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IOTC–2011–WPEB07–R[E]

Report of the Seventh Session of the IOTC Working Party on Ecosystems and Bycatch

Lankanfinolhu, North Malé Atoll, Republic of Maldives,
24–27 October 2011

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EXECUTIVE SUMMARY

The Seventh Session of the Indian Ocean Tuna Commission's (IOTC) Working Party on Ecosystems and Bycatch (WPEB) was held in Lankanfinolhu, North Malé Atoll, Paradise Island Resort and Spa, Republic of Maldives, from 24 to 27 October 2011. A total of 49 participants attended the Session, including two invited experts, Dr. Evgeny Romanov (CAPRUN-ARDA, La Réunion) and Dr. Enric Cortes (NMFS-NOAA USA). The following are a subset of the complete recommendations from the WPEB07 to the Scientific Committee, which are provided at (Appendix IV).

Sharks

The WPEB **NOTED** that the best way to reduce or avoid the practice of shark finning in the IOTC area, to encourage full utilisation, to ensure accurate catch statistics, and to facilitate the collection of biological information, would be to land all sharks with fins attached (which includes partially cut and folded). The majority of the WPEB **RECOMMENDED** such action be achieved through the replacement of IOTC Resolution 05/05 (5% shark fin:body weight ratio). However, the WPEB **NOTED** that such a recommendation would have practical implementation issues for some fleets and may degrade the quality of the product. The WPEB further **RECOMMENDED** that all CPCs strive to obtain and maintain the best possible data, including improved species identification. (para.154)

Recognizing the general lack of shark data being recorded and reported to the IOTC Secretariat, the WPEB **RECOMMENDED** that: (para.161)

- Resolution 10/02 is revised in order to include the list of most commonly caught elasmobranch species (Table 2) for which nominal catch data shall be reported as part of the statistical requirement for IOTC CPCs.
- that the list of shark species to be recorded in logbooks for all gears be modified as in Table 3.

Seabirds

Taking into account the information presented in working papers IOTC–2011–WPEB07–43, IOTC–2011–WPEB07–44 and IOTC–2011–WPEB07–54, the WPEB **AGREED** that a combination of weighted branchlines, bird scaring lines and night setting is best practice mitigation in reducing bycatch of seabirds to the lowest possible level in pelagic longline fisheries. The WPEB **RECOMMENDED** that Resolution 10/06 be amended to reflect this advice, and to incorporate the technical specifications outlined in the paragraphs above (paras. 203, 206, 208). (para.209)

The WPEB strongly **RECOMMENDED** that the Resolution 10/06 be amended in order to make the reporting of seabird interactions mandatory for vessels fishing for species under the IOTC mandate. In addition and as a matter of consistency, to increase the reporting of these interactions, the WPEB further **RECOMMENDED** that the recording of interactions with seabirds be included in the minimum requirements for logbooks for all fleets. (para.221)

MANAGEMENT ADVICE ON THE STATUS OF SHARKS, SEABIRDS AND MARINE TURTLES

Sharks

Blue sharks

The WPEB **RECOMMENDED** the following management advice for blue sharks in the Indian Ocean, for the consideration of the Scientific Committee: (para.170)

> ***Stock status.*** The current IUCN threat status of 'Near Threatened' applies to blue sharks globally (Table 4). There is a paucity of information available on this species and this situation is not expected to improve in the short to medium term. There is no quantitative stock assessment and limited basic fishery indicators currently available for blue shark in the Indian Ocean therefore the stock status is highly uncertain. 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 (16–20 years), mature at 4–6 years, and have relativity few offspring (25–50 pups every year), the blue shark is vulnerable to overfishing. Blue shark assessments in the Atlantic and Pacific oceans seem to indicate that blue shark stocks can sustain relatively high fishing pressure.

Oceanic whitetip sharks

The WPEB **RECOMMENDED** the following management advice for oceanic whitetip sharks in the Indian Ocean, for the consideration of the Scientific Committee: (para.171)

> ***Stock status.*** The current IUCN threat status of 'Vulnerable' applies to oceanic whitetip sharks globally

(Table 5). There is a paucity of information available on this species and this situation is not expected to improve in the short to medium term. 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 highly uncertain. 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 vulnerable to overfishing. Despite the lack of data, it is apparent from the information that is available that oceanic whitetip shark abundance has declined significantly over recent decades.

Scalloped hammerhead sharks

The WPEB **RECOMMENDED** the following management advice for scalloped hammerhead sharks in the Indian Ocean, for the consideration of the Scientific Committee: (para.172)

Stock status. The current IUCN threat status of 'Endangered' applies to scalloped hammerhead sharks globally and specifically for the western Indian Ocean (Table 6). There is a paucity of information available on this species and this situation is not expected to improve in the short to medium term. 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 highly uncertain. Scalloped hammerhead sharks are commonly taken by a range of fisheries in the Indian Ocean. They are extremely vulnerable to gillnet fisheries. Furthermore, pups occupy shallow coastal nursery grounds, often heavily exploited by inshore fisheries. Because of their life history characteristics – they are relatively long lived (over 30 years), and have relativity few offspring (<31 pups each year), the scalloped hammerhead shark is vulnerable to overfishing.

Shortfin mako sharks

The WPEB **RECOMMENDED** the following management advice for shortfin mako sharks in the Indian Ocean, for the consideration of the Scientific Committee: (para.173)

Stock status. The current IUCN threat status of 'Vulnerable' applies to shortfin mako sharks globally (Table 7). There is a paucity of information available on this species and this situation is not expected to improve in the short to medium term. There is no quantitative stock assessment or basic fishery indicators currently available for shortfin mako shark in the Indian Ocean therefore the stock status is highly uncertain. Shortfin mako sharks are commonly taken by a range of fisheries in the Indian Ocean. Because of their life history characteristics – they are relatively long lived (over 30 years), females mature at 18–21 years, and have relativity few offspring (<25 pups every two or three years), the shortfin mako shark is vulnerable to overfishing.

Silky sharks

The WPEB **RECOMMENDED** the following management advice for silky sharks in the Indian Ocean, for the consideration of the Scientific Committee: (para.174)

Stock status. The current IUCN threat status of 'Near Threatened' applies to silky sharks in the western and eastern Indian Ocean and globally (Table 8). There is a paucity of information available on this species and this situation is not expected to improve in the short to medium term. There is no quantitative stock assessment or basic fishery indicators currently available for silky shark in the Indian Ocean therefore the stock status is highly uncertain. 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 at 6–12 years, and have relativity few offspring (<20 pups every two years), the silky shark is vulnerable to overfishing. Despite the lack of data, it is clear from the information that is available that silky shark abundance has declined significantly over recent decades.

Bigeye thresher sharks

The WPEB **RECOMMENDED** the following management advice for bigeye thresher sharks in the Indian Ocean, for the consideration of the Scientific Committee: (para.175)

Stock status. The current IUCN threat status of 'Vulnerable' applies to bigeye thresher shark globally (Table 9). There is a paucity of information available on this species and this situation is not expected to improve in the short to medium term. 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 highly uncertain. 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 9-13 years, and have few offspring (2-4 pups every year), the bigeye thresher shark is vulnerable to overfishing.

Pelagic thresher sharks

The WPEB **RECOMMENDED** the following management advice for pelagic thresher sharks in the Indian Ocean, for the consideration of the Scientific Committee: (para.176)

> ***Stock status.*** The current IUCN threat status of 'Vulnerable' applies to pelagic thresher shark globally (Table 10). There is a paucity of information available on this species and this situation is not expected to improve in the short to medium term. 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 highly uncertain. 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.

Seabirds

The WPEB **RECOMMENDED** the following management advice for seabirds in the Indian Ocean, for the consideration of the Scientific Committee: (para.222)

> ***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 12. 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 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 assessments 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.

Marine turtles

The WPEB **RECOMMENDED** the following management advice for marine turtles in the Indian Ocean, for the consideration of the Scientific Committee: (para.247)

> ***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 13. 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 and to a lesser extent purse seine fishing and longline is not known.

Other issues

Noting that depredation has been reported to be high in some areas of the Indian Ocean (e.g. 19% in the Seychelles longline fishery: IOTC–2011–WPB09–R), which is much higher than in other regions of the Indian Ocean and would lead to bias in the CPUE series, the WPEB **RECOMMENDED** that the main longline fleets in the Indian Ocean (Taiwan,China, Japan, Indonesia, EU,Spain, EU,Portugal) carry out research and monitoring programs aimed at determining the level of depredation in a range of areas and under different fishing conditions, and for the results to be presented at the next session of the WPEB. (para.269)

The WPEB **RECOMMENDED** that the Commission agree for a new position to be created at the IOTC Secretariat (Fishery Officer), with duties to focus on bycatch issues. (para.288)

The WPEB **RECOMMENDED** that the Scientific Committee note the re-elected Chair (Dr. Charles Anderson) and Vice-Chair (Dr. Evgeny Romanov) of the WPEB for the next *biennium*. (para.298)

1. OPENING OF THE MEETING

1. The Seventh Session of the Indian Ocean Tuna Commission's (IOTC) Working Party on Ecosystems and Bycatch (WPEB) was held in Lankanfinolhu, North Malé Atoll, Paradise Island Resort and Spa, Republic of Maldives, from 24 to 27 October 2011. A total of 49 participants attended the Session. The list of participants is provided at Appendix I.

2. The meeting was opened on 24 October, 2011 by the Chair, Dr. Charles Anderson, who subsequently welcomed participants to the Republic of Maldives. The Chair informed participants that his first term as Chair of the WPEB was due to expire at the end of the current meeting and also that the position of Vice-Chair was currently vacant. The Chair indicated that participants should consider potential nominees for these two positions throughout the meeting, before electing individuals to these posts for the next biennium prior to the close of the meeting.

2. ADOPTION OF THE AGENDA

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

3. OUTCOMES OF THE THIRTEENTH SESSION OF THE SCIENTIFIC COMMITTEE

4. The WPEB **NOTED** paper IOTC–2011–WPEB07–03 which outlined the main outcomes of the Thirteenth Session of the Scientific Committee, specifically related to the work of the WPEB.

5. The WPEB **NOTED** the recommendations of the Thirteenth Session of the Scientific Committee on data and research related to ecosystems and bycatch, thanked the IOTC Secretariat for producing this useful paper, and agreed to consider how best to progress these issues at the present meeting.

4. OUTCOMES OF THE FIFTEENTH SESSION OF THE COMMISSION

6. The WPEB **NOTED** paper IOTC–2011–WPEB07–04 which outlined the main outcomes of the Fifteenth Session of the Commission, specifically related to the work of the WPEB.

7. The WPEB **NOTED** the Commission's request that an Ecological Risk Assessment (ERA) approach be applied to the various shark species considered at risk by fishing activities in the Indian Ocean, and for the WPEB to undertake appropriate analyses under the guidance of relevant experts.

8. The WPEB **NOTED** the outcomes of the Fifteenth Session of the Commission, thanked the IOTC Secretariat for producing this useful paper, 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 meeting.

5. UPDATE ON THE KOBE PROCESS

9. The WPEB **NOTED** paper IOTC–2011–WPEB07–05 which provided an update on the outcomes of the First Meeting of the Bycatch Joint Technical Working Group (BJTWG).

10. The WPEB **NOTED** that the Kobe process is not a decision making forum, but rather, that all recommendations are for discussion and decision by individual tuna Regional Fisheries Management Organisation (RFMO).

11. The WPEB **NOTED** paper IOTC–2011–WPEB07–06 which provided an update on the outcomes of the third joint meeting of the tuna RFMOs (KOBE III), which was held in La Jolla, California (USA) from 11–15 July 2011.

12. The WPEB **RECOMMENDED** that the Secretariat maintain its involvement in the KOBE process and to lead and/or facilitate the IOTCs involvement with the BJTWG.

13. **NOTING** the recommendation of the first BJTWG meeting and the KOBE II and III meetings, that an additional staff member be hired at each tuna RFMO to deal with bycatch issues, the WPEB **RECOMMENDED** that a Fisheries Officer be employed at the IOTC Secretariat to focus on issues that include bycatch.

6. PROGRESS ON THE RECOMMENDATIONS OF WPEB06

14. The WPEB **NOTED** paper IOTC–2011–WPEB07–07 which provided an update on the progress made in implementing the recommendations from previous WPEB meetings, and also provided alternative recommendations for the consideration and potential endorsement by participants.

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

16. The WPEB **AGREED** that the Chair of the WPEB and the IOTC Secretariat should continue to develop this document each year prior to the WPEB meeting, and to include in the table, any comments from the Scientific Committee and the Commission relevant to specific recommendations.

7. REVIEW OF DATA AVAILABLE ON ECOSYSTEMS AND BYCATCH

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

17. The WPEB **NOTED** paper IOTC–2011–WPEB07–08 which reviewed the status of the information available on non-targeted species associated with IOTC fisheries, in the databases at the IOTC Secretariat as of September 2011.

Data and reporting requirements

18. The WPEB **NOTED** each of the IOTC Resolutions relevant to bycatch species (notably Resolutions 05/05, 10/12, and 10/02 dealing with sharks, Resolution 10/06 on seabirds and Resolution 09/06 on marine turtles), including the data and reporting requirements (Table 1).
    - Sharks: Contracting and non-Contracting Cooperating Parties (CPCs) are required to collect and report the same information as is collected and reported for tuna and tuna-like species (catch, effort and size frequency).
    - Marine turtles: CPCs should collect and report information on the numbers of animals caught, where possible by species.
    - Seabirds: CPCs should report any information available on interactions.

TABLE 1. IOTC data collection and reporting requirements for non-target species.

Sharks	
IOTC Resolution 05/05: *Concerning the conservation of sharks caught in association with fisheries managed by IOTC*	Paragraph 1: CPCs shall annually report data for catches of sharks, in accordance with IOTC data reporting procedures, including available historical data.
IOTC Resolution 10/02: *Mandatory statistical requirements for IOTC Members and Cooperating Non-Contracting Parties (CPC's)*	Paragraph 3: The provisions, applicable to tuna and tuna-like species, shall also be applicable to the most commonly caught shark species and, where possible, to the less common shark species.
IOTC Resolution 10/12: *On the conservation of THRESHER SHARKS (family Alopiidae) caught in association with fisheries in the IOTC area of competence*	Paragraph 1: This measure shall apply to all fishing vessels on the IOTC Record of authorised Vessels. Paragraph 4: CPCs shall encourage their fishermen to record incidental catches as well as live releases. These data will be then kept at the IOTC secretariat. Paragraph 7: The Contracting Parties, Co-operating non-Contracting Parties, especially those directing fishing activities for sharks, shall submit data for sharks, as required by IOTC data reporting procedures (including estimates of dead discard and size frequencies), in advance of the 2011 Scientific Committee meeting.
Seabirds	
IOTC Resolution 10/06: *On reducing the incidental bycatch of seabirds in longline fisheries*	Paragraph 7: CPCs shall provide to the Commission, as part of their annual reports, all available information on interactions with seabirds, including bycatch by fishing vessels carrying their flag or authorised to fish by them. This is to include details of species where available to enable the Scientific Committee to annually estimate seabird mortality in all fisheries within the IOTC area of competence.
IOTC Resolution 10/02: *Mandatory statistical*	Paragraph 3: …..The provisions, applicable to tuna and tuna-like

requirements for IOTC Members and Cooperating Non-Contracting Parties (CPC's)	species, shall also be applicable to the most commonly caught shark species and, where possible, to the less common shark species. CPCs are also encouraged to record **and provide data on species other than sharks and tunas taken as bycatch.**
Marine turtles IOTC Resolution 09/06: *On Marine Turtles*	Paragraph 2: CPCs shall collect (including through logbooks and observer programs) and provide to the Scientific Committee all data on their vessels' interactions with marine turtles in fisheries targeting the species covered by the IOTC Agreement. CPCs shall also furnish available information to the Scientific Committee on successful mitigation measures and other impacts on marine turtles in the IOTC Area, such as the deterioration of nesting sites and swallowing of marine debris.
IOTC Resolution *10/02*: *Mandatory statistical requirements for IOTC Members and Cooperating Non-Contracting Parties (CPC's)*	Paragraph 3: ….The provisions, applicable to tuna and tuna-like species, shall also be applicable to the most commonly caught shark species and, where possible, to the less common shark species. CPCs are also encouraged to record **and provide data on species other than sharks and tunas taken as bycatch.**
Marine mammals IOTC Resolution 10/02: *Mandatory statistical requirements for IOTC Members and Cooperating Non-Contracting Parties (CPC's)*	Paragraph 3: ….The provisions, applicable to tuna and tuna-like species, shall also be applicable to the most commonly caught shark species and, where possible, to the less common shark species. CPCs are also encouraged to record **and provide data on species other than sharks and tunas taken as bycatch.**

19. The WPEB **NOTED** the inconsistent use of the term 'Bycatch' within and among tuna RFMOs. The WPEB **AGREED** that in the context of the IOTC, the WPEB has been using the term bycatch for all those species caught in IOTC fisheries other than the sixteen species of tuna and tuna-like species that are listed in the IOTC Agreement.

20. The WPEB **RECOMMENDED** that the Scientific Committee and the Commission considers the need to develop and agree to a set of definitions for the most commonly used scientific terms in IOTC Resolutions.

21. The WPEB **NOTED** that some of the wording used in the range of IOTC Resolutions relating to bycatch, including provisions for the reporting of data on sharks are vague. In particular the WPEB **NOTED** the lack of clarity about the species that are covered by the term '*most commonly caught shark species'*, used in IOTC Resolution 10/02. In this regard, the WPEB **RECOMMENDED** that the Scientific Committee considers proposing amendments to IOTC Resolutions 05/05 and 10/02 as follows:
    - Resolution 05/05 *Concerning the conservation of sharks caught in association with fisheries managed by IOTC*:
        i. **Existing** text para.11: This resolution applies only to sharks caught in association with fisheries managed by the IOTC.
        ii. **Proposed** text para.11: This resolution applies to sharks caught in association with IOTC fisheries and any other fisheries for sharks.
    - Resolution 10/02 *Mandatory statistical requirements for IOTC Members and Cooperating non-Contracting Parties (CPC'S)*:
        i. **Existing** text para.2: *Nominal catch data: Estimates of the total annual catch by species and gear for all species under the IOTC mandate.*
        ii. **Proposed** text para.2: *Nominal catch data: Estimates of the total annual catch by species and gear for all species under the IOTC mandate and most commonly caught shark species, as agreed by the IOTC Scientific Committee.*
        iii. **Existing** text at the end of para.3: *These provisions, applicable to tuna and tuna-like species, shall also be applicable to the most commonly caught shark species and, where possible, to the less common shark species. CPC's are also encouraged to record and provide data on species other than sharks and tunas taken as bycatch.*
        iv. **Proposed** text to be moved to the end of para.4: *These provisions are applicable to all IOTC species and shall also be applicable to other species covered in IOTC measures establishing minima requirements for operational catch-and-effort data*

(logbook data). CPC's are also encouraged to record and provide data on species other than sharks and tunas taken as bycatch.

Sharks

22. The WPEB **RECOMMENDED** that the Scientific Committee note the status of catch statistics for the main species of sharks, by major fisheries (gears), for the period 1950–2010, as provided in Appendix V: Tables a–c. Although some CPCs have reported more detailed data on sharks in recent years, including time-area catches and effort, and length frequency data for the main commercial shark species, the WPEB expressed strong **CONCERN** that the information on retained catches and discards of sharks contained in the IOTC database remains very incomplete.

23. The WPEB **NOTED** that records of discards of sharks and catches by shark species are not available from most fleets and periods. Also for all fleets, historical data series, necessary to undertake formal stock assessments, are missing or highly incomplete. Size frequency data have been reported only for some fisheries in recent years, and biological data, such as fin-body ratio by species, are still largely missing.

24. Noting that the information on retained catches and discards of sharks contained in the IOTC database remains very incomplete for most fleets, and that catch-and-effort as well as size data are essential to assess the status of shark stocks, the WPEB **RECOMMENDED** all CPCs to collect and report catches of sharks (including historical data), landings and biological data on sharks so that more detailed analysis can be undertaken for the next WPEB meeting.

25. The WPEB **NOTED** the improved data being submitted for sharks by Taiwan,China and Japan in recent years.

Seabirds and marine turtles

26. The WPEB **NOTED** that for seabirds and marine turtles, there is no information available in the IOTC Secretariat's databases for most longline and gillnet fleets that operate in the Indian Ocean, although some new information on seabirds was presented during the current meeting.

Marine mammals

27. The WPEB **NOTED** that data on marine mammals was not covered in the document presented by the IOTC Secretariat as the Commission does not have any mandatory requirements for data collection and reporting, and therefore no data on marine mammals caught as bycatch in the fisheries targeting tuna and tuna-like species in the Indian Ocean has been submitted by CPCs. However, some new data on marine mammal bycatch in longline fisheries was presented during the current meeting.

28. The WPEB **RECOMMENDED** that data on marine mammal interactions with IOTC fisheries are collected and reported by CPCs to the IOTC Secretariat.

Summary discussion

29. The WPEB **AGREED** that the paucity of data held by the IOTC Secretariat on the bycatch species and species groups makes any attempt to estimate levels of bycatch very difficult, if not impossible.

30. The WPEB **RECOMMENDED** that the Scientific Committee note that despite the adoption of IOTC Resolutions 05/05 and 08/01, recently superseded by Resolution 10/02, the levels of reporting of data on sharks and other bycatch species remains very poor and prevents useful analyses of that data.

31. The WPEB **NOTED** that to date, many countries have not reported bycatch data, and urged all countries to make the necessary arrangements for bycatch data to be collected and reported to the IOTC as soon as possible. The WPEB recalled the value of reporting to the IOTC Secretariat all information on tuna fisheries bycatch collected during national programs and encouraged contracting parties to initiate such programs. Summarised bycatch estimates are valuable, but original data as per IOTC standards are required. 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.

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

33. The WPEB **RECOMMENDED** that the actions outlined in Appendix VII should be undertaken by each CPC to improve the standing of the data on sharks, seabirds, marine turtles and marine mammals currently available at the IOTC Secretariat. In general, these recommendations are made over and above the existing obligations and technical specifications relating to the reporting of data.

34. 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 organizations, the WPEB **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 this regard, the WPEB **RECOMMENDED** that the Scientific Committee considers presenting a proposal to the Commission for this activity, including a budget.

35. Noting the need to provide advice to the Commission concerning the status of the most commonly caught species of sharks in the Indian Ocean, the WPEB **AGREED** on the need to explore the shark data presently available at the IOTC Secretariat, and to determine if that data can be used to derive total estimates of shark catches for each species. Noting that additional resources will be required to carry out this activity, the WPEB **RECOMMENDED** that the Commission consider increasing the staff of the IOTC Secretariat to incorporate a new Fisheries Officer post to work on bycatch issues.

36. Noting that despite the mandatory reporting requirements detailed in Resolutions 05/05, 08/04, 09/06, 10/02, 10/03, and 10/06, bycatch data remain largely unreported by CPCs, the WPEB **RECOMMENDED** that the Scientific Committee address these concerns to the Compliance Committee and the Commission in order for them to take steps to develop mechanisms which would ensure that CPCs fulfill their bycatch reporting obligations.

Standing of CPC bycatch data reporting

37. The WPEB **NOTED** paper IOTC–2011–WPEB07–55 which summarised the standing of CPCs reporting bycatch data as per IOTC Conservation and Management Measures, including the following abstract provided by the authors:

> "*Since 1998, the IOTC has adopted 8 Conservation and Management Measures (7 Resolutions and 1 Recommendation) regarding the recording and reporting of bycatch data in fisheries targeting tuna and tuna-like species in the IOTC area of competence. Four of these CMMs are general measures on the recording and reporting of catch, catch and effort and size frequency data data and the remaining four are CMMs specific to some bycatch group, i.e. sharks, marine turtle and seabirds. Most of these CMMs do not specify at what level of resolution the information should be recorded and reported to the Secretariat and as a result to not ensure that data are collected and reported in a way that they could be used to assess the status of these resources. As a result of the adoption of these CMMs, limited data has been submitted and is available at the Secretariat, however not always with a specific and spatial distribution that would allow scientific analyses*."

38. The WPEB **NOTED** that the level of reporting of bycatch data as per IOTC Conservation and Management Measures (CMMs) by CPCs is limited (Appendix VIII), and **AGREED** that the current set of IOTC CMMs does not provide the necessary framework to ensure that CPCs collect and report data on bycatch. Therefore, the status of shark resources and the impact of incidental catches by fishing vessels targeting tuna and tuna-like species in the IOTC area on marine turtles and seabirds cannot be determined.

39. The WPEB **RECOMMENDED** that the Working Party on Data Collection and Statistics (WPDCS) review the data to be recorded in logbooks by fishing vessels in the IOTC area of competence as well as the mandatory statistical data to be reported (Resolution 10/02 *mandatory statistical requirements for IOTC Members and Cooperating non-Contracting Parties*), and in particular on the list of shark species for which catch, catch and effort and size data should be recorded and reported.

40. The WPEB **RECOMMENDED** that the current IOTC Resolution 05/05 *Concerning the conservation of sharks caught in association with fisheries managed by IOTC*, is strengthened to ensure that CPCs report annually on the nominal catches, catch and effort and size data for shark species identified by the WPDCS.

41. The WPEB **RECOMMENDED** that current IOTC Resolution 09/06 *on Marine Turtles* and Resolution 10/06 *On Reducing the Incidental Bycatch of Seabirds in Longline Fisheries* are strengthened to ensure that CPCs report annually on the level of incidental catches of marine turtles and seabirds by species.

42. The WPEB **RECOMMENDED** that the current IOTC Resolution 08/04 *concerning the recording of catch by longline fishing vessels in the IOTC area*, Resolution 10/03 *concerning the recording of catch by fishing vessels in the IOTC area* and Resolution 10/02 *mandatory statistical requirements for IOTC members and cooperating non-contracting parties* be amended in order to include a clear list of shark and marine turtle species or group of species, that should be recorded and reported to the IOTC Secretariat as per the IOTC requirements for target species.

7.2 Data from other sources

Regional Observer Scheme

43. The WPEB **NOTED** paper IOTC–2011–WPEB07–09 which provided an update on the Regional Observer Scheme (ROS), including the following abstract provided by the authors:

> "*At its 13th Session, the Commission adopted Resolution 09/04* on a Regional Observer Scheme, *which was superseded in 2010, and again in 2011 by Resolution 11/04* on a Regional Observer Scheme. *This resolution makes provision for national observer scheme to be implemented in all CPCs in order to cover at least 5 % of the number of operations/sets for each gear type by the fleet of each CPC while fishing in the IOTC Area of competence of 24 meters overall length and over, and under 24 meters if they fish outside their EEZs. In 2010, the Scientific Committee endorsed an Observer Manual, a set of observer forms and an Observer Trip Report Template that included minimum data requirements developed by a workshop that took place in May 2010, as well as the recommendation from the workshop that CPCs shall send to the Secretariat a list of their accredited observers participating into the ROS. However, the Scientific Committee noted concerns of some CPCs and requested that these concerns be addressed at the next Session of the WPDCS in 2012. While the ROS started in July 2010, only 4 CPCs have send a list, or partial list, of accredited observers, and only 1 trip report has been sent to the Secretariat."*

44. The WPEB **NOTED** the update of the implementation of the Regional Observer Scheme (Appendix IX) and **EXPRESSED** its disappointment on the very low level of reporting to the IOTC Secretariat, which undermined any progress in the work requested by the Commission.

45. The WPEB **NOTED** the Scientific Committee's recommendation in 2010 which states that *"the SC endorsed the recommendation of the technical workshop that a list of accredited scientific observers should be submitted to the Secretariat and recommended that CPCs do so within the best delays"* (para.244, SC13), and **RECOMMENDED** that all IOTC CPCs submit a list of accredited observers to be deployed under the framework of the Regional Observer Scheme before the 14th Session of the Scientific Committee, and for this recommendation to be communicated to all CPCs by the Secretariat.

46. The WPEB **RECOMMENDED** that IOTC CPCs report on the annual level of observer and sampling coverage on their fleets since 1st July 2010 at the next Session of the Scientific Committee. CPCs should emphasize the problems and difficulties met in implementing their observer programme and propose corrective actions that they intend to take in order to comply with Resolution 11/04.

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

48. The WPEB **NOTED** that piracy in the western Indian Ocean has resulted in the halting of the European observer program in that area since July 2008.

Observer programs in RFMOs

49. The WPEB **NOTED** paper IOTC–2011–WPEB07–42 which provided a discussion of observer programs in RFMOs, including the following abstract provided by the authors:

"*As of 2011, all five tuna commissions (tRFMOs) have established some form of „regional observer program" (ROP) covering both purse seine and longline fleets. However, significant differences exist between the tRFMO ROPs, and major elements of the IOTC Resolution need to be strengthened if this program is to be effective. In particular:*

(i) No raw data from the IOTC ROP are currently being submitted to the IOTC Secretariat. In contrast, submission of ROP data (as opposed to Trip Reports) is mandatory by WCPFC (and IATTC, in relation large purse seine vessels).

(ii) IOTC CPCs should establish that in general there are few practical confidentiality impediments to the submission of data collected through the ROP to the Secretariat. Data confidentiality standards are well established within the framework of IOTC resolutions. These should be reiterated and clarified in terms of how the Secretariat and subsidiary bodies of the Commission can make use of ROP data, and when data from an individual vessel legitimately represents a concern to national or commercial interests.

(iii) Resolution 11/04 should be revised to include a requirement for mandatory submission of data collected under the auspices of the Resolution, as is currently required in other tRFMOs. The role of the Secretariat in managing the implementation of this resolution must be strengthened.

(iv) Progress in implementation of the ROPs, and in data reporting, will fundamentally require a funded program of capacity building work with CPCs."

50. The WPEB **ACKNOWLEDGED** that the availability of higher resolution (operational data) scientific observer data for scientific purposes would be highly advantageous to studies examining the impacts of IOTC fisheries on bycatch species. However, the WPEB **NOTED** that the availability of such detailed observer data would raise some confidentiality issues as well as technical ones due to the specificity of the data and their generally low coverage.

51. The WPEB **AGREED** that the best quality observer data should be collected, following the requirements endorsed by the Scientific Committee, and are maintained by the IOTC CPCs, and that this data shall be available upon request for joint specific analysis.

52. The WPEB **ENCOURAGED** that this data are maintain at the finest possible level, and could be submitted to the IOTC Secretariat (for backup purposes) which would be subject to the data confidentiality rules as defined in Resolution 98/02 *data confidentiality policy and procedures*.

53. The WPEB **ENCOURAGED** all CPCs to maintain scientific observer databases at the finest possible levels, and for CPCs with these databases to provide the IOTC Secretariat with lists and descriptions of the datasets held, so that other CPCs may become aware of the data available from other CPCs for potential collaborative analysis of such fine scale data.

54. The WPEB **AGREED** that once data from national observer programs increases and are submitted to the IOTC Secretariat, as required in Resolution 11/04 *on a Regional Observer Scheme*, it shall be entered and maintained in a database at the IOTC Secretariat, noting that analyses of this data and coordination could be undertaken by a Fisheries Officer at the Secretariat. The WPEB also **NOTED** that future collaborative studies and analyses at fine scale resolution would be facilitated by the definition of an adequate exchange format for observer data.

55. The WPEB **RECOMMENDED** that, in addition to the implementation of the Regional Observer Scheme, the collection of scientific data by all other means available including auto-sampling (collection of data by trained crew) and electronic monitoring (sensors and video cameras) be encouraged and developed, and for CPCs to report on progress at the next WPEB meeting.

56. Noting paragraph 14 of Resolution 11/04 *on a Regional Observer Scheme* which states that "*The funds available from the IOTC balance of funds may be used to support the implementation of this programme in developing States, notably the training of observers and field samplers*", and that the IOTC Secretariat has hired a consultant to carry out an evaluation of the data collection and reporting capabilities of a number of developing coastal state CPCs, the WPEB **RECOMMENDED** that the IOTC Secretariat facilitate the training of observers and field samplers according to the IOTC Regional Observer Scheme Manual and Observer Trip Report Template.

