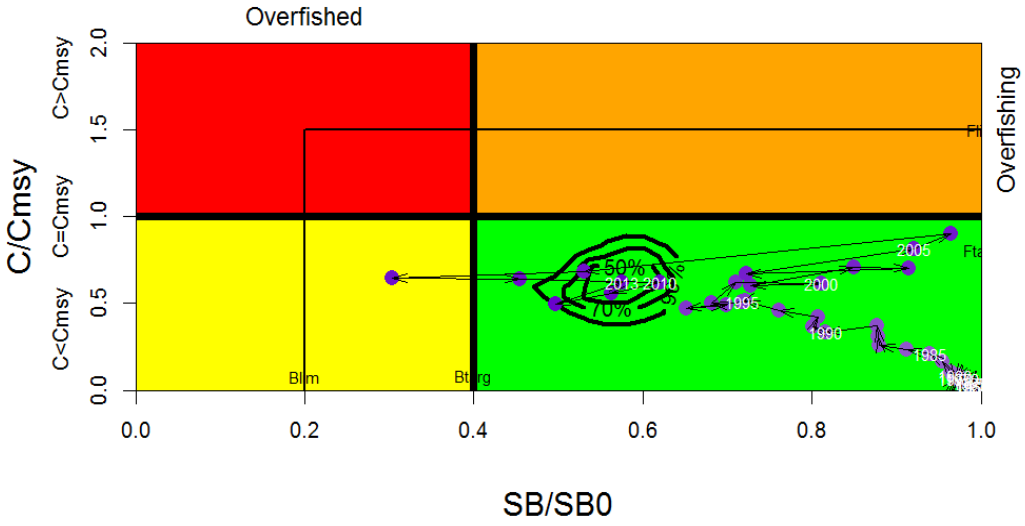


Fig. 2. Skipjack tuna: SS3 Aggregated Indian Ocean assessment Kobe plot (contours are the 50, 70 and 90 percentiles of the 2013 estimate). Blue circles indicate the trajectory of the point estimates for the SB/SB0 ratio and F proxy ratio for each year 1950–2013 estimated as C/C_{MSY}. Interim target (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 (relative to the 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 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)
$B_{2016} < B_{MSY}$	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
$B_{2023} < B_{MSY}$	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 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)
$B_{2016} < B_{Lim}$	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
$B_{2023} < B_{Lim}$	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

***** *Catches for 2013, at the time of the last skipjack tuna assessment conducted in 2014.*

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		2016 stock status determination
Indian Ocean	Catch 2015[2]: Average catch 2011–2015:	407,575 t 390,185 t	**67.6%***
	MSY (1000 t) (80% CI): F_{MSY} (80% CI): SB_{MSY} (1,000 t) (80% CI): F_{2015}/F_{MSY} (80% CI): SB_{2015}/SB_{MSY} (80% CI): SB_{2015}/SB_0 (80% CI):	422 (406-444) 0.151 (0.148-0.154) 947 (900-983) 1.11 (0.86-1.36) 0.89 (0.79-0.99) 0.29 (n.a.-n.a.)	

[1]Boundaries for the Indian Ocean stock assessment are defined as the IOTC area of competence.
[2]Proportion of catch estimated or partially estimated by IOTC Secretariat in 2015: 23%
* 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. The confidence intervals for SB_{2015}/SB_0 were not estimated for the models used.

Colour key	Stock overfished ($SB_{year}/SB_{MSY} < 1$)	Stock not overfished ($SB_{year}/SB_{MSY} \geq 1$)
Stock subject to overfishing ($F_{year}/F_{MSY} > 1$)	**67.6%**	3.7%
Stock not subject to overfishing ($F_{year}/F_{MSY} \leq 1$)	27.3%	1.4%
Not assessed/Uncertain		

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. In 2016, two models were applied to the yellowfin tuna stock in the IOTC area of competence to update the assessment of yellowfin undertaken in 2015: a Biomass Dynamic Model (BDM) and Stock Synthesis III (SS3) model, which gave qualitatively similar results. Stock status and management advice was based on the SS3 model formulation. Spawning stock biomass in 2015 was estimated to be 28.9% of the unfished levels (Table 1) and 89% (79–99%) of the level which can support MSY. The assessment is somewhat more optimistic than the 2015 assessment mainly due to the use of a new composite LL CPUE series, which results in a lower estimate of fishing mortality in the NE Indian Ocean. In addition, the catch series revised in 2016 reduced the catch data for 2014 by 5.1% (from 430,327 to 408,497, although the impact of this revision on status determination was minor. According to the information available for the stock assessment, the total catch has remained relatively stable at levels somewhat lower than the estimated MSY since 2012 (407,575 t in 2015, 408,497 in 2014, 405,048 in 2013 and 400,502 in 2012). The inclusion of revised and new data into the updated assessment using the model structure applied in the 2015 assessment, resulted in a higher estimated biomass in 2014 and lower estimated F/F_{MSY} than the corresponding estimates from the 2015 stock assessment. Nonetheless, the updated assessment estimates SB_{2015}/SB_{MSY} at 0.89 (0.79-0.99) and F_{2015}/F_{MSY} at 1.11 (0.86-1.36). The quantified uncertainty in these estimates is an underestimate of the underlying uncertainty of the assessment. On the weight-of-evidence available in 2016, the yellowfin tuna stock is determined to remain **overfished** and subject to **overfishing** (Table 1 and Fig. 2).

Outlook. The 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 (Fig. 1), with recent fishing mortality exceeding the MSY-related levels. There is a risk of continuing to exceed the MSY-based biomass reference point if catches increase or remain at current levels (2015) until 2018 (88% risk that $SB < SB_{MSY}$) (Table 2). The modelled probabilities of the stock attaining levels consistent with the Commission's current management objective (e.g. $SB > SB_{MSY}$) are shown in the K2MSM, which provides a range of options for reducing catches and the probabilities of the yellowfin tuna stock recovering to the MSY target levels (Table 2) after 3 and 10 years.

Management advice. The stock status determination did not change in 2016, but does give a somewhat more optimistic estimate of stock status than the 2015 assessment as a direct result of the use of more reliable information

on catch rates of longline fisheries and updated catch up to 2015. The stock status is driven by unsustainable catches of yellowfin tuna taken over the last four (4) years, and the relatively low recruitment levels estimated by the model in recent years. The Commission has an interim plan for the rebuilding of this stock (Resolution 16/01), with catch limitations beginning January 1 2017. The possible effect of this measure can only be assessed once estimates of abundance in 2018 would be available at the 2019 asessement. The projections produced to advise on future catches are, in the short term, driven by the below average recruitment estimated for in recent years since these year classes have yet to reach maturity and contribute to the spawning biomass (see Table 2).

The following key points should also be noted:

- **Maximum Sustainable Yield (MSY):** estimate for the whole Indian Ocean is estimated at 422,000 t with a range between 406,000-444,000 t (Table 1). The 2011-2015 average catches (390,185 t) were below the estimated 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 11% above the interim target reference point of F_{MSY}, and below the interim limit reference point of $1.4*F_{MSY}$ (Fig. 2).
- **Biomass**: Current spawning biomass is considered to be 11% below the interim target reference point of SB_{MSY}, however above the interim limit reference point of $0.4*SB_{MSY}$ (Fig. 2).
- **Main fishing gear** (Average catch 2012–15): Purse seine ≈34% (FAD associated school ≈20%; free swimming school ≈13%); Longline ≈19%; Handline ≈19%; Gillnet ≈16%; Trolling ≈7%; Pole-and-line ≈5%; ≈Other 2%).
- **Main fleets** (Average catch 2012–15): European Union ≈21% (EU,Spain ≈15%; EU,France ≈7%); Maldives ≈12%; Indonesia ≈10%; I.R. Iran ≈10%; Sri Lanka ≈9%; Yemen ≈8%; India ≈7%.

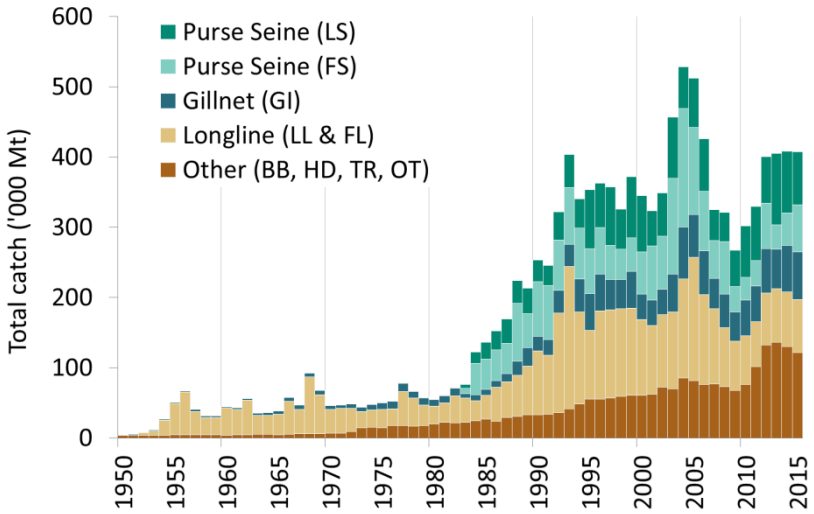


Fig. 1. Annual catches of yellowfin tuna by gear (1950–2015). Data as of September 2016.

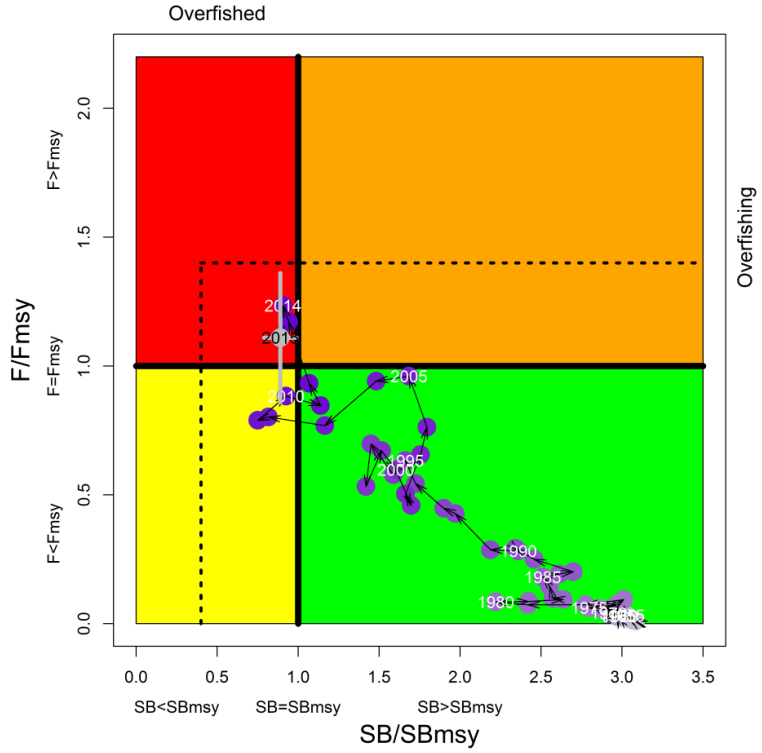


Fig. 2. Yellowfin tuna: Stock synthesis Kobe plot. Blue dots indicate the trajectory of the point estimates for the B/B_{MSY} ratio and F_{MSY} proxy ratio for each year 1950–2015. The grey line represents the 80% confidence interval associated with the 2015 stock status. Dotted black lines are the interim limit reference points adopted by the Commission via Resolution 15/10.

TABLE 2. Yellowfin tuna: Stock synthesis assessment Kobe II Strategy Matrix. Probability (percentage) of violating the MSY-based target (top) and limit (bottom) reference points for constant catch projections (relative to the catch level from 2015 (407,575t), -30%, - 25%, ± 20%, -15%,± 10%, -5%), projected for 3 and 10 years), projected for 3 and 10 years.

Reference point and projection timeframe	**Alternative catch projections (relative to the catch level from 2015) and probability (%) of violating MSY-based target reference points ($B_{targ} = B_{MSY}$; $F_{targ} = F_{MSY}$)**								
	70% (285,302t)	75% (305,680t)	80% (326,059t)	85% (346,438t)	90% (366,816t)	95% (387,195t)	100% (407,574t)	110% (448,331t)	120% (489,089t)
$B_{2018} < B_{MSY}$	53	61	67	77	80	88	88	97	99
$F_{2018} > F_{MSY}$	2	7	23	47	65	73	100	100	100
$B_{2025} < B_{MSY}$	6	n.a.	20	37	60	100	100	100	100
$F_{2025} > F_{MSY}$	0	n.a.	10	40	57	100	100	100	100
Reference point and projection timeframe	**Alternative catch projections (relative to the catch level from 2015) and probability (%) of violating MSY-based limit reference points ($B_{lim} = 0.4\ B_{MSY}$; $F_{Lim} = 1.4\ F_{MSY}$)**								
	70% (285,302t)	75% (305,680t)	80% (326,059t)	85% (346,438t)	90% (366,816t)	95% (387,195t)	100% (407,574t)	110% (448,331t)	120% (489,089t)
$B_{2018} < B_{Lim}$	2	1	2	4	6	6	12	21	38
$F_{2018} > F_{Lim}$	0	0	1	10	32	52	100	100	100
$B_{2025} < B_{Lim}$	0	n.a.	1	7	30	>30*	>30*	>30*	>30*
$F_{2025} > F_{Lim}$	0	n.a.	0	11	53	>30*	>30*	>30*	>30*

** At least one fishery not able to take the catch due to absence of vulnerable fish in the projection period. The probability levels are not well determined, but likely progressively exceed 30% as the catch level increases beyond 90%.*

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		2016 stock status determination
Indian Ocean	Catch 2015[2]: Average catch 2011–2015:	41,760 t 31,900 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.
[2]Proportion of catch estimated or partially estimated by IOTC Secretariat in 2015: 39%

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 assessment was undertaken in 2016. Thus, stock status is based on the previous assessment undertaken in 2014, as well as indicators available in 2015. The SS3 model, used for stock status advice, 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 was above a biomass level that would produce MSY. Spawning stock biomass in 2013 was estimated to be 58–89% of the unfished levels. Catches has increased in the last two years from around 30,000 t in 2013 to 41,760 t in 2015 (Fig. 1), and most recent catches of 41,760 t in 2015 are 2,360 t above the MSY level (39,400 t). On the weight-of-evidence available in 2016, the stock is determined to be ***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 2011-2013 average levels (<1% risk that $SB_{2022} < SB_{MSY}$, and <1% risk that $F_{2022} > F_{MSY}$) (Table 2).

Management advice. The most recent catches (41,760 t in 2015) are 2,360 t above the MSY level (39,400 t). Hence catches in 2017 should be reduced to less than MSY (39,400 t). As the updated stock assessment is scheduled in 2017, more concrete advice after 2018 should be developed next year.

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. 2).
    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. 2).

- **Main fishing gear** (2012–15): Longline catches are currently estimated to comprise approximately 85% of the total estimated swordfish catch in the Indian Ocean.
- **Main fleets** (2012–15): Indonesia (fresh longline): 20%; Taiwan, China (longline): 17%; Sri Lanka (longline-gillnet): 12%; EU, Spain (swordfish targeted longline): 12% (of the total estimated swordfish catch).

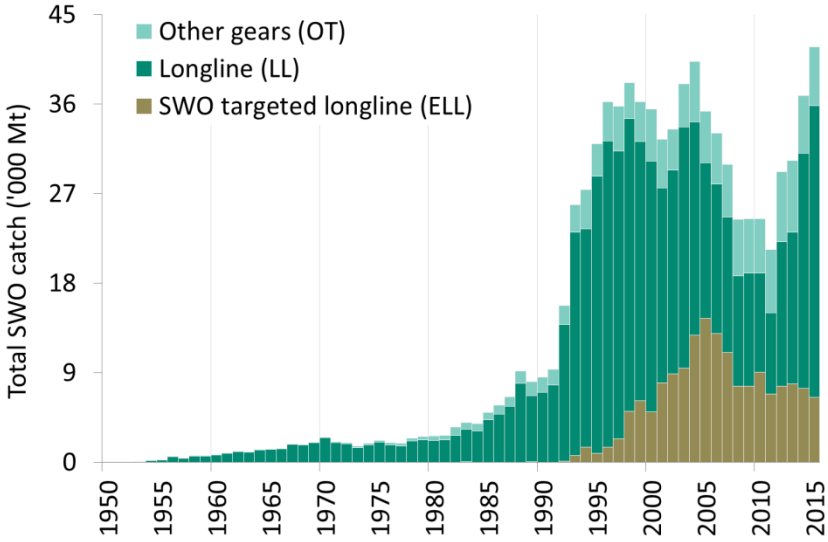


Fig. 1. Swordfish: catches by gear and year recorded in the IOTC Database (1950–2015).
Other gears includes: longline-gillnet, handline, gillnet, coastal longline, troll line, sport fishing, and all other gears.

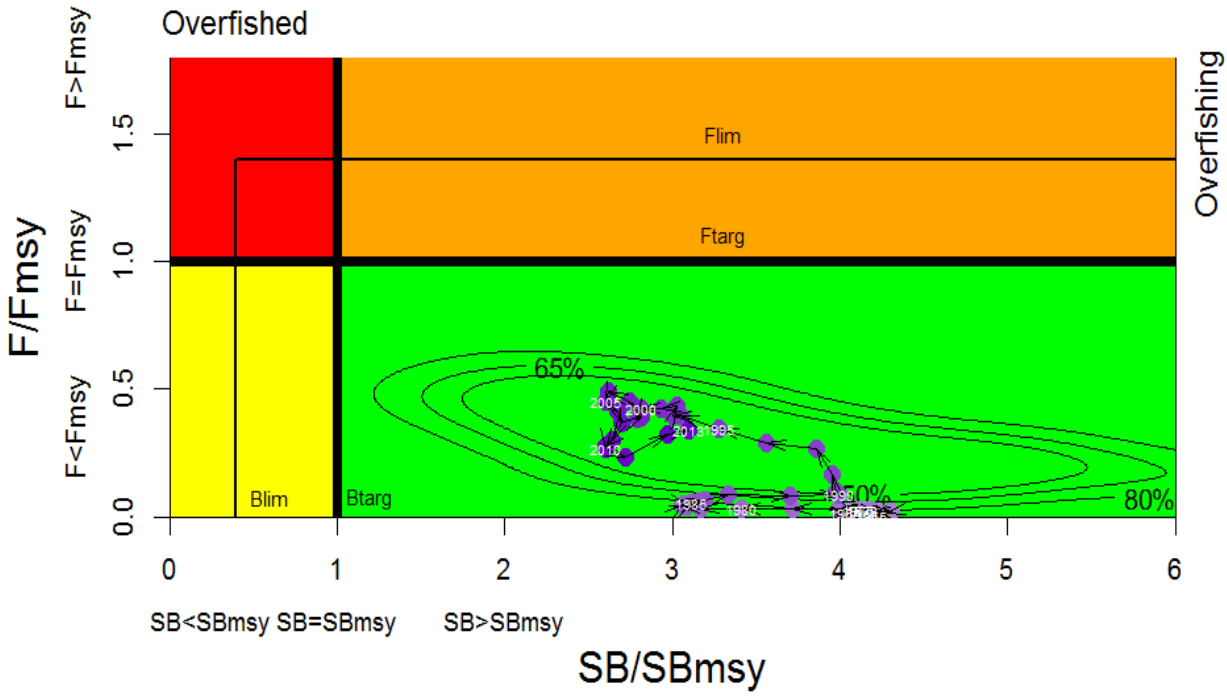


Fig. 2. Swordfish: SS3 Aggregated Indian Ocean assessment Kobe plot (contours are the 50, 65 and 80 percentiles of the 2013 estimate). Blue circles indicate the trajectory of the point estimates for the SB ratio and F ratio for each year 1950–2013. Interim target (F_{targ} and SB_{targ}) and limit (F_{lim} 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, 27,809 t) 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, 27,809 t) 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

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		2016 stock status determination
Indian Ocean	Catch 2015[2]:	18,490 t	80%*
	Average catch 2011–2015:	15,276 t	
	MSY (1,000 t) (80% CI):	9.932 (6.963-12.153)	
	F_{MSY} (80% CI):	0.211 (0.089-0.430)	
	B_{MSY} (1,000 t) (80% CI):	47.430 (27.435-100.109)	
	F_{2015}/F_{MSY} (80% CI):	2.42 (1.52-4.06)	
	B_{2015}/B_{MSY} (80% CI):	0.81 (0.55-1.10)	
	B_{2015}/B_{1950} (80% CI):	0.30 (0.20-0.41)	

[1]Boundaries for the Indian Ocean = IOTC area of competence;
[2]Proportion of catch estimated or partially estimated by IOTC Secretariat in 2015: 22%
* 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.

