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

Report of the 10th Session of the IOTC Working Party on Ecosystems and Bycatch

Yokohama, Japan, 27–31 October 2014

DISTRIBUTION:
Participants in the Session
Members of the Commission
Other interested Nations and International Organizations
FAO Fisheries Department
FAO Regional Fishery Officers

BIBLIOGRAPHIC ENTRY
IOTC–WPEB10 2014. Report of the 10th Session of the IOTC Working Party on Ecosystems and Bycatch. Yokohama, Japan, 27–30 October 2014. *IOTC–2014–WPEB10–R[E]: 94 pp.*

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

Contact details:

Indian Ocean Tuna Commission
Le Chantier Mall
PO Box 1011
Victoria, Mahé, Seychelles
Ph: +248 4225 494
Fax: +248 4224 364
Email: secretariat@iotc.org
Website: http://www.iotc.org

ACRONYMS

ACAP	Agreement on the Conservation of Albatrosses and Petrels
BSH	Blue shark
CITES	Convention on International Trade in Endangered Species
CMM	Conservation and Management Measure (of the IOTC; Resolutions and Recommendations)
CPCs	Contracting Parties and Cooperating Non-Contracting Parties
CPUE	Catch per unit of effort
current	Current period/time, i.e. $F_{current}$ means fishing mortality for the current assessment year.
EEZ	Exclusive Economic Zone
ERA	Ecological Risk Assessment
EU	European Union
F	Fishing mortality; F_{2010} is the fishing mortality estimated in the year 2010
FAD	Fish Aggregation Device
FAO	Food and Agriculture Organization of the United Nations
F_{MSY}	Fishing mortality at MSY
GLM	Generalised liner model
HBF	Hooks between floats
IO	Indian Ocean
IOTC	Indian Ocean Tuna Commission
IOSEA	Indian Ocean - South-East Asian Marine Turtle Memorandum
IO-ShYP	Indian Ocean Shark multi-Year Plan
IPOA	International Plan of Action
IUU	Illegal, Unreported and Unregulated, fishing
LL	Longline
LSTLV	Large-scale tuna longline vessel
MoU	Memorandum of Understanding
MPF	Meeting Participation Fund
MSY	Maximum sustainable yield
n.a.	Not applicable
NGO	Non-Governmental Organisation
NPOA	National Plan of Action
PSA	Productivity Susceptibility Analysis
ROS	Regional Observer Scheme
SC	Scientific Committee of the IOTC
SB	Spawning biomass (sometimes expressed as SSB)
SB_{MSY}	Spawning stock biomass which produces MSY
Taiwan,China	Taiwan, Province of China
UN	United Nations
WPDCS	Working Party on Data Collection and Statistics, of the IOTC
WPEB	Working Party on Ecosystems and Bycatch, of the IOTC

KEY DEFINITIONS

Bycatch	All species, other than the 16 species listed in Annex B of the IOTC Agreement, caught or interacted with by fisheries for tuna and tuna-like species in the IOTC area of competence.
Discards	Any species, whether an IOTC species or bycatch species, which is not retained onboard for sale or consumption.
Large-scale driftnets	Gillnets or other nets or a combination of nets that are more than 2.5 kilometers in length whose purpose is to enmesh, entrap, or entangle fish by drifting on the surface of, or in, the water column.

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**).

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The 10th Session of the Indian Ocean Tuna Commission's (IOTC) Working Party on Ecosystems and Bycatch (WPEB) was held in Yokohama, Japan, from 27 to 31 October 2014. A total of 37 participants (32 in 2013) attended the Session.

The following are a subset of the complete recommendations from the WPEB10 to the Scientific Committee, which are provided at Appendix XIX.

Identification cards for shark, seabirds and marine turtles

WPEB10.02 (para. 21) **NOTING** the recent online survey distributed by the IOTC Secretariat, the WPEB strongly **RECOMMENDED** that the IOTC Secretariat ensure that hard copies of the identification cards continue to be printed in hard copy form 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. At this point in time, electronic formats, including 'applications or apps' are only suitable for larger scale vessels, and even in the case of EU purse seine vessels, the use of hard copies is relied upon due to on board fish processing and handling conditions, as well as weather conditions.

Observer trip reporting template

WPEB10.03 (para. 57) The WPEB **RECOMMENDED** that the Scientific Committee **ADOPT** the revised versions of the observer reporting templates (see para. 55 of the WPEB10 Report), consistent with Resolution 11/04 *"…the IOTC Scientific Committee will elaborate an observer working manual, a template to be used for reporting (including minimum data fields) and a training program*".

Resolution 11/04 ***on a regional observer program***

WPEB10.06 (para. 211) **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* makes no reference to the data collected not being used for compliance purposes, the WPEB **RECOMMENDED** that at the next revision of Resolution 11/04, it be clearly stated that the data collected shall not be used for compliance purposes.

Revision of the WPEB Program of Work 2015–2019

WPEB10.07 (para. 249) The WPEB **RECOMMENDED** that the SC consider and endorse the WPEB Program of Work (2015–2019), as provided at Appendix XVIII.

Consolidated recommendations of the 10th Session of the Working Party on Ecosystems and Bycatch

WPEB10.09 (para. 256) The WPEB **RECOMMENDED** that the Scientific Committee consider the consolidated set of recommendations arising from WPEB10, provided at Appendix XIX, as well as the management advice provided in the draft resource stock status summary for each of the seven shark species, as well of those for marine turtles and seabirds:

Sharks

- Blue sharks (*Prionace glauca*) – Appendix IX
- Oceanic whitetip sharks (*Carcharhinus longimanus*) – Appendix X
- Scalloped hammerhead sharks (*Sphyrna lewini*) – Appendix XI
- Shortfin mako sharks (*Isurus oxyrinchus*) – Appendix XII
- Silky sharks (*Carcharhinus falciformis*) – Appendix XIII
- Bigeye thresher sharks (*Alopias superciliosus*) – Appendix XIV
- Pelagic thresher sharks (*Alopias pelagicus*) – Appendix XV

Other species/groups

- Marine turtles – Appendix XVI
- Seabirds – Appendix XVII

Stock status summary

A summary of the stock status for some of the most commonly caught shark species caught in association with IOTC fisheries for tuna and tuna-like species is provided in Table 1.

TABLE 1. Status summary for key shark species caught in association with IOTC fisheries for tuna and tuna-like species.

Stock	Indicators	Prev	2010	2011	2012	2013	2014	Advice to Commission
Sharks: Although they are not part of the 16 species directly under the IOTC mandate, sharks are frequently caught in association with other species as 'bycatch', although for some fleets are often as much a target as tuna. 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 tuna fisheries, but the list is not exhaustive.								
Blue shark *Prionace glauca*	Catch 2013: 23,197 t Average catch 2009–2013: 24,447 t MSY (1000 t) (80% CI): Unknown F_{MSY} (80% CI): Unknown B_{MSY} (1000 t) (80% CI): Unknown F_{2013}/F_{MSY} (80% CI): Unknown $SB_{2013/S}B_{MSY}$ (80% CI): Unknown SB_{2013}/SB_0 (80% CI): Unknown							There remains considerable uncertainty about the relationship between abundance, CPUE series and total catches over the past decade. There is a paucity of information available on this species, but this 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. There is no quantitative stock assessment and limited basic fishery indicators currently available for blue shark in the Indian Ocean. o Blue sharks – Appendix IX
Silky shark *Carcharhinus falciformis*	– –							There is a paucity of information available for these species and this situation is not expected to improve in the short to medium term, with the exception of blue shark. There is no quantitative stock assessment and limited basic fishery indicators currently available. Therefore the stock status is uncertain. The available evidence indicates considerable risk to the stock status at current effort levels. The primary source of data that drive the status determination (total catches) is highly uncertain and should be investigated further as a priority. o Oceanic whitetip sharks – Appendix X o Scalloped hammerhead sharks – Appendix XI o Shortfin mako sharks – Appendix XII o Silky sharks – Appendix XIII o Bigeye thresher sharks – Appendix XIV o Pelagic thresher sharks – Appendix XV
Oceanic whitetip shark *Carcharhinus longimanus*	– –							
Scalloped hammerhead shark *Sphyrna lewini*	– –							
Shortfin mako *Isurus oxyrinchus*	– –							
Bigeye thresher shark *Alopias superciliosus*	– –							
Pelagic thresher shark *Alopias pelagicus*	– –							

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

1. OPENING OF THE MEETING

1. The 10th Session of the Indian Ocean Tuna Commission's (IOTC) Working Party on Ecosystems and Bycatch (WPEB) was held in Yokohama, Japan, from 27 to 31 October 2014. A total of 37 participants (32 in 2013) attended the Session. The list of participants is provided at Appendix I. The meeting was opened by Mr Kotaro Yokawa, from the National Research Institute of Far Sea Fisheries, Japan, who welcomed participants to Japan and formally opened the 10th Session of the IOTC Working Party on Ecosystems and Bycatch (WPEB10). The Chair, Dr Rui Coelho, also welcomed participants to Japan, including the Invited Expert, Dr Joel Rice, from the Secretariat of the Pacific Community (SPC), New Caledonia.

2. ADOPTION OF THE AGENDA AND ARRANGEMENTS FOR THE SESSION

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

3. OUTCOMES OF THE 16TH SESSION OF THE SCIENTIFIC COMMITTEE

3. The WPEB **NOTED** paper IOTC–2014–WPEB10–03 which outlined the main outcomes of the 16th Session of the Scientific Committee (SC16), specifically related to the work of the WPEB and **AGREED** to consider how best to progress these issues at the present meeting.

4. **NOTING** that the SC adopted a set of standardised IOTC Working Party and Scientific Committee reporting terminology, contained in Appendix IV of the SC16 Report (para. 23 of the SC16 Report), the WPEB **AGREED** that the terminology (which is provided in the opening pages of this WPEB10 Report) will provide greater clarity and remove some of the ambiguity in the way advice is provided to the next level in the Commission's structure.

5. The WPEB **RECALLED** that the SC adopted revised '*Guidelines for the presentation of stock assessment models'* in 2012, which include the minimum requirements for presenting CPUE standardisations. All participants who undertake CPUE standardisations and/or stock assessments should familiarise themselves with these guidelines (provided in paper IOTC–2014–WPEB10–INF01).

6. The WPEB **NOTED** that in 2013, the SC made a number of requests in relation to the WPEB09 report (noting that updates on Recommendations of the SC16 are dealt with under Agenda item 5. Those requests and the associated responses from the WPEB10 are provided below for reference.

4. OUTCOMES OF SESSIONS OF THE COMMISSION

4.1 Outcomes of the 18th Session of the Commission

7. The WPEB **NOTED** paper IOTC–2014–WPEB10–04 which outlined the main outcomes of the 18th Session of the Commission, specifically related to the work of the WPEB and **AGREED** to consider how best to provide the Scientific Committee with the information it needs, in order to satisfy the Commission's requests, throughout the course of the current WPEB meeting.

8. The WPEB **NOTED** the 7 Conservation and Management Measures (CMMs) adopted at the 18th Session of the Commission (consisting of 6 Resolutions and 1 Recommendation):

IOTC Resolutions

- Resolution 14/01 *On the removal of obsolete Conservation and Management Measures*
- Resolution 14/02 *For the conservation and management of tropical tunas stocks in the IOTC area of competence*
- Resolution 14/03 *On enhancing the dialogue between fisheries scientists and managers*
- Resolution 14/04 *Concerning the IOTC record of vessels authorised to operate in the IOTC area of competence*
- Resolution 14/05 *Concerning a record of licensed foreign vessels fishing for IOTC species in the IOTC area of competence and access agreement information*
- Resolution 14/06 *On establishing a programme for transhipment by large-scale fishing vessels*

IOTC Recommendations

- Recommendation 14/07 *To standardise the presentation of scientific information in the annual Scientific Committee report and in Working Party reports*

9. The WPEB **ACKNOWLEDGED** the importance of standardising the way in which the subsidiary bodies of the Commission provide advice. Recommendation 14/07, newly adopted at the 18th Session of the Commission,

details a range of options for further standardising the way in which advice may be presented in the IOTC Executive Summaries. While the current species Executive Summaries already comply with most of the suggestions contained in Recommendation 14/07, there is always room for improvement. However, the SC's '*Guidelines for the presentation of stock assessment models'* adopted in 2012 (provided in paper IOTC–2014–WPEB10–INF01), will now need to be updated to include the new elements from Recommendation 14/07.

10. **NOTING** that the Commission also made a number of general comments and requests on the recommendations made by the Scientific Committee in 2013, which have relevance for the WPEB (details as follows: paragraph numbers refer to the report of the Commission (IOTC–2014–S18–R): the WPEB **AGREED** that any advice to the Commission would be provided in the Management Advice section of each stock status summary for the bycatch species detailed in the relevant species sections of this report.

    The Commission addressed the list of recommendations made by the SC16 (Appendix V) from its 2013 report (IOTC–2013–SC16–R) that related specifically to the Commission. The Commission ***ENDORSED*** *the list of recommendations, taking into account the range of issues outlined in this Report (S18) and incorporated within adopted Conservation and Management Measures. (para. 10 of the S18 report)*

    Environmental conditions/functioning

    NOTING *the importance of the environmental conditions and their inter-annual variability on CPUE indices of IOTC species, and more generally, on recruitment and biomass, the SC* ***REQUESTED*** *that the working parties take into account more environment and ecosystem-related issues when undertaking stock assessment analyses. This could be achieved by encouraging a greater participation of oceanographers and ecosystem modellers in the work of the working parties. Additional funds may be needed to attract modellers to IOTC working parties.* (para. 140 of the SC16 Report)

    At-sea trials of line-weighting options for pelagic longline vessels

    The SC ***CONGRATULATED*** *the Government of the Republic of Korea, Sajo Industries and BirdLife International for the highly successful collaborative research undertaken to date. The results demonstrate that Korean-style branchlines can be optimised for a fast sink rate with a weighting regime that appears to have a very low risk of impacting negatively catch rates of target species, with no safety risks to crew and with no operational difficulties.* (para. 70 of the SC16 Report)

    NOTING *that further work is required, preferably in areas of high seabird abundance, to achieve robust sample sizes for assessing the impacts of weights on target and non-target catch rates, the SC strongly* ***ENCOURAGED*** *the collaborative research efforts to continue and for the findings to be presented to the WPEB in 2014.* (para. 71 of the SC16 Report)

Meeting participation fund

11. **NOTING** that the MPF was used to fund the participation of only 5 national scientists to the WPEB10 meeting in 2014 (from 10 applications) compared to 11 recipients in 2013 (from 11 applications), all of which were required to submit and present a working paper at the WPEB meeting, the WPEB **RECALLED** that:

    - The IOTC Meeting Participation Fund (MPF), adopted by the Commission in 2010 (Resolution 10/05 *On the establishment of a Meeting Participation Fund for developing IOTC Members and non-Contracting Cooperating Parties*), and now incorporated into the IOTC Rules of Procedure (2014), was established for the purposes of supporting scientists and representatives from IOTC Contracting Parties and Cooperating Non-Contracting Parties (CPCs) who are developing States to attend and contribute to the work of the Commission, the Scientific Committee and its Working Parties.

    - The Commission has made the following directives to the IOTC Secretariat:
        i. The Commission had directed the IOTC Secretariat (via Resolution 10/05 and now via the IOTC Rules of Procedure (2014)) to ensure that: (para. 88 of the S18 Report)
            a) the MPF be utilised, as a first priority, to support the participation of scientists from developing CPCs in scientific meetings of the IOTC, including Working Parties, rather than non-science meetings.
            b) the MPF will be allocated in such a way that no more than 25% of the expenditures of the Fund in one year is used to fund attendance to non-scientific meetings.
            c) thus, 75% of the annual MPF shall be allocated to facilitating the attendance of developing CPC scientists to the Scientific Committee and its Working Parties.
        ii. The Commission had directed the IOTC Secretariat that any cost savings made on the annual IOTC budget, shall also be used to further supplement the $60,000 currently budgeted for the MPF.

- In accordance with para. 89 of the S18 Report, the IOTC Secretariat is actively seeking extra budgetary funding sources to supplement the MPF budget from individual Contracting Parties as well as other interested groups. However, the WPEB was informed by the IOTC Secretariat that other sources should actively be sought by interested candidates, including the UNFSA meeting fund, as well as through their own domestic budgetary processes.

12. The WPEB **RECOMMENDED** that the Scientific Committee consider revising the MPF rules of procedure, so that a Draft paper be submitted to the relevant Working Party MPF Selection Panel earlier than the current 15 days before the meeting, so that the Panel may review the full paper rather than just the abstract, and provide guidance on areas for improvement and the suitability of the application to receive funding using the MPF. The justification of this request is based upon the reduced funds available and the need to maximise benefits. However, some participants did not want the deadline to be brought earlier than the current 15 day deadline.

4.2 Review of Conservation and Management Measures relevant to Ecosystems and Bycatch

13. The WPEB **NOTED** paper IOTC–2014–WPEB10–05 which aimed to encourage participants at the WPEB10 to review some of the existing Conservation and Management Measures (CMM) relevant to relevant to ecosystems and bycatch, noting the CMMs contained in document IOTC–2014–WPEB10–04; and as necessary to 1) provide recommendations to the Scientific Committee on whether modifications may be required; and 2) recommend whether other CMMs may be required.

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

5. PROGRESS ON THE RECOMMENDATIONS OF WPEB09

15. The WPEB **NOTED** paper IOTC–2014–WPEB10–06 which provided an update on the progress made in implementing the recommendations from the previous WPEB meeting which were endorsed by the Scientific Committee, and **AGREED** to provide alternative recommendations for the consideration and potential endorsement by participants as appropriate given any progress.

16. The WPEB **NOTED** that any recommendations developed during a Session, must be carefully constructed so that each contains the following elements:
    - a specific action to be undertaken (deliverable);
    - clear responsibility for the action to be undertaken (i.e. a specific CPC of the IOTC, the Secretariat, another subsidiary body of the Commission or the Commission itself);
    - a desired time frame for delivery of the action (i.e. by the next working party meeting, or other date).

17. The WPEB **REQUESTED** that the IOTC Secretariat continue to prepare a paper on the progress of the recommendations arising from the previous WPEB, incorporating the final recommendations adopted by the Scientific Committee and endorsed by the Commission, as well as any updates and requests.

Identification cards for shark, seabirds and marine turtles

18. The WPEB **RECALLED** its recommendation from 2013, that the shark, seabird and marine turtle species identification cards be translated into a range of priority languages, and that the Commission allocate funds for this purpose (WPEB09 recommendations WPEB09.06, para. 38 and WPEB09.07, para 39 of the WPEB09 Report). These recommendations were subsequently endorsed by the Scientific Committee via SC Recommendation SC16.59, para. 143 and SC16.60, para. 144 of the SC16 Report).

19. The WPEB **NOTED** that the Commission at its 18th Session approved the translation and printing recommendations of the SC, with US$12,000 allocated for this purpose. The WPEB was informed by the IOTC Secretariat that the translation process had commenced with a consultant hired to prepare the text contained in all of the identification cards into a format that will be used for translation in early 2015. The intention is to seek 'voluntary' translators for as many of the priority languages as possible, and to hire the services for the remaining languages as necessary.

20. The WPEB **RECALLED** its request from the WPEB09, that the IOTC Secretariat makes further edits/improvements to the cards for the next English and French printing, as necessary (e.g. the addition of new species), and also to examine the feasibility of producing the cards in electronic (e-book) format for future use using smart media/hardware. An example of a current e-book for species identification may be found at: http://www.afma.gov.au/static/seabird/

21. **NOTING** the recent online survey distributed by the IOTC Secretariat, the WPEB strongly **RECOMMENDED** that the IOTC Secretariat ensure that hard copies of the identification cards continue to be printed in hard copy form 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. At this point in time, electronic formats, including 'applications or apps' are only suitable for larger scale vessels, and even in the case of EU purse seine vessels, the use of hard copies is relied upon due to on board fish processing and handling conditions, as well as weather conditions.

22. The WPEB **NOTED** that ACAP together with the Japanese Fisheries Research Agency, is in the process of finalising a seabird bycatch identification guide for use in observer programmes and containing photos of seabird corpses for assisting the identification of dead seabirds caught at sea. The guide is due for completion in early 2015 and will be translated into languages other than English.

23. The WPEB **AGREED** that the ACAP identification guides would be a useful addition to the IOTC seabird identification guides, and that for future iterations of the identification guide, the IOTC Secretariat could liaise with ACAP in order to include the photos of dead seabirds in the IOTC identification guide.

Identification guides for fishing gear

24. The WPEB **RECALLED** that in 2013 the WPEB made the following recommendation to the SC
"*WPEB09.12 (para.117) 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 WPEB RECOMMENDED that the Commission allocate funds in the 2014 IOTC Budge 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."*

25. **NOTING** that other RFMOs (I-ATTC) and development bodies (SPC) have developed regional "longline terminal gear identification guides", the WPEB **AGREED** that the development of such guide for the Indian Ocean fisheries is likely to result in an improvement of data for stock assessment purposes, in particular catchability of target species. The IOTC Secretariat should contact the SPC to determine if their guide could be adopted for use in the Indian Ocean.

Fisheries officer (Bycatch)

26. The WPEB **NOTED** that due to the rapidly increasing scientific workload at the IOTC Secretariat, including a wide range of additional duties on ecosystems and bycatch assigned to it by the SC and the Commission, and that the new Fishery Officer (Science) supporting the IOTC scientific activities has not been given a mandate by the Commission to work on ecosystems and bycatch matters, the WPEB had previously asked the Commission to approve the hiring of a Fishery Officer (Bycatch) to work on bycatch matters in support of the scientific process. However, the Commission does not consider this to be a current priority which some WPEB participants agreed with for budgetary reasons.

6. REVIEW OF DATA AVAILABLE ON ECOSYSTEMS AND BYCATCH

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

IOTC database

27. The WPEB **NOTED** paper IOTC–2014–WPEB10–07 Rev_1 which provided an overview of the standing of a range of information received by the IOTC Secretariat for bycatch (including byproduct) species, in accordance with IOTC Resolution 10/02 *Mandatory statistical requirements for IOTC Members and Cooperating non-Contracting Parties (CPC's)*, for the period 1950–2013. A summary for sharks is provided at Appendix IV.

28. The WPEB **NOTED** the main data issues that are considered to negatively affect the quality of the statistics for bycatch (including byproduct) species available at the IOTC Secretariat, by species group, type of dataset and fishery, which are provided in Appendix V, and **REQUESTED** that the CPCs listed in the Appendix, make efforts to remedy the data issues identified and to report back to the WPEB at its next meeting.

29. The WPEB **NOTED** the standing of catch statistics for the main species of sharks, by major fisheries (gears), for the period 1950–2013 (Appendix VI) and **EXPRESSED** strong concern as the information on retained catches and discards of sharks contained in the IOTC database remains very incomplete for most fleets despite their mandatory reporting status, and that catch-and-effort as well as size data are essential to assess the status of shark stocks.

30. The WPEB **NOTED** the comment from scientists from Japan that they have historic data sets for sharks that could eventually be provided, including for oceanic whitetip sharks and thresher sharks. However, at this point the data need processing, which may require a substantial amount of time before it is considered to be reliable enough to submit as an official catch history.

31. The WPEB **NOTED** that many other CPCs have additional data holdings which should be reported to the IOTC Secretariat in accordance with IOTC data reporting requirements. CPCs should to the full extent possible, report this information, particularly historical data holdings. Paragraph 6c of IOTC Resolution 10/02 permits the revision of data already submitted as long as a justification is provided. Resolution *12/02 on Data confidentiality policy and procedures* outlines how data submitted to the IOTC Secretariat is handled.

32. The WPEB **RECALLED** the value of reporting to the IOTC Secretariat all information on bycatch, caught in fisheries targeting tuna and tuna-like species, or collected during national monitoring programs, and encouraged CPCs to initiate such programs. Summarised bycatch estimates are valuable, but original data as per IOTC standards is highly beneficial. The WPEB particularly emphasised the necessity of improvements to both the quantity and quality of data on sharks to be collected and reported over the coming years.

33. The WPEB **RECALLED** that presenting data at a working party meeting does not constitute a formal submission to the IOTC Secretariat. These data should be submitted formally to the IOTC Secretariat in accordance with the IOTC mandatory statistical requirements, outlined in Resolution 10/02, and other Resolutions for bycatch species.

34. **NOTING** that the IOTC Secretariat estimates total catches using alternative sources to obtain the best possible information to use in scientific advice, and that this approach has been endorsed by the SC, the WPEB **AGREED** that this approach should continue, as is the case in other RFMOs. These estimates should be reviewed in consultation with the relevant CPC. The WPEB will review these estimates annually.

35. The WPEB **NOTED** the work completed by the EU in 2012 to estimate total shark catches in the Indian Ocean and **ENCOURAGED** other CPCs to collaborate to strengthen this work.

6.2 Regional observer scheme – Update (Resolution 11/04 On a regional observer scheme)

36. The WPEB **NOTED** paper IOTC–2014–WPEB10–08 Rev_1 which provided an update on the national implementation of the IOTC regional observer scheme (ROS) for each IOTC CPC, noting that the ROS started on 1st July 2010 (Resolution 09/04 superseded by Resolution 10/04 and Resolution 11/04), including the following abstract provided by the authors:

> "*As of 10th October 2014, 172 observer trip reports had been submitted to the IOTC Secretariat by 8 CPCs. Coverage rates are still low and no artisanal fleets have yet implemented an observer scheme, however, a number of other CPCs are reporting progress in the development of observer programmes. This paper raises a number of issues regarding the quality of the reported data received to date and makes recommendations for the revision of the reporting templates to improve the quality of future data submitted*." – (see paper for full abstract).

37. **NOTING** the update of the implementation of the Regional Observer Scheme (Appendix VII), the WPEB again **EXPRESSED** its disappointment on the very low level of reporting to the IOTC Secretariat of both the observer trip reports and the list of accredited observers since the start of the ROS in July 2010. Such a low level of implementation and reporting is detrimental to the work of the WPEB and SC, in particular regarding the estimation of incidental catches of non-targeted species, as requested by the Commission.

38. The WPEB **NOTED** that the IOTC Regional Observer Scheme could be a significant source of potential data for marine turtles (e.g. sex and species composition, etc.) for some longline and gillnet fisheries.

39. The WPEB **NOTED** that 14 CPCs have submitted a list of accredited observers and have been allocated an IOTC observer registration number. 8 of these CPCs have submitted observer trips reports to the IOTC Secretariat since the commencement of the scheme, totalling 172 observer trip reports.

40. The WPEB **NOTED** the estimation of the level of effort covered by observers in 2010, 2011, 2012 and 2013 for industrial longline and purse seine vessels remains very low with only two CPCs reaching the minimum 5% coverage required by Resolution 11/04 for each gear (Longline: EU,Portugal and Rep. of Korea; Purse seine: EU,France and Rep. of Korea) (see paper IOTC–2014–WPEB10–08 Rev_1). For EU,France, coverage is estimated for the whole fleet, while observers can only be deployed on the largest vessels which have a 12% coverage. Reported coverage for the artisanal fleets is currently zero, but in future a summary will also be provided to give an overview of the level of coverage achieved by these fleets. While CPCs are required to report on the level of coverage by gear type, the methods used to estimate the level of coverage achieved are often not provided. Given there are some discrepancies between coverage rates estimated by the IOTC Secretariat and the coverage rates reported by CPCs, clarity on the methods used are needed.

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

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

42. **NOTING** the low levels of observer coverage achieved by CPCs to date, the WPEB **REQUESTED** that the planned capacity building activities to take place in 2015 support national programs, while possibilities such as self-sampling schemes should be considered in the meantime as an intermediate stage towards full implementation of the requirements set out in IOTC Resolution 11/04.

43. The WPEB **RECOGNISED** that the implementation of a national observer scheme is not a simple task, e.g. due to piracy activities, and that the financial and human costs involved in the deployment of observers are important to consider, in particular for CPCs with large fishing fleets.

44. The WPEB **AGREED** that the minimum observer coverage of 5% set out by Resolution 11/04 is already below the minimum necessary coverage estimated by simulations, and that it should not be lowered.

45. The WPEB **NOTED** that Japan considered their coverage to be higher than estimated, based on the proportion of sets observed. The IOTC Secretariat do not receive reported estimates of the total number of sets, only total numbers of hooks, thus this is the best way to estimate total coverage. Nevertheless, estimating coverage based on the number of hooks should provide very similar results as those estimating coverage based on the number of sets unless there is a consistent bias in the selection of sets to be observed or if not all hooks are observed within the sets.

46. The WPEB **RECALLED** that at the most recent Session of the Commission (S18, held in June 2014), the Commission responded to the SC as follows:

"*The Commission NOTED the recommendation from the SC that the total number of days-at-sea covered by observers versus the total number of days-at-sea for each fleet over a year is used instead of the number of sets/operations. However, this was not endorsed as it was felt that observer coverage rates were better calculated on the actual effort observed (i.e. number of hooks, number of sets).*" (para. 32 of S18 Report)

47. The WPEB **ENCOURAGED** all CPCs to submit observer data to the IOTC Secretariat in electronic format, noting that to date only one CPC has provided all information electronically. This would improve the efficiency of data collation and management for analysis.

48. The WPEB **NOTED** that the electronic observer templates used by CCAMLR incorporate error checking functionalities which are only possible with electronically submitted data and welcomed plans by the IOTC Secretariat to do the same.

49. The WPEB **AGREED** that substantial investments should be made now, to ensure sound observer database design and development. This would result in maximising the utility of the data collected in the future.

50. The WPEB **NOTED** that IRD (EU,France) is currently using a database for purse seine observer data which is in the process of being extended for longline fleets. A pilot scheme will be implemented in 2015, and that the results of this scheme will be presented at the next WPEB meeting.

Observer trip reporting template

51. The WPEB **NOTED** that while the observer reporting templates allow for a substantial amount of detailed information on catch and bycatch to be reported, there are a number of issues that have been identified with the current format in which the data are submitted. Bearing in mind the comments at the 15th Session of the Commission where it was noted that the observer report template 'will be reviewed and revised as necessary", a number of potential areas for revision were identified and discussed at the WPEB10 meeting:
    - Resolution of information provided
    - Sampling
    - Redundant questions
    - Format of information and categorisation
    - Level of detail

52. **NOTING** the high workload required from observers, due to the large number of data recording requirements, the WPEB **AGREED** to prioritise the data collection requirements based on the objectives of the Scientific Committee, ensuring that there is a clear purpose for every data field to prevent the collection of redundant information.

53. The WPEB **NOTED** the need for the harmonisation of observer templates across RFMOs, particularly where CPCs are required to report to more than one RFMO.

54. The WPEB **NOTED** that a workshop will take place on the harmonisation of observer programmes for longline fleets in January 2015, and that the IOTC Secretariat will attend.

55. The WPEB **REQUESTED** that the IOTC Secretariat finalise the revision of the observer reporting templates inter-sessionally based on the gear-specific recommendations made by the breakout group meetings held during the current working party meeting, and for these revisions to be provided to the WPDCS for its consideration and then the Scientific Committee for adoption.

56. The WPEB **AGREED** that the priorities and minimum requirements for data collection will be periodically reviewed and the templates revised where necessary in accordance with Resolution 11/04 and suggested revisions put forward to the WPDCS.

57. The WPEB **RECOMMENDED** that the Scientific Committee **ADOPT** the revised versions of the observer reporting templates (see para. 55 of the WPEB10 Report), consistent with Resolution 11/04 *"…the IOTC Scientific Committee will elaborate an observer working manual, a template to be used for reporting (including minimum data fields) and a training program*".

7. REVIEW OF NATIONAL BYCATCH ISSUES IN IOTC MANAGED FISHERIES AND NATIONAL PLANS OF ACTION (SHARKS; SEABIRDS; MARINE TURTLES)

7.1 Assessing the need for an NPOA

58. The WPEB **RECALLED** that the IPOA-SHARKS is a voluntary instrument that applies to all States engaged in shark fisheries. The text sets out a set of activities which implementing States are expected to carry out, including an assessment of whether a problem exists with respect to sharks, adopting a National Plan of Action for the conservation and management of sharks (NPOA-SHARKS), as well as procedures for national reviews and reporting requirements. The calendar years by when these actions preferably should have been taken, are indicated.