Bycatch and discards – EU,France

57. The WPEB **NOTED** paper IOTC–2011–WPEB07–23 which provided an overview of bycatch and discards from the EU,France purse seine fishery, including the following abstract provided by the authors:

"*The observer program for the French tropical tuna purse seine fishery started in December 2005 under the scientific responsibility of the Institut de Recherche pour le Développement. The observer sampling coverage covered 4.3% of the fishing trips during the 2005-2010 period with piracy threat limiting the boarding of observers since mid-2009. Using bycatch ratios with tuna fisheries production as previously estimated for the European purse seine fishery, estimates for the French fleet component are presented and discussed for the 2003-2010 period.*"

58. The WPEB **NOTED** that, on purse seiners, up to 27% of sharks maybe sorted and discarded on the upper deck, in particular large individuals. Specific instructions are given to the observers in the European Union observer program to sample exhaustively discards from the upper deck, but, it is agreed that this component of the discards may be under estimated by observers that are sampling from the lower deck.

59. The WPEB further **NOTED** that this could be estimated through the deployment of video monitoring system on the upper deck, however, the WPEB **RECOMMENDED** that intensive sampling with two observers are conducted, whenever possible, in order to better evaluate this potential bias and to report progress and findings to the next WPEB meeting.

60. The WPEB **NOTED** that when marine turtles or marine mammals were encircled by the EU purse seiners, they generally escape unharmed, as documented during the previous session of the WPEB.

7.3 Develop recommendations to the Scientific Committee

61. Noting the increasing workload of the IOTC Secretariat regarding bycatch issues, including requests from the Commission, the WPEB **RECOMMENDED** that an additional Fishery Officer be hired to handle a range of issues related to bycatch, including those from the Commission relating to ecosystems and bycatch issues.

62. The WPEB **RECOMMENDED** that the current Resolution 98/02 *on data confidentiality policy and procedures* be considered for revision by the Commission to incorporate the specifics of the Regional Observer Scheme.

63. The WPEB **NOTED** that some developing and coastal CPCs are experiencing difficulties in developing their national observer programme, as part of the ROS as specified in Resolution 11/04 *on a Regional Observer Scheme*, due to a number of factors including financial and human resource constraints, and **SUGGESTED** the issue be raised at the Scientific Committee. However, the WPEB did not support any decrease of the 5% observer coverage set out in the provision of the resolution.

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

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

Circle hook symposium

64. The WPEB **NOTED** paper IOTC–2011–WPEB07–10 which provided an overview of the outcomes of the International Symposium on Circle Hook held in the USA, from May 4–6, 2011, including the following abstract provided by the authors:

"*At the 15th Session of the Commission, the Commission recommended that the Secretariat attend the 2011 International Symposium on Circle Hooks that was organized by the National Oceanic and Atmospheric Administration (NOAA) in May 2011 in Miami, USA: "*The Commission requests that the Secretariat attend the Circle Hook symposium that will be held in May in Miami and report the key findings to the Scientific Committee.*"(para.42 of the S15 report). Subsequently, one representative from the Secretariat attended the 2011 International Symposium on Circle Hooks in Miami, USA with the aim of gathering key pieces of information for presentation to the WPEB and the Scientific Committee*."

65. The WPEB **NOTED** the outcomes of the 2011 International Symposium on Circle Hooks, which was attended by the Secretariat at the request of the Commission.

66. The WPEB **RECOMMENDED** that the Scientific Committee note that based on the results of the scientific studies presented at the International Symposium on Circle Hooks in 2011, and other research previously presented to the WPEB, the use of circle hooks in longline fisheries:

- is not likely to have a negative effect on the catch rates for most tuna and tuna-like species noting however, that research has shown declines in catch rates of some billfishes and in particular swordfish;
- will increase the proportion of animals being brought alive to the fishing vessel, implying better quality and value for target species and an improved chance of survival for bycatch species which are to be released;
- is likely to significantly reduce the incidental catch of marine turtles and improve the survivorship of hooked marine turtles if handled correctly immediately before, during and after the de-hooking process;
- may reduce the incidental catch of seabirds;
- is likely to result in an increase in catches of sharks when using wire trace, although their use would also result in a reduction in post-release mortality;
- should be combined with the use of monofilament leaders instead of wire leaders, thereby reducing shark catch rates and likely post-bite-off mortality, as the use of circle hooks will result in less gut hooking of sharks.

67. The WPEB **NOTED** that the use of circle hooks in combination with monofilament leaders may reduce the incidental catch and/or post-capture mortality of marine turtles and sharks. The WPEB **ENCOURAGED** their use in all longline vessels targeting tuna and tuna-like species in the IOTC area of competence, in particular for shallow sets, and **ENCOURAGED** further studies on the socio-economic impact of the use of circle hooks in longline fisheries.

68. The WPEB **RECOMMENDED** that all CPCs comply with the requirements of Resolution 09/06 *on Marine Turtles* which states that "*CPCs with longline vessels that fish for species covered by the IOTC Agreement shall: Ensure that the operators of all longline vessels carry line cutters and de-hookers in order to facilitate the appropriate handling and prompt release of marine turtles caught or entangled, and that they do so in accordance with IOTC Guidelines to be developed. CPCs shall also ensure that operators of such vessels are required to carry and use, where appropriate, dip-nets, in accordance with guidelines to be adopted by the IOTC*.", and that the IOTC Secretariat develop guidelines for handling and de-hooking marine turtles caught on longliners, and for these to be distributed to all CPCs before the next WPEB meeting.

69. The WPEB **RECOMMENDED** that further research into the effectiveness of circle hooks adopt a multi-species approach, so as to avoid, as far as possible, promoting a mitigation measure for one bycatch taxon that might exacerbate bycatch problems for other taxa.

70. The WPEB **RECOMMENDED** that the IOTC Secretariat develop an identification guide for hooks used in IOTC fisheries, and to distribute the guide to all CPCs once completed.

Bycatch species identification cards

71. The WPEB **NOTED** paper IOTC–2011–WPEB07–11 which provided an overview of the status of development of identification cards for sharks, seabirds and marine turtles, including the following abstract provided by the authors:

> *"In order for observer to better identify bycatch species and to better report on the level of bycatch by species, the WPEB and the Scientific Committee have been requested that the Secretariat developed identification cards for marine turtles, seabirds and sharks. With the help of experts, the Secretariat has completed the identification cards for marine turtles and seabirds and is well advance in the production of the cards for sharks. The remaining of the funds provisioned for the design of these cards will allow the printing of a limited number of them that will be given to developing CPCs to be used by their scientific observers.*"

72. The WPEB **NOTED** that the IOTC Secretariat has finalised the IOTC identification cards for marine turtles and seabirds and **COMMENDED** the Secretariat for its work.

73. The WPEB **NOTED** the draft shark identification cards developed by the Secretariat with the assistance of various shark experts, and **ENCOURAGED** these to be finalised and distributed to CPCs before the end of 2011, to improve shark identification.

74. The WPEB **RECOMMENDED** that the IOTC Secretariat print and disseminate the IOTC identifications cards for marine turtles, seabirds and sharks using the remaining funds allocated to the task and to distribute these to developing coastal states as a priority, for use by observers accredited for the Regional Observer Scheme and field samplers (Resolution 11/04), and to a larger extent to their

fishing fleets targeting tuna, tuna-like and shark species. This would allow accurate observer, sampling and logbook data on marine turtles, seabirds and sharks to be recorded and reported as per IOTC requirements.

75. The WPEB **RECOMMENDED** that IOTC CPCs eventually translate, print and disseminate the IOTC identifications cards for marine turtles, seabirds and sharks as a priority to their observers accredited for the Regional Observer Scheme and field samplers (Resolution 11/04), and to a larger extent to their fishing fleets targeting tuna, tuna-like and shark species. This would allow accurate observer, sampling and logbook data on marine turtles, seabirds and sharks to be recorded and reported as per IOTC requirements.

76. The WPEB **RECOMMENDED** that the additional funds from the IOTC accumulated funds or other sources be allocated to print and distribute the identification cards to developing coastal states.

Status of National Plans of Action

77. The WPEB **NOTED** paper IOTC–2011–WPEB07–12 which provided an update on the development and implementation of National Plans of Action for seabirds and sharks by IOTC CPCs, including the following abstract provided by the authors:

> "*At its 13th Session in 2010, the Scientific Committee (SC) noted both the recommendation by the WPEB for the Secretariat to develop a table outlining CPC progress in the development and implementation of NPOAs, and the draft table provided to the meeting. At that time, the Secretariat had only been able to obtain updates from a small number of CPCs. Subsequently, the SC recommended: "that the remaining CPCs provide updates on the progress of developing or implementing NPOA-sharks at the WPEB in 2011". In August 2011, the Secretariat circulated the table adopted by the Scientific Committee for comment and updating by each of the 32 CPCs (29 Members and 3 Cooperating Non-Contracting Parties). Comments and updates were received from 20 CPCs."*

78. The WPEB **NOTED** the current status of development and implementation of National Plans of Action 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 (Appendix X). Despite the time that has elapsed since then, very few CPCs have developed NPOA's, or even carried out assessments to ascertain if the development of a Plan is warranted.

79. Noting that the FAO prepared best practice guidelines to reduce the incidental catch of seabirds in capture fisheries in 2009 to support implementation of the IPOA-Seabirds, the WPEB **RECOMMENDED** that CPCs use these guidelines to immediately review bycatch in longline, trawl and gillnet fisheries within their jurisdiction and develop, if appropriate, NPOA-Seabirds for fisheries where seabird bycatch is problematic.

80. The WPEB **NOTED** the current status of development and implementation of Nation Plans of Action for sharks as provided in Appendix X and **RECOMMENDED** that all CPCs without an NPOA-Sharks expedite the development and implementation of their NPOA-Sharks, and to report progress to the WPEB in 2012, 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.

Environmental data

81. The WPEB **NOTED** paper IOTC–2011–WPEB07–17 which provided an outline of climate and oceanographic conditions in the Indian Ocean up until August 2011, including the following abstract provided by the author:

> "*Various datasets (SST, wind stress, mixed layer depth, chlorophyll) are used to depict past trends and present situation (up to August 2011) of several ocean-climate indicators in the Indian Ocean. The long term and basin scale trend of the sea surface temperature (SST) has been steadily increasing since 1955 at a rate of 0.10°C/decade and the SST in the Western Indian Ocean (WIO) increased at an even higher rate (0.13°C/decade). Accordingly, the occurrence of 2°area-month strata with SST>26°C (a threshold for tuna larvae survival) has increased by more than 2% since the period 1960-1965. The anomalous events recorded in the past two years were an El Nino (warm event in Central Pacific and WIO) in 2010 and La Nina (cold event in CentPac and WIO) in 2011. Emphasis was made on changes recorded in the sea surface chlorophyll field over the WIO, with negative anomalies prevailing since 2007. The potential detrimental effect of the current depressed biological productivity at the base of the*

food chain on tuna concentration and biological processes (slower growth of pelagic fish, increased natural mortality) is presented as a working hypothesis which would require further investigation. This should be considered when assessing the reasons for the substantial decline in PS".

82. The WPEB **NOTED** the variability pattern of the surface chlorophyll concentration (SCC) which has oscillated from lows (during the 1997–1998 El Niño) to highs (2003–2005) then back to lows from 2007 onwards. The negative SCC anomalies in 2010 and 2011 have been estimated at 25–30% below the average, as depicted in January–February and August–September (the two peaks of the seasonal cycle). SCC anomalies in August–September seem to be related to a weaker Somali upwelling as a prominent southward wind stress anomaly (i.e. not favouring the upwelling activity) has been recorded since 2008 in the West Somali Basin. A declining trend in SCC is obvious from 2009 to 2011 in the WIO. A depressed primary productivity is also observed in the Maldives archipelago, with persistent low SCC anomaly since 2006, which represents a 15% below-normal SCC in 2011. Overall, the substantial decline of SSC in the WIO and Maldives might limit the carrying capacity of the pelagic ecosystem.

83. The WPEB also **NOTED** an anomalously lasting event of enhanced SCC which was detected in the Central Indian Ocean (5°S–15°S/75°E–90°E) from October 2010 onwards, and still visible in the last available month of the series (August 2011). Combined plots of Sea Surface Temperature (SST), 20°C isotherm depth anomaly and SCC suggest that high productivity event was initially triggered by a very shallow thermocline leading to a cooling of the mixed layer, then becoming visible in the SST and SCC two months later. Potential effect on forage enhancement for top predators might be considered which contrasts with the situation observed in the WIO.

84. The WPEB **NOTED** paper IOTC–2011–WPEB07–18 which provided an overview of a method to profile ocean surface layer temperatures, including the following abstract provided by the authors:

"*A simple, labour-non-intensive method of temperature profiling of the upper ocean layer is described. A simple set of modern but affordable equipment such as temperature-depth recorder, electric fishing reel, braided fishing line, fishing rod, and a personal computer are necessary. In the experiments described a series of casts to a maximum depth of 481 m were performed onboard a medium sized vessel of 24 m LOA. Detailed list of equipment used, general methodology and advantages of this method are described.*"

85. The WPEB **NOTED** the initial trials of a new Temperature–Depth Recorder (TDR), which appears to be an extremely effective method of water temperature profiling from small, non-equipped boats. A similar solution was developed independently by IATTC scientists and successfully used during their field operations in the Eastern Pacific.

86. The WPEB **NOTED** that further tests onboard smaller boats are planned in forthcoming months to check feasibility of described methodology under varying condition, and urged the authors to provide further updates at the next WPEB meeting.

India – bycatch

87. The WPEB **NOTED** paper IOTC–2011–WPEB07–19 which provided an overview of bycatch in the tuna longline fishery of India, including the following abstract provided by the authors:

"*During the exploratory surveys conducted by Fishery Survey of India around Andaman and Nicobar Islands several bycatch species were recorded along with the targeted species of tunas (Thunnus albacares, Thunnus obesus and Katsuwonus pelamis). Among these, billfishes, sharks, barracudas, seer fish, etc… were common. Though the sharks are not the targeted species in the tuna longlining, they constitute a major share of the catch. The exploratory surveys reported high hooking rate of pelagic sharks. The dominant species are of the family Alopiidae, commonly called thresher sharks (A. pelagicus, A. superciliosus and A. vulpinus). The fishes caught by the longliner M.F.V. Blue Marlin during 2003–2010 were analyzed for catch composition of tuna and the bycatch species, as well as for their distribution patterns, abundance, and certain biological aspects. A total of 30 different bycatch species from 12 families were recorded. The targeted species i.e tuna contributed to 29% of the catch in numbers and 34% in weight, whereas billfishes contributed 10% both in number and weight and shark contributed 38% and 54% in number and weight respectively. The aggregated hooking rate for all fishes during the survey period was found to be 0.60%. Among that, the hooking rate of sharks was found to be 0.23%. The male to female ratio for all the three species of threshers,*

i.e. A. pelagicus, A. vulpinus and A. superciliosus, are found to be 1:0.6, 1:0.4 and 1:0.4 and the dominance was noticed at pre caudal length of 121–140 cm, 141–160 cm and 121–140 cm respectively. The food preference is mainly fishes followed by squids and octopus for all the three species."

88. The WPEB **NOTED** that while 17 species of sharks are reportedly caught by Indian longline vessels, silky sharks were not reported which was considered unusual. The authors were urged to seek independent validation of species identification using photographic documentation gathered during the study.

89. The main author of the paper **NOTED** that although *C. falciformis* was not recorded during that research survey, it has been recorded in research longline catches from the west coast of India (IOTC–2011–WPEB07–13) and that it could have been captured by other vessels in Andaman and Nicobar waters. In the future, the authors would check for occurrence of this species.

Mauritius – bycatch

90. The WPEB **NOTED** paper IOTC–2011–WPEB07–20 which provided an overview of bycatch landings in Mauritius, including the following abstract provided by the authors:

"*Port Louis is an important port for longliners operating in the South West Indian Ocean region. Many of them are licensed to fish in the EEZ of Mauritius. One of the conditions of the fishing licence provides that bycatch should be landed and sold on the local market. During landings, bycatch data is collected as these data are important for the ecosystem based management of fishery resources. This paper presents a summary of bycatch landed by licensed and non-licensed longliners for the last two years, the species composition of the bycatch and the fishing zones. Analysis of the data collected revealed that oilfish, sharks and sailfish are the dominant bycatch species.*"

91. The WPEB **NOTED** the following statement made by a participant on behalf of the United Kingdom: "*The UK has no doubt about its sovereignty over the British Indian Ocean Territory which was ceded to Britain in 1814 and has been a British dependency ever since. As the UK Government has reiterated on many occasions, we have undertaken to cede the Territory to Mauritius when it is no longer needed for defense purposes.*"

92. The WPEB **NOTED** the following statement made by a participant on behalf of the Republic of Mauritius: "*Mauritius does not recognize the so-called British Indian Ocean Territory. The Chagos Archipelago was illegally excised from the territory of Mauritius prior to its independence in violation of UN General Assembly resolutions 1514 (XV) of 14 December 1960 and 2066 (XX) of 16 December 1965.*"

Pakistan – bycatch

93. The WPEB **NOTED** paper IOTC–2011–WPEB07–21 which provided an overview of bycatch by Pakistan flagged vessels targeting tuna in the Indian Ocean, including the following abstract provided by the authors:

"*This paper is based on the data collected by Marine Fisheries Department (MFD) observers deployed on board licensed tuna longliners that were in operation in 2005 (5 vessels) and 2006 (8 vessels) in the waters of Pakistan. These vessels operated under "Deep Sea Fishing Policy" allowing Pakistani parties to undertake fishing operations in deeper waters in collaboration with foreign ship-owners, in line with mandatory requirements laid down in the Policy such as (i) installation of VMS; (ii) port inspection; (iii) deputation of MFD observers on board each vessels during each trip; (iv) restriction on discards etc. The document focuses on the comparison of catches of yellowfin tuna and bycatch of tuna longliners operated under license in 2005 and 2006. It has been concluded that during the operation, the bycatch comprised of species of marlin, sail fish and sharks. The quantity of the bycatch remained less than 3% of the total yellowfin tuna catch. This minimum proportion of less bycatch might be due to the selectivity of the gear targeting yellow fin tuna (e.g. hook, bait, etc.) as well as fishing practices in particular areas and seasons. However, further studies are being carried out which also include a comprehensive study of bycatch of gillnets used in Pakistan.*"

94. The WPEB **NOTED** that the data provided does not include any estimates of bycatch of the Pakistani driftnet fishery, which is believed to have large numbers of bycatch (i.e. marine mammals, marine turtles, sharks and small seabirds).

95. The WPEB **NOTED** that a study was conducted to assess the level of bycatch on board the driftnet fleet and **URGED** the scientists from Pakistan to report their progress and findings at the next Session of the WPEB.

96. The WPEB **NOTED** paper IOTC–2011–WPEB07–22 which provided information on material developed by I.R. Iran, including the following abstract provided by the authors:

"In order to increase public awareness of fishermen about how they can mitigate bycatch of marine mammals, turtles and seabirds, the Iran Fisheries Organization (IFO), in cooperation with the Department Of Environment (DOE), NGOs and fishermen cooperatives, has prepared some guidelines tin a brochure which is going to be distributed among tuna fishermen. The main objective of these guidelines is to train fishermen on procedure to release entangled animals from their nets, to train them in reporting interactions with marine mammals, marine turtles and other bycatch species and to protect themselves from risks and hazards during the release. IFO has already trained over 1000 fishermen and is going to continue free training courses for fishermen and vessels crews."

97. The WPEB **WELCOMED** the initiative of the IFO in raising the awareness of the fishermen on bycatch issues in the driftnet fleet. However, the WPEB **REGRETTED** that no information was provided on the level of bycatch and their species composition in regards to the driftnet fleet of Iran.

98. The WPEB **NOTED** paper IOTC–2011–WPEB07–INF32 which provided information on potential bycatch from driftnet fisheries operating in the Indian Ocean, including the following abstract provided by the authors:

"This document makes an attempt to evaluate the potential level of bycatch and ecological impact of the driftnet fisheries in the Indian Ocean. It was first noted that the total catch of gillnetters in the Indian Ocean has been steadily increasing from 100,000 tons in the early 1980s, to more than 500,000 tons in 2010. It was noted that such very large scale of gillnet fisheries was, by far, unique in the word. It was noted that unfortunately the fishing zones and the bycatches of these fisheries remain totally unknown to IOTC scientists, due to the lack of logbook information and of observer data on the large numbers of driftnet vessels. However, multiple observations done by EU purse seiners skippers have been showing that many of these driftnet vessels are active in the offshore equatorial areas of the Indian ocean. Based on the scientific knowledge from other oceans on the potential bycatches of such driftnet fishery, the document concludes that the driftnet fisheries presently active in the Indian Ocean are probably a source of a large incidental mortality of dolphins, marine turtles, sharks and possibly whales. Its recommendation is that ways to estimate these accidental mortalities, for instance developing small scale observer programs, doing experimental fishing cruise in the driftnet fishing zones, or installing camera on board of these vessels should be investigated in the near future."

99. The WPEB **NOTED** that other studies, in particular a review from FAO (Driftnet fisheries and their impacts on non-target species: a worldwide review, Northridge, S.P. FAO Fisheries Technical Paper, No.320. Rome, FAO. 1991. 115p.) and more recent reviews made by the Convention on Migratory Species (CMS) (provided as information documents: IOTC–2011–WPEB07–INF35 and INF34), had proven that driftnets have a large impact on the marine ecosystems and that this was the basis of the 1992 UN ban on their use in the high seas. However, it **NOTED** that these studies were not undertaken in the context of the driftnet fleets targeting tuna and tuna-like species in the Indian Ocean.

100. The WPEB **ACKNOWLEDGED** that driftnet fisheries are important for some developing coastal states of the Indian Ocean, however, the WPEB **AGREED** that due to the large scale of the fishery and its lack of specific selectivity, this gear is likely to have large negative impacts on bycatch species (e.g. some sharks, marine turtles, marine mammals, other fishes and possibly seabirds), in particular in the north-western Indian Ocean. However, these interactions/catches are largely undocumented and unquantified.

101. The WPEB **RECOMMENDED** that scientists from all CPCs having fleets using driftnets in the Indian Ocean shall provide at the next session of the WPEB a report summarizing the known information on bycatch in driftnet fisheries, including sharks and marine mammals, with estimates of their likely order of magnitude where more detailed data are not available.

102. The WPEB **RECOMMENDED** that CPCs explore means to undertake research cruises using driftnet vessels in the Indian Ocean aimed at documenting and quantifying the nature and extent of bycatch in these fisheries and for results to be presented at the next Session of the WPEB.

103. Noting the lack of data on bycatch of these fleets, the WPEB **REMINDED** coastal countries with gillnet fisheries of their responsibilities to monitor catches and bycatch of these fisheries and **RECOMMENDED** them to improve sampling of landings, to develop and implement their observer schemes, to seek support from the IOTC to develop such activities if necessary and report on progress at the next Session of the WPEB.

SEAFDEC research

104. The WPEB **NOTED** paper IOTC–2011–WPEB07–48 which provided a report on bycatch from the tuna longline fishery by SEAFDEC research vessels, including the following abstract provided by the authors:

> "*Catch data, by three SEAFDEC research vessels namely, M.V.SEAFDEC and M.V. SEAFDEC2, recorded through fishing logbook from year 2005 to 2011, is summarized and calculated the hook rate in Catch Per Unit Effort (CPUE). Total numbers of fishing operation are 73 tuna longline operations. Total numbers of hook deployed are 38,333 hooks. Numbers of deployed hooks are ranged from 90 to 620 hooks in an operation and average in an operation is 490 hooks. Numbers of individual bycatch were 494 individual fishes with 6940.26 kg. Distribution of CPUEs in kilogram per haul and hook rate (%) from the longline operations is 1.29 individual fish/100 hooks, 18.1 kg/100 hooks. Three dominant catch is listed; 1) Lancetfish (Alepisaurus ferox); 2) Bigeye Thresher Shark (Alopias superciliosus); and 3) Sting Ray (Dasyatis spp.).*"

9. SHARKS AND RAYS

9.1 Review of new information on the status of sharks

Mozambique fisheries

105. The WPEB **NOTED** paper IOTC–2011–WPEB07–24 which provided an overview of the catch of sharks by licensed vessels in Mozambican waters, including the following abstract provided by the authors:

> *"The catch composition of foreign longliners licensed to fish in Mozambican waters during 2010 consisted of bigeye (20%), followed by sharks (11%), yellowfin tuna (8%) and the remaining 61% was represented by other species. Twenty three species were observed during the observer trip, including 4 tuna species, 4 billfish species, 13 shark species, and 2 other species. The dominant shark species were Carcharhinus sorrah, Galeocerdo cuvier, Squalus megalops and Sphyrna lewini."*

106. The WPEB **NOTED** the absence of information on shark catches from artisanal fisheries in Mozambique and **RECOMMENDED** that information on bycatch from artisanal fisheries is provided at the next Session of the WPEB.

Madagascar fisheries

107. The WPEB **NOTED** paper IOTC–2011–WPEB07–26 which provided some statistics on catches of sharks by Malagasy vessels, including the following abstract provided by the authors:

> *"The traditional fishermen of Madagascar are the most ancient sector of the shark's fisheries in Madagascar. Recently, shrimp fisheries started shifting their activity into pelagic fisheries by converting their vessels to small scale longliners. From late 2008 to early 2010 four longliners operated in the eastern part of the Madagascan EEZ while only one operated in the western part. In addition, several trolling vessels and encircling gillnetters operated within the Malagasy EEZ (a total of 30 vessels were registered in 2010). Most of them (60%) operated in the western part of the EEZ. Data recovered by the Statistical Unit of Tuna Fisheries in Antsiranana (USTA) from logbook show that sharks represent 23% of longliners' catches in the eastern area and 17% in the western waters. Catch of sharks by trolls and encircling gillnets are negligible: 1.13% and 0.74% of landed catches in the east and west respectively. Lack of detail in reporting is a key problem in data collection, especially for sharks (where there is no information at the species level). The USTA is currently planning to expand its data collection system to manage shark resources, paying specific attention to threatened species."*

108. Noting the absence of data on fishing effort, numbers and species of sharks caught, the WPEB **RECOMMENDED** that the data collection system in Madagascar is strengthened in order to provide catch and effort reports that are consistent with IOTC standards and **ENCOURAGED** Madagascar to work with the IRD of La Réunion to develop a specific logbook for their new longline fleet.

Maldives fisheries

109. The WPEB **NOTED** paper IOTC–2011–WPEB07–27 which described the shark longline fishery that operated in the northern Maldives, including the following abstract provided by the authors:

"Shark longlining was carried out by up to 80 boats at the height of the fishery in about 1998–2000. Subsequently the fishery declined, due to poor catches and low economic returns. The fishery closed in 2010 with the national ban on shark fishing, which was reinforced with a ban on trade in shark products in 2011. Sampling was carried out on 180 landings from shark fishing boats (dhonis in 2000–2004). Silky sharks (Carcharhinus falciformis) made up 84% of the catch at that time. The various shark stocks that supported the Kulhudhufushi shark fishery were sequentially overfished. Reef sharks in the northern atolls had been heavily overfished by the 1980s. Nearshore pelagic sharks around the northern atolls had been overfished by the 1990s. Offshore oceanic sharks had been declining in abundance for some years before the fishery closed in 2010. Reef shark and nearshore pelagic sharks were overfished by local boats. But the decline in oceanic shark catches was the result of high (and probably unsustainable) levels of fishing by overseas fisheries."

110. The WPEB **NOTED** that data collected on shark abundance represents a consistent time series for the periods 1987–1988 and 2000–2004, collected with similar longline gear, and that the data was showing a declining trend in oceanic whitetip shark abundance, which is a potential indicator of overall stock depletion. The WPEB further **NOTED** that it could be related to localised effects, however this was deemed unlikely as oceanic whitetip sharks are wide-ranging and abundance trends from long-term research conducted by the former Soviet Union between the 1960s and 1980s indicate a similar decline of oceanic whitetip sharks, and that sightings of this species in Maldives and La Réunion islands is now quite uncommon.

111. The WPEB **RECOMMENDED** that all available data and/or indicators on oceanic whitetip shark abundance and population trends are compiled in order to assess current stock status and the level of decline for discussion at the next WPEB and Scientific Committee.

EU purse seine fishery

112. The WPEB **NOTED** paper IOTC–2011–WPEB07–29 which provides information on the CPUE and numbers of silky sharks (*Carcharhinus falciformis*) caught accidentally by the EU purse seine fishery around floating objects in the Indian Ocean for the period 2003–2009, including the following abstract provided by the authors:

"Data were collected by the French and Spanish observer programmes representing a total of 3052 observed fishing sets (1548 on free swimming schools and 1504 on FADs, the term FADs representing here all floating objects, natural and artificial). The largest catch of silky sharks per unit of effort (mean numbers of silky sharks/FAD set) was observed north of the fishing grounds (centered on 12°N and 60°E). Interpolation by kriging was then used to estimate the spatial distribution of the total FAD-catches of silky sharks using the European tuna purse seine logbooks. Due to the uneven spatial distribution of the fishing effort, the largest amount of silky sharks caught around FADs did not occur in the area with the highest catch per unit of effort north from 10°N, but in an area centered between 2°N and 53°E. The spatial distribution of silky shark catches was quite constant among years. Effects of potential mitigation measures are discussed."

113. The WPEB **NOTED** the potential risk of displacement of fishing effort in the north of the IOTC time-area closure which may increase the catches of silky sharks.

114. The WPEB **RECOMMENDED** further research on silky sharks, including the possible construction of a data series of silky shark abundance from purse seine associated school fisheries.

115. The WPEB **NOTED** that it is important to collect data from all major gears catching silky sharks, including but not restricted to purse seines, longlines and gillnets and the WPEB **RECOMMENDED** that indicators of the relative abundance of silky sharks are developing to better quantify changes in abundance.

EU,Portugal longline fishery

116. The WPEB **NOTED** paper IOTC–2011–WPEB07–30 which presents preliminary information on the bycatch of blue and shortfin mako sharks in the EU,Portugal longline fleet operating in the Indian Ocean, including the following abstract provided by the authors:

"The analysis, which was based on historical logbook data that is currently being revisited, included aspects of licensed and effectively active fleet, overall catch and effort spatial and temporal distribution, and catch-at-size data. It was noted that after a peak in 2006, catch and effort has substantial decreased thereafter, mostly due to piracy. As a consequence, currently most of the activity is concentrated in the SW region. Finally, details on the ongoing data collection were provided, based on the implementation of a self-reporting and onboard observer scheme."

117. The WPEB **NOTED** that transition from monofilament branchlines to wire leaders resulted in higher shark bycatch, and is probably related to a change of target species from swordfish to blue sharks. The WPEB further **NOTED** that various configurations of longline gears and transitions between them are a source of uncertainty in shark abundance indices for longline fisheries.

118. The WPEB **ENCOURAGED** further research into the hooking success of wire leaders compared with monofilament branchlines as well as for the different type of hooks commonly used in longline operations, i.e. circle, tuna and J-hooks.

119. The WPEB **NOTED** paper IOTC–2011–WPEB07–56 which describes Maldives shark fisheries, including the following abstract provided by the authors:

"It was noted that Maldivian fishermen traditionally exploited sharks on a small scale over several centuries. Large sharks (particularly large tiger sharks) were targeted for their livers used for oil (to treat their wooden fishing boats). Shark meat and fins were of limited interest. Between the 1960s – early 1980s export-oriented fishing for sharks was developed. New fishing techniques: longlining for reef and oceanic sharks, netting for reef sharks, and deep vertical longlining for gulper sharks were used. Overseas markets for shark fins, dried shark meat, and high quality liver oil were targeted. The deepwater gulper shark fishery went into decline within 5 years, and was stopped by the early 1990s. Reef sharks were overexploited by the mid-1990s. Decline of oceanic shark catch rates were observed by the 2000s, causing many fishermen to desert the fishery. Reef sharks are of great economic importance to diving tourists, and this led to conflict of interest between tourism operators and shark fishermen. Taking into consideration that various fishery management measurements failed to halt the decline of reef shark abundance, a national ban on shark fishing was introduced in March 2010, followed by a total trade ban in July 2011."

120. The WPEB **NOTED** that shark fishing in now totally banned throughout the Maldives and that specific mitigation measures shall be adopted if Maldives develops a longline fishery.