Colour key	Stock overfished ($B_{year}/B_{MSY}< 1$)	Stock not overfished ($B_{year}/B_{MSY}\geq 1$)
Stock subject to overfishing ($F_{year}/F_{MSY}> 1$)	80%	19%
Stock not subject to overfishing ($F_{year}/F_{MSY}\leq 1$)	0%	1%
Not assessed/Uncertain		

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. Stock status based on BSP-SS stock assessment suggests that the stock in 2015 is in the red zone in the Kobe plot with F/F_{MSY}=2.42 and B/B_{MSY}=0.81. Another approach by ASPIC examined in 2016 came to similar conclusions. The Kobe plot (Fig. 2) from the BSP-SS model indicated that the stock has been **subject to overfishing** and **overfished** in recent years (Table 1; Fig. 2).

Outlook. The uncertainty in the data available for assessment purposes and the CPUE series suggests that the advice should be interpreted with caution. The recent sharp increase of catch changed the status of stock to the red zone of the Kobe plot. Even if the catch levels are reduced by 40% of the average 2013-2015 levels, it is unlikely that biomass would be above the B_{MSY} and F would be below the F_{MSY} in the next 10 years.(Table 2).

Management advice. The current catches of BLM (average of 17,171 t in the last 3 years between 2013-2015) (Fig. 1) are considerably higher than MSY (9,932 t) and the stock is overfished ($B_{2015}< B_{MSY}$ and currently subject to overfishing ($F_{2015}> F_{MSY}$). Even with a 40% reduction in current catches, it is very unlikely (less than 5%) to achieve the Commission objectives of being in the green zone of the Kobe Plot by 2025. Current catch levels are not sustainable and there is a need for urgent actions to decrease these catch levels. **The SC recommends that the maximum catch limit should be lower than MSY (9,932t).**

The following key points should be noted:

- **Maximum Sustainable Yield (MSY)**: estimate for the whole Indian Ocean is 9,932 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** (2012–15): gillnet: 51%; Longline: 27% (of the total estimated black marlin catch).
- **Main fleets** (2012–15): I.R. Iran (gillnet): 29%; India (gillnet and troll): 20%, Sri Lanka (gillnet and fresh longline): 19%; Indonesia (fresh longline and hand line): 15% (of the total estimated black marlin catch).

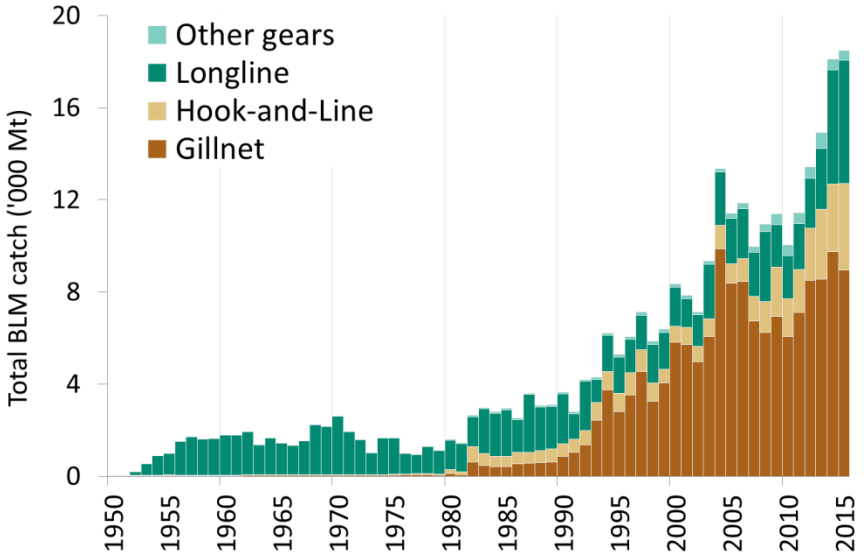


Fig. 1. Black marlin: catches by gear and year recorded in the IOTC Database (1950–2015). Other gears includes: coastal purse seine, Danish purse seine, beach seine and purse seine.

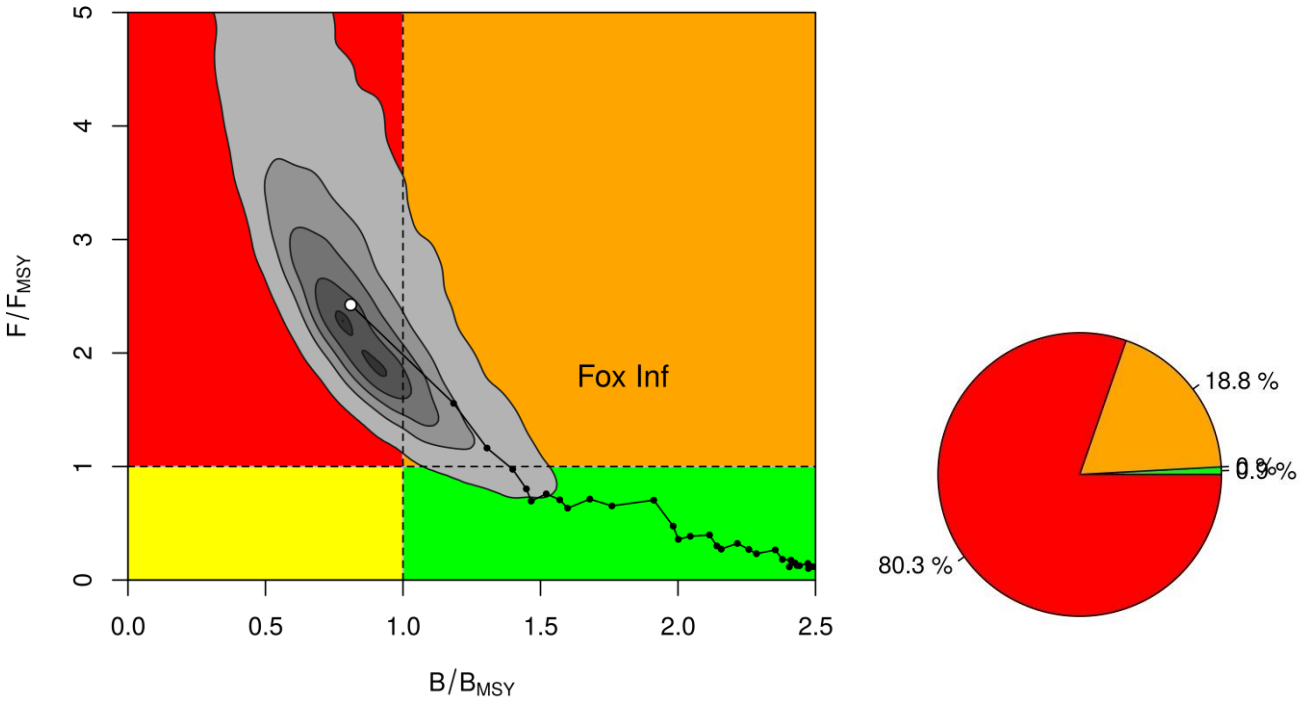


Fig. 2. Black marlin: BSP-SS aggregated Indian Ocean assessment Kobe plots for black marlin (contours are the 25, 50, 75 and 90 percentiles of the 2015 estimate). Black line indicates the trajectory of the point estimates (blue circles) for the spawning biomass (B) ratio and F ratio for each year 1950–2015.

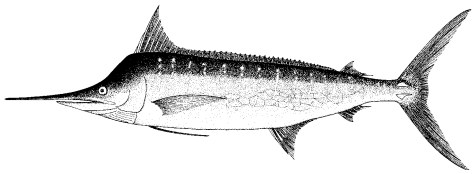
Table 2. Black Marlin: Indian Ocean BSP-SS Kobe II Strategy Matrix.Probability (percentage) of violating the MSY-based target reference points for nine constant catch projections (average catch level from 2013–15 (17,171 t), ± 10%, ± 20%, ± 30% ± 40%) projected for 3 and 10 years.

Reference point and projection timeframe	**Alternative catch projections (relative to the average catch level from 2013–15, 17,171 t) and probability (%) of violating MSY-based target reference points ($B_{targ} = B_{MSY}$; $F_{targ} = F_{MSY}$)**								
	60%	**70%**	**80%**	**90%**	**100%**	**110%**	**120%**	**130%**	**140%**
	10,303 t	12,020 t	13,737 t	15,454 t	17,171 t	18,888 t	20,605 t	22,322 t	24,039 t

$B_{2018} < B_{MSY}$	91	94	96	97	98	98	99	99	99
$F_{2018} > F_{MSY}$	89	96	98	99	100	100	100	100	100
$B_{2025} < B_{MSY}$	98	100	100	100	100	100	100	100	100
$F_{2025} > F_{MSY}$	97	99	100	100	100	100	100	100	100

APPENDIX XIV
EXECUTIVE SUMMARY: BLUE MARLIN

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



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 2015[2]: Average catch 2011–2015:	15,706 t 14,847 t	**46.8%***
	MSY (1,000 t) (80% CI): F_{MSY} (80% CI): B_{MSY} (1,000 t) (80% CI): F_{2015}/F_{MSY} (80% CI): B_{2015}/B_{MSY} (80% CI): B_{2015}/B_{1950} (80% CI):	11.926 (9.232–16.149) 0.109 (0.076 –0.160) 113.012 (71.721 – 161.946) 1.18 (0.80–1.71) 1.11 (0.90–1.35) 0.56 (0.44 – 0.71)	

[1]Boundaries for the Indian Ocean = IOTC area of competence; n.a. = not available
[2]Proportion of catch estimated or partially estimated by IOTC Secretariat in 2015: 47%
* 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.

Colour key	Stock overfished($B_{year}/B_{MSY}< 1$)	Stock not overfished ($B_{year}/B_{MSY}\geq 1$)
Stock subject to overfishing($F_{year}/F_{MSY}> 1$)	24.6%	46.8%
Stock not subject to overfishing ($F_{year}/F_{MSY}\leq 1$)	1.0%	27.6%
Not assessed/Uncertain		

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. Stock status based on BSP-SS stock assessment suggests that the stock in 2015 is in the orange zone in the Kobe plot and both F and B are close to their MSYs, i.e., F/F_{MSY}=1.18 and B/B_{MSY}=1.11. Two other approaches examined in 2016 came to similar conclusions, namely ASPIC and SS3. The Kobe plot (Fig. 2) from the BSP-SS model indicated that the stock has been **subject to overfishing** but **not overfished** in recent years, while the stock biomass is slightly above the BMSY level (Table 1; Fig. 2).

Outlook. The uncertainty in the data available for assessment purposes and the CPUE series suggests that the advice should be interpreted with caution. The recent rapid increase of catch may bring the status of stock to the red zone (Kobe plot) in the near future if such high levels of catch continue. There is a high probability (70-80%) to exceed MSY-based reference points in next 10 years if the current catch level is continued. But if the catch level is reduced by 20%, then the risk will be reduced to close to or less than 50% (Table 2).

Management advice. The current catches of BUM (average of 14,847 t in the last 5 years, 2011-2015) (Fig.1) are higher than MSY (11,926 t) and the stock is currently subject to overfishing ($F_{2015} > F_{MSY}$). In order to achieve the Commission objectives of being in the green zone of the Kobe Plot by 2025 ($F_{2025} < F_{MSY}$ and $B_{2025} > B_{MSY}$) with at least a 50% probability, the catches of blue marlin would have to be reduced by 24% compared to the average catch of 2013-2015, to a maximum value of 11,704 t.

The following key points should be noted:

- **Maximum Sustainable Yield (MSY)**: estimate for the whole Indian Ocean is 11,926 t (estimated range 9,232–16,149 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** (2012–15): Longline: 74%; Gillnet: 23% (of the total estimated blue marlin catch).
- **Main fleets** (2012–15): Taiwan,China (longline): 33%; Indonesia (fresh longline): 31%; Pakistan (gillnet): 12%; I.R. Iran (gillnet): 9%; Sri Lanka: 6% (of the total estimated blue marlin catch).

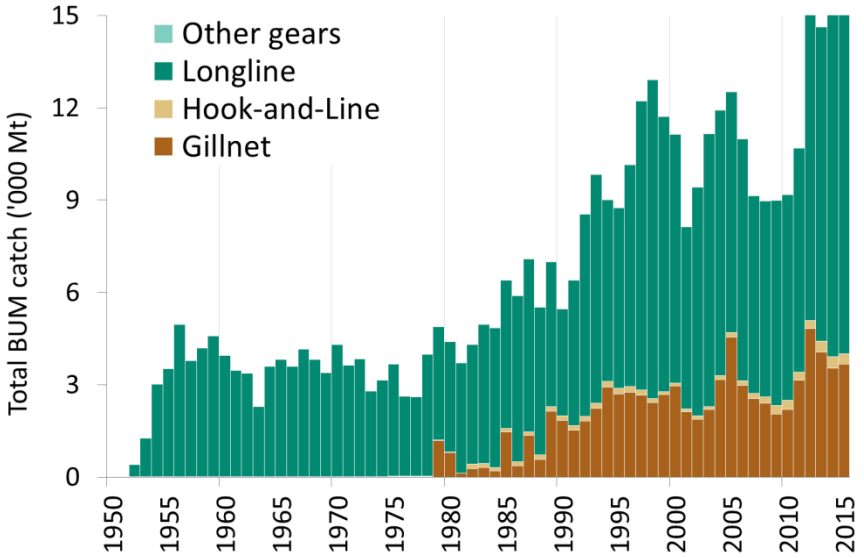


Fig. 1. Blue marlin: catches by gear and year recorded in the IOTC Database (1950–2015). Other gears includes: coastal purse seine, Danish purse seine, beach seine and purse seine.

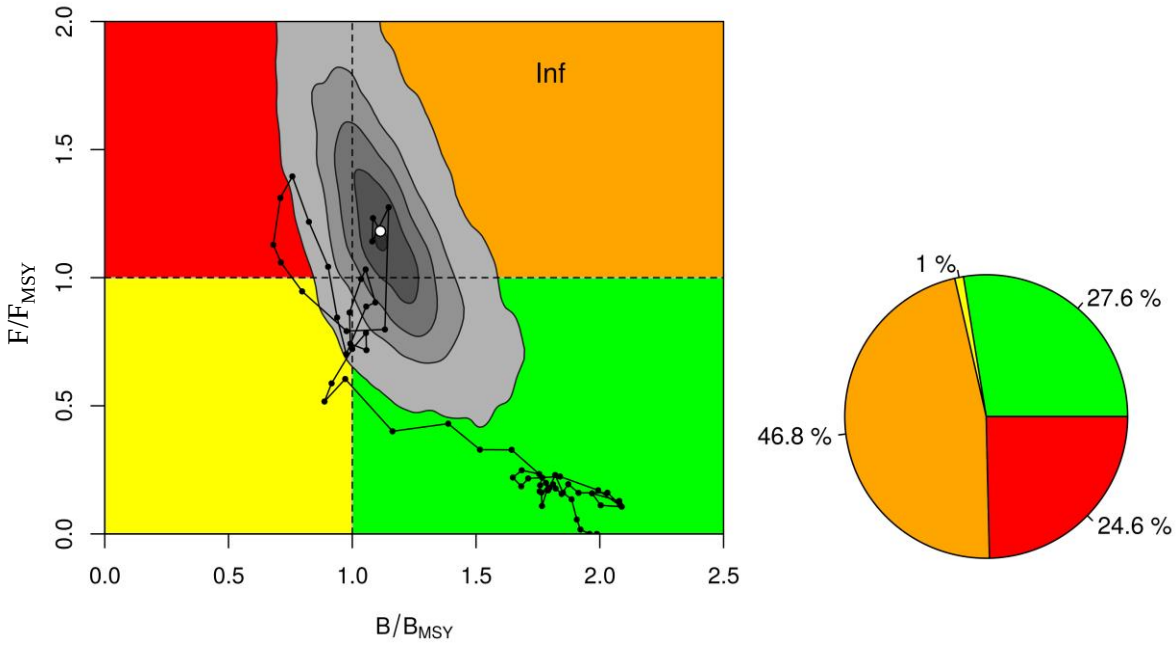


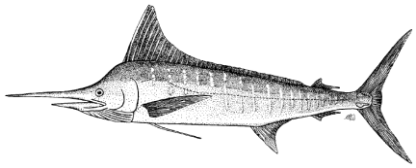
Fig. 2. Blue marlin: BSP-SS Aggregated Indian Ocean assessment Kobe plot for blue marlin (90% bootstrap confidence surfaces shown around 2015 estimate). Black line indicates the trajectory of the point estimates for the biomass (B) ratio and F ratio for each year 1950–2015.

Table 2. Blue Marlin: Indian Ocean BSP-SS Kobe II Strategy Matrix. Probability (percentage) violating the MSY-based target reference points for nine constant catch projections (average catch level from 2013–2015 (15,401 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 2013–2015, 15,401 t) and probability (%) of violating MSY-based target reference points ($B_{targ} = B_{MSY}$; $F_{targ} = F_{MSY}$)**								
	60%	**70%**	**80%**	**90%**	**100%**	**110%**	**120%**	**130%**	**140%**
	9,240 t	10,780 t	12,321 t	13,861 t	15,401 t	16,941 t	18,481 t	20,021 t	21,561 t
$B_{2018}<B_{MSY}$	26	31	37	43	48	54	59	64	69
$F_{2018}> F_{MSY}$	14	30	47	63	75	84	90	94	96
$B_{2025}<B_{MSY}$	16	30	46	60	73	82	88	93	95
$F_{2025}> F_{MSY}$	12	30	51	68	80	89	93	96	98

APPENDIX XV
EXECUTIVE SUMMARY: STRIPED MARLIN

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



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 2015[2]:	4,410 t	
	Average catch 2011–2015:	4,481 t	
	MSY (1,000 t) (80% CI):	5.22 (5.18–5.59)	60%*
	F_{MSY} (80% CI):	0.62 (0.59–1.04)	
	B_{MSY} (1,000 t) (80% CI):	8.4 (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.)	

[1]Boundaries for the Indian Ocean = IOTC area of competence; n.a. = not available.
[2]Proportion of catch estimated or partially estimated by IOTC Secretariat in 2015: 53%
* 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.

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. No new assessment was done in 2016. 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. Two approaches examined in 2015 came to similar conclusions, namely a Bayesian Surplus Production Model, and a Stock Reduction Analysis using only catch data. 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. In 2016 reported catches increased to 4,410 t. On the weight-of-evidence available in 2016, the stock is determined to be ***overfished*** and ***subject to overfishing*** (Table 1; Fig. 2).

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, given 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 in order to reduce catches well below MSY estimates to enable the stock to rebuild. The K2SM provides the Commission with a range of catch scenarios and associated probabilities of striped marlin stock status in relation to MSY reference levels (Table 2).There is a very high risk of exceeding the biomass MSY-based reference points by 2017 if catches increase further or are maintained at current levels (average 2012-2014) until 2017 (>75% risk that $B_{2017}< B_{MSY}$, and $F_{2017}> F_{MSY} \approx 68\%$) (Table 2).

Management advice. A precautionary approach to the management of striped marlin should be considered by the Commission to reduce catches below 4,000 t thereby ensuring the stock may rebuild to sustainable levels.

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 4,410 t. Catches should be reduced to below 4,000 t following advice from the 18th Session of the Scientific Committee.