59. The WPEB **RECALLED** that the IPOA-SEABIRDS is a voluntary instrument that applies to all States engaged in longline fisheries. The text sets out a set of activities which implementing States are expected to carry out, including an assessment of whether a problem exists with respect to the incidental catch of seabirds in its longline fishery, adopting a National Plan of Action for reducing the incidental catch of seabirds in longline fisheries (NPOA-SEABIRDS) as well as procedures for national reviews and reporting requirements. The calendar years by when these actions preferably should have been taken, are indicated.

60. The WPEB **NOTED** that following discussions held at the WPEB09 in 2013, the SC discussed options to develop a process for assessing the need for an NPOA by CPCs, in particular for seabirds. The SC was unable to reach a conclusion in the time available and the issue was passed back to the WPEB to discuss further.

61. The WPEB **RECALLED** that the matter was initiated by India and Sri Lanka at the WPEB09 meeting, as they had made a request to the IOTC to have their NPOA requirements for seabirds classified as '*Not applicable (n.a.)*'. Both of these CPCs have reported very few or no interactions with seabirds by their respective fisheries targeting tuna and tuna-like species in the IOTC area of competence.

62. The WPEB **NOTED** that gillnets and longlines are the dominant fishing gears in some CPCss, and scientific evidence exists that both gears may interact with seabirds causing incidental mortalities, however, the interactions vary depending on specific gear configurations (see paper IOTC–2014–WPEB10–INF21). Some participants did not agree with these conclusions due to the low levels of data currently available.

63. The WPEB **NOTED** that a small working group was created at SC16, consisting of the Vice-Chair of WPEB and representatives of India and Sri Lanka, to develop a process to deal with requests from CPCs for a possible exemption category of '*not applicable (n.a.)*' regarding NPOAs.

64. The WPEB **AGREED** that the process should require the following three elements 1) a scientifically-based approach to be taken; 2) to contain a requirement for the Precautionary approach, as adopted by the IOTC in Resolution 12/01 *On the implementation of the precautionary approach*; and 3) that the FAO guidelines concerning developments of NPOAs, which consider NPOAs-Seabirds as a voluntary initiative by each CPC.

65. The WPEB **RECOMMENDED** the following process should be followed by CPCs when requesting the IOTC Secretariat apply 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: http://iotc.org/science/table-progress-implementing-npoa-sharks-npoa-seabirds-and-fao-guidelines-reduce-sea-turtle-mortality

- 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 (available at: http://54.247.127.44/marineIBAs/default.html), 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.

7.2 Updated status of development and implementation of National Plans of Action for seabirds and sharks, and the implementation of the FAO guidelines to reduce marine turtle mortality in fishing operations (CPCs).

66. The WPEB **NOTED** paper IOTC–2014–WPEB10–09 Rev_1 which provided an update 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 IOTC CPCs, including the following abstract provided by the authors:

> *"At its 18th Session the Commission NOTED the updated status of development and implementation of National Plans of Action for seabirds and sharks, and the implementation of the FAO guidelines to reduce marine turtle mortality in fishing operations, by each CPC, as provided in the Scientific Committee report. (S18 Report, para. 35) The Commission AGREED with the request from the Scientific Committee that all CPCs without an NPOA-Sharks and/or NPOA-Seabirds expedite the development and implementation of a NPOA, and to report progress to the WPEB and SC in 2014, recalling that NPOA-Sharks are a framework that should facilitate estimation of shark catches, and development and implementation of appropriate management measures, which should also enhance the collection of bycatch data and compliance with IOTC Resolutions. (S18 Report, para. 36)*"

67. The WPEB **REQUESTED** that the IOTC Secretariat continue to periodically revise the table summarising progress towards the development of NPOA-Sharks, NPOA-Seabirds, and the implementation of the FAO guidelines to reduce marine turtle mortality in fishing operations, by each CPC for the consideration at each WPEB and the SC meeting. The current version is provided at Appendix VIII.

68. The WPEB **NOTED** the new NPOA portal on the IOTC website (http://iotc.org/science/status-of-national-plans-of-action-and-fao-guidelines) which provides details of the most recent updated table of progress in implementing NPOA-Sharks, NPOA-Seabirds and the FAO Guidelines to Reduce Sea Turtle Mortality in Fishing Operations. It also provides other information in support of CPCs wishing to develop their own NPOAs, such as the guidelines and NPOA documents from all CPCs who have submitted their NPOAs.

Shark and seabirds NPOA

69. The WPEB **NOTED** the current status of development and implementation of National Plans of Action (NPOAs) for sharks and seabirds, by each CPC, recalling that the IPOA-Seabirds and IPOA-Sharks were adopted by the FAO in 1999 and 2000, respectively, and required the development of NPOAs. Despite the time that has elapsed since then, very few CPCs have developed NPOAs, or even carried out assessments to ascertain if the development of a Plan is warranted. Currently only 12 of the 35 IOTC CPCs have an NPOA-Sharks (8 more in development), while only 5 CPCs have an NPOA-Seabirds (2 in development). A single CPC has determined than an NPOA-Sharks is not needed, and 5 have similarly determined than an NPOA-Seabirds is not needed.

Marine turtle national management plans/strategies

70. The WPEB **NOTED** the current status of development and implementation of the FAO guidelines to reduce marine turtle mortality in fishing operations. Currently only 6 of the 35 IOTC CPCs have implemented the AO guidelines (2 more in progress).

71. The WPEB **REQUESTED** the IOTC and IOSEA Secretariats work collaboratively with any CPC requesting assistance to develop their national management plans for the reduction of marine turtle bycatch in tuna fisheries.

8. NEW INFORMATION ON BIOLOGY, ECOLOGY, FISHERIES AND ENVIRONMENTAL DATA RELATING TO ECOSYSTEMS AND BYCATCH SPECIES

8.1 Review new information on environment and ecosystem interactions and modelling, including climate change issues affecting pelagic ecosystems in the IOTC area of responsibility.

RFMO Ecosystem approaches to fisheries management

72. The WPEB **NOTED** paper IOTC–2014–WPEB10–33 which provided a preliminary review of ICCAT, IOTC and IATTC progress in applying an ecosystem approach to fisheries management, including the following abstract provided by the authors:

"*Tuna and billfish species, the structure of their communities and food webs they form provide and sustain important high-sea ecosystem services for human wellbeing. International agreements such as the UN Fish Stock Agreement and the FAO Code of Conduct have increased the expectations for RFMOs to implement an ecosystem approach to fisheries management. An ecosystem approach would ensure the sustainability of catches without compromising the structure and function of marine ecosystems and ensuring the delivery of ecosystem services. Here, we construct an idealized Driver-Pressure-State-Ecosystem Services-Response (DPSER) conceptual ecological model for a role model tuna RFMO to highlight how this planning tool could potentially be used as a framework to implement an ecosystem approach in tuna RFMOs. We use the DPSER model to assess the progress of ICCAT, IOTC and IATTC in applying an ecosystem approach to fisheries management. We seek to identify what type of research approaches are currently used in each RFMO and identify data and methodological needs, as well as limitations in capacities that hinder the implementation on an ecosystem approach*." – (see paper for full abstract)

73. The WPEB **NOTED** the usefulness of this comparative summary of the current status of tRFMOs in applying ecosystem approaches. Due to difference between fisheries among tRFMOs, management indicators may need to be very different.

74. The WPEB **NOTED** that the study suggested that IATTC is performing better than the other tRFMOs, in terms of developing thresholds. It was suggested that this may have been due to the inclusion of incidental mortality limits for dolphins, which are not considered to be an issue by some IOTC scientists for the IOTC or ICCAT. The comparability of this indicator across the RFMOs was also questioned.

SEAPODYM

75. The WPB **NOTED** paper IOTC–2014–WPEB10–33 which describes the application of the SEAPODYM model to swordfish in the Pacific and Indian Ocean and how it may be applied to sharks, including the following abstract provided by the authors:

"*In 2011, a first Spatial Ecosystem And Population Dynamic Model (SEAPODYM) application to Pacific swordfish (Xiphias gladius) was developed in collaboration with the Secretariat of the Pacific Community (SPC) and the PIFSC/NOAA (Hawaii, USA). The objective was to investigate the impacts of both fishing and climate variability on this species. The oceanic environment used to force SEAPODYM was predicted from a coupled physical-biogeochemical ocean model (NEMO-PISCES) driven by an atmospheric reanalysis (NCEP) on a 2° x month resolution (ORCA2 grid) over the historical fishing period (1948-2003). Available spatially-disaggregated catch per unit of effort (CPUE) and length-frequency data from the fisheries operating in the Pacific Ocean were assimilated into the model to achieve parameter optimization with a Maximum Likelihood Estimation (MLE) approach. The preliminary results suggested the existence of 3 overlapping adult core habitats, in good agreement with previous hypotheses of 3 sub-stocks mentioned in the literature (Kolody et al. 2009; Hinton & Maunder 2011; Courtney and Piner 2009), but nevertheless linked by their common tropical spawning grounds.*" – (see paper for full abstract)

76. The WPEB **NOTED** that the first attempt of SEAPODYM (Spatial Ecosystem And Population Dynamic Model) on swordfish in the Indian Ocean proposes hypothesis on a range of spatio-temporal distributions of this swordfish life history stages (juveniles, sub-adults and mature adults). This is the first time that estimations of stock size and dynamics are obtained from an integrative model based on environmental and prey fields. The

estimation of MSY from SEAPODYM environment-driven methodology will be a useful comparison with conventional stock assessment models.

77. The WPEB strongly **ENCOURAGED** the authors to continue this important and highly useful work and expand it for shark species in the Indian Ocean. Annual updates on the work should be presented at WPEB meetings for comparison with stock assessments each year.

9. GILLNET FISHERIES: PROBLEMS AND NEEDS *(INCLUDING CAPACITY BUILDING)*

9.1 Regional review of the current and historical data available for gillnet fleets operating in the Indian Ocean

78. The WPEB **RECALLED** the recommendation from the SC as follows:

SC16.14 (para. 38) *The SC reiterated its previous RECOMMENDATION that the Commission considers allocating funds to support a regional review of the current and historical data available for gillnet fleets operating in the Indian Ocean. As an essential contribution to this review, scientists from all CPCs having gillnet fleets in the Indian Ocean, in particular those from I.R. Iran, Oman, Pakistan and Sri Lanka, should collate the known information on bycatch in their gillnet fisheries, including sharks, marine turtles and marine mammals, with estimates of the likely order of magnitude where more detailed data are not available. A consultant should be hired for 30 days to assist CPCs with this task (budget estimate: Table 3*).

79. The WPEB **NOTED** the Commission, at its 18th Session did not consider funding this project on a regional review of current and historical data available for gillnet fleets operating in the Indian Ocean as it was not proposed to the SCAF in the Program of Work. This is something that the new Fishery Officer (Science) may be able to facilitate.

80. The WPEB **REQUESTED** that each individual CPC begin work on the recommendation from the SC (SC16.14) at a national level through data mining and research activities. The IOTC Secretariat may be able to provide assistance in this regard on a case by case basis through inter-sessional small group workshops.

GEF-tunaABNJ Project

81. The WPEB **NOTED** the presentation on the activities of the Areas Beyond National Jurisdiction GEF project. The tuna-ABNJ research activities for sharks will be focused on the Pacific Ocean. The tuna-ABNJ project also contains a component on further development of a bycatch mitigation system, including the generation of new regional bycatch analysis that may include the Indian Ocean.

82. The WPEB **RECALLED** that the GEF-tuna ABNJ project contains an element to examine bycatch in gillnet fisheries in the northwest Indian Ocean, which is being managed by WWF-Pakistan. The contract for funding has only just been signed and the outline of the work was provided to the IOTC Secretariat during the WPEB10 for comment and is provided as an Information Paper (IOTC–2014–WPEB10–INF27). An update on project details may be available for the SC17 and future details including preliminary results will be presented at the next WPEB meeting.

83. The WPEB **THANKED** the GEF tuna-ABNJ project for funding the participation of the Technical Coordinator-Sharks and Bycatch (Dr Shelley Clarke), **NOTING** her excellent and highly relevant contributions to the session and **REQUESTED** funding for her participation next year.

Information papers on gillnets

84. The WPEB **NOTED** papers IOTC–2014–WPEB10–INF21 and INF25, which provide a global assessment of bycatch in gillnet fisheries, as well as an assessment of cetacean mortality in the tuna fisheries of Pakistan. It was felt that CPCs undertaking studies in accordance with the SC recommendation (SC16.14) may find the information useful.

9.2 Training for CPCs having gillnet fleets on species identification, bycatch mitigation and data collection methods and also to identify other potential sources of assistance – Development of plans of action

85. The WPEB **RECALLED** the recommendation from the SC as follows:

SC16.15 (para. 39) *The SC RECOMMENDED that the Commission allocate funds in its 2014 and 2015 budgets for the IOTC Secretariat to facilitate training for CPCs having gillnet fleets on bycatch mitigation methods, species identification, and data collection methods (budget estimate: Table 4).*

86. **NOTING** that this was approved by the Commission and included in its Regular Budget for 2014 and 2015 (US$19,000 in 2014 and US$36,000 in 2015), and the indication from the IOTC Secretariat that the project would commence in early 2015, the WPEB **AGREED** on the urgency of the work detailed in SC recommendation SC16.15, which called for training for CPCs having gillnet fleets on species identification, bycatch mitigation and data collection methods.

10. SHARKS AND RAYS

10.1 Review new information on the biology, stock structure, bycatch mitigation measures, fisheries and associated environmental data

CITES listing of shark and ray species (14 September 2014)

87. The WPEB **NOTED** paper IOTC–2014–WPEB10–12 which detailed some issues for t-RFMOs in relation to the listing of shark and ray species by the CITES with particular reference to the Indian Ocean Tuna Commission, including the following abstract provided by the authors:

"*This paper identifies a number of potential issues for Regional Fisheries Management Organizations (RFMOs) managing tuna and tuna-related species, in particular the Indian Ocean Tuna Commission (IOTC), arising from the additional listings by the Convention on International Trade in Endangered Species (CITES) of sharks and rays at the most recent Conference of Parties. These new Appendix II listings of five sharks (oceanic whitetip shark, porbeagle shark, smooth hammerhead shark, scalloped hammerhead shark and great hammerhead shark), and all species of manta rays, were adopted in March 2013 and came into effect on 14 September 2014. All exports of these species, including landings in non-flag State ports, now require permits to be issued by the flag State CITES Management Authority. If an export permit is to be issued, legal acquisition and non-detriment findings (NDFs) must also be issued. An NDF represents a certification by an authorized CITES Scientific Authority that the proposed export is not detrimental to the survival of the species. Catches on the high seas which are landed in flag State ports will not require export permits but will require Introduction from the Sea certificates which also require NDFs. Based on IOTC data holdings for 2008–13, this paper lists the flag States catching CITES-listed shark and ray species in order to identify which States may need to action CITES documentation procedures for catches of these species. In addition, this paper describes existing IOTC stock status assessments and management tools that may be useful to national CITES Authorities when considering NDFs.*"

88. The WPEB **NOTED** that these new Appendix II listings of five sharks (oceanic whitetip shark, porbeagle shark, smooth hammerhead shark, scalloped hammerhead shark and great hammerhead shark), and all species of manta rays came into effect on 14 September 2014. All exports of these species, including landings in non-flag State ports, as well as scientific samples, now require permits to be issued by the flag State CITES Management Authority.

89. **NOTING** that this could affect sample collection of ongoing projects, the WPEB **ACKNOWLEDGED** the offer of assistance from the IOTC Secretariat to provide support to national scientists in resolving documentation issues related to the international exchange of scientific samples of CITES listed species.

Indonesian shark fisheries

90. The WPEB **NOTED** paper IOTC–2014–WPEB10–13 Rev_1 which describes the species composition, CPUE and length frequency of oceanic sharks based on observer data from the Indonesian longline fishery in the Indian Ocean, including the following abstract provided by the authors:

"*Data about species composition, CPUE (catch number per 1000 hooks) of sharks and length frequency of dominant shark species caught in the Indian Ocean had been collected by scientific observers of the Research Institute for Tuna Fisheries data during 2005 - 2013. The total shark was caught 3,421 individuals comprised of 19 species. The most abundant species are blue shark and crocodile shark catched in all survey locations except west off Sumatra for of blue shark. CPUE average of blue shark is 1.55 (SD+/-1.62) with values ranging between 0.37 and 13.83 sharks / 1000 hooks. Highest CPUE of blue shark were caught in latitude of 300-350 S. Length frequency distribution of blue shark shows 60–312 cm FL (SD+/-32.41) males and 70 - 258 cm FL (SD+/-31.03) females, with a domination of 195 cm and 205 cm sizes, respectively. Sex ratio of males and females of blue shark during this period is 1: 0.46, with a significant difference from the expected ratio is 1: 1 ($\chi 2 = 27.5871$, $P < 0.05$). CPUE average of crocodile shark is 1.60 (SD+/-1.71) with values ranging between 0.37 and 20.13 sharks / 1000 hooks, and highest. CPUE were caught in latitude of 120 – 150 S. Length frequency distribution of crocodile shark shows 39-103 cm FL (SD+/-3.32) males and 37-106 cm FL (SD+/-17.08) females. It is dominated by 90 cm FL size, with sex ratio of males and females during this period is 1: 0,67, while a significant difference from the expected ratio is 1:1 ($\chi 2 = 24,9958$, $P<0.05$).*"

91. The WPEB **ACKNOWLEDED** the efforts made by Indonesia to implement its observer program, and to improve shark species identification by its data recorders by developing and implementing a system of observer training and data validation.

92. The WPEB **ENCOURAGED** the authors to continue this work and present updates at the next WPEB meeting. The authors could try to standardise their nominal CPUE series, especially for the blue sharks as that would be

extremely relevant for next. Indonesia is encouraged to seek technical help either from other CPCs or from the IOTC Secretariat to conduct such analysis.

93. The WPEB **NOTED** that:
    - increasing fuel prices have led to an increase in the retention of carcasses for additional financial gain, which were previously discarded.
    - although the crocodile shark (*Pseudocarcharias kamoharai*) was previously considered to be a rare species in the Indonesian domestic longline fisheries, it is now the second most abundant species. This may indicate a shift in ecosystem balance and could be indicative of a meso-predator release effect, or it can be driven by changes in species targeting.
    - Indonesian long-distance fishing vessels operating from 8–15°S keep their catch fresh rather than frozen, while its freezer vessels operate at a longer distance from port, up to 15°S.
    - the discrepancies between the presented VMS data and previously reported catch positions by Indonesian flagged fishing vessels. Participants were informed that despite the legally binding requirements contained in IOTC Resolution 06/03, that the VMS must remain turned on from during all fishing operations and that it be placed within a tamper proof box to ensure it is not turned off, some skippers routinely turn off their VMS as they say that it interferes with radio fishing buoy signals.

I.R. Iran shark fisheries

94. The WPEB **NOTED** paper IOTC–2014–WPEB10–14 Rev_1 which provided an estimation of the I.R. Iran fishing vessels bycatch in IOTC are of competence in 2013, including the following abstract provided by the authors:

    "*In order to assess the level of Iranian tuna fishing vessels by-catch in the IOTC competence of area, we used the 2013 data which collected through the Iran Fishery Organization data Collection system. Base on the system outputs, about 30 different species of Tuna, Tuna like and the other species are caught by Iranian fishermen through the Tuna fishing activities. Based on 2013 information in total, 226409 tons of different species including 195360 tons Tuna and Tuna like species (target species 86.3%), 14280 tons Billfish (6.3%), 6994 tons different species of Sharks (3.1%) and 9775 tons the other species (4.3%) are caught by Iranian fishing vessels in the IOTC competence of area. According to 2013 data, 95% of catch comes from Gill net gear, while around 2.6% of catch belong to Purse seiners and 2.2% comes from Trolling vessels."* – (see paper for full abstract)

95. The WPEB **NOTED** that certain species which are commonly reported as shark bycatch in the I.R. Iran gillnet fisheries (*Rhizoprionodon acutus*, *Carcharhinus dussumieri, C. sorrah*) are not included in the IOTC shark identification cards.

96. The WPEB **NOTED** that the study is based on logbook and port sampling information and does not include information on discards. The study could be improved by including an examination of temporal trends in shark catches and landings in future analyses.

UK(OT) historical shark fisheries

97. The WPEB **NOTED** paper IOTC–2014–WPEB10–15 which provided a characterisation of shark bycatch from tuna longliners operating in the UK(OT) between 2000 and 2010 from observer and vessel logbook data, including the following abstract provided by the authors:

    "*Observer and vessel logbook data collected in the British Indian Ocean Territory (BIOT) were analysed to provide information on catch rates and species composition of sharks caught as bycatch in the longline fishery prior to 2010. Observer data, collected over 3 seasons between 2000 and 2003, showed that 4% of the catch (by numbers) was made up of sharks, with catch rates averaging 3.6 fish per 1,000 hooks. The majority were blue sharks (Prionace glauca) (52%), pelagic thresher sharks (Alopias pelagicus) (15%) and silky sharks (Carcharhinus falciformis) (14%) by number. Vessel logbook data from between 2006 and 2010, showed a fluctuation in the proportion of sharks caught (by numbers and weight) between 8-15% (mean= 11%) of total catch. Catch per unit effort (CPUE) by number varied between 0.69-1.68 (mean= 1.16) fish per 1,000 hooks; by weight, CPUE varied 23.61-44.13 kg (mean= 34.58 kg) per 1,000 hooks."* – (see paper for full abstract)

98. The WPEB **NOTED** the lack of information from vessel logbooks on discards either alive or dead from the historical data set.

99. The WPEB **NOTED** that observers were only onboard vessels for about one week, whereas trips were often two months in duration. Total observer coverage was very low (<1%) which may explain some of the more surprising results.

Maldives shark fisheries

100. The WPEB **NOTED** paper IOTC–2014–WPEB10–16 which provided a update on the status of the shark fishery ban in the Maldives and the Implementation of the National Plan of Action on Shark, including the following abstract provided by the authors:

"*Sharks have always exhibited an economic significance to the Maldives. In the 1970s, a highly targeted artisanal fishery for sharks had developed and at the same time a newly introduced tourism industry was developing in the country. In comparison with the tuna fishery of the country, the shark fishery was a minor fishery with a small community of fisherfolk involved. From the onset of the commercial shark fisheries, the shark fisheries were in conflict with other stakeholders, the dive tourism sector and the pole and line tuna fishery. The contribution of shark fisheries to the economy was miniscule compared with the implications of over-exploitation of sharks on the thriving dive tourism industry. These factors played a major role in the shark fisheries management of the country. The management measures taken were unsuccessful in resolving the conflicts, which culminated in the declaration of the complete shark fishery ban in 2010."* – (see paper for full abstract)

101. The WPEB **NOTED** that an NPOA for sharks is currently being finalised and is due to be published in the near future. Once completed, a copy will be submitted to the IOTC Secretariat for additional to the NPOA portal on the IOTC website.

102. The WPEB **NOTED** that the Maldives has in place, a ban on targeted shark fishing in the Maldives EEZ, requiring all longliners targeting tunas to record the condition and fate of the shark bycatch in the logbooks. In addition, any dead shark bycatch retained has to be declared to an observer. As there are no designated observers at this point in time, vessels are required to discard all sharks caught and record the discards in logbooks. Although no explicit ban on trade exists, any sharks fished from the Maldives EEZ cannot be exported in principle, as there is a fishery ban on sharks in place.

India shark fisheries

103. The WPEB **NOTED** paper IOTC–2014–WPEB10–17 Rev_1 which detailed the diversity and abundance of pelagic shark bycatch in the tuna fishery of the Indian seas, including the following abstract provided by the authors:

"*Pelagic sharks are the most important component of the bycatch in the tuna longline fishery. Results of fishery resource survey conducted by the Fishery Survey of India in the EEZ revealed that sharks constitute 39.81% by weight to the total catch in the longline fishery. Significant variations in the diversity and abundance of pelagic sharks were observed among three regions of seas around India, i.e., eastern Arabian Sea, western Bay of Bengal and Andaman and Nicobar waters. Exploratory surveys revealed that abundance of pelagic sharks are prominent in Andaman and Nicobar region followed by the eastern Arabian Sea and western Bay of Bengal. In the drift gillnet fishery for large pelagics, elasmobranchs constituted 4-12% of the catch. The pelagic sharks constituted 93%, rays 6% and skates the rest of the elasmobranchs exploited by this gear. Measures adopted by India for the conservation and management of these ecologically and economically important resources are presented and discussed."* – (see paper for full abstract)

104. The WPEB **NOTED** the sharp decline in shark catch rate in recent years, potentially driven by changes in species targeting. However, the unusually high proportion of blacktip reef sharks reported caught by the oceanic fishery is potentially a misidentification issue, however the authors did not consider this to be the case.

105. The WPEB **NOTED** the nine species of sharks that have been designated as protected by the Ministry of Environment and Forests of India, as they have are of public interest, some of which are not protect elsewhere.

EU,Portugal LL-SHARKs project

106. The WPEB **NOTED** paper IOTC–2014–WPEB10–18 Rev_2 which provided preliminary results of the LL-SHARKs project: an ongoing project comparing wire versus monofilament traces in the Portuguese pelagic swordfish fishery in the Southwest Indian Ocean, including the following abstract provided by the authors:

"*The effects of traditional nylon monofilament versus wire leaders in a commercial longline fishery targeting swordfish (Xiphias gladius) in the South West Indian Ocean were compared, based on total of 82 longline experimental sets conducted on a commercial vessel that deployed equal number of nylon monofilament and wire leaders (total of 82,656 hooks baited with squid). A higher number of taxa were caught on wire leaders, which also showed higher (13%) catch rates in number for sharks and particularly for the blue shark (Prionace glauca). In contrast, nylon monofilament leaders showed higher bite-offs rates (389%) than wire leaders. These results are probably due to the fact that species with sharp teeth could escape the longline by biting through the nylon leaders. The total retained catch value per unit of effort (VPUE) did not change between leader materials. Thus, banning wire leaders could be*

an effective way of reducing bycatch, particularly of sharks, that fishers may be keen to adopt. However, these results seem to be fishery specific and VPUEs are highly dependent on market fluctuations. Therefore, more studies are required for a thorough assessment of this shark bycatch mitigation measure." – (see paper for full abstract)

107. **NOTING** the carefully designed experiment, the WPEB **ENCOURAGED** additional studies be developed to focus on other hook and bait types, as the results of these kinds of studies are likely to be fishery specific, particularly to gear specification.

108. The WPEB **NOTED** that:
    - circle hooks can increase shark catch rates, but are not used in the EU,Portugal longline fishery and that battery flashlight are commonly deployed on every hook.
    - there are species other than sharks that may also be responsible for hook bite-offs, but where bite-off took place during hauling, sharks were the species groups observed, rather than other species.
    - lower levels of bite-off occur when wire leaders are used. This is likely to take place when larger animals are hooked. The wire leaders are relatively short (65cm) and hooking is generally deep, so the monofilament section can sometimes be bitten, however, in some instances, the wire section was also reported as being severed.
    - this fishery generally targets swordfish, however some vessels are known to change their fishing strategy and use wire leader type during a fishing operation. There are a range of issues that might affect this such as the recent decrease in shark fin prices which may have influenced targeting.

India low value bycatch

109. The WPEB **NOTED** paper IOTC–2014–WPEB10–19 which provided a review of the low value bycatch from tuna and trawl operations along the southern peninsular India, including the following abstract provided by the authors:

"*India, a tropical country has multispecies fishery, exploiting species that differ in their biological characteristics and habitats. Trawl is the major gear that contributes to the marine fish production of the country. We have the fish trawls and the shrimp trawls, the former hauls slightly off bottom with more floats and the shrimp trawl scrapes through the bottom with more sinkers. Over the years the fisheries sector in India witnessed progressive expansion of trawling to greater depths resulting in phenomenal growth in marine fish production from a subsistence fisheries in the 50's to 3.78 million t in 2014 (CMFRI, 2014).The highest rate of incidental catch of non-target species as identified by Alversonet al (1994) and other worker's is associated with shrimp trawling. This is cause for concern as sieving the seas with fine mesh nets removes species that are important link in the trophic food chain, affecting the predator-prey relation and thus the ecosystem."*

110. The WPEB **THANKED** the authors for the paper and asked that the working paper be revised to incorporate the tuna bycatch elements presented during the meeting.

Blue shark biology: China

111. **NOTED** paper IOTC–2014–WPEB10–21 which provided preliminary observations on the reproductive biology of blue shark in the Indian Ocean, including the following abstract provided by the authors:

"*In recent years, China has successfully conducted scientific observer program for tuna longline fishery in the Indian Ocean. This working paper reported reproductive information of blue shark (Prionace glauca) based on specimens sampled during an observer trip in the tropical water of western Indian Ocean. Size distributions of juvenile, maturing, ovulating, and gravid females, and immature and mature males were estimated. Proportion of specimens in different maturation stages by month was also investigated."* – (see paper for full abstract)

112. **NOTING** the spatial extent of the study covered an area with few juveniles, the WPEB **ENCOURAGED** the authors to collaborate with other CPC scientists to increase sampling coverage. This is particularly important given the wide distribution and complex population structure of blue sharks dominated by adults in equatorial regions and all sizes in temperate waters.

Blue shark and silky shark growth

113. The WPEB **NOTED** paper IOTC–2014–WPEB10–22 which modelled growth of blue shark and silky shark in the southwest Indian Ocean assessed by back-calculated length from vertebrae, including the following abstract provided by the authors:

"*The blue shark (BSH), Prionace glauca and the silky shark (FAL), Carcharhinus falciformis are the main shark species taken as bycatch in the pelagic longline and purse seine fisheries in the Indian Ocean, respectively. Because of the paucity of the basic biological information and fishery statistics, population*

trends in the region cannot be assessed. Growth parameters are necessary for predicting population responses to fishing pressure but they remain unknown for these two populations. Growth parameters are crucial for both management and conservation purposes. Between 2009 and 2010, 188 BSH (36-276 cm LF) and 197 FAL (51-264 cm LF) were collected in the southwest Indian Ocean by observers and during scientific surveys. Of these samples, vertebrae were aged and distances between the centre of the vertebrae and each growth ring were determined to estimate back-calculated individual lengths at age. For both species, the relationship between fish length (L) and vertebrae radius (R) was best modelled by an allometric L-R model with a significant negative allometry for BSH (F-test, P<0.001) and a significant positive allometry for FAL (F-test, P<0.05)." – (see paper for full abstract)

114. The WPEB **NOTED** that the growth rates estimated in this study were higher than those estimated from the Atlantic Ocean in the recent shark ERA (Murua et al. 2012[1]), and therefore may impact the productivity estimates of the ERA.

115. **NOTING** the importance of this study and the potential impact on estimates of survivorship and longevity, which has implications for future stock assessments, the WPEB **ENCOURAGED** CPCs to dedicate more effort to developing age and growth studies on sharks.

116. The WPEB **NOTED** the sampling of predominantly juvenile silky sharks. This could be supplemented by other studies to ensure a greater number of adults are also sampled which is important for this type of study.

117. **NOTING** the potentially large impact of the biological parameters on the results of the assessment the WEPB **AGREED** that cooperative biological studies on main shark species continue to be conducted.

118. The WPEB **NOTED** the importance of inter-laboratory collaborations for this type of research and **WELCOMED** the offer from Japan and EU,Portugal to join such collaborations.