121. The WPEB **NOTED** paper IOTC–2011–WPEB07–57 which describes bycatch from a longline research vessel operating in the eastern Indian Ocean, including the following abstract provided by the authors:

"Shark bycatch in the pelagic longline fishery along Ninety East Ridge in the Eastern Indian Ocean was investigated during 12 January – 12 February. 2011. Data were collected onboard M.V.SEAFDEC for 14 longline sets which deployed about 600 hooks per set during day time. Three types of hook (J-hook, C-hook No.14 & 18) were used in this experiment.. A total of 204 individuals belonging to 17 different species were recorded. The largest proportion of catches was target species, primarily tunas (26.48%), marlin and swordfish (2.45%). Sharks and rays (9.3% of catches) represented by the crocodile shark (Pseudocarcharias kamoharai), blue shark (Prionace glauca), silky shark (Carcharhinus falciformis), blacktip shark (C. limbatus), and pelagic stingray (Pteroplatytrygon violacea). Most abundant species was longnose lancetfish (Alepisaurus ferox) (43.1%). On very limited sample was suggested that circle hooks demonstrate higher catchability and retention rate than tuna hooks."

122. Noting the apparent confusion in the terminology of the various hook types (e.g. tuna hook vs. J-hook), the WPEB **REITERATED** the need to develop a guide for hooks used in IOTC fisheries.

9.2 Review of any National Plans of Action relating to reduction of shark bycatch in tuna fisheries

Seychelles NPOA-Sharks

123. The WPEB **NOTED** paper IOTC–2011–WPEB07–50 which documents progress made on the implementation of the Seychelles National Plan of Action for the Conservation and Management of Sharks, including the following abstract provided by the authors:

> "*The aim of this paper is to give a brief description of the progress that has been made in relation to the implementation of the Seychelles Shark National Plan of Action, from its inception to the current date. Similar to other shark stocks, those in the Seychelles EEZ have been subject to intense pressure with issues related to finning given the increased demand for shark fins in the Asian market. The Seychelles Shark NPOA, in accordance with FAO guidelines under its International Plan of Action (IPOA, was developed in April 2007 by the Seychelles Fishing Authority under the umbrella of the Ministry of Environment and Natural Resources (MENRT). This was conducted jointly by different government organizations and NGOs. The establishment of the steering committee took place in April 2008, consisting of 23 members of different organizations who meet regularly to oversee the implementation of the NPOA. This provides a useful tool for fishers, tourism operators and managers making decisions about the long-term management and conservation of Seychelles shark resources. The NPOA is divided into 11 work programmes and 59 actions, each with a different level of priority. Funds are being secured by both NGOs and the government (Seychelles Fishing Authority) in order to address the activities identified under the various work programmes. To date, the majority of the Work Programme has been completed with a few areas requiring urgent attention. It is anticipated that most activities will be completed in 2011 with a review at the end of 2012*".

124. The WPEB **NOTED** that this was the only update provided with respect to current progress on the implementation of NPOAs, and **REITERATED** the need for the development of NPOAs by CPCs which have yet to do so. All CPCs which already have shark NPOAs in place were also urged to report progress on the implementation of their NPOAs at the next WPEB.

125. The WPEB **NOTED** that this is a positive example of a CPC taking the lead in implementing an action plan, and that Seychelles, in collaboration with IRD, is currently undertaking some research activities, including tagging, in their waters.

126. The WPEB **NOTED** that no new NPOA-Sharks had been adopted in last 12 months. Currently only seven CPCs have an NPOA-Sharks, with eight others in development (Appendix X).

127. The WPEB **REITERATED** that CPCs should fulfil their FAO obligation to assess the need for an NPOA-Sharks and develop plans if appropriate. The WPEB **RECOMMENDED** that to assist in this, the IOTC Secretariat should revise annually the table summarising progress towards the development of NPOA-Sharks by CPCs for the consideration as each WPEB and the Scientific Committee meeting.

9.3 Research programmes on sharks

Silky sharks and EU,France purse seiners

128. The WPEB **NOTED** paper IOTC–2011–WPEB07–28, which provided a study on rates of silky shark caught incidentally onboard EU,France purse seine vessels, including the following abstract provided by the authors:

> *"Nowadays French purse seiners operating in the Indian Ocean release all sharks and rays caught in order to reduce the fishery induced mortality of elasmobranchs. During two commercial fishing trips, numbers of sharks (primarily silky sharks, Carcharhinus falciformis) that were alive or dead, were recorded once they had been sorted by the crew on the upper and lower decks. More sharks were observed in the lower deck (73%) than in the upper deck. The silky sharks observed on the upper deck were significantly larger than the ones found in the lower deck. The immediate mortality (sharks that were dead at the time of observation) rates appeared to be linked with the location of the individual, as more sharks were found dead on the lower deck than the upper deck. The immediate mortality rates also increased with the set size (tonnage). In total, 20 silky sharks (125.3 ± 33.8 cm total length) were tagged with MiniPATs to study their post release survival. Six tags showed mortality directly after release, while data from three tags suggested delayed mortality after 2.5, 14 and 15 days. Nine tags showed that the sharks survived. Two tags failed to report data and one was incorrectly initiated. Following these findings a 'best practices' manual for fishers will be prepared to*

increase rates of survival of sharks caught by purse seine vessels. However, other methods prior to the sharks being brought onboard must also be investigated."

129. The WPEB **NOTED** the relatively high probability (number) of recapture of tagged sharks after a few days at liberty, and that this high recapture rate is related to the association of sharks with drifting FADs. This suggests there is high probability of fishing mortality even for individuals which have survived one or more fishing operations unless appropriate mitigation measures are applied.

130. The WPEB **NOTED** that a protocol of 'best practices' for shark handling and release onboard purse seiners will be developed by the MADE project and ISSF to minimize the risk of injury of vessel crew and will increase shark survival opportunities and **RECOMMENDED** that these guidelines are presented at the next session of the WPEB.

131. The WPEB **RECOMMENDED** that more research is conducted on other mitigation methods to be used prior to the sharks being brought onboard, as well as on post-release mortality of sharks.

Sharks and EU, Portugal longliners

132. The WPEB **NOTED** paper IOTC–2011–WPEB07–31, which provided results of at-haulback mortality estimates for elasmobranchs caught by EU,Portugal longliners operating in the Indian Ocean, including the following abstract provided by the authors:

"At-haulback mortality is species-specific, with some species having high percentages of alive specimens at time of haulback (e.g. manta rays, pelagic stingray and blue shark), while others have higher percentages of dead specimens (e.g. smooth hammerhead, silky shark and bigeye thresher). For the blue shark the size seems to be an important covariate, with larger specimens showing decreasing odds of mortality. The results presented are in accordance to what has been previously reported for the Atlantic Ocean."

133. The WPEB **NOTED** that post-hooking mortality rates of bigeye thresher sharks and smooth hammerhead sharks can be high, suggesting that an existing or potential new regulation prohibiting the retention of the two species may be of limited utility if not combined with other mitigation measures (i.e. use of circle hooks and monofilament leader) as it may simply encourage the discarding of shark carcasses. The WPEB further **NOTED** the need for additional research on post-hooking mortality and post-release survival.

Sharks and La Reunion longline fishery

134. The WPEB **NOTED** paper IOTC–2011–WPEB07–INF29 which documented an observer programme running onboard pelagic longline fleet at Reunion Island, including the following abstract provided by the authors:

"The longliner fleet based in La Reunion is characterized by a dominance of small to medium longliners of an average length over all (LOA) of about 17 m. Only, the largest fishing unit with a LOA ranged from 20 m to 24 m are able to embark an observer on board to collect data regarding the fishing activity, to deploy instruments (TDR = time depth recorders) to measure the maximum fishing depth of the longline and to record all capture (species identification, location on the longline, hook type and hooking position, status at the capture (alive or dead), fate (commercialized, conserved on board, discarded, depredation) and length measurements). From February to October 2010 a total of 13 trips (commercial and scientific surveys) were covered totalizing 199 days at sea and 113 fishing operations between 18–28°S, 39–65°E. For commercial operations the coverage rate of largest longliners reaches 9% in terms of number of sets. A total of 1017 time-depth-temperature profiles of the maximum fishing depth of baskets (mainline between two floats) were recorded. A total of 5558 individuals of 56 species or group of species were caught representing a global nominal catch rate (CPUE) of about 4.6 fish / 100 hooks. Seven species have a contribution in capture higher than 5% (swordfish=26.7%, yellowfin=12.2%, bigeye=9.5%, dolphinfish=8.5%, albacore=7.5% for commercialized species and blue shark=11.8% and pelagic stingray=7.7% for discarded bycatch species). Retaining/discarding ratio was 60.4%/39.6%. The depredation affected 3% of fish caught in numbers. Endangered species were rarely observed in the catches: 7 marine turles (5 released alive), 5 bottlenose dolphin (one died) and 1 seabird. A total of 997 sharks of 15 species were caught. The blue shark (67%), the silky shark (9.2%), the pelagic thresher shark (4.6%) and the scalloped hammerhead shark (4.6%) are the dominant species in shark capture. Most of sharks were released. On the average 50% of shark individuals were brought along the board alive (a minimum of 40% of alive fish was observed for the silky shark and a maximum of 62% were

observed for thresher sharks). Further analysis that will consider factors related to the capture (soaking time, hook type, hooking position) must be undertaken to better understand the survival of fish on hook for mitigation purposes."

135. Noting that the at-haulback mortality rates of sharks in this study are lower than in another study presented at the meeting (see IOTC–2011–WPEB07–31), in particular for *Alopias spp.*, the WPEB **URGED** further research to be undertaken.

136. The WPEB **NOTED** paper IOTC–2011–WPEB07–INF33 which described the preliminary results testing the Indian Ocean blue shark *Prionace glauca* ageing accuracy using bomb radiocarbon dating, including the following abstract provided by the authors:

"Bomb derived radiocarbon from nuclear testing in the atmosphere provides one of the best age validation approaches available for long-lived fishes. Vertebrae from two blue sharks caught in 1986 and 1983 were sectioned, aged and assayed for ^{14}C content in particular annuli. The shark caught in 1986 was too young for detailed assay: estimated age 18–19 years. This was confirmed by post-bomb ^{14}C concentration in the 1-2 annuli. The age of the blue shark caught in 1983 was estimated at 26 years. ^{14}C chronology obtained from assays of series of annuli showed offset from reference chronologies of about 3 years. The actual age of sharks appears to be 23 years which means that the shark was also too young for definitive validation. Further studies are necessary to obtain validation of blue shark ageing using the ^{14}C method. Another archival georeferenced and size referenced vertebra(e) from big blue shark caught in early 1980s is needed to obtain definitive validation of age estimates. However this study shows that the assumption of annual formation of growth bands on Indian Ocean blue shark vertebrae is correct and age interpretation is relatively accurate."

EU,Portugal shark research programme

137. The WPEB **NOTED** paper IOTC–2011–WPEB07–INF28, which provided an overview of the Portuguese pelagic shark research programme currently being carried out at IPIMAR, including the following abstract provided by the authors:

"The programme covers 3 main research lines: fisheries, fleet dynamics and biological studies. The fisheries research line involves: i) revisiting historical official logbook data and the collection of skippers logbooks and VMS data; ii) spatial-temporal analysis of fishing effort and catch at size for major shark species; and iii) haulback mortality. The fleet dynamics involves: i) the spatial-temporal analysis of the fishing activity; and ii) investigating the link between gear configuration/characteristics and target vs. by-catch of sharks issue. Final, the biological studies focus on: i) life history issues (ages, growth and reproduction); ii) genetics (population structure and paternity; and iii) morphometrics (weight: length, length:length, weight:weight relationships and fin:body weights relationships)."

138. The WPEB **NOTED** information paper IOTC–2011–WPEB07–INF31 describing the first workshop of the BOBLME Working Group on Sharks, including the following abstract provided by the authors:

"The Bay of Bengal (BOB) Region is one of the most heavily fished regions in the world for sharks (taken here to include sharks, rays and chimaeras). The two countries which rank highest in FAO statistics for shark landings (Indonesia and India) border the BOB. Work on co-ordinated national and regional management of shark populations in the region was initiated through the Bay of Bengal Programme Intergovernmental Organisation (BOBP-IGO) in 2008. The BOBLME, The first workshop of the BOBLME Working Group on Sharks was held in the Maldives, from 5 to 7 July 2011, with participation from six of the eight member countries of the BOBLME project, plus shark specialists and facilitators. The workshop identified common issues and problems faced by member countries in management of shark fisheries (i.e. such as lack of catch and trade data, lack of human resources and trained personnel), as well as recommendations for solutions at national and regional level. Of the eight member countries, two have already adopted (but not fully implemented) their NPOA-sharks, three have draft NPOA-sharks which require updating and adoption, and three did not have an NPOA-sharks as yet."

9.4 Improvement on shark identification

139. The WPEB **NOTED** the progress that the Secretariat has made on the development of identification cards for shark species in the IOTC region as indicated in IOTC–2011–WPEB07–11.

140. The WPEB **RECOMMENDED** a databank of geo-referenced photographs of sharks (and other species groups) caught in the Indian Ocean be established at the IOTC Secretariat with contributions by scientists and observers from the region. The WPEB **NOTED** that this would be a useful tool for verification of species identifications.

9.5 Stock indicators / ERA on sharks

141. The WPEB **NOTED** paper IOTC–2011–WPEB07–25, which provided an overview of approaches used to assess the status of shark populations: experiences from the USA and ICCAT in the Atlantic Ocean, including the following abstract provided by the author:

> "*Assessment of Atlantic and other shark stocks has traditionally been impaired by scarcity of data that results in pervasive uncertainty. In light of the differing degrees of data availability that analysts are faced with, an approach where model choice is dictated by data type and quantity is advocated. This approach can be thought of as a stepwise procedure, with models increasing in complexity as a function of data availability. The most important characteristics of the biology and population dynamics of sharks, and the types of fishery data required by different modeling approaches as well as those that are generally available are first reviewed. A suite of methods that can be used for preliminary or more advanced assessment of shark stock status and to help guide management actions is then presented, drawing examples from experiences in the USA and the International Commission for the Conservation of Atlantic Tunas (ICCAT) assessment arenas*."

142. Noting the general lack of catch data on sharks, the WPEB strongly **RECOMMENDED** that an ERA is conducted for sharks caught in fisheries targeting tuna and tuna-like species in the Indian Ocean before the next session of the WPEB. In order to do so, the WPEB **RECOMMENDED** that the Scientific Committee request the Commission to allocate specific funds for such an analysis. Should a Fishery Officer be recruited at the IOTC Secretariat, he/she may be in a position to coordinate this task.

143. The WPEB **NOTED** that although ERAs are typically conducted for a specific fishery, an ERA could be carried out for the main fisheries with separate susceptibility analyses combined into one via a weighting scheme.

Blue shark catches in South African longline fisheries

144. The WPEB **NOTED** paper IOTC–2011–WPEB07–32 which described spatial and temporal patterns in blue shark (*Prionace glauca*) catches in South African longline fisheries, including the following abstract provided by the author:

> "*The blue shark is targeted in the pelagic shark-directed longline fishery and is a common bycatch in the tuna and swordfish directed fishery in South Africa. Of the total pelagic shark landings in South Africa, the blue shark comprised 35% of landed mass from 1998 to 2008. Spatio-temporal analyses on nominal, and standardised CPUE revealed seasonality, with greatest blue shark abundance during summer and autumn off the west coast of South Africa. Standardised CPUE for both fisheries revealed that blue shark abundance has remained relatively stable from 1998 to 2008. This is contradictory to findings reported from observer data from the tuna directed longline fishery, which found a significant reduction in CPUE from 2001 to 2005*".

Blue shark catches in Japansese longline fishery

145. The WPEB **NOTED** paper IOTC–2011–WPEB07–33, which provided information on the CPUE trend of blue shark (*Prionace glauca*) caught by Japanese longline fishery in the Indian Ocean, including the following abstract provided by the authors:

> "*The standardised CPUE of blue sharks caught by the Japanese tuna longline fishery in the Indian Ocean were calculated using logbook data from 1971–1993 and 1994–2010. The standardised CPUEs obtained from selected catch and effort data (reporting rate of sharks was higher than 80 % per cruise) show relatively stable trends up to the beginning of the 2000s when it gradually started to decrease. The trends in CPUE estimated from the data sets filtered by the 10% reporting criteria were not markedly different to those expected using the ≥90% filter from1994 to 2010. The general trends in the CPUE of blue sharks were fairly robust to changes in the selection criteria (change in reporting ratio from 0 to 90 %), and thus it is considered that the results using the ≥80% filter in this report, which is the criteria of data selection verified in the Atlantic, can be assumed to be representative of the trends in abundance of blue sharks in the Indian Ocean*."

146. The WPEB **QUERIED** the method of producing blue shark catches prior to 1994, when all sharks were combined. It was clarified that all shark catches were considered to be blue shark for those trips in which 80% or more of operations reported shark catch.

147. The WPEB **NOTED** that while the blue shark standardised CPUE in this study appears to be relatively stable, other data presented at previous session of the WPEB onboard research longline cruises reported significant reduction in the abundance of this species (e.g. IOTC–2008–WPEB04–10).

Shortfin mako catches in Japanese longline fishery

148. The WPEB **NOTED** paper IOTC–2011–WPEB07–34, which analysed the trends in CPUE of shortfin mako (*Isurus oxyrinchus*) caught by the Japanese longline fishery in the Indian Ocean, including the following abstract provided by the authors:

> "*The Japanese log-book system for data collection on shortfin mako sharks from distant-water longliners has been in place since 1994. However, some Japanese longliners release/discard their shortfin mako catch and the Japanese log-book system does not require regular reporting. Because of this, filtered catch and effort data where all catches were supposed to have been reported were used to analyse the CPUE. The annual trend of the standardised CPUE, however, became moderate when the easier filtering criteria were used, and its overall trend was not greatly affected by changing the filtering criteria. This indicated that the standardised CPUE estimated in this study is roughly reflecting the trend in the fishable abundance of the shortfin mako shark in the Indian Ocean*".

Oceanic whitetip catches in Japanese longline fishery

149. The WPEB **NOTED** paper IOTC–2011–WPEB07–35, which analysed the trend in CPUE of oceanic whitetip sharks caught by the Japanese longline fishery in the Indian Ocean, including the following abstract provided by the authors:

> "*The oceanic whitetip shark (Carcharhinus longimanus) has been caught as bycatch in the Japanese longline fishery. Japan decided to include oceanic whitetip sharks in the logbook reporting system for longline fisheries in 1997, although historical trends in CPUE have not been analysed for the species. This document presents the first results of the standardised CPUE of the species in the Indian Ocean. In this analysis, a generalised linear model (GLM) with a log-normal error structure was used for the standardisation and a GLM-tree model was applied for the area stratification. In the GLM, year, area, quarter, hooks per basket (a proxy of set depth of gear) and interactions between year and another factor were set as explanatory variables. Unrealistically low estimates of CPUE were obtained in a few years, which were likely biased by the extremely low catches in these years. Between 2003 and 2009, the standardised CPUE showed a gradual decrease. Although the data may contain some sets with unexpectedly high catchability, the effect of this is likely to be relatively small. The trend in standardised CPUE indicates the need to collect the catch and size data necessary for stock assessment before severe depletion of this population occurs*."

Sharks in the EU,Portugal longline fishery

150. The WPEB **NOTED** paper IOTC–2011–WPEB07–36, which provided standardised CPUE of major shark species caught by the EU,Portugal longline fishery in the Indian Ocean, including the following abstract provided by the authors:

> "*Standardized CPUE trends for the blue and mako shark captured by Portuguese longliners targeting swordfish in the Indian Ocean were presented. The data come from historical logbooks, and was completed with VMS data (currently available between 2006 and 2010). CPUEs (round weight in kg /1000 hooks) were standardized with Generalized Linear Models with the Delta method approach, and using year, month (categorized by quarter), location and vessel as explanatory variables. Model validation was carried out with a residual analysis. The standardized series is still very short (5 years) and the trends for those 5 years seem relatively stable for both species. This was a preliminary analysis for an ongoing project. We are currently in the process of integrating further VMS data to the catch and effort dataset and standardize the series for the years previous to 2006*."

151. Noting that some of the CPUE analyses presented to the WPEB use relatively short time series starting in the early 2000s, the WPEB **RECALLED** that some fisheries have been operating much longer, since the 1950s for the Japanese longline fishery, and that some important information about changes in abundance since the beginning of the fishery will have been missed.

9.6 Shark fin to body weight ratio

152. The WPEB **NOTED** paper IOTC–2011–WPEB07–37, which provided observations on the ratio between fin and body weights for the blue shark caught by the Portuguese longline fleet in the Indian Ocean, including the following abstract provided by the authors:

"During the last decade there has been a debate regarding the ratios between fin and body weight for sharks. This debate has been particularly important in Europe, where a 5% value was implemented by the EC in 2003. Herein we report ratios and factors for the conversion of fin weight into round and dressed weight for the blue shark (BSH - Blue shark, Prionace glauca) caught by the Portuguese longline fishery targeting swordfish in the SW Indian Ocean. A total of 447 specimens were measured and weighted by onboard observers between May and September 2011. The fin:body weight ratios observed were 6.02% and 14.78%, for the round and dressed weight, respectively. Moreover, a comparison is made with results found for the Atlantic Ocean. Weight-length relationships for the blue shark are also presented."

153. The WPEB **NOTED** that there is much variability in the fin to body weight ratio and that the 5% ratio measure currently used is not entirely satisfactory for all purposes, in particular as this measure does not specify whether it refers to dressed or round weight, species of the shark and type of fins retained, and discussions at the WPEB showed that there were different understandings on what was required.

154. The WPEB **NOTED** that the best way to reduce or avoid the practice of shark finning in the IOTC area, to encourage full utilisation, to ensure accurate catch statistics, and to facilitate the collection of biological information, would be to land all sharks with fins attached (which includes partially cut and folded). The majority of the WPEB **RECOMMENDED** such action be achieved through the replacement of IOTC Resolution 05/05 (5% shark fin:body weight ratio). However, the WPEB **NOTED** that such a recommendation would have practical implementation issues for some fleets and may degrade the quality of the product. The WPEB further **RECOMMENDED** that all CPCs strive to obtain and maintain the best possible data, including improved species identification.

9.7 Shark bycatch mitigation

155. Noting that while circle hooks can increase the catch rate of sharks, they also increase their survival at-haulback and therefore the WPEB **NOTED** that the use of circle hooks could increase post-release survivorship of thresher sharks for which a retention ban has been adopted by the IOTC (Resolution 10/12 *on the conservation of thresher sharks (family Alopiidae) caught in association with fisheries in the IOTC area of competence*).

156. The WPEB **ENCOURAGED** that circle hooks combined with monofilamenent leader should be used in fisheries not targeting sharks in order to increase their post-release survival. However, the WPEB **NOTED** that monofilament branchline should be made of only one strand of nylon, as it was reported than branchline made of several twisted nylon strands would be as resistant as wire leaders.

9.8 Review of Resolutions and Recommendations on sharks:

157. The WPEB **NOTED** paper IOTC–2011–WPEB07–13 which aimed to encourage the WPEB to review the existing Conservation and Management Measures (CMM) relating to ecosystems and bycatch; 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.

158. The WPEB **NOTED** paper IOTC–2011–WPEB07–53 which provided a review of IOTC discussions and recommendations for shark conservation in the Indian Ocean, including the following abstract provided by the authors:

"Australia, with the support of other interested parties, intends to present a proposal at IOTC 16 that would amend both Resolution 05/05 Concerning the conservation of sharks caught in association with fisheries managed by IOTC, and Resolution 10/12 On the conservation of thresher sharks (Family Alopiidae) caught in association with fisheries in the IOTC area of competence. The proposal will seek to strengthen conservation and management arrangements for sharks caught in association with fisheries managed by the IOTC, in line with the recommendations of the WPEB and SC. The proposal would simplify compliance and monitoring arrangements, while providing mechanisms to ensure the long-term sustainability of shark populations in the Indian Ocean. Noting the ongoing concerns outlined by WPEB and SC for the sustainability of sharks in the Indian Ocean, the proposal will seek to:

- require fins to be naturally attached (including partially cut and folded), or attached by other mechanisms to the trunk, until the first landing [or transhipment].

- prohibit the use of wire traces.

Australia is seeking comments and views from CPCs to guide the drafting of a new shark Resolution, and welcomes discussion on the proposed Resolution at the WPEB, SC and Commission meetings".

9.9 Develop recommendations to the Scientific Committee

159. The WPEB **NOTED** that Resolution 10/02 makes provision for data to be reported to the IOTC on "the most commonly caught shark species and, where possible, to the less common shark species", without giving any list defining the most common and less common species.

160. The WPEB **NOTED** IOTC Recommendation 11/06 *concerning the recording of catch and effort by fishing vessels in the IOTC area of competence* adopted during the 15th Session of the Commission which aims to harmonize the minimum logbook requirement for all gears in the IOTC area, including gillnet and pole-and-line, and expand the list of sharks to be recorded in logbooks as previously recommended by the WPEB.

161. Recognizing the general lack of shark data being recorded and reported to the IOTC Secretariat, the WPEB **RECOMMENDED** that:
    - Resolution 10/02 is revised in order to include the list of most commonly caught elasmobranch species (Table 2) for which nominal catch data shall be reported as part of the statistical requirement for IOTC CPCs.

TABLE 2. List of the most commonly elasmobranch species caught.

Common name	**Species**	Code
Manta and devil rays	Mobulidae	MAN
Whale shark	*Rhincodon typus*	RHN
Thresher sharks	*Alopias spp.*	THR
Mako sharks	*Isurus spp.*	MAK
Silky shark	*Carcharhinus falciformis*	FAL
Oceanic whitetip shark	*Carcharhinus longimanus*	OCS
Blue shark	*Prionace glauca*	BSH
Hammerhead shark	Sphyrnidae	SPY
Other Sharks and rays	–	SKH

    - that the list of shark species to be recorded in logbooks for all gears be modified as in Table 3.

TABLE 3. List of elasmobranchs species to be recorded in the logbook for longline, purse seine and gillnet fishing vessels.

For longline:	**For gillnet:**
Blue Shark (*Prionace glauca*)	Blue Shark (*Prionace glauca*)
Mako Sharks (*Isurus* spp.)	Mako Sharks (*Isurus* spp.)
Porbeagle Shark (*Lamna nasus*)	Other requiem sharks (*Carcharhinus spp.*)
Other requiem sharks (*Carcharhinus spp.*)	Oceanic Whitetip Shark (*Carcharhinus longimanus*)
Oceanic Whitetip Shark (*Carcharhinus longimanus*)	Hammerhead Sharks (Sphyrnidae)
Hammerhead Sharks (Sphyrnidae)	Thresher Sharks (*Alopias* spp.)
Thresher Sharks (*Alopias* spp.)	Tiger shark (*Galeocerdo cuvier)*
Other sharks	Mantas and devils rays (Mobulidae)
	Other sharks
	Other rays

For purse seine:

Oceanic Whitetip Shark (*Carcharhinus longimanus*)
Silky sharks (*Carcharhinus falciformis*)
Mantas and devils rays (Mobulidae)
Other sharks
Other rays

162. The WPEB **RECOMMENDED** that the Commission considers clarifying that observers are allowed to collect biological samples (vertebrae, tissues, reproductive tracts, stomachs) from sharks that are dead at haulback, whose retention is prohibited by current regulation, e.g. thresher sharks under Resolution 10/12.

163. The WPEB **RECOMMENDED** that the recommendations from the KOBE bycatch technical working group are considered to encourage research and development of best practice with regard to setting nets on whale sharks to determine the impacts of the practice. It was noted that these practices are generally recorded in logbooks for the purse seine fleet and the whale sharks are also extracted from the net by fishers, however, it was agreed it would be useful to have information on the extent of the practice and to develop best practice methods through direct collaboration with WCPFC.

164. The WPEB **NOTED** some evidence suggesting decline of the oceanic whitetip shark (*Carcharhinus longimanus*) and that IATTC and ICCAT have already quantitative analyses of this species and adopted, as a result, a management plan, i.e. banned retention of oceanic whitetip sharks. However, the WPEB **AGREED** that such a ban could lead to an increase of discards at sea. Moreover, a complete ban will not prevent fishers from catching this species as a bycatch and may not affect the level of fishery induced mortality of oceanic whitetip shark.

165. Noting the summary of available information on the oceanic whitetip shark (Appendix XI) indicating a decline in abundance over the last past two decades, the WPEB **RECOMMENDED** an urgent need for a more quantitative approach to the assessment of this species.

166. The WPEB strongly **ENCOURAGED** CPCs to practice live release of oceanic whitetip sharks brought alive alongside or onboard of the vessel, or any other mitigation measures, and to provide accurate records of all capture and release of live animals and retention of dead individuals. Appropriate handling guidelines and training need to be combined with the practice of live release. The WPEB also **NOTED** that in gillnet fisheries, the likelihood of live release of oceanic whitetip sharks is low.

167. The WPEB **RECOMMENDED** research and development of mitigation measures to minimize bycatch of the oceanic whitetip shark and its unharmed release for all types of fishing gears and that CPCs with data on oceanic whitetip sharks (i.e. total annual catches, CPUE time series and size data) to make these available to the next meeting in 2012 when the WPEB **AGREED** to revisit the status of oceanic whitetip sharks and management options be proposed if appropriate.

168. Noting that the data holdings of the IOTC Secretariat for sharks are limited and would not facilitate stock assessments, the WPEB **RECOMMENDED** that historic datasets held by CPCs be provided to the IOTC Secretariat as a matter of urgency, in disaggregated forms.

169. The WPEB **NOTED** the offer from Japanese scientists to provide their spatially disaggregated shark datasets dating back to the 1970s, and **URGED** them to provide these datasets before the next WPEB meeting.

Blue sharks

170. The WPEB **RECOMMENDED** the following management advice for blue sharks in the Indian Ocean, for the consideration of the Scientific Committee:

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. The current IUCN threat status of 'Near Threatened' applies to blue sharks globally (Table 4). There is a paucity of information available on this species and this situation is not expected to improve in the short to medium term. There is no quantitative stock assessment and limited basic fishery indicators currently available for blue shark in the Indian Ocean therefore the stock status is highly uncertain. 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 (16–20 years), mature at 4–6 years, and have relativity few offspring (25–50 pups every year), the blue shark is vulnerable to overfishing. Blue shark assessments in the Atlantic and Pacific oceans seem to indicate that blue shark stocks can sustain relatively high fishing pressure.

TABLE 4. Status of blue shark (*Prionace glauca*) in the Indian Ocean – IUCN threat status

Common name	Scientific name	IUCN threat status		
		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, 2011)

Outlook. Maintaining or increasing effort will likely 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.

Oceanic whitetip sharks

171. The WPEB **RECOMMENDED** the following management advice for oceanic whitetip sharks in the Indian Ocean, for the consideration of the Scientific Committee:

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. The current IUCN threat status of 'Vulnerable' applies to oceanic whitetip sharks globally (Table 5). There is a paucity of information available on this species and this situation is not expected to improve in the short to medium term. 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 highly uncertain. 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 vulnerable to overfishing. Despite the lack of data, it is apparent from the information that is available that oceanic whitetip shark abundance has declined significantly over recent decades.

TABLE 5. Status of oceanic whitetip shark (*Carcharhinus longimanus*) in the Indian Ocean – IUCN threat status

Common name	Scientific name	IUCN threat status		
		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, 2011)

Outlook. Maintaining or increasing effort will probably 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 oceanic whitetip sharks will decline in these areas in the near future, and may result in localised depletion.

Scalloped hammerhead sharks

172. The WPEB **RECOMMENDED** the following management advice for scalloped hammerhead sharks in the Indian Ocean, for the consideration of the Scientific Committee:

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 6). There is a paucity of information available on this species and this situation is not expected to improve in the short to medium term. 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 highly uncertain. Scalloped hammerhead sharks are commonly taken by a range of fisheries in the Indian Ocean. They are extremely vulnerable to gillnet fisheries. Furthermore, pups occupy shallow coastal nursery grounds, often heavily exploited by inshore fisheries. Because of their life history characteristics – they are relatively long lived (over 30 years), and have relativity few offspring (<31 pups each year), the scalloped hammerhead shark is vulnerable to overfishing.