- **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 have been established for striped marlin.
- **Main fishing gear** (2012–15): Longline: 69%; Gillnet: 24% (of the total estimated striped marlin catch).
- **Main fleets** (2012–15): Indonesia (drifting longline and coastal longline): 36%; Taiwan,China (drifting longline): 23%; I.R. Iran (gillnet): 14%; Pakistan (gillnet): 8% (of the total estimated striped marlin catch).

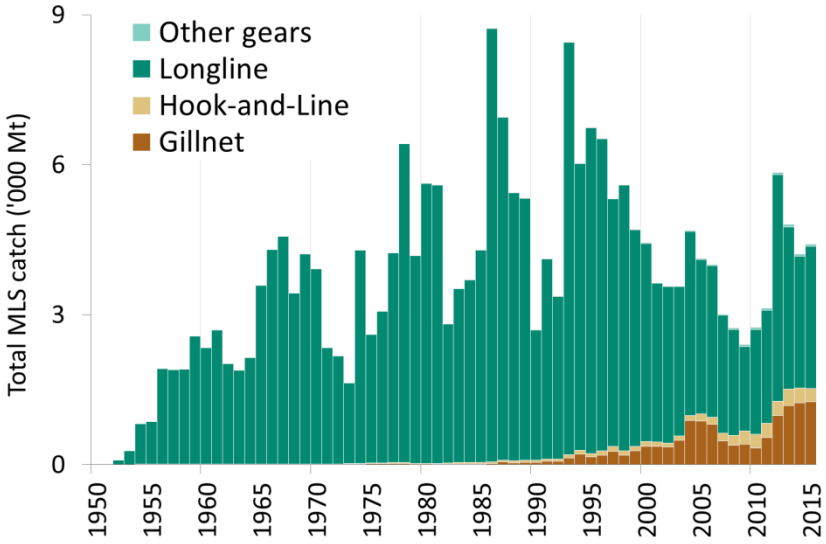


Fig. 1. Striped marlin: catches by gear and year recorded in the IOTC Database (1950–2015).Other gears includes: coastal purse seine, Danish purse seine, beach seine and purse seine.

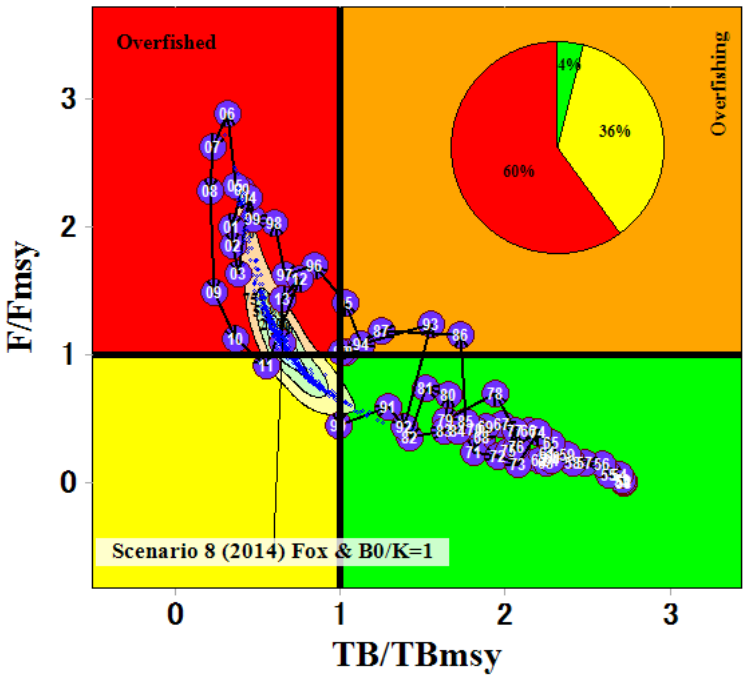


Fig. 2. Striped marlin: ASPIC aggregated Indian Ocean assessment Kobe plot with the confidence surface and compositions of its uncertainties in terms of 4 phases (pie chart).

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%	**70%**	**80%**	**90%**	**100%**	**110%**	**120%**	**130%**	**140%**
	2,949 t	3,441 t	3,932 t	4,424 t	4,915 t	5,407 t	5,898 t	6,390 t	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		2016 stock status determination
Indian Ocean	Catch 2015[2]:	28,455 t	
	Average catch 2011–2015:	28,543 t	
	MSY (1,000 t) (80% CI):	25.00 (16.18–35.17)	
	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_0 (80% CI):	0.56 (0.44–0.67)	

[1]Boundaries for the Indian Ocean = IOTC area of competence.
[2]Proportion of catch estimated or partially estimated by IOTC Secretariat in 2015: 35%

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. In 2015, 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 (Fig. 1), indicating that fishing mortality levels may be becoming too high (Fig. 2). 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 2016, the stock is determined to be still **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.

Management advice. The same management advice for 2016 (catches below a MSY of 25,000 t) is kept for the next year (2017).

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 have been established for I.P. sailfish.

- **Main fishing gear** (2012–15): Gillnet: 75%; Troll and handlines: 18% (of the total estimated I.P. sailfish catch).
- **Main fleets** (2012–15): I.R. Iran (gillnet): 31%; Pakistan (gillnet): 18%; India (gillnet and troll): 17%; Sri Lanka (gillnet and fresh longline): 10% (of the total estimated I.P. sailfish catch).

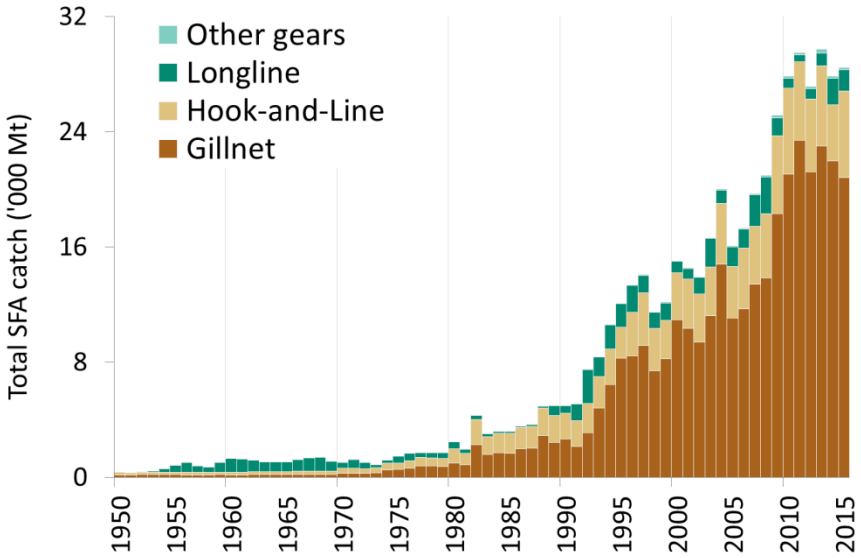


Fig. 1. Indo-Pacific sailfish: catches by gear and year recorded in the IOTC Database (1950–2015). Other gears includes: coastal purse seine, Danish purse seine, beach seine and purse seine.

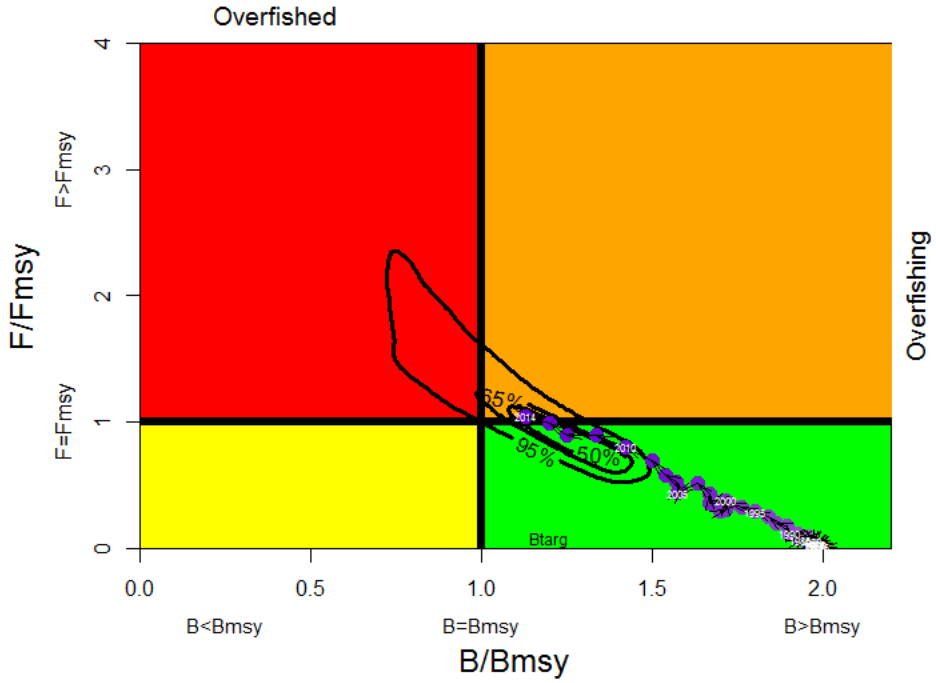


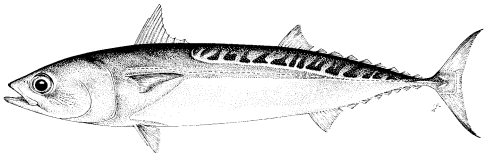
Fig. 2. Indo-Pacific sailfish: Stock reduction analysis (Catch MSY Method) of aggregated Indian Ocean assessment Kobe plot (contours are the 50, 65 and 90 percentiles of the 2014 estimate). Black lines indicate the trajectory of the point estimates (blue circles) for the B ratio and F ratio for each 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%	**70%**	**80%**	**90%**	**100%**	**110%**	**120%**	**130%**	**140%**
	17,498 t	20,415 t	23,331 t	26,248 t	29,164 t	32,080 t	34,997 t	37,913 t	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		2016 stock status determination
Indian Ocean	Catch 2015[2]: Average catch2011–2015:	10,481 t 8,987 t	
	MSY (1,000 t) (80% CI): F_{MSY} (80% CI): B_{MSY} (1,000 t) (80% CI): F_{2015}/F_{MSY} (80% CI): B_{2015}/B_{MSY} (80% CI): B_{2015}/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]Proportion of catch estimated or partially estimated by IOTC Secretariat in 2015: 37%
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 10,481t (Fig.1). 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.

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 2011–2015). 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.

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.

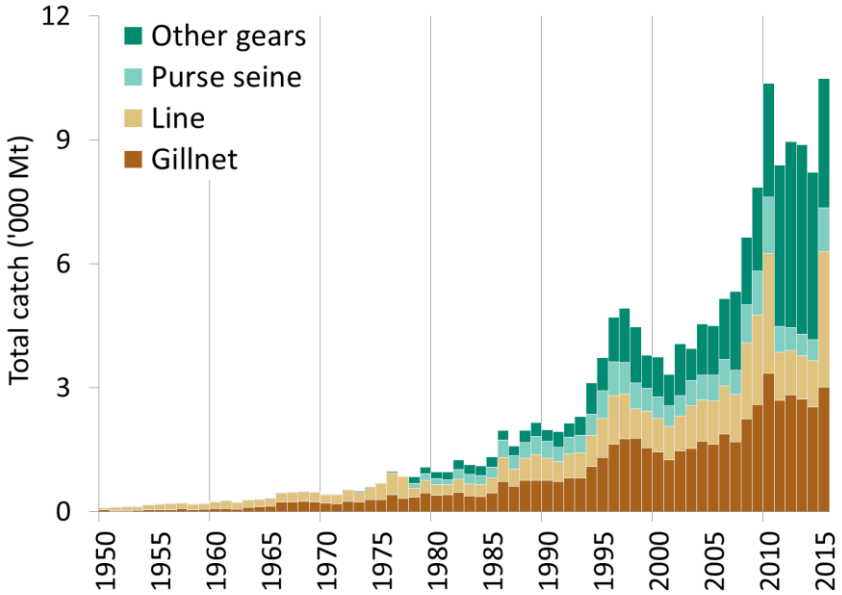
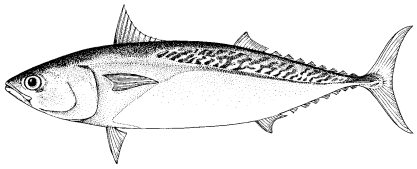


Fig. 1. Bullet tuna: Annual catches of bullet tuna by gear recorded in the IOTC Database (1950–2015) (data as of October 2016).

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		2016 stock status determination
Indian Ocean	Catch 2015[2]:	81,441 t	
	Average catch 2011–2015:	94,657 t	
	MSY (1,000 t) (80% CI):	unknown	
	F_{MSY} (80% CI):	unknown	
	B_{MSY} (1,000 t) (80% CI):	unknown	
	F_{2015}/F_{MSY} (80% CI):	unknown	
	B_{2015}/B_{MSY} (80% CI):	unknown	
	B_{2015}/B_0 (80% CI):	unknown	

[1]Boundaries for the Indian Ocean stock assessment are defined as the IOTC area of competence.
[2]Proportion of catch estimated or partially estimated by IOTC Secretariat in 2015: 79%
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 (~100,000 t) (Fig.1). There is insufficient information to evaluate the effect that this level of catch, or a further increase in catch may have on the resource. Research emphasis on improving indicators and exploration of stock structure and stock assessment approaches for data poor fisheries should be considered a high priority for this species.

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 2011–2015: 94,657 t). 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.

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.

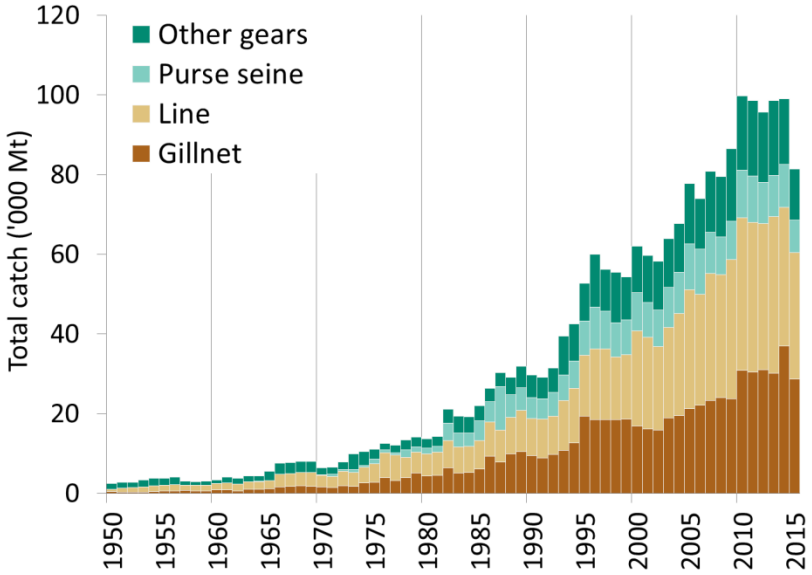
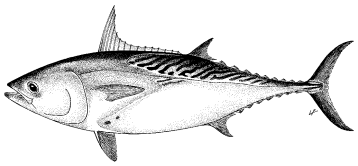


Fig. 1. Frigate tuna: Annual catches of frigate tuna by gear recorded in the IOTC Database (1950–2015) (data as of October 2016).

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		2016 stock status determination
Indian Ocean	Catch 2015[2]: Average catch 2011–2015:	152,772 t 158,817 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]Proportion of catch estimated or partially estimated by IOTC Secretariat in 2015: 45%
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. A stock assessment was not undertaken for kawakawa in 2016 and status is determined on the basis of the 2015 assessment, which used catch data from 1950 to 2013. Analysis using an Optimised Catch Only Method (OCOM) approach in 2015 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, and the large increase in kawakawa catches over the last decade (Fig. 1), measures need to be taken in order to slow the rate of increasing catch, though catch of 2014 and 2015 are lower than that estimated in 2013. 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. 2). Further analysis of the CPUE data should be undertaken in preparation for the next stock assessment 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 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).

Management Advice. Although the stock status is classified as not overfished and not subject to overfishing, the K2SM developed in 2015 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 2013 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 2013 catch levels, 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 2013 levels.

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

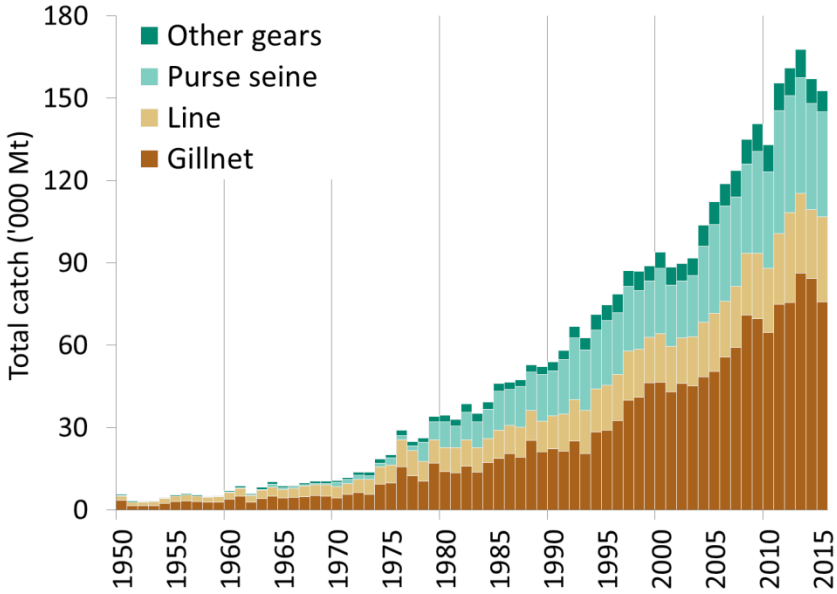


Fig. 1. Kawakawa: Annual catches of kawakawa by gear recorded in the IOTC database (1950–2015) (data as of October 2016).

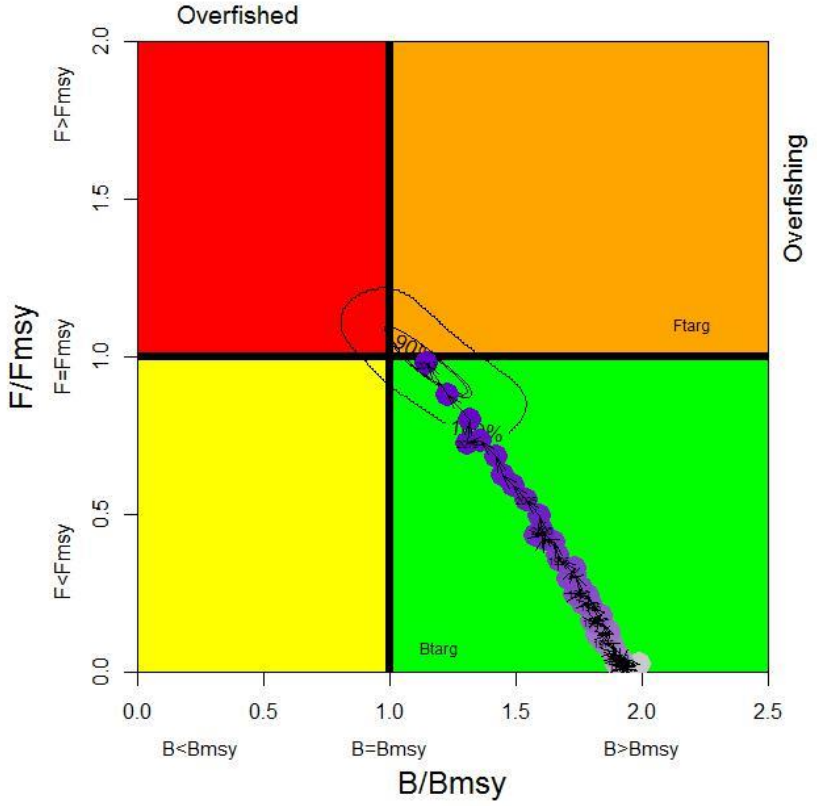


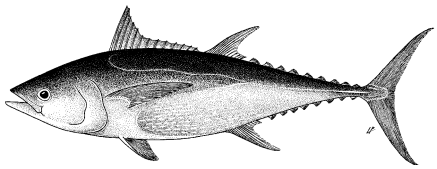
Fig. 2. Kawakawa. OCOM aggregated Indian Ocean assessment. The Kobe plot presents the trajectories for the range of plausible model options included in the formulation of the final management advice. The trajectory of the geometric mean of the plausible model options is also presented (1950–2013).