Blue shark hotspots in the southwest Indian Ocean

119. The WPEB **NOTED** paper IOTC–2014–WPEB10–23 which provided a characterisation of blue shark hotspots in the southwest Indian Ocean, including the following abstract provided by the authors:

"*Oceanic circulation structures nutrients distribution and affects primary productivity. Hydrodynamic features drive the distribution of intermediate trophic level species which aggregations commonly attract top predators. Blue shark (Prionace glauca, BSH) is the main bycatch species of Réunion Island pelagic longline fishery that mainly targets swordfish in the South-West Indian Ocean. The relation between BSH abundance and the environment is poorly known and deserves to be investigated if fishing management measures to reduce blue shark bycatch would have to be considered. The goal of this study is to characterise environmental factors favouring BSH hotspots. Nominal catch per unit of effort (CPUEn) from fishermen-reported data (2011-2013; 671 sets and 2 517 blue sharks caught) was used as proxy of local abundance. We proceeded in two steps: (i) the nominal CPUE (CPUEn) was standardized using a Tweedie generalized additive model (GAM) to remove variability from distribution of fishing effort, boat and gear which were summarised in a vessel typology, (ii) the residual CPUE (CPUEres) from the standardisation model was used to test with a GAM for the effect of environmental variables."* – (see paper for full abstract)

120. The WPEB **NOTED** that predicting bycatch distribution can be used for mitigating bycatch, as when assessed together with target species predicted distribution it allows to identify ecological and economical optimum fishing areas.

121. The WPEB **REQUESTED** that the authors test the predictive capability of the model through various approaches such as sub-setting the data. The method used to separate out operational information to obtain a set of predictive variables which are solely environmental, assumes that operational and environmental variables are independent.

Information papers on sharks

122. The WPEB **NOTED** the range of information papers on sharks, as presented in IOTC–2014–WPEB10–02 and thanked the contributors for the information. In particular, the following information papers were presented and discussed.

Post capture survival of whale sharks

123. The WPEB **NOTED** paper IOTC–2014–WPEB10–INF14 which assessed the post-capture survival of whale sharks released from purse seine nets through tagging.

[1] IOTC–2012–WPEB08–31

124. The WPEB **NOTED** the 100% survival rate and **ENCOURAGED** the expansion of the study to increase the sample size which is too low (n=5) to extrapolate the results at this stage.

125. The WPEB **NOTED** that the WCPFC have a similar tagging study planned and that a similar study in the Indian Ocean should be carried out.

Indonesia scientific observer program

126. The WPEB **NOTED** the informal presentation from Indonesia: 'Scientific observer data in the Research Institute for Tuna Fisheries'. The data collection protocol includes fisheries and biological information both on target species (tuna) and bycatch species. The detailed observer data collected is in an electronic format which could be readily submitted to the IOTC Secretariat.

127. The WPEB **ENCOURAGED** Indonesia to continue the good work and to present another update at the next WPEB.

10.2 Historical data series for sharks and rays, in particular for blue shark and oceanic whitetip shark

128. The WPEB **RECALLED** the Scientific Committee's recommendation to the Commission as follows:
SC16.17: (Para 41) *NOTING that there is extensive literature available on pelagic shark fisheries and interactions with fisheries targeting tuna and tuna-like species, in countries having fisheries for sharks, and in the databases of governmental or non-governmental organisations, the SC AGREED on the need for a major data mining exercise in order to compile data from as many sources as possible and attempt to rebuild historical catch series of the most commonly caught shark species, in particular blue shark and oceanic whitetip shark. In this regard, the SC RECOMMENDED that the Commission allocates funds for this activity, in the 2014 and 2015 IOTC budgets*.

129. The WPEB **NOTED** that the Commission did not allocate funds in the Regular Budget. The $60,000 requested will need to be found from an external source for 2015.

10.3 Indian Ocean Shark multi-Year Program (IO-ShYP)

Report of the IO-ShYP01

130. The WPEB **NOTED** paper IOTC–2014–IOShYP01–R[E]: Report of the Indian Ocean Shark Year Program workshop (IO-ShYP01), including the following abstract provided by the authors:
"*The Indian Ocean Shark Year Program workshop (IO-ShYP01) was held in Olhão, Portugal from 14 to 16 May 2014. Prior to the workshop, participants to the IO-ShYP01 compiled the current information available, identified major gaps in knowledge, and established draft priorities for future research and cooperation among IOTC scientists and other groups. Readers of the report are encouraged to interpret it as a document with the sole aim of improving the information at the IOTC for future use in developing stock assessment and/or status indicators for shark species caught by IOTC fisheries and not as compliance issues with IOTC Conservation and Management Measures on provision of data for shark species. The main objective of the IO–ShYP was to "promote cooperation and coordination among IOTC researchers, to improve the quality of the scientific advice on sharks provided to the Commission, namely by conducting quantitative stock assessments for selected species by 2016, and to better assess the impact on shark stocks of the current IOTC Conservation and Management Measures*." – (see paper for full abstract)

131. The WPEB **NOTED** that the extensive review made by the small working group, compiled the current information available, identified major gaps in knowledge, and established draft priorities for future research and cooperation among IOTC scientists and other groups.

132. The WPEB **REQUESTED** that the IOTC Secretariat liaise with CPCs to collate previous and ongoing research programs on shark in the Indian Ocean, as the IO-ShYP report is unlikely to document all sources of potentially useful information.

133. **NOTING** that the impact of ghost fishing has only been investigated for FADs, not for other gears such as gillnets for which the information is very sparse and spatially variable, the WPEB **ACKNOWLEDGED** the importance of this topic, despite it not being identified as a high priority by the IO-ShYP compared with other areas of research.

134. **NOTING** the summary of available data on genetic studies highlights the lack of literature on the topic, the WPEB **AGREED** that networks of institutions working on shark genetics in the region should be formed, even where published reports are not available.

135. **NOTING** the number of shark tagging projects taking place in the Indian Ocean, the WPEB **REQUESTED** the IOTC Secretariat to create a shark portal on the IOTC website, whereby information could be shared. The STAGIS platform currently in use by SPC and the Metadatabase used by ICCAT may be used as examples.

136. The WPEB **NOTED** the efforts already made to collate this tagging information and the lack of data provision by various research institutions which is likely to be an ongoing issue due to confidentiality prior to peer review of analysis.

137. The WPEB **NOTED** that socioeconomic factors should be considered in all studies on bycatch mitigation, particularly those related to small-scale fisheries.

Adoption of an IO-ShYP multi-year research program

138. The WPEB **NOTED** paper IOTC–2014–WPEB10–11 which provided the DRAFT Indian Ocean shark multi-year research program (IO-ShYP) for discussion and further development by the WPEB, including the following abstract provided by the authors:

> "*Subsequent to the IO-ShYP01 meeting, participants drafted a provisional Program of Work 2015–2019, as detailed in Appendix A of this paper. The WPEB10 is invited to consider, revise and adopt a Program of Work (2015–2019)"*

139. The WPEB **ENDORSED** the priority topics for obtaining the information necessary to develop stock status indicators for sharks in the Indian Ocean based on the IOTC–2014–IOShYP01–R and expanded in paper IOTC–2014–WPEB10–11, and that the priority topics to be included in the WPEB Program of Work (see Section 12).

10.4 Data for input into stock assessments (indicators), in particular for blue shark and oceanic whitetip shark

EU,Portugal blue shark CPUE

140. The WPEB **NOTED** paper IOTC–2014–WPEB10–24 which provided blue shark catches by the Portuguese pelagic longline fleet between 1998–2013 in the Indian Ocean: catch, effort and standardized CPUE (Fig. 1), including the following abstract provided by the authors:

> "*The Portuguese pelagic longline fishery in the Indian Ocean started in the late 1990's, targeting mainly swordfish in the southwest region. A recent effort by the Portuguese Institute for the Ocean and Atmosphere (IPMA) was made to collect of historical catch and effort data on this fishery since the late 1990's to the present date, as well as vessel monitoring system (VMS) data. This working document analyses the catch, effort and standardized CPUE trends for that period. Nominal annual CPUEs were calculated as kg/1000 hooks, and were standardized with Generalized Linear Models (GLM) using year, quarter, area, gear type, vessel, swordfish/blue shark ratio and regional: seasonal interactions. Sensitivity analyses were carried out for the model type used (lognormal, tweedie or gamma), to the inclusion of the ratio factor in the models, and to the definition of the areas. Model goodness-of-fit and comparison was carried out with AIC and the coefficient of determination (R2), and model validation with a residual analysis."* – (see paper for full abstract)

141. The WPEB **NOTED** the use of a species ratio factor as a covariate to incorporate targeting effects within the model and the issues associated with this approach and **SUGGESTED** that other methods might also be explored further in the future such as the use of a PCA to include the catch of other species.

142. The WPEB **REQUESTED** the authors to trial the use of regression trees on a full suite of potential explanatory variables and use backwards model selection.

143. The WPEB **NOTED** the low proportion of zero catches (4%) negating the need for a delta or other approach to deal with zeros which are typically used when the proportion exceeds 10%.

144. The WPEB **NOTED** that a finer spatial resolution could be explored for the spatial covariate, but due to sparse data this might not be suitable. An alternative approach might be to define areas based on the length and size composition data.

145. The WPEB **SUGGESTED** that a smaller core region is defined where a more consistent blue shark signal is achieved.

146. The WPEB **NOTED** the potential use of environmental variables such as thermocline depth, but as the majority of hooks are set in shallow waters between 30–50m this is unlikely to affect the results. However other environmental variables might have more influence and so could be investigated further.

Taiwan,China blue shark CPUE

147. The WPEB **NOTED** paper IOTC–2014–WPEB10–25 Rev_1 which provided standardised catch rates of blue sharks caught by the Taiwan,China longline fishery in the Indian Ocean (Fig. 1), including the following abstract provided by the authors:

"*The blue shark catch and effort data from observers' records of Taiwanese large longline fishing vessels operating in the Indian Ocean from 2004-2012 were analyzed. Based on the fishing grounds of the target species, three areas, namely, A (north of 10ºN), B (10ºN-10ºS), and C (south of 10ºS), were categorized. To cope with the large percentage of zero shark catch, the catch per unit effort (CPUE) of blue shark, as the number of fish caught per 1,000 hooks, was standardized using a two-step delta-lognormal model that treats the proportion of positive sets and the CPUE of positive catches separately. Standardized indices with 95% bootstrapping confidence intervals are reported. The standardized CPUE showed a stable trend for blue sharks from 2004 to 2008 and increased steadily thereafter with a peak in 2012. The results obtained in this study can be improved if longer time series observers' data are available."* – (see paper for full abstract)

148. The WPEB **CONGRATULATED** the authors for presenting, for the first time, a standardisation of blue shark CPUE for the Taiwan,China longline fleet operating in the Indian Ocean, and **ENCOURAGED** the authors to continue this work and provide an update at the next WPEB meeting.

149. The WPEB **SUGGESTED** the use of catch at size information to investigate temporal and spatial differences in length composition may be a useful additional approach for the next WPEB meeting.

150. **NOTING** the possible area effects, the WPEB **SUGGESTED** exploring nominal CPUE in the three regions over time or the inclusion of longitude as well as latitude (with interactions) to see whether spatial factors are influencing the nominal trend.

151. The WPEB **SUGGESTED** investigating data filters based on targeting and gear specifications used.

152. The WPEB **SUGGESTED** that the study could be further improved through the use of proportional sampling when stratifying observer coverage in future.

Japan blue shark CPUE

153. The WPEB **NOTED** paper IOTC–2014–WPEB10–26 which provided standardised CPUE of blue shark caught by Japanese longliners (Fig. 1), including the following abstract provided by the authors:

"*Blue shark is one of popular and important bycatch sharks for Japanese tuna longline fishery in the Indian Ocean. Mastunaga (2007), Hiraoka and Yokawa (2011 and 2012) estimated abundance index of blue shark caught by Japanese longliners in the Indian Ocean using filtered log-book data of commercial boat, based on the assumption that log-book data of the cruises with higher than 80% shark reporting rate contains all blue shark catch. This assumption, however, validated in the Atlantic (Nakano and Clarke, 2006), criticize was raised for the necessity of validation on the data of Indian Ocean (IOTC, 2012). In the present study, abundance index of blue shark estimated using observer data collected by Japanese national observer program of CCSBT. CCSBT observer program started in 1992 and its data widely covers high latitudinal area in the south Indian Ocean where blue shark abundantly distributes."* – (see paper for full abstract)

154. The WPEB **CONGRATULATED** the authors on the improvements made to the standardisation of blue shark CPUE for the Japanese longline fleet operating in the Indian Ocean.

155. The WPEB **NOTED** that:
    - the time periods used in the model were based on the fishing seasons for southern bluefin tuna.
    - the shorter time period covered by the observer dataset used in this study compared with the logbook datasets used previously and **SUGGESTED** that further work be conducted to explore whether the data sets can be standardised and merged so that the logbook data can still be used for estimating the historical part of the series.
    - the plan to extend the CPUE series back to the 1970s for the next meeting, and that there were issues with obtaining accurate estimations of species composition due to the lack of species-specific reporting prior to 1994 and lack of observers prior to 1992.

CPUE discussion summary

156. The WPEB **NOTED** that possible interactions of year with other covariates could be explored through area specific CPUEs or mixed models.

157. The WPEB **REQUESTED** that any future CPUE analysis papers include model comparisons and residual diagnostics, as per the '*Guidelines for the presentation of stock assessment models'* adopted by the SC in 2012

(IOTC–2014–WPEB10–INF01). Comparison of catch to derived CPUE should be examined and detailed in the meeting paper.

158. The WPEB **ENCOURAGED** all CPCs to provide additional blue shark CPUE series for the next WPEB meeting, if sufficient data is available, even for shorter time periods.

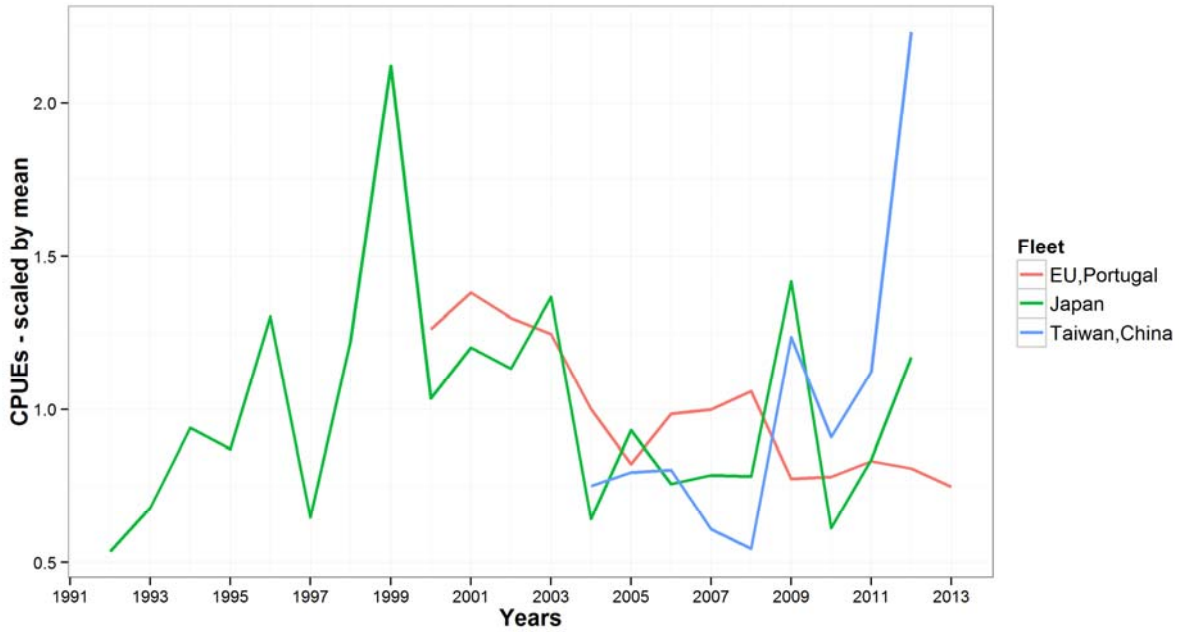


Fig. 1. Blue shark: Comparison of the blue shark standardised CPUE series for the longline fleets of EU,Portugal (2000–2013), Japan (1992–2012) and Taiwan,China (2004–2012).

Invited Expert presentation: Shark research in the Pacific – Secretariat of the Pacific Community

159. The WPEB **NOTED** the presentation by the Invited Expert which provided an overview of recent shark research at the Secretariat of the Pacific Community, including the following abstract provided by the author:

"*The presentation covered the SPC Shark Research Plan (SRP) which spanned the years 2010-14 and included an indicator analysis, stock status profiles, and stock assessments for the original five key shark species / species-groups. Further goals of the SRP included coordination of research, seeking improvements to shark data, and research into mitigation measures. This presentation focuses on the contribution of SPC-OFP to the SRP through its joint roles as the WCPFC Scientific Service provider and a provider of technical advice to its own members. The presentation covered 1) the highlights of the past four years work; 2) some of the challenges SPC-OFP faced and potential lessons; 3) make recommendations to the IOTC WPEB with respect to the planned shark work. Five stock assessments were conducted for three key shark stocks and in addition several auxiliary analyses were conducted in support of direct requests from WCPFC outside of the original SRP. The main challenges encountered were that the complexity and resources needed for the shark assessments were much greater than expected and some of the key data for the assessments was held by neither SPC nor WCPFC. With respect to the stock assessment aspect of the SRP the main points are to:*

- *Use the method most suited to the data*
- *Possible to use integrated models with low information "data poor" species*
- *Use of Structural Sensitivity Analysis allows the investigation of the main drivers of the assessment results/areas of uncertainty.*

With respect to the research into mitigation the analyses to date have confirmed that data collected through the implementation of observer programs is very poorly suited to address key questions regarding mitigation and therefore specific mitigation experiments are likely required; and that significant amounts of the observed catch of silky and oceanic whitetip sharks is a result of using sharklines.

160. The WPEB **THANKED** the excellent contribution of the invited expert for the meeting, Dr Joel Rice from SPC that provided examples from other Oceans on some approaches that can also be tested in the Indian Ocean and contributed greatly to the group understanding of shark data limitations and assessment methods.

161. The WPEB **NOTED** that with respect to the work regarding improved data quality SPC has developed materials that may lead to better reporting of species-specific catches of sharks on commercial logbooks (e.g., guides and posters); and developed materials that assist species identification of sharks in various processed states for port and transhipment monitoring.

162. The WPEB **NOTED** the suggestion by the Invited Expert that an integrated stock assessment of blue shark, using structural uncertainty analysis would be a sound next step, given the initial SS3 modelling of the data presented to the WPEB10 meeting.

163. The WPEB **NOTED** that while an integrated stock assessment can be used for data poor fisheries, better data are still required to improve the model. Although only developed under severe time constraints for illustrating how it could be developed, the Stock Synthesis is probably the key approach to use given its use in WCPFC and ICCAT. In addition, it has the ability to incorporate life history differences and structural uncertainty in key parameter estimates that are crucial to shark assessments.

164. The WPEB **ENDORSED** the integrated stock assessment approach, to be further refined in 2015 and presentation at the WPEB11.

165. The WPEB **NOTED** that the stock assessments conducted by SPC on silky shark and oceanic whitetip shark were based on observer data dating back only to 1995. This indicates what can be achieved with a relatively short time series of good quality data. While data records may date back further, the uncertainty will be higher and so it is important to explicitly account for this and not simply combine high and low quality data into a single series.

166. The WPEB **NOTED** that for catch free methods to be used, it is important that the abundance trends accurately reflect the entire stock, however, this is unclear with the current CPUE series trends.

Alternative catch estimates: blue shark and oceanic whitetip shark

167. The WPEB **NOTED** paper IOTC–2014–WPEB10–INF26 on alternative estimates of catches of blue shark and oceanic whitetip shark in the Indian Ocean based on shark fin trade data, including the following abstract provided by the author:

> *"This method was previously applied to the Atlantic Ocean by ICCAT as described in a peer-reviewed paper, as well as to the Western and Central Pacific at the request of the Secretariat of the Pacific Community. The method involves multiple assumptions and would best be applied for cross-referencing to catch estimates prepared from more traditional data sources. Estimates were constructed using four steps. First, estimates by species in number and biomass based on Hong Kong shark fin auction data and extrapolated to the global trade in 2000 were reconstructed using triangular distributions in a BUGS model. Then these estimates are adjusted using annual imports into Hong Kong for 1996-2011. Figures are then further adjusted based on the diminishing share of Hong Kong's shark fin trade as compared to the total global trade in recent years. Finally, these adjusted global estimates are scaled in a number of ways (by proportional tuna catches, by longline effort and by trade from Indian Ocean basin countries) to represent potential catches in the Indian Ocean. It is important to note that these estimates capture only a portion of the potential shark mortality (i.e. only those sharks' whose fins are traded). Several other trends in the global statistics that may reflect changes in shark fisheries were highlighted. Since 2003 the global catches of sharks and rays has declined by 15% while total catches of marine fishes as reported to FAO have remained relatively stable. This suggests that sharks and rays as whole may not be able to withstand current levels of fishing effort. The proportion of reported shark and ray catches which are reported as blue shark has grown substantially in the last decade whereas the proportion reported as being mako sharks has increased at a much lower rate. This may indicate that the species composition of catches and trade may be shifting to rely more heavily on the productive blue shark. The reported trade in shark meat has also increased substantially over the past decade which may be contributing to better reporting of shark landings, i.e. because carcasses are more likely to be enumerated than are fins only".*

168. The WPEB **THANKED** the author for the presentation that provided a method for catch reconstruction based on a different data source.

169. **NOTING** that in one of the three proportioning methods used, there is uncertainty about whether to include distant water fishing fleets in the Indian Ocean basin trade statistics, the WPEB **SUGGESTED** sensitivity analysis be conducted to explore this.

170. The WPEB **NOTED** the recent drop in the price of fins as the market appears to have shifted away from the elite towards to the average consumer in China and to southeast Asia.

Parameters for future analyses: CPUE standardisation and stock assessments

171. The WPEB **AGREED** that in order to obtain comparable CPUE standardisations for shark species, the set of parameters detailed in Table 2 (developed at the previous WPEB meeting), if available, could be used for the standardisation of CPUE analysis in 2015, which could then be used as indices of abundance for the stock assessments for blue shark and oceanic whitetip shark (and other species if available).

TABLE 2. A selection of the possible parameters for the standardisation of shark CPUE series.

CPUE standardisation parameters/approach	Value for CPUE standardisation
Model	*Delta-Log Normal/Poisson/Log-Normal/Tweedie*
Area	*To be defined (possibly use the North, South and Coastal Areas corresponding to Longhurst ecological provinces for the Indian Ocean).* Explore core area(s) as an alternative TBD
CE Resolution	Operational data
GLM Factors	Year, Quarter, Area, HBF, environmental, species ratios + interactions

Review of data needs and way forward for the evaluation of shark stocks - catch data reconstruction

172. The WPEB **NOTED** that reconstructing catch data is very important and will have a great impact in the models and projections.

173. The WPEB **REQUESTED** that the WPEB Chair work with CPCs individually or jointly if possible, to develop and refine data which can be used in catch reconstruction. In doing so, full account should be taken of data quality with respect to deficiencies in accurate reporting, as well as for the estimation of catch and discards. This would be done in collaboration with the IOTC Secretariat inter-sessionally. CPCs should facilitate the sharing of information for this task, including information coming from national observer programs, guaranteeing that it will be used under strict confidentiality rules.

174. The WPEB **RECOMMENDED** a short inter-sessional meeting is conducted with a small group of scientists to work mainly on blue shark catch data reconstruction to be used for stock assessment in 2015.

175. The WPEB **NOTED** potential alternatives for catch estimates that could be used for comparative purposes, including estimating shark catches based on target species catches, generating catch estimates from shark fin trade data, and from shark catch rates and effort. These alternative catch estimates should be presented at future sessions of the WPEB for review. Some participants did not agree with this.

176. The WPEB **NOTED** that in the Indian Ocean there are more uncertainties than in other Oceans as there is less information on the fishery and biology.

177. The WPEB **NOTED** that the uncertainties in the stock status can be driven by the model assumptions, data inputs and the biological assumptions. The uncertainties identified in the preparatory work and the analysis itself should be appropriately explored, for example by using a structural sensitivity analysis.

178. The WPEB **SUGGESTED** a revision on the blue shark size data on a basin wide Indian Ocean scale accounting for spatial, seasonal and sex-related effects. This should be done by the WPEB Chair in coordination with the CPCs, and in collaboration with the IOTC Secretariat inter-sessionally. CPCs will facilitate the sharing of information for this task, including information coming from national observer programs, guaranteeing that it will be used under strict confidentiality rules.

179. The WPEB **NOTED** the similarity between the estimates for some species based on the analysis of trade data and those generated by paper IOTC–2013–WPEB09–19 Rev_1; presented to the WPEB in 2013, where catch levels were estimated based on average catch ratios of each shark species to target species for different metiers. In this study catch rates by species and gear determined by observer data, expert knowledge and available literature.

180. The WPEB **NOTED** the static nature of the approach using 10 year averages whereas the ratios may actually vary over time and **SUGGESTED** methods using CPUE and effort should also be explored.

10.5 Development of technical advice on the status of the shark stocks

181. The WPEB **ADOPTED** the management advice developed for a subset of shark species commonly caught in IOTC fisheries for tuna and tuna-like species, as provided in the draft resource stock status summaries and **REQUESTED** that the IOTC Secretariat update the draft stock status summary for sharks with the latest 2013 catch data, and for the summary to be provided to the SC as part of the draft Executive Summary, for its consideration:
    - Blue sharks (*Prionace glauca*) – Appendix IX
    - Oceanic whitetip sharks (*Carcharhinus longimanus*) – Appendix X
    - Scalloped hammerhead sharks (*Sphyrna lewini*) – Appendix XI
    - Shortfin mako sharks (*Isurus oxyrinchus*) – Appendix XII
    - Silky sharks (*Carcharhinus falciformis*) – Appendix XIII
    - Bigeye thresher sharks (*Alopias superciliosus*) – Appendix XIV

- Pelagic thresher sharks (*Alopias pelagicus*) – Appendix XV

11. OTHER BYCATCH AND BYPRODUCT SPECIES INTERACTIONS

11.1 Review new information on other bycatch and byproduct, in terms of biology, ecology, fisheries interactions and bycatch mitigation measures

Data and reporting requirements

182. The WPEB **RECALLED** the IOTC Resolutions relevant to marine turtle species (notably Resolutions 10/02, 12/04 and 13/03), including the data recording and reporting (Table 3) requirements by which Contracting Parties and Cooperating Non-Contracting Parties (CPCs) are required to collect and report all marine turtle interaction data.

TABLE 3. IOTC data collection and reporting requirements for marine turtles.

Resolution	Paragraph
IOTC Resolution 12/04: *On Marine Turtles*	Paragraph 3: CPCs shall collect (including through logbooks and observer programs) and provide to the IOTC Secretariat no later than 30 June of the following year in accordance with Resolution 10/02 (or any subsequent revision), all data on their vessels' interactions with marine turtles. The data shall include the level of logbook or observer coverage and an estimation of total mortality of marine turtles incidentally caught in their fisheries.

183. The WPEB **AGREED** that the lack of data from CPCs on interactions and mortalities of marine turtles in the Indian Ocean is a substantial concern, resulting in an inability of the WPEB to estimate levels of marine turtle bycatch. There is an urgent need to quantify the effects of fisheries for tuna and tuna-like species in the Indian Ocean on marine turtle species, as required by Resolution 11/04, and it is clear that little progress on obtaining and reporting data on interactions with marine turtles has been made. This data is necessary to allow the IOTC to respond and manage the adverse effects on marine turtles, and other bycatch species.

184. The WPEB **RECALLED** that, in accordance with Resolution 12/04, paragraph 6, CPCs are obliged to ensure that fishers are aware of and use proper mitigation, identification, handling and de-hooking techniques. Furthermore, it is mandatory that vessels keep onboard all necessary equipment for the release of marine turtles, in accordance with handling guidelines in the *IOTC Marine Turtle Identification Cards*. Appropriate equipment for longliners includes line cutters, dehooking devices and dipnets for safely bringing marine turtles onboard.

185. The WPEB **AGREED** that for future session of the WPEB, the Chair would need to solicit more papers on marine turtle catch mitigation techniques for gillnets (i.e. concerning bycatch mitigation measures under investigation or use in the Indian Ocean and other regions), with a view to developing further technical advice for the SC.

11.2 Marine turtles: Review new information on marine turtle biology, ecology, fisheries interactions and bycatch mitigation measures

Sri Lanka fisheries interactions with marine turtles

186. The WPEB **NOTED** paper IOTC–2014–WPEB10–27 which detailed the impact of large pelagic fisheries on the survival of marine turtles in Sri Lanka, including the following abstract provided by the authors:

> "*Large pelagic fisheries in Sri Lanka are developing rapidly, with an ever-increasing offshore fishing fleet. Over 3000 boats at present are actively engaged in fisheries employing gillnets and longlines accounting for more than 95 % of the total fishing effort. However, both fishing methods have long been cited as major cause for sea turtle mortality. Incidental catch data of sea turtles are somewhat ambiguous to make up a noteworthy representation in the large pelagic catch statistics of Sri Lanka which is collected through port sampling programme. Since all species of sea turtles are protected by law, the turtle encountered in the gear is usually returned to the sea as discards. In complying with the IOTC Resolution 12/04 the conservation of marine turtles, the interaction of sea turtles with fishing gear (separately for gillnet and longline) targeting tuna have been studied at two major landing centers in the west coast; Negombo and Beruwala over one year period via direct communication with fishermen, monitoring of catches, onboard observer programme and stranding data.*" – (see paper for full abstract)

187. The WPEB **NOTED** the study was based on fisher species identification but that misidentification by fishers is thought to be low. Some participants commented that the lower bycatch rates reported for marine turtles in gillnet fisheries compared with longline fisheries was unexpected. The WPEB **ENCOURAGED** the continuation of this important work especially using data from the regional observer program for the gillnet fleet of Sri Lanka.

188. The WPEB **NOTED** that Sri Lanka has ongoing research to identify marine turtle nesting and the indication from the authors that the initial results will presented at next WPEB meeting.

Ghost net impacts on marine turtles

189. The WPEB **NOTED** paper IOTC–2014–WPEB10–28 which detailed the high mortality of olive Ridley turtles in ghost nets in the central Indian Ocean, including the following abstract provided by the authors:

> "*Lost, abandoned or discarded fishing nets, otherwise known as 'ghost nets', pose a serious risk to large marine fauna throughout the world, including in the Indian Ocean. Since 1988, a total of 129 Olive Ridley Turtles (Lepidochelys olivacea) have been found entangled in ghost nets in Maldivian waters. Given that the predominant fishing techniques used in the Maldives are pole-and-line and handline, the majority of ghost nets found must have drifted with oceanic currents from neighbouring countries and international waters. Our data suggest that these nets may be coming to the Maldivian waters from India, Sri Lanka, and further afield in Southeast Asia during the Northeast Monsoon, and from the Arabian Sea during the Southwest Monsoon. Entangled Olive Ridley Turtles are most often encountered in the Northeast Monsoon, and sexually immature individuals make up the majority of entanglements. 71% of Olive Ridley entanglements were associated with large conglomerates of multiple fishing nets."* – (see paper for full abstract)

190. **NOTING** the high number of ghost nets found in the waters of the Maldives originating from different countries according to the monsoon season and their impact on olive Ridley turtle, the WPEB **ENCOURAGED** the authors to continue this important work and try to investigate and estimate the mortalities induced by ghost nets on marine turtle.

191. WPEB **NOTED** that in many RFMOs (e.g. IOTC and NAFO) the marking of all fishing gears used in a RFMO area of responsibility is a mandatory requirement and that marking requirements are also recommended by FAO Code of Conduct for Responsible Fisheries and implementation of methods to facilitate the retrieval of derelict fishing gear and other marine debris is encouraged in the FAO guidelines to reduce sea turtle mortality in fishing operations.

192. The WPEB **NOTED** the Global Ghost Gear Initiative, which aims to create an online data hub to record and analyse ghost gear volumes, geography and trends in order to more accurately quantify the problem.