TABLE 6. Status of scalloped hammerhead shark (*Sphyrna lewini*) in the Indian Ocean – IUCN threat status

Common name	Scientific name	IUCN threat status		
		Global status	WIO	EIO
Scalloped hammerhead shark	*Sphyrna lewini*	Endangered	Endangered	Least concern

IUCN = International Union for Conservation of Nature; WIO = Western Indian Ocean; EIO = Eastern Indian Ocean
SOURCES: IUCN (2007, 2011)

Outlook. Maintaining or increasing effort will probably result in further 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, and may result in localised depletion.

Shortfin mako sharks

173. The WPEB **RECOMMENDED** the following management advice for shortfin mako sharks in the Indian Ocean, for the consideration of the Scientific Committee:

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. The current IUCN threat status of 'Vulnerable' applies to shortfin mako sharks globally (Table 7). There is a paucity of information available on this species and this situation is not expected to improve in the short to medium term. There is no quantitative stock assessment or basic fishery indicators currently available for shortfin mako shark in the Indian Ocean therefore the stock status is highly uncertain. Shortfin mako sharks are commonly taken by a range of fisheries in the Indian Ocean. Because of their life history characteristics – they are relatively long lived (over 30 years), females mature at 18–21 years, and have relativity few offspring (<25 pups every two or three years), the shortfin mako shark is vulnerable to overfishing.

TABLE 7. Status of shortfin mako shark (*Isurus oxyrinchus*) in the Indian Ocean – IUCN threat status

Common name	Scientific name	IUCN threat status		
		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, 2011)

Outlook. Maintaining or increasing effort will probably 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 shortfin mako shark will decline in these areas in the near future, and may result in localised depletion.

Silky sharks

174. The WPEB **RECOMMENDED** the following management advice for silky sharks in the Indian Ocean, for the consideration of the Scientific Committee:

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. The current IUCN threat status of 'Near Threatened' applies to silky sharks in the western and eastern Indian Ocean and globally (Table 8). There is a paucity of information available on this species and this situation is not expected to improve in the short to medium term. There is no quantitative stock assessment or basic fishery indicators currently available for silky shark in the Indian Ocean therefore the stock status is highly uncertain. 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 at 6–12 years, and have relativity few offspring (<20 pups every two years), the silky shark is vulnerable to overfishing. Despite the lack of data, it is clear from the information that is available that silky shark abundance has declined significantly over recent decades.

TABLE 8. Status of silky shark (*Carcharhinus falciformis*) in the Indian Ocean – IUCN threat status

Common name	Scientific name	IUCN threat status		
		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, 2011)

Outlook. Maintaining or increasing effort will 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.

Bigeye thresher sharks

175. The WPEB **RECOMMENDED** the following management advice for bigeye thresher sharks in the Indian Ocean, for the consideration of the Scientific Committee:

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. The current IUCN threat status of 'Vulnerable' applies to bigeye thresher shark globally (Table 9). There is a paucity of information available on this species and this situation is not expected to improve in the short to medium term. 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 highly uncertain. 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 9-13 years, and have few offspring (2-4 pups every year), the bigeye thresher shark is vulnerable to overfishing.

TABLE 9. Status of bigeye thresher shark (*Alopias superciliosus*) in the Indian Ocean – IUCN threat status

Common name	Scientific name	IUCN threat status		
		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, 2011)

Outlook. Current longline fishing effort is directed to other species, however bigeye thresher shark is a common bycatch in these fisheries. Hooking mortality is apparently very high, therefore IOTC Resolution 10/12 prohibiting retaining of any part of thresher shark onboard and promoting live release of thresher shark are apparently ineffective for species conservation. Maintaining or increasing effort will probably result in further declines in biomass, productivity and CPUE. However there are few data to estimated CPUE trends, in view of IOTC Resolution 10/12 and reluctance of fishing fleets 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.

Pelagic thresher sharks

176. The WPEB **RECOMMENDED** the following management advice for pelagic thresher sharks in the Indian Ocean, for the consideration of the Scientific Committee:

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. The current IUCN threat status of 'Vulnerable' applies to pelagic thresher shark globally (Table 10). There is a paucity of information available on this species and this situation is not expected to improve in the short to medium term. 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 highly uncertain. 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.

TABLE 10. Status of pelagic thresher shark (*Alopias pelagicus*) in the Indian Ocean – IUCN threat status

Common name	Scientific name	IUCN threat status		
		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, 2011)

Outlook. Current longline fishing effort is directed to other species, however pelagic thresher shark is a common bycatch in these fisheries. Hooking mortality is apparently very high, therefore IOTC Resolution 10/12 prohibiting retaining of any part of thresher sharks onboard and promoting live release of thresher shark are apparently ineffective for species conservation. Maintaining or increasing effort will probably result in further declines in biomass, productivity and CPUE. However there are few data to estimate CPUE trends, in view of IOTC Resolution 10/12 and reluctance of fishing fleets 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.

9.10 Update of shark species Executive Summaries

177. The WPEB **NOTED** paper IOTC–2011–WPEB07–14 which aimed to encourage the WPEB to develop a clear and concise draft Executive Summary for sharks in the Indian Ocean, for the consideration of the Scientific Committee, and which summarised the status of the blue shark (*Prionace glauca*), oceanic whitetip shark (*Carcharhinus longimanus*), scalloped hammerhead shark (*Sphyrna lewini*), shortfin mako shark (*Isurus oxyrinchus*), silky shark (*Carcharhinus falciformis*), bigeye thresher shark (*Alopias superciliosus*) and pelagic thresher shark (*Alopias pelagicus*) in the Indian Ocean.

178. The WPEB **NOTED** that Recommendation 30 from the IOTC performance review panel states: "New guidelines for the presentation of more user friendly scientific reports in terms of stock assessments should be developed. …".).

179. The WPEB **RECOMMENDED** that the IOTC Secretariat update the draft shark Executive Summaries with the latest 2010 interaction data, and for these to be provided to the Scientific Committee for its consideration.

10. SEABIRDS

10.1 Review of new information on the status of seabirds

180. The WPEB **NOTED** paper IOTC–2011–WPEB07–38 which provided new information on distribution of albatrosses and petrels breeding in the Indian Ocean and assessment of potential overlap with the IOTC fisheries, including the following abstract provided by the authors:

> *"The paper presents recent data and analysis on the distribution of the different life-history stages (juveniles, immatures, and of different populations for several species of albatrosses and petrels, based on tracking studies from French Territories. One objective was to estimate the degree of overlap with fisheries, based on recently available data on zones of high bycatch of Taiwanese and Japanese fisheries within the IOTC. The study shows that extensive overlap exists between zones of high bycatch and zones of high densities of albatrosses and petrels, with strong heterogeneities between life history stages, and show that young naïve birds (juveniles) occur in zones of high bycatches. The study shows also that different populations of the same species may have very different rates of overlap with fisheries, and that the zones of high bycatch of two fisheries examined have very different degree of overlap according to species, and within species according to life history stages and populations, that have thus different susceptibility to bycatch. The study suggests that this heterogeneity has to be taken into account in future analyses, that more information is needed on bycatch rates and band recoveries by different fisheries, and collaboration between seabird biologist and fishery scientist is highly recommended*."

181. The WPEB **NOTED** that reporting information from birds that have leg-bands are a very important source of data for seabird biology. The WPEB **NOTED** that observers are important to ensure returning of band recovery information, and that there was a need to educate more fishers about the

need to return band information. It was suggested that schemes to incentivise returning of bands/band data be investigated.

182. The WPEB **REQUESTED** that when band recovery information is submitted, that the relevant banding scheme acknowledge the submission and return the banding information (species identity, island of origin, age/time of banding, etc.) as a courtesy to the individual who submitted the data.

183. The WPEB **NOTED** that because some seabird species range widely, into other ocean basins, it is desirable to harmonise technical specifications for mitigation measures (e.g. tori line design) among RFMOs where possible and appropriate.

184. The WPEB **NOTED** the widespread distributions of species known to be vulnerable to bycatch in fisheries for tuna and tuna-like species in the Indian Ocean. It further noted the variability in ranges based on life cycle phase, age, sex, etc., and the incomplete coverage from all populations/life cycles/ages.

185. The WEPB **NOTED** the joint effort of seabird biologists and the Japanese Fisheries Agency to better understand relationships between seabird distribution and zones of high by-catch and encourage further cooperative work.

186. The WPEB **RECOMMENDED** that the Scientific Committee note that the current area of application for seabird bycatch mitigation measures was supported by the available evidence and should not be revised at this point.

187. The WPEB **NOTED** paper IOTC–2011–WPEB07–38 which provided an overview of the National Plan of Action for the conservation of the Amsterdam albatross *Diomedea amsterdamensis*: potential risks from longline fisheries in the IOTC zone, including the following abstract provided by the authors:

> "*The paper presents the French National Plan of Action for the conservation of Amsterdam albatross Diomedea amsterdamensis, launched in 2010. It details various actions planned in the next 5 years. The critically endangered Amsterdam albatross is one of the rarest bird species, with only ~30 pairs breeding on Amsterdam Island and a total population of only ~200 individuals remaining. Demographic modelling indicates that the additional mortality of only 5 birds per year would cause a decrease of >3% per year. This would cause the Amsterdam albatross to become extinct within a few decades. Its foraging range at all life history stages overlaps completely with tuna longline fisheries in the southern zone of the IOTC, in areas where high mortalities are reported, causing concern for potential negative interactions. The talk stressed the importance of obtaining information on bycatch in the range of the species, and of band recoveries, since the species is difficult to distinguish at sea from wandering albatrosses, but the entire population is banded. We suggest that particular efforts should be taken to eliminate mortality risks for seabirds in the range of the species, and additional observations in the central Indian Ocean fisheries where the species forages: specific funding is available through the Action Plan to fund observers on board of longliners studying occurrence of species around longliners and bycatch processes*."

188. The WPEB **NOTED** that through the French National Plan, funds have been earmarked for observers to go on tuna longliners operating in the range of this species. Japan expressed interest in assistance with getting observers onboard these vessels. The WPEB encouraged the French, Japanese, and other governments and scientists to pursue this collaborative effort to place experienced, international observers onboard vessels fishing on the High Seas within the range of the Amsterdam Albatross.

189. The WPEB **NOTED** paper IOTC–2011–WPEB07–41 which provided an overview of modelling work on Crozet wandering albatrosses and impact of longline fisheries in the IOTC zone, including the following abstract provided by the authors:

> "*This paper presents a population assessment for Crozet wandering albatross Diomedea exulans population using demographic data from 1960-2009. This can be considered as a Level 3 Ecological Risk Assessment. An age, sex, life-stage and spatially structured model is described that is conditioned upon breeding population size, breeding success, adult and juvenile survival rates and observed bycatch rate data. The model includes comprehensive data on the spatial and temporal distributions of fishing effort and foraging distributions to estimate temporal overlaps, fishery catchability and consequent bycatch. Results show that the model was not able to replicate the observed data without making some broad assumptions about seabird catchability from the pelagic longline fleets and seabird behaviour. Consequently, the*

rapid decline in breeding pairs observed between the late 1960s and the early 1970s could not be explained without assuming that (i) the southern Japanese pelagic longline fleet had a substantially higher rate of capture than other fleets, and (ii) a distinct seabird behaviours (shy-bold / attracted/not attracted by fishing boats - behavioural types) exist that lead to an increased susceptibility to capture of only one part of the population. The more recent decline in breeding pairs (from the late 1990s) was not able to be explained without assuming that the Indian Ocean Taiwanese fresh longline fleet has a greater rate of capture in comparison with other pelagic longline fleets (including that of the Taiwanese deep freezing fleet). The results suggest that research should be addressed to confirm these assumptions, especially to obtain more comprehensive effort statistics for the pelagic longline fleets, in particular the Taiwanese fresh longline fleet."

190. The WPEB **NOTED** that there are ongoing studies to check for individual seabird foraging strategies to see if some birds track vessels consistently and others don't.

191. The WPEB **NOTED** that there is uncertainty as to what fishing gear and techniques characterize the Taiwan,China fresh tuna fishery. This highlights the need to have detailed characterizations of fishing operations, and the observer programme should continue to collect and report on these features.

192. The WPEB **RECOMMENDED** that targeted observer effort be deployed in specific fisheries where high seabird bycatch is known or suspected.

193. The WPEB **NOTED** paper IOTC–2011–WPEB07–40 which provided an preliminary view of bycatch hotspots: bycatch distribution in the IOTC area of the southern hemisphere, including the following abstract provided by the authors:

"*Information was presented on the distribution of seabird bycatch across the IOTC area based on data collected by Japanese observers from 1997-2009/2010. Shy-type albatrosses, which do not breed in the Indian Ocean, were caught more than some albatross species which have a colony in the Indian Ocean. This indicates bycatch of non-breeding individuals or/and such mobility of broad range in albatrosses. From this result, it would be reasonable to integrate three oceans (Indian, Pacific and Atlantic) for discussing seabird bycatch hotspots. Bycatch CPUE patterns differ substantially between albatross species which have colonies in the Indian Ocean. For example, many more wandering albatrosses were recorded caught than sooty Phoebetria fusca and light-mantled albatrosses P. palpebrata, despite similar population numbers. Data from Japanese longliners identified bycatch of albatrosses in the southern hemisphere concentrated off southern African waters, especially in the SE Atlantic between April to September, and in the southeastern Indian Ocean in April to December, and these areas and seasons can be considered seabird bycatch hotspots. Considering numbers and seasonality of albatrosses and petrels bycatch, the current seabird mitigation approach (two-column approach) adopted by IOTC should be replaced with more stringent mitigation measures for these hotspots by considering their effectiveness, safety and practicability*.

194. The WPEB **NOTED** the Procellariiform seabird bycatch from Japanese tuna longliners in the IOTC area between 1992–2009, and total breeding pairs per species and major breeding locations in the Indian Ocean, as provided in Table 11.

TABLE 11. Procellariiform seabird bycatch (by species) from Japanese tuna longliners in the IOTC area between 1992–2009, and total breeding pairs per species and major breeding locations in the Indian Ocean: o indicates breeding site, x indicates no breeding at site. Bycatch data were derived from a total of 14,813,680 hooks observed.

Species	Number of bycatch	Number of pairs	Iles Kerguelen	Iles Crozet	Prince Edward Island
Wandering albatross	117	22,437	o	o	o
Black-browed albatross	241	600,852	o	o	x
Shy albatross	191	13,000	x	x	x
Yellow-nosed albatross	234	41,580	o	o	o
Grey-headed	435	99,000	o	o	o
Sooty albatross	25	19,000	o	o	o
Light-mantled albatross	37	24,000	o	o	o
Northern giant petrel	113	11,500	o	o	o
White-chinned petrel	147	unknown	o	o	o

195. The WPEB **NOTED** that presenting bycatch figures only, without reference to relative fishing or observer effort, makes interpretation of spatial 'hotspots' difficult. The WPEB further **NOTED** that a collaborative effort between scientists from Japan, EU,France, ACAP and BirdLife International to examine this and species identification issues is ongoing, and requested that an update be provided at the next WPEB meeting.

196. The WPEB **AGREED** that training of observers to identify seabirds is needed and CPCs should welcome seabird scientists onboard their vessels to assist with this.

10.2 Review of any National Plans of Action for reducing incidental catches of seabirds in longline fisheries

197. The WPEB **NOTED** that no new NPOA-Seabirds had been adopted in last 12 months. Currently only four CPCs have an NPOA-Seabirds, with two others in preparation (Appendix X).

198. The WPEB **REITERATIED** its recommendation (para.79) that CPCs fulfill their FAO obligation to assess the need for an NPOA-seabirds and develop plans if appropriate. To assist in this the IOTC Secretariat should revise annually the table summarising progress towards the development of NPOA-Seabirds by CPCs for the consideration as each WPEB and Scientific Committee meeting.

10.3 Research on interaction between seabirds and tuna fisheries in the Indian Ocean

199. The WPEB **NOTED** paper IOTC–2011–WPEB07–40 which provided a preliminary report of 2010 weighted branchline trials in the tuna joint venture fishery in the South African EEZ, including the following abstract provided by the authors:

> "*The lack of comprehensive research developing and comparing seabird bycatch mitigation technologies appropriate to pelagic longline fisheries has led to considerable debate regarding best-practice mitigation to prevent seabird mortality in pelagic tuna fisheries. Research in the South African tuna joint venture fishery in 2009 obviated the need to shrink the area astern of the vessel that birds have access to baited hooks via weighted branchlines to force seabird interactions into an area that can be successfully defended with streamer lines – a concept that has become known as 'shrink and defend'. Taking this philosophy further, in 2010 the performance of revised "hybrid" streamer lines deployed with weighted (W) and un-weighted (UW) branchlines were compared on two Japanese vessels fishing in the South Africa EEZ. Seventeen seabird species attended the vessel during line setting, but only four made primary attacks on baits and were killed. White-chinned petrels were the most abundant bird; they were present during all sets, attacked baits at the highest rate and were the species most killed. Albatross attack rates were nearly two orders of magnitude lower than that of white-chinned petrels but eight were killed, suggesting strongly that secondary attacks – birds stealing baits from other birds having made a primary attack – drove albatross mortality. Twenty-four of the 27 bird mortalities occurred after nautical dawn. All three birds caught at night were on UW lines. Weighting branchlines with hybrid streamer lines dramatically reduced seabird attacks, secondary attacks and seabird mortalities with little effect on fish catch. Four of 27 bird mortalities (2 white-chinned petrels, 1 shy albatross, and 1 cape gannet) were on W branchlines – a reduction in seabird bycatch rate of 86 % compared to UW (UW = 0.290 and W = 0.040 birds/1,000 hook). Mean tuna catch was near equal on the two branchline types, but W branchlines tangled on themselves three times more often than UW branchlines. No crew injuries occurred from either branchline type*."

200. The WPEB **AGREED** that these preliminary results indicate that the 'shrink and defend' conceptual framework of seabird bycatch mitigation is effective at reducing seabird interactions with pelagic longline fishing gear. Specifically, these results strongly suggest that two hybrid streamer lines together with weighted branchlines and night setting constitute best-practice seabird bycatch mitigation for the joint venture fleet operating in the South Africa EEZ and other white-chinned petrel dominated fishing areas. These results also suggest that the Column A and Column B mitigation approach adopted by WCPFC (CMM 2007-04) and IOTC (Resolution 10/06 *on reducing incidental bycatch of seabirds in longline fisheries*), as currently written, would not prompt the simultaneous use of two hybrid streamer lines, branchline weighting and night setting, and therefore, falls short of the best-practice mitigation identified in this study.

201. The WPEB **NOTED** paper IOTC–2011–WPEB07–43 which provided a review of seabird bycatch mitigation measures for pelagic longline fishing operations, including the following abstract provided by the authors:

"*A review of recent research on seabird mitigation measures for pelagic longline gear was conducted by ACAP's Seabird Bycatch Working Group (SBWG), which met in Guayaquil, Ecuador in August 2011. The SBWG comprises global experts in seabird bycatch mitigation research and implementation and advises ACAP on actions that will assist in assessment, mitigation and reduction of negative interactions between fishing operations and seabirds*."

202. The WPEB **NOTED** that one of the major products coming out of the ACAP SBWG meeting was an updated review of current mitigation research for pelagic longline fisheries. The products of this work include a summary review, presented in IOTC–2011–WPEB07–43.

203. The WPEB **NOTED** that three measures ─ weighting of branchlines, night setting of longlines and use of bird scaring lines ─ are proven and recommended measures for use in pelagic longline gear. The WPEB **RECOMMENDED** that the Scientific Committee note that other measures, including the three which are currently included in Resolution 10/06 ─ blue-dyed squid bait, offal discharge control and use of a line shooting device ─ are not considered to be effective mitigation measures following ACAPs review of available mitigation measures:
    - Blue dyed squid bait has been insufficiently researched and cannot be recommended.
    - Line shooting device. There is no experimental evidence that line shooters reduce seabird bycatch in pelagic longline fisheries; therefore, they should not be considered a seabird bycatch mitigation option, although they will continue to be used on many vessels because they are considered to improve fishing efficiency.
    - Offal discharge control. Appropriate management of offal is encouraged as good operating practice but is not considered a primary mitigation measure in pelagic fisheries as there are much smaller quantities of fish waste derived from fishing operations, in direct contrast to the situation in demersal fisheries. The inclusion of offal management as a mitigation measure in Resolution 10/06 most likely has been taken from use of this measure in CCAMLR and other demersal longline fisheries, where it is much more important.

204. The WPEB **NOTED** paper IOTC–2011–WPEB07–44 which provided a summary of best practice advice for reducing the impact of pelagic longline gear on seabirds, including the following abstract provided by the authors:

    "*Recognising that most (84%) breeding albatrosses overlap with the pelagic longline fisheries for tuna and swordfish managed by the five tuna RFMOs, the adoption of best practice seabird conservation in these fisheries is a high priority. A combination of weighted branchlines, bird scaring lines and night setting are best practice mitigation in reducing bycatch of seabirds to the lowest possible level in pelagic longline fisheries. These measures should be applied in high risk areas such as the high latitudes of southern hemisphere oceans to reduce the incidental mortality of seabirds to the lowest possible levels. Other factors such as safety, practicality and the characteristics of the fishery should also be recognised. Currently, no single mitigation measure can reliably prevent the incidental mortality of seabirds in most pelagic longline fisheries. The most effective approach is to use the measures described in combination*."

205. The WPEB **NOTED** that this paper provided a distillation of the review of mitigation measures available for pelagic longline gear reported on in paper IOTC–2011–WPEB07–43.

206. The WPEB **RECOMMENDED** that the Scientific Committee note that:
    - A combination of weighted branchlines, bird scaring lines and night setting are best practice mitigation in reducing bycatch of seabirds to the lowest possible level in pelagic longline fisheries. These measures should be applied in high risk areas within the Indian Ocean and other southern hemisphere oceans.
    - Currently, no single mitigation measure can reliably prevent the incidental mortality of seabirds in most pelagic longline fisheries. The most effective approach is to use the measures described in combination. Other factors such as safety, practicality and the characteristics of the fishery should also be recognised when framing conservation measures.
    - The current recommended minimum standards for branchline weighting configurations are:
        i. Greater than 45 g weight attached within 1 m of the hook; or
        ii. Greater than 60 g weight attached within 3.5 m of the hook; or
        iii. Greater than 98 g weight attached within 4m of the hook.
    - Positioning weight farther than 4 m from the hook is not recommended.

207. The WPEB **AGREED** that setting longlines at night, between nautical twilight and nautical dawn, is highly effective at reducing incidental mortality of seabirds because the majority of vulnerable seabirds are inactive at night.

208. The WPEB **NOTED** that for bird scaring lines (BSL), ACAP best practice advice recognises that vessel size is an important determinant in their practical use, with respect to the aerial extent that can be achieved, and the ability to deploy single or twin BSLs. For vessels that exceed 35 m in length, an aerial extent of 100 m and use of two BSLs is **RECOMMENDED**; for smaller vessels an aerial extent of 75 m and use of a single BSL is **RECOMMENDED**.

209. Taking into account the information presented in working papers IOTC–2011–WPEB07–43, IOTC–2011–WPEB07–44 and IOTC–2011–WPEB07–54, the WPEB **AGREED** that a combination of weighted branchlines, bird scaring lines and night setting is best practice mitigation in reducing bycatch of seabirds to the lowest possible level in pelagic longline fisheries. The WPEB **RECOMMENDED** that Resolution 10/06 be amended to reflect this advice, and to incorporate the technical specifications outlined in the paragraphs above (paras. 203, 206, 208).

210. Further, the WPEB **NOTED**, in agreement with IOTC–2011–WPEB07–40, that if this **RECOMMENDATION** was accepted, together with the **RECOMMENDATION** to remove blue-dyed squid bait, line shooters and offal discharge control from the existing measure, the 'two column' approach used in Resolution 10/06 would be abandoned in favour of an approach that specifies the three measures to be applied in areas of seabird interaction risk.

211. The WPEB **RECOMMENDED** that at this stage, line weighting should be seen as an adaptive management response to the seabird bycatch problem. Continued refinement of line weighting configurations (mass, number and position of weights and materials) through controlled research and application in fisheries, is highly desirable to find configurations that are most safe, practical and effective. The regimes recommended above should be implemented in working fisheries, monitored through observer programmes, and reviewed and modified if found to be inadequate in reducing bycatch to acceptable levels.

212. The meeting **NOTED** that the development of the mitigation measures outlined in the papers presented was the result of excellent collaboration between fishers, seabird experts and mitigation technologists with specialist expertise. Many IOTC members will lack capacity to collect such data, but it is imperative that this be done if further progress is to be made. The WPEB **RECOMMENDED** that CPCs look to establish collaborative relationships with other CPCs, NGOs and IGOs with the relevant skill set to provide the necessary training and build capacity.

213. The WPEB **NOTED** that the development of a revised seabird Conservation and Management Measure, that adopts the use of the three best practice mitigation measures, needs to take into consideration socio-economic factors relevant to fishers, and the need to ensure ongoing collection of data to refine mitigation measures.

214. The WPEB **NOTED** that it was desirable to harmonise mitigation measures across ocean basins, where feasible, to assist fishers in gaining experience in the use of best practice mitigation measures, and to improve fishing efficiency through eliminating the need to change fishing gear when fishing in different areas.

10.4 Identification sheets for observers

215. The WPEB **NOTED** ACAP's SBWG recently discussed the development of seabird identification guides for use in observer programmes and agreed that guides designed to identify bird corpses were of much greater use for aiding the identification of seabirds caught at sea than those based on live birds. Such guides have been developed in Canada, Ecuador, Japan and the United States of America. It was **NOTED** that ACAP'S Secretariat has now commenced work on the development of this guide, and will provide this to IOTC and other tuna RFMOs when it is complete.

216. The WPEB **NOTED** that identification of dead seabirds was not a simple task and required considerable training of observers. It was not realistic to expect that all fishing masters would possess the necessary skills to reliably observe seabirds killed in fisheries, and reliable data would most likely only come from trained and experienced observers.

217. The WPEB **RECOMMENDED** that any amendment to Resolution 10/06 allow sufficient time for orderly implementation, to allow training and redevelopment of gears and operations.

10.5 Review of Resolutions and Recommendations on seabirds:

218. The WPEB **NOTED** paper IOTC–2011–WPEB07–16 which aimed to encourage the WPEB to review the existing Conservation and Management Measures (CMMs) relating to seabirds, 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.

219. The WPEB **AGREED** that although IOTC Recommendation 05/09 *on incidental mortality of seabirds* has not been revoked, it became obsolete with the adoption of Resolution 10/06, and **RECOMMENDED** that it be removed from the list of current Conservation and Management Measures of the Commission.

220. The WPEB **AGREED** that the current wording of Resolution 10/06 does not make mandatory the reporting of interactions between fishing vessels catching species under the IOTC Agreement and seabirds when this information is deemed necessary to assess the status of these species.

221. The WPEB strongly **RECOMMENDED** that the Resolution 10/06 be amended in order to make the reporting of seabird interactions mandatory for vessels fishing for species under the IOTC mandate. In addition and as a matter of consistency, to increase the reporting of these interactions, the WPEB further **RECOMMENDED** that the recording of interactions with seabirds be included in the minimum requirements for logbooks for all fleets.

10.6 Develop recommendations to the Scientific Committee

222. The WPEB **RECOMMENDED** the following management advice for seabirds in the Indian Ocean, for the consideration of the Scientific Committee:

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 12. 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 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 assessments 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* includes an evaluation requirement (para. 8) by the Scientific Committee in time for the 2011 meeting of the Commission. However, given the lack of reporting of seabird interactions by CPCs to date, such an evaluation cannot be undertaken at this stage. Unless IOTC CPCs become compliant with the data collection and reporting requirements for seabirds, the WPEB will continue to be unable to address this issue. Notwithstanding this, it is acknowledged that the impact on seabird populations from fishing for tuna and tuna-like species, particularly using longline gear may increase if fishing pressure increases. Any fishing in areas with high abundance of procellariiform seabirds is likely to cause incidental capture and mortality of these seabirds unless measures that have been proven to be effective against Southern Ocean seabird assemblages are employed.

TABLE 12. Status of seabirds in the Indian Ocean – 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
Albatross		
Atlantic Yellow-nosed	*Thalassarche*	Endangered
Black-browed albatross	*Thalassarche*	Endangered
Indian yellow-nosed albatross	*Thalassarche carteri*	Endangered
Shy albatross	*Thalassarche cauta*	Near Threatened
Sooty albatross	*Phoebetria fusca*	Endangered
Tristan albatross	*Diomedea dabbenena*	Critically Endangered

Wandering albatross	*Diomedia exulans*	Vulnerable
White-capped albatross	*Thalassarche steadi*	Near Threatened
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

223. The WPEB **RECOMMENDED** that the Scientific Committee consider the following:
    - The available evidence indicates considerable risk to the status of seabirds 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.
    - Maintaining or increasing effort in the Indian Ocean without refining and implementing appropriate mitigation measures, 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 seabirds.
    - Resolution 10/06 on reducing the incidental bycatch of seabirds in longline fisheries includes an evaluation requirement (para. 8) by the Scientific Committee in time for the 2011 meeting of the Commission, noting that this deadline is now overdue.

10.7 Update of seabirds Executive Summary

224. The WPEB **NOTED** paper IOTC–2011–WPEB07–16 which aimed to encourage the Working Party on Ecosystems and Bycatch (WPEB) to develop a clear and concise draft Executive Summary for seabirds in the Indian Ocean, for the consideration of the Scientific Committee.

225. The WPEB **RECOMMENDED** that the IOTC Secretariat update the draft seabirds Executive Summary with the latest 2010 interaction data, including the number of breeding pairs for each species, and for these to be provided to the Scientific Committee for its consideration.

11. MARINE TURTLES

11.1 Review of new information on the status of marine turtles

226. The WPEB **NOTED** a presentation on marine turtles research monitored by France in the South West Indian Ocean, including the following abstract provided by the author:

    "Those activities are covered by the Southwest Indian Ocean Fisheries Project (SWIOFP) and other Reunion Island-based projects. Migratory routes of adult green and juvenile green and hawksbill turtles are investigated using Argos transmitters to evaluate the degree of exposure to fishing activities. More than 110 transmitters have been deployed on nesting females in 2009-2011 and 50 more will be deployed in 2012. The tracks show regional-wide movements from the nesting sites (Europa, Glorieuses, Tromelin) to coastal areas of Madagascar, Mozambique, Tanzania and Kenya. The degree of overlap with fisheries must take into account the seasonal movements of the fleets and will be assessed in a further stage of the study."

227. The WPEB **NOTED** that trends in some marine turtle populations in the in some areas are recovering and that migitation measures and conservation effort should continue.

228. Noting the general lack of data on incidental catch of marine turtles, the WPEB **RECOMMENDED** that an ERA is conducted for marine turtles caught in fisheries targeting tuna and tuna-like species in the Indian Ocean before the next session of the WPEB. In order to do so, the WPEB **RECOMMENDED** that the Scientific Committee request the Commission to allocate specific funds for such an analysis.

229. The WPEB further **RECOMMENDED** that data on incidental catches of marine turtles should be better recorded in the artisanal and coastal fisheries of the Indian Ocean.

11.1 Research on effect of marine turtles mitigating measures

230. The WPEB **NOTED** that the use of circle hooks in longline fisheries reduces the catch rates and increase the survival of marine turtles.

231. The WPEB **NOTED** the progress made regarding the design and deployment of ecological FADs. Several designs of ecological FADs have been tested onboard the European purse seine fleet and it seems that they considerably reduce the entanglement of sharks and marine turtles. However, events of sharks entangled in these ecological FADs were still observed, although very rare (2 occurrences). Consequently new designs of ecological FADs will soon been tested by the EU,France fleet with the goal of zero entanglement.

11.2 Review of any national management plans/strategies for the reduction of marine turtle bycatch in tuna fisheries

232. The WPEB **NOTED** that no new information regarding the development and implementation of any national management plans for the reduction of marine turtle bycatch in tuna fisheries was presented and **RECOMMENDED** that CPCs develop such a plan and that the scientists participating in the WPEB report on progress at the next session of the WPEB.

11.3 Research on interaction between turtles and tuna fisheries in the Indian Ocean

233. The WPEB **NOTED** the information provided in several documents on levels of interactions between marine turtles and tuna fisheries in the Indian Ocean, noting that such information was limited.

234. The WPEB **RECOMMENDED** that all fleets, including longline, purse seine and gillnet fleets, shall report on interactions between marine turtles and fisheries for tuna and tuna-like species, at the next session of the WPEB.