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

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		2016 stock status determination
Indian Ocean	Catch 2015[2]: Average catch 2011–2015:	135,920 t 157,313 t	**51%**
	MSY (1,000 t) (*): F_{MSY} (*): B_{MSY} (1,000 t) (*): F_{2014}/F_{MSY} (*): B_{2014}/B_{MSY} (*): B_{2014}/B_0 (*):	143 (106–194) 0.39 (0.29–0.54) 298 (197–545) 1.03 (0.88–1.26) 0.99 (0.78–1.19) 0.50 (0.39-0.60)	

[1]Boundaries for the Indian Ocean stock assessment are defined as the IOTC area of competence.
[2]Proportion of catch estimated or partially estimated by IOTC Secretariat in 2015: 32%
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 the Optimised Catch-Only Method (OCOM) indicates that the stock is being exploited at a rate that exceeded F_{MSY} in recent years, and the stock appears to be below B_{MSY} (51% of plausible models runs) (Fig. 2). Catches decreased between 2012 and 2015 from 175 459 to 135 920 t (Fig. 1). Catches have remained above MSY since 2011, except in 2015. The F_{2014}/F_{MSY} ratio is slightly lower than previous estimates, reflecting the drop in catches reported in the last few years. Nevertheless, the estimate of the B_{2014}/B_{MSY} ratio (0.99) was also slightly lower than in previous years. An assessment using Catch-MSY was also undertaken in 2016 and results were consistent with OCOM in terms of status. Therefore, based on the weight-of-evidence currently available, the stock is considered to be both **overfished** and **subject to overfishing** (Table 1; Fig. 2).

Outlook. There remains considerable uncertainty about stock structure and the total catches in the Indian Ocean. The increase of annual catches for longtail tuna to a peak in 2012 increased the pressure on the Indian Ocean stock as a whole, though that trend has reversed since then. As noted in 2015, 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 risk of exceeding MSY-based reference points by 2017 if catches are maintained at current (2014) levels (69% risk that $B2017<B_{MSY}$, and 81% risk that $F2017>F_{MSY}$). (Table 2).

Management advice. There is a continued high risk of exceeding MSY-based reference points by 2017 if catches are maintained at current (2014) levels (69% risk that $B2017<B_{MSY}$, and 81% risk that $F2017>F_{MSY}$). If catches are reduced by 10% this risk is lowered to 27% probability $B2017<B_{MSY}$ and 39% probability $F2017>F_{MSY}$). If the Commission wishes to recover the stock to levels above the MSY reference points, the Scientific Committee recommends catches should be reduced by approximately 10% of 2014 levels which corresponds to catches somewhat below MSY in order to recover the status of the stock in line with the decision framework described in Resolution 15/10.

The following should be noted:

- The Maximum Sustainable Yield estimate of around 143,000 t was exceeded since 2011 in spite of recent declines in catches, but not in 2015. Given that the stock is overfished according to the point estimate, reductions in catch are warranted to maintain the stock at B_{MSY} level.
- 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.
- Improvement in data collection and reporting is required to assess the stock status, primarily abundance index series from I.R. Iran, Oman, India and Indonesia.
- Limit reference points: The Commission has not adopted limit reference points for any of the neritic tunas under its mandate.

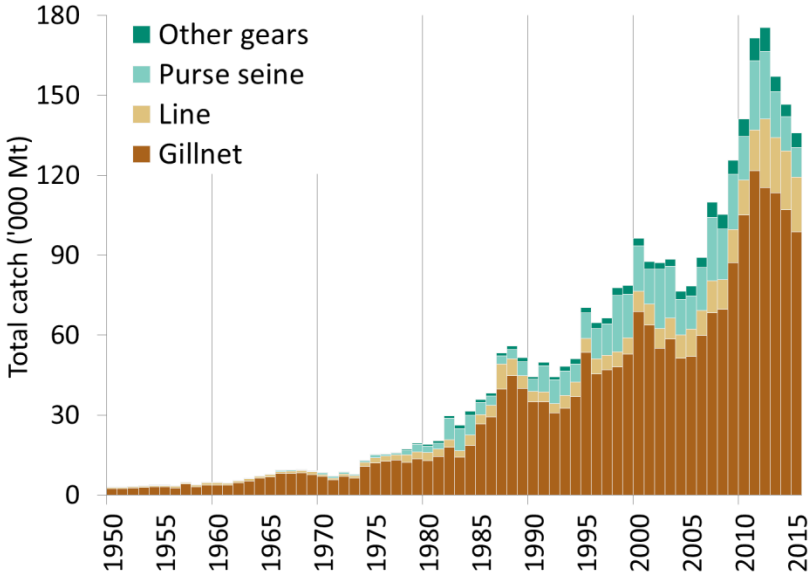


Fig. 1. Longtail tuna: Annual catches by gear recorded in the IOTC Database (1950–2015) (data as of October 2016).

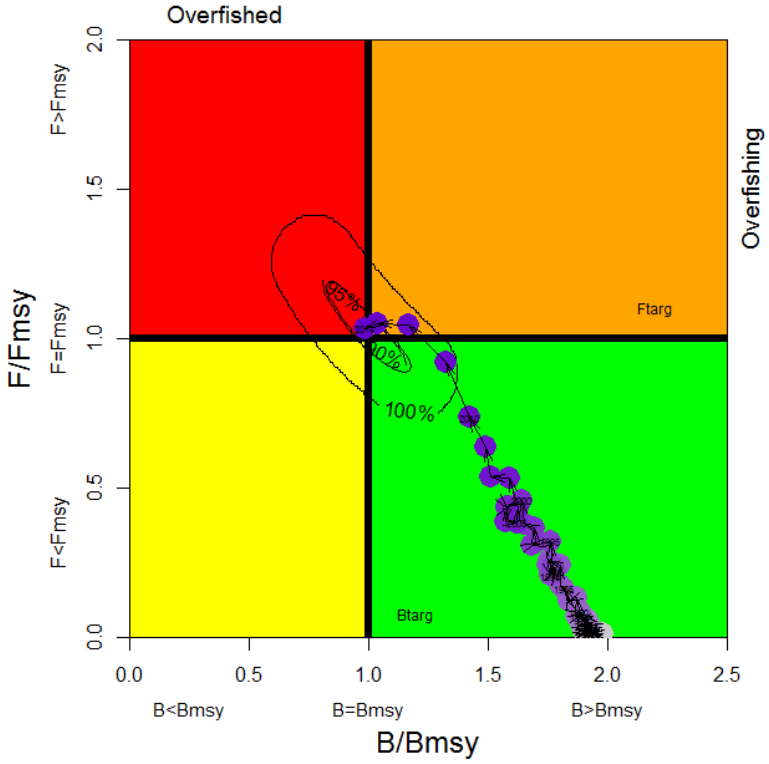


Fig. 2. Longtail tuna. Longtail OCOM Indian Ocean assessment Kobe plot (all plausible model runs shown around 2014 estimate). Blue circles indicate the trajectory of the point estimates for the SB ratio and F ratio for each year

1950–2014. Target reference points are shown as B_{MSY} and F_{MSY}.

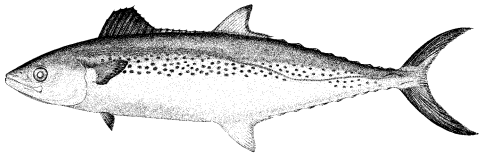
TABLE 2. Longtail tuna OCOM aggregated Indian Ocean assessment Kobe II Strategy Matrix. Probability (percentage) of violating the MSY-based target for nine constant catch projections (2014 +20%,+10%, -10%, - 20%, -30% projected for 3 and 10 years).

Reference point and projection timeframe	**Alternative catch projections (relative to 2014) and weighted probability (%) scenarios that violate reference points**					
	70% (102,726 t)	80% (117,401 t)	90% (132,076 t)	100% (146,751 t)	110% (161,426 t)	120% (176,101 t)
$B^{5}_{2017} < B_{MSY}$	1	7	27	69	95	100
$F_{2017} > F_{MSY}$	1	12	39	81	98	100
$B_{2024} < B_{MSY}$	0	0	2	85	100	100
$F_{2024} > F_{MSY}$	0	0	2	90	100	100

[5] Fishable biomass

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		2016 stock status determination
Indian Ocean	Catch 2015[2]: Average catch 2011–2015:	45,956 t 45,485 t	
	MSY (1,000 t) [*]: F_{MSY} [*]: B_{MSY} (1,000 t) [*]: F_{2014}/F_{MSY} [*]: B_{2014}/B_{MSY} [*]: B_{2014}/B_0 [*]:	46 [38.9–54.4] 0.52 [0.40–0.69] 66.0 [45.9–107.9] 0.98 [0.85–1.14] 1.10 [0.84–1.29] 0.55 [0.42–0.64]	

[1]Boundaries for the Indian Ocean stock assessment are defined as the IOTC area of competence.
[2]Proportion of catch estimated or partially estimated by IOTC Secretariat in 2015: 41%
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. Following a first data-poor assessment in 2015, Indo-Pacific king mackerel was again assessed using SRA techniques (Catch-MSY and OCOM) in 2016. The OCOM model, considered the more robust of the two SRA models applied in terms of assumptions and treatment of priors, indicates that overfishing is not occurring and the stock is not overfished (Fig. 2; Table 1). Moreover, the average catches (c. 45,000 t) over the last 5 years have been slightly below estimated MSY of 46,000 t (Fig. 1). However, catches have increased in the last 2 years and in 2014 exceeded the MSY range. The continuing low levels of catch reporting for this species, coupled with the highly variable and uncertain estimates of growth parameters used to estimate model priors, prompted the WPNT to exercise caution in interpreting model results for king mackerel. Consequently, and similar to 2015, the WPNT considered that 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 adopted.

Outlook. Total annual catches for Indo-Pacific king mackerel increased in 2013 and 2014, likely increased pressure on the Indian Ocean stock. Catches in 2015 decreased from 2014 levels. There remains considerable uncertainty about stock structure and 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, and until more data-rich approaches can be applied, data-poor approaches will be required to assess stock status. Though data-poor methods are yet to be used to provide stock status advice, further refinements to the SRA models and application of additional data-poor approaches may improve confidence in the results.

Management advice. A precautionary approach to the management of IP king mackerel should be considered by the Commission, by ensuring that catches are reduced to levels below the current estimated range 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.

The following should be noted:

- The Maximum Sustainable Yield estimate for the whole Indian Ocean is 46,000 t, and catches catches in the last 3 years have been around this level.
- 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.

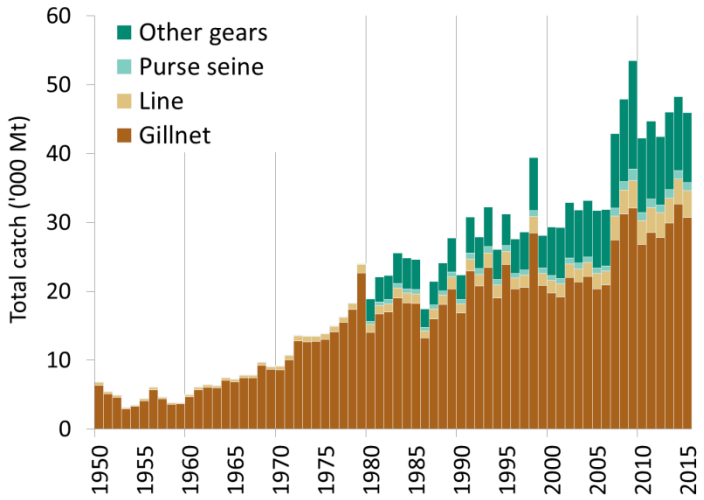


Fig. 1. Indo-Pacific king mackerel: Annual catches of Indo-Pacific king mackerel by gear recorded in the IOTC database (1950–2015) (data as of October 2016).

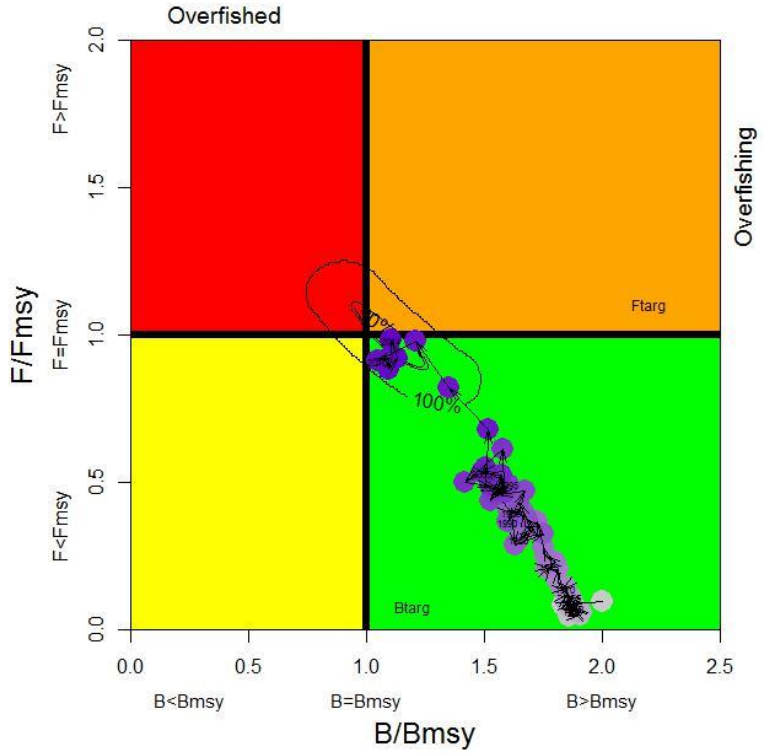
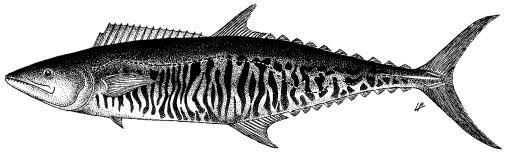


Fig. 2. Indo-Pacific king mackerel: OCOM Indian Ocean assessment Kobe plot (Plausible range shown around 2014 estimate). Blue circles indicate the trajectory of the point estimates for the SB ratio and F ratio for each year 1950–2014. Target reference points are shown (B_{MSY} and F_{MSY}).

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		2016 stock status determination
Indian Ocean	Catch 2015[2]: Average catch 2011–2015:	152,798 t 151,227 t	72%
	MSY (1,000 t) [*]: F_{MSY} [*]: B_{MSY} (1,000 t) [*]: F_{2014}/F_{MSY} [*]: B_{2014} B_{MSY} [*]: B_{2014}/B_0 [*]:	131.1 [98.7–178.8] 0.34 [0.21–0.56] 326 [178–702] 1.21 [0.95–1.48] 0.95 [0.74–1.27] 0.47 [0.37–0.63]	

[1]Boundaries for the Indian Ocean stock assessment are defined as the IOTC area of competence.
[2] Proportion of catch estimated or partially estimated by IOTC Secretariat in 2015: 54%
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} (72% of plausible model runs). 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 for this stock. Based on the weight-of-evidence available, including the two different SRA approaches pursued in 2016, the stock appears to be **overfished** and **subject to overfishing** (Table 1, Fig. 2). Catches in 2015 and recent average catches are above the current MSY median estimates (131,000 t) (Fig. 2).

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 2017 and 2024 if catches are maintained at current (2014) levels (100% risk that $B_{2017}<B_{MSY}$, and 100% risk that $F_{2017}>F_{MSY}$) (Table 2).

Management advice. There is a continued high risk of exceeding MSY-based reference points by 2024, even if catches are reduced to 80% of the 2014 levels (53% risk that $B_{2024}<B_{MSY}$, and 97% risk that $F_{2024}>F_{MSY}$). The modelled probabilities of the stock achieving levels consistent with the MSY reference levels (e.g. $B > B_{MSY}$ and $F<F_{MSY}$) in 2024 are 1 and 10%, 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 at least 30% of current levels which corresponds to catches below MSY in order to recover the status of the stock.

The following should be noted:

- Maximum Sustainable Yield estimate for the whole Indian Ocean was estimated at 131,000, while 2015 catches (152,798 t) are exceeding this level.
- The change in advice from 2015 is due to the fact that the stock biomass has continued to decline, and that catches have continued to increase in 2013 and 2014, resulting in a lower probability of recovering the stock with last year's recommended reduction in catches.
- Reconstruction of the catch history needs to occur, as do improvements to 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 increase in narrow-barred Spanish mackerel catch in the last decade, measures need to be taken to reduce catches in the Indian Ocean (Table 2).
- Limit reference points: The Commission has not adopted limit reference points for any of the neritic tunas under its mandate.

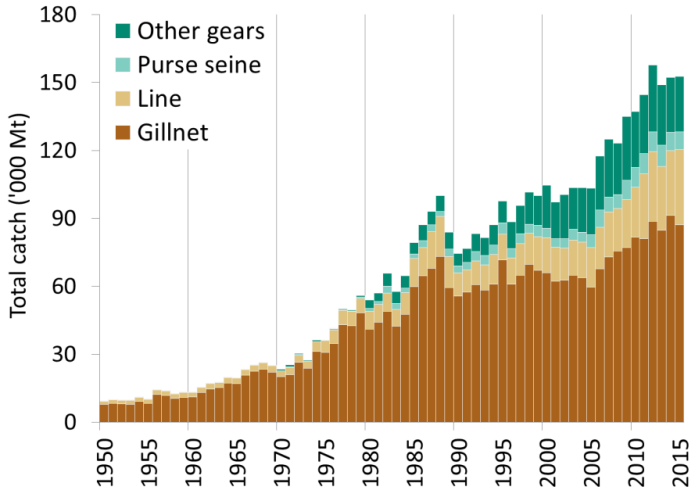


Fig. 1. Narrow-barred Spanish mackerel: Annual catches of narrow-barred Spanish mackerel by gear recorded in the IOTC database (1950–2015) (data as of October 2016).

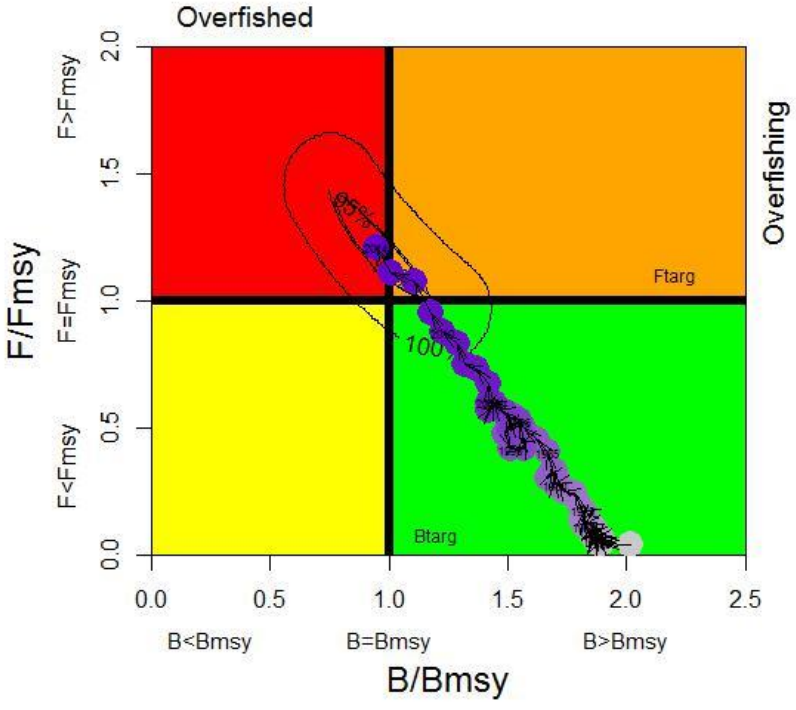


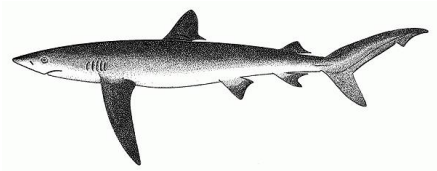
Fig. 2. Narrow-barred Spanish mackerel. OCOM Indian Ocean assessment Kobe plot. The Kobe plot presents the trajectories for the range of plausible model options included in the formulation of the final management advice. The trajectory of the geometric mean of the plausible model options is also presented.