Development of technical advice on the status of marine turtle species

193. The WPEB **ADOPTED** the management advice developed for marine turtles, as provided in the draft status summary and **REQUESTED** that the IOTC Secretariat update the draft stock status summary with the latest 2013 interaction data, and for the summary to be provided to the SC as part of the draft Executive Summary, for its consideration:
    - Marine turtles (Appendix XVI).

11.3 Seabirds: Review new information on seabird biology, ecology, fisheries interactions and bycatch mitigation measures

Data and reporting requirements

194. The WPEB **NOTED** that there continues to be very limited information on interactions with seabirds available in the IOTC Secretariat's databases for most longline fleets and for all gillnet fleets that operate in the Indian Ocean.

195. The WPEB **RECALLED** each of the IOTC Resolutions relevant to seabirds (notably Resolutions 10/02 and 12/06, including the recording and reporting requirements (Table 4). Contracting and Cooperating Non-Contracting Parties (CPCs) are required to collect and report incidental bycatch of seabirds.

TABLE 4. IOTC data collection and reporting requirements for seabirds.

Resolution	Paragraph
IOTC Resolution 12/06: *On reducing the incidental bycatch of seabirds in longline fisheries*	Paragraph 1 (start): CPCs shall record data on seabird incidental bycatch by species, notably through scientific observers in accordance with Resolution 11/04 and report these annually. Paragraph 2: 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 bycatch through logbooks, including details of species, if possible. Paragraph 3: CPCs shall provide to the Commission as part of their annual reports, information on how they are implementing this measure.

Resolution 12/06: Review of seabird mitigation measures

196. The WPEB **NOTED** paper IOTC–2014–WPEB10–29 that provided preliminary identification of minimum elements to review the effectiveness of seabird bycatch mitigation regulations in tuna RFMOs, including the following abstract provided by the authors:

> "*The five tuna regional fishery management organizations (RFMOs) have established requirements for their pelagic longline vessels to use seabird bycatch mitigation measures in most areas overlapping with albatrosses, petrels, and other seabirds impacted by bycatch, and have plans to monitor and review the effectiveness of these measures. However, methodologies or criteria for undertaking such reviews have not yet been defined. This paper summarizes the preliminary views of an ACAP (Agreement on the Conservation of Albatrosses and Petrels) intersessional group that has been formed to discuss what the minimum elements may be for such reviews. The following four elements are recommended to form part of monitoring the effectiveness of the seabird conservation measures adopted by IOTC in 2014 (Res 12/06): 1). The extent to which the tuna RFMO seabird conservation and management measure(s) reflects 'best practice' for pelagic longline fisheries, and has appropriate spatial, temporal and vessel application; 2) The quality and representativeness of the data available for the review; 3) The degree of implementation by vessels (compliance); 4) Analysis and monitoring of seabird bycatch levels over time, most likely including a) Reported bycatch rates (birds per 1000 hooks) and b) Total number of birds killed per tuna RFMO per year. In addition, the paper recommends adoption of harmonized review methods across tuna RFMOs, in addition to ongoing efforts to harmonize tuna RFMO bycatch data collection, reporting and storage mechanisms*."

197. **NOTING** that many albatross and petrel species migrate between the areas of jurisdiction of more than one tuna RFMO, the WPEB **AGREED** that the harmonisation of bycatch data collection, reporting and storage mechanisms should be carried out, noting RFMO specific requirements, so that cumulative impacts on each species can be assessed.

198. The WPEB **NOTED** the need to undertake a quantitative evaluation on the effectiveness of seabird bycatch mitigation measures as a priority area of work given that the Scientific Committee will be analysing the impact of this Resolution on seabird bycatch in 2015, for the consideration of the Commission in 2016.

199. **NOTING** that since Resolution 12/06 came into force in July 2014, a 2015/16 assessment would have access to less than a year of data, which is unlikely to be adequate, the WPEB **AGREED** that there was useful work that should be progressed in 2015, and certain elements, such as the list of best practice mitigation measures, that should be reviewed.

200. The WPEB **RECALLED** that Resolutions 12/06 and 11/04 require CPCs to collect and report data on seabird bycatch and bycatch mitigation measures, and that these data are essential for the review of Resolution 12/06.

201. The WPEB **NOTED** that the observer data submission templates being updated by the IOTC Secretariat would provide a mechanism to report the necessary data that will form part of the review, and future monitoring exercises.

202. The WPEB **AGREED** that it is important for CPCs to report seabird bycatch figures in their National Reports as CPUE (i.e. linking bycatch to effort), together with associated observer coverage information.

203. The WPEB **NOTED** that the approach proposed in the paper included an element of compliance monitoring (the degree of implementation by vessels), and **AGREED** that this should be kept separate from the scientific assessment process.

204. The WPEB **RECOGNISED** the trans-oceanic nature of many seabird species, which necessitates evaluation of mitigation effects across ocean basins and through collaboration with other tRFMOs.

205. **NOTING** that there are analogous processes underway in other fora, such as CCSBT and ICCAT, to investigate appropriate methods to review the efficacy of seabird bycatch mitigation measures, the WPEB **AGREED** that there is value in developing and maintaining linkages between these, and that outputs of the CCSBT seabird workshop (November 2014) should be considered in the process to develop IOTC's seabird assessment.

206. The WPEB **NOTED** the establishment of the CCSBT *Effectiveness of Seabird Mitigation Measures Technical Group* to provide advice on optimal approaches for measuring and monitoring the effectiveness of seabird bycatch mitigation measures in southern bluefin tuna longline fisheries.

207. The WPEB **NOTED** that for the first time, it was informed that the CCSBT was holding a technical working group meeting on the effectiveness of seabird mitigation measures, from 4–6 November 2014 in Tokyo, Japan, and the suggestion that this working group should be the lead on assessing the effectiveness of seabird mitigation measures across tRFMOs. However, as this group operates under the CCSBT rules of procedure, the meeting documents and reports are not in the public domain and therefore not accessible for all IOTC CPCs.

208. The WPEB **AGREED** that if meetings are held to discuss issues such as the evaluation of seabird mitigation measures in the Indian Ocean, the IOTC WPEB Chair, Vice-Chair, SC Chair and IOTC Secretariat should be present, and that material discussed and reported be placed in the public domain, so that all IOTC CPCs can follow the process in a transparent manner.

209. The WPEB **AGREED** that the development of a seabird portal for information sharing through the IOTC website would be useful to support collaborative research efforts.

210. **RECOGNISING** that most participants of the WPEB are experts in fisheries rather than seabirds, the WPEB **AGREED** that there was a need for collaborations with seabird specialists to fully investigate the impact of the mitigation measures and to make the best use of the available data.

Resolution 11/04 ***on a regional observer program***

211. **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* makes no reference to the data collected not being used for compliance purposes, the WPEB **RECOMMENDED** that at the next revision of Resolution 11/04, it be clearly stated that the data collected shall not be used for compliance purposes.

Sri Lanka seabird interactions

212. The WPEB **NOTED** paper IOTC–2014–WPEB10–30 that provided the results of a study on seabirds in the seas around Sri Lanka and their interaction in pelagic fisheries, including the following abstract provided by the authors:

> "*The present appraisal study was undertaken by the National Aquatic Resources Research and Development Agency (NARA) covering a period of one year (2013/2014) to assess the impact of large pelagic fisheries on the survival of seabirds. This study was carried out to comply with the Resolution 12/06 on reducing the incidental bycatch of seabirds in longline fisheries. Data was collected from port sampling and also from onboard observation in research cruises made in Sri Lankan coastal waters and Bay of Bengal in Indian Ocean and also on commercial fishing vessels. Being a tropical oceanic island in the Indian Ocean a large number of seabird species are reported from the coastal seas around the Sri Lanka. The majority of seabirds reported are migrants; winter, summer or passage migrants and they reside for one season of the year, either partially or almost exclusively at sea but mainly in shallow coastal waters. Compared to the numbers reported of terrestrial birds, seabirds are far less in numbers in the seas around Sri Lanka."* – (see paper for full abstract)

213. The WPEB **COMMENDED** Sri Lanka for the study and **ENCOURAGED** other CPCs to initiate similar work. The combination of different sources of information used in this study including scientific cruises, observer information and fisher interviews as well as the type and relative quality of the data provided from each. While observer data are generally considered more reliable, the extent of local ecological knowledge obtained through fisher interviews can be high and is thought to be fairly reliable given that seabirds are not protected in Sri Lanka and so there are no reporting concerns.

214. The WPEB **THANKED** BirdLife for the offer of assistance to Sri Lanka in species identification for future studies.

215. The WPEB **NOTED** that while the preliminary results presented from this study suggest that a NPOA for seabirds is probably not necessary, the spatial extent of the study was nevertheless fairly limited and so the current results should be interpreted with caution.

216. The WPEB **AGREED** to apply a provisional 'Not applicable (n.a.)' status for Sri Lanka's longline fisheries with regards to seabirds, while the SC considers adopting a more formal process for reviewing such requests from CPCs (see Section 7.1), and that the study is expanded both spatially and temporally, particularly through the collection of more observer data.

217. The WPEB **WELCOMED** the initiation of a research project which will be utilising data collected by bird radar, used by the purse seine fleet to locate schools of fish. This project will incorporate data from four vessels in each ocean and will analyse the interactions between seabirds and purse seine fishing vessels.

Information papers on seabirds

218. The WPEB **NOTED** that the GEF-funded, FAO-managed Common Oceans programme for improved management of tuna fisheries in Areas Beyond National Jurisdiction had been initiated, and that BirdLife South Africa was implementing the seabird bycatch reduction component of this project.

219. The WPEB **RECALLED** that paper IOTC–2013–SC16–10 had reported on the successful research between BirdLife International and the Republic of Korea, into the use of Lumo Leads ® as a line weighting option. The trials concluded that 45 g Lumo Leads could be placed at the hook without causing operational problems, and that some Korean longline vessels operating in the southern Indian Ocean were now using Lumo Leads, in compliance with Res 12/06. It was further noted that additional at-sea research would provide important insights into the impacts of line weighting on target catch rates and seabird bycatch rates, and that Korea and BirdLife International were planning to undertake such research in 2015.

220. The WPEB **ENCOURAGED** the continuation and expansion of this study to increase the statistical power of the results. This included the suggestion of future trials of a number of alternative experimental treatment gear configurations to compare with the control group. The spatial extent of the study could also be widened.

221. The WPEB **ENCOURAGED** other CPCs with significant longline effort south of 25°S to explore collaborative research programmes, to assist fleets wishing to implement line weighting as one of the measures used in compliance with Res 12/06.

222. The WPEB **NOTED** a demonstration by BirdLife of a new device, the hookpod, to reduce seabird bycatch.. The lights associated with the pods have a longevity of ~200 hours.

223. **NOTING** the great potential of the device to mitigate bycatch with minimal impact on target catches, the WPEB **AGREED** that there may be potential logistical difficulties which could arise during baiting by some fishers who prefer to embed the entire hook in the bait, rather than leaving the tip of the hook exposed.

224. The WPEB **NOTED** the trials that have taken place in South African swordfish fisheries, shallow tuna fisheries in Brazil, tuna fisheries in Australia and more limited trials on a Japanese research vessel.

225. **NOTING** that the hook pods may not be suitable for use in all fisheries, the WPEB **ENCOURAGED** further trials with results to be presented at the next meeting of the WPEB.

226. **NOTING** that several new technologies are being developed and tested, which could result in a single measure being acceptable for reducing seabird bycatch rates, and that pending the outcomes of scientific trials, it may be possible to recommend these new technologies as an optional single measure to reduce seabird bycatch, thus the WPEB **ENCOURAGED** researchers to present the results of studies into the effectiveness and practicalities of such measures, at the 2015 meeting of the WPEB, with a view to possibly recommending the revision of the list of suitable mitigation measures for the 2016 review of Res 12/06.

227. ***Development of technical advice on the status of seabird species***

228. The WPEB **ADOPTED** the management advice developed for seabirds, as provided in the draft status summary and **REQUESTED** that the IOTC Secretariat update the draft stock status summary with the latest 2013 interaction data, and for the summary to be provided to the SC as part of the draft Executive Summary, for its consideration:
    - Seabird (Appendix XVII).

11.4 Marine mammals: *Review new information on marine mammal biology, ecology, fisheries interactions and bycatch mitigation measures*

Cetacean interactions in tuna fisheries

229. The WPEB **NOTED** paper IOTC–2014–WPEB10–31 which detailed the results of a study examining the interactions between cetaceans and tuna fisheries in the western and central Indian Ocean presented, including the following abstract provided by the authors:
    "*This report reviews information on interactions between cetaceans (whales and dolphins) and tuna fisheries in the western and central Indian Ocean. The average annual catch of tuna and related species in the Indian Ocean was just over 1.5 million tonnes during 2008-12. Of this, almost 1.1 million tonnes (71%) came from the western and central Indian Ocean. The main fisheries for tuna and tuna-like species in the region are gillnet (40% of reported catch during 2008-12), purse seine (26%), longline (12%), handline and troll (11%) and pole-and-line (9%).*" – (see paper for full abstract)

230. The WPEB **NOTED** the catch estimations based on literature on studies from the 1980s and 1990s and that these should be interpreted with caution when extrapolating these results both temporally and spatially.

231. The WPEB **NOTED** the important issues raised in the paper highlighting cetacean interactions with IOTC fisheries and **ENCOURAGED** all CPCs to investigate this issue more thoroughly so that the literature can be updated.

232. The WPEB **NOTED** the comment by Sri Lanka that cetaceans have not been reported as landings by port samplers and **ENCOURAGED** the authors to explore catches through the observer program.

11.5 Marine mammal identification cards

233. The WPEB **NOTED** paper IOTC–2014–WPEB10–32 which detailed the need to develop IOTC identification guides for marine mammals in the Indian Ocean, including the following abstract provided by the authors:
"*There is a need to develop 'IOTC identification cards' for identification of marine mammals which interact with IOTC-managed fisheries. A total of 32 species of cetaceans are suggested for inclusion in the identification cards. Estimated cost of development and production is $US 17,000.*"

234. The WPEB **WELCOMED** the efforts to improve species identification of marine mammals by observers in the French purse seine fisheries based on systematic sightings.

235. The WPEB **AGREED** on the importance of the development of a set of species identification cards for cetaceans in the Indian Ocean and **ENCOURAGED** experts to provide assistance to lower the costs in developing the cards.

236. The WPEB **RECALLED** that there are already several cetacean species identification guides that are publically available, including the FAO World Wide Guide for the identification of marine mammals and the WIOMSA guide. Nevertheless, it was **AGREED** that these identification guides are not suitable for use on vessels as they are not waterproof and a guide specific to the Indian Ocean may be preferable to a worldwide document.

On the development best practice guideline for release of marine mammals

237. The WPEB **RECALLED** para. 6 of IOTC Resolution 13/04 *On the conservation of cetaceans* which states:
"*The Commission requests that the IOTC Scientific Committee develop best practice guidelines for the safe release and handling of encircled cetaceans, taking into account those developed in other Regional Fisheries Management Organisations, including the Western and Central Pacific Fisheries Commission, and that these guidelines be submitted to the 2014 Commission meeting for endorsement.*"

238. The WPEB **NOTED** that responding to commission Resolution 13/04, WPEB at the 9th Session, held in September 2013, reviewed the requirements outlined in Resolution 13/04 on the conservation of cetaceans, but could not reach agreement on guidelines for the safe release and handling of encircled cetaceans in IOTC fisheries. Some participants felt that such a guide was unnecessary, while others considered the proposed guidelines for whale sharks could be adapted for cetaceans.

239. The WPEB **RECALLED** that the SC16, held in December 2013 recommended that the Commission allocates funds in its 2014 and 2015 budgets, to produce and print the IOTC best practice guidelines for the safe release and handling of encircled cetaceans. The guidelines could be incorporated into a set of IOTC cetacean identification cards: "*Cetacean identification for Indian Ocean fisheries*". This was not endorsed by the Commission.

240. The WPEB **NOTED** that cetaceans are a highly diverse group and best practice for two principal groups that may interact with purse seine fisheries: baleen whales and dolphins (porpoises) might differ considerably.
    - Baleen whales. Owing to high individual mass of baleen whales that usually exceed 5t they escapes from the net by themselves ramming through the net wall. In many cases they escapes by diving below led line or escape from the purse seine before end of the pursing.
    - Dolphins/porpoises. Best practice to release encircled dolphins/porpoises was successfully developed in EPO by US NMFS and I-ATTC. This best practice involves, besides release technique (known as backdown), a considerable modification of the fishing gear itself: 'Medina panel' i.e. introduction of small-mesh panel in the purse seine net to decrease accidental entanglement of dolphins. Equipment of purse seine vessels with speed-boats that could be used for dolphins/porpoises release would be also necessary. All these modification might imply considerable additional costs for fisheries.

12. RESEARCH RECOMMENDATIONS AND PRIORITIES

12.1 Revision of the WPEB Program of Work 2015–2019

241. The WPEB **NOTED** paper IOTC–2014–WPEB10–10 which provided the WPEB10 with an opportunity to consider and revise the WPEB Program of Work (2015–2019), by taking into account the specific requests of the Commission, Scientific Committee, and the resources available to the IOTC Secretariat and CPCs.

242. The WPEB **RECALLED** that the SC, at its 16th Session, requested that all Working Parties provide their work plans with items prioritised based on the requests of the Commission or the SC. (SC16. para. 194). Similarly, at the 18th Session of the Commission, the Scientific Committee was requested to provide its Program of Work on a multi-year basis, with project priorities clearly identified. In doing so, the SC should consider the immediate and longer term needs of the Commission.

243. The WPEB **NOTED** the range of research projects on ecosystems and bycatch, currently underway, or in development within the IOTC area of competence, and reminded participants to ensure that the projects described are included in their National Reports to the SC, which are due in early November, 2014.

244. The WPEB **NOTED** the forthcoming New Zealand Fisheries Assessment Report providing an indicator based analysis of the status of New Zealand blue, mako and porbeagle sharks by Francis, Clarke and Griggs. This study demonstrates a range of indicators that might be used to monitor the status of a population, such as CPUE series, distribution, species composition, size and sex ratio analysis which may be useful to explore for Indian Ocean populations.

245. **NOTING** that the full assessment for oceanic whitetip sharks scheduled for 2017 and **ACKNOWLEDGING** the current poor data situation, the WPEB **RECALLED** that the specific request from the Scientific Committee is to evaluate the effectiveness of the no retention measure for oceanic whitetip sharks.

246. The WPEB **NOTED** that the development of indicators for scalloped hammerhead sharks was scheduled for 2015 and the lack of discrimination between the hammerhead species in many data collection activities. The presence of some time series catch data for scalloped hammerhead sharks in South Africa, although the data cover a limited area.

247. The WPEB **ENCOURAGED** CPCs to review all data that are available, explore the possibilities for analysis and review the results taking into account quality of the data. In particular, the WPEB **ENCOURAGED** the presentation of size data by coastal CPCs focussing on the priority species listed for each year.

248. **RECOGNISING** the known importance of sharks to marine ecosystems, and to better implement the shark Conservation and Management Measures adopted by the Commission, the WPEB **AGREED** that an assessment of shark catch and effort by CPCs which have fisheries catching sharks commence as detailed in the WPEB Program of Work.

249. The WPEB **RECOMMENDED** that the SC consider and endorse the WPEB Program of Work (2015–2019), as provided at Appendix XVIII.

13. OTHER BUSINESS

13.1 Development of priorities for an Invited Expert/s at the next Working Party on Ecosystems and Bycatch meeting

250. The WPEB **NOTED** with thanks, the contributions of the Invited Expert for the meeting, Dr Joel Rice, from the Secretariat of the Pacific Community (SPC) and encouraged him to maintain links with IOTC scientists to aid in the improvement of approaches to assess ecosystem and bycatch issues in the IOTC area of competence.

251. The WPEB **AGREED** to the following core areas of expertise and priority areas for contribution that need to be enhanced for the next meeting of the WPEB in 2015, by the Invited Experts:
- **Expertise:** Sharks – stock assessment; including from regions other than the Indian Ocean; data poor assessment approaches, including indicator-based analysis, for sharks.
- **Priority areas for contribution:** Sharks – refining the information base, historical data series and indicators for shark species for stock assessment purposes (species focus: blue shark).

252. The WPEB **RECOMMENDED** that an Invited Expert be brought to the WPEB in 2015 so as to further increase the capacity of the WPEB to undertake work on sharks, and for this to be included in the IOTC budget for 2015.

13.2 Date and place of the 11th Session of the Working Party on Ecosystems and Bycatch

253. The WPEB **THANKED** Japan for hosting the 10th Session of the WPEB and commended Japan on the warm welcome, the excellent facilities and assistance provided to the IOTC Secretariat in the organisation and running of the Session.

254. The WPEB **AGREED** on the importance of having IOTC working party meetings within key CPCs catching species of relevance to the working party, in this case on sharks, noting that this meeting should be held in conjunction with the WPB. Following a discussion on who would host the 11th and 12th Sessions of the WPEB in 2015 and 2016 respectively, the WPEB **REQUESTED** that the IOTC Secretariat liaise with EU,Portugal to determine if they would be able to host the 11th Session. The WPEB should continue to be held in conjunction with the Working Party on Billfish. An offer was also made by the Secretariat to hold the meeting in the Seychelles. The meeting locations will be communicated by to the SC for its consideration at its next session to be held in December 2014 (Table 5).

Table 5. Draft meeting schedule for the WPEB (2015 and 2016)

Meeting	2015		2016	
	Date	**Location**	**Date**	**Location**
Working Party on **Ecosystems and Bycatch**	Options: (5d) 27–31 May 14–18 Oct.	EU,Portugal	Options: (5d) Late May Mid Oct.	TBD
Working Party on **Billfish**	After the WPEB (5d)	EU,Portugal	Prior to the WPEB (4d)	TBD

255. The WPEB **NOTED** the importance of having a degree of stability in the participation of CPCs to each of the working party meetings and **ENCOURAGED** participants to regularly attend each meeting to ensure as much continuity as possible.

13.3 Review of the draft, and adoption of the Report of the 10th Session of the Working Party on Ecosystems and Bycatch

256. The WPEB **RECOMMENDED** that the Scientific Committee consider the consolidated set of recommendations arising from WPEB10, provided at Appendix XIX, as well as the management advice provided in the draft resource stock status summary for each of the seven shark species, as well of those for marine turtles and seabirds:

Sharks

- Blue sharks (*Prionace glauca*) – Appendix IX
- Oceanic whitetip sharks (*Carcharhinus longimanus*) – Appendix X
- Scalloped hammerhead sharks (*Sphyrna lewini*) – Appendix XI
- Shortfin mako sharks (*Isurus oxyrinchus*) – Appendix XII
- Silky sharks (*Carcharhinus falciformis*) – Appendix XIII
- Bigeye thresher sharks (*Alopias superciliosus*) – Appendix XIV
- Pelagic thresher sharks (*Alopias pelagicus*) – Appendix XV

Other species/groups

- Marine turtles – Appendix XVI
- Seabirds – Appendix XVII

257. The report of the 10th Session of the Working Party on Ecosystems and Bycatch (IOTC–2014–WPEB10–R) was **ADOPTED** on the 31 October 2014.

APPENDIX I
LIST OF PARTICIPANTS

Chairperson
Dr Rui **Coelho**
IPMA, Portuguese Institute for the Ocean and Atmosphere, Faro, EU,Portugal
Email: rpcoelho@ualg.pt

Vice-Chairperson
Dr Evgeny **Romanov**
CAP RUN – ARDA, EU,France
Email: evgeny.romanov@ird.fr

Invited Expert:
Dr Joel **Rice**
Secretariat of the Pacific Community, New Caledonia
Email: joelr@spc.int

Other Participants:
Khadeeja **Ali**
Marine Research Centre, Ministry of Fisheries & Agriculture, Maldives
Email: kali@mrc.gov.mv

Dr Pascal **Bach**
IRD, EU,France
Email: pascal.bach@ird.fr

Dr Jerome **Bourjea**
IFREMER, EU,France
Email: jbourjea@ifremer.fr

Dr Pierre **Chavance**
IRD, EU,France
Email: pierre.chavance@ird.fr

Dr Shelley **Clarke**
WCPFC, Federated States of Micronesia
Email: shelley.clarke@wcpfc.int

Dr Wetjens **Dimmlich**
WWF, Seychelles
Email: wdimmlich@wwf.panda.org

Mr Jose Ramon **Fernandez Costa**
IEO – Spanish Institute of Oceanography, EU,Spain
Email: jose.costa@co.ieo.es

Ms. H.L.N. Sandamali **Herath**
Department of Fisheries, Colombo 10
Email: hlsherath@gmail.com

Dr Minoru **Kanaiwa**
Tokyo University of Agriculture, Japan
Email: m3kanaiw@bioindustry.nodai.ac.jp

Ms Yuna **Kim**
Birdlife International, Rep. of Korea
Email: contact.yuna.kim@gmail.com

Dr Rekha **Maldeniya**
National Aquatic Resources Research and Development Agency (NARA), Sri Lanka
Email: rekhamaldeniya@gmail.com

Dr Sarah **Martin**
IOTC Secretariat, Seychelles
Email: sarah.martin@iotc.org

Dr Ansy **Mathew N.P.**
Department of Animal Husbandry, Dairying & Fisheries, Ministry of Agriculture, Government of India, India
Email: ansy@rediffmail.com

Mr Hiroaki **Matsunaga**
NRIFSF, FRA, Japan
Email: matsuh@fra.affrc.go.jp

Mr James **Moir Clark**
MRAG, United Kingdom
Email: j.clark@mrag.co.uk

Mr Kazuki **Murai**
Tokyo University of Agriculture, Japan
Email: km204282@bioindustry.nodai.ac.jp

Dr Miguel **Neves Santos**
Portuguese Institute for the Ocean and Atmosphere, Faro, EU,Portugal
Email: mnsantos@ipma.pt

Dr Tom **Nishida**
National Research of Far Sea Fisheries, Japan
Email: tnishida@affrc.go.jp

Mr Dian **Novianto**
Research Institute for Tuna Fisheries, Indonesia
Email: dianovianto78@gmail.com

Dr Seiji **Ohshimo**
Fisheries Research Agency, Japan
Email: oshimo@affrc.go.jp

Mr Rondolph **Payet**
IOTC Secretariat, Seychelles
Email: rondolph.payet@iotc.org

Dr S. Lakshmi **Pillai**
Ceneral Marine Fisheries REsearch Institute, Kochi, India
Email: slakshimipillai@rediffmail.com

Dr Philippe **Sabarros**
IRD, EU,France
Email: philippe.sabarros@ird.fr

Mr Reza **Shahifar**
Iran Fisheries Organisation, I.R. Iran
Email: r.shahifar@gmail.com

Dr Rishi **Sharma**
IOTC Secretariat, Seychelles
Email: rishi.sharma@iotc.org

Mr Martin **Stelfox**
Olive Ridley Project, Maldives
Email: oliveridleyproject@yahoo.com

Dr Shuhei **Uematsu**
WWF Japan
Email: uematsu@wwf.or.jp

Dr Yuji **Uozumi**
National Research Institute of Far Sea Fisheries, Japan
Email: uozumi@affrc.go.jp

Dr Shen-Ping **Wang**
National Taiwan Ocean University, Keelung
Email: wsp@mail.ntou.edu.tw

Dr Ross **Wanless**
BirdLife International, South Africa
Email: ross.wanless@birdlife.org.za

Dr David **Wilson**
IOTC Secretariat, Seychelles
Email: david.wilson@iotc.org

Dr Anton **Wolfaardt**
Agreement on the Conservation of Albatrosses and Petrels (ACAP), South Africa
Email: acwolfaardt@gmail.com

Mr Atsuya **Yamamoto**
Tokyo University of Agriculture, Japan
Email: a3yamamo@bioindustry.nodai.ac.jp

Mr Kotaro **Yokawa**
National Research Institute of Far Sea Fisheries, Japan
Email: yokowa@affrc.go.jp

APPENDIX II
AGENDA FOR THE 10TH WORKING PARTY ON ECOSYSTEMS AND BYCATCH

Date: 27–31 October 2014
Location: Queen's forum, Queen's Tower B 7th floor
Yokohama, Kanagawa, Japan
Tokyo, Japan
Time: 09:00 – 17:00 daily
Chair: Dr. Rui Coelho; **Vice-Chair**: Dr. Evgeny Romanov

1. **OPENING OF THE MEETING** (Chair)
2. **ADOPTION OF THE AGENDA AND ARRANGEMENTS FOR THE SESSION** (Chair)
3. **OUTCOMES OF THE 16th SESSION OF THE SCIENTIFIC COMMITTEE** (IOTC Secretariat)
4. **OUTCOMES OF SESSIONS OF THE COMMISSION**
   - 4.1. Outcomes of the 18th Session of the Commission (IOTC Secretariat);
   - 4.2. Review of Conservation and Management Measures relevant to Ecosystems and Bycatch (IOTC Secretariat).
5. **PROGRESS ON THE RECOMMENDATIONS OF WPEB09** (Chair and IOTC Secretariat)
6. **REVIEW OF DATA AVAILABLE ON ECOSYSTEMS AND BYCATCH**
   - 6.1. Review of the statistical data available for ecosystems and bycatch species (IOTC Secretariat);
   - 6.2. Regional Observer Scheme – Update (IOTC Secretariat).
7. **REVIEW OF NATIONAL BYCATCH ISSUES IN IOTC MANAGED FISHERIES AND NATIONAL PLANS OF ACTION** (sharks; seabirds; marine turtles) (CPCs and IOTC Secretariat)
   - 7.1. Assessing the need for an NPOA (IOTC Secretariat);
   - 7.2. Updated status of development and implementation of National Plans of Action for seabirds and sharks, and the implementation of the FAO guidelines to reduce marine turtle mortality in fishing operations (CPCs).
8. **NEW INFORMATION ON BIOLOGY, ECOLOGY, FISHERIES AND ENVIRONMENTAL DATA RELATING TO ECOSYSTEMS AND BYCATCH SPECIES**
   - 8.1. Review new information on environment and ecosystem interactions and modelling, including climate change issues affecting pelagic ecosystems in the IOTC area of responsibility.
9. **GILLNET FISHERIES: PROBLEMS AND NEEDS** (recommendations from the SC / decisions of the Commission)
   - 9.1. Regional review of the data available for gillnet fleets operating in the Indian Ocean.
   - 9.2. Training for CPCs having gillnet fleets on species identification, bycatch mitigation and data collection methods and also to identify other potential sources of assistance – Development of plans of action.
10. **SHARKS AND RAYS**
    - 10.1. Review new information on the biology, stock structure, bycatch mitigation measures, fisheries and associated environmental data (all)
    - 10.2. Historical data series for sharks and rays, in particular for blue shark and oceanic whitetip shark;
    - 10.3. Indian Ocean Shark multi-Year Program (IO-ShYP)
      - Presentation of the IO-ShYP plan (IO-ShYP01 workshop 14-16 May 2014, Olhão Portugal);
      - Discussion on further development of IO-ShYP plan;
      - Adoption of IO-ShYP plan.
    - 10.4. Data for input into stock assessments (indicators), in particular for blue shark and oceanic whitetip shark (all);
      - Catch and effort
      - Catch at size

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

10.5. Development of technical advice on the status of the shark stocks (all);

10.6. Update of shark species Executive Summaries for the consideration of the Scientific Committee (all).

11. OTHER BYCATCH AND BYPRODUCT SPECIES INTERACTIONS

11.1. Review new information on other bycatch and byproduct, in terms of biology, ecology, fisheries interactions and bycatch mitigation measures (all).

11.2. Marine turtles
- Review new information on marine turtle biology, ecology, fisheries interactions and bycatch mitigation measures (all);
- Development of technical advice on the status of marine turtle species (all).

11.3. Seabirds
- Review new information on seabird biology, ecology, fisheries interactions and bycatch mitigation measures (all);
- Development of technical advice on the status of seabird species (all).