11.4 To develop recommendations on appropriate mitigation measures

235. The WPEB **REITERATED** its recommendation (para. 69) that further research into the effectiveness of circle hooks adopt a multi-species approach, so as to avoid, as far as possible, promoting a mitigation measure for one bycatch taxon that might exacerbate bycatch problems for other taxa.

236. The WPEB **RECOMMENDED** that the development and adoption of improved FAD designs to reduce the incidence of entanglement of marine turtles and sharks, including the use of biodegradable materials, be undertaken by the main fleets using FADs, noting that the use of these FADs could become mandatory in the future.

11.5 To develop guidelines for appropriate handling and release

237. The WPEB **NOTED** that the identification cards prepared by the Secretariat, includes one page on handling and release practices for hooked marine turtles. The WPEB further **NOTED** that the IATTC has been producing videos on best handling and releasing of marine turtles caught in longline fisheries and **ENCOURAGED** scientists to use this material to train observers and fishers.

11.6 To develop regional standards for data collection, exchange and training

238. The WPEB **NOTED** that the identification cards prepared by the Secretariat shall improve identification and therefore reporting of incidental catch of marine turtles and that the MoU IOSEA is conducting some training activities.

11.7 To produce a marine turtle Identification Guide

239. The WPEB **NOTED** the progress the Secretariat has made on the development of identification cards for marine turtles as indicated in IOTC–2011–WPEB07–11 and **ACKNOWLEDGED** the assistance of the Secretariat of the Pacific Community, as well as marine turtles experts for the completion of this work.

11.8 Review of Resolutions and Recommendations on turtles

240. The WPEB **NOTED** that there are two current Conservation and Management Measures regarding marine turtles, Recommendation 05/08 *On sea turtles* and Resolution 09/06 *On marine turtles.* However, the WPEB **AGREED** that although Recommendation 05/08 *On sea turtles* has not been revoked, it became obsolete with the adoption of Resolution 09/06 *On marine turtles* and **RECOMMENDED** that it be removed from the list of current Conservation and Management Measures of the Commission.

241. Noting that reporting of interactions with marine turtles is already mandatory through Resolution 09/06 which states "*CPCs shall collect (including through logbooks and observer programs) and provide to the Scientific Committee all data on their vessels' interactions with marine turtles in fisheries targeting the species covered by the IOTC Agreement"* (Res.09/06, para.2), and in order to increase the reporting of interactions, the WPEB **RECOMMENDED** that the recording of marine turtles caught as bycatch is included in the minimum requirements of logbooks for all fleets fishing in the IOTC area.

11.9 Develop recommendations to the Scientific Committee

242. The WPEB **RECOMMENDED** that the Scientific Committee note that the lack of data from CPCs on interactions and mortalities of marine turtles in the Indian Ocean is a significant concern, resulting in an inability of the WPEB to estimate levels of marine turtle bycatch.

243. The WPEB **RECOMMENDED** that the Scientific Committee note that there is an urgent need to quantify the effects of fisheries for tuna and tuna-like species in the Indian Ocean on non-target species, and it is clear that little progress on obtaining and reporting data on interactions with marine turtles has been made. This data is imperative to allow the IOTC to respond and manage the adverse effects on marine turtles, and other bycatch species.

244. The WPEB **RECOMMENDED** that the comprehensive 'Assessment of the conservation status of the leatherback turtle in the Indian Ocean and South-East Asia', prepared by IOSEA in 2006, be reviewed, especially with regard to its recommended follow-up.

245. Noting that the Western Indian Ocean Marine Science Association (WIOMSA) meeting was being held at the same time as WPEB07 and the participation of marine turtle experts was limited, the WPEB **RECOMMENDED** that the timing of the next WPEB meeting be communicated to the organisers of the WIOMSA meeting as early as possible by the IOTC Secretariat, so that marine turtle experts could participate at the next Session of the WPEB.

246. Noting that paragraph 4 of Resolution 09/06 *on marine turtles* currently refers to "hard shelled turtles", which could potentially be read to exclude leatherback turtles, and noting the WPEB and the Scientific Committee's previous agreement that the resolution does apply to leatherback turtles in its entirety, the WPEB **RECOMMENDED** that the Commission revise Resolution 09/06 *on marine turtles* so that the term "hard-shelled" be deleted and replaced by "marine" to ensure application to all marine turtle species.

247. The WPEB **RECOMMENDED** the following management advice for marine turtles in the Indian Ocean, for the consideration of the Scientific Committee:

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 13. 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 and to a lesser extent purse seine fishing and longline is not known.

Outlook. Resolution 09/06 on marine turtles includes an evaluation requirement (para. 9) by the Scientific Committee in time for the 2011 meeting of the Commission (para.10). However, given the lack of reporting of marine turtle interactions by CPCs to date, such an evaluation was not able to be undertaken. Unless IOTC CPCs become compliant with the data collection and reporting requirements for marine turtles, the WPEB 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.

TABLE 13. Status of marine turtles in the Indian Ocean – 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
Flatback turtle	*Natator depressus*	Data deficient
Green turtle	*Chelonia mydas*	Endangered
Hawksbill turtle	*Eretmochelys*	Critically Endangered
Leatherback turtle	*Dermochelys*	Critically Endangered
Loggerhead turtle	*Caretta caretta*	Endangered
Olive ridley turtle	*Lepidochelys*	Vulnerable

248. The WPEB **RECOMMENDED** that the Scientific Committee consider the following:
    - The available evidence indicates considerable risk to the status of 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.
    - Maintaining or increasing 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.

11.2 Update of marine turtle Executive Summary

249. The WPEB **NOTED** paper IOTC–2011–WPEB07–15 which aimed to encourage the WPEB to develop a clear and concise draft Executive Summary for marine turtles in the Indian Ocean, for the consideration of the Scientific Committee.

250. The WPEB **RECOMMENDED** that the IOTC Secretariat update the draft marine turtle Executive Summary with the latest 2010 interaction data, and for these to be provided to the Scientific Committee for its consideration.

12. MARINE MAMMALS

12.1 Research programmes on marine mammals

251. The WPEB **NOTED** paper IOTC–2011–WPEB07–45 which provided a review of available literature and of potential solutions to Odontocete bycatch and depredation in longline fisheries, including the following abstract provided by the authors:

    "*Operational interactions between odontocetes (i.e., toothed whales) and longline gear are a global phenomenon that may threaten the conservation of odontocete populations and the economic viability of longline fisheries. This review attempts to define the issue, summarize the trends and geographical extent of its occurrence over the last half century, explore the potential impact on odontocetes and on fisheries, and describe potential acoustic and physical mitigation solutions. Reports of odontocete bycatch rates are highly variable (between 0.002 and 0.231 individuals killed per set) and at least 20 species may be involved. Information about population size, migration patterns and life history characteristics are scarce, although at least one population may be in decline due to losses attributable to longline bycatch. Information about the financial impact of depredation on pelagic longline fisheries is also scarce, although estimates of daily fleet-wide losses range between US$1,034 and US$8,449 (overall income was not reported). Such biological and financial losses may be unsustainable. Recent developments in acoustic and physical mitigation technologies have yielded mixed results. Acoustic mitigation technologies have no moving parts but require complex electronics. To date, they have been insufficiently developed and their efficacy has been difficult to assess. Physical mitigation technologies generally require complex moving parts, although they are relatively simple to develop and assess. Both require considerable further development and testing before widespread commercial production and use is possible. Development of these approaches should be prioritized and a 'toolbox' of various partial solutions should be compiled, because a single panacea to the problem is unlikely to emerge*."

13. OTHER BYCATCH AND BYPRODUCT SPECIES

13.1 Research programmes on other species

252. The WPEB **NOTED** paper IOTC–2011–WPEB07–47 which provided an analysis of species composition of fish assemblage based on observer data in the southwestern Indian Ocean, including the following abstract provided by the authors:

> "*In this study, species composition of pelagic fishes was analyzed based on the data collected in a Chinese longline observer trip in the southwestern Indian Ocean during July-September, 2010.The trip was supposed to capture bigeye tuna, however, target species was changed to oilfish (Ruvettus pretiosus) and escoler (Lepidocybium flavobrunneum). This study can improve our understanding of species composition in the pelagic fish assemblage involving in longline fishery in the Indian Ocean. All the data analyzed were collected by a single scientific observer onboard a commercial longline fishing vessel in the southwestern Indian Ocean (S33°35'-S36°07', E30°05'-E34°05'). A total of 42 sets were observed. Fourteen species were identified in the catch during this observer trip, including 3 tuna species, 2 billfish species, 2 shark species and 7 other species. No sea birds were captured during the trip, although they were sometimes around the vessel when hauling.*"

253. The WPEB **RECALLED** the IOTC depredation and bycatch workshop held in 2007, where it was suggested that data collection on depredation and bycatch of all major bycatch groups (i.e. marine mammals, non-target sharks, marine turtles and seabirds) in all major fisheries in the IOTC area of competence, was critical if the impacts were to be accurately determined.

254. The WPEB **ENCOURAGED** research aimed at assessing the population status of major bycatch species being caught in fisheries for tuna and tuna-like species in the Indian Ocean and to endeavour to identify possible bycatch mitigation measures.

255. Noting the potential negative impacts of fish aggregation devices (FADs) on bycatch in fisheries for tuna and tuna-like species in the Indian Ocean, the WPEB **RECOMMENDED** that CPCs utilizing anchored FADs undertake research aimed as assessing the effect of anchored FADs on bycatch, and for the results to be reported to the next session of the WPEB.

14. DEPREDATION

14.1 Review of available data and new information on depredation

256. The WPEB **NOTED** paper IOTC–2011–WPEB07–INF30 which provided an outline of mitigating odontocete bycatch and depredation in pelagic longline fisheries using physical deterrence at the hook, including the following abstract provided by the authors:

> "*Spatial overlap between fisheries and odontocetes (toothed whales) has become extensive, increasing the occurrence of depredation (where the catch is removed or damaged by a foraging predator) and by-catch (where the depredating predator is incidentally caught). This phenomenon raises concerns about the economic viability of the fisheries involved and the conservation status of the odontocetes species involved. Two devices, designed to be attached to the longline snood, are being developed to combat this problem. One is comprised of a monofilament nylon cage (the 'cage device') and the other is comprised of two lengths of small-link stainless steel chain (the 'chain device'). Each is designed to simulate a tangle in the fishing gear, which fishers report will act to physically and psychologically deter depredating odontocetes. The first 'controlled' trial was conducted in Coral Sea (Australian territory) in July 2011. Units of the two devices were attached alternately to each snood along the longline, so depredating odontocetes could choose between fish caught on either 'control' snoods (without a device attached) or 'treatment' snoods (those fitted with the cage or chain device). The aims were to assess the impact of the cage and chain devices on rates of (1) target fish catch, (2) odontocete depredation and (3) odontocete by-catch. A total of 4,532 hook hauls were observed and preliminary analyses indicated that the presence of the devices on snoods had little or no effect on target fish catch rate (Chi squared test [cage/chain – control]: P = 0.41), thus addressing aim 1. Unfortunately, no operational interactions with odontocetes were observed during the trial, thus aims 2 and 3 remain unaddressed. Nonetheless, the devices performed well operationally, with no structural failures or tangles reported and the crew finding them easy to handle, and had no effect on fish catch composition, suggesting incorporation into normal fishing practices would be feasible. A second trial will soon be*

conducted in waters around Fiji and it is hoped that several further trials will be conducted in other locations, including the Indian Ocean, to account for regional differences in gear type, catch composition and odontocete species present."

Summary discussion – Marine mammals and depredation

257. The WPEB **AGREED** that the review of odontocete depredation and bycatch in longline fisheries (IOTC–2011–WPEB07–45) confirms this is an extensive and widespread problem, affecting the economics of many longline fisheries, and potentially the status of depredating odontocete populations.

258. The WPEB **AGREED** that odontocetes are vulnerable to rapid decline with even small numbers lost as bycatch. The aforementioned review also demonstrates that enough is now known about the problem to justify moving toward a problem solving phase, without the need to further characterize the problem.

259. The WPEB **NOTED** the ongoing Australian study that attempts to address this problem (IOTC–2011–WPEB07–INF30) is the only one of its kind. Preliminary results are promising, although much more data is required.

260. The WPEB **NOTED** that drift gillnet fisheries experience incidental catch of marine mammals, both as actively used gear and as ghost (i.e. lost) gear, although the species involved and the extent to which it occurs remains unclear.

261. The WPEB **NOTED** that EU purse seine vessels do not intentionally set on baleen whales in the present period. It is believed that since the mid-1990s fishing practices changed, and in May 2007 an EU ban (Council Regulation n.520/2007) was implemented. Fishers use the presence of whales to detect the presence of tuna but do not encircle whales. There have been 5 sets of the 2000 independently observed sets (during 2003–2007) where whales have been incidentally caught (13 individuals in total, currently identified as 5 *Balenoptera physalus* and 9 *Pseudorca crassidens*), but all were released alive. The WPEB **NOTED** that they were still some identification issues and encouraged additional observer training.

262. The WPEB **NOTED** that observer data from the Indian Ocean show no sets on dolphins, as it is the case in the eastern tropical Pacific Ocean.

14.2 Requirement for improvement of the data on depredation

263. The WPEB **AGREED** that to gain a better understanding of depredation in all relevant commercial fisheries (i.e. longline, drift gillnet and purse seine) in the Indian Ocean area of competence, it is suggested that improvements to data collection protocols (i.e. observer programs and logbook recording) be encouraged. This may be facilitated by either amending the existing Resolution 08/04 *Minimum requirement for recording data in longlines*, or creating a new resolution specific to marine mammals and other major bycatch groups (i.e. non-target sharks, marine turtles and seabirds).

264. The WPEB **NOTED** that there is almost no data on depredation and bycatch of marine mammals in other fisheries, such as drift gillnets and purse seines, in the IOTC area of competence.

265. The WPEB **AGREED** that the reporting of depredation data would allow the WPEB to analyze and monitor the depredation issues within the longline fisheries, noting that depredation rates may be an important input into stock assessment models. Proposed additions in longline logbooks:
    - For each species, number of individuals damaged by sharks or cetaceans should be given in brackets after the number of individual caught. Numbers of damaged fish should not to be included with the number of individuals caught, which are considered as non-damaged individuals.
    - Each depredation event (damage of the catch by sharks or cetaceans) should be documented in the remarks. The cause of damage may be identified by sighting of predators in the vicinity of the vessel/gear or by post-mortem traces on damaged fish; this should be indicated in the remarks. Sightings information should include the number of individual predators seen in the vicinity of the gear/vessel.

14.3 Possible consequences of depredation on stock assessment

266. The WPEB **NOTED** that depredation may have important implications on the effective management of target fish stocks, in terms of impacting on catch statistics and stock assessments by negatively biasing the real exploitation rate, as an unknown, but possibly large proportion of the number of hooked fish

are taken directly off the hook by depredating whales and damaged fish are discarded and often not recorded as part of the catches.

14.4 Review of Resolutions and Recommendations on depredation

267. The WPEB **AGREED** that Resolution 00/02 *on a survey of predation of longline caught fish*, is no longer current, despite not having been revoked or superseded. As such, the WPEB **RECOMMENDED** that it be removed from the list of current IOTC Conservation and Management Measures.

14.5 Develop recommendations to the Scientific Committee.

268. Noting that there is currently no mandatory requirement to report incidences of depredation, the WPEB **RECOMMENDED** that data collection capacity be strengthened, with regard to depredation, in longlines and other major fisheries (i.e. drift gillnets and purse seines). In addition, the use of other data collection methods, such as questionnaires and interviews (which are an important, inexpensive and rapid method for highlighting problems), should be encouraged.

269. Noting that depredation has been reported to be high in some areas of the Indian Ocean (e.g. 19% in the Seychelles longline fishery: IOTC–2011–WPB09–R), which is much higher than in other regions of the Indian Ocean and would lead to bias in the CPUE series, the WPEB **RECOMMENDED** that the main longline fleets in the Indian Ocean (Taiwan,China, Japan, Indonesia, EU,Spain, EU,Portugal) carry out research and monitoring programs aimed at determining the level of depredation in a range of areas and under different fishing conditions, and for the results to be presented at the next session of the WPEB.

270. The WPEB **RECOMMENDED** that research be carried out by EU scientists to analyse the incidental encirclement of whales, through logbooks and observer data from EU flagged vessels, specifically when setting on whales prior to the mid-1990s and in association with whales after the mid-1990s. These results should be presented to the next session of the WPEB.

271. The WPEB **NOTED** the development of handling guidelines for cetacean by the WCPFC and **RECOMMENDED** that these be presented and discussed at the session of the WPEB.

272. The WPEB **ENCOURAGED** greater participation in the WPEB by scientists with particular expertise in aspects of depredation and in strategies to mitigate them.

273. The WPEB **ENCOURAGED** assistance and participation by CPCs in the Australian Government initiative to mitigate depredation and bycatch of odontocetes (toothed whales) on pelagic longlines (refer to: IOTC working paper IOTC–2011–WPEB07–45 and IOTC information paper IOTC–2011–WPEB07–INF30).

274. Noting that the IOTC Secretariat has received limited information to date on marine mammal interactions with driftnet fisheries in the Indian Ocean, the WPEB **RECOMMENDED** that all CPCs using drift gillnets to report all interactions between marine mammals and drift gillnet fisheries in the Indian Ocean.

275. Noting that there is no mandatory requirement to record and report incidental catches of marine mammals, the WPEB **RECOMMENDED** all CPCs to collect and report marine mammal incidental catches through their observer programmes and **ENCOURAGED** that these interactions are recorded in the logbook of fleets catching species under the IOTC Agreement and reported to the IOTC Secretariat.

15. ECOSYSTEM APPROACHES

15.1 Ecological Risk Assessment (ERA) for bycatch monitoring, analysis and management, in an RFMO context

276. The WPEB **NOTED** the presentation which provided an outline of SIBER: Sustained Indian Ocean biochemistry and Ecosystem Research, including the following abstract provided by the authors:

> *"SIBER is an emerging international program co-sponsored by IMBER (Integrated Marine Biogeochemistry and Ecosystem Research) and IOGOOS (Indian Ocean Global Ocean Observing System) focused on the Indian Ocean. The overarching goal of the SIBER is to motivate and coordinate international interest in Indian Ocean research in order to improve our understanding of the role of the Indian Ocean in global biogeochemical cycles and the interaction between these cycles and marine ecosystem dynamics. This understanding will be*

required in order to predict the impacts of climate change, eutrophication and harvesting on the global oceans and the Earth System and it is fundamental to policy makers in the development of management strategies for the globally important Indian Ocean. SIBER has had two Scientific Steering Committee Meetings, the last one in July 2011, where it's Science Programme and its Implementation Strategy was discussed including identification of SIBER hot-topics. It was noted that research themes of SIBER are highly relevant to WPEB in the context of ecosystem health and sustainable management of tuna species. The Group was encouraged to explore SIBER linkages in work. The SIBER website is at http://www.incois.gov.in/Incois/siber/siber.jsp".

277. The WPEB **NOTED** paper IOTC–2011–WPEB07–49 which provided an overview of the PROSPER Project: first year of operations, preliminary results of ecosystem and bycatch studies in the waters of Reunion and Tromelin Islands, including the following abstract provided by the authors:

"*Preliminary results of longline fisheries development project PROSPER aimed to diversification of pelagic longline fisheries in the Reunion Island is presented. Zone of pelagic longline surveys corresponds to the French Exclusive Economic Zone (EEZ) around La Reunion Island and the shared EEZ of France-Mauritius around Tromelin Island and adjacent waters. Extensive environmental sampling and experimental fishing with deep longline were performed during first year of operations. Preliminary results showed that a low activity of mesoscale eddies are principal reason of low catches of target species: albacore, yellowfin and bigeye tuna. A total of 34 species/taxa were recorded: non commercial species, longnose lancetfish dominates in the catches representing 45% of the catch. Sharks catch corresponds to 16% of catch with dominance of the blue shark (9% of total catch). Anomalous environmental conditions are most probable cause of low eddies activities and low level of catch for target species*."

278. The WPEB **NOTED** paper IOTC–2011–WPEB07–51 which provided species composition and richness of the pelagic ecosystem based on EU purse seiner observer data in the Southwestern Indian Ocean, including the following abstract provided by the authors:

"*Since beginnings of 50''s, the tuna purse seine fishery has been extended in the Atlantic and Indian Oceans. Observer programs by PNDB (National Base Data Plan) has been carried out since 2003, with the aim to study the number and composition of discards. Moreover, changes produced in the Indian Ocean in the biodiversity patterns and trophic levels in tuna discards and accessories species as consequence of the increase use of FADs were observed*."

279. The WPEB **NOTED** that the analysis suggested that richness and biodiversity increased from 2003 until 2006, which may be linked to the use of FADs in purse seine fisheries. The fishes were the species group where the biodiversity was most increased. However, changes in biodiversity patterns were observed since 2007, probably due to the piracy problems, which caused a decrease in the effort as a consequence of the movement of part of the fleet to the Atlantic Ocean. The relation between the surface temperature SST and the number of sets was also studied, as well as the correlation between the specie richness of the different by-catch species groups.

280. The WPEB **NOTED** paper IOTC–2011–WPEB07–52 which provided an update of the EU MADE Project, including the following abstract provided by the authors:

"*Numerous and various data have been collected by the project in the Indian Ocean: biological samples of sharks, PAT and miniPAT tagging of pelagic sharks, acoustic tagging of tuna, sharks and other bycatch species at FADs, observers data, knowledge from fishers. These data are currently being analysed in order to investigate the potential of spatial (using results on the spatial dynamics of sharks for instance) and technical measures (e.g. ecological FADs, best practices onboard vessels, use of artificial bait, best vertical distribution of hooks, etc.) for both purse seine and longline vessels. The project will organize an international symposium in late 2012 to review progress in the world on this topic*."

281. The WPEB **NOTED** progress on other project focusing on bycatch mitigation measures, such as the ISSF bycatch project and ORTHONGEL project.

15.2 Ecological interactions

282. Noting with concern the high levels of shark byproduct and bycatch reported in many National Reports to the Scientific Committee, and considering that future management decisions would benefit from collated bycatch data in an attempt to quantify cumulative bycatch impacts, the WPEB

RECOMMENDED that research be undertaken as a high priority to assess the cumulative impacts of IOTC fishing operations on bycatch species, with a particular emphasis on shark species, noting that the data required to do this is already present in the National Reports of CPCs.

15.3 Recommendations for the Scientific Committee

283. The WPEB **NOTED** the importance of the ecosystem scale research presented, and encouraged further research on ecosystem approaches and modelling, and for these to be presented at the next session of the WPEB.

284. The WPEB **RECALLED** the previous WPEB commitments to document the population explosions of mantis shrimps and swimming crabs within the western Indian Ocean to improve understanding of ecosystem variability and its implications for abundance and catchability of pelagic species. The WPEB **NOTED** the commitment by the Chair, in conjunction with other participants, to finalise this report in time to present its findings to the next session of the WPEB.

285. The WPEB **RECALLED** the presentation of IOTC–2011–WPEB07–17 regarding the potential impacts on ecosystems of changing climate and oceanographic conditions in the Indian Ocean. The WPEB particularly noted the paper's conclusion that the depressed primary productivity in the western Indian Ocean might decrease the carrying capacity of the ecosystem, with adverse effects on the foraging conditions for top predators, tuna concentration (less free schools) and biological processes (slower growth, high natural mortality), and encouraged continuation of this research.

16. RESEARCH RECOMMENDATIONS AND PRIORITIES

16.1 Development a draft work plan for the WPEB

Employment of a Fisheries Officer – duties to include issues of bycatch

286. The WPEB **NOTED** the lack of data being submitted by CPCs on bycatch, as detailed throughout this report (IOTC–2011–WPEB07–R), the lack of development and implementation of regional observer programs, the lack of CPCs developing NPOAs for sharks and seabirds, and the high risk of some bycatch species to IOTC fisheries.

287. The WPEB **NOTED** the Terms of Reference for a bycatch officer, developed by the Scientific Committee in 2010 (provided at Appendix XI of the report of the thirteenth session of the Scientific Committee: IOTC–2010–SC13–R), and **AGREED** that it should be revised to include priorities, as well as possible duties in areas other than Ecosystems and Bycatch.

288. The WPEB **RECOMMENDED** that the Commission agree for a new position to be created at the IOTC Secretariat (Fishery Officer), with duties to focus on bycatch issues.

Additional core topics for research

289. The WPEB **RECOMMENDED** that the Scientific Committee add the following core topic areas as priorities for research over the coming year, noting that the first step will be for the Scientific Committee to establish priorities, taking into account data gaps, capacity among CPCs, and areas for implementation:

- ***Ecological Risk Assessment***
    i. Sharks
    ii. Marine turtles
- ***Stock status analyses***
    i. Oceanic whitetip shark
- ***Depredation***
    i. Longline fishery depredation
- ***Bycatch mitigation***
    i. Sharks
    ii. Seabirds – line weighting
    iii. Marine turtles
    iv. Marine mammals
- ***Capacity building***
    i. Scientific assistance to CPCs and specific fleets considered to have the highest risk to bycatch species (e.g. gillnet fleets and longline fleets).

17. OTHER BUSINESS

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

290. The WPEB **NOTED** with thanks, the outstanding contributions of the two invited experts for the meeting, Dr. Evgeny Romanov (CAPRUN-ARDA, La Réunion) and Dr. Enric Cortes (NMFS-NOAA USA) and encouraged them both 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.

291. The WPEB **RECOMMENDED** the following core areas of expertise and priority areas for contribution, that need to be enhanced for the next meeting of the WPEB in 2012, by an Invited Expert/s:
    - Expertise: Ecological Risk Assessments (sharks and marine turtles); Mitigation techniques (marine turtles, marine mammals, sharks).
    - Priority areas for contribution: Marine turtle expert with mitigation expertise; Shark expert with expertise on ERAs.

17.2 Date and place of the Eighth Session of the Working Party on Ecosystems and Bycatch

292. The WPEB participants were unanimous in thanking the Republic of Maldives for hosting the Seventh Session of the WPEB and commended the Maldives on the warm welcome, the excellent facilities and assistance provided to the IOTC Secretariat in the organisation and running of the Session.

293. Following a discussion on who would host the Eighth Session of the WPEB, and noting that with the Working Party on Tropical Tunas being held in conjunction with the Working Party on Methods and the tuna tagging symposium in late October or early November 2012, the WPEB **RECOMMENDED** that the next session of the WPEB be held in conjunction with the Working Party on Billfish in September or October 2012. The exact dates and meeting location will be confirmed and communicated by the IOTC Secretariat to the Scientific Committee for its consideration at its next session to be held in December 2011.

294. The WPEB **NOTED** that as quantitative information on sharks becomes available, there should be the possibility for simple stock status analyses based on fisheries and biological indicators and development of stock status indicators for some species in the near future. Expertise in stock assessment from other IOTC working parties, e.g. the Working Party on Tropical Tunas or the Working Party on Billfish, would be of value for such analyses. Therefore, the WPEB **RAISED** the possibility of creating a separate Working Party on Sharks in the future.

295. The WPEB **AGREED** that the workload of the WPEB has increased exponentially in recent years and yet there appears to be limited resources being given to issues of bycatch, despite the range of IOTC Conservation and Management Measures and other international agreements addressing bycatch in fisheries for tuna and tuna-like species. Thus, the WPEB **RECOMMENDED** that CPCs allocate sufficient resources to address issues of bycatch as high priority issues, and that the Commission agree to the addition of a new Fishery Officer post at the IOTC Secretariat.

17.3 Election of a Chairperson and Vice-Chairperson of the Working Party on Ecosystems and Bycatch for the next biennium

296. The WPEB **THANKED** the current Chair for the WPEB, Dr. Charles Anderson for his outstanding chairmanship over the past *biennium*.

297. The WPEB **CONSIDERED** candidates for the positions of Chair and Vice-Chair of the WPEB for the next biennium. Dr. Charles Anderson was nominated and re-elected as Chair, and Dr. Evgeny Romanov was nominated and elected as Vice-Chair of the WPEB for the next *biennium*.

298. The WPEB **RECOMMENDED** that the Scientific Committee note the re-elected Chair (Dr. Charles Anderson) and Vice-Chair (Dr. Evgeny Romanov) of the WPEB for the next *biennium*.

17.4 Review of the draft, and adoption of the Report of the Seventh Session of the Working Party on Ecosystems and Bycatch.

299. The WPEB **RECOMMENDED** that the Scientific Committee consider the consolidated set of recommendations arising from WPEB07, provided at Appendix IV.

300. The report of the Seventh Session of the Working Party on Ecosystems and Bycatch (IOTC–2011–WPEB07–R) was **ADOPTED** on the 27 October 2011.

APPENDIX I
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APPENDIX II
AGENDA FOR THE SEVENTH WORKING PARTY ON ECOSYSTEMS AND BYCATCH

Date: 24–27 October 2011
Location: Paradise Island Resort, Lankanfinolhu,
North Malé Atoll, Maldives
Time: 09:00 – 17:00 daily
Chair: Dr. Charles Anderson

1. **OPENING OF THE MEETING** (Chair)
2. **ADOPTION OF THE AGENDA** (Chair)
3. **OUTCOMES OF THE THIRTEENTH SESSION OF THE SCIENTIFIC COMMITTEE** (Secretariat)
4. **OUTCOMES OF THE FIFTEENTH SESSION OF THE COMMISSION** (Secretariat)
5. **UPDATE ON THE KOBE PROCESS** (Chair)
6. **PROGRESS ON THE RECOMMENDATIONS OF WPEB06** (Secretariat and Chair)
7. **REVIEW OF DATA AVAILABLE ON ECOSYSTEMS AND BYCATCH**
   - 7.1 Review of the statistical data available for ecosystems and bycatch species (Secretariat)
   - 7.2 Data from other sources (papers from CPCs)
   - 7.3 Regional Observer Scheme (Secretariat)
   - 7.4 Develop recommendations to the Scientific Committee.
8. **NEW INFORMATION ON BIOLOGY, ECOLOGY, FISHERIES AND ENVIRONMENTAL DATA RELATING TO ECOSYSTEMS AND BYCATCH SPECIES**
   - 8.1 Review new information on the biology, stock structure, their fisheries and associated environmental data (CPC papers).
   - 8.2 Circle Hook symposium (Secretariat)
9. **SHARKS AND RAYS**
   - 9.1 Review of new information on the status of sharks
   - 9.2 Review of any National Plans of Action relating to reduction of shark bycatch in tuna fisheries
   - 9.3 Research programmes on sharks
   - 9.4 Improvement on shark identification
   - 9.5 Stock indicators / ERA on sharks
   - 9.6 Shark fin to body weight ratio
   - 9.7 Shark bycatch mitigation
     - Effect of terminal gear on shark by-catch: leaders (wire vs. monofilament), hooks (circle vs. tuna vs. J-hooks). Review of regional research results and/or open discussion / results from other oceans.
     - Best practices of shark handling / live release: circle hooks, wire leaders, live release. Shark post-release mortality in the PS and LL fisheries.
   - 9.8 Review of Resolutions and Recommendations on sharks:
     - Resolution 05/05 *Concerning the conservation of sharks caught in association with fisheries managed by IOTC*
     - Resolution 10/12 *On the Conservation of Thresher Sharks (Family Alopiidae) caught in Association with Fisheries in the IOTC Agreement Area*.
   - 9.9 Develop recommendations to the Scientific Committee
   - 9.10 Update of shark species Executive Summaries (Chair).
10. **SEABIRDS**
    - 10.1 Review of new information on the status of seabirds
    - 10.2 Review of any new National Plans of Action for reducing incidental catches of seabirds in longline fisheries
    - 10.3 Research on interaction between seabirds and tuna fisheries in the Indian Ocean

10.4 Identification sheets for observers
10.5 Review of Resolutions and Recommendations on seabirds:
- Recommendation 05/09 *On incidental mortality of seabirds*
- Resolution 10/06 *On Reducing the Incidental Bycatch of Seabirds in Longline Fisheries.*

10.6 Develop recommendations to the Scientific Committee
10.7 Update of seabird Executive Summary (Chair).

11. MARINE TURTLES
11.10 Review of new information on the status of marine turtles
11.11 Research on effect of marine turtles mitigating measures
11.12 Review of any national management plans/strategies for the reduction of marine turtle bycatch in tuna fisheries
11.13 Research on interaction between turtles and tuna fisheries in the Indian Ocean
11.14 To develop recommendation on appropriate mitigation measures
11.15 To develop guidelines for appropriate handling and release
11.16 To develop regional standards for data collection, exchange and training
11.17 To produce a marine turtle Identification Guide
11.18 Review of Resolutions and Recommendations on turtles:
- Recommendation 05/08 *On sea turtles*
- Resolution 09/06 *On marine turtles*

11.19 Develop recommendations to the Scientific Committee
11.20 Update of marine turtle Executive Summary (Chair).

12. MARINE MAMMALS
12.1 Research programmes on marine mammals
12.2 Develop recommendations to the Scientific Committee.

13. OTHER BYCATCH AND BYPRODUCT SPECIES
13.1 Research programmes on other species
13.2 Develop recommendations to the Scientific Committee.