Table 2. Narrow-barred Spanish mackerel: 2016 OCOM Indian Ocean assessment Kobe II Strategy Matrix. Probability (percentage) of plausible models violating the MSY-based reference points for five constant catch projections (2014 catch level, -10%, -20%, -30%, +10% and + 20%) projected for 3 and 10 years. Note: from the 2016 stock assessment using catch estimates at that time.

Reference point and projection timeframe	**Alternative catch projections (relative to 2014) and weighted probability (%) scenarios that violate reference point**					
	70% (108,306 t)	**80%** (123,778 t)	**90%** (139,251 t)	**100%** (154,723 t)	**110%** (170,195t)	**120%** (185,668 t)
$B_{2017} < B_{MSY}$	53	86	98	100	100	100
$F_{2017} > F_{MSY}$	97	100	100	100	100	100
$B_{2024} < B_{MSY}$	1	53	100	100	100	100
$F_{2024} > F_{MSY}$	10	97	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[6]	Indicators		2016 stock status determination
Indian Ocean	Reported catch 2015[2]:	30,054 t	
	Not elsewhere included (nei) sharks[3] 2015:	57,125 t	
	Average reported catch 2011–15:	29,535 t	
	Ave. not elsewhere included (nei) sharks[3] 2011–15:	49,785 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]Proportion of catch estimated or partially estimated by IOTC Secretariat for 2015: 65%
[3]Includes all other shark catches reported to the IOTC Secretariat, which may contain this species (i.e., SHK: sharks various nei; RSK: requiem sharks nei).

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

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

Common name	Scientific name	IUCN threat status[3]		
		Global status	WIO	EIO
Blue shark	*Prionace glauca*	Near Threatened	–	–

The process of the threat assessment from IUCN is independent from the IOTC and is presented for information purpose only 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, Fig. 1). Three stock assessment models were applied to the blue shark resource in 2015 (Fig. 2). 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 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** (2011–15): Coastal longline; longline targeting swordfish; longline (deep-freezing).
- **Main fleets** (2011–15): Indonesia; EU,Spain; Taiwan, China; Japan; EU,Portugal.

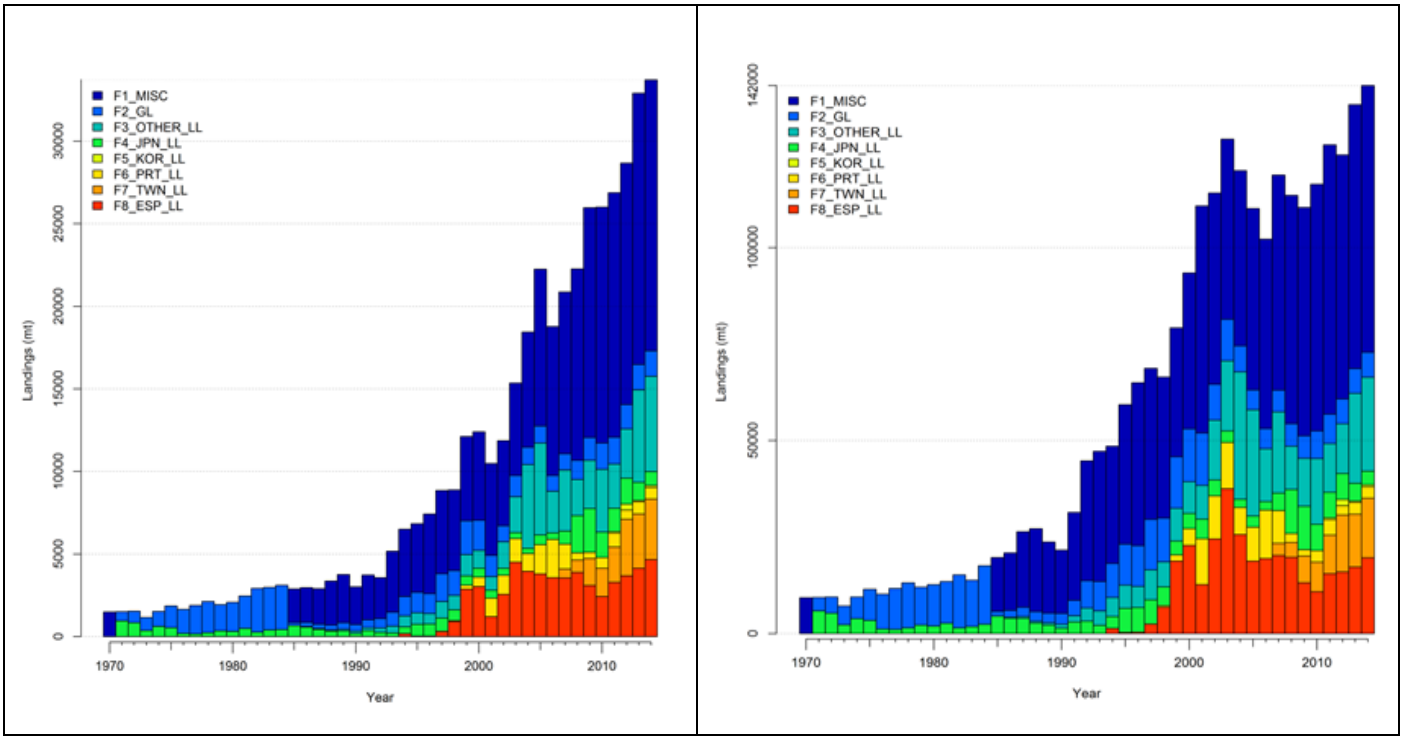


Fig. 1. Blue shark: Total reported catch estimates (Left: IOTC database; Right: Trade data) by fleet from 1970–2014 (MISC = other gears; GL = Gillnet; LL = Longline; JPN = Japan; KOR = Rep. of Korea; PRT = EU,Portugal; TWN = Taiwan,China; ESP = EU,Spain)

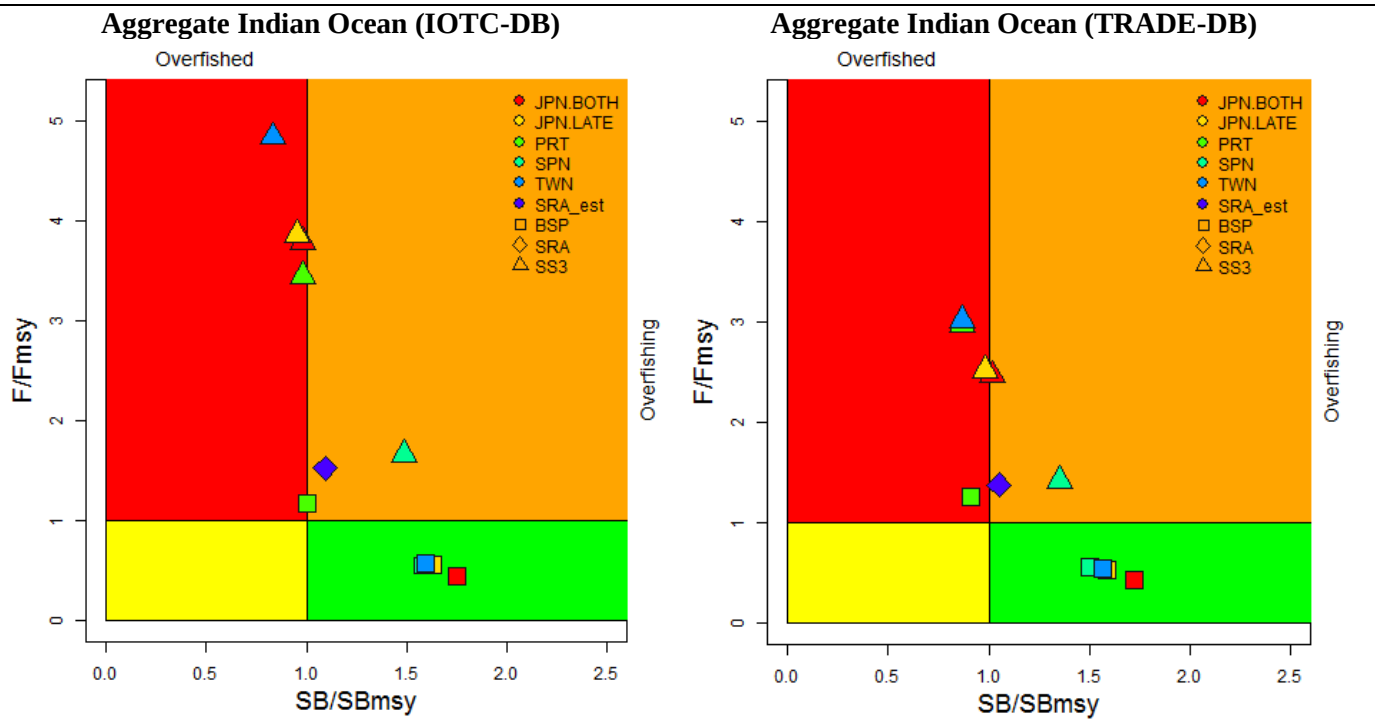


Fig. 2. Blue shark: Aggregated Indian Ocean stock assessment Kobe plot for the 2014 estimate based on a range of models explored with steepness = 0.5, and fits to CPUE series. Note that these are for different datasets, namely the IOTC DB and Trade based datasets (IOTC DB: left panel and TRADE DB: right 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.

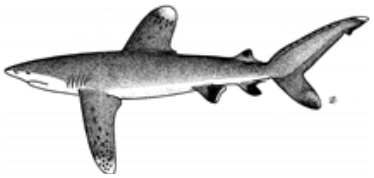
Reference point and projection timeframe	**Alternative catch projections (relative to the average catch level from 2012–2014, 31,759 t) and probability (%) of violating MSY-based target reference points ($B_{targ} = B_{MSY}$; $F_{targ} = F_{MSY}$)**								
	60% (19,055t)	**70%** (22,231 t)	**80%** (25,407 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



Status 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		2016 stock status determination
Indian Ocean	Reported catch 2015[2]: Not elsewhere included (nei) sharks[3] 2015: Average reported catch 2011–2015: Av. not elsewhere included 2011-2015 (nei) sharks[3]:	211 t 57,125t 248 t 49,785 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]Proportion of catch estimated or partially estimated by IOTC Secretariat for 2015: 0%
[3]Includes all other shark catches reported to the IOTC Secretariat, which may contain this species (i.e., SHK: sharks various nei; RSK: requiem sharks nei).

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

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 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 Despite the limited amount of data, recent studies (Tolotti et al., 2016) suggest that oceanic whitetip shark abundance has declined in recent years (2000-2015) compared to historic years (1986-1999). Available pelagic longline 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).

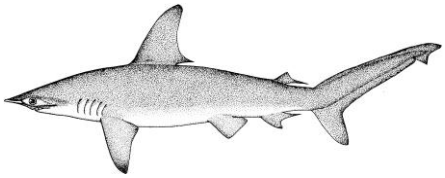
Outlook. Maintaining or increasing effort with associated fishing mortality can result in declines in biomass, productivity and CPUE. The impact of piracy in the western Indian Ocean has resulted in the displacement and subsequent concentration of a substantial portion of longline fishing effort into 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, noting that recent studies suggest that longline mortality at haulback is high (50%) in the Indian Ocean (IOTC-2016-WPEB12-26), while mortality rates for interactions with other gear types such as purse seines and gillnets may be higher. 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** (2011–15): Gillnet; gillnet-longline.
- **Main fleets** (2011–15): I.R. Iran; Sri Lanka; Madagascar; China.

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		2016 stock status determination
Indian Ocean	Reported catch 2015[2]:	52 t	
	Not elsewhere included (nei) sharks[3] 2015:	57,125t	
	Average reported catch 2011–2015:	75 t	
	Av. not elsewhere included (nei) sharks[3] 2011–15:	49,785 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]Proportion of catch estimated or partially estimated by IOTC Secretariat for 2015: 0%
[3]Includes all other shark catches reported to the IOTC Secretariat, which may contain this species (i.e., SHK: sharks various nei; RSK: requiem sharks nei).

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[3]		
		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
[3]The process of the threat assessment from IUCN is independent from the IOTC and is presented for information purpose only
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 (Murua et al., 2012) 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. 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** (2011–15): Gillnet-longline; longline-gillnet; longline (fresh).
- **Main fleets** (2011–15): Sri Lanka; NEI-Fresh

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		2016 stock status determination
Indian Ocean	Reported catch 2015[2]: Not elsewhere included (nei) sharks[3] 2015: Average reported catch 2010–15: Av. not elsewhere included (nei) sharks[3] 2011–15:	1,268 t 57,125t 1,447 t 49,785 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]Proportion of catch estimated or partially estimated by IOTC Secretariat for 2015: 21%
[3]Includes all other shark catches reported to the IOTC Secretariat, which may contain this species (i.e., SHK: sharks various nei; RSK: requiem sharks nei).

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[3]		
		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
[3]The process of the threat assessment from IUCN is independent from the IOTC and is presented for information purpose only
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 (Murua et al., 2012) 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

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.

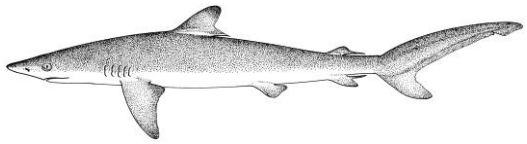
Management advice. A precautionary approach to the management of shortfin mako shark should be considered by the Commission. Mechanisms need to be developed by the Commission to encourage CPCs to comply with their recording and reporting requirement on sharks, so as to better inform scientific advice.

The following key points should also be noted:

- **Maximum Sustainable Yield (MSY)**: Unknown.
- **Reference points**: Not applicable.
- **Main fishing gear** (2011–15): Longline targeting swordfish; longline (deep-freezing); longline (targeting sharks); gillnet.
- **Main fleets** (2011–15): EU,Spain; South Africa; EU,Portugal; Japan.

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		2016 stock status determination
Indian Ocean	Reported catch[2] 2015: Not elsewhere included (nei) sharks[3] 2015: Average reported catch 2011–15: Av. not elsewhere included (nei) sharks[3] 2011–15:	3,232 t 57,125t 3,707 t 49,785 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]Proportion of catch estimated or partially estimated by IOTC Secretariat for 2015: 14%
[3]Includes all other shark catches reported to the IOTC Secretariat, which may contain this species (i.e., SHK: sharks various nei; RSK: requiem sharks nei).

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

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** (2011–15): Gillnet; gillnet-longline; longline (fresh); longline-gillnet.
- **Main fleets** (2011–15): Sri Lanka; I.R. Iran; Taiwan,China.

APPENDIX XXVIII
EXECUTIVE SUMMARY: BIGEYE THRESHER SHARK

Indian Ocean Tuna Commission
Commission des Thons de l'Océan Indien
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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		2016 stock status determination
Indian Ocean	Reported catch[2] 2015: Not elsewhere included (nei) sharks[3] 2015: Average reported catch 2011–15: Av. not elsewhere included (nei) sharks[3] 2011–15:	0 t 57,125t 94 t 49,785 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]Proportion of catch estimated or partially estimated by IOTC Secretariat for 2015: 0%
[3]Includes all other shark catches reported to the IOTC Secretariat, which may contain this species (i.e., SHK: sharks various nei; RSK: requiem sharks nei).

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[3]		
		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
[3]The process of the threat assessment from IUCN is independent from the IOTC and is presented for information purpose only
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[7].

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 (Murua et al., 2012) 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

[7]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 Ecosystemsand Bycatch).

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 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** (2011–15): Gillnet-longline; longline-gillnet.
- **Main fleets** (2011–15): Sri Lanka.

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		2016 stock status determination
Indian Ocean	Reported catch[2] 2015: Not elsewhere included (nei) sharks[3] 2015: Average reported catch 2011–15: Av. not elsewhere included (nei) sharks[3] 2011-15:	0 t 57,125t 69 t 49,785 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]Proportion of catch estimated or partially estimated by IOTC Secretariat for 2015: 0%
[3]Includes all other shark catches reported to the IOTC Secretariat, which may contain this species (i.e., SHK: sharks various nei; RSK: requiem sharks nei).

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[3]		
		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
[3]The process of the threat assessment from IUCN is independent from the IOTC and is presented for information purpose only
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[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 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 (Murua et al., 2012) 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

[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 Ecosystemsand Bycatch).

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 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** (2011–15): Gillnet-longline; longline-gillnet.
- **Main fleets** (2011–15): Sri Lanka.

APPENDIX XXX
EXECUTIVE SUMMARY: MARINE TURTLES

Indian Ocean Tuna Commission
Commission des Thons de l'Océan Indien
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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[9]
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.

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

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 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
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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[10]
Albatross		
Atlantic Yellow-nosed Albatross	*Thalassarche chlororynchos*	Endangered
Black-browed albatross	*Thalassarche melanophris*	Near Threatened
Indian yellow-nosed albatross	*Thalassarche carteri*	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. Following a data call in 2016, the IOTC Secretariat received seabird bycatch data from 6 CPCs, out of the 15 with reported or expected longline effort South of 25ºS (IOTC-2016-SC19-Info 2). Due to the lack of data submissions from other CPCs, and the limited information provided on the use of seabird bycatch mitigations, it has not yet been possible to undertake an assessment for seabirds. 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 the IUCN threat status for all birds is currently being re-assessed; this process is expected to be completed by the end of 2016. 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

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

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 Resolution 12/06 and the frequency of use of each of the 3 measures (because vessels can chose two out of three possible options) are still poorly known. 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. Following the data call in 2016 it was possible to carry out a preliminary and qualitative analysis. The information provided suggests higher sea bird catch rates at higher latitudes, even within the area south of 25°S, and higher catch rates in the coastal areas in the eastern and western parts of the southern Indian Ocean. In terms of mitigation measures, the preliminary information available suggests that those currently in use (Resolution 12/06) may be proving effective in some cases, but there are also some conflicting aspects that need to be explored further. 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 fully 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
2016 UPDATE ON THE IMPLEMENTATION OF THE IOTC REGIONAL OBSERVER SCHEME

CPCs	Active Vessels LOA≥24m or High Seas vessels[11]				Progress	List of accredited observers submitted	Number of observer reports provided[12]					
	LL	PS	GN	BB			2010	2011	2012	2013	2014	2015
MEMBERS												
Australia	2	6			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					No information received by the Secretariat.	**No**	**No**	**No**	**No**	**No**	**No**	**No**
China –Taiwan,China	53 233				China has implemented an observer programme	**YES: 3** **YES: 54**	**1(O)** **No**	**No** **No**	**1(O)** **1(0)**	**1(O)** **19(O)**	**2(O)** **17(O)**	**1(O)** **24(O)**
Comoros					Comoros does not have vessels ≥ 24m. Two observers have been 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	17 6 18 1	12 0 17 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: 64** **EU,Portugal: 4** **EU,Spain : 9** **EU,UK : No**	FRA 6**(O)** **No** **No** **No**	FRA 12**(O)** PRT 1**(O)** **No** **No**	FRA 17 **(O)** PRT 1**(O)** **No** **No**	FRA 15 **(O)** PRT 1**(O)** ESP **1(O)** **No**	FRA 32(O) PRT 1**(O)** ESP **2(O)** **No**	FRA 25(O) PRT 1**(O)** ESP **23(E)** **No**
France (OT)					N/A	**N/A**	No	9(O)	7(O)	7(O)	NA	NA
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	22				India has not yet developed an observer programme.	**No**	**No**	**No**	**No**	**No**	**No**	**No**
Indonesia	550	18	1		Indonesia has 13 registered IOTC observers and a number of initiatives in place and has recently begun reporting to IOTC.	**YES:9**	**No**	**No**	**No**	**No**	**5(E)**	**No**
Iran, Isl. Rep. of		5	1190		IOTC observer training took place in 2015. 30 observers have now been selected and are due to be deployed in 2016.	**No**	**No**	**No**	**No**	**No**	**No**	**No**
Japan	53	2			Japan started its observer programme on the 1st of July 2010.	**YES: 19**	**8(E)**	**11(E)**	**10(E)**	**7(E)**	**8(E)**	**No**