11.4. Marine mammals
- Review new information on marine mammal biology, ecology, fisheries interactions and bycatch mitigation measures (all);

11.5. Marine mammal identification cards (all).

12. RESEARCH RECOMMENDATIONS AND PRIORITIES

12.1. Revision of the WPEB Program of Work 2015–2019 (Chair)

13. OTHER BUSINESS

13.1. Development of priorities for an Invited Expert/s at the next Working Party on Ecosystems and Bycatch meeting (Chair);

13.2. Date and place of the 11th Session of the Working Party on Ecosystems and Bycatch (Chair and IOTC Secretariat);

13.3. Review of the draft, and adoption of the Report of the 10th Session of the Working Party on Ecosystems and Bycatch (Chair).

APPENDIX III
LIST OF DOCUMENTS

Document	Title	Availability
IOTC–2014–WPEB10–01a	Draft: Agenda of the 10th Working Party on Ecosystems and Bycatch	✓(23 July 2014)
IOTC–2014–WPEB10–01b	Draft: Annotated agenda of the 10th Working Party on Ecosystems and Bycatch	✓(13 October 2014) ✓(26 October 2014)
IOTC–2014–WPEB10–02	Draft: List of documents of the 10th Working Party on Ecosystems and Bycatch	✓(13 October 2014) ✓(31 October 2014)
IOTC–2014–WPEB10–03	Outcomes of the 16th Session of the Scientific Committee (IOTC Secretariat)	✓(12 September 2014)
IOTC–2014–WPEB10–04	Outcomes of the 18th Session of the Commission (IOTC Secretariat)	✓(12 September 2014)
IOTC–2014–WPEB10–05	Review of Conservation and Management Measures relevant to ecosystems and bycatch (IOTC Secretariat)	✓(12 September 2014)
IOTC–2014–WPEB10–06	Progress made on the recommendations of WPEB09 (IOTC Secretariat)	✓(30 September 2014)
IOTC–2014–WPEB10–07 Rev_1	Review of the statistical data and fishery trends for bycatch species (IOTC Secretariat)	✓(12 October 2014) ✓(24 October 2014)
IOTC–2014–WPEB10–08 Rev_1	Update on the implementation of the IOTC Regional Observer Scheme (IOTC Secretariat)	✓(12 October 2014) ✓(23 October 2014)
IOTC–2014–WPEB10–09	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)	✓(30 September 2014)
IOTC–2014–WPEB10–10	Revision of the WPEB Program of Work (2015–2019) (IOTC Secretariat)	✓(30 September 2014)
Sharks		
IOTC–2014–WPEB10–11	DRAFT: Indian Ocean shark multi-year research program (IO-ShYP) (IO-SHYP Small Working Group)	✓(13 October 2014)
IOTC–2014–WPEB10–12	Issues for t-RFMOs in relation to the listing of shark and ray species by the CITES with particular reference to the Indian Ocean Tuna Commission (Clarke S & IOTC Secretariat)	✓(12 October 2014)
IOTC–2014–WPEB10–13 Rev_1	Species composition, CPUE and length frequency of oceanic sharks based on observer data from the Indonesian longline fishery in the Indian Ocean (Novianto D, Rochman F & Nugraha B)	✓(13 October 2014) ✓(22 October 2014)
IOTC–2014–WPEB10–14 Rev_1	Estimation Iranian fishing vessels bycatch in IOTC are of competence in 2013 (Shahifar R, Khorshidi S & Shabestari BJ)	✓(15 October 2014) ✓(21 October 2014)
IOTC–2014–WPEB10–15	Characterisation of shark bycatch from tuna longliners operating in the UK(OT) between 2000 and 2010 from observer and vessel logbook data (Moir Clark J)	✓(17 October 2014)
IOTC–2014–WPEB10–16	Status of the shark fishery ban in the Maldives and the Implementation of the National Plan of Action on Sharks (Ali K)	✓(13 October 2014)
IOTC–2014–WPEB10–17 Rev_1	Diversity and abundance of pelagic shark bycatch in the tuna fishery of the Indian seas (Sethi B & Mathew A)	✓(13 October 2014) ✓(29 October 2014)
IOTC–2014–WPEB10–18 Rev_2	Preliminary results of the LL-SHARKs project: a comparison of wire versus monofilament traces in the Portuguese pelagic swordfish fishery in the Southwest Indian Ocean (Santos MN, Coelho R, Lino PG)	✓(12 October 2014) ✓(26 October 2014) ✓(28 October 2014)
IOTC–2014–WPEB10–19	Low value bycatch from tuna and trawl operations along the southern peninsular India (Pillai SL, Dineshbabu AP, Kizhakudan SJ, Thomas S & Maheswarudu)	✓(24 October 2014)
IOTC–2014–WPEB10–20	Withdrawn	Withdrawn
IOTC–2014–WPEB10–21	Observation on reproduction biology of blue shark (*Prionace glauca*) in the Indian Ocean (Zhu J & Dai X)	✓(15 October 2014)
IOTC–2014–WPEB10–22	Modelling growth of blue shark (*Prionace glauca*) and silky shark (*Carcharhinus falciformis*) in the southwest Indian Ocean assessed by back-calculated length from vertebrae (Rabehagasoa N, Vigliola L, Lorrain A, Sabarros PS, Romanov E & Bach P)	✓(12 October 2014)
IOTC–2014–WPEB10–23	Characterisation of blue shark (*Prionace glauca*) hotspots in the South-West Indian Ocean (Selles J, Sabarros PS, Romanov E, Dagorne D, Le Foulgoc L & Bach P)	✓(14 October 2014)

Document	Title	Availability
IOTC–2014–WPEB10–24	Blue shark catches by the Portuguese pelagic longline fleet between 1998-2013 in the Indian Ocean: catch, effort and standardized CPUE (Coelho R, Santos MN & Lino PG)	✓(12 October 2014)
IOTC–2014–WPEB10–25 Rev_1	Standardised catch rates of blue sharks caught by the Taiwanese longline fishery in the Indian Ocean (Tsai W-P & Liu K-M)	✓(12 October 2014) ✓(17 October 2014)
IOTC–2014–WPEB10–26	Standardised CPUE of blue shark caught by Japanese longliners (Yokawa K & Kanaiwa M)	✓(26 October 2014)
Marine Turtles		
IOTC–2014–WPEB10–27	Impact of large pelagic fisheries on the survival of sea turtles in Sri Lanka (Maldeniya R & Danushka P)	✓(16 October 2014)
IOTC–2014–WPEB10–28	High mortality of Olive Ridley Turtles (*Lepidochelys olivacea*) in Ghost nets in the central Indian Ocean (Stelfox MR, Hudgins JA, Ali K & Anderson RC)	✓(13 October 2014)
Seabirds		
IOTC–2014–WPEB10–29	Preliminary identification of minimum elements to review the effectiveness of seabird bycatch mitigation regulations in tuna RFMOs (Small C, Wolfaardt A, Tuck G, Debski I, Papworth W, & Kim MA)	✓(11 October 2014)
IOTC–2014–WPEB10–30 Rev_1	Seabirds in the seas around Sri Lanka: their interaction in pelagic fisheries (Maldeniya R, Ratnasuriya MIG, Jayasekara JHA & Danushka P)	✓(10 October 2014) ✓(28 October 2014)
Marine Mammals and Depredation		
IOTC–2014–WPEB10–31	Cetaceans and Tuna Fisheries in the Western and Central Indian Ocean (Anderson RC)	✓(26 September 2014)
IOTC–2014–WPEB10–32	A concept note on the need to develop an IOTC identification guide for marine mammals (Romanov EV, Anderson C, Bach P & Moazzam M)	✓(12 October 2014)
Ecosystem approaches		
IOTC–2014–WPEB10–33	Preliminary review of ICCAT, IOTC and IATTC progress in applying an ecosystem approach to fisheries management (Juan-Jordá MJ, Arrizabalaga H, Dulvy NK, Cooper AB & Murua H)	✓(25 October 2014)
IOTC–2014–WPEB10–34	Applications of the SEAPODYM model to swordfish in the Pacific and Indian Ocean (Dragon AC, Lehodey P & Senina I)	✓(10 October 2014)
Information papers		
IOTC–2014–WPEB10–INF01	IOTC SC – Guidelines for the presentation of stock assessment models	✓(11 September 2014)
IOTC–2014–WPEB10–INF02	National Action Plan for marine turtles in the French territories of the Indian Ocean - Regional component (Phillipe J-S, Ciccione S, Bourjea J, Ballorain K, Marinesque S & Glenard Z)	✓(6 October 2014)
IOTC–2014–WPEB10–INF03	WCPFC (2014): A Proposal for a Research Plan to Determine the Status of the Key Shark Species (Clarke SC and Harley SJ)	✓(7 October 2014)
IOTC–2014–WPEB10–INF04	WCPFC (2013): Updated stock assessment of silky sharks in the western and central Pacific Ocean (Rice J & Harley S)	✓(7 October 2014)
IOTC–2014–WPEB10–INF05	WCPFC (2012): Stock assessment of oceanic whitetip sharks in the western and central Pacific Ocean (Rice J & Harley S)	✓(7 October 2014)
IOTC–2014–WPEB10–INF06	WCPFC (2014): Stock assessment of Blue Shark in the North Pacific Ocean using Stock Synthesis (Rice J, Harley S & Kai M)	✓(7 October 2014)
IOTC–2014–WPEB10–INF07	WCPFC (2011): An Indicator-based Analysis of Key Shark Species based on Data Held by SPC-OFP (Clarke S, Harley S, Hoyle S & Rice J)	✓(7 October 2014)
IOTC–2014–WPEB10–INF08	WCPFC (2014): Development of Limit Reference Points for Elasmobranchs (Clarke S & Hoyle S)	✓(7 October 2014)
IOTC–2014–WPEB10–INF09	WCPFC (2011) Estimation of Catch Rates for Key Shark Species in Tuna Fisheries of the Western and Central Pacific Ocean using Observer Data. WCPFC–SC7–2011 / EB–IP–02 (Lawson T)	✓(11 October 2014)
IOTC–2014–WPEB10–INF10	WCPFC (2012) Alternative catch time series for oceanic whitetip and silky sharks in the Western and Central Pacific Ocean. WCPFC-SC8-SA-IP-12 (Rice J)	✓(11 October 2014)

Document	Title	Availability
IOTC–2014–WPEB10–INF11	WCPFC (2009) An Alternative Estimate of Catches of Five Species of Sharks in the Western and Central Pacific Ocean based on Shark Fin Trade Data. Western and Central Pacific Fisheries Commission, Scientific Committee Paper SC5/EB-WP-02 (Clarke S)	✓(11 October 2014)
IOTC–2014–WPEB10–INF12	Population structure and biology of shortfin mako, *Isurus oxyrinchus*, in the south-west Indian Ocean (Groeneveld JC, Cliff G, Dudley SFJ, Foulis AJ, Santos J &Wintner SP)	✓(12 October 2014)
IOTC–2014–WPEB10–INF13	Mortality rate of silky sharks (*Carcharhinus falciformis*) caught in the tropical tuna purse seine fishery in the Indian Ocean (Poisson F, Filmalter JD, Vernet A-L & Dagorn L)	✓(12 October 2014)
IOTC–2014–WPEB10–INF14	Post-capture survival of whale sharks released from purse seine nets: preliminary results from tagging experiment (Escalle L, Chavance P, Amandé JM, Filmalter JD, Forget F, Gaertner D, Dagorn L & Mérigot B)	✓(12 October 2014)
IOTC–2014–WPEB10–INF15	Collaborative research: Development of a manual on elasmobranch handling and release best practices in tropical tuna purse-seine fisheries (Poisson F, Séret B, Vernet A-L, Goujon M, Dagorn L)	✓(12 October 2014)
IOTC–2014–WPEB10–INF16	Marine turtle interaction with purse-seine fishery in the Atlantic and Indian oceans: Lessons for management (Bourjea J, Clermont S, Delgado A, Murua H, Ruiz J, Ciccione S & Chavance P)	✓(12 October 2014)
IOTC–2014–WPEB10–INF17	BOBLME fishery summaries (Anon)	✓(12 October 2014)
IOTC–2014–WPEB10–INF18	Ghosts of the ocean (Anon)	✓(15 October 2014)
IOTC–2014–WPEB10–INF19	Preliminary study about the suitability of an electronic monitoring system to record scientific and other information from the tropical tuna purse seine fishery (Monteagudo JP, Legorburu G, Justel-Rubio A & Restrepo V)	✓(16 October 2014)
IOTC–2014–WPEB10–INF20	Sri Lanka national plan of action for the conservation and management of sharks (Anon)	✓(23 October 2014)
IOTC–2014–WPEB10–INF21	CMS: Assessment of bycatch in gill net fisheries (Anon)	✓(27 October 2014)
IOTC–2014–WPEB10–INF22	Some biological aspects of shark in Indian Ocean at southern part of Java waters (Suman A & Chodrijah U)	✓(12 October 2014)
IOTC–2014–WPEB10–INF23	China's practice for shark bycatch mitigation in tuna fisheries (Huihui S)	✓(16 October 2014)
IOTC–2014–WPEB10–INF24	Mortality of marine megafauna induced by fisheries: Insights from the whale shark, the world's largest fish (Capietto, Escalle L, Chavance P, Dubroca L, Delgado de Molina A, Murua H, Floch L, Damiano A, Rowat D & Merigot B)	✓(28 October 2014)
IOTC–2014–WPEB10–INF25	An assessment of cetacean mortality in the tuna fisheries of Pakistan (Nawaz R & Moazzam M)	✓(28 October 2014)
IOTC–2014–WPEB10–INF26	Historical Catch Estimate Reconstruction for the Indian Ocean based on Shark Fin Trade Data (Clarke S)	✓(31 October 2014)
IOTC–2014–WPEB10–INF27	Tuna-ABNJ Project output 1.1.3 DRAFT (WWF Pakistan)	✓(31 October 2014)
Reports from other meetings		
IOTC-2014-IOShYP01-R[E]	Report of the Indian Ocean Shark Year Program workshop (IO-ShYP01)	✓(12 September 2014)
Data sets		
IOTC–2014–WPEB10–DATA01	Bycatch datasets available	✓(16 October 2014)
IOTC–2014–WPEB10–DATA02	Catch and Effort - Longline	✓(14 October 2014)
IOTC–2014–WPEB10–DATA03	Catch and Effort - vessels using pole and lines or purse seines	✓(14 October 2014)
IOTC–2014–WPEB10–DATA04	Catch and Effort - Coastal	✓(14 October 2014)
IOTC–2014–WPEB10–DATA05	Catch and Effort - all vessels	✓(14 October 2014)
IOTC–2014–WPEB10–DATA06	Catch and Effort - reference	✓(14 October 2014)
IOTC–2014–WPEB10–DATA07	Size Frequency - Sharks	✓(14 October 2014)
IOTC–2014–WPEB10–DATA08 Rev_1	Size frequency - reference	✓(15 October 2014)
IOTC–2014–WPEB10–DATA09	Data Catalogue	✓(15 October 2014)
IOTC–2014–WPEB10–DATA10	Data Shark Equations	✓(17 October 2014)
IOTC–2014–WPEB10–DATA11	Shark datasets available	✓(14 October 2014)

APPENDIX IV
THE STANDING OF A RANGE OF INFORMATION RECEIVED BY THE IOTC SECRETARIAT FOR BYCATCH (INCLUDING BYPRODUCT) SPECIES

Extract from IOTC–2014–WPEB10–07 Rev_1

(Table, figure and appendix references in this Appendix, refer only to those contained in this appendix)

SUMMARY OF FISHERIES DATA AVAILABLE FOR SHARKS

Data available on the total catches of sharks in the Indian Ocean

The total shark nominal catch data are presented in Fig. 1 by CPC. Very few countries have reported catches of sharks for the early years, but the number of countries reporting increases over time. Total reported catches also increase over time with a particularly dramatic increase in reported catches in the 1990s, reaching a peak of approximately 120,000 t in 1999. Since then reported nominal catches have fluctuated and are currently around 100,000 t.

These figures should be reviewed with caution given the historically low reporting rates. In addition to the underestimates from lack of reporting, when the catches are reported they are thought to represent only the catches of those species that are retained onboard without taking in to account discards (nominal catches). In many cases the reported catches refer to dressed weights while no information is provided on the type of processing undertaken, creating more uncertainty in the estimates of catches in live weight equivalents. Nevertheless, reporting rates in recent years have improved substantially (Appendix 3 of *IOTC–2014–WPEB10–07 Rev_1*) following the adoption of new measures by the Commission on sharks and other bycatch, which call for IOTC CPCs to collect and report more detailed statistics on bycatch species to the IOTC.

Main reported gear types associated with shark bycatch for IOTC fisheries

Fig. 2 shows the distribution of catches by gear type. Gillnets report the highest nominal catches of sharks in 2013, making up nearly 40% of catches followed by the handline and longline fleets. Of gillnets, the majority comprise standard, unclassified gillnets, followed by gillnet, handline and troll line combinations and gillnet/longline combinations.

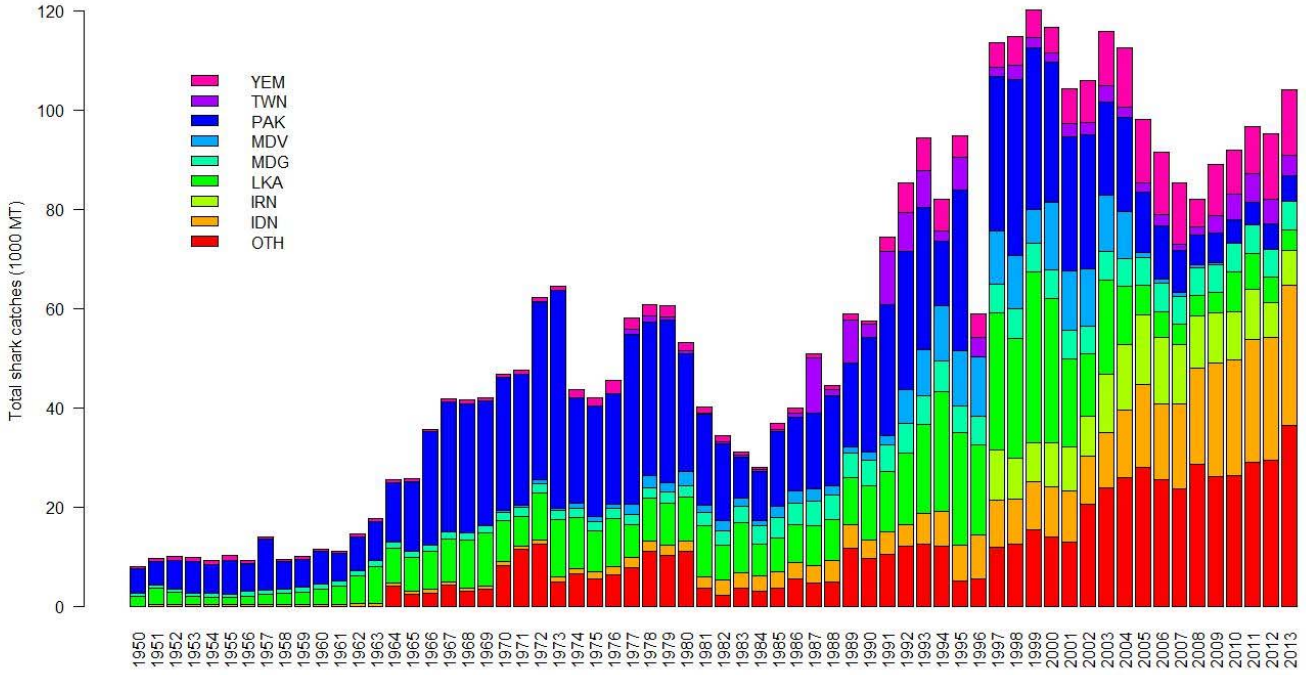


Fig. 1. Total reported nominal catches of sharks by CPC from 1950–2013

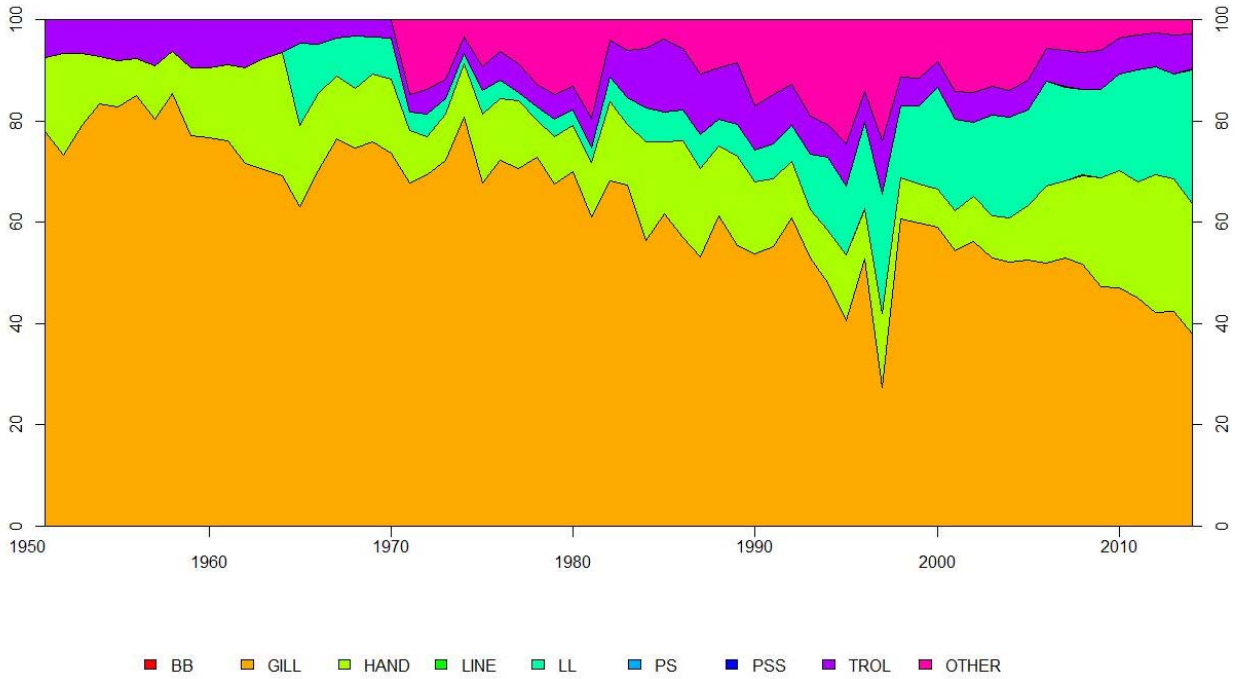


Fig. 2. Summary of shark catches reported by gear type (1950–2013). Bait boat/pole and line (BB), gillnet (GILL), Handline (HAND), Line (LINE), logline (LL), Purse seine (PS), small purse seines/ring nets (PSS), troll lines (TROLL) and all other gear types (OTHER).

Main species of sharks caught in IOTC fisheries

A list of all species of sharks that are known to occur in Indian Ocean fisheries directed at IOTC species or pelagic sharks is provided in Appendix 2 (of *IOTC–2014–WPEB10–07 Rev_1*). In addition to an increase in reporting of shark catches over time, the resolution of the data provided has been improving with an increased proportion of reported shark catches provided identified to species/genus (Fig. 3). Of the shark catches reported by species, the blue shark forms the greatest proportion, comprising >60% of total catches, with silky, thresher, hammerhead and makos forming a smaller percentage (Fig. 4).

The increase in reporting by species is apparent in the species-specific catch series (Fig. 5) with steadily increasing trends in reporting since the 1970s seen for blue, thresher, hammerhead and mako sharks. The reporting of catches of oceanic whitetips and rays has increased very rapidly in a much shorter time frame, while the reported catches of silky sharks peak just prior to 2000.

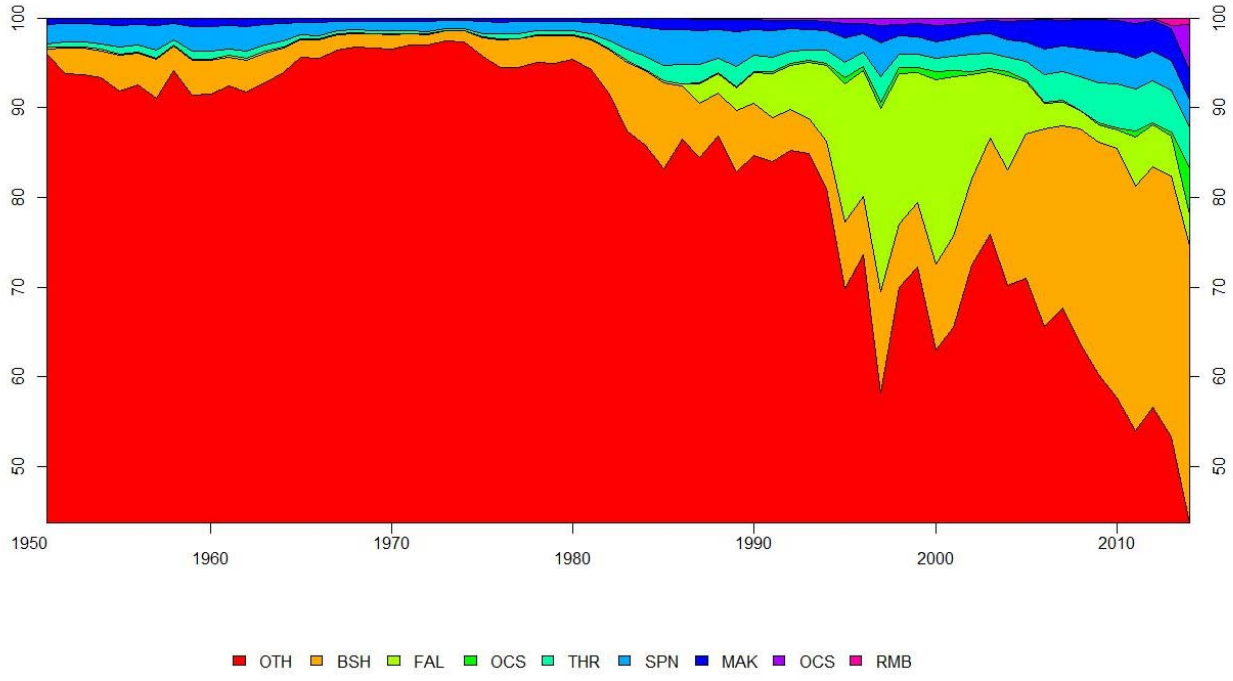


Fig. 3. Proportion of shark catches reported by species and as aggregate catch (OTH).

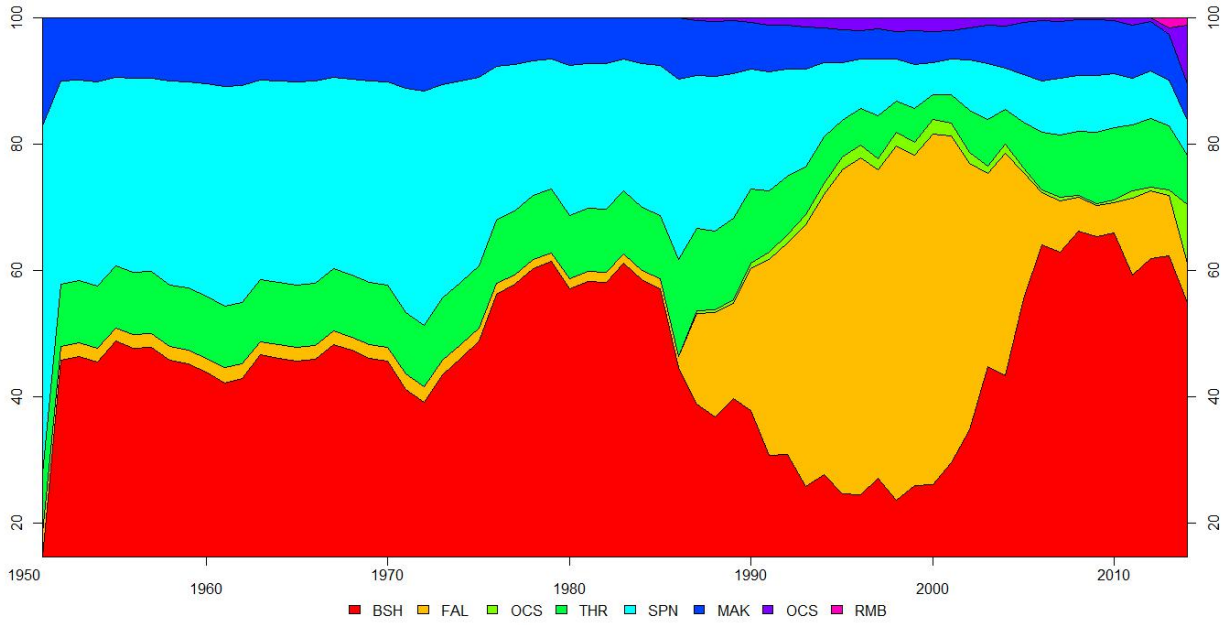


Fig.4. Proportion of reported shark catches by species

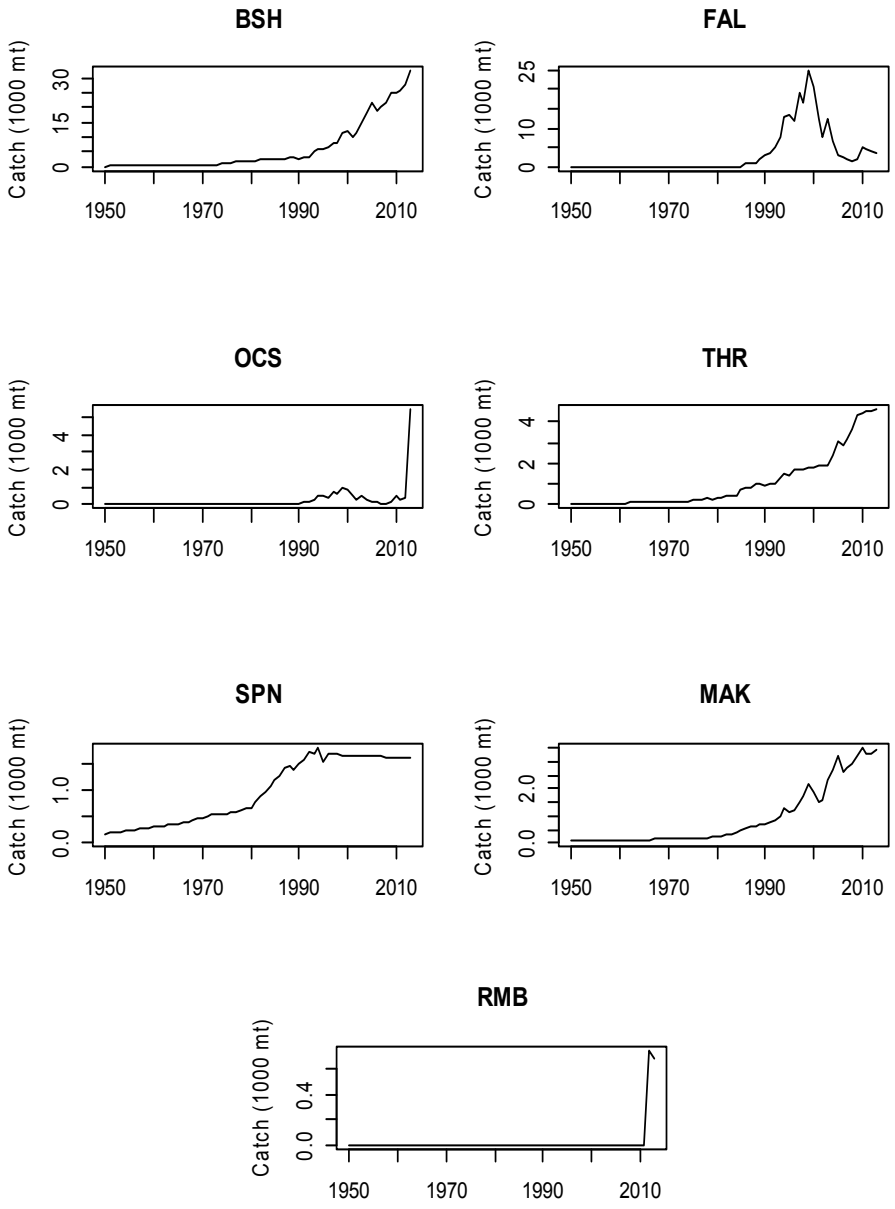


Fig. 5. Catches reported by species for all fleets (1950–2013)

There are some clear trends in species catches by gear types as indicated in (Table 1). Reported catches by longlines comprise predominantly blue sharks followed by mako sharks, while reported catches of handline gears are also dominated by blue sharks, followed by thresher sharks. Silky sharks dominate the reported catches of purse seiners and troll lines reported relatively high catches of hammerhead sharks. Reporting by species is very uncommon for gillnet fleets, where the majority of catches are reported in aggregate.