14. DEPREDATION
14.1 Review of available data and new information on depredation
14.2 Requirement for improvement of the data on depredation
14.3 Possible consequences of depredation on stock assessment
14.4 Review of Resolutions and Recommendations on depredation:
- Resolution 00/02 *On A Survey Of Predation Of Longline Caught Fish*

14.5 Develop recommendations to the Scientific Committee.

15. ECOSYSTEM APPROACHES
15.1 Ecological Risk Assessment (ERA) for bycatch monitoring, analysis and management, in an RFMO context
15.2 Ecological interactions
15.3 Develop recommendations to the Scientific Committee.

16. RESEARCH RECOMMENDATIONS AND PRIORITIES
16.1 Develop a draft work plan.

17. OTHER BUSINESS
17.1 Development of priorities for an Invited Expert/s at the next Working Party on Ecosystems and Bycatch meeting
17.2 Date and place of the Eighth Session of the Working Party on Ecosystems and Bycatch
17.3 Election of a Chairperson and Vice-Chairperson for the next biennium
17.4 Any other business
17.5 Review of the draft, and adoption of the Report of the Seventh Session of the Working Party on Ecosystems and Bycatch.

APPENDIX III
LIST OF DOCUMENTS

Document	Title	Availability
IOTC–2011–WPEB07–01a	Draft agenda of the Seventh Working Party on Ecosystems and Bycatch	✓(19 July)
IOTC–2011–WPEB07–01b	Draft annotated agenda of the Seventh Working Party on Ecosystems and Bycatch	✓(15 September)
IOTC–2011–WPEB07–02	Draft list of documents	✓(15 September)
IOTC–2011–WPEB07–03	Outcomes of the Thirteenth Session of the Scientific Committee (Secretariat)	✓(19 July)
IOTC–2011–WPEB07–04	Outcomes of the Fifteenth Session of the Commission (Secretariat)	✓(19 July)
IOTC–2011–WPEB07–05	Report of the First Bycatch Joint Tuna Technical Working Group (Chair)	✓(22 August)
IOTC–2011–WPEB07–06	Recommendations arising from the KOBE III meeting (Secretariat)	✓(22 August)
IOTC–2011–WPEB07–07	Progress made on the recommendations of WPEB06 (Secretariat and Chair)	✓(28 September)
IOTC–2011–WPEB07–08	Review of the statistical data available for the bycatch species (M. Herrera and L. Pierre — Secretariat)	✓(7 October)
IOTC–2011–WPEB07–09	Update on the Regional Observer Scheme (Secretariat)	✓(6 October)
IOTC–2011–WPEB07–10	Outcomes of the Circle Hook Symposium 4–6 May 2011, Miami, USA (Secretariat)	✓(6 October)
IOTC–2011–WPEB07–11 Rev_1	Status of the development of identification cards for sharks, seabirds and marine turtles (Secretariat)	✓(7 October)
IOTC–2011–WPEB07–12	Status of development and implementation of National Plans for Action for Seabirds and Sharks (Secretariat)	✓(30 September)
IOTC–2011–WPEB07–13	Review of current Conservation and Management Measures relating to ecosystems and bycatch (Secretariat and Chair)	✓(2 September)
IOTC–2011–WPEB07–14	Status of sharks in the Indian Ocean (Secretariat)	✓(4 October)
IOTC–2011–WPEB07–15	Status of marine turtles in the Indian Ocean (Secretariat)	✓(30 September)
IOTC–2011–WPEB07–16	Status of seabirds in the Indian Ocean (Secretariat)	✓(30 September)
IOTC–2011–WPEB07–17	Outline of climate and oceanographic conditions in the Indian Ocean: an update to August 2011 (F. Marsac)	✓(13 October)
IOTC–2011–WPEB07–18	A simple, relatively inexpensive method of ocean' surface layer temperature profiling (E. Romanov, J-F. Ternon, E. Richard, P. Bach, A. Le Turc, J-P Lamoureux)	✓(9 October)
IOTC–2011–WPEB07–19	Bycatch in tuna longline fishery in the Indian EEZ around Andaman and Nicobar Islands (A.B. Kar, K. Govindaraj, G.V.A. Prasad and L. Ramalingam)	✓(13 October)
IOTC–2011–WPEB07–20 _Rev1	Bycatch landings in Mauritius for 2009/2010 (A. Sheik Mamode)	✓(13 October)
IOTC–2011–WPEB07–21	Bycatch of tuna fishing vessels – Pakistan (S. Hussain)	✓(16 October)
IOTC–2011–WPEB07–22	Reduction of Marine mammals, Sea birds and turtles bycatch in Tuna fishing (R. Shahifar, Sh. Ghasemi and F. Barati)	✓(9 October)
IOTC–2011–WPEB07–23 Rev_1	Bycatch and Discards of the French Tuna Purse Seine Fishery during the 2003-2010 Period Estimated through the Observer Programme. (P. Chavance, J.M. Amande, R. Pianet, E. Chassot, A. Damiano)	✓(23 October)
IOTC–2011–WPEB07–24	Sharks caught as by catch in Mozambican waters (B. Palha de Sousa)	✓(10 October)
IOTC–2011–WPEB07–25	An overview of approaches used to assess the status of shark populations: experiences from the USA and ICCAT in the Atlantic Ocean (E. Cortes)	✓(9 October)
IOTC–2011–WPEB07–26	Sharks caught as bycatch by malagasy national fleet in the Madagascar waters (D.M. Rahombanjanahary)	✓(30 September)

Document	Title	Availability
IOTC–2011–WPEB07–27 Rev_1	Shark longline fishery in the northern Maldives (R.C. Anderson, M.S. Adam and M.R. Saleem)	✓(20 October)
IOTC–2011–WPEB07–28	Survival rate of silky sharks (*Carcharhinus falciformis*) caught incidentally onboard French tropical purse seiners (F. Poisson, A.L. Vernet, J.D. Filmalter, M. Goujon and L. Dagorn)	✓(11 October)
IOTC–2011–WPEB07–29	Areas with high bycatch of silky sharks (*Carcharhinus falciformis*) in the western Indian Ocean purse seine fishery (M.J. Amandé, N. Bez, N. Konan, H. Murua, A. Delgado de Molina, P. Chavance and L. Dagorn)	✓(11 October)
IOTC–2011–WPEB07–30	Preliminary observations on the by-catch of elasmobranchs caught by the Portuguese longline fishery in the Indian Ocean: biology, ecology and fishery (R. Coelho, P.G. Lino and M.N. Santos)	✓(18 October)
IOTC–2011–WPEB07–31	At-haulback mortality of elasmobranchs caught on the Portuguese longline swordfish fishery in the Indian Ocean (R. Coelho, P.G. Lino and M.N. Santos)	✓(28 September)
IOTC–2011–WPEB07–32	Spatial and temporal patterns in blue shark (*Prionace glauca*) catch in South African longline fisheries (K. Jolly, C. da Silva, A. Jarre and C.A. Attwood)	✓(3 October)
IOTC–2011–WPEB07–33 Rev_1	Standardized CPUE for blue shark caught by Japanese tuna longline fishery in the Indian Ocean, 1971-1993 and 1994-2010 (Y. Hiraoka and K. Yokawa)	✓(19 October)
IOTC–2011–WPEB07–34	Standardized CPUE of shortfin mako shark (*Isurus oxyrinchus*) caught by Japanese longliners in the Indian Ocean in the period between 1994 and 2010 (A. Kimoto, Y. Hiraoka, T. Ando and K. Yokawa)	✓(20 October)
IOTC–2011–WPEB07–35	Trends of standaridzed CPUE of oceanic whitetip shark (*Carcharhinus longimanus*) caught by Japanese longline fishery in the Indian Ocean (Y. Semba and K. Yokawa)	✓(19 October)
IOTC–2011–WPEB07–36	Standardized CPUE of major shark species caught by the Portuguese longline fishery in the Indian Ocean (R. Coelho, P.G. Lino and M.N. Santos)	✓(10 October)
IOTC–2011–WPEB07–37	Observations on the ratio between fin and body weights for the blue shark caught by the Portuguese longline fleet in the Indian Ocean (M.N. Santos, R. Coelho, J. Fernandez-Carvalho and P.G. Lino)	✓(22 September)
IOTC–2011–WPEB07–38	New information on distribution of albatrosses and petrels breeding in the Indian Ocean and assessment of potential overlap with IOTC fisheries (K. Delord and H. Weimerskirch)	✓(6 October)
IOTC–2011–WPEB07–39	National Action Plan for the conservation of the Amsterdam albatross *Diomedea amsterdamensis*: potential risks from long line fisheries in the IOTC zone (H. Weimerskirch, K. Delord and J.B. Thiebot)	✓(6 October)
IOTC–2011–WPEB07–40	Preliminary view of bycatch hotspot: bycatch distribution in the IOTC area of the southern hemisphere (Y. Inoue, K. Yokawa, H. Minami and D. Ochi)	✓(20 October)
IOTC–2011–WPEB07–41	Modelling work on Crozet wandering albatrosses and impact of longline fisheries in the IOTC zone (G. Tuck, R. Thompson, C. Barbraud, K. Delord, M. Louzao and H. Weimerskirch)	✓(19 October)
IOTC–2011–WPEB07–42	Observer Programmes in RFMOs: a perspective from the BirdLife International Global Seabird Programme (R. Wanless and C. Small)	✓(19 October)
IOTC–2011–WPEB07–43	Review of seabird bycatch mitigation measures for pelagic longline fisheries (ACAP)	✓(28 September)
IOTC–2011–WPEB07–44	Summary best practice advice for reducing the impact of pelagic longline gear on seabirds (ACAP)	✓(28 September)

Document	Title	Availability
IOTC–2011–WPEB07–45	Odontocete bycatch and depredation in longline fisheries: a review of available literature and of potential solutions (D.J. Hamer, S.J. Childerhouse and N.J. Gales)	✓(27 September)
IOTC–2011–WPEB07–46	Withdrawn	Withdrawn
IOTC–2011–WPEB07–47 Rev_1	Species composition of fish assemblage based on observer data in the southwestern Indian Ocean (J. Zhu, X. Dai and L. Xu)	✓(30 September)
IOTC–2011–WPEB07–48	Report on bycatch from tuna longline fishing operation eastern Indian Ocean by SEAFDEC Research Vessels Year 2005–2011 (S. Promjinda and I. Chanrachkij)	✓(11 October)
IOTC–2011–WPEB07–49 Rev_1	PROSPER Project: first year of operations. Preliminary results of ecosystem and bycatch studies in the waters of Reunion and Tromelin Islands (E. Romanov, P. Bach and E. Richard, J.-F. Ternon, A. Le Turc)	✓(11 October)
IOTC–2011–WPEB07–50	Progress made on the Implementation of the Seychelles National Plan of Action for the Conservation and Management of Sharks – 2007 (E. Socrate)	✓(24 October)
IOTC–2011–WPEB07–51	Species composition and richness of the pelagic ecosystem based on EU PS observer data in the Southwestern Indian Ocean (N. Lezama1, H. Murua, J. Ruiz, P. Chavance, A. Delgado de Molina)	✓(23 October)
IOTC–2011–WPEB07–52	An update of the EU MADE Project (L. Dagorn)	✓(3 October)
IOTC–2011–WPEB07–53	Review of IOTC discussions and recommendations for shark conservation in the Indian Ocean (D.S. Kirby, C. Van Der Geest, H. Patterson, K. Cheshire, C. McCloud)	✓(4 October)
IOTC–2011–WPEB07–54	Preliminary report of 2010 weighted branchline trials in the tuna joint venture fishery in the South African EEZ (E. Melvin, T. Guy and N. Sato)	✓(8 October)
IOTC–2011–WPEB07–55	CPC reporting of bycatch data as per IOTC Conservation and Management Measures (Secretariat)	✓(10 October)
IOTC–2011–WPEB07–56	Status of shark fisheries in the Maldives (H. Sinan, M.S. Adam and R.C. Anderson)	✓(19 October)
IOTC–2011–WPEB07–57	Shark bycatch in the pelagic longline fishery along Ninety East Ridge taken by research vessel (P. Chaidee and N. Darumas)	✓(16 September)
	INFORMATION PAPERS	
IOTC–2011–WPEB07–INF01	An integrated approach to determining the risk of over-exploitation for data-poor pelagic Atlantic sharks (C. Simpfendorfer, E. Cortés, M. Heupel, E. Brooks, E. Babcock, J. Baum, R. McAuley, S. Dudley, J. Stevens, S. Fordham and A. Soldo)	✓(3 August)
IOTC–2011–WPEB07–INF02	An indicator-based analysis of key shark species based on data held by SPC-OFP (S. Clarke, S. Harley, S. Hoyle and J. Rice)	✓(3 August)
IOTC–2011–WPEB07–INF03	Analysis of North Pacific Shark Data from Japanese Commercial Longline and Research/Training Vessel Records (S. Clarke, K. Yokawa, H. Matsunaga and H. Nakano)	✓(3 August)
IOTC–2011–WPEB07–INF04	A Status Snapshot of Key Shark Species in the Western and Central Pacific and Potential Mitigation Options (S. Clarke)	✓(3 August)
IOTC–2011–WPEB07–INF05	A Proposal for a Process for Designating WCPFC Key Shark Species for Data Provision and Assessment (S. Clarke)	✓(3 August)
IOTC–2011–WPEB07–INF06	A Progress Report on the Shark Research Plan (S. Clarke, S. Harley, L. Protoy and P. Williams)	✓(3 August)
IOTC–2011–WPEB07–INF07	Analyses of Catch Data for Oceanic Whitetip and Silky Sharks reported by Fishery Observers in the Hawaii-based Longline Fishery in 1995–2010 (B. Walsh and S. Clarke)	✓(3 August)
IOTC–2011–WPEB07–INF08	Chondrichthyan guide for fisheries managers: A practical guide to mitigating chondrichthyan bycatch (H.M. Patterson and M.J. Tudman)	✓(5 August)

Document	Title	Availability
IOTC–2011–WPEB07–INF09	Fisheries and Aquaculture Reviews and Studies – Sharks (J. Musick and S. Musick)	✓(25 August)
IOTC–2011–WPEB07–INF10	The future of sharks: A review of action and inaction (M. Lack and G. Sant)	✓(25 August)
IOTC–2011–WPEB07–INF11	Best practices to mitigate seabird bycatch in longline, trawl and gillnet fisheries—efficiency and practical applicability (S. Løkkeborg)	✓(25 August)
IOTC–2011–WPEB07–INF12	Bycatch of highsea longline fisheries and measures taken by Taiwan: Actions and challenges (H.-Wen Huang)	✓(25 August)
IOTC–2011–WPEB07–INF13	Smart Tuna Hook (Anon)	✓(25 August)
IOTC–2011–WPEB07–INF14	First documented southern transatlantic migration of a blue shark *Prionace glauca* tagged off South Africa (C. da Silva, S.E. Kerwath, C. Wilke, M. Meÿer and S.J. Lamberth)	✓(2 September)
IOTC–2011–WPEB07–INF15	Tagging-recapture activities of large pelagic sharks carried out by Spain or in collaboration with the tagging programs of other countries (J. Mejuto, B. García-Cortés and A. Ramos-Cartelle)	✓(15 September)
IOTC–2011–WPEB07–INF16	Blue shark record – Information on first transoceanic migration of blue shark in the Indian Ocean (Anonymous)	✓(15 September)
IOTC–2011–WPEB07–INF17	From monsoons to mantas: seasonal distribution of *Manta alfredi* in the Maldives (R.C. Anderson, M.S. Adam and J.I. Goes)	✓(15 September)
IOTC–2011–WPEB07–INF18	Seeing Spots: Photo-identification as a Regional Tool for Whale Shark Identification (K. Brooks, D. Rowat, S.J. Pierce, D. Jouannet and M. Vely)	✓(16 September)
IOTC–2011–WPEB07–INF19	Occurrence of whale shark (*Rhincodon typus*) in the Indian Ocean: A case for regional conservation (D. Rowat)	✓(16 September)
IOTC–2011–WPEB07–INF20	Regional Management Units for Marine Turtles: A Novel Framework for Prioritizing Conservation and Research across Multiple Scales (B.P. Wallace, A.D. DiMatteo, B.J. Hurley, E.M. Finkbeiner, A.B. Bolten, M.Y. Chaloupka, B.J. Hutchinson, F.A. Abreu-Grobois, D. Amorocho, K.A. Bjorndal, J. Bourjea, B.W. Bowen, R.B. Duenas, P. Casale, B.C. Choudhury, A. Costa1, P.H. Dutton, A. Fallabrino, A. Girard, M. Girondot, M.H. Godfrey, M. Hamann, M. Lopez-Mendilaharsu, M.A. Marcovaldi, J.A. Mortimer, J.A. Musick, R. Nel, N.J. Pilcher, J.A. Seminoff, S. Troeng, B. Witherington and R.B. Mast)	✓(20 September)
IOTC–2011–WPEB07–INF21	Hawksbill turtle monitoring in Cousin Island Special Reserve, Seychelles: an eight-fold increase in annual nesting numbers (Z.C. Allen, N.J. Shah, A. Grant, G.-D. Derand and D. Bell)	✓(20 September)
IOTC–2011–WPEB07–INF22	Loggerheads and leatherbacks in the Western Indian Ocean (G.R. Hughes)	✓(20 September)
IOTC–2011–WPEB07–INF23	Global Conservation Priorities for Marine Turtles (B.P. Wallace, A.D. DiMatteo, A.B. Bolten, M.Y. Chaloupka, B.J. Hutchinson, F.A. Abreu-Grobois, J.A. Mortimer, J.A. Seminoff, D. Amorocho, K.A. Bjorndal, J. Bourjea, B.W. Bowen, R. B. Duenas, P. Casale, B.C. Choudhury, A. Costa1, P.H. Dutton, A. Fallabrino, E.M. Finkbeiner, A. Girard, M. Girondot, M. Hamann, B.J. Hurley, M. Lopez-Mendilaharsu, M.A. Marcovaldi, J.A. Musick, R. Nel, N.J. Pilcher, S. Troeng, B. Witherington, R.B. Mast)	✓(1 October)
IOTC–2011–WPEB07–INF24	Protection of leatherback turtles (*Dermochelys coriacea*) from fishing impacts in the Indian Ocean (C. van der Geest and J. Davey)	✓(4 October)
IOTC–2011–WPEB07–INF25	Marine turtles in Mozambique: The development of an effective conservation and management programme (A. Costa, H. Motta, M.A.M. Pereira, E.J.S. Videira, C.M.M. Louro and J. João)	✓(12 October)

Document	Title	Availability
IOTC–2011–WPEB07–INF26	Monitoring, tagging and conservation of marine turtles in Mozambique: annual report 2010/11 (E.J.S Videira, M.A.M Pereira and C.M.M. Louro)	✓(12 October)
IOTC–2011–WPEB07–INF27	Report on the conservation status of marine turtles in Mozambique (C.M.M. Louro, M.A.M. Pereira and A.C.D. Costa)	✓(12 October)
IOTC–2011–WPEB07–INF28	Shark research programme currently being carried out at IPIMAR (M.N. Santos and R. Coelho)	ppt. presentation at meeting
IOTC–2011–WPEB07–INF29	Report for 2010 on exhaustive data collected by observers on board largest pelagic longliners based in La Reunion (P. Bach, E. Romanov, N. Rabearisoa, S. Akbaraly and A. Sharp)	ppt. presentation at meeting
IOTC–2011–WPEB07–INF30	Mitigating whale by-catch and depredation in pelagic longline fisheries using physical deterrence at the hook (D.J. Hamer, S.J. Childerhouse, S.G. Candy and N.J. Gales)	✓(11 October)
IOTC–2011–WPEB07–INF31	Report of the BOBLME sharks Working Group. 5–7 July 2011 – Malé, Madives (BOBLME)	✓(18 October)
IOTC–2011–WPEB07–INF32	Potential impact of drift nets fisheries on Indian ocean ecosystems? (A. Fonteneau)	✓(24 October)
IOTC–2011–WPEB07–INF33	Bomb radiocarbon dating of the Indian Ocean blue shark *Prionace glauca*: a preliminary test of ageing accuracy. (E. Romanov and S. Campana)	✓(24 October)
IOTC–2011–WPEB07–INF34	Draft CMS Assessment of bycatch in gillnet fisheries (Sextant Technology Ltd.)	✓(25 October)
IOTC–2011–WPEB07–INF35	UNEP-CMS Marine Mammals bycatch in fishing nets	✓(25 October)

APPENDIX IV
CONSOLIDATED RECOMMENDATIONS OF THE SEVENTH SESSION OF THE WORKING PARTY ON ECOSYSTEMS AND BYCATCH

Note: Appendix references refer to the Report of the Seventh Session of the Working Party on Ecosystems and Bycatch Tunas (IOTC–2011–WPEB07–R)

KOBE process

WPEB07.01 (para.12) The WPEB **RECOMMENDED** that the Secretariat maintain its involvement in the KOBE process and to lead and/or facilitate the IOTCs involvement with the Bycatch Joint Technical Working Group.

WPEB07.02 (para.13) **NOTING** the recommendation of the first BJTWG meeting and the KOBE II and III meetings, that an additional staff member be hired at each tuna RFMO to deal with bycatch issues, the WPEB **RECOMMENDED** that a Fisheries Officer be employed at the IOTC Secretariat to focus on issues that include bycatch.

Data available

WPEB07.03 (para.20) The WPEB **RECOMMENDED** that the Scientific Committee and the Commission considers the need to develop and agree to a set of definitions for the most commonly used scientific terms in IOTC Resolutions.

WPEB07.04 (para.21) The WPEB **NOTED** that some of the wording used in the range of IOTC Resolutions relating to bycatch, including provisions for the reporting of data on sharks are vague. In particular the WPEB **NOTED** the lack of clarity about the species that are covered by the term '*most commonly caught shark species'*, used in IOTC Resolution 10/02. In this regard, the WPEB **RECOMMENDED** that the Scientific Committee considers proposing amendments to IOTC Resolutions 05/05 and 10/02 as follows:

- Resolution 05/05 *Concerning the conservation of sharks caught in association with fisheries managed by IOTC*:
    i. **Existing** text para.11: This resolution applies only to sharks caught in association with fisheries managed by the IOTC.
    ii. **Proposed** text para.11: This resolution applies to sharks caught in association with IOTC fisheries and any other fisheries for sharks.
- Resolution 10/02 *Mandatory statistical requirements for IOTC Members and Cooperating non-Contracting Parties (CPC'S)*:
    i. **Existing** text para.2: *Nominal catch data: Estimates of the total annual catch by species and gear for all species under the IOTC mandate.*
    ii. **Proposed** text para.2: *Nominal catch data: Estimates of the total annual catch by species and gear for all species under the IOTC mandate and most commonly caught shark species, as agreed by the IOTC Scientific Committee.*
    iii. **Existing** text at the end of para.3: *These provisions, applicable to tuna and tuna-like species, shall also be applicable to the most commonly caught shark species and, where possible, to the less common shark species. CPC's are also encouraged to record and provide data on species other than sharks and tunas taken as bycatch.*
    iv. **Proposed** text to be moved to the end of para.4: *These provisions are applicable to all IOTC species and shall also be applicable to other species covered in IOTC measures establishing minima requirements for operational catch-and-effort data (logbook data). CPC's are also encouraged to record and provide data on species other than sharks and tunas taken as bycatch.*

WPEB07.05 (para.22) The WPEB **RECOMMENDED** that the Scientific Committee note the status of catch statistics for the main species of sharks, by major fisheries (gears), for the period 1950–2010, as provided in Appendix V: Tables a–c. Although some CPCs have reported more detailed data on sharks in recent years, including time-area catches and effort, and length frequency data for the main commercial shark species, the WPEB expressed strong **CONCERN** that the information on retained catches and discards of sharks contained in the IOTC database remains very incomplete.

WPEB07.06 (para.24) Noting that the information on retained catches and discards of sharks contained in the IOTC database remains very incomplete for most fleets, and that catch-and-effort as well as size data are essential to assess the status of shark stocks, the WPEB **RECOMMENDED** all CPCs to collect and report catches of sharks (including historical data), landings and biological data on sharks so that more detailed analysis can be undertaken for the next WPEB meeting.

WPEB07.07 (para.28) The WPEB **RECOMMENDED** that data on marine mammal interactions with IOTC fisheries are collected and reported by CPCs to the IOTC Secretariat.

WPEB07.08 (para.30) The WPEB **RECOMMENDED** that the Scientific Committee note that despite the adoption of IOTC Resolutions 05/05 and 08/01, recently superseded by Resolution 10/02, the levels of reporting of data on sharks and other bycatch species remains very poor and prevents useful analyses of that data.

WPEB07.09 (para.32) The WPEB **NOTED** the main bycatch data issues that are considered to negatively affect the quality of the statistics available at the IOTC Secretariat, by type of dataset and fishery, which are provided in Appendix VI, and **RECOMMENDED** that the CPCs listed in Appendix VI, make efforts to remedy the data issues identified and to report back to the WPEB at its next meeting.

WPEB07.10 (para.33) The WPEB **RECOMMENDED** that the actions outlined in Appendix VII should be undertaken by each CPC to improve the standing of the data on sharks, seabirds, marine turtles and marine mammals currently available at the IOTC Secretariat. In general, these recommendations are made over and above the existing obligations and technical specifications relating to the reporting of data.

WPEB07.11 (para.34) 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 organizations, the WPEB **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 this regard, the WPEB **RECOMMENDED** that the Scientific Committee considers presenting a proposal to the Commission for this activity, including a budget.

WPEB07.12 (para.35) Noting the need to provide advice to the Commission concerning the status of the most commonly caught species of sharks in the Indian Ocean, the WPEB **AGREED** on the need to explore the shark data presently available at the IOTC Secretariat, and to determine if that data can be used to derive total estimates of shark catches for each species. Noting that additional resources will be required to carry out this activity, the WPEB **RECOMMENDED** that the Commission consider increasing the staff of the IOTC Secretariat to incorporate a new Fisheries Officer post to work on bycatch issues.

WPEB07.13 (para.36) Noting that despite the mandatory reporting requirements detailed in Resolutions 05/05, 08/04, 09/06, 10/02, 10/03, and 10/06, bycatch data remain largely unreported by CPCs, the WPEB **RECOMMENDED** that the Scientific Committee address these concerns to the Compliance Committee and the Commission in order for them to take steps to develop mechanisms which would ensure that CPCs fulfill their bycatch reporting obligations.

WPEB08.14 (para.39) The WPEB **RECOMMENDED** that the Working Party on Data Collection and Statistics (WPDCS) review the data to be recorded in logbooks by fishing vessels in the IOTC area of competence as well as the mandatory statistical data to be reported (Resolution 10/02 *mandatory statistical requirements for IOTC Members and Cooperating non-Contracting Parties*), and in particular on the list of shark species for which catch, catch and effort and size data should be recorded and reported.

WPEB07.15 (para.40) The WPEB **RECOMMENDED** that the current IOTC Resolution 05/05 *Concerning the conservation of sharks caught in association with fisheries managed by IOTC*, is strengthened to ensure that CPCs report annually on the nominal catches, catch and effort and size data for shark species identified by the WPDCS.

WPEB07.16 (para.41) The WPEB **RECOMMENDED** that current IOTC Resolution 09/06 *on Marine Turtles* and Resolution 10/06 *On Reducing the Incidental Bycatch of Seabirds in Longline Fisheries* are strengthened to ensure that CPCs report annually on the level of incidental catches of marine turtles and seabirds by species.

WPEB07.17 (para.42) The WPEB **RECOMMENDED** that the current IOTC Resolution 08/04 *concerning the recording of catch by longline fishing vessels in the IOTC area*, Resolution 10/03 *concerning the recording of catch by fishing vessels in the IOTC area* and Resolution 10/02 *mandatory statistical requirements for IOTC members and cooperating non-contracting parties* be amended in order to include a clear list of shark and marine turtle species or group of species, that should be recorded and reported to the IOTC Secretariat as per the IOTC requirements for target species.

WPEB07.18 (para.45) The WPEB **NOTED** the Scientific Committee's recommendation in 2010 which states that *"the SC endorsed the recommendation of the technical workshop that a list of accredited scientific observers should be submitted to the Secretariat and recommended that CPCs do so within the best delays"* (para.244, SC13), and **RECOMMENDED** that all IOTC CPCs submit a list of accredited observers to be deployed under the framework of the Regional Observer Scheme before the 14th Session of the Scientific Committee, and for this recommendation to be communicated to all CPCs by the Secretariat.

WPEB07.19 (para.46) The WPEB **RECOMMENDED** that IOTC CPCs report on the annual level of observer and sampling coverage on their fleets since 1st July 2010 at the next Session of the Scientific Committee. CPCs should emphasize the problems and difficulties met in implementing their observer programme and propose corrective actions that they intend to take in order to comply with Resolution 11/04.

WPEB07.20 (para.47) The WPEB **RECOMMENDED** that all IOTC CPCs urgently implement the requirements of Resolution 11/04 *on a Regional Observer Scheme*, which states that: "*The observer shall, within 30 days of completion of each trip, provide a report to the CPCs of the vessel. The CPCs shall send within 150 days at the latest each report, as far as continuous flow of report from observer placed on the longline fleet is ensured, which is recommended to be provided with 1°x1° format to the Executive Secretary, who shall make the report available to the Scientific Committee upon request. In a case where the vessel is fishing in the EEZ of a coastal state, the report shall equally be submitted to that Coastal State." (para. 11),* **NOTING** that the timely submission of observer trip reports to the Secretariat is necessary to ensure that the Scientific Committee is able to carry out the tasks assigned to it by the Commission, including the analysis of accurate and high resolution data, in particular for bycatch, which would allow the scientists to better assess the impacts of fisheries for tuna and tuna-like species on bycatch species.

WPEB07.21 (para.55) The WPEB **RECOMMENDED** that, in addition to the implementation of the Regional Observer Scheme, the collection of scientific data by all other means available including auto-sampling (collection of data by trained crew) and electronic monitoring (sensors and video cameras) be encouraged and developed, and for CPCs to report on progress at the next WPEB meeting.

WPEB07.22 (para.56) Noting paragraph 14 of Resolution 11/04 *on a Regional Observer Scheme* which states that "*The funds available from the IOTC balance of funds may be used to support the implementation of this programme in developing States, notably the training of observers and field samplers*", and that the IOTC Secretariat has hired a consultant to carry out an evaluation of the data collection and reporting capabilities of a number of developing coastal state CPCs, the WPEB **RECOMMENDED** that the IOTC Secretariat facilitate the training of observers and field samplers according to the IOTC Regional Observer Scheme Manual and Observer Trip Report Template.

WPEB07.23 (para.59) The WPEB further **NOTED** that this could be estimated through the deployment of video monitoring system on the upper deck, however, the WPEB **RECOMMENDED** that intensive sampling with two observers are conducted, whenever possible, in order to better evaluate this potential bias and to report progress and findings to the next WPEB meeting.

WPEB07.24 (para.61) Noting the increasing workload of the IOTC Secretariat regarding bycatch issues, including requests from the Commission, the WPEB **RECOMMENDED** that an additional Fishery Officer be hired to handle a range of issues related to bycatch, including those from the Commission relating to ecosystems and bycatch issues.

WPEB07.25 (para.62) The WPEB **RECOMMENDED** that the current Resolution 98/02 *on data confidentiality policy and procedures* be considered for revision by the Commission to incorporate the specifics of the Regional Observer Scheme.