[11] The number of active vessels is given for 2015
[12] Year in which the observed trip has started (E: Electronic; O: Other)

CPCs	Active Vessels LOA≥24m or High Seas vessels[11]				Progress	List of accredited observers submitted	Number of observer reports provided[12]					
	LL	PS	GN	BB			2010	2011	2012	2013	2014	2015
Kenya					Kenya has had no vessels listed in the active vessel registry since 2010, however, Kenya is developing an observer programme and 5 observers have been trained by SWIOFP.	**YES: 5**	**No**	N/A	N/A	N/A	N/A	N/A
Korea, Rep. of	14	5			Korea has had an observer programme since 2002 and has 28 observers registered in the Indian Ocean.	**YES: 29**	**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. However, observer data reported are not to IOTC standards.	**YES: 7**	**No**	**No**	**18(O)** [13]	**8(O)**	**7(O)**	**No**
Malaysia	10				Malaysia is developing plans for the implementation of an observer programme.	**No**	**No**	**No**	**No**	**No**	**No**	**No**
Maldives	28			339	Maldivian vessel landings are monitored by field samplers at landing sites. Maldives is currently developing an at-sea observer programme.	**YES: 4**	**No**	**No**	**No**	**No**	**No**	**No**
Mauritius		7			Mauritius has developed an observer scheme and started submitting data for 2015.	**YES: 8**	**No**	**No**	**No**	**No**	**No**	**5(O)**
Mozambique	9				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**	**7(E)**
Oman	1				IOTC observer training took take place in 2015, however no observer reports have been submitted as yet.	**No**	**No**	**No**	**No**	**No**	**No**	**No**
Pakistan					IOTC observer training took take place in 2015 and Pakistan is committed to establishing an observer scheme. A crew-based observer scheme has already been initiated by WWF-Pakistan, however no data has yet been submitted to the IOTC Secretariat.	**No**	**No**	**No**	**No**	**No**	**No**	**No**
Philippines					No information received by the Secretariat.	**No**	**No**	**No**	**No**	**No**	**No**	**No**
Seychelles	37	10			Seychelles initiated an observer programme in 2014 and has started to report observer data	**YES: 78**	**No**	**No**	**No**	**No**	**6(O)**	**46(O)**
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

[13] Reports from Madagascar include observers onboard foreign vessels

CPCs	Active Vessels LOA≥24m or High Seas vessels[11]				Progress	List of accredited observers submitted	Number of observer reports provided[12]					
	LL	PS	GN	BB			2010	2011	2012	2013	2014	2015
South Africa	15				South Africa operates an observer programme for foreign vessels operating within the EEZ as well as for national vessels (since 2014).	**YES: 16**	**No**	**12(O)**	**10(O)**	**13(O)**	**8+2(O)[14]**	**7+9(O)**
Sri Lanka	1		1564		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)**	**2(O)**
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 conducted observer training in 2015 and is due to begin deployment in 2017 as there were no active vessels in 2016	**YES: 8**	**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
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

[14] 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

2016: UPDATE ON PROGRESS REGARDING RESOLUTION 16/03 – ON THE SECOND PERFORMANCE REVIEW FOLLOW–UP

(NOTE: NUMBERING AND RECOMMENDATIONS AS PER APPENDIX I OF RESOLUTION 16/03)

REFERENCE #	RECOMMENDATION	RESPONSIBILITY	UPDATE/STATUS	TIMELINE	PRIORITY
PRIOTC02.02 (para. 86)	***Status of living marine resources*** The PRIOTC02 **RECOMMENDED** that: a) while continuing to work on improving data collection and reporting, the Scientific Committee should continue to utilise qualitative stock assessment methodologies for species where these is limited data available, including ecological risk based approaches, and support the development and refinement of data poor fisheries stock assessment techniques to support the determination of stock status.	*Scientific Committee*	**Ongoing:** An ecological risk assessment is scheduled to take place in 2018 for the main shark species as well as for marine turtles in the Indian Ocean. In 2013, 2014 and 2015, data poor approaches to determining stock status were applied to a range of billfish and neritic tuna species. The WPM has been requested to consider options to rank stock status determination using a 'tier' approach to assist in the interpretation of the level of uncertainty present in assessment methods applied.	TBD	TBD
	b) confidentiality provisions and issues of accessibility to data by the scientists involved needs to be clearly delineated, and/or amended if necessary, so that stock assessment analysis can be replicated.	*Scientific Committee & Commission*	**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. Ongoing developments to the new integrated IOTC database are improving the accessibility of IOTC data sets for users outside the Secretariat, while ensuring that confidentiality rules are fully respected.	TBD	TBD

	c) Chairpersons and Vice-Chairpersons of the Scientific Committee and respective Working Parties, in conjunction with the IOTC Secretariat, develop guiding principles for the provision of papers to ensure that they are directly related to the Program of Work of the respective Working Party and/or Scientific Committee, as endorsed by the Commission, while still encouraging for new and emerging issues to be presented.	*Scientific Committee & Working Party Chairs and Vice-Chairs*	**Pending:** Work will commence on this activity in 2017 under the guidance of the SC Chair	TBD	TBD
	d) ongoing peer review and input by external scientific experts should be incorporated as standard best practice for Working Parties and included in the Commission's regular budget.	*Scientific Committee & Commission*	**Ongoing**: 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 and recommended that all Working Party meetings in 2016 would extend an invitation to an external expert.	TBD	TBD
PRIOTC02.03 (para. 96)	***Data collection and reporting*** The PRIOTC02 **RECOMMENDED** that: a) the Commission make further investments in data collection and targeted capacity building, which is necessary for further improvement in the provision and quality of data in support of the Commission's objectives, as well as to identify the sources of the uncertainty in data and work towards reducing that uncertainty.	*Commission*	**Ongoing:** There are multiple opportunities and sources of funding for capacity building on data collection and scientific analyses, both within the IOTC budget and in the context of other partnerships.	TBD	TBD

	b) while there are budgetary implications, the IOTC Secretariat staffing dedicated to data collection and data capacity building activities should be increased from 3 to 5 full-time data staff.	*Commission*	**Pending:** Recruitment of a P1 (Fisheries Officer) will be conducted in early-2017, however, the IOTC Data Section still remains severely understaffed given the increasing burdens on monitoring data compliance and technical support missions, support to the implementation of the Regional Observer Scheme, development of the IOTC database and dissemination systems, and new work streams taking place in 2017 (e.g., E-monitoring, ROS Pilot Project, support for implementation of skipjack HCR [Res 16/02], and yellowfin catch reduction [Res.16/01].	TBD	TBD
	c) the IOTC Secretariat should facilitate discussions with coastal State non-CPCs and other non-CPCs fishing within the IOTC area of competence to formalise long-term strategies for data submission to the IOTC Secretariat, including all relevant historical data sets.	*IOTC Secretariat*	**Ongoing:** This is partially being addressed by the programme of work allocated to the IOTC Data Compliance and Support missions.	TBD	TBD
	d) steps to gain access to fine-scale data to be used in joint analysis, with sufficient protection of confidentiality, should be taken.	*IOTC Secretariat*	**Ongoing:** The collaborative longline CPUE (involving Japan, Rep. of Korea, and Taiwan,China and an independent fisheries consultant) has involved the sharing of operational level data. While the results of analyses, and joint-CPUE, have been published, the fine-scale data remains confidential. This capability should be part of the improved functionalities provided by the new IOTC database, depending on the quality of these fine-scale data and confidentiality restrictions.	TBD	TBD

	e) where budgets and other resources permit, to encourage data preparatory meetings preceding stock assessment review meetings (Working Parties).	*Scientific Committee*	**Pending:** While there is agreement that such meetings would be beneficial for the stock assessment work, current resources and time constraints due to the increasing number of meetings might make difficult to implement this recommendation. The SC agreed to also explore other methods to overcome this issue such as using the WP meeting for data preparation in the year prior to assessment.	TBD	TBD
	f) innovative and/or alternative means of data collection and reporting should be explored and, as appropriate, implemented, including a move towards electronic data collection and reporting for all fleets.	*Scientific Committee*	**Ongoing:** The IOTC Secretariat is currently developing an E-Reporting tool for the Regional Observer Scheme to facilitate reporting of ROS data. A pilot E-monitoring project is also planned for 2017, focused on small-scale fisheries (e.g., gillnet, gillnet-longline multi-gear vessels) for which there are practical difficulties placing on-board observers, and for which there is currently little or no data reported to the IOTC Secretariat.	TBD	TBD
PRIOTC02.05 (para. 104)	***Capacity building (Data Collection)*** The PRIOTC02 **RECOMMENDED** that: a) the Commission expand its current data support and data compliance missions and that the IOTC Secretariat should be granted increased autonomy to seek and attract external donor funds to support the work approved by the Commission, including supporting actions and/or capacity building initiatives from Compliance Missions that are applicable to more than two CPCs.	*Commission*	**Ongoing:** The IOTC Secretariat is actively engaged in a programme of data compliance and support missions, but is constrained by current staffing resources within the Data Section. In 2016, missions were conducted to Tanzania (Feb), Mauritius (Aug), and Indonesia (Oct). External funding for the missions was provided by EU DG-MARE.	TBD	TBD

	b) the IOTC should continue the workshop series aimed at Connecting the IOTC Science and Management processes. The aims of the workshop series should be to: 1) improve the level of comprehension among IOTC CPCs on how the scientific process informs the management process for managing of IOTC species and ecosystem-based management; 2) increase the awareness of IOTC Contracting Parties to their obligations, as stipulated in the Commissions' Conservation and Management Measures which are based on rigorous scientific advice; 3) improve the decision making process within the IOTC; and 4) to provide direct assistance in the drafting of proposals for Conservation and Management Measures.	*Commission & Secretariat*	**Pending**	TBD	TBD
PRIOTC02.06 (para. 106)	***Non-target species*** The PRIOTC02 **RECOMMENDED** that the Commission should continue to improve upon the requirements of data collection and reporting mechanisms of non-IOTC species that interact with IOTC fisheries.	*Commission and Scientific Committee*	**Ongoing**	TBD	TBD
PRIOTC02.07 (para. 112)	***Quality and provision of scientific advice*** The PRIOTC02 **RECOMMENDED** that: a) the Scientific Committee should continue the good work undertaken since the PRIOTC01 and strive to make further improvements in the way it communicates information about stock status and future prospects for the stocks to the Commission.	*Scientific Committee & Working Parties*	**Ongoing**	TBD	TBD
	b) an independent peer review process (and budgeting mechanism) for stock assessments should be implemented if IOTC science is to be considered to be in line with best practice and to maintain a high standard of quality assurance.	*Scientific Committee & Commission*	**Ongoing:** Invited external experts are routinely invited to participate in the meetings of the WP to provide additional expertise.	TBD	TBD

	c) the Scientific Committee, through its Working Party on Ecosystems and Bycatch should pursue the application of ecosystem modelling frameworks.	*Scientific Committee & Working Party on Ecosystems and Bycatch*	**Ongoing**: The WPEB has recently added an item into its Program of Work on the development for a plan for ecosystem based fisheries management approaches in the IOTC and has requested the development of a preliminary template. SC representatives and the Secretariat will participate in the tRFMO joint workshop on operationalization of the EAFM.	TBD	TBD
	d) continue to develop and adopt robust target and limit reference points, and species or fishery specific harvest control rules through management strategy evaluations, noting that this process has commenced for several species and is specified in IOTC Resolution 15/10 *on target and limit reference points and a decision framework*. The mandated Resolution 14/03 [superseded by Resolution 16/09] *on enhancing the dialogue between fisheries scientists and managers*, will benefit from having communication between the Scientific Committee and the Commission more formally structured, facilitated dialogue to enhance understanding and inform decision making.	*Scientific Committee & Commission*	**Ongoing:** The 1st Meeting of the Technical Committee on Management Procedures is due to take place in 2017.	TBD	TBD
	e) the Commission and its subsidiary bodies continue to ensure that meeting schedules and activities are rationalised so that the already heavy workload of those involved, and budgeting constraints, are taken into account.	*Commission & Scientific Committee*	**Ongoing**: All Working Parties are requested by the SC to rank activities in their respective programs of work as high, medium or low and allocate a numerical ranking within the high priority category.	TBD	TBD

	f) the Commission fully implements Resolution 12/01 *On the implementation of the precautionary approach*, so as to apply the precautionary approach, in accordance with relevant internationally agreed standards, in particular with the guidelines set forth in the UNFSA, and to ensure the sustainable utilisation of fisheries resources as set forth in Article V of the IOTC Agreement, including ensuring that a lack of information or increased uncertainty in datasets/stock assessment, is not used as a justification to delay taking management actions to ensure the sustainability of IOTC species and those impacted by IOTC fisheries.	*Commission*	**Ongoing:** A harvest control rule was adopted for skipjack tuna, and work is progressing on yellowfin, bigeye and albacore tunas, with support of external funding (FAO ABNJ Tuna Project)	TBD	TBD
	g) while there are budgetary implications, the IOTC Secretariat staffing dedicated to scientific analysis should be increased from 2 to 4 full-time science staff.	*Commission*	**Pending:** The SC strongly recommended that the Commission take the steps to ensure that the IOTC Secretariat is sufficiently resourced to continue to support the Scientific Committee and able to respond to the increasing workload.	TBD	TBD
PRIOTC02.08 (para. 123)	***Adoption of Conservation and Management Measures*** The PRIOTC02 **RECOMMENDED** that: a) the Science-Management Dialogue is strengthened to improve understanding of modern approaches to fisheries management, including the implementation of Harvest Strategies through the use of Management Strategy Evaluation. The Commission adopt a formal process of developing and implementing Harvest Strategies within a prescribed timeframe.	*Commission & Scientific Committee*	**Ongoing:** The Commission adopted Resolution 16/09, establishing a Technical Committee on Management Procedures, formalising a process to facilitate discussion and adoption of harvest strategies	TBD	TBD
PRIOTC02.21 (para. 204)	b) The IOTC should develop cooperative mechanisms, such as MoUs, to work in a coordinated manner on issues of common interest, in particular non-target species and an ecosystem approach with other RFMOs especially with SIOFA.	*Commission*	**Ongoing**: The IOTC is currently working with other tRFMOs, within the framework of the Kobe process, through joint meetings on the MSE, ecosystem approaches to management, harmonisation of observer schemes and a joint working group on FADs.	TBD	TBD

PRIOTC02.22 (para. 211)	***Special requirements of developing States*** The PRIOTC02 **RECOMMENDED** that: a) the continuation and optimisation of the IOTC Meeting Participation Fund indefinitely as part of the IOTC Regular Budget, and that the MPF is used to support participation of all eligible Contracting Parties in order to create a more balanced attendance to both science and non-science meetings of the Commission.	*Commission*	**Ongoing:** In 2017, 67 MPF applications were accepted by the IOTC Secretariat, the highest number to date – although a significant proportion of applicants were funded through external funding sources rather than the IOTC regular budget.	TBD	TBD
	b) the IOTC Secretariat in partnership with development agencies and organisations, should develop a five year regional fisheries capacity development program to ensure coordinated capacity building activities across the region.	*Secretariat & Commission*	**Pending.**	TBD	TBD

APPENDIX XXXIVA
WORKING PARTY ON NERITIC TUNAS PROGRAM OF WORK (2017–2021)

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

	Topic	Sub-topic and project	Priority	Est. budget and/or potential source	Timing				
					2017	2018	2019	2020	2021
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	High (2)	CPCs directly					
		➢ Quantitative biological studies are necessary for all neritic tunas throughout their range to determine key biological parameters including age-at-maturity and fecundity-at-age/length relationships, age-length keys, age and growth, which will be fed into future stock assessments.							
3.	CPUE standardisation	Develop standardised CPUE series for the main fisheries for longtail, kawakawa, Indo-Pacific King mackerel 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		CPCs					

		gillnet), Malaysia (coastal purse seine), Pakistan, Oman, Thailand (coastal purse seine) and India (all gillnet).		directly					
		➢ Spanish mackerel. Priority fleets: Gillnet fisheries of Indonesia, India, Iran, Pakistan and Oman.		CPCs directly					
		➢ Kawakawa. Priority fleets: Indonesia (purse seine/ line), Malaysia (coastal purse seine), Thailand (coastal purse seine), India (gillnet), Iran (gillnet) and Pakistan (gillnet).		CPCs directly					
		➢ Indo-Pacific king mackerel. Priority fleets: Gillnet fisheries of India, Indonesia, Pakistan (gillnet/troll) 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 XXXIVB
WORKING PARTY ON TEMPERATE TUNAS PROGRAM OF WORK (2017–2021)

Table 1. Priority topics for obtaining the information necessary to develop stock status indicators for albacore in the Indian Ocean (2017-2021).

Topic	Sub-topic and project	Priority	Est. budget and/or potential source	Timing				
				2017	2018	2019	2020	2021
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 (3)	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 (1)	TBD					
	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 will look at improvement in precision of estimates given different		TBD					

		amounts of age structure data, depending on fishery, growth curve, and effective sample sizes.								
		2.2 Age-at-Maturity	High (4)							
		2.2.1 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	Medium (5)							
		3.1.1 Collect gonad samples from albacore to confirm the spawning time and location of the spawning area that are presently hypothesized for albacore.		CPCs directly						
4	CPUE standardisation	4.1 Develop standardized 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 (2)	CPUE Workshop (TBD)						
		4.1.1 Changes in species targeting is the most important issue to address in CPUE standardizations.		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 catches (e.g. north of 10oS). Sensitivity to the choice of constant should be tested.		CPCs directly						
		4.1.4 The appropriate inclusion of environmental variables in CPUE standardization 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		CPCs directly						

		may need to be careful consideration of the mechanisms of interaction to include the variable in the most informative way.							
		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	Target and Limit reference points	5.1 To advise the Commission, by end of 2016 at the latest on Target Reference Points (TRPs) and Limit Reference Points (LRPs).	High (WPM)						
		5.1.1 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.							
6	Management measure options	6.1 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. Agreed to pass this task temporarily to WPM.	High (WPM)						

APPENDIX XXXIVC
WORKING PARTY ON BILLFISH PROGRAM OF WORK (2017–2021)

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				
				2017	2018	2019	2020	2021
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)						
	1.1.3 Develop a close-kin mark recapture method (*Bravington et al.* 2016) on marlins to estimates population size and other important demographic parameters. This method includes the sampling of juveniles and adult fish and genetic parenting analyses to estimate the population size from mark-recapture models.	High (1)						
	1.2 Tagging research to determine connectivity, movement rates and mortality estimates of billfish.	High (2)	US$100,000					
	1.2.1 Tagging studies (PSAT)		(TBD)					
2. Biological and ecological information	2.1 Age and growth research	High (7)						
	2.1.1 CPCs to provide further research reports on billfish biology, namely age and growth studies including through the use of fish		CPCs directly					

	(incl. parameters for stock assessment)		otolith or other hard parts, either from data collected through observer programs or other research programs.							
		2.2 Age-at-Maturity		High (8)						
			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 relationships, age-length keys, age and growth, which will be fed into future stock assessments.		(CPCs directly)					
		2.3 Spawning time and locations		High (9)						
			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 (6)	(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 (5)	(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	High (Ongoing)	Consultant US$54,000					

		targeting marlins and sailfish should undertake a comprehensive analysis for provision to the WPB.								
5.	CPUE standardization	5.1 Develop and/or revise standardized 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 (10)	(CPCs directly)						
		5.1.2 Striped marlin: Priority fleets: Japan, Taiwan,China	High (11)	(CPCs directly)						
		5.1.3 Black marlin: Priority fleets: Longline: Taiwan,China; Gillnet: I.R. Iran, Sri Lanka	High (13)	(CPCs directly)						
		5.1.4 Blue marlin: Priority fleets: Japan, Taiwan,China	High (14)	(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 (12)	(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 (15)	US$??						
		6.2 Stock assessment on billfish species in 2017 and 2018	High (3)	Consultant/ US$16,250						
		6.3 Workshops on techniques for assessment including CPUE estimations for billfish species from gillnet fisheries in 2017 and 2018.	High (4)	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 (16)							
		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 (17)							
		8.1.1 These management measures will therefore have to ensure the achievement of the conservation and optimal utilization of stocks as laid down in article V of the Agreement for the establishment		WPM						

	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.				