Table 1. Species-specific catches by gear type (2005–13)

	BB	GILL	HAND	LINE	LL	PS	PSS	TROL
OTH	100%	92%	14%	100%	22%	28%	100%	61%
BSH	0%	3%	59%	0%	56%	0%	0%	0%
FAL	0%	4%	0%	0%	7%	72%	0%	2%
THR	0%	0%	17%	0%	0%	0%	0%	4%
SPN	0%	0%	6%	0%	0%	0%	0%	26%
MAK	0%	0%	3%	0%	10%	0%	0%	8%
OCS	0%	0%	0%	0%	4%	0%	0%	0%

Reported catches and catch rates by fleet

Fleets reporting the highest nominal catches of sharks since 2000 are shown in Fig. 6. This highlights the relatively high catches of the Indonesia line fisheries (including troll lines, hook and line, hand line and coastal longlines) and the gillnet fisheries of Pakistan, I.R. Iran and Yemen.

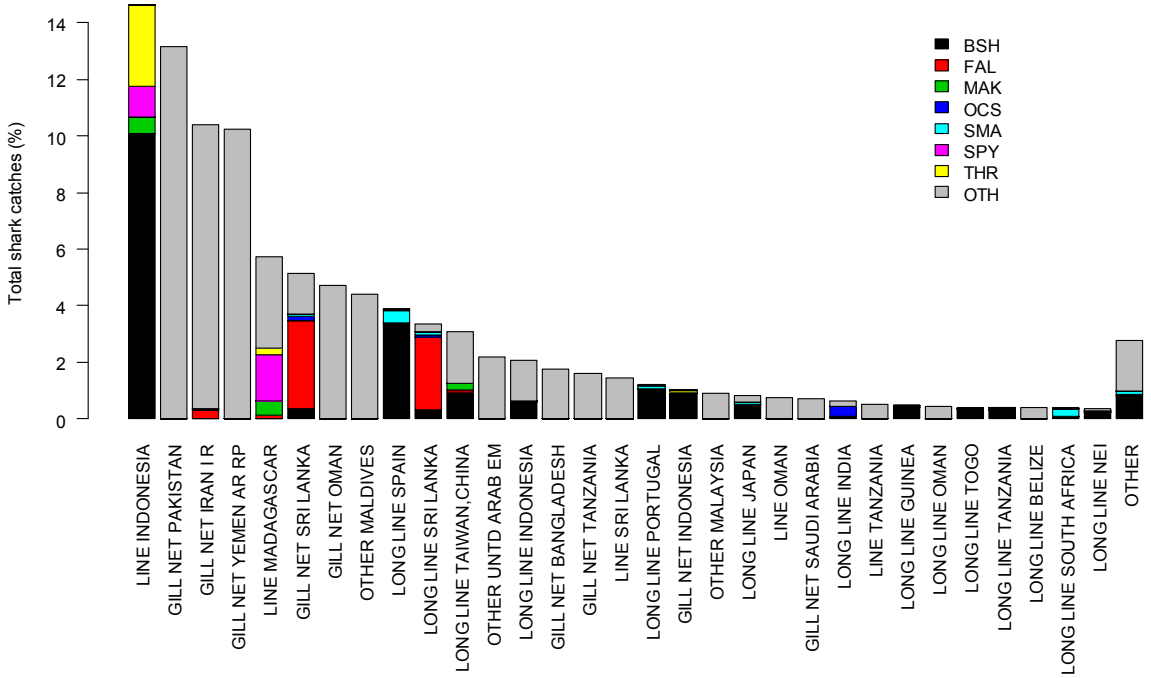


Fig. 6. Total shark catches reported by fleet and species from 2000–13

While industrial longliners and drifting gillnets harvest important amounts of pelagic sharks, industrial purse seiners, pole-and-lines and most coastal fisheries are unlikely to harvest important amounts of pelagic sharks.

- **Pole and line fisheries:** The shark catches reported for the pole and line fisheries of Maldives are very low and none are reported for India. The amounts of sharks caught by these fisheries, if any, are not thought significant.
- **Gillnet fisheries:** The species of sharks caught are thought to vary significantly depending on the area of operation of the gillnets:
    - Gillnets operated in areas having low concentrations of pelagic sharks: The gillnet fisheries of most coastal countries operate these gears in coastal waters. The abundance of pelagic sharks in these areas is thought low.
    - Gillnets operated in areas having high concentrations of pelagic sharks: Gillnets operated in Sri Lanka, Indonesia and Yemen (waters around Socotra), in spite of being set in coastal areas, are likely to catch significant amounts of pelagic sharks.

- **Gillnets operated on the high seas:** Vessels from Taiwan,China were using drifting gillnets (driftnets) from 1982 to 1992, when the use of this gear was banned worldwide. The catches of pelagic sharks were very high during that period. Driftnet vessels from Iran and Pakistan have been fishing on the high seas since, but with lower catch rates. This was initially in waters of the Arabian Sea but covering a larger area in recent years as they expanded their range to include the tropical waters of the western Indian Ocean and Mozambique Channel. The quantity of sharks caught by these fleets is thought to be relatively high, representing between 25–50% of the total combined catches of sharks and other species.
- **Gillnet/longline fishery of Sri Lanka:** Between 1,200 and 3,200 vessels (12 m average length) operating gillnets and longlines in combination have been harvesting important amounts of pelagic sharks since the mid-1980s. The longlines are believed to be responsible for most of the catches of sharks. Catches of sharks comprised ~45% of the total combined catch for all species in 1995 and declined to <2% in the late 2000s. Catches of sharks by vessel by year have also decreased markedly since the mid-1990s.
- **Fisheries using handlines:** The majority of fisheries using hand lines and trolling in the Indian Ocean operate these gears in coastal waters, so although the total proportion of sharks caught has been high historically, the amount of pelagic sharks caught are thought to be low. The proportion of other species of sharks might change depending on the area fished and time of the day.
- **Deep-freezing tuna longliners** and **fresh-tuna longliners**: Catches of sharks are thought to represent between 20–40% of the total combined catch for all species. However, the catches of sharks recorded in the IOTC database only make for a small proportion of the total catches of all species over longline fleets. The catches series for sharks are, therefore, thought to be very incomplete. However, levels of reporting have improved in recent years, following the implementation of catch monitoring schemes in different ports of landing of fresh-tuna longliners[2], and the recording of catches of main species of sharks in logbooks and observer programmes. The catches estimated, however, are unlikely to represent the total catches of sharks for this fishery due to the paucity of information on levels of discards of sharks, which are thought high in some areas and for some species.
- **Freezing (fresh) swordfish longliners**: Catches of sharks are thought to represent between 40–60% of the total combined catch for all species. The amount of sharks caught by longliners targeting swordfish in the Indian Ocean has been monotonically increasing since the mid-1990s. The catches of sharks recorded for these fleets are thought more realistic than those recorded for other longline fisheries. The high catches are thought to be due to:
    - Gear configuration and time fished: The vessels targeting swordfish use surface longlines and set the lines at dusk or during the night. Many pelagic sharks are thought to be abundant at these depths and most active during dusk or night hours.
    - Area fished: The fleets targeting swordfish have been deploying most of the fishing effort in the Southwest Indian Ocean, in the vicinity of South Africa, southern Madagascar, Reunion and Mauritius. High amounts of sharks are thought to occur in these areas.
    - Changes in the relative amounts of swordfish and sharks in the catches: Some of the vessels targeting swordfish are known to alternate swordfish and sharks, in particular blue shark, as main target, depending on the season, or when catch rates of swordfish are poor.
- **Industrial tuna purse seiners:** Catches of sharks are thought to represent less than 0.5% of the total combined catch for all species (10% of total discards). In 2012, the European Union reported preliminary estimates of catches of sharks for EU,France purse seiners for the period 2003–10, as derived from samples collected by observers during 2003–07. The Secretariat has started receiving information on the Iranian purse sine fleet but has not received data from other purse seine fleets concerning bycatch levels of sharks (Seychelles or Thailand).
- **Trolling fisheries:** The majority of fisheries trolling in the Indian Ocean operate in coastal waters so the amounts of pelagic sharks caught are thought to be low. The amount that other species of sharks make out of the catches of tuna and tuna-like species might change depending on the area fished and time of the day.

Spatial information on sharks catches

Fig. 7 and Fig. 8 present the spatial catches of sharks reported in numbers for deep-freezing longliners flagged in Taiwan,China over time. The reporting by species has improved over time, indicating that the majority of the catches are Blue sharks with an increase in catches of silky sharks in the northern Indian Ocean apparent in recent years. The presence of low numbers of dusky sharks in the reported catches are somewhat surprising given its coastal distribution but may reflect species identification errors.

[2] The IOTC-OFCF (Overseas Fisheries Cooperation Foundation of Japan) Project implemented programmes in cooperation with local institutions in Thailand and Indonesia.

Fig. 9 shows the shark catches reported by the Japanese longline fleet from 2009–13. These show a clear dominance of Blue sharks, followed by relatively minor catches of shortfin mako and porbeagle sharks. However, it is important to note that time-area catches of sharks by species are only available from 2007 for Taiwan,China or 2009 for Japan, while these fleets have been operating in the Indian Ocean since the 1950s. Unlike Taiwan,China, for which catches of sharks are available in aggregated form up to the late 1970s, Japan has not provided catches of sharks other than those reported for 2009 and following years. In addition, the catches available are considered to be incomplete, as they are likely to not include discards.

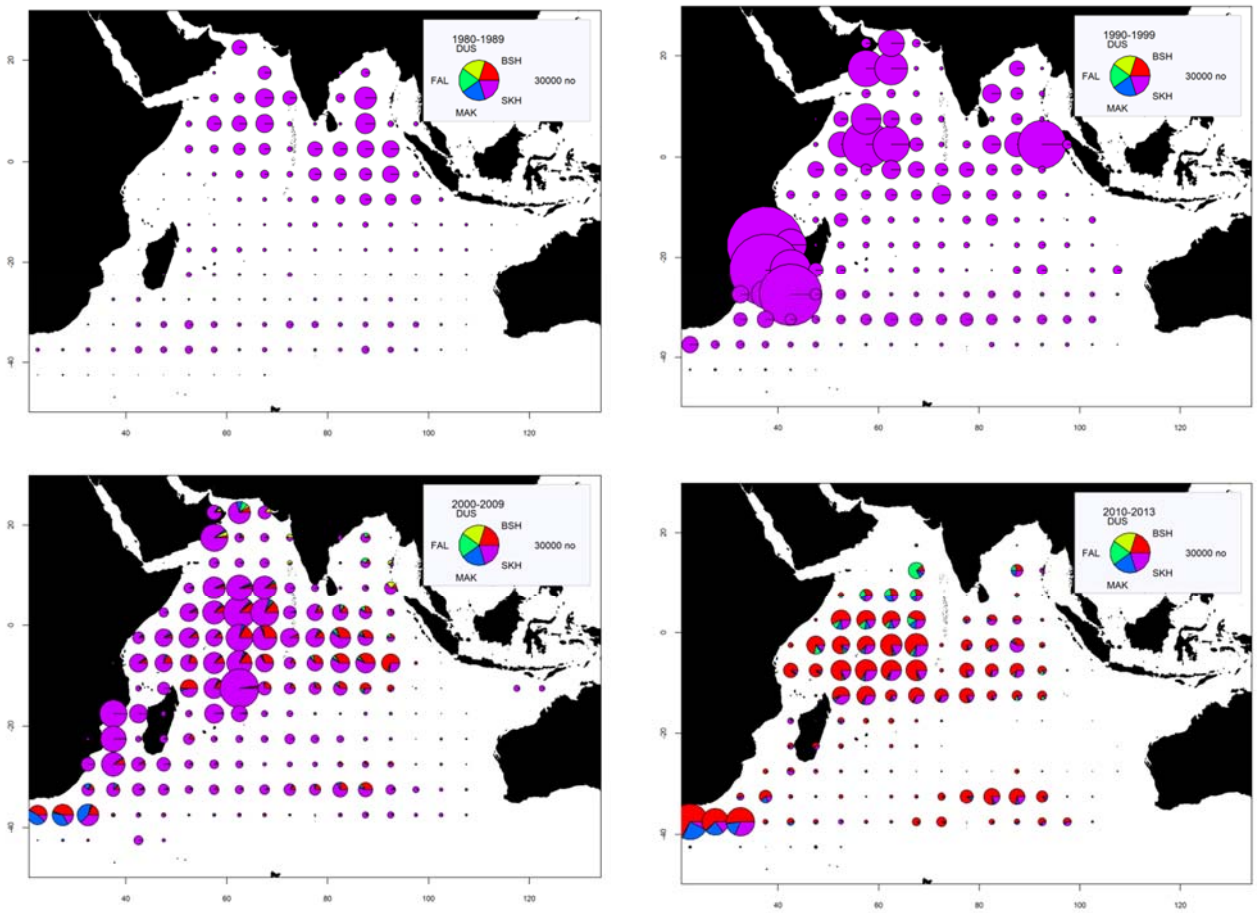


Fig. 7. Time-area catches (total numbers) of sharks for deep-freezing longliners flagged in Taiwan,China, by decade (also including 2010–13) and species. Unidentified sharks catches are shown in purple.

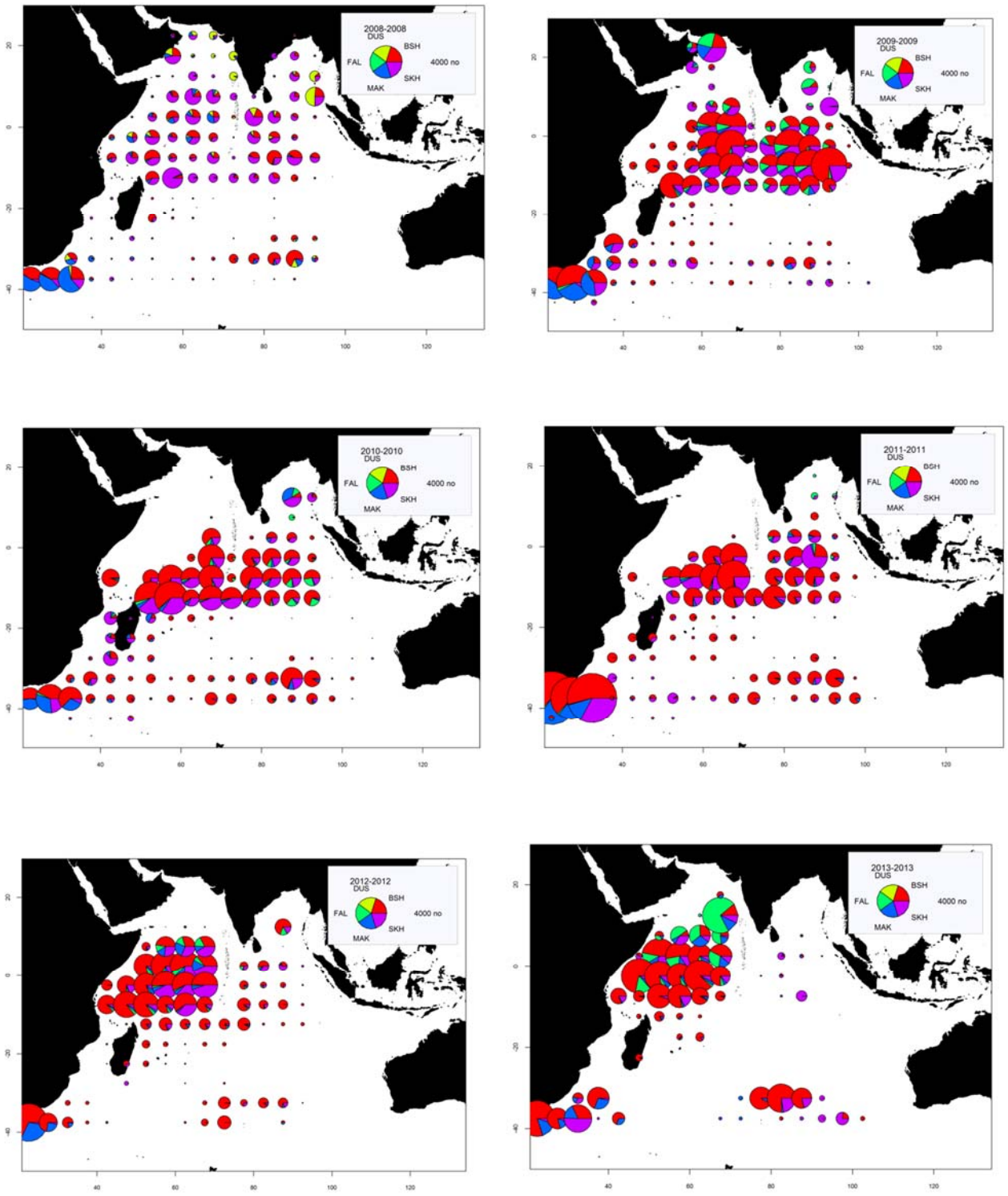


Fig. 8. Time-area catches (total numbers) of sharks for deep-freezing longliners flagged in Taiwan,China, by year (2008–13) and species. Unidentified sharks catches are shown in purple.

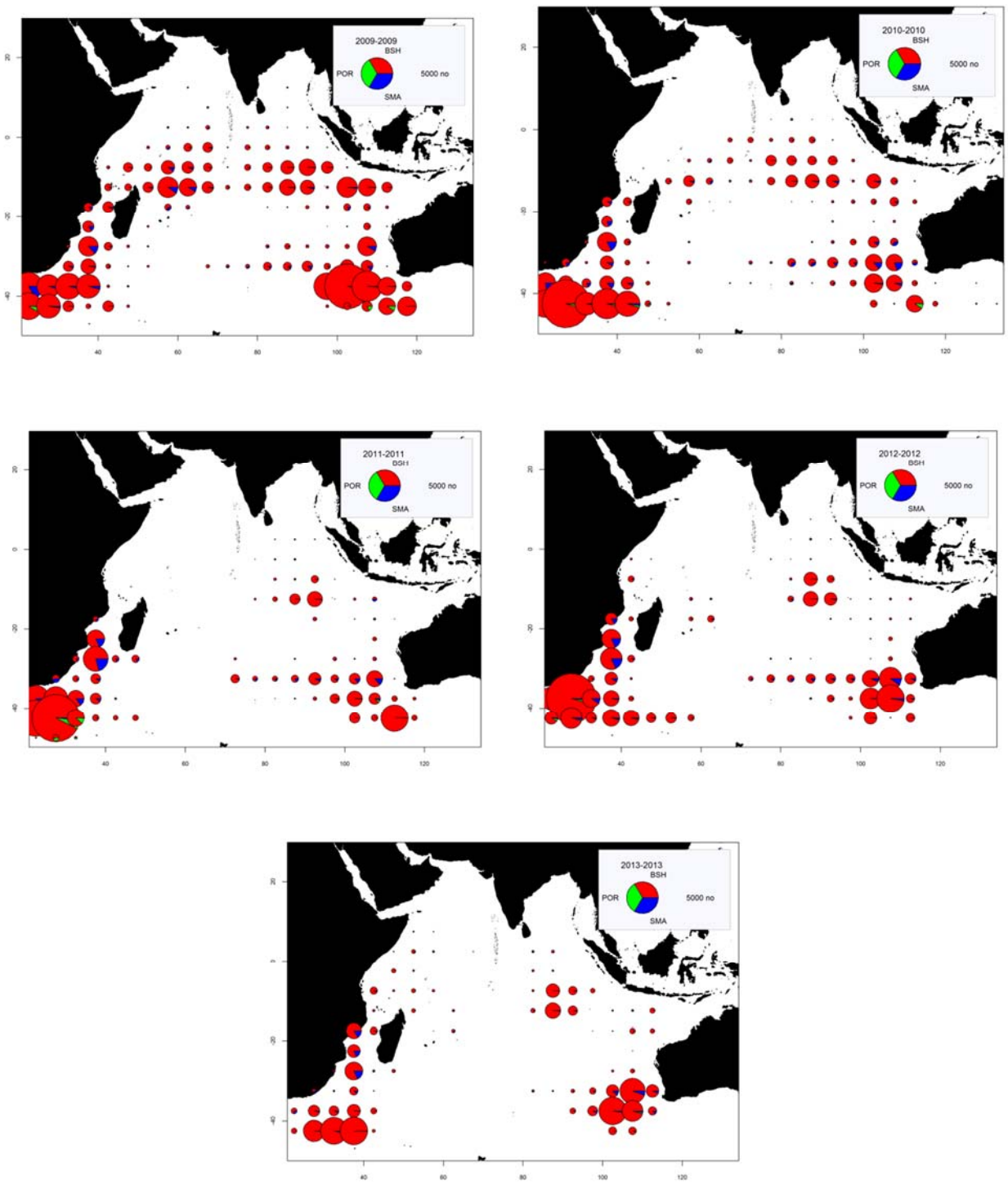


Fig. 9. Time-area catches (total numbers) of sharks for deep-freezing longliners flagged in Japan by year (2009–13) and species.

Length frequency data

Due to the different types of length measurement reported, a number of conversions were performed to standardise the length-frequency information. Given the increasing amount of data reported and the need for standardisation, a set of species-specific conversion factors and proxies that have been agreed by the Working Party could help improve the estimates.

Data are reported aggregated using different length classes ranging from 1 cm to 10 cm intervals. In addition to this, there appears to be rounding taking place when the smaller size intervals are used, creating abnormal peaks in the distributions. The graphs shown below have been aggregated to 5cm intervals in order to smooth this effect.

Error! Reference source not found. shows the aggregated fork length frequency distribution for the longline fleets eporting size information on blue sharks for all areas between 2005 and 2013. The data reported for vessels flagged for China, Japan, Rep. of Korea and EU,Portugal include data reported for longline fleets with observers onboard. The results highlight the difference in the selectivity of fleets for different sized specimens, with the EU,Portugal fleet selecting larger blue sharks than the other fleets.

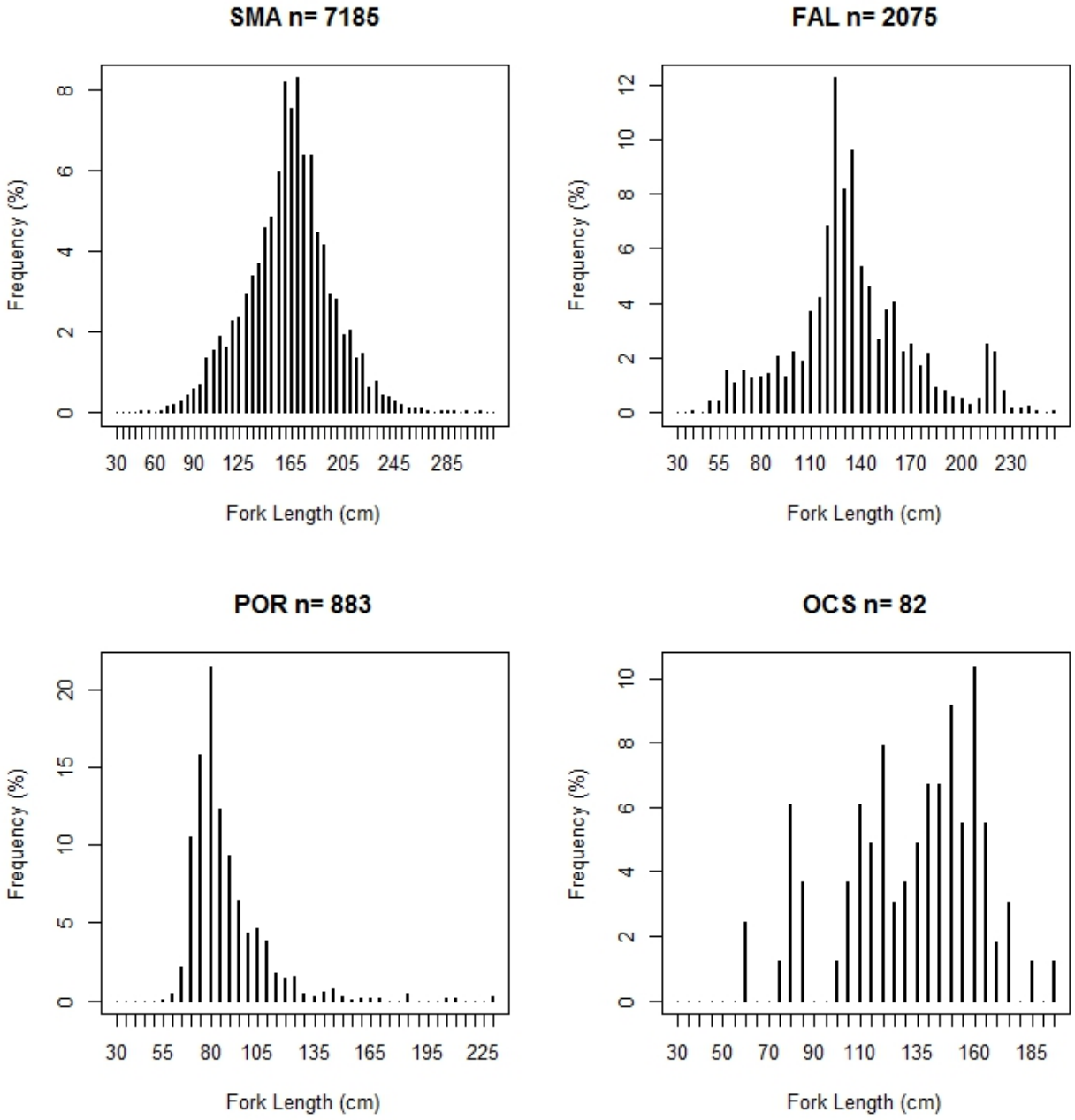


Fig. 10 Fig. 11 shows the length distributions for the other shark species with reported size frequency data aggregated across all fleets and all years.

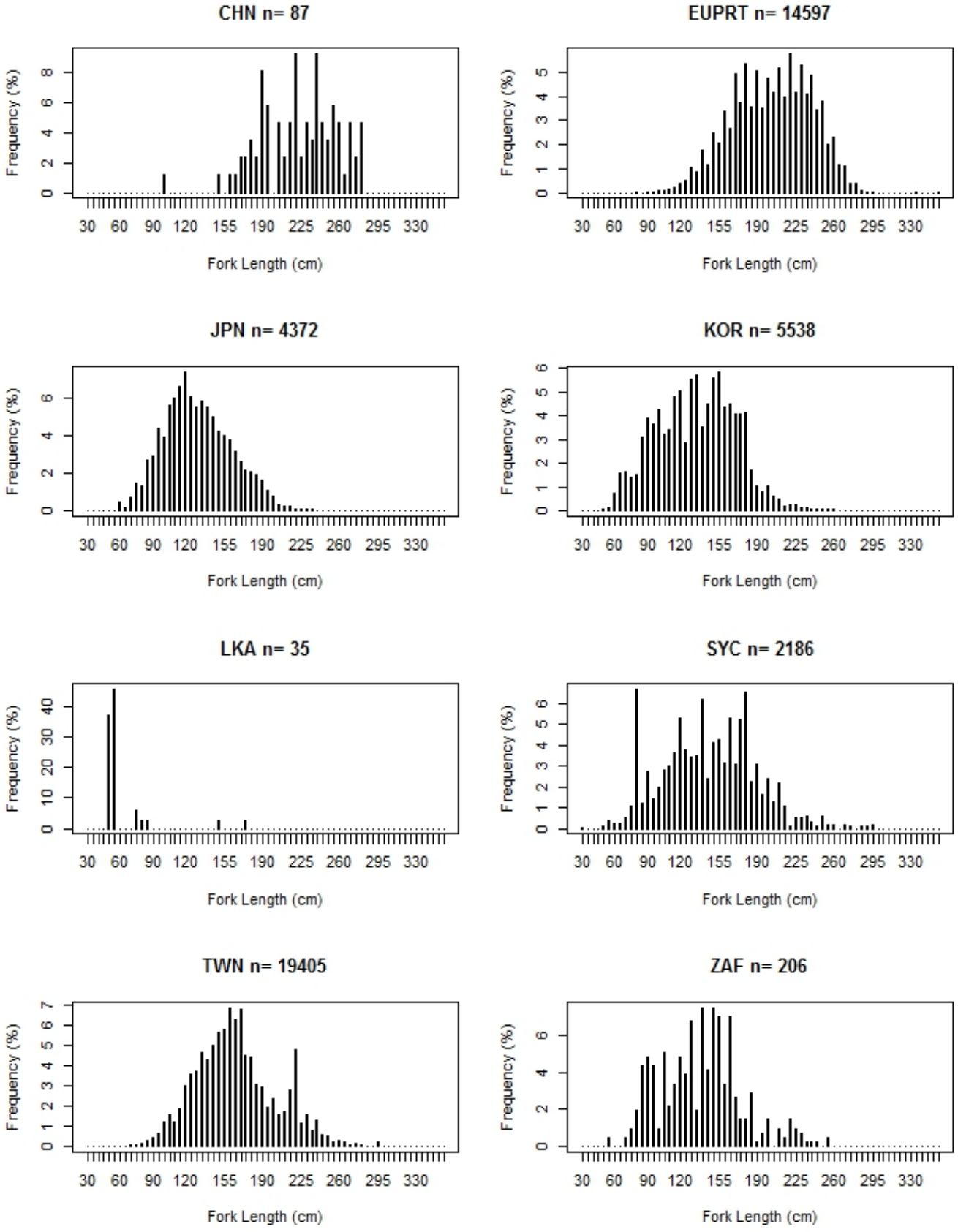


Fig. 11. Fork length frequency distributions (%) of blue shark derived from the samples reported for the longline fleets of China (LL), EU(Portugal) (ELL), Japan (LL), Korea (LL), Sri Lanka (G/L), Seychelles (LL) Portugal (ELL), Taiwan,China (FLL/LL) and South Africa (ELL) between 2005 and 2013 in 5 cm length classes.