New information on biology, ecology, fisheries and environmental data relating to ecosystems and bycatch species

WPEB07.26 (para.66) The WPEB **RECOMMENDED** that the Scientific Committee note that based on the results of the scientific studies presented at the International Symposium on Circle Hooks in 2011, and other research previously presented to the WPEB, the use of circle hooks in longline fisheries:

- is not likely to have a negative effect on the catch rates for most tuna and tuna-like species noting however, that research has shown declines in catch rates of some billfishes and in particular swordfish;
- will increase the proportion of animals being brought alive to the fishing vessel, implying better quality and value for target species and an improved chance of survival for bycatch species which are to be released;
- is likely to significantly reduce the incidental catch of marine turtles and improve the survivorship of hooked marine turtles if handled correctly immediately before, during and after the de-hooking process;
- may reduce the incidental catch of seabirds;
- is likely to result in an increase in catches of sharks when using wire trace, although their use would also result in a reduction in post-release mortality;
- should be combined with the use of monofilament leaders instead of wire leaders, thereby reducing shark catch rates and likely post-bite-off mortality, as the use of circle hooks will result in less gut hooking of sharks.

WPEB07.27 (para.68) The WPEB **RECOMMENDED** that all CPCs comply with the requirements of Resolution 09/06 *on Marine Turtles* which states that "*CPCs with longline vessels that fish for species covered by the IOTC Agreement shall: Ensure that the operators of all longline vessels carry line cutters and de-hookers in order to facilitate the appropriate handling and prompt release of marine turtles caught or entangled, and that they do so in accordance with IOTC Guidelines to be developed. CPCs shall also ensure that operators of such vessels are required to carry and use, where appropriate, dip-nets, in accordance with guidelines to be adopted by the IOTC*.", and that the IOTC Secretariat develop guidelines

for handling and de-hooking marine turtles caught on longliners, and for these to be distributed to all CPCs before the next WPEB meeting.

WPEB07.28 (para.69) The WPEB **RECOMMENDED** that further research into the effectiveness of circle hooks adopt a multi-species approach, so as to avoid, as far as possible, promoting a mitigation measure for one bycatch taxon that might exacerbate bycatch problems for other taxa.

WPEB07.29 (para.70) The WPEB **RECOMMENDED** that the IOTC Secretariat develop an identification guide for hooks used in IOTC fisheries, and to distribute the guide to all CPCs once completed.

WPEB07.30 (para.74) The WPEB **RECOMMENDED** that the IOTC Secretariat print and disseminate the IOTC identifications cards for marine turtles, seabirds and sharks using the remaining funds allocated to the task and to distribute these to developing coastal states as a priority, for use by observers accredited for the Regional Observer Scheme and field samplers (Resolution 11/04), and to a larger extent to their fishing fleets targeting tuna, tuna-like and shark species. This would allow accurate observer, sampling and logbook data on marine turtles, seabirds and sharks to be recorded and reported as per IOTC requirements.

WPEB07.31 (para.75) The WPEB **RECOMMENDED** that IOTC CPCs eventually translate, print and disseminate the IOTC identifications cards for marine turtles, seabirds and sharks as a priority to their observers accredited for the Regional Observer Scheme and field samplers (Resolution 11/04), and to a larger extent to their fishing fleets targeting tuna, tuna-like and shark species. This would allow accurate observer, sampling and logbook data on marine turtles, seabirds and sharks to be recorded and reported as per IOTC requirements.

WPEB07.32 (para.76) The WPEB **RECOMMENDED** that the additional funds from the IOTC accumulated funds or other sources be allocated to print and distribute the identification cards to developing coastal states.

WPEB07.33 (para.79) Noting that the FAO prepared best practice guidelines to reduce the incidental catch of seabirds in capture fisheries in 2009 to support implementation of the IPOA-Seabirds, the WPEB **RECOMMENDED** that CPCs use these guidelines to immediately review bycatch in longline, trawl and gillnet fisheries within their jurisdiction and develop, if appropriate, NPOA-Seabirds for fisheries where seabird bycatch is problematic.

WPEB07.34 (para.80) The WPEB **NOTED** the current status of development and implementation of Nation Plans of Action for sharks as provided in Appendix X and **RECOMMENDED** that all CPCs without an NPOA-Sharks expedite the development and implementation of their NPOA-Sharks, and to report progress to the WPEB in 2012, 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.

WPEB07.35 (para.101) The WPEB **RECOMMENDED** that scientists from all CPCs having fleets using driftnets in the Indian Ocean shall provide at the next session of the WPEB a report summarizing the known information on bycatch in driftnet fisheries, including sharks and marine mammals, with estimates of their likely order of magnitude where more detailed data are not available.

WPEB07.36 (para.102) The WPEB **RECOMMENDED** that CPCs explore means to undertake research cruises using driftnet vessels in the Indian Ocean aimed at documenting and quantifying the nature and extent of bycatch in these fisheries and for results to be presented at the next Session of the WPEB.

WPEB07.37 (para.103) Noting the lack of data on bycatch of these fleets, the WPEB **REMINDED** coastal countries with gillnet fisheries of their responsibilities to monitor catches and bycatch of these fisheries and **RECOMMENDED** them to improve sampling of landings, to develop and implement their observer schemes, to seek support from the IOTC to

develop such activities if necessary and report on progress at the next Session of the WPEB.

Sharks and rays

WPEB07.38 (para.106) The WPEB **NOTED** the absence of information on shark catches from artisanal fisheries in Mozambique and **RECOMMENDED** that information on bycatch from artisanal fisheries is provided at the next Session of the WPEB.

WPEB07.39 (para.108) Noting the absence of data on fishing effort, numbers and species of sharks caught, the WPEB **RECOMMENDED** that the data collection system in Madagascar is strengthened in order to provide catch and effort reports that are consistent with IOTC standards and **ENCOURAGED** Madagascar to work with the IRD of La Réunion to develop a specific logbook for their new longline fleet.

WPEB07.40 (para.111) The WPEB **RECOMMENDED** that all available data and/or indicators on oceanic whitetip shark abundance and population trends are compiled in order to assess current stock status and the level of decline for discussion at the next WPEB and Scientific Committee.

WPEB07.41 (para.114) The WPEB **RECOMMENDED** further research on silky sharks, including the possible construction of a data series of silky shark abundance from purse seine associated school fisheries.

WPEB07.42 (para.115) The WPEB **NOTED** that it is important to collect data from all major gears catching silky sharks, including but not restricted to purse seines, longlines and gillnets and the WPEB **RECOMMENDED** that indicators of the relative abundance of silky sharks are developing to better quantify changes in abundance.

WPEB07.43 (para.127) The WPEB **REITERATED** that CPCs should fulfill their FAO obligation to assess the need for an NPOA-Sharks and develop plans if appropriate. The WPEB **RECOMMENDED** that to assist in this, the IOTC Secretariat should revise annually the table summarising progress towards the development of NPOA-Sharks by CPCs for the consideration as each WPEB and the Scientific Committee meeting.

WPEB07.44 (para.130) The WPEB **NOTED** that a protocol of 'best practices' for shark handling and release onboard purse seiners will be developed by the MADE project and ISSF to minimize the risk of injury of vessel crew and will increase shark survival opportunities and **RECOMMENDED** that these guidelines are presented at the next session of the WPEB.

WPEB07.45 (para.131) The WPEB **RECOMMENDED** that more research is conducted on other mitigation methods to be used prior to the sharks being brought onboard, as well as on post-release mortality of sharks.

WPEB07.46 (para.140) The WPEB **RECOMMENDED** a databank of geo-referenced photographs of sharks (and other species groups) caught in the Indian Ocean be established at the IOTC Secretariat with contributions by scientists and observers from the region. The WPEB **NOTED** that this would be a useful tool for verification of species identifications.

WPEB07.47 (para.142) Noting the general lack of catch data on sharks, the WPEB strongly **RECOMMENDED** that an ERA is conducted for sharks caught in fisheries targeting tuna and tuna-like species in the Indian Ocean before the next session of the WPEB. In order to do so, the WPEB **RECOMMENDED** that the Scientific Committee request the Commission to allocate specific funds for such an analysis. Should a Fishery Officer be recruited at the IOTC Secretariat, he/she may be in a position to coordinate this task.

WPEB07.48 (para.154) The WPEB **NOTED** that the best way to reduce or avoid the practice of shark finning in the IOTC area, to encourage full utilisation, to ensure accurate catch statistics, and to facilitate the collection of biological information, would be to land all sharks with fins attached (which includes partially cut and folded). The majority of the WPEB **RECOMMENDED** such action be achieved through the replacement of IOTC Resolution 05/05 (5% shark fin:body weight ratio). However, the WPEB **NOTED** that such a

recommendation would have practical implementation issues for some fleets and may degrade the quality of the product. The WPEB further **RECOMMENDED** that all CPCs strive to obtain and maintain the best possible data, including improved species identification.

WPEB07.49 (para.161) Recognizing the general lack of shark data being recorded and reported to the IOTC Secretariat, the WPEB **RECOMMENDED** that:

- Resolution 10/02 is revised in order to include the list of most commonly caught elasmobranch species (Table 2) for which nominal catch data shall be reported as part of the statistical requirement for IOTC CPCs.

TABLE 2. List of the most commonly elasmobranch species caught.

Common name	**Species**	Code
Manta and devil rays	Mobulidae	MAN
Whale shark	*Rhincodon typus*	RHN
Thresher sharks	*Alopias spp.*	THR
Mako sharks	*Isurus spp.*	MAK
Silky shark	*Carcharhinus falciformis*	FAL
Oceanic whitetip shark	*Carcharhinus longimanus*	OCS
Blue shark	*Prionace glauca*	BSH
Hammerhead shark	Sphyrnidae	SPY
Other Sharks and rays	–	SKH

- that the list of shark species to be recorded in logbooks for all gears be modified as in Table 3.

TABLE 3. List of elasmobranchs species to be recorded in the logbook for longline, purse seine and gillnet fishing vessels.

For longline:	**For gillnet:**
Blue Shark (*Prionace glauca*)	Blue Shark (*Prionace glauca*)
Mako Sharks (*Isurus* spp.)	Mako Sharks (*Isurus* spp.)
Porbeagle Shark (*Lamna nasus*)	Other requiem sharks (*Carcharhinus spp.*)
Other requiem sharks (*Carcharhinus spp.*)	Oceanic Whitetip Shark (*Carcharhinus longimanus*)
Oceanic Whitetip Shark (*Carcharhinus longimanus*)	Hammerhead Sharks (Sphyrnidae)
Hammerhead Sharks (Sphyrnidae)	Thresher Sharks (*Alopias* spp.)
Thresher Sharks (*Alopias* spp.)	Tiger shark (*Galeocerdo cuvier)*
Other sharks	Mantas and devils rays (Mobulidae)
	Other sharks
	Other rays

For purse seine:

Oceanic Whitetip Shark (*Carcharhinus longimanus*)
Silky sharks (*Carcharhinus falciformis*)
Mantas and devils rays (Mobulidae)
Other sharks
Other rays

WPEB07.50 (para.162) The WPEB **RECOMMENDED** that the Commission considers clarifying that observers are allowed to collect biological samples (vertebrae, tissues, reproductive tracts, stomachs) from sharks that are dead at haulback, whose retention is prohibited by current regulation, e.g. thresher sharks under Resolution 10/12.

WPEB07.51 (para.163) The WPEB **RECOMMENDED** that the recommendations from the KOBE bycatch technical working group are considered to encourage research and development of best practice with regard to setting nets on whale sharks to determine the impacts of the practice. It was noted that these practices are generally recorded in logbooks for the purse seine fleet and the whale sharks are also extracted from the net by fishers, however, it was agreed it would be useful to have information on the extent of the practice and to develop best practice methods through direct collaboration with WCPFC.

WPEB07.52 (para.165) Noting the summary of available information on the oceanic whitetip shark (Appendix XI) indicating a decline in abundance over the last past two decades, the WPEB **RECOMMENDED** an urgent need for a more quantitative approach to the assessment of this species.

WPEB07.53 (para.167) The WPEB **RECOMMENDED** research and development of mitigation measures to minimize bycatch of the oceanic whitetip shark and its unharmed release for all types of fishing gears and that CPCs with data on oceanic whitetip sharks (i.e. total annual catches, CPUE time series and size data) to make these available to the next meeting in 2012 when the WPEB **AGREED** to revisit the status of oceanic whitetip sharks and management options be proposed if appropriate.

WPEB07.54 (para.168) Noting that the data holdings of the IOTC Secretariat for sharks are limited and would not facilitate stock assessments, the WPEB **RECOMMENDED** that historic datasets held by CPCs be provided to the IOTC Secretariat as a matter of urgency, in disaggregated forms.

Blue sharks

WPEB07.55 (para.170) The WPEB **RECOMMENDED** the following management advice for blue sharks in the Indian Ocean, for the consideration of the Scientific Committee:

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. The current IUCN threat status of 'Near Threatened' applies to blue sharks globally (Table 4). There is a paucity of information available on this species and this situation is not expected to improve in the short to medium term. There is no quantitative stock assessment and limited basic fishery indicators currently available for blue shark in the Indian Ocean therefore the stock status is highly uncertain. 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 (16–20 years), mature at 4–6 years, and have relativity few offspring (25–50 pups every year), the blue shark is vulnerable to overfishing. Blue shark assessments in the Atlantic and Pacific oceans seem to indicate that blue shark stocks can sustain relatively high fishing pressure.

TABLE 4. Status of blue shark (*Prionace glauca*) in the Indian Ocean – IUCN threat status

Common name	Scientific name	IUCN threat status		
		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, 2011)

Outlook. Maintaining or increasing effort will likely 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.

Oceanic whitetip sharks

WPEB07.56 (para.171) The WPEB **RECOMMENDED** the following management advice for oceanic whitetip sharks in the Indian Ocean, for the consideration of the Scientific Committee:

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. The current IUCN threat status of 'Vulnerable' applies to oceanic whitetip sharks globally (Table 5). There is a paucity of information available on this species and this situation is not expected to improve in the short to medium term. 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 highly uncertain. 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 vulnerable to overfishing. Despite the lack of data, it is apparent from the information that is available that oceanic whitetip shark abundance has declined significantly over recent decades.

TABLE 5. Status of oceanic whitetip shark (*Carcharhinus longimanus*) in the Indian Ocean – IUCN threat status

Common name	Scientific name	IUCN threat status		
		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, 2011)

Outlook. Maintaining or increasing effort will probably 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 oceanic whitetip sharks will decline in these areas in the near future, and may result in localised depletion.

Scalloped hammerhead sharks

WPEB07.57 (para.172) The WPEB **RECOMMENDED** the following management advice for scalloped hammerhead sharks in the Indian Ocean, for the consideration of the Scientific Committee:

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 6). There is a paucity of information available on this species and this situation is not expected to improve in the short to medium term. 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 highly uncertain. Scalloped hammerhead sharks are commonly taken by a range of fisheries in the Indian Ocean. They are extremely vulnerable to gillnet fisheries. Furthermore, pups occupy shallow coastal nursery grounds, often heavily exploited by inshore fisheries. Because of their life history characteristics – they are relatively long lived (over 30 years), and have relativity few offspring (<31 pups each year), the scalloped hammerhead shark is vulnerable to overfishing.

TABLE 6. Status of scalloped hammerhead shark (*Sphyrna lewini*) in the Indian Ocean – IUCN threat status

Common name	Scientific name	IUCN threat status		
		Global status	WIO	EIO
Scalloped hammerhead shark	*Sphyrna lewini*	Endangered	Endangered	Least concern

IUCN = International Union for Conservation of Nature; WIO = Western Indian Ocean; EIO = Eastern Indian Ocean
SOURCES: IUCN (2007, 2011)

Outlook. Maintaining or increasing effort will probably result in further 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, and may result in localised depletion.

Shortfin mako sharks

WPEB07.58 (para.173) The WPEB **RECOMMENDED** the following management advice for shortfin mako sharks in the Indian Ocean, for the consideration of the Scientific Committee:

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. The current IUCN threat status of 'Vulnerable' applies to shortfin mako sharks globally (Table 7). There is a paucity of information available on this species and this situation is not expected to improve in the short to medium term. There is no quantitative stock assessment or basic fishery indicators currently available for shortfin mako shark in the Indian Ocean therefore the stock status is highly uncertain. Shortfin mako sharks are commonly taken by a range of fisheries in the Indian Ocean. Because of their life history characteristics – they are relatively long lived (over 30 years), females mature at 18–21 years, and have relativity few offspring (<25 pups every two or three years), the shortfin mako shark is vulnerable to overfishing.

TABLE 7. Status of shortfin mako shark (*Isurus oxyrinchus*) in the Indian Ocean – IUCN threat status

Common name	Scientific name	IUCN threat status		
		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, 2011)

Outlook. Maintaining or increasing effort will probably 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 shortfin mako shark will decline in these areas in the near future, and may result in localised depletion.

Silky sharks

WPEB07.59 (para.174) The WPEB **RECOMMENDED** the following management advice for silky sharks in the Indian Ocean, for the consideration of the Scientific Committee:

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. The current IUCN threat status of 'Near Threatened' applies to silky sharks in the western and eastern Indian Ocean and globally (Table 8). There is a paucity of information available on this species and this situation is not expected to improve in the short to medium term. There is no quantitative stock assessment or basic fishery indicators currently available for silky shark in the Indian Ocean therefore the stock status is highly uncertain. 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 at 6–12 years, and have relativity few offspring (<20 pups every two years), the silky shark is vulnerable to overfishing. Despite the lack of data, it is clear from the information that is available that silky shark abundance has declined significantly over recent decades.

TABLE 8. Status of silky shark (*Carcharhinus falciformis*) in the Indian Ocean – IUCN threat status

Common name	Scientific name	IUCN threat status		
		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, 2011)

Outlook. Maintaining or increasing effort will 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.

Bigeye thresher sharks

WPEB07.60 (para.175) The WPEB **RECOMMENDED** the following management advice for bigeye thresher sharks in the Indian Ocean, for the consideration of the Scientific Committee:

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. The current IUCN threat status of 'Vulnerable' applies to bigeye thresher shark globally (Table 9). There is a paucity of information available on this species and this situation is not expected to improve in the short to medium term. 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 highly uncertain. 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 9-13 years, and have few offspring (2-4 pups every year), the bigeye thresher shark is vulnerable to overfishing.

TABLE 9. Status of bigeye thresher shark (*Alopias superciliosus*) in the Indian Ocean – IUCN threat status

Common name	Scientific name	IUCN threat status		
		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, 2011)

Outlook. Current longline fishing effort is directed to other species, however bigeye thresher shark is a common bycatch in these fisheries. Hooking mortality is apparently very high, therefore IOTC Resolution 10/12 prohibiting retaining of any part of thresher shark onboard and promoting live release of thresher shark are apparently ineffective for species conservation. Maintaining or increasing effort will probably result in further declines in biomass, productivity and CPUE. However there are few data to estimated CPUE trends, in view of IOTC Resolution 10/12 and reluctance of fishing fleets 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.

Pelagic thresher sharks

WPEB07.61 (para.176) The WPEB **RECOMMENDED** the following management advice for pelagic thresher sharks in the Indian Ocean, for the consideration of the Scientific Committee:

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. The current IUCN threat status of 'Vulnerable' applies to pelagic thresher shark globally (Table 10). There is a paucity of information available on this species and this situation is not expected to improve in the short to medium term. 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 highly uncertain. 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.

TABLE 10. Status of pelagic thresher shark (*Alopias pelagicus*) in the Indian Ocean – IUCN threat status

Common name	Scientific name	IUCN threat status		
		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, 2011)

Outlook. Current longline fishing effort is directed to other species, however pelagic thresher shark is a common bycatch in these fisheries. Hooking mortality is apparently very high, therefore IOTC Resolution 10/12 prohibiting retaining of any part of thresher sharks onboard and promoting live release of thresher shark are apparently ineffective for species conservation. Maintaining or increasing effort will probably result in further declines in biomass, productivity and CPUE. However there are few data to estimate CPUE trends, in view of IOTC Resolution 10/12 and reluctance of fishing fleets 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.

WPEB07.62 (para.179) The WPEB **RECOMMENDED** that the IOTC Secretariat update the draft shark Executive Summaries with the latest 2010 interaction data, and for these to be provided to the Scientific Committee for its consideration.

Seabirds

WPEB07.63 (para.186) The WPEB **RECOMMENDED** that the Scientific Committee note that the current area of application for seabird bycatch mitigation measures was supported by the available evidence and should not be revised at this point.

WPEB07.64 (para.192) The WPEB **RECOMMENDED** that targeted observer effort be deployed in specific fisheries where high seabird bycatch is known or suspected.

WPEB07.65 (para.203) The WPEB **NOTED** that three measures ─ weighting of branchlines, night setting of longlines and use of bird scaring lines ─ are proven and recommended measures for use in pelagic longline gear. The WPEB **RECOMMENDED** that the Scientific Committee note that other measures, including the three which are currently included in Resolution 10/06 ─ blue-dyed squid bait, offal discharge control and use of a line shooting device ─ are not considered to be effective mitigation measures following ACAPs review of available mitigation measures:

- Blue dyed squid bait has been insufficiently researched and cannot be recommended.
- Line shooting device. There is no experimental evidence that line shooters reduce seabird bycatch in pelagic longline fisheries; therefore, they should not be considered a seabird bycatch mitigation option, although they will continue to be used on many vessels because they are considered to improve fishing efficiency.
- Offal discharge control. Appropriate management of offal is encouraged as good operating practice but is not considered a primary mitigation measure in pelagic fisheries as there are much smaller quantities of fish waste derived from fishing operations, in direct contrast to the situation in demersal fisheries. The inclusion of offal management as a mitigation measure in Resolution 10/06 most likely has been taken from use of this measure in CCAMLR and other demersal longline fisheries, where it is much more important.

WPEB07.66 (para.206) The WPEB **RECOMMENDED** that the Scientific Committee note that:

- A combination of weighted branchlines, bird scaring lines and night setting are best practice mitigation in reducing bycatch of seabirds to the lowest possible

level in pelagic longline fisheries. These measures should be applied in high risk areas within the Indian Ocean and other southern hemisphere oceans.

- Currently, no single mitigation measure can reliably prevent the incidental mortality of seabirds in most pelagic longline fisheries. The most effective approach is to use the measures described in combination. Other factors such as safety, practicality and the characteristics of the fishery should also be recognised when framing conservation measures.
- The current recommended minimum standards for branchline weighting configurations are:
    i. Greater than 45 g weight attached within 1 m of the hook; or
    ii. Greater than 60 g weight attached within 3.5 m of the hook; or
    iii. Greater than 98 g weight attached within 4m of the hook.
- Positioning weight farther than 4 m from the hook is not recommended.

WPEB07.67 (para.208) The WPEB **NOTED** that for bird scaring lines (BSL), ACAP best practice advice recognises that vessel size is an important determinant in their practical use, with respect to the aerial extent that can be achieved, and the ability to deploy single or twin BSLs. For vessels that exceed 35 m in length, an aerial extent of 100 m and use of two BSLs is **RECOMMENDED**; for smaller vessels an aerial extent of 75 m and use of a single BSL is **RECOMMENDED**.

WPEB07.68 (para.209) Taking into account the information presented in working papers IOTC–2011–WPEB07–43, IOTC–2011–WPEB07–44 and IOTC–2011–WPEB07–54, the WPEB **AGREED** that a combination of weighted branchlines, bird scaring lines and night setting is best practice mitigation in reducing bycatch of seabirds to the lowest possible level in pelagic longline fisheries. The WPEB **RECOMMENDED** that Resolution 10/06 be amended to reflect this advice, and to incorporate the technical specifications outlined in the paragraphs above (paras. 203, 206, 208).

WPEB07.69 (para.210) Further, the WPEB **NOTED**, in agreement with IOTC–2011–WPEB07–40, that if this **RECOMMENDATION** was accepted, together with the **RECOMMENDATION** to remove blue-dyed squid bait, line shooters and offal discharge control from the existing measure, the 'two column' approach used in Resolution 10/06 would be abandoned in favour of an approach that specifies the three measures to be applied in areas of seabird interaction risk.

WPEB07.70 (para.211) The WPEB **RECOMMENDED** that at this stage, line weighting should be seen as an adaptive management response to the seabird bycatch problem. Continued refinement of line weighting configurations (mass, number and position of weights and materials) through controlled research and application in fisheries, is highly desirable to find configurations that are most safe, practical and effective. The regimes recommended above should be implemented in working fisheries, monitored through observer programmes, and reviewed and modified if found to be inadequate in reducing bycatch to acceptable levels.

WPEB07.71 (para.212) The meeting **NOTED** that the development of the mitigation measures outlined in the papers presented was the result of excellent collaboration between fishers, seabird experts and mitigation technologists with specialist expertise. Many IOTC members will lack capacity to collect such data, but it is imperative that this be done if further progress is to be made. The WPEB **RECOMMENDED** that CPCs look to establish collaborative relationships with other CPCs, NGOs and IGOs with the relevant skill set to provide the necessary training and build capacity.

WPEB07.72 (para.217) The WPEB **RECOMMENDED** that any amendment to Resolution 10/06 allow sufficient time for orderly implementation, to allow training and redevelopment of gears and operations.

WPEB07.73 (para.219) The WPEB **AGREED** that although IOTC Recommendation 05/09 *on incidental mortality of seabirds* has not been revoked, it became obsolete with the adoption of

Resolution 10/06, and **RECOMMENDED** that it be removed from the list of current Conservation and Management Measures of the Commission.

WPEB07.74 (para.221) The WPEB strongly **RECOMMENDED** that the Resolution 10/06 be amended in order to make the reporting of seabird interactions mandatory for vessels fishing for species under the IOTC mandate. In addition and as a matter of consistency, to increase the reporting of these interactions, the WPEB further **RECOMMENDED** that the recording of interactions with seabirds be included in the minimum requirements for logbooks for all fleets.

WPEB07.75 (para.222) The WPEB **RECOMMENDED** the following management advice for seabirds in the Indian Ocean, for the consideration of the Scientific Committee:

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 12. 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 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 assessments 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* includes an evaluation requirement (para. 8) by the Scientific Committee in time for the 2011 meeting of the Commission. However, given the lack of reporting of seabird interactions by CPCs to date, such an evaluation cannot be undertaken at this stage. Unless IOTC CPCs become compliant with the data collection and reporting requirements for seabirds, the WPEB will continue to be unable to address this issue. Notwithstanding this, it is acknowledged that the impact on seabird populations from fishing for tuna and tuna-like species, particularly using longline gear may increase if fishing pressure increases. Any fishing in areas with high abundance of procellariiform seabirds is likely to cause incidental capture and mortality of these seabirds unless measures that have been proven to be effective against Southern Ocean seabird assemblages are employed.

TABLE 12. Status of seabirds in the Indian Ocean – 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
Albatross		
Atlantic Yellow-nosed	*Thalassarche*	Endangered
Black-browed albatross	*Thalassarche*	Endangered
Indian yellow-nosed albatross	*Thalassarche carteri*	Endangered
Shy albatross	*Thalassarche cauta*	Near Threatened
Sooty albatross	*Phoebetria fusca*	Endangered
Tristan albatross	*Diomedea dabbenena*	Critically Endangered
Wandering albatross	*Diomedia exulans*	Vulnerable
White-capped albatross	*Thalassarche steadi*	Near Threatened
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

WPEB07.76 (para.223) The WPEB **RECOMMENDED** that the Scientific Committee consider the following:

- The available evidence indicates considerable risk to the status of seabirds 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.
- Maintaining or increasing effort in the Indian Ocean without refining and implementing appropriate mitigation measures, 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 seabirds.
- Resolution 10/06 on reducing the incidental bycatch of seabirds in longline fisheries includes an evaluation requirement (para. 8) by the Scientific Committee in time for the 2011 meeting of the Commission, noting that this deadline is now overdue.

WPEB07.77 (para.225) The WPEB **RECOMMENDED** that the IOTC Secretariat update the draft seabirds Executive Summary with the latest 2010 interaction data, including the number of breeding pairs for each species, and for these to be provided to the Scientific Committee for its consideration.

Marine turtles

WPEB07.78 (para.228) Noting the general lack of data on incidental catch of marine turtles, the WPEB **RECOMMENDED** that an ERA is conducted for marine turtles caught in fisheries targeting tuna and tuna-like species in the Indian Ocean before the next session of the WPEB. In order to do so, the WPEB **RECOMMENDED** that the Scientific Committee request the Commission to allocate specific funds for such an analysis.

WPEB07.79 (para.229) The WPEB further **RECOMMENDED** that data on incidental catches of marine turtles should be better recorded in the artisanal and coastal fisheries of the Indian Ocean.

WPEB07.80 (para.232) The WPEB **NOTED** that no new information regarding the development and implementation of any national management plans for the reduction of marine turtle bycatch in tuna fisheries was presented and **RECOMMENDED** that CPCs develop such a plan and that the scientists participating in the WPEB report on progress at the next session of the WPEB.

WPEB07.81 (para.234) The WPEB **RECOMMENDED** that all fleets, including longline, purse seine and gillnet fleets, shall report on interactions between marine turtles and fisheries for tuna and tuna-like species, at the next session of the WPEB.

WPEB07.82 (para.236) The WPEB **RECOMMENDED** that the development and adoption of improved FAD designs to reduce the incidence of entanglement of marine turtles and sharks, including the use of biodegradable materials, be undertaken by the main fleets using FADs, noting that the use of these FADs could become mandatory in the future.

WPEB07.83 (para.240) The WPEB **NOTED** that there are two current Conservation and Management Measures regarding marine turtles, Recommendation 05/08 *On sea turtles* and Resolution 09/06 *On marine turtles.* However, the WPEB **AGREED** that although Recommendation 05/08 *On sea turtles* has not been revoked, it became obsolete with the adoption of Resolution 09/06 *On marine turtles* and **RECOMMENDED** that it be removed from the list of current Conservation and Management Measures of the Commission.

WPEB07.84 (para.241) Noting that reporting of interactions with marine turtles is already mandatory through Resolution 09/06 which states "*CPCs shall collect (including through logbooks and observer programs) and provide to the Scientific Committee all data on their vessels' interactions with marine turtles in fisheries targeting the species covered by the IOTC Agreement"* (Res.09/06, para.2), and in order to increase the reporting of interactions, the WPEB **RECOMMENDED** that the recording of marine turtles caught as bycatch is included in the minimum requirements of logbooks for all fleets fishing in the IOTC area.

WPEB07.85 (para.242) The WPEB **RECOMMENDED** that the Scientific Committee note that the lack of data from CPCs on interactions and mortalities of marine turtles in the Indian Ocean is a significant concern, resulting in an inability of the WPEB to estimate levels of marine turtle bycatch.

WPEB07.86 (para.243) The WPEB **RECOMMENDED** that the Scientific Committee note that there is an urgent need to quantify the effects of fisheries for tuna and tuna-like species in the Indian Ocean on non-target species, and it is clear that little progress on obtaining and reporting data on interactions with marine turtles has been made. This data is imperative to allow the IOTC to respond and manage the adverse effects on marine turtles, and other bycatch species.

WPEB07.87 (para.244) The WPEB **RECOMMENDED** that the comprehensive 'Assessment of the conservation status of the leatherback turtle in the Indian Ocean and South-East Asia', prepared by IOSEA in 2006, be reviewed, especially with regard to its recommended follow-up.

WPEB07.88 (para.245) Noting that the Western Indian Ocean Marine Science Association (WIOMSA) meeting was being held at the same time as WPEB07 and the participation of marine turtle experts was limited, the WPEB **RECOMMENDED** that the timing of the next WPEB meeting be communicated to the organisers of the WIOMSA meeting as early as possible by the IOTC Secretariat, so that marine turtle experts could participate at the next Session of the WPEB.

WPEB07.89 (para.246) Noting that paragraph 4 of Resolution 09/06 *on marine turtles* currently refers to "hard shelled turtles", which could potentially be read to exclude leatherback turtles, and noting the WPEB and the Scientific Committee's previous agreement that the resolution does apply to leatherback turtles in its entirety, the WPEB **RECOMMENDED** that the Commission revise Resolution 09/06 *on marine turtles* so that the term "hard-shelled" be deleted and replaced by "marine" to ensure application to all marine turtle species.