APPENDIX XXXIVD
WORKING PARTY ON ECOSYSTEMS AND BYCATCH PROGRAM OF WORK (2017–2021)

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				
					2017	2018	2019	2020	2021
	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)					
	1.1.1 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.								
	1.1.2 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 distribution, making use of conventional and electronic	High (1)	AZTI, IRD, Others	US$80K each species (TBD)	BSH SMA OCS	SMA OCS			

Topic	Sub-topic and project	Priority ranking	Lead	Est. budget (potential source)	Timing				
					2017	2018	2019	2020	2021
	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$50,000 (available from IRD)	RHN				
2. Fisheries data collection	2.1 Historical data mining for the key species and IOTC fleets (e.g. as artisanal gillnet and longline coastal fisheries) and implementation of Regional Observer Schemes, including:								
	2.1.1 Capacity building of fisheries observers (including the provision of ID guides, training, etc.)	High (20)	WWF-Pakistan/ ACAP (seabirds)	US$?? (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)					
	2.1.4 Integration of data mining with observer programs to reconstruct species composition and catches of sharks	Medium (26)		US$15k (EU)					
	2.1.5 Electronic monitoring (NOTING the recommendation from the Scientific Committee (SC17.43) that the Commission considers assigning the IOTC Secretariat, in consultation with interested IOTC scientists, to develop a project on electronic monitoring in the IOTC area of competence, the Commission NOTED that a concept note/proposal should be developed to allow an	High (12)		US$?? (TBD)					

Topic	Sub-topic and project		Priority ranking	Lead	Est. budget (potential source)	Timing				
						2017	2018	2019	2020	2021
		evaluation of the efficacy of electronic monitoring in 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))								
	2.1.6	Resolution 16/04 On the development of a pilot project for the Regional Observer Scheme. Development of a proposal for review by the SC19	High (X)							
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)	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 (EU)	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	High (23)	IRD/AZTI	US$50,000 IRD	RHN				

Topic	Sub-topic and project	Priority ranking	Lead	Est. budget (potential source)	Timing				
					2017	2018	2019	2020	2021
	efficiency of management resolution of non-intentioned encirclement on purse seine			(commenced)					
	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$?? (TBD)	SMA OCS FAL	OCS			
	3.4 Ecological Risk Assessment	High (X)			Prep	Full			
4. Shark bycatch mitigation measures	4.1 Develop studies on shark mitigation measures (operational, technological aspects and best practices)								
	4.1.1 Longline selectivity, to assess the effects of hooks styles, bait types and trace materials on shark catch rates, hooking-mortality, bite-offs and fishing yield (socio-economics)	High (14)		US$?? (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)					

Topic	Sub-topic and project	Priority ranking	Lead	Est. budget (potential source)	Timing				
					2017	2018	2019	2020	2021
	5.1.3 Oceanic whitetip shark: Priority fleets: Longline fleets; purse seine fleets	High (18)	CPCs directly	US$?? (TBD)					
	5.1.4 Silky shark: Priority fleets: Purse seine fleets	Med (27)	CPCs directly	US$?? (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$?? (TBD)					
	6.1.2 Res. 12/04 (para. 11) Part II. The recommendations of the IOTC Working Party on Ecosystems and Bycatch shall be provided to the IOTC Scientific Committee for	Low (28)	CPCs directly	US$?? (TBD)					

Topic	Sub-topic and project	Priority ranking	Lead	Est. budget (potential source)	Timing				
					2017	2018	2019	2020	2021
	consideration at its annual session in 2012. In developing its recommendations, the IOTC Working Party on Ecosystems and Bycatch shall examine and 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				
					2017	2018	2019	2020	2021
	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	High (8)	Consultant	US$?? (TBD)					

Topic	Sub-topic and project	Priority ranking	Lead	Est. budget (potential source)	Timing				
					2017	2018	2019	2020	2021
	gears and their fishing practices (e.g., transhipment, onboard storage capacity). 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€					
	9.3 Assessment of trophic relationships in pelagic bycatch using chemical tracers		SFA	50,000€					

APPENDIX XXXIVE
WORKING PARTY ON TROPICAL TUNAS PROGRAM OF WORK (2017–2021)

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				
					2017	2018	2019	2020	2021
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.	MED (on-going)	CSIRO/AZTI/IRD/RITF	1.3 m Euro: (European Union; 20% additional co-financing)					
	1.1.1 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.								
	1.1.2 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).	MED		US$?? (TBD)					
2. Biological and ecological information (incl. parameters for stock assessment)	2.1 Age and growth								
	2.1.1 Design and develop a plan for a biological sampling program to support research on tropical tuna biology. The plan would consider the need for the sampling program to provide representative coverage of the distribution of the different tropical tuna species within the Indian Ocean and make use of samples and data collected through observer programs, port sampling and/or other research programs. The plan would also consider the types of biological samples that could be collected	High	CPCs directly	US$?? (TBD)					

Topic	Sub-topic and project	Priority ranking	Lead	Est. budget (potential source)	TIMING				
					2017	2018	2019	2020	2021
	(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.	High	CPCs directly	US$?? (TBD)					
3. Ecological information	3.1 Spawning time and locations								
	3.1.1 Collect gonad samples from tropical tunas to confirm the spawning time and location of the spawning area that are presently hypothesised for each tropical tuna species.	Med		US$?? (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.	Med	Consultant	US$30K					
5. CPUE standardisation	5.1 Develop standardised CPUE series for each tropical tuna fleet/fishery for the Indian Ocean (numbering check)								
	5.1.1 Further development and validation of the collaborative longline CPUE indices using the data from multiple fleets (see Terms of Reference, Appendix IXa below).	High (on-going)	SC and consultants	US$40K (IOTC)					

Topic	Sub-topic and project	Priority ranking	Lead	Est. budget (potential source)	TIMING				
					2017	2018	2019	2020	2021
	5.1.2 That standardised CPUE index for juvenile yellowfin tuna and bigeye tuna caught by the EU purse seiner fleets, be estimated and submitted to the WPTT before the next round of stock assessments of tropical tunas.		CPCs directly	US$?? (TBD)					
	5.1.3 Development of minimum criteria (e.g. 10% using a simple random stratified sample) for logbook coverage to use data in standardisation processes; and 2) identifying vessels through exploratory analysis that were misreporting, and excluding them from the dataset in the standardisation analysis.		CPCs directly	US$?? (TBD)					
	5.1.4 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$?? (TBD)					
	5.1.5 The standardisation of purse seine CPUE be made where possible using the operational data on the fishery.		CPCs directly	US$?? (TBD)					
	Bigeye tuna: High priority fleets	High	CPCs directly	US$?? (TBD)					
	Skipjack tuna: High priority fleets	High	CPCs directly	US$?? (TBD)					
	Yellowfin tuna: High priority fleets	High	CPCs directly	US$?? (TBD)					
	5.1.6 That methods be developed for standardising purse seine catch species composition using operational data, so as to provide alternative indices of relative abundance.	High	Consultant and CPCs directly	US$?? (TBD)					
	5.1.7 Investigate the potential to use the Indian longline survey as a fishery-independent index of abundance for tropical tunas.	High	Consultant And CPCs directly	US$30K (TBD)					
6. Stock assessment / stock	6.1 Develop and compare multiple assessment approaches to determine stock status for tropical tunas 6.2 Scoping of ageing studies of tropical tunas to provide information on	Med	Consultant and CPCs directly	US$?? (TBD)					

Topic	Sub-topic and project	Priority ranking	Lead	Est. budget (potential source)	TIMING				
					2017	2018	2019	2020	2021
indicators	population age structure (based on species and age composition of sampled catches)	Med							
	6.3 Develop a high resolution age structured operating model that can be used to test the spatial assumptions including potential effects of limited tags mixing on stock assessment outcomes (see Terms of Reference, Appendix IXb below).	Med		US$60K					
	6.4 Stock assessment priorities – detailed review of the existing data sources, including:	Med		US$?? (TBD)					
	i. Size frequency data: Evaluation of the reliability of length composition from the longline fisheries (including recent and historical data), review of issues on the use of the (EU) purse seine length composition data prior to 1991, and the need for a thorough review of the size frequency data held by IOTC, in collaboration with the fleets involved, to improve the utilization of these data in tropical tuna stock assessments.								
	ii. Tagging data: Further analysis of the tag release/recovery data set.								
	iii. Alternative CPUE series: a review of the available data from the Indian tuna longline survey data.								
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. There are various options, among which some are already under test. Not all of these options are rated with the same priority, and those being currently under development need to be promoted, as proposed below:	High	CPCs directly	US$?? (TBD)					
	i. Acoustic FAD monitoring, with the objective of deriving abundance indices based on the biomass estimates provided by								

	Topic	Sub-topic and project	Priority ranking	Lead	Est. budget (potential source)	TIMING				
						2017	2018	2019	2020	2021
		echo-sounder buoys attached to FADs	High							
		ii. Longline-based surveys (expanding on the Indian model) or "sentinel surveys" in which a small number of commercial sets follow a standardised scientific protocol	Med							
		iii. Aerial surveys, potentially using remotely operated or autonomous drones	Med							
		iv. Genetics-based tagging techniques using recaptured individuals or identification of closely-related pairs								
8	Target and Limit reference points	8.1 To advise the Commission, 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	High	CPCs directly	US$?? (TBD)					

APPENDIX XXXIVF
WORKING PARTY ON DATA COLLECTION AND STATISTICS PROGRAM OF WORK (2017–2021)

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

Topic	Sub-topic and project	Priority ranking	Lead	Est. budget (potential source)	Timing				
					2017	2018	2019	2020	2021
1. Data Collection Standards - ROS	**1.1** Artisanal fisheries	**1**							
	1.1.1 For countries that are known for already having well established sampling systems in place, assess the outcomes / review the projects and proceed with immediate actions and support (if needed).			(TBD)					
	1.1.2 Assessment of the status of all countries whose sampling systems are not fully known or established.			(TBD)					
	1.1.3 Develop minima data requirements for the routine collection of data at the landing place, through sampling by enumerators			(TBD)					
	1.1.4 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			(TBD)					
	1.1.5 Develop/Amend Fisheries specific data collection protocols, by country, where necessary			(TBD)					
	1.1.6 Assist implementation of pilot sampling activities in countries/fisheries not/insufficiently sampled in the past; priority to be given to the following fisheries: 1. Coastal fisheries of Indonesia 2. Coastal fisheries of Pakistan 3. Coastal fisheries of Sri Lanka 4. Coastal fisheries of Yemen 5. Coastal fisheries of Madagascar 6. Coastal fisheries of Comoros 7. Coastal fisheries of Tanzania			(TBD)					

	8. Coastal fisheries of Thailand 9. Coastal fisheries of Malaysia							
	1.2 Industrial fisheries	**1**						
	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		(TBD)					
	1.2.2 Organize a Regional Workshop on the Implementation of the IOTC Regional Observer Scheme		US$ TBD (DG-MARE)					
	1.2.3 Develop/Amend fisheries specific at-sea observer data collection protocols, by country, where necessary		US$ 20K (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. Iran (driftnet; purse seine) 2. Sri Lanka (purse seine; drifting gillnet & longline) 3. Indonesia (longline) 4. Pakistan (driftnet) 5. India (longline) 6. Mauritius (purse seine; longline)		(TBD)					
2. Assistance to CPCs for the fulfillment of Resolution 16/01 mandate	**2.1** Provide support to identified CPCs to increase their level of monitoring and reporting in accordance with paragraph 8 of Resolution 16/01	**1**	US$ 40K (TBD – EU grant 2017)					

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.	**1**	US$ 40K (TBD)					
4. Compliance with IOTC Data Requirements	**4.1** Data support missions	**2**						
	4.1.1 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.		US$ 25K (EU DG-MARE)					
5. Implementation Data Collection Sport Fisheries	**5.1** Produce a catalogue of sport fisheries in the Indian Ocean; facilitate collection and reporting of data from sport clubs; training of local staff.	**4**	US$ 75K (EU-DG MARE)					
6. IOTC Data access	**6.1** Design and implementation of a metadata catalog to describe information and processes made available by IOTC followed by the development of software libraries (in the most widely adopted languages for statistical analysis, e.g. R, Python etc.) to simplify scientists' access to IOTC Remote data services.	**3**	US$ 20K (TBD)					

APPENDIX XXXIVG
WORKING PARTY ON METHODS PROGRAM OF WORK (2017–2021)

The Program of Work consists of the following, noting that a timeline for implementation would be developed by the SC once it has agreed to the priority projects across all of its Working Parties:

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

Topic	Sub-topic and project	Research Priority	Funding Priority	Lead	Est. budget (potential source)	Timing				
						2017	2018	2019	2020	2021
1. Management Strategy Evaluation	1.1 Albacore	High	5	EU (JRC)	Funded (EC JRC)					
	1.1.1 Revision of Operating Models based on WPM and SC feedback, including possible robustness tests									
	1.1.2 Implementation of initial set of simulation runs and results									
	1.1.3 Revision of Management Procedures and Indicators after presentation of initial set to TCMP and Commission									
	1.1.4 Evaluation of new set of Management Procedures (if required)									
	1.2 Skipjack tuna	High	2	Maldives						
	1.2.1 Review of model implementation and participation in MSE process				$?? (TBD)					
	1.3 Bigeye tuna	High	4	Australia (CSIRO)	$75,000 (ABNJ)					
	1.3.1 Update OM & present preliminary MP results to TCMP, WPTT/WPM review of new OM									
	1.3.2 Present revised MP results to TCMP with target adoption date of 2018; iteratively update development if required)				$?? (TBD)					
	1.4 Yellowfin tuna	High	3	Australia	$75,000					

				(CSIRO)	(ABNJ)					
	1.4.1 Update OM & present preliminary MP results to TCMP, WPTT/WPM review of new OM				$??					
	1.4.2 Present revised MP results to TCMP with target adoption date of 2018; iteratively update development if required)				(TBD)					
	1.5 Swordfish	High	1	TBD	$?? (TBD)					
	1.5.1 Initial OM									
	1.5.2 Conditioning and OM set up									
	1.5.3 Generic MP tests									
	1.5.4 Final Model with MPs									
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)	Medium	6	Consult.						
	2.2 Review of current practices and recommendation for the consideration at WPM08 and SC20.				$10,000 (TBD)					
3. Multiple stock status derived from different model structures	3.1 Develop specific guidance for the most appropriate models to be used or how to synthesize the results when multiple stock assessment models are presented. (*see IOTC-2016-WPTT18-R, para.91*)	Medium	7		$?? (TBD)					

APPENDIX XXXV
SCHEDULE OF STOCK ASSESSMENTS FOR IOTC SPECIES AND SPECIES OF INTEREST FROM 2017–2021, AND FOR OTHER WORKING PARTY PRIORITIES

Working Party on Neritic Tunas					
Species	**2017**	**2018**	**2019**	**2020**	**2021**
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	**2017**	**2018**	**2019**	**2020**	**2021**
Albacore	–	Data preparatory meeting	**Stock assessment**	–	Data preparatory meeting

Working Party on Billfish					
Species	**2017**	**2018**	**2019**	**2020**	**2021**
Black marlin		**Full assessment**		**Full assessment**	
Blue marlin		**Full assessment**		**Full assessment**	
Striped marlin	**Full assessment**		**Full assessment**		**Full assessment**
Swordfish	**Full assessment**				**Full assessment**
Indo-Pacific sailfish			**Full assessment***		

Working Party on Tropical Tunas					
Species	**2017**	**2018**	**2019**	**2020**	**2021**
Bigeye tuna	Indicators	Indicators	**Full assessment**	Indicators	Indicators
Skipjack tuna	**Full assessment**	Indicators	Indicators	**Full assessment**	Indicators
Yellowfin tuna	Indicators	**Full assessment**	Indicators	Indicators	**Full assessment**
Working Party on Ecosystems and Bycatch					
Species	**2017**	**2018**	**2019**	**2020**	**2021**

Blue shark	**Full assessment***	Indicators; Revisit ERA	Indicators	Indicators	**Full assessment***
Oceanic whitetip shark	Indicators	Revisit ERA	Indicators	**Full assessment***	Revisit ERA
Scalloped hammerhead shark	Indicators	Revisit ERA	Indicators	–	Revisit ERA
Shortfin mako shark	Indicators	Revisit ERA	–	–	Revisit ERA
Silky shark	Indicators	Indicators; Revisit ERA	**Full assessment***	–	Indicators; Revisit ERA
Bigeye thresher shark		Revisit ERA	–	–	Revisit ERA
Pelagic thresher shark	Indicators	Revisit ERA	–	–	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	Revisit ERA
Seabirds	–	–	Review of mitigation measures in Res. 12/06	–	-
Marine Mammals	–	–	–	–	–
Ecosystem Based Fisheries Management (EBFM) approaches	**Results of joint tRFMO meeting**	–	–	–	–

*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 2017 AND 2018

	2017			2018		
Meeting	**No.**	**Date**	**Location**	**No.**	**Date**	**Location**
Working Party on **Neritic Tunas** (WPNT)	7th	10-13 July (4d)	Maldives	8th	20-23 March	Kenya?
Working Party on **Temperate Tunas** (WPTmT)	-	-	-	7th	July	Seychelles ?
Working Party on **Billfish** (WPB)	15th	10-14 September (5d)	EU-Spain	16th	3-8 September (5d)	TBD
Working Party on **Ecosystems and Bycatch** (WPEB)	13th	4-8 September (5d)	EU-Spain	14th	10-14 September (5d)	TBD
Working Party on **Methods** (WPM)	8th	13-15 October (with WPTT)	Victoria, Seychelles	9th	22-23 October	TBD
Working Party on **Tropical Tunas** (WPTT)	19th	17-22 October (6d)	Victoria, Seychelles	20th	16-20 October (5d)	TBD
Working Party on **Data Collection and Statistics** (WPDCS)	13th	26-28 November (3d)	Victoria, Seychelles	14th	22-24 November (3d)	Victoria, Seychelles
Scientific Committee (SC)	20th	30 Nov. – 4 Dec (5 d)	Victoria, Seychelles	21st	26-30 November (5 d)	Victoria, Seychelles

APPENDIX XXXVII
CONSOLIDATED SET OF RECOMMENDATIONS OF THE 19TH SESSION OF THE SCIENTIFIC COMMITTEE (1–5 DECEMBER 2016) TO THE COMMISSION

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

Tuna – Highly migratory species

SC19.01 (para. 142) 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 2016 (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

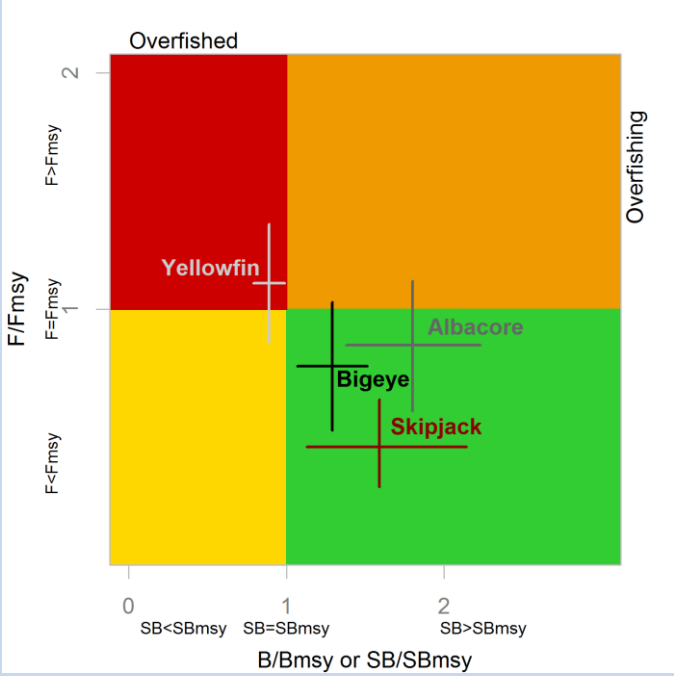

Fig. 4. Combined Kobe plot for bigeye tuna (black: 2016), skipjack tuna (brown: 2014), yellowfin tuna (grey: 2016), and albacore tuna (dark grey: 2016) showing the estimates of current stock size (SB) and current fishing mortality (F) in relation to optimal spawning stock size and optimal fishing mortality. Cross bars illustrate the range of uncertainty from the model runs with a 80% CI. 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