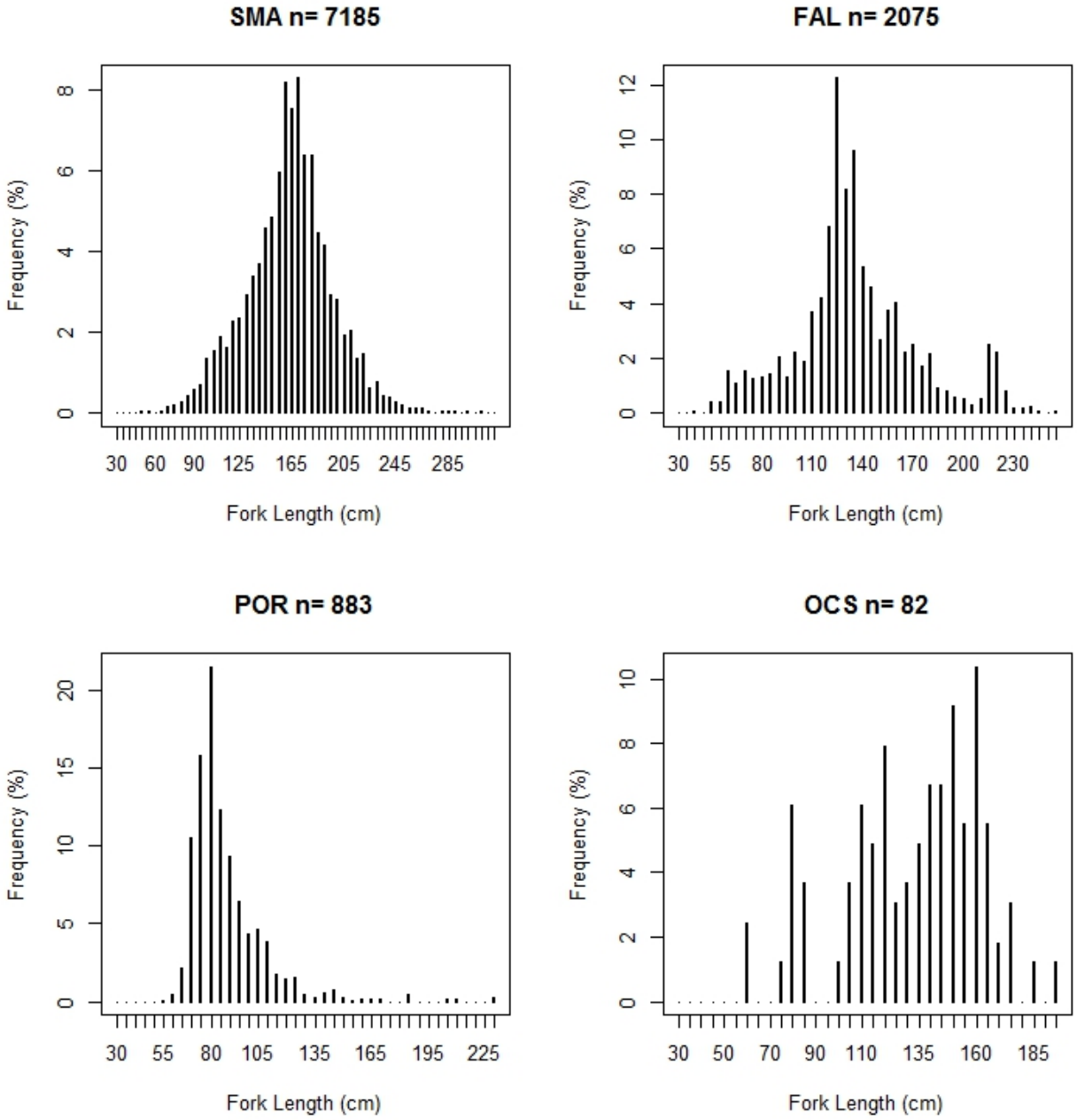


Fig. 10. Fork length frequency distributions (%) for silky shark, porbeagle shark, shortfin mako shark and oceanic whitetip shark between 2005 and 2013.

SUMMARY OF FISHERIES DATA AVILABLE FOR SEABIRDS

Main species and fisheries concerned

The main species of seabirds likely to be caught as bycatch in IOTC fisheries are presented in Table 2[3].

Table 2. Main species of seabirds likely to be incidentally caught on longline operations

Common Name	Status*	Scientific Name
Amsterdam Albatross	Critically Endangered	*Diomedea amsterdamensis*
Antipodean Albatross	Vulnerable	*Diomedea antipodensis*
Black-browed Albatross	Endangered	*Thalassarche melanophrys*
Buller's Albatross	Near Threaten	*Thalassarche bulleri*
Campbell Albatross	Vulnerable	*Thalassarche impavida*
Chatham Albatross	Vulnerable	*Thalassarche eremite*
Grey-headed Albatross	Vulnerable	*Thalassarche chrysostoma*
Light-mantled Albatross	Near Threatened	*Phoebetria palpebrata*
Northern Royal Albatross	Endangered	*Diomedea sanfordi*
Southern Royal Albatross	Vulnerable	*Diomedea epomophora*
Salvin's Albatross	Vulnerable	*Thalassarche salvini*
Shy Albatross	Near Threatened	*Thalassarche cauta*
White-capped Albatross	Near Threatened	*Thalassarche steadi*
Sooty Albatross	Endangered	*Phoebetria fusca*
Tristan Albatross	Critically Endangered	*Diomedea dabbenena*
Wandering Albatross	Vulnerable	*Diomedea exulans*
Atlantic Yellow-nosed Albatross	Endangered	*Thalassarche chlororhynchos*
Indian Yellow-nosed Albatross	Endangered	*Thalassarche carteri*
Northern Giant Petrel	Least Concern	*Macronectes halli*
Southern Giant Petrel	Least Concern	*Macronectes giganteus*
White-chinned Petrel	Vulnerable	*Procellaria aequinoctialis*
Westland Petrel	Vulnerable	*Procellaria westlandica*
Short-tailed Shearwater	Least Concern	*Puffinus tenuirostris*
Sooty Shearwater	Near Threatened	*Puffinus griseus*

*Source IUCN 2006, BirdLife International 2004b.

The interaction between seabirds and IOTC fisheries is likely to be significant only in Southern waters (below 25 degrees South), an area where most of the effort is exerted by longliners. Incidental catches are, for this reason, likely to be of importance only for longline fleets having vessels operating in these areas (Taiwan,China, Japan, Rep. of Korea, the European Union, Indonesia, and Malaysia).

[3] As in IOTC–2007–WPEB–22, Appendix 2, page 24. Paper submitted on behalf of the Agreement for the Conservation of Albatrosses and Petrels (ACAP)

Status of data on seabird bycatch

The parties having provided data on interactions of IOTC fisheries with species of seabirds are recorded in **Error! Reference source not found.**. These are Australia, Japan, EU-France, EU-Portugal, France (OT), Republic of Korea, South Africa, China (nil capture), and Taiwan,China. Some information on the incidental catches of seabirds by some longline fleets operating in the Southern Indian Ocean is also held by the Secretariat. The data available were provided by the CCSBT and are to be completed with more recent information in the future.

The paucity of the information available makes it difficult to estimate total levels of seabird bycatch by vessels in the IOTC area of competence.

SUMMARY OF FISHERIES DATA AVILABLE FOR MARINE TURTLES

Main species and fisheries concerned

The main species of marine turtles likely to be caught as bycatch by IOTC fisheries are listed in Table 3.

Table 3. Main species of Indian Ocean marine turtles[4].

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

The interaction between marine turtles and IOTC fisheries is likely to be significant only in tropical areas, involving both industrial and artisanal fisheries, notably for:

- Industrial purse seine fisheries, in particular on sets using fish aggregating devices (European Union, Seychelles, Iran, Thailand, Japan)
- Gillnet fisheries operating in coastal waters or on the high seas (Sri Lanka, Iran, Pakistan, Indonesia)
- Industrial longline fisheries operating in tropical areas (China, Taiwan,China, Japan, Indonesia, Seychelles, India, Oman)

Both loggerhead and leatherback turtles are caught incidentally on IOTC fisheries in higher numbers than the other species.

Status of data on marine turtle bycatch

The parties having provided data on interactions of IOTC fisheries with species of marine turtles are recorded in Table 3. These are, by type of fishery:

- Surface: EU,France; EU,Spain
- Longline: Australia; China (nil capture), Taiwan,China, EU,France, EU,Portugal, EU,Spain, EU,UK, France(OT), Japan, Rep. of Korea, South Africa
- Driftnet: None

The paucity of the information available makes it difficult to estimate levels of marine turtle bycatch by species.

[4] Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia

APPENDIX V
MAIN ISSUES IDENTIFIED CONCERNING DATA ON NON-IOTC SPECIES

General issues

There are a number of key issues with the data that are apparent from this summary (discussed below). The main consequence of this is that the estimation of total catches of sharks in the Indian Ocean is compromised by the paucity of the data available.

Unreported catches

Although some fleets have been operating since 1950, there are many cases where historical catches have gone unreported as many countries were not collecting fishery statistics in years prior to 1970. It is therefore thought that important catches of sharks might have gone unrecorded in several countries. There are also a number of fleets which are still not reporting on their interactions with bycatch species, despite fleets using similar gears reporting high catch rates of bycatch.

Some fleets have also been noted to report catches by species only for those that have been specifically identified by the Commission and do not report catches of other species even in aggregate form. This creates problems for the estimation of total catches of all sharks and for attempts to apportion aggregate catches into species groups at a later date. The changing requirements for species-specific reporting also complicates the interpretation of these data.

Errors in reported catches

For the fleets that do report interactions, there are a number of issues with these estimates. The estimates are sometimes based on retained catches rather than total catches, and so if discarding is high then this is a major source of error. Errors are also introduced due to the processing of the retained catches that is undertaken. This creates problems for calculating total weight or numbers, as sometimes dressed weight might be recorded instead of live weights. For high levels of processing, such as finning where the carcasses are not retained, the estimation of total live weight is extremely difficult.

Poor resolution of data

Historically, shark catches have not been reported by species but simply as an aggregated total, however, the proportion of catches reported by species has increased substantially in recent years. Misidentification of shark species is also common. Processing creates further problems for species identification, requiring a high level of expertise and experience in order to be able to accurately identify specimens, if at all. The level of reporting by gear type is much higher and catches reported with no gear type allocated form a small proportion of the total.

The following list covers the main issues which the IOTC Secretariat considers affect the quality of the statistics available at the IOTC, by species group, type of dataset and type of fishery.

SHARKS

1. Catch-and-Effort data from gillnet fisheries:

- Drifting gillnet fisheries of Iran and Pakistan: To date, Iran and Pakistan have not reported catches of sharks, by species, for their gillnet fisheries.
- Gillnet/longline fishery of Sri Lanka: Sri Lanka has not reported catch-and-effort data for sharks as per the IOTC standards.
- Driftnet fishery of Taiwan,China (1982–92): Catch-and-effort data does not include catches of sharks by species.

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

- Historical catches of sharks from major longline fisheries: To date, Japan, Taiwan,China, Indonesia and Rep. of Korea, have not provided estimates of catches of sharks, by species, for years before 2006.
- Fresh-tuna longline fisheries of Indonesia and Malaysia: Indonesia and Malaysia have not reported catches of sharks by IOTC standards for longliners under their flag. In addition Indonesia has not reported catch-and-effort data for its longline fishery to date.
- Freezing longline fisheries of EU-Spain, India, Indonesia, Malaysia, and Oman: These countries have not reported catch-and-effort data of sharks by species for longliners under their flag.

3. **Catch-and-Effort data from coastal fisheries:**
   - Coastal fisheries of India, Indonesia, Madagascar, Sri Lanka and Yemen: To date, these countries have not provided detailed catches of sharks to the IOTC, in particular Thresher and other pelagic shark species caught by their coastal fisheries.
4. **Discard levels from surface and longline fisheries:**
   - Discard levels of sharks from major longline fisheries: To date the EU(Spain), Japan and Indonesia, have not provided estimates of total discards of sharks, by species, in particular thresher sharks and oceanic whitetip sharks, although the EU, Japan and Rep. of Korea are reporting observer data.
   - Discard levels of sharks for industrial purse seine fisheries: To date, the European Union (before 2003), Iran, Japan, Seychelles, and Thailand, have not provided estimates of total quantities of discards of sharks, by species, for industrial purse seiners under their flag, although the EU and Japan are reporting observer data.
5. **Size frequency data:**
   - Gillnet fisheries of Iran and Pakistan: To date, Iran and Pakistan have not reported size frequency data for their driftnet fisheries.
   - Longline fisheries of India, Malaysia, Oman and Philippines: To date, these countries have not reported size frequency data for their longline fisheries, including length frequency of discards of thresher sharks.
   - Coastal fisheries of India, Indonesia, Madagascar, Sri Lanka and Yemen: To date, these countries have not reported size frequency data for their coastal fisheries.
6. **Biological data:**
   - Surface and longline fisheries, in particular China, Taiwan,China, Indonesia and Japan: The Secretariat had to use length-age keys, length-weight keys, ratios of fin-to-body weight, and processed weight-live weight keys for sharks from other oceans due to the general paucity of biological data available from the Indian Ocean.

OTHER BYCATCH

1. **Incidental catches of SEABIRDS:**
   - Longline fisheries operating in areas with high densities of seabirds. Seychelles has not reported incidental catches of seabirds for longliners under their flag.
2. **Incidental catches of MARINE TURTLES:**
   - Gillnet fisheries of Pakistan: to date, there have been no reports on incidental catches of marine turtles for the driftnet fisheries.
   - Longline fisheries of Malaysia, Oman, Philippines, and Seychelles: To date, these countries have not reported incidental catches of marine turtles for their longline fisheries.
   - Purse seine fisheries of the EU (excluding 2003–07 and EU-France), Iran, Japan, Seychelles, and Thailand: To date these countries have not reported incidental catches of marine turtles for their purse seine fisheries, including incidental catches of marine turtles on Fish Aggregating Devices.

APPENDIX VI
AVAILABILITY OF CATCH DATA FOR SHARKS BY GEAR

Availability of catch data for the main shark species expressed as the proportion of fleets for which catch data on sharks are available out of the total number of fleets[5] for which data on IOTC species are available, by fishery, species of shark, and year, for the period 1950–2013.

Shark species in bold are those identified as mandatory for reporting by the Commission in 2013, for which data shall be recorded in logbooks and reported to the IOTC Secretariat; reporting of catch data for other species can be done in aggregated form (i.e. all species combined as ***sharks nei*** or ***mantas and rays nei***).
Hook and line refers to fisheries using handline and/or trolling and ***Other gears nei*** to other unidentified fisheries operated in coastal waters.
Catch rates of sharks on pole-and-line fisheries are thought to be nil or negligible.
Average levels of reporting for 1950–2013 and 2009–2013 are shown in columns ***All*** and ***Last***, respectively.

[5] The definition of fleets has changed since the previous report. Previously a fleet fishing in two areas were considered as two separate fleets, whereas here they are considered as one.

APPENDIX VII
IMPLEMENTATION OF THE REGIONAL OBSERVER SCHEME
(Updated 29 October 2014)

CPCs	Active Vessels LOA≥24m or High Seas vessels[6]				Progress	List of accredited observers submitted	Number of observer reports provided[7]				
	LL	PS	GN	BB			2010	2011	2012	2013[8]	2014
MEMBERS											
Australia	4	5			Australia has implemented an observer programme that complies with the IOTC Regional Observer Scheme.	**YES: 21**	**2(O)**	**1(O)**	**2(O)**	**No**	**2(O)**
Belize	3				Belize is planning to launch an observer programme in 2104.	**No**	**No**	**No**	**No**	**No**	**No**
China –Taiwan,China	36 272				China has an observer programme and has submitted two trip reports.	**YES: 2** **YES: 54**	**1(O)** **No**	**No** **No**	**1(O)** **No**	**No** **No**	**No** **No**
Comoros					Comoros does not have vessels ≥ 24m. Two observers were trained under the IOC Regional Monitoring Project, and 5 by SWIOFP.	**YES: 7**	N/A	N/A	N/A	N/A	N/A
Eritrea	No information received				No information received by the Secretariat.	**No**	**No**	**No**	**No**	**No**	**No**
European Union	48	27			EU has an observer programme on-board its purse seine and longline fleets. To date, no information has been received from EU,Spain and EU,UK.	Partial: **EU,France: 52** **EU,Portugal: 4** **EU,Spain : No** **EU,UK : No**	**No**	EU, France: 13+9**(O)** EU, Portugal: 1**(O)**	EU, France: 13+7**(O)** EU, Portugal: 1**(O)**	EU, France: 16+6**(O)** EU, Portugal: 1**(O)**	EU, France: 18(O) EU, Portugal: 1**(O)**
Guinea					No information received by the Secretariat.	**No**	**No**	**No**	**No**	**No**	**No**
India					India has not yet developed an observer programme.	**No**	**No**	**No**	**No**	**No**	**No**
Indonesia	1238				Indonesia has 13 registered IOTC observers	**YES:13**	**No**	**No**	**No**	**No**	**No**
Iran, Isl. Rep. of		4	1224		No information received by the Secretariat.	**No**	**No**	**No**	**No**	**No**	**No**
Japan	73				Japan started its observer programme on the 1st of July 2010, and currently deploys 19 observers in the Indian Ocean.	**YES: 19**	**6(E)**	**8(E)**	**14(E)**	**No**	**No**
Kenya	2				Kenya is developing an observer programme and 5 observers have been trained by SWIOFP.	**YES: 5**	**No**	**No**	**No**	**No**	**No**
Korea, Rep. of	9	4			Korea has had an observer programme since 2002 with 3 observers deployed in the Indian Ocean.	**YES: 29**	**2(O)**	**No**	**2(O)**	**3(O)**	**No**

[6] The number of active vessels is given for 2013.
[7] Year in which the observed trip has started (E: Electronic; O: Other)
[8] 2014 data covers only the first three quarters. This will be updated for the SC.

CPCs	Active Vessels LOA≥24m or High Seas vessels[6]				Progress	List of accredited observers submitted	Number of observer reports provided[7]				
	LL	PS	GN	BB			2010	2011	2012	2013[8]	2014
Madagascar	8				Madagascar is developing an observer programme. Five and three observers have been trained through SWIOFP and IOC respectively and reports have been provided for 2012.	YES: 7	No	No	5(O)	No	No
Malaysia	5				Malaysia is developing plans for the implementation of an observer programme.	No	No	No	No	No	No
Maldives	7			311	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
Mauritius		2			Mauritius is developing an observer programme. Five observers have been trained through SWIOFP and three through the IOC.	YES: 8	No	No	No	No	No
Mozambique					Mozambique has an observer programme and has submitted one trip report.	YES: 11	No	No	1(O)	No	No
Oman	5				No information received by the Secretariat.	No	No	No	No	No	No
Pakistan					No information received by the Secretariat.	No	No	No	No	No	No
Philippines	9				No information received by the Secretariat.	No	No	No	No	No	No
Seychelles	32	7			Seychelles is developing an observer programme. Four observers have been trained through SWIOFP and three through the IOC.	YES: 7	No	No	No	No	No
Sierra Leone	No information received				No information received by the Secretariat.	No	No	No	No	No	No
Sri Lanka	7	8	2226		Sri Lanka has begun a pilot observer initiative.	No	No	No	No	No	No
Sudan	No information received				No information received by the Secretariat.	No	No	No	No	No	No
Tanzania, United Rep.of	5				Tanzania does not currently have an observer programme in place.	No	No	No	No	No	No
Thailand	5				No information received by the Secretariat.	No	No	No	No	No	No
United Kingdom					The UK does not have any active vessels in the Indian Ocean.	N/A	N/A	N/A	N/A	N/A	N/A
Vanuatu	3				Vanuatu does not currently have an observer programme in place.	No	No	No	No	No	No
Yemen	No information received				No information received by the Secretariat.	No	No	No	No	No	No
COOPERATING NON-CONTRACTING PARTIES											
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
South Africa	10			5	South Africa currently only operates an observer programme for foreign vessels operating within the EEZ.	YES: 16	No	13(O)[9]	10(O)[10]	13(O)	No

[9] Reports from South African observers onboard foreign vessels operating in the EEZ of South Africa.
[10] *Ibid.* 3.

APPENDIX VIII

2014: 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

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:** Domestic laws introduced in 2013. Available on request.
Comoros		–		–			**Sharks:** Development has not begun. **Seabirds:** Development has not begun. **Marine turtles:** No information received by the Secretariat.
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)							**Sharks:** Approved on 05-Feb-2009. **Seabirds:** No information received by the Secretariat. **Marine turtles:** No information received by the Secretariat.
Guinea							**Sharks:** No information received by the Secretariat. **Seabirds:** No information received by the Secretariat. **Marine turtles:** No information received by the Secretariat.
India			n.a. (provisional)				**Sharks:** Currently being drafted with the assistance of BOBP-IGO **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 have approved. **Marine turtles:** No information received by the Secretariat.
Indonesia		–		–			**Sharks:** NPOA guidelines developed and released for public comment among stakeholders in 2010 (funded by ACIAR Australia—DGCF). Training commenced in 2011, including data collection for sharks based on forms of statistical data to national standards (by DGCF (supported by ACIAR Australia). Implementation expected late 2011/early 2012. **Seabirds:** Development has not begun. **Marine turtles:** No information received by the Secretariat.
Iran, Islamic Republic of		–		–		_	**Sharks:** Have communicated to all fishing cooperatives the IOTC resolutions on sharks. Have in place a ban on the retention of live sharks. **Seabirds:** I.R. Iran determined that seabird interactions are not a problem for their fleet as they consist of gillnet vessels only. i.e. no longline vessels. **Marine turtles:** No information received by the Secretariat.
Japan		03-Dec-2009		03-Dec-2009			**Sharks:** NPOA–Shark assessment implementation report submitted to COFI in July 2012 **Seabirds:** NPOA–Seabird implementation report submitted to COFI in July 2012. **Marine turtles:** No information received by the Secretariat.
Kenya			n.a.	–			**Sharks:** Due to paucity of the most basic information on shark stocks in Kenyan waters, it was decided the NPOA-Sharks be developed in the planning year 2014/ 2015. This will enable the country to carry out some baseline surveys on the shark fishery in the 2013/ 2014 planning year. **Seabirds:** Kenya does not have any flagged longline vessels on its registry. There is no evidence of any gear seabird interaction with the current fishing fleet. Kenya does not therefore consider developing NPOA seabirds as necessary for the time being. **Marine turtles:** No information received by the Secretariat.
Korea, Republic of		08-Aug-11		–		–	**Sharks:** Currently being implemented. **Seabirds:** Drafted in April 2014 and on standby for approval by the minister. **Marine turtles:** All Rep. of Korea vessels fully implement Res 12/04.
Madagascar		–		–			**Sharks:** Development has not begun. **Seabirds:** Development has not begun. Note: A fisheries monitoring system is in place in order to ensure compliance by vessels with the IOTC's shark and seabird conservation and management measures. **Marine turtles:** No information received by the Secretariat.

Malaysia		2008	n.a.	–		2008	**Sharks:** A review of the NPOA-Shark (2008) is in the final stages, with stakeholder consultation due to be completed in September 2013. A revised NPOA-Sharks is expected to be published by the end of 2013. **Seabirds:** Malaysia has carried out a review and determined that an NPOA-Seabirds is not necessary as no longline vessels flagged to Malaysia fish south of 20 degrees south. **Marine turtles:** A NPOA For Conservation and Management of Sea Turtles had been published in 2008.
Maldives, Republic of		–	n.a.	–			**Sharks:** Maldives has developed the NPOA-Sharks with the assistance of Bay of Bengal Large Marine Ecosystem (BoBLME) Project. A stakeholder consultation for the NPOA-Sharks was held in April of 2014. The NPOA-Sharks is in the finalization process and is expected to be published in November of 2014. The longline logbooks ensure the collection of shark bycatch data to genus level. Maldives would be reporting on shark bycatch to the appropriate technical Working Party meetings of IOTC. **Seabirds:** Article 12 of IPOA states that if a 'problem exists' CPCs adopt an NPOA. IOTC Resolution 05/09 suggests CPCs to report on seabirds to the IOTC Scientific Committee if the issue is appropriate'. Maldives considers that seabirds are not an issue in the Maldives fisheries, both in the pole-and-line fishery and in the longline fishery. The new longline fishing regulations has provision on mitigation measures on seabird bycatch. **Marine turtles:** Longline regulation has provisions to reduce marine turtle bycatch. The regulation urges longline vessels to have dehookers for removal of hook and a line cutter on board, to release the caught marine turtles as prescribed in Resolution 12/04.
Mauritius							**Sharks:** Mauritius does not issue national or foreign fishing licence to vessels targeting sharks in its Exclusive Economic Zone. However, sharks are usually landed as bycatch. Mauritius will work in consultation with the IOTC Secretariat to prepare a simplified NPOA-sharks for Mauritius. **Seabirds:** Mauritius does not have national vessels operating beyond 25^0S. However, fishing companies have been requested to implement all mitigation measures as provided in the IOTC Resolutions. **Marine turtles:** Mauritius does not have national boats operating outside its EEZ. Moreover, marine turtles are protected by the national law. Fishing companies have been **requested** to carry line cutters and de-hookers in order to facilitate the appropriate handling and prompt release of marine turtles caught or entangled.
Mozambique		–		–			**Sharks**: Drafting of new legislation is in progress which considers the issues of shark conservation in licensing requirements. The SWIOFish project within the framework of the implementation of the Linefish Management Plan is going to finance the NPOA shark from 2015. Moreover, Mozambique has developed in 2014, the Terms and Conditions of Licensing for tuna fishing to be attached to fishing license. These contain all the measures for the conservation and management of tuna fisheries and include the aspects related to conservation of sharks, seabirds and marine turtles. **Seabirds**: Mozambique is regularly briefing the Masters of their fishing vessels on the mandatory requirement to report any seabird interaction with longliner fleet.

							Marine turtles: see above.
Oman, Sultanate of							**Sharks:** No information received by the Secretariat. **Seabirds:** No information received by the Secretariat. **Marine turtles:** No information received by the Secretariat.
Pakistan							**Sharks:** Sharks are landed with the fins attached and each and every part of the body of sharks are utilised. A workshop on "Conservation and Management of Sharks was conducted on 15th September 2014. As per recommendations of the workshop, there is still a need for collection and synthesis of more compatible data to prepare Shark Assessment Report (SAR) / draft NPOA. PLAN: (i) October, 2014 to March 2015: Collection and synthesis of additional data. (ii) April, 2015 to June 2015: Preparation of SAR and draft NPOA. Circulation of draft NPOA to concerned stakeholders for comments. (iii) July, 2015 to September 2015: Holding workshop, presentations of draft NPOA / comments, recommendations and adoption of NPOA. **Seabirds:** Pakistan considers that seabird interactions are not a problem for Pakistani fishing fleet as our tuna fishing operations do not include longline vessels. **Marine turtles:** Pakistan has already framed Regulations regarding the prohibition of catching and retaining marine turtles. As regards to the reduction of marine turtle bycatch by gillnetters; presently Marine Fisheries Department (MFD) in collaboration with International Union for Conservation of Nature (IUCN) Pakistan, is undertaking an assessment. Stakeholder Coordination Committee Meeting was conducted on 10th September 2014. The "Turtle Assessment Report (TAR)" will be finalized by February 2015 and necessary guidelines / action plan will be finalized by June 2015. As per clause-5 (c) of Pakistan Fish Inspection & Quality Control Act, 1997, "Aquatic turtles, tortoises, snakes, mammals including dugongs, dolphins, porpoises and whales etc" are totally forbidden for export and domestic consumption.
Philippines		Sept. 2009		–			**Sharks:** Under periodic review. **Seabirds:** Development has not begun. No seabird interactions recorded. **Marine turtles:** No information received by the Secretariat.
Seychelles, Republic of		Apr-2007		–			**Sharks:** NPOA-sharks to currently being reviewed and a report will be provided for the next WPEB. **Seabirds:** Development has not begun. The industrial longline fleet of Seychelles has been instructed to conform with the requirements of Res. 12/06. **Marine turtles:** No plan developed as the moment.
Sierra Leone							**Sharks:** No information received by the Secretariat. **Seabirds:** No information received by the Secretariat. **Marine turtles:** No information received by the Secretariat.
Somalia							**Sharks:** Somalia is currently revising its fisheries legislation (current one being from 1985) and will consider the development of NPOAs as part of this revision process. **Seabirds:** See above. **Marine turtles:** No information received by the Secretariat.

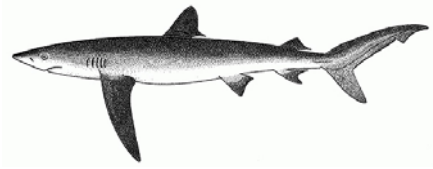
Sri Lanka			n.a. (provisional)				**Sharks:** An NPOA-sharks has been finalized and is currently being implemented. **Seabirds:** Sri Lanka has determined that seabird interactions are not a problem for their fleets. However a formal review has not yet taken place which the WPEB and SC have approved. **Marine turtles:** No information received by the Secretariat.
Sudan							**Sharks:** No information received by the Secretariat. **Seabirds:** No information received by the Secretariat. **Marine turtles:** No information received by the Secretariat.
Tanzania, United Republic of		–		–			**Sharks:** Initial discussions have commenced. **Seabirds:** Initial discussions have commenced. Note: Terms and conditions related to protected sharks and seabirds contained within fishing licenses. **Marine turtles:** No information received by the Secretariat.
Thailand		23-Nov-2005		–			**Sharks:** Second NPOA-sharks currently being drafted. **Seabirds:** Development has not begun. **Marine turtles:** Not yet implemented.
United Kingdom	n.a.	–	n.a.	–		–	British Indian Ocean Territory (Chagos Archipelago) waters are a Marine Protected Area closed to fishing except recreational fishing in the 3nm territorial waters around Diego Garcia. Separate NPOAs have not been developed within this context. **Sharks/Seabirds:** For sharks, UK is the 24th signatory to the Convention on Migratory Species 'Memorandum of Understanding on the Conservation of Migratory Sharks' which extends the agreement to UK Overseas Territories including British Indian Ocean Territories; Section 7 (10) (e) of the *Fisheries (Conservation and Management) Ordinance* refers to recreational fishing and requires sharks to be released alive. No seabirds are caught in the recreational fishery. **Marine turtles:** No marine turtles are captured in the recreational fishery. A monitoring programme is taking place to assess the marine turtle population in UK (OT).
Vanuatu		Aug 2014					**Sharks:** Commenced in August 2014. **Seabirds:** No information received by the Secretariat. **Marine turtles:** No information received by the Secretariat.
Yemen							**Sharks:** No information received by the Secretariat. **Seabirds:** No information received by the Secretariat. **Marine turtles:** No information received by the Secretariat.
COOPERATING NON-CONTRACTING PARTIES							
Djibouti							**Sharks:** No information received by the Secretariat. **Seabirds:** No information received by the Secretariat. **Marine turtles:** No information received by the Secretariat.
Senegal		25-Sept-2006		–			**Sharks:** The Sub-Regional Fisheries Commission supported the development of a NPOA-sharks for Senegal in 2005. Other activities conducted include the organization of consultations with industry, the investigation of shark biology and social -economics of shark fisheries). The NPOA is currently being revised. Consideration is being made to the inclusion of minimum mesh size, minimum shark size, and a ban on shark finning.

							Seabirds: The need for a NPOA-seabirds has not yet been assessed. **Marine turtles:** No information received by the Secretariat.
South Africa, Republic of		–		2008			**Sharks:** The gazetting of the draft NPOA-sharks for public comment has been approved by the Minister of the Department of Agriculture, Forestry and Fisheries (6 July 2012). **Seabirds:** Published in August 2008 and fully implemented. The NPOA-seabirds has been earmarked for review. **Marine turtles:** No information received by the Secretariat.

Colour key	
NPOA Completed/ FAO Guidelines fully implemented	
NPOA Drafting being finalized / FAO Guidelines partially implemented	
NPOA Drafting commenced / FAO Guidelines being communicated	
Not begun	

APPENDIX IX
DRAFT RESOURCE STOCK STATUS SUMMARY – BLUE SHARK

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



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

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

Area[1]	Indicators		2014 stock status determination
Indian Ocean	Reported catch 2013: Not elsewhere included (nei) sharks[2]: Average reported catch 2009–2013: Not elsewhere included (nei) sharks[2]:	23,197 t 46,728 t 24,447 t 49,318 t	**Uncertain**
	MSY (1000 t) (80% CI): F_{MSY} (80% CI): SB_{MSY} (1000 t) (80% CI): F_{2013}/F_{MSY} (80% CI): SB_{2013}/SB_{MSY} (80% CI): SB_{2013}/SB_0 (80% CI):	unknown	

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

Colour key	Stock overfished(SB_{year}/SB_{MSY}< 1)	Stock not overfished (SB_{year}/SB_{MSY}≥ 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[11]		
		Global status	WIO	EIO
Blue shark	*Prionace glauca*	Near Threatened	–	–

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

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. There remains considerable uncertainty about the relationship between abundance, CPUE series and total catches over the past decade (Table 1). 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). There is a paucity of information available on this species, but this 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. There is no quantitative stock assessment and limited

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

basic fishery indicators currently available for blue shark in the Indian Ocean therefore the stock status is **uncertain** (Table 1).