SC19.02 (para. 144) 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 2016 (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

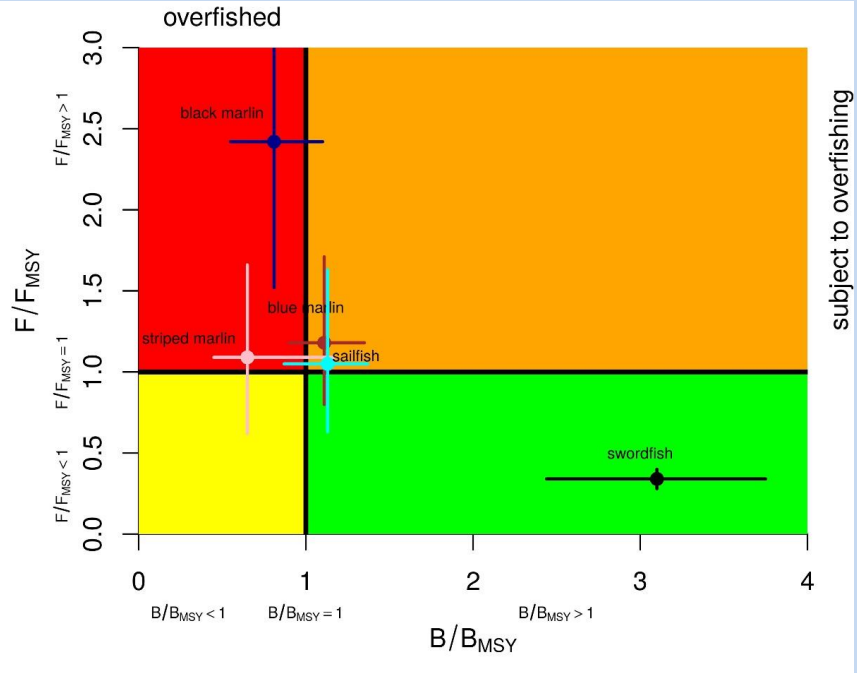

Fig. 5. Combined Kobe plot for swordfish (black), Indo-pacific sailfish (cyan), black marlin (light blue), blue marlin (brown) and striped marlin (pink) showing the 2015 and 2016 estimates of current stock size (SB or B, species assessment dependent) and current fishing mortality (F) in relation to optimal spawning stock size and optimal fishing mortality. Cross bars illustrate the range of uncertainty from the model runs.

Tuna and seerfish – Neritic species

SC19.03 (para. 145) 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 2016 (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

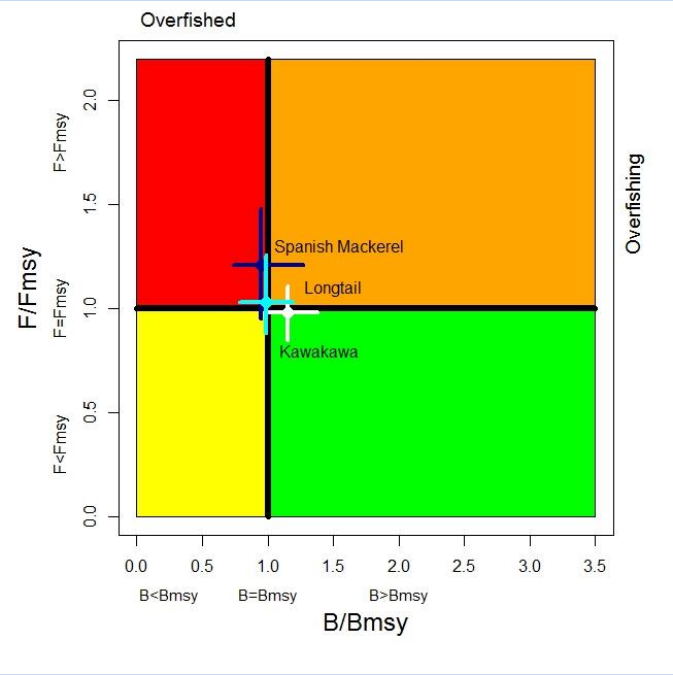

Fig. 6. Combined Kobe plot for longtail tuna (cyan: 2016), narrow-barred Spanish mackerel (dark blue: 2016), and kawakawa (white: 2015) showing the estimates of stock size (B) and current fishing mortality (F) in relation to optimal spawning stock size and optimal fishing mortality using the OCOM modelling approach. Cross bars illustrate the range of uncertainty from the model runs.

Sharks

SC19.04 (para. 146) 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

SC19.05 (para. 147) 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

SC19.06 (para. 148) 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

SC19.07 (para. 21) **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 2016, 23 reports were provided by CPCs (26 in 2015, 26 in 2014) (Table 2).

SC19.08 (para. 22) The SC **RECOMMENDED** that the Compliance Committee and Commission note the lack of compliance by 9 Contracting Parties (Members) and 3 Cooperating Non-Contracting Parties (CNCPs), that did not submit a National Report to the Scientific Committee in 2016, noting that the Commission agreed that the submission of the annual reports to the Scientific Committee is mandatory.

Report of the 6th Session of the Working Party on Neritic Tunas (WPNT06)

CPUE standardisation

SC19.09 (para. 29) **ACKNOWLEDGING** the importance of indices of abundance for future stock assessments, the WPNT **RECOMMENDED** that the development of standardised CPUE series is explored, with priority given to fleets which account for the largest catches of neritic tuna and tuna-like species (e.g., I.R. Iran, Indonesia, India, Pakistan, and Sri Lanka).

Selection of Stock Status indicators

SC19.10 (para. 32) The SC **NOTED** the importance of exploring alternative data poor stock assessment methods and **RECOMMENDED** that the Commission allocates funding for work to explore methods based on different data sources, such as catch curve estimation of mortality from length-frequency data. A range of data sources should be explored, including data from observer programmes, the sport fisheries project, and non-state actor (e.g. WWF) projects for suitability.

SC19.11 (para. 33) The SC **RECALLED** the recommendation of the WPNT05 for the SC to request the Working Party on Methods evaluate a proposed alternative methodology for presenting management advice for data poor methods in 2016. The SC **REQUESTED** that the WPM evaluate the possibility of using different colours to distinguish between stocks which have not been assessed (e.g., white) and stocks which have been assessed but the status is considered to be uncertain (e.g., grey).

Report of the 6th Session of the Working Party on Temperate tunas

New information on biology, ecology, fisheries and environmental data relating to temperate tunas

SC19.12 (para. 41) **NOTING** the general paucity of biological indicators available from the Indian Ocean, and particularly the lack of age-specific maturity as a primary source of uncertainty in the stock assessment of albacore tuna, the SC **RECOMMENDED** a study on the growth curve of albacore tuna in the Indian Ocean as a high priority in the **SC** Program of Work.

Report of the 14th Session of the Working Party on Billfish

SC19.13 (para. 46) The SC **RECOMMENDED** that on the next revisions of the IOTC Agreement, short billed spearfish be included as an IOTC species.

Billfish species identification

SC19.14 (para. 48) The SC **AGREED** on the importance of the hard, waterproof copies of the IOTC species identification guides for observers and port samplers, and **RECOMMENDED** that funds are allocated for further printing of the species ID guides for distribution to sports fishing clubs and recreational fisheries to improve the quality of data reported, and that funds also be continued for the translation of these into the priority languages identified by the SC.

Swordfish habitat and behavior

SC19.15 (para. 51) The SC **RECOMMENDED** that, for subsequent WPB meetings, swordfish is treated as a single stock and that references related to swordfish for the southwest Indian Ocean are removed from the Executive Summary and from the summary of available data for all billfish species.

Report of the 12th Session of the Working Party on Ecosystems and Bycatch (WPEB12)

Identification guides for fishing gear

SC19.16 (para. 55) The SC **RECALLED** the recommendation made by the WPEB in 2013 and 2014: Noting the continued confusion in the terminology of various hook types being used in IOTC fisheries, (e.g. tuna hook vs. J-hook; definition of a circle hook), the SC **RECOMMENDED** that the Commission allocate funds in the 2014 IOTC Budget to develop an identification guide for fishing hooks and pelagic fishing gears used in IOTC fisheries. The total estimated production and printing costs for the first 1000 sets of the identification cards is around a maximum of US$16,500 (Table 6). The IOTC Secretariat shall seek funds from potential donors to print additional sets of the identification cards at US$5,500 per 1000 sets of cards.

Regional observer scheme

SC19.17 (para. 56) **RECALLING** the SC18 (IOTC–2015–SC18–R, para. 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".*

the SC **RECOMMENDED** all CPCs to submit observer data in an electronic format that can be automatically exported and processed into a standard spreadsheet-like format (e.g. csv, xml, txt, xls, dbase, mdb etc.), avoiding formats whose processing could be time consuming and unnecessarily complex (e.g. pdf, Microsoft Word documents etc.), at the same time ensuring that all of the agreed minimum data reporting requirements have been fulfilled.

SC19.18 (para. 57) **RECALLING** 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*", and **NOTING** that the objective of the ROS contained in Resolution 11/04, and the rules contained in Resolution 12/02 "*On data confidentiality policy and procedures"* make no reference to the data collected not being used for compliance purposes, the SC reiterated its **RECOMMENDATION** that at the next revision of Resolution 11/04, it be clearly stated that the data collected shall only be used for scientific purposes.

Bycatch data exchange protocol (BDEP)

SC19.19 (para. 58) The SC **RECOMMENDED** that, on completion of the development of the ROS database and the input of all of the historical data, the IOTC Secretariat continue to populate the BDEP template, adapting it where necessary, and present this to the WPDCS and SC for further review.

Gillnet fisheries

SC19.20 (para. 59) **NOTING** that gillnets are regularly being used with lengths in excess of 4,000 m (and up to 7,000 m) within and occasionally into the high seas, and that those used within the EEZ may sometimes drift onto the high seas in contravention of Resolution 12/12, the SC reiterated it's previous **RECOMMENDATION** 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.

Data collection opportunities

SC19.21 (para. 60) The SC **RECOGNISED** that although the IOTC Regional Observer Programme (ROP) for transhipment is primarily a mechanism for compliance monitoring, it does provide potential opportunities for gathering photographs and information for scientific purposes, including on seabird bycatch mitigation measures. Therefore, the SC **RECOMMENDED** that the collection of seabird bycatch mitigation photographs through the ROP is trialled as a pilot.

ACAP best practice advice: update

SC19.22 (para. 68) The SC **RECOMMENDED** that Resolution 12/06 be reviewed and **ENCOURAGED** the line weighting specifications to be updated to conform with the latest ACAP advice: (a) 40 g or greater attached within 0.5 m of the hook; or (b) 60 g or greater attached within 1 m of the hook; or (c) 80 g or greater attached within 2 m of the hook. CPCs are **ENCOURAGED** to test the safety and practicality of the above mentioned measure as well as sliding lead devices for line weighting, and to report the results back to the WPEB or SC.

SC19.23 (para. 69) The SC **RECOMMENDED** that when Resolution 12/06 is reviewed, the two hook-shielding devices recommended by ACAP as best practice mitigation measures be incorporated as stand-alone mitigation options for use in IOTC fisheries operating south of 25°S, and that these measures should conform with the technical specifications and performance attributes detailed in the ACAP advice. The SC **CLARIFIED** that if used, the hook-shielding devices would not need to be combined with any other mitigation measure. In relation to the Smart Tuna Hook, the SC **NOTED** that on the basis of information provided, after release from the hook the shield sinks to the seafloor where it corrodes

within 12 months, the byproduct of which is iron oxide and carbon. However, the SC **NOTED** concerns regarding pollution associated with the discarded shields of the Smart Tuna Hooks, and **REQUESTED** that further information be made available to clarify the potential effects.

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

SC19.24 (para. 82) 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 16 of the 36 IOTC CPCs have an NPOA-Sharks (6 more in development), while only 7 CPCs have an NPOA-Seabirds (3 more in development). A single CPC has determined that an NPOA-Sharks is not needed, and 3 have similarly determined that an NPOA-Seabirds is not needed. Currently 10 CPCs have implemented the FAO guidelines to reduce marine turtle mortality in fishing operations, and two CPCs (European Union, France (OT)) have implemented a full NPOA.

Report of the 18th Session of the Working Party on Tropical Tunas (WPTT18)

Bigeye tuna CPUE summary discussion

SC19.25 (para. 93) The SC **RECOMMENDED** that the multi-nation CPUE standardisation collaboration continue their efforts to improve the understanding of commercial CPUE as relative abundance indices, and expand future work to include other fleets, including the Seychelles longline fleet.

Stock Synthesis III (SS3) assessment of yellowfin tuna

SC19.26 (para. 95) **NOTING** the discussions on the tagging mixing period during previous WPTT meetings, related to the assessment of yellowfin and other tropical tuna stocks, the SC **RECOMMENDED** that additional work to be conducted to elucidate the most appropriate approach to tag modelling in IOTC stock assessments.

Parameters for future analyses: Yellowfin tuna CPUE standardisation and stock assessments

SC19.27 (para. 96) The SC **RECOMMENDED** that development of the next stock assessment of yellowfin tuna should include a detailed review of the existing data sources (conducted by the stock assessment consultant, in collaboration with the IOTC Secretariat and main longline and purse seine fleets), including:

ix. Size frequency data: Evaluation of the reliability of length composition from the longline fisheries (including recent and historical data), review of issues with the use of the (EU) purse seine length composition data prior to 1991, and the need for a thorough review of the size frequency data held by IOTC, in collaboration with the fleets involved, to improve the utilization of these data in tropical tuna stock assessments.

x. Collaborative longline CPUE: Further refinement of the procedures to standardize the composite longline logsheet data sets to develop the longline CPUE indices;

xi. Tagging data: Comprehensive analysis of the tag release/recovery data set;

xii. Alternative CPUE series: a review of the available data from the Indian tuna longline survey data.

Report of the 7th Session of the Working Party on Methods (WPM07)

Presentation and evaluation of MSE results

SC19.28 (para. 100) The SC **RECOMMENDED** the proposed standardised methods for the presentation of MSE results (Appendix IX) are submitted to TCMP and S21 for discussion, revision and endorsement, as appropriate. Subsequently, this should be considered a living document that will benefit from revision based upon feedback received from the TCMP, which will first meet in 2017.

Operational definition of TRPs and LRPs

SC19.29 (para. 101) The SC **NOTED** the request for advice on the feasibility of reporting stock status in relation

to limit reference points in addition to the target reference points currently used:

*"The Commission **NOTED** the progress towards development of harvest strategies for key stocks, including the adoption of limit and target reference points for a number of stocks, and **REQUESTED** that the SC provide advice to the 21st Session of the IOTC on the feasibility of reporting stock status in relation to the agreed limit reference points"* (IOTC-2016-S20-R, para. 16[15]).

The SC **NOTED** that if stock status advice changes as soon as the target reference points are exceeded, it is likely for advice to change based purely on natural fluctuations in stock abundance or other expected sources of variability. The SC **RECOMMENDED** that the operational definition of TRPs and LRPs is included for discussion at the Technical Committee on Management Procedures.

Revision of the WPM Program of work (2017–2021)

SC19.30 (para. 102) SC **NOTED** that the next stock assessment of Indian Ocean swordfish is due to take place in 2017 and **RECOMMENDED** that the development of MSE of swordfish is considered as a high priority in the revised WPM Program of Work and that funding is allocated for this activity, to start the conditioning of an OM for this stock.

Report of the 12th Session of the Working Party on Data Collection and Statistics (WPDCS12)

Further analysis of length frequency data and likely impacts on the assessments

SC19.31 (para. 109) The SC **RECOMMENDED** that a collaborative work on longline size frequency data gathering scientists from Taiwan,China, Japan, Seychelles and Rep. of Korea should be conducted in 2017 in conjunction with the joint CPUE workshop, to compare the different data sets available and extract information useful for the future stock assessments of yellowfin, bigeye and albacore tuna.

Capacity Building Activities: Data Collection and Processing in Coastal Countries, and Compliance with Minimum Requirements

SC19.32 (para. 116) The SC **RECOMMENDED** that a capacity building workshop on R data extraction, manipulation and data visualisation takes place in 2017, **NOTING** that funding sources have to be sought and that Sri Lanka has expressed strong interest in this type of activity.

General discussion on data issues

SC19.33 (para. 120) The SC **NOTED** the issues with lack of data and poor quality data problems that were identified throughout the working party reports strongly **RECOMMENDED** that these issues are addressed through improved compliance with Resolutions 15/01 *On the recording of catch and effort data by fishing vessels in the IOTC area of competence*, and 15/02 *Mandatory statistical reporting requirements for IOTC contracting parties and cooperating non-contracting parties*.

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

Data collection and capacity building

SC19.34 (para. 121) 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, particularly in relation to the implementation of the Regional Observer Scheme and data collection and reporting for artisanal fisheries and **RECOMMENDED** that the Commission further increases the IOTC Capacity Building budget to fund these activities in the future.

Meeting participation fund

SC19.35 (para. 123) The SC reiterated its **RECOMMENDATION** 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.

[15] Provisional until approval of the final version of the S20 report by correspondence.

IOTC species identification guides: Tuna and tuna-like species

SC19.36 (para. 124) The SC **RECOMMENDED** that the Commission allocates budget towards continuing the translation and printing of the IOTC species ID guides so that hard copies of the identification cards can 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 on board.

IOTC Secretariat staffing

SC19.37 (para. 126) **NOTING** the very heavy workload at the IOTC Secretariat and the ever increasing demands by the Commission and the Scientific Committee, and also the capacity to respond to requests for assistance by countries, the SC **RECOMMENDED** that the recommendation from the Performance Review PRIOTC02.07(g) is implemented, and that permanent staff of the IOTC Data and Science Section be increased by two (2) (1 x P4 and 1 x P3 level positions), supplemented by additional short-term consultants, to commence work by 1 January 2018 or earlier, and that funding for these new positions should come from both the IOTC regular budget and from external sources to reduce the financial burden on the IOTC membership.

Collaborative Longline CPUE

SC19.38 (para. 127) The SC **ACNOWLEDGED** the work of the WPTT and WPTmT and especially improvements in the joint CPUE standardization work which is critical for reliably estimating the stocks. The SC **NOTED** that the joint CPUE has become a critical component for the assessments of temperate and tropical tuna species and the SC **RECOMMENDED** that this work continue under the current framework, but that plans should be developed to formalize the process within the IOTC in the near future.

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

SC19.39 (para. 128) 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

Development of a proposal for a Pilot Project to be presented to the Commission 2017

SC19.40 (para. 160) The SC **NOTED** the substantial resourcing that the proposed framework will require and **RECOMMENDED** that the Commission provide adequate resources to enable implementation of the project.

Progress on the Imlpementation of the Recommendations of the Second Performance Review Panel

SC19.41 (para. 168) The SC **RECOMMENDED** that the Commission note the updates on progress regarding Resolution 16/03, as provided at Appendix XXXIII.

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

Consultants

SC19.42 (para. 179) **NOTING** the highly beneficial and relevant work done by IOTC stock assessment consultants in 2016 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.

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

SC19.43 (para. 185) The SC further **NOTED** that the intention of this is to hold a dialogue meeting between Commissioners as well as scientists and **RECOMMENDED** that the Commission consider holding an internal IOTC meeting in early 2017 in advance of the global meeting.

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

SC19.44 (para. 204) The SC **RECOMMENDED** that the Commission consider the consolidated set of recommendations arising from SC19, provided at Appendix XXXVII