Outlook. Maintaining or increasing effort can result in further 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 blue shark will decline in these areas in the near future, and may result in localised depletion. 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 investigated further as a priority.
- Noting that current reported catches (probably largely underestimated) are estimated at an average ~ 24,447 t over the last five years, ~ 23,197 t in 2013, maintaining or increasing effort can result in declines in biomass, productivity and CPUE.
- Mechanisms need to be developed by the Commission to encourage CPCs to comply with their reporting requirement on sharks.

APPENDIX X
DRAFT RESOURCE STOCK STATUS 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		2014 stock status determination
Indian Ocean	Reported catch 2013: Not elsewhere included (nei) sharks[2]: Average reported catch 2009–2013: Not elsewhere included (nei) sharks[2]:	230 t 46,728 t 317 t 49,318 t	**Uncertain**
	MSY (1000 t) (80% CI): F_{MSY} (80% CI): SB_{MSY} (1000 t) (80% CI): F_{2013}/F_{MSY} (80% CI): SB_{2013}/SB_{MSY} (80% CI): SB_{2013}/SB_0 (80% CI):	unknown	

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

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

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

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

Common name	Scientific name	IUCN threat status[12]		
		Global status	WIO	EIO
Oceanic whitetip shark	*Carcharhinus longimanus*	Vulnerable	–	–

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

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. There remains considerable uncertainty about the relationship between abundance, standardised CPUE series and total catches over the past decade (Table 1). The ecological risk assessment (ERA) conducted for the Indian Ocean by the WPEB and SC in 2012 (IOTC–2012–SC15–INF10 Rev_1) consisted of a semi-quantitative risk assessment analysis to evaluate the resilience of shark species to the impact of a given fishery, by combining the

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

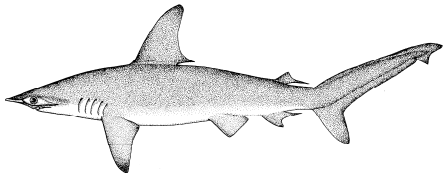
biological productivity of the species and its susceptibility to each fishing gear type. Oceanic whitetip shark received a high vulnerability ranking (No. 5) in the ERA rank for longline gear because it was estimated as one of the least productive shark species, and was also characterised by a high susceptibility 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 lack of data, there is anecdotal information suggesting that oceanic whitetip shark abundance has declined over recent decades. Available standardised CPUE indices from Japan and EU,Spain indicate conflicting trends as discussed in the full Executive Summary for oceanic whitetip sharks. There is no quantitative stock assessment and limited basic fishery indicators currently available for oceanic whitetip sharks in the Indian Ocean therefore the stock status is **uncertain** (Table 1).

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

- The two primary sources of data that drive the assessment, total catches and CPUE are lacking or uncertain and should be investigated further as a priority.
- Noting that current catches (probably largely underestimated) are estimated at an average ~317 t over the last five years, ~230 t in 2013, maintaining or increasing effort with an associated fishing mortality can result in further declines in biomass, productivity and CPUE.
- Mechanisms need to be developed by the Commission to encourage CPCs to comply with their reporting requirement on sharks.

APPENDIX XI
DRAFT RESOURCE STOCK STATUS 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		2014 stock status determination
Indian Ocean	Reported catch 2013: Not elsewhere included (nei) sharks[2]: Average reported catch 2009–2013: Not elsewhere included (nei) sharks[2]:	128 t 46,728 t 91 t 49,318 t	**Uncertain**
	MSY (1000 t) (80% CI): F_{MSY} (80% CI): SB_{MSY} (1000 t) (80% CI): F_{2013}/F_{MSY} (80% CI): SB_{2013}/SB_{MSY} (80% CI): SB_{2013}/SB_0 (80% CI):	unknown	

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

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

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

Common name	Scientific name	IUCN threat status[13]		
		Global status	WIO	EIO
Scalloped hammerhead	*Sphyrna lewini*	Endangered	Endangered	–

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

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. The current IUCN threat status of 'Endangered' applies to scalloped hammerhead sharks globally and specifically for the western Indian Ocean (Table 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. 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

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

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**.

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. The following should be noted:

- One of the primary sources of data that drive the assessment (total catches) is highly uncertain and should be investigated further as a priority.
- Noting that current reported catches (probably largely underestimated) are estimated at an average ~91 t over the last five years, ~128 t in 2013, maintaining or increasing effort can result in declines in biomass and productivity.
- Mechanisms need to be developed by the Commission to encourage CPCs to comply with their reporting requirement on sharks.

APPENDIX XII
DRAFT RESOURCE STOCK STATUS 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		2014 stock status determination
Indian Ocean	Reported catch 2013: Not elsewhere included (nei) sharks[2]: Average reported catch 2009–2013: Not elsewhere included (nei) sharks[2]:	1,572 t 46,728 t 1,364 t 49,318 t	**Uncertain**
	MSY (1000 t) (80% CI): F_{MSY} (80% CI): SB_{MSY} (1000 t) (80% CI): F_{2013}/F_{MSY} (80% CI): SB_{2013}/SB_{MSY} (80% CI): SB_{2013}/SB_0 (80% CI):	unknown	

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

Colour key	Stock overfished(SB_{year}/SB_{MSY}< 1)	Stock not overfished (SB_{year}/SB_{MSY}≥ 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. Shortfin mako shark: IUCN threat status of shortfin mako shark (*Isurus oxyrinchus*) in the Indian Ocean

Common name	Scientific name	IUCN threat status[14]		
		Global status	WIO	EIO
Shortfin mako shark	*Isurus oxyrinchus*	Vulnerable	–	–

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

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

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

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

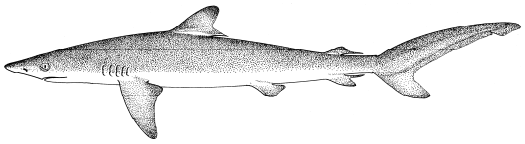
Because of their life history characteristics – they are relatively long lived (over 30 years), females mature at 18–21 years, and have relativity few offspring (<25 pups every two or three years), the shortfin mako shark can be vulnerable to overfishing. There is no quantitative stock assessment currently 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. The following should be noted:

- The two primary sources of data that drive the assessment, total catches and CPUE are uncertain and should be investigated further as a priority.
- Noting that current reported catches are estimated (probably largely underestimated) at an average ~1,364 t over the last five years, ~1,572 t in 2013, maintaining or increasing effort can result in declines in biomass, productivity and CPUE.
- Mechanisms need to be developed by the Commission to encourage CPCs to comply with their reporting requirement on sharks.

APPENDIX XIII
DRAFT RESOURCE STOCK STATUS 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		2014 stock status determination
Indian Ocean	Reported catch 2013: Not elsewhere included (nei) sharks[2]: Average reported catch 2009–2013: Not elsewhere included (nei) sharks[2]:	3,573 t 46,728 t 3,843 t 49,318 t	**Uncertain**
	MSY (1000 t) (80% CI): F_{MSY} (80% CI): SB_{MSY} (1000 t) (80% CI): F_{2013}/F_{MSY} (80% CI): SB_{2013}/SB_{MSY} (80% CI): SB_{2013}/SB_0 (80% CI):	unknown	

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

Colour key	Stock overfished(SB_{year}/SB_{MSY}< 1)	Stock not overfished (SB_{year}/SB_{MSY}≥ 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. Silky shark: IUCN threat status of silky shark (*Carcharhinus falciformis*) in the Indian Ocean

Common name	Scientific name	IUCN threat status[15]		
		Global status	WIO	EIO
Silky shark	*Carcharhinus falciformis*	Near Threatened	Near Threatened	Near Threatened

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

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

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

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

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. The following should be noted:

- Total catches are uncertain and should be investigated further as a priority.
- Noting that current reported catches (probably largely underestimated) are estimated at an average ~1,364 t over the last five years, ~ 1,572 t in 2013, increasing effort can result in declines in biomass.
- Mechanisms need to be developed by the Commission to encourage CPCs to comply with their reporting requirement on sharks.

APPENDIX XIV
DRAFT RESOURCE STOCK STATUS SUMMARY – BIGEYE THRESHER SHARK

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

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

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

Area[1]	Indicators		2014 stock status determination
Indian Ocean	Reported catch 2013: Not elsewhere included (nei) sharks[2]: Average reported catch 2009–2013: Not elsewhere included (nei) sharks[2]:	0 t 46,728 t 75 t 49,318 t	**Uncertain**
	MSY (1000 t) (80% CI): F_{MSY} (80% CI): SB_{MSY} (1000 t) (80% CI): F_{2013}/F_{MSY} (80% CI): SB_{2013}/SB_{MSY} (80% CI): SB_{2013}/SB_0 (80% CI):	unknown	

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

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

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

Common name	Scientific name	IUCN threat status[16]		
		Global status	WIO	EIO
Bigeye thresher shark	*Alopias superciliosus*	Vulnerable	–	–

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

NOTE: IOTC Resolution 12/09 *On the conservation of thresher sharks (family Alopiidae) caught in association with fisheries in the IOTC area of competence*, prohibits retention onboard, transhipping, landing, storing, selling or offering for sale any part or whole carcass of thresher sharks of all the species of the family Alopiidae[17].

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

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

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

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. The following should be noted:

- Two important sources of data that inform the assessment, total catches and CPUE are highly uncertain or not available, and should be investigated further as a priority.
- Noting that current catches (probably largely underestimated) are estimated at an average ~97 t over the last five years, ~0 t in 2013, maintaining or increasing effort can result in declines in biomass, productivity and CPUE.
- Mechanisms need to be developed by the Commission to encourage CPCs to comply with their reporting requirement on sharks.

APPENDIX XV
DRAFT RESOURCE STOCK STATUS SUMMARY – PELAGIC THRESHER SHARK

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

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		2014 stock status determination
Indian Ocean	Reported catch 2013: Not elsewhere included (nei) sharks[2]: Average reported catch 2009–2013: Not elsewhere included (nei) sharks[2]:	0 t 46,728 t 75 t 49,318 t	**Uncertain**
	MSY (1000 t) (80% CI): F_{MSY} (80% CI): SB_{MSY} (1000 t) (80% CI): F_{2013}/F_{MSY} (80% CI): SB_{2013}/SB_{MSY} (80% CI): SB_{2013}/SB_0 (80% CI):	unknown	

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

Colour key	Stock overfished(SB_{year}/SB_{MSY}< 1)	Stock not overfished (SB_{year}/SB_{MSY}≥ 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. Pelagic thresher shark: IUCN threat status of pelagic thresher shark (*Alopias pelagicus*) in the Indian Ocean

Common name	Scientific name	IUCN threat status[18]		
		Global status	WIO	EIO
Pelagic thresher shark	*Alopias pelagicus*	Vulnerable	–	–

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

NOTE: IOTC Resolution 12/09 *On the conservation of thresher sharks (family Alopiidae) caught in association with fisheries in the IOTC area of competence*, prohibits retention onboard, transhipping, landing, storing, selling or offering for sale any part or whole carcass of thresher sharks of all the species of the family Alopiidae[19].

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. There remains considerable uncertainty in the stock status due to lack of information necessary for assessment or to for the development of other indicators of the stock (Table 1). The ecological risk assessment (ERA) conducted for the Indian Ocean by the WPEB and SC in 2012 (IOTC–2012–SC15–INF10 Rev_1) consisted of a semi-quantitative risk assessment analysis to evaluate the resilience of shark species to the impact of a given fishery, by combining the biological productivity of the species and its susceptibility to each fishing gear type. Pelagic thresher

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

shark received a high vulnerability ranking (No. 3) in the ERA rank for longline gear because it was characterised as one of the least productive shark species, and with a high susceptibility to longline gear. Despite its low productivity, pelagic thresher shark has a low vulnerability ranking to purse seine gear due to its low susceptibility for this particular 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. The following should be noted:

- Two important sources of data that inform the assessment, total catches and CPUE are uncertain or unavailable, and should be investigated further as a priority.
- Noting that current catches (probably largely underestimated) are estimated at an average ~75 t over the last five years ~0 t in 2013, maintaining or increasing effort can result in declines in biomass, productivity and CPUE.
- Mechanisms need to be developed by the Commission to encourage CPCs to comply with their reporting requirement on sharks.

APPENDIX XVI
DRAFT RESOURCE STOCK STATUS SUMMARY – MARINE TURTLES

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

Status of marine turtles in the Indian Ocean

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

Common name	Scientific name	IUCN threat status[20]
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

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. While the status of marine turtles is affected by a range of factors such as degradation of nesting beaches 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. However, given the lack of reporting of marine turtle interactions by CPCs to date, such an evaluation cannot not 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 determination 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: 39 interactions reported in 2010 by 3 CPCs.
- The Ecological Risk Assessment conducted by Nel et al. (2013) concluded that, from the limited data received on longlining and purse seining, the former posed the greater apparent risk to marine turtles. The

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

ERA estimated that ~3,500 marine turtles are caught by longliners annually, followed by ~250 turtles p.a. in purse seine operations. Two separate approaches to estimate gillnet impacts on marine turtles, based on very limited data, calculated that 52,425 turtles p.a. or 11,400–47,500 turtles p.a. are caught in gillnets (with a mean of the two methods being 29,488 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 biomass.
- That appropriate mechanisms are developed by the Compliance Committee to ensure CPCs comply with their data collection and reporting requirements for marine turtles.

APPENDIX XVII
DRAFT RESOURCE STOCK STATUS SUMMARY – SEABIRDS

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

Status of seabirds in the Indian Ocean

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

Common name	Scientific name	IUCN threat status[21]
Albatross		
Atlantic Yellow-nosed Albatross	*Thalassarche chlororynchos*	Endangered
Black-browed albatross	*Thalassarche melanophrys*	Near Threatened
Indian yellow-nosed albatross	*Thalassarche car teri*	Endangered
Shy albatross	*Thalassarche cauta*	Near Threatened
Sooty albatross	*Phoebetria fusca*	Endangered
Light-mantled albatross	*Phoebetria palpebrata*	Near Threatened
Amsterdam albatross	*Diomedea amsterdamensis*	Critically Endangered
Tristan albatross	*Diomedea dabbenena*	Critically Endangered
Wandering albatross	*Diomedia exulans*	Vulnerable
White-capped albatross	*Thalassarche steadi*	Near Threatened
Grey-headed albatross	*Thalassarche chrysostoma*	Endangered
Petrels		
Cape/Pintado petrel	*Daption capense*	Least Concern
Great-winged petrel	*Pterodroma macroptera*	Least Concern
Grey petrel	*Procellaria cinerea*	Near Threatened
Northern giant-petrel	*Macronectes halli*	Least Concern
White-chinned petrel	*Procellaria aequinoctialis*	Vulnerable
Others		
Cape gannet	*Morus capensis*	Vulnerable
Flesh-footed shearwater	*Puffinus carneipes*	Least Concern

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. No assessment has been undertaken by the IOTC WPEB for seabirds due to the lack of data being submitted by CPCs. However, the current International Union for Conservation of Nature (IUCN) threat status for each of the seabird species reported as caught in IOTC fisheries to date is provided in Table 1. It is important to note that a number of international global environmental accords (e.g. Convention on Migratory Species (CMS), 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, the level of mortality of seabirds due to fishing gear in the Indian Ocean is poorly known, although where there has been rigorous assessment of impacts in areas south of 25 degrees (e.g. in South Africa), very high seabird bycatch rates have been recorded in the absence of a suite of proven bycatch mitigation measures.

Outlook. Resolution 10/06 *On Reducing the Incidental Bycatch of Seabirds in Longline Fisheries* was superseded by Resolution 12/06 on 1 July 2014, which includes an evaluation requirement (para. 8) by the Scientific Committee in time for the 2016 meeting of the Commission. The level of compliance with 12/06 and the frequency of use of each of the 3 measures (because vessels can chose two out of three possible options) are currently unknown. Methods to

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

evaluate the effectiveness of the measures need to be developed. Observer reports and logbook data should be analysed to support assessments of the effectiveness of mitigation measures used and relative impacts on seabird mortality rates. . Seabird interactions information reported in National Reports should be stratified by season, broad area, and in the form of catch per unit effort. Unless IOTC CPCs become compliant with the data collection, Regional Observer Programme and reporting requirements for seabirds, the WPEB will continue to be unable to address this issue.. The following should be noted:

- The available evidence indicates considerable risk from longline fishing to the status of seabirds in the Indian Ocean, where the best practice seabird bycatch 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 bycatch 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 Programme requirements and the mandatory measures described in Res 12/06.

APPENDIX XVIII
WORKING PARTY ON ECOSYSTEMS AND BYCATCH PROGRAM OF WORK (2015–2019)

The following is the Draft WPEB Program of Work (2015–2019) and is based on the specific requests of the Commission and Scientific Committee. The Program of Work consists of the following, noting that a timeline for implementation would be developed by the SC once it has agreed to the priority projects across all of its Working Parties:

- **Table 1**: Priority topics for obtaining the information necessary to develop stock status indicators for sharks in the Indian Ocean;
- **Table 2**: High priority topics, by project for bycatch species in the Indian Ocean;
- **Table 3**: Stock assessment and ERA schedule.
- **Table 4**: Proposed timeline for the development of the high priority research projects.

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

Topic	Sub-topic	Priority
SHARKS		
Fisheries and data collection	Implementation of Regional Observer Schemes in major IOTC fleets, including coastal artisanal fleets, and/or the collection of scientific data by all other means available.	High
	Historical data mining for the key species and fleets, such as artisanal gillnet and longline coastal fisheries, and integration with current observer programs to reconstruct species composition and catches of sharks.	High
	Collection of information about catch and effort and spatial distribution of fleets which are believed to have large catches on pelagic catches (i.e. various longline fleet, gillnet and coastal fisheries) and where those statistics are mostly absent.	High
Biology and ecology	Age and growth, prioritising blue shark, shortfin mako shark and oceanic whitetip shark	High
	Stock identification (e.g., tagging and genetics), blue shark, shortfin mako shark and oceanic whitetip shark	High
	Migrations and habitat use (e.g., electronic and conventional tagging) blue shark, shortfin mako shark and oceanic whitetip shark	High
	Post-release mortality (electronic tagging), prioritising shortfin mako, oceanic whitetip shark and thresher sharks	High
	Reproduction	Medium
Mitigation measures: Operational and technological aspects	Assess efficiency of measure on currently prohibited shark species (Resolutions 12/09 & 13/03)	High
	Assess efficiency of the combination of circle hooks and bait types, including potential impact at the socio-economic level.	High
	Identify pelagic shark hotspots and investigate associated environmental conditions affecting shark distribution.	High
	Improve the knowledge on the use of wire/braided nylon traces and assess economic implications.	High
	Gillnet selectivity studies, including mesh size, hanging ratio, net twine material, and others, and the potential impact at the socio-economic level.	High
Mitigation measures: Best practices	Develop guidelines and protocols for safe handling and release of sharks and other protected species from longlines and gillnets.	High
	Post-release mortality of whale sharks released from purse seine, to assess the efficiency of the best practice currently set in place.	High
	Test and improve the efficiency of shark release procedure through a release panel in purse-seines. Experiments are being carried out by ISSF in other oceans.	Medium to High
	Efficiency and economics impacts of corrodible hooks.	Medium
	Efficiency and economics impacts of weak hooks.	Medium

	Efficiency and economics impacts of permanent magnets, electropositive rare earth metals (EPREM) and other electrical measures.	Medium
	Impact of soaking time on the shark bycatch and target catch levels for major fleets, and determine an optimal soaking time by target species.	Medium
	Develop and test the efficiency of artificial baits in longline fisheries.	Medium
	Test the use and efficiency of acoustic attractants that produce sounds with a strong attractive effect on sharks and potentially attract sharks away from the fishing gear.	Medium
CPUE standardisation	Develop standardised CPUE series for each key shark species and fishery in the Indian Ocean. (High priority fleets: TWN-CHN LL, EU-Spain LL, Japan LL; Indonesia LL)	High
Stock assessment / Stock indicators	Develop and compare multiple assessment approaches to determining stock status for key shark species.	High
MARINE TURTLES		
	Review of bycatch mitigation measures.	High
	Revised Ecological Risk Assessment (ERA)	Med
SEABIRDS		
	Review of bycatch mitigation measures.	High
MARINE MAMMALS		
	Longline depredation studies	Med

Table 2. High priority topics, by project for bycatch in the Indian Ocean.

Topic	Sub-topic and Project	Priority
SHARKS		
Fisheries and data collection	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: • Capacity building of fisheries observers (including the provision of ID guides, training, etc.); • 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; • Historical data mining for the key species, including the collection of information about catch, effort and spatial distribution of those fleets; • Integration of data mining with observer programs to reconstruct species composition and catches of sharks.	High

Biology and ecology	Develop basic biology and ecology studies to fill essential knowledge gaps on the key IOTC shark species, including: • Age and growth studies for the blue (BSH), shortfin mako (SMA) and oceanic whitetip (OCS) sharks; • Stock delimitation identification (i.e., tagging and genetics[22]) for the blue (BSH), shortfin mako (SMA) and oceanic whitetip (OCS) sharks; • Migration and habitat use, including identification of hotspots and investigate associated environmental conditions affecting the sharks distribution, and making use of conventional and electronic tagging, for blue (BSH), shortfin mako (SMA) and oceanic whitetip (OCS) sharks; • Post-release mortality (electronic tagging), to assess the efficiency of management resolutions on no retention species (i.e. oceanic whitetip (OCS) and threshers sharks), shortfn mako sharks SMA) ranked as the most vulnerable species to longline fisheries.	High
Mitigation measures	Develop studies on shark mitigation measures (operational, technological aspects and best practices), including: • 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); • 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); • Post-release mortality of whale sharks in purse-seine fisheries, to assess the efficiency of the best practice currently set in place; • Develop guidelines and protocols for safe handling and release of sharks caught on longlines and gillnets fisheries.	High
CPUE standardisation	Develop standardised CPUE series for each key shark species and fishery in the Indian Ocean • (High priority fleets: TWN-CHN LL, EU,Spain LL, Japan LL; Indonesia LL)	High
Stock assessment / Stock indicators	Develop and compare multiple assessment approaches to determining stock status for key shark species	High
Marine turtles	Review of bycatch mitigation measures Res. 12/04 (para. 11) 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; 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. The recommendations of the IOTC Working Party on Ecosystems and Bycatch shall be provided to the IOTC Scientific Committee for consideration at its annual session in 2012. In developing its recommendations, the IOTC Working Party on Ecosystems and Bycatch shall examine and 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.	High
	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
Seabirds	Review of bycatch mitigation measures: 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	High

[22] Genetic studies might be integrated in a single study including other IOTC tuna and tuna-like species.

	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.

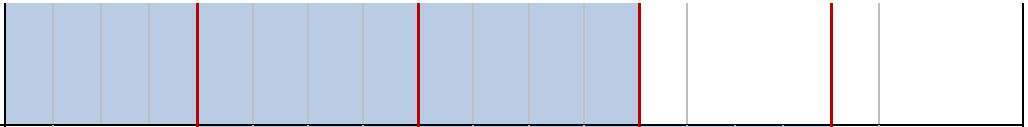
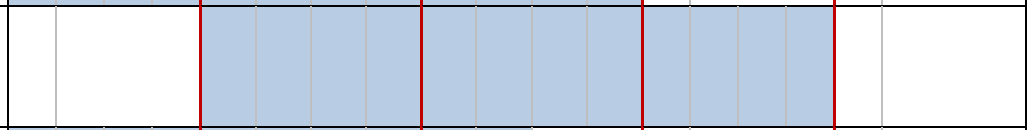
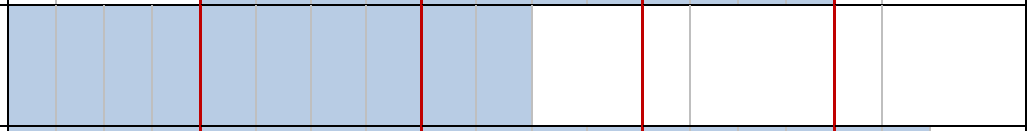
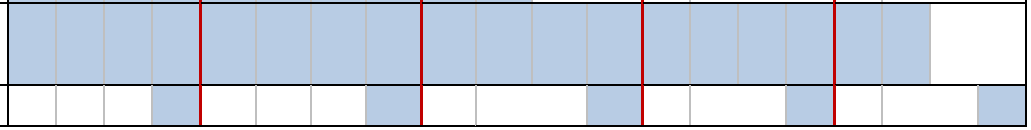
Table 3. Assessment schedule for the IOTC Working Party on Ecosystems and Bycatch (WPEB)

Species/group	2015	2016	2017	2018	2019
Working Party on Ecosystems and Bycatch					
Blue shark	**Full assessment***		Indicators	Revisit ERA	**Full assessment***
Oceanic whitetip shark		Indicators; Review of measures in Res. 13/06	**Full assessment***	Revisit ERA	
Scalloped hammerhead shark		Indicators		Revisit ERA	Indicators
Shortfin mako shark		Indicators		Revisit ERA	
Silky shark	Indicators			Revisit ERA	Indicators
Bigeye thresher shark			Indicators	Revisit ERA	
Pelagic thresher shark		Indicators		Revisit ERA	
Marine turtles	Review of mitigation measures in 12/04		Revisit ERA		Review of mitigation measures in 12/04
Seabirds	Review of mitigation measures in 12/06		Review of mitigation measures in 12/06		Review of mitigation measures in 12/06
Marine Mammals					

Including data poor stock assessment methods*

Table 4: Proposed timeline for the development of the high priority research projects.

		Year 1 - 2015				Year 2 - 2016				Year 3 - 2017				Year 4 - 2018				Year 5 - 2019			
Project	**Task**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Fisheries and data collection	Capacity building of fisheries observers (including the provision of ID guides, training, etc.)																				
	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																				
	Historical data mining for the key species, including the collection of information about catch, effort and spatial distribution of those fleets																				
	Integration of data mining with observer programs to reconstruct species composition and catches of sharks																				
	Reporting to the IOTC WPEB and IOTC SC																				
Biology and ecology	Age and growth studies for the blue (BSH), shortfin mako (SMA) and oceanic whitetip (OCS) sharks	BSH				BSH+SMA+OCS				SMA+OCS				OCS							
	Stock delimitation identification (i.e., tagging and genetics*) for the blue (BSH), shortfin mako (SMA) and oceanic whitetip (OCS) sharks	BSH				BSH+SMA+OCS				SMA+OCS				OCS							
	Migration and habitat use, including identification of hotspots and investigate associated environmental conditions affecting the sharks distribution, and making use of conventional and electronic tagging, for blue (BSH), shortfin mako (SMA) and oceanic whitetip (OCS) sharks			BSH		BSH+SMA				BSH+SMA+OCS				SMA+OCS							
	Post-release mortality (electronic tagging), to assess the efficiency of management resolutions on no retention species (i.e. oceanic whitetip (OCS) and threshers sharks) and shotfin mako (SMA) the most vulnerable species on longline fisheries	SMA				THR				OCS											
	Reporting to the IOTC WPEB and IOTC SC																				

Mitigation measures	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)	
	Gillnet selectivity, to assess the effect of mesh size, hanging ratio and net twine on sharks catches composition (i.e. species and size)	
	Post-release mortality of whale sharks in purse-seine fisheries, to assess the efficiency of the best practice currently set in place	
	Develop guidelines and protocols for safe handling and release of sharks caught on longlines and gillnets fisheries	
	Reporting to the IOTC WPEB and IOTC SC	

* Genetic studies might be integrated in a single study including other IOTC tuna and tuna-like species.

APPENDIX XIX
CONSOLIDATED RECOMMENDATIONS OF THE 10TH SESSION OF THE WORKING PARTY ON ECOSYSTEMS AND BYCATCH

Note: Appendix references refer to the Report of the 10th Session of the Working Party on Ecosystems and Bycatch (IOTC–2014–WPEB10–R)

Meeting participation fund

WPEB10.01 (para. 12) The WPEB **RECOMMENDED** that the Scientific Committee consider revising the MPF rules of procedure, so that a Draft paper be submitted to the relevant Working Party MPF Selection Panel earlier than the current 15 days before the meeting, so that the Panel may review the full paper rather than just the abstract, and provide guidance on areas for improvement and the suitability of the application to receive funding using the MPF. The justification of this request is based upon the reduced funds available and the need to maximise benefits. However, some participants did not want the deadline to be brought earlier than the current 15 day deadline.

Identification cards for shark, seabirds and marine turtles

WPEB10.02 (para. 21) **NOTING** the recent online survey distributed by the IOTC Secretariat, the WPEB strongly **RECOMMENDED** that the IOTC Secretariat ensure that hard copies of the identification cards continue to be printed in hard copy form 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. At this point in time, electronic formats, including 'applications or apps' are only suitable for larger scale vessels, and even in the case of EU purse seine vessels, the use of hard copies is relied upon due to on board fish processing and handling conditions, as well as weather conditions.

Observer trip reporting template

WPEB10.03 (para. 57) The WPEB **RECOMMENDED** that the Scientific Committee **ADOPT** the revised versions of the observer reporting templates (see para. 55 of the WPEB10 Report), consistent with Resolution 11/04 *"…the IOTC Scientific Committee will elaborate an observer working manual, a template to be used for reporting (including minimum data fields) and a training program*".

Assessing the need for an NPOA

WPEB10.04 (para. 65) The WPEB **RECOMMENDED** the following process should be followed by CPCs when requesting the IOTC Secretariat apply 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: http://iotc.org/science/table-progress-implementing-npoa-sharks-npoa-seabirds-and-fao-guidelines-reduce-sea-turtle-mortality

- 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 (available at: http://54.247.127.44/marineIBAs/default.html), 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.

Review of data needs and way forward for the evaluation of shark stocks - catch data reconstruction

WPEB10.05 (para. 174) The WPEB **RECOMMENDED** a short inter-sessional meeting is conducted with a small group of scientists to work mainly on blue shark catch data reconstruction to be used for stock assessment in 2015.

Resolution 11/04 ***on a regional observer program***

WPEB10.06 (para. 211) **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* makes no reference to the data collected not being used for compliance purposes, the WPEB **RECOMMENDED** that at the next revision of Resolution 11/04, it be clearly stated that the data collected shall not be used for compliance purposes.

Revision of the WPEB Program of Work 2015–2019

WPEB10.07 (para. 249) The WPEB **RECOMMENDED** that the SC consider and endorse the WPEB Program of Work (2015–2019), as provided at Appendix XVIII.

Development of priorities for an Invited Expert/s at the next Working Party on Ecosystems and Bycatch meeting

WPEB10.08 (para. 252) The WPEB **RECOMMENDED** that an Invited Expert be brought to the WPEB in 2015 so as to further increase the capacity of the WPEB to undertake work on sharks, and for this to be included in the IOTC budget for 2015.

Consolidated recommendations of the 10th Session of the Working Party on Ecosystems and Bycatch

WPEB10.09 (para. 256) The WPEB **RECOMMENDED** that the Scientific Committee consider the consolidated set of recommendations arising from WPEB10, provided at Appendix XIX, as well as the management advice provided in the draft resource stock status summary for each of the seven shark species, as well of those for marine turtles and seabirds:

Sharks

- Blue sharks (*Prionace glauca*) – Appendix IX
- Oceanic whitetip sharks (*Carcharhinus longimanus*) – Appendix X
- Scalloped hammerhead sharks (*Sphyrna lewini*) – Appendix XI
- Shortfin mako sharks (*Isurus oxyrinchus*) – Appendix XII
- Silky sharks (*Carcharhinus falciformis*) – Appendix XIII
- Bigeye thresher sharks (*Alopias superciliosus*) – Appendix XIV
- Pelagic thresher sharks (*Alopias pelagicus*) – Appendix XV

Other species/groups

- Marine turtles – Appendix XVI
- Seabirds – Appendix XVII