WPEB07.90 (para.247) The WPEB **RECOMMENDED** the following management advice for marine turtles in the Indian Ocean, for the consideration of the Scientific Committee:

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 13. 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 and to a lesser extent purse seine fishing and longline is not known.

Outlook. Resolution 09/06 on marine turtles includes an evaluation requirement (para. 9) by the Scientific Committee in time for the 2011 meeting of the Commission (para.10). However, given the lack of reporting of marine turtle interactions by CPCs to date, such an evaluation was not able to be undertaken. Unless IOTC CPCs become compliant with the data collection and reporting requirements for marine turtles, the WPEB 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.

TABLE 13. Status of marine turtles in the Indian Ocean – 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
Flatback turtle	*Natator depressus*	Data deficient
Green turtle	*Chelonia mydas*	Endangered
Hawksbill turtle	*Eretmochelys*	Critically Endangered
Leatherback turtle	*Dermochelys*	Critically Endangered
Loggerhead turtle	*Caretta caretta*	Endangered
Olive ridley turtle	*Lepidochelys*	Vulnerable

WPEB07.91 (para.248) The WPEB **RECOMMENDED** that the Scientific Committee consider the following:

- The available evidence indicates considerable risk to the status of 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.
- Maintaining or increasing 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.

WPEB07.92 (para.250) The WPEB **RECOMMENDED** that the IOTC Secretariat update the draft marine turtle Executive Summary with the latest 2010 interaction data, and for these to be provided to the Scientific Committee for its consideration.

Other bycatch and byproduct species

WPEB07.93 (para.255) Noting the potential negative impacts of fish aggregation devices (FADs) on bycatch in fisheries for tuna and tuna-like species in the Indian Ocean, the WPEB **RECOMMENDED** that CPCs utilizing anchored FADs undertake research aimed as assessing the effect of anchored FADs on bycatch, and for the results to be reported to the next session of the WPEB.

Depredation

WPEB07.94 (para.267) The WPEB **AGREED** that Resolution 00/02 *on a survey of predation of longline caught fish*, is no longer current, despite not having been revoked or superseded. As such, the WPEB **RECOMMENDED** that it be removed from the list of current IOTC Conservation and Management Measures.

WPEB07.95 (para.268) Noting that there is currently no mandatory requirement to report incidences of depredation, the WPEB **RECOMMENDED** that data collection capacity be strengthened, with regard to depredation, in longlines and other major fisheries (i.e. drift gillnets and purse seines). In addition, the use of other data collection methods, such as questionnaires and interviews (which are an important, inexpensive and rapid method for highlighting problems), should be encouraged.

WPEB07.96 (para.269) Noting that depredation has been reported to be high in some areas of the Indian Ocean (e.g. 19% in the Seychelles longline fishery: IOTC–2011–WPB09–R), which is much higher than in other regions of the Indian Ocean and would lead to bias in the CPUE series, the WPEB **RECOMMENDED** that the main longline fleets in the Indian Ocean (Taiwan,China, Japan, Indonesia, EU,Spain, EU,Portugal) carry out research and monitoring programs aimed at determining the level of depredation in a range of areas and under different fishing conditions, and for the results to be presented at the next session of the WPEB.

WPEB07.97 (para.270) The WPEB **RECOMMENDED** that research be carried out by EU scientists to analyse the incidental encirclement of whales, through logbooks and observer data from EU flagged vessels, specifically when setting on whales prior to the mid-1990s and in association with whales after the mid-1990s. These results should be presented to the next session of the WPEB.

WPEB07.98 (para.271) The WPEB **NOTED** the development of handling guidelines for cetacean by the WCPFC and **RECOMMENDED** that these be presented and discussed at the session of the WPEB.

WPEB07.99 (para.274) Noting that the IOTC Secretariat has received limited information to date on marine mammal interactions with driftnet fisheries in the Indian Ocean, the WPEB **RECOMMENDED** that all CPCs using drift gillnets to report all interactions between marine mammals and drift gillnet fisheries in the Indian Ocean.

WPEB07.100 (para275). Noting that there is no mandatory requirement to record and report incidental catches of marine mammals, the WPEB **RECOMMENDED** all CPCs to collect and report marine mammal incidental catches through their observer programmes and **ENCOURAGED** that these interactions are recorded in the logbook of fleets catching species under the IOTC Agreement and reported to the IOTC Secretariat.

Ecosystem approaches

WPEB07.101 (para.282) Noting with concern the high levels of shark byproduct and bycatch reported in many National Reports to the Scientific Committee, and considering that future management decisions would benefit from collated bycatch data in an attempt to quantify cumulative bycatch impacts, the WPEB **RECOMMENDED** that research be undertaken as a high priority to assess the cumulative impacts of IOTC fishing operations on bycatch species, with a particular emphasis on shark species, noting that the data required to do this is already present in the National Reports of CPCs.

Research recommendations and priorities

WPEB07.102 (para.288) The WPEB **RECOMMENDED** that the Commission agree for a new position to be created at the IOTC Secretariat (Fishery Officer), with duties to focus on bycatch issues.

WPEB07.103 (para.289) The WPEB **RECOMMENDED** that the Scientific Committee add the following core topic areas as priorities for research over the coming year, noting that the first step will be for the Scientific Committee to establish priorities, taking into account data gaps, capacity among CPCs, and areas for implementation:

- ***Ecological Risk Assessment***
  i. Sharks
  ii. Marine turtles
- ***Stock status analyses***

i. Oceanic whitetip shark

- ***Depredation***
  i. Longline fishery depredation
- ***Bycatch mitigation***
  i. Sharks
  ii. Seabirds – line weighting
  iii. Marine turtles
  iv. Marine mammals
- ***Capacity building***
  i. Scientific assistance to CPCs and specific fleets considered to have the highest risk to bycatch species (e.g. gillnet fleets and longline fleets).

Other business

WPEB07.104 (para.291) The WPEB **RECOMMENDED** the following core areas of expertise and priority areas for contribution, that need to be enhanced for the next meeting of the WPEB in 2012, by an Invited Expert/s:

- Expertise: Ecological Risk Assessments (sharks and marine turtles); Mitigation techniques (marine turtles, marine mammals, sharks).
- Priority areas for contribution: Marine turtle expert with mitigation expertise; Shark expert with expertise on ERAs.

WPEB07.105 (para.293) Following a discussion on who would host the Eighth Session of the WPEB, and noting that with the Working Party on Tropical Tunas being held in conjunction with the Working Party on Methods and the tuna tagging symposium in late October or early November 2012, the WPEB **RECOMMENDED** that the next session of the WPEB be held in conjunction with the Working Party on Billfish in September or October 2012. The exact dates and meeting location will be confirmed and communicated by the IOTC Secretariat to the Scientific Committee for its consideration at its next session to be held in December 2011.

WPEB07.106 (para.295) The WPEB **AGREED** that the workload of the WPEB has increased exponentially in recent years and yet there appears to be limited resources being given to issues of bycatch, despite the range of IOTC Conservation and Management Measures and other international agreements addressing bycatch in fisheries for tuna and tuna-like species. Thus, the WPEB **RECOMMENDED** that CPCs allocate sufficient resources to address issues of bycatch as high priority issues, and that the Commission agree to the addition of a new Fishery Officer post at the IOTC Secretariat.

WPEB07.107 (para.298) The WPEB **RECOMMENDED** that the Scientific Committee note the re-elected Chair (Dr. Charles Anderson) and Vice-Chair (Dr. Evgeny Romanov) of the WPEB for the next *biennium*.

WPEB07.108 (para.299) The WPEB **RECOMMENDED** that the Scientific Committee consider the consolidated set of recommendations arising from WPEB07, provided at Appendix IV.

APPENDIX V
AVAILABILITY OF CATCH DATA FOR SHARKS BY GEAR

Availability of catch data for the main shark species expressed as the amount of fleets (%) for which catch data on sharks are available out of the total number of fleets for which data on IOTC species are available, by fishery, species of shark, and year, for the period 1950–2010

a. Longline and gillnet fisheries

Availability of catch data for main shark species expressed as the amount of fleets (%) for which catch data on sharks are available out of the total number of fleets for which data on IOTC species are available, by fishery, species of shark, and year, for the period 1950–2010

b. Purse seine and pole-and-line* fisheries

*** Note that catch rates of sharks on pole-and-line fisheries are thought to be nil or negligible**

Availability of catch data for main shark species expressed as the amount of fleets (%) for which catch data on sharks are available out of the total number of fleets for which data on IOTC species are available, by fishery, species of shark, and year, for the period 1950–2010

c. Handline, trolling (Line) and other fisheries operated in coastal waters (Other)

APPENDIX VI
DATASETS TO BE PROVIDED FOR SHARKS AND OTHER SPECIES

Types of datasets to be provided for sharks and other species caught in fisheries targeting tuna and tuna-like species in the IOTC area of competence, and parties having provided data[1] in each case

SHARKS

Historical data on SHARKS according to IOTC reporting requirements

Applies to: All CPC
Time period: All years before 2006
Deadline: June (December) 30th 2006
Report to: IOTC Secretariat
Binding status: Obligatory
Parties having provided data for industrial fleets:

- Surface: EU-France; EU-Spain
- Longline: Australia; Belize; China; Taiwan,China; EU-France; EU-Portugal; EU-Spain; EU-UK; France; Guinea; Indonesia; Republic of Korea; Malaysia; Mauritius; Oman; Senegal; Seychelles; South Africa; Thailand
- Driftnet: Pakistan

Remarks: It is not clear which species of sharks are covered by this requirement (see below).

Nominal catch data for MOST COMMON SHARK species

Applies to: All CPC
Time period: 2006 and later years
Deadline: June (December) 30th of year following that for which data are due
Report to: IOTC Secretariat
Binding status: Obligatory
Parties having provided data for industrial fleets:

- Surface: EU-France; EU-Spain
- Longline: Australia; Belize; China; Taiwan,China; EU-Portugal; EU-Spain; EU-UK; Indonesia; Japan; Kenya; Philippines; Sri Lanka; South Africa; Thailand
- Driftnet: Nil

Remarks: There is no definition for "most common species of sharks" and therefore it is not clear which species are covered by this requirement

Nominal catch data for OTHER SHARK species

Applies to: All CPC
Time period: 2006 and later years
Deadline: June (December) 30th of year following that for which data are due
Report to: IOTC Secretariat
Binding status: Voluntary
Parties having provided data for industrial fleets:

- Surface: EU-France; EU-Spain
- Longline: Australia; Belize; China; Taiwan,China; EU-France; EU-Portugal; EU-Spain; EU-UK; France; Indonesia; Japan; Kenya; Republic of Korea; Malaysia; Mauritius; Oman; Philippines; Seychelles; South Africa; Thailand; Uruguay
- Driftnet: Pakistan

Remarks: As above, there is need to define for which shark species reporting of catch is obligatory so as the remaining species can be inferred

Catch-and-effort data for MOST COMMON SHARK species

Applies to: All CPC
Time period: 2006 and later years
Deadline: June (December) 30th of year following that for which data are due
Report to: IOTC Secretariat
Binding status: Obligatory
Parties having provided data for industrial fleets:

- Surface: Nil
- Longline: China; Taiwan,China; EU-Portugal; EU-UK; Japan; Philippines; Seychelles; South Africa;
- Driftnet: Nil

Remarks: Same as above. Minima requirements for operational catch-and-effort data include provisions for the following species of sharks, by fishery:

- Longline and gillnet: Blue Shark (*Prionace glauca*); Porbeagle Shark (*Lamna nasus*); Mako Sharks (*Isurus spp.*); Oceanic Whitetip Shark (*Carcharhinus longimanus*); Hammerhead Sharks (*Sphyrna spp.*); Other sharks (by species, where possible, in particular: Thresher Sharks (*Alopias spp.*); Tiger Shark (*Galeocerdo cuvier*); Crocodile Shark (*Pseudocarcharias kamoharai*); Other Requiem sharks (*Carcharhinus spp.*); Great White shark (*Carcharodon carcharias*); Pelagic stingray (*Pteroplatytrygon violacea*))
- Purse seine: Not specified; where possible, data by species for: Whale Shark (*Rhincodon typus*); Oceanic Whitetip Shark (*Carcharhinus longimanus*); Silky shark (*Carcharhinus falciformis*)

[1] Note that the parties recorded in the table are those having provided any data at all but no attempt is made at this time to assess the completeness and quality of the data provided.

SHARKS

- Pole-and-line: Not specified; recorded as other species (sharks are seldom caught by baitboats)
- Other gears: There are no requirements for operational catch-and-effort data for gears other than the above.

However, it is not clear if the above species are those for which reporting of catch-and-effort data is due.

Catch-and-effort data for OTHER SHARK species

Applies to: All CPC
Time period: 2006 and later years
Deadline: June (December) 30th of year following that for which data are due
Report to: IOTC Secretariat
Binding status: Voluntary
Parties having provided data for industrial fleets:

- Surface: Nil
- Longline: China; Taiwan,China; EU-France; EU-Portugal; EU-UK; Japan; Republic of Korea; Malaysia; Mauritius; Oman; Seychelles; South Africa; Sri Lanka; Thailand; Uruguay
- Driftnet: Nil

Remarks: As above, there is need to define for which shark species reporting of catch-and-effort data is obligatory so as the remaining species can be inferred

Size frequency data for MOST COMMON SHARK species

Applies to: All CPC
Time period: 2006 and later years
Deadline: June (December) 30th of year following that for which data are due
Report to: IOTC Secretariat
Binding status: Obligatory
Parties having provided data for industrial fleets:

- Surface: Nil
- Longline: Japan; Republic of Korea; Seychelles; South Africa; Sri Lanka;
- Driftnet: Nil

Remarks: There is no definition for "most common species of sharks" and therefore it is not clear which species are covered by this requirement

Size frequency data for OTHER SHARK species

Applies to: All CPC
Time period: 2006 and later years
Deadline: June (December) 30th of year following that for which data are due
Report to: IOTC Secretariat
Binding status: Voluntary
Parties having provided data for industrial fleets:

- Surface: Nil
- Longline: Indonesia; Japan; Republic of Korea; Seychelles; South Africa; Sri Lanka;
- Driftnet: Nil

Remarks: As above, there is need to define for which shark species reporting of size frequency data is obligatory so as the remaining species can be inferred

Estimates of amounts of THRESHER SHARKS discarded dead and size frequency distribution of discards

Applies to: CPC having vessels in the IOTC Record of Authorized vessels
Time period: 2010 and later years
Deadline: IOTC Scientific Committee Meeting in December 2011
Report to: IOTC Scientific Committee
Binding status: Obligatory
Parties having provided data: Not applicable; first report due for December 2011.
Remarks: It is unclear if it is required to collect size data on all discards or only on dead discards; collecting size frequency data on thresher sharks before release may compromise survival of those specimens that are caught alive (rates of mortality at capture have been estimated at around 50% in the Atlantic Ocean)

Reports from scientific observers onboard vessels 24m LOA or greater under the IOTC Regional Observer Scheme

Applies to: CPC having vessels 24m LOA or greater in the IOTC Record of Authorized vessels
Time period: Since July 2010
Deadline: No later than 150 days after the end of each observer trip
Report to: IOTC Secretariat
Binding status: Obligatory
Parties having provided data: None
Remarks: Some of the contents of the observer report will be reviewed by the IOTC Scientific Committee in 2011 but this should not preclude IOTC parties from providing observer reports as per the standards currently in place.

Reports from scientific observers onboard vessels less than 24m LOA under the IOTC Regional Observer Scheme

Applies to: CPC having vessels less than 24m LOA in the IOTC Record of Authorized vessels
Time period: Progressive implementation to achieve recommended levels of coverage by January 2013
Deadline: No later than 150 days after the end of each observer trip
Report to: IOTC Secretariat
Binding status: Obligatory
Parties having provided data: None
Remarks: As above

OTHER SPECIES

Estimates of total incidental catches of SEABIRDS from longline fisheries

Applies to: CPC having longline fisheries in the IOTC Area

SHARKS

Time period: 2011 and later years
Deadline: IOTC Scientific Committee Meetings, included in the National Report
Report to: IOTC Scientific Committee each year
Binding status: Obligatory
Parties having provided data for industrial fleets: Not applicable; first report due for December 2012.
Remarks: Requirements do not include reporting of incidental catches by species or area, in particular area fished with respect to the 25°S latitude boundary. There is also need to identify for which species of seabirds, out of the many occurring in the Indian Ocean, reporting of data by species is considered to be a priority. Estimation of total levels of bycatch of seabirds by IOTC longline fisheries will be compromised or not possible unless requirements are extended to account for this.

Estimates of total incidental catches of SEABIRDS, by species, from all years and fisheries

Applies to: All CPC
Time period: All years
Deadline: IOTC Scientific Committee Meetings, included in the National Report
Report to: IOTC Scientific Committee each year
Binding status: Voluntary
Parties having provided data for industrial longline fleets: Australia; China; EU-France; EU-Spain; EU-UK; France; South Africa
Remarks: Same as above.

Estimates of total incidental catches of MARINE TURTLES

Applies to: All CPC
Time period: 2010 and later years
Deadline: IOTC Scientific Committee Meetings
Report to: IOTC Scientific Committee each year
Binding status: Obligatory
Parties having provided data for industrial fleets:

- Surface: EU-France; EU-Spain
- Longline: Australia; China; EU-France; EU-Spain; EU-UK; France
- Driftnet: Nil

Remarks: Requirements do not include reporting of incidental catches by species or area. Estimation of total levels of bycatch of marine turtles by IOTC fisheries will be compromised or not possible unless requirements are extended to account for this.

Estimates of total incidental catches of OTHER SPECIES

Applies to: All CPC
Time period: 2006 and later years
Deadline: June (December) 30th of year following that for which data are due
Report to: IOTC Secretariat
Binding status: Voluntary
Parties having provided data for industrial fleets: Several parties have provided data concerning this requirement.
Remarks: This group refers to species of very different nature, including marine mammals, and other groups of other marine species. For the sake of clarity it would be better to clarify which species or species groups are the focus of this requirement. It would also be better to create specific requirements for marine mammals, along the lines of those created for Seabirds or marine turtles.

Reports from scientific observers onboard vessels 24m LOA or greater under the IOTC Regional Observer Scheme
Reports from scientific observers onboard vessels less than 24m LOA under the IOTC Regional Observer Scheme

Remarks: Refer to Table 1 (SHARKS)

APPENDIX VII
STEPS TO IMPROVE THE CERTAINTY OF FISHERIES STATISTICS FOR SHARKS, SEABIRDS, MARINE TURTLES AND MARINE MAMMALS

SHARKS		
Data / information / work required	**Fishery**	**Major fleets involved**
Retained catches:		
Historical catch-and-effort information	Driftnet fisheries operated on the high seas	Pakistan and Iran
	Gillnet and longline fisheries operated on the high seas	Sri Lanka
	Deep-freezing longline fisheries for tunas	Japan, Taiwan,China, and South Korea
	Fresh-tuna longline fisheries for tunas	Indonesia, Taiwan,China, and Malaysia
	Longline fisheries targeting swordfish	EU-Spain
Historical catch level estimates by species and year	Fresh-tuna and/or deep-freezing longliners	Taiwan,China, Indonesia, Japan, South Korea
	Driftnet fisheries operated on the high seas	Pakistan and Iran
	Fisheries operated in coastal waters	India, Indonesia, Madagascar, Sri Lanka, and Yemen
	Purse seine	EU (before 2003 and after 2007) and the Seychelles (all time period)
Discard levels:		
Estimates of historical discard levels for sharks by species and year	All industrial longline fisheries	EU, Japan, Taiwan,China, Indonesia and South Korea
	All industrial purse seine fisheries	EU (excluding 2003-07), Iran, Japan, Seychelles, and Thailand
	All gillnet fisheries operated on the high seas	Pakistan, Iran, and Sri Lanka
Size frequency data:		
Size frequency data for the most commonly caught shark species	All industrial fleets, notably longline and driftnet fleets	EU, Malaysia, Indonesia Pakistan, Iran, and Sri Lanka
All historical size frequency data available for the most commonly caught shark species data available	All industrial fleets, notably longline and driftnet fleets	Japan, Taiwan,China, and South Korea Pakistan, Iran, and Sri Lanka
Biological data:		
Data used to derive length-weight keys (where appropriate by season and sex), ratios of fin-to-body weight, non-standard measurements-fork length keys and processed weight-live weight keys.	All fleets	Taiwan,China, Indonesia, and Japan
SEABIRDS		
Data / information / work required	**Fishery**	**Major fleets involved**
Provision of historical data on incidental catches of seabirds, by species and fishing area, indicating the type of mitigation measure/s used in each case.	All industrial longline fisheries	Longline: Taiwan,China, Japan, Indonesia, Malaysia, Philippines, EU-Spain, EU-Portugal, Seychelles and South Korea
Provision of data collected through observer programmes, as specified by the Commission.		
Detailed estimation of seabird bycatch, by species and year, including the precision of such estimates.		
Research on the effect of seabird bycatch mitigation measures.		
MARINE TURTLES		
Data / information / work required	**Fishery**	**Major fleets involved**
Provision of data collected through observer programmes and estimates of total levels of bycatch of marine turtles, as specified by the Commission.	All industrial longline fisheries	Taiwan,China, India, Indonesia, Japan, Republic of Korea, Malaysia, Oman, Philippines, and Seychelles
	All gillnet fisheries operated on the high seas	Pakistan, Sri Lanka, and Iran
	All gillnet fisheries operated in coastal waters	India, Indonesia, Oman and Yemen
	Industrial purse seine fleets	EU (before 2003), Seychelles, Iran, Japan and Thailand
MARINE MAMMALS		
Data / information / work required	**Fishery**	**Major fleets involved**
Provision of historical data on incidental catches of marine mammals, by species and fishing area.	Industrial longline fisheries	Longline: Taiwan,China, Japan, Indonesia, Malaysia, Philippines, Spain, Portugal, Seychelles and South Korea
Provision of data collected through observer programmes, as specified by the Commission.	Gillnet fisheries on the high seas	Iran, Pakistan, Sri Lanka

APPENDIX VIII
CPC REPORTING OF BYCATCH DATA AS PER IOTC CONSERVATION AND MANAGEMENT MEASURES

CPC	Resolutions relating to bycatch data	Observations
Australia	Res. 10/02 and earlier resolution, plus other related resolutions (R.05/05; 09/06 and 10/06): On Mandatory Statistical Requirements.	Catch of sharks – Reported aggregated NC shark data for 1970-1980 and 1999-2008 and per species for 2009-2010. Bycatch of marine turtles – Observer data reported by species for 2003 to 2009. Bycatch of seabirds – Observer data reported by species for 2003-2009
	Res. 10/03 (PS) & Res. 08/04 (LL) On the Recording of catch by fishing vessels.	Has provided information on the level of implementation and logbook forms used on domestic vessels.
	Res. 10/06 On Reducing incidental bycatch of sea-birds in longline fisheries.	Has reported information for 2009 and 2010.
Belize	Res. 10/02 and earlier resolution, plus other related resolutions (R.05/05; 09/06 and 10/06): On Mandatory Statistical Requirements.	Catch of sharks - Reported aggregated NC shark data in 2002, 2005 and 2006, and per species in 2007 and 2008. Bycatch of marine turtles – Not submitted. Bycatch of seabirds – Not submitted.
	Res. 10/03 (PS) & Res. 08/04 (LL) On the Recording of catch by fishing vessels	Has provided information on the level of implementation.
	Res. 10/06 On Reducing incidental bycatch of sea-birds in longline fisheries	Has reported information for 2010.
China Taiwan,China	Res. 10/02 and earlier resolution, plus other related resolutions (R.05/05; 09/06 and 10/06): On Mandatory Statistical Requirements.	Catch of sharks –Reported aggregated NC shark data for 1999-2000 and disaggregated by species from 2007 to 2009. Bycatch of marine turtles – reported nil catch (not submitted by Taiwan,China) Bycatch of seabirds – reported nil catch (not submitted by Taiwan,China)
	Res. 10/03 (PS) & Res. 08/04 (LL) On the Recording of catch by fishing vessels	China has no purse-seiner in the Indian Ocean and has provided information on the level of implementation on longliners.
	Res. 10/06 On Reducing incidental bycatch of sea-birds in longline fisheries	Has provided information on the level of implementation for 2010.
Comoros	Res. 10/02 and earlier resolution, plus other related resolutions (R.05/05; 09/06 and 10/06): On Mandatory Statistical Requirements.	Catch of sharks – Data not submitted. Bycatch of marine turtles – Data not submitted. Bycatch of seabirds - Data not submitted
	Res. 10/03 (PS) & Res. 08/04 (LL) On the Recording of catch by fishing vessels	Has reported that it does not have longliners.
	Res. 10/06 On Reducing incidental bycatch of sea-birds in longline fisheries	Has reported information for 2010; *the fishing technique used by the artisanal fishing fleet does not encourage the incidental catch of seabirds*.
Eritrea	Res. 10/02 and earlier resolution, plus other related resolutions (R.05/05; 09/06 and 10/06): On Mandatory Statistical Requirements.	Catch of sharks – Data not submitted. Bycatch of marine turtles – Data not submitted. Bycatch of seabirds - Data not submitted

CPC	Resolutions relating to bycatch data	Observations
	Res. 10/03 (PS) & Res. 08/04 (LL) On the Recording of catch by fishing vessels.	Has not provided information on the level of implementation. *No logbook has been provided to the Secretariat.*
	Res. 10/06 On Reducing incidental bycatch of sea-birds in longline fisheries.	Has not reported information for 2009. No information provided in 2010
European Union	Res. 10/02 and earlier resolution, plus other related resolutions (R.05/05; 09/06 and 10/06): On Mandatory Statistical Requirements.	Catch of sharks – EU,Spain: reported from 1993 to 2009 data by species for its longline fleet EU,Portugal: reported from 1998 to 2010 data by species for its longline fleet EU,France (Réunion): reported aggregated data from 1993 to 2008 for its longline fleet. EU,UK: reported since 2004-2010 data by species Bycatch of marine turtles – EU,Spain reported data aggregated for its longline fleet EU,France (Réunion): report data by species for its longline fleet EU,UK: report nil catches EU,PS: reported data per species Bycatch of seabirds – EU,Spain reported data aggregated for its longline fleet EU,France (Réunion): report data by species for its longline fleet EU,UK: report nil catches
	Res. 10/03 (PS) & Res. 08/04 (LL) On the Recording of catch by fishing vessels.	Has provided information on the level of implementation and logbook forms used on EU-flagged vessels.
	Res. 10/06 On Reducing incidental bycatch of sea-birds in longline fisheries.	Has reported information for 2009. New regulation being discussed by the European Council in 2011
France (OT)	Res. 10/02 and earlier resolution, plus other related resolutions (R.05/05; 09/06 and 10/06): On Mandatory Statistical Requirements.	Catch of sharks – Data submitted. Bycatch of marine turtles – Data submitted by species for longliners (observer). Bycatch of seabirds - Data submitted by species (observer).
	Res. 10/03 (PS) & Res. 08/04 (LL) On the Recording of catch by fishing vessels.	Has provided information on the level of implementation and logbook forms used on domestic vessels. *Aggregated data have not been* submitted for foreign licensed vessels. Only provided list of foreign vessels for 2010
	Res. 10/06 On Reducing incidental bycatch of sea-birds in longline fisheries.	Has reported information for 2009 and 2010
Guinea	Res. 10/02 and earlier resolution, plus other related resolutions (R.05/05; 09/06 and 10/06): On Mandatory Statistical Requirements.	Catch of sharks – Data not submitted. Reported catches by species from 2001 to 2003 and 2005 Bycatch of marine turtles – Data not submitted. Bycatch of seabirds - Data not submitted
	Res. 10/03 (PS) & Res. 08/04 (LL) On the Recording of catch by fishing vessels.	Has not provided information on the level of implementation.
	Res. 10/06 On Reducing incidental bycatch of sea-birds in longline fisheries.	Has not reported information for 2009.

CPC	Resolutions relating to bycatch data	Observations
Indonesia	Res. 10/02 and earlier resolution, plus other related resolutions (R.05/05; 09/06 and 10/06): On Mandatory Statistical Requirements.	Catch of sharks –. Has reported data since 1997-2009 with different levels of disaggregation by species
		Bycatch of marine turtles – Data not submitted. Bycatch of seabirds - Data not submitted
	Res. 10/03 (PS) & Res. 08/04 (LL) On the Recording of catch by fishing vessels.	Has not provided information on the level of implementation.
	Res. 10/06 On Reducing incidental bycatch of sea-birds in longline fisheries.	Has not provided information on the level of implementation.
India	Res. 10/02 and earlier resolution, plus other related resolutions (R.05/05; 09/06 and 10/06): On Mandatory Statistical Requirements.	Catch of sharks – Reporting of low catches from 1986 to 2002. No data reported since 2002
		Bycatch of marine turtles – Data not submitted. Bycatch of seabirds - Data not submitted.
	Res. 10/03 (PS) & Res. 08/04 (LL) On the Recording of catch by fishing vessels.	Has not provided information on the level of implementation.
	Res. 10/06 On Reducing incidental bycatch of sea-birds in longline fisheries.	Has not provided information on the level of implementation.
Iran	Res. 10/02 and earlier resolution, plus other related resolutions (R.05/05; 09/06 and 10/06): On Mandatory Statistical Requirements.	Catch of sharks – Data not submitted. Bycatch of marine turtles – Data not submitted. Bycatch of seabirds - Data not submitted
	Res. 10/03 (PS) & Res. 08/04 (LL) On the Recording of catch by fishing vessels.	Has not provided information on the level of implementation.
	Res. 10/06 On Reducing incidental bycatch of sea-birds in longline fisheries.	Has not provided information on the level of implementation.
Japan	Res. 10/02 and earlier resolution, plus other related resolutions (R.05/05; 09/06 and 10/06): On Mandatory Statistical Requirements.	Catch of sharks –Reported NC shark data by species in 2009-2010 for its longline fleet
		Bycatch of marine turtles – Data not submitted. Bycatch of seabirds - Data not submitted.
	Res. 10/03 (PS) & Res. 08/04 (LL) On the Recording of catch by fishing vessels.	Has provided information on the level of implementation and logbook forms used on domestic vessels.
	Res. 10/06 On Reducing incidental bycatch of sea-birds in longline fisheries.	Has reported information for 2009.
Kenya	Res. 10/02 and earlier resolution, plus other related resolutions (R.05/05; 09/06 and 10/06): On Mandatory Statistical Requirements.	Catch of sharks –Reported NC shark data by species from 2006-2009 for its longline fleet.
		Bycatch of marine turtles – Data not submitted. Bycatch of seabirds - Data not submitted.
	Res. 10/03 (PS) & Res. 08/04 (LL) On the Recording of catch by fishing vessels.	Has provided information on the level of implementation. *Aggregated data have not been* submitted for foreign licensed vessels.
	Res. 10/06 On Reducing incidental bycatch of sea-birds in longline fisheries.	Has not reported information for 2009.
Korea, Republic of	Res. 10/02 and earlier resolution, plus other related resolutions (R.05/05; 09/06 and 10/06): On Mandatory Statistical Requirements.	Catch of sharks –Reported NC shark data aggregated from 1971-2009. Reported some size data in 2007. Submitted for year 2010

CPC	Resolutions relating to bycatch data	Observations
		Bycatch of marine turtles – Data not submitted. Bycatch of seabirds - Data not submitted.
	Res. 10/03 (PS) & Res. 08/04 (LL) On the Recording of catch by fishing vessels.	Has provided information on the level of implementation.
	Res. 10/06 On Reducing incidental bycatch of sea-birds in longline fisheries.	Has reported information for 2009 and 2010
Sri Lanka	Res. 10/02 and earlier resolution, plus other related resolutions (R.05/05; 09/06 and 10/06): On Mandatory Statistical Requirements.	Catch of sharks – Published NC shark data aggregated from 1951-1993. and disaggregated from 1994-1999. Reported partial NC shark data per species from 2000-2006 and aggregated from 2007-2010.
		Bycatch of marine turtles – Data not submitted. Bycatch of seabirds - Data not submitted
	Res. 10/03 (PS) & Res. 08/04 (LL) On the Recording of catch by fishing vessels.	Has not provided information on the level of implementation. Had provided list of foreign vessels only for 2010
	Res. 10/06 On Reducing incidental bycatch of sea-birds in longline fisheries.	Has reported that due to the nature of the longline operations no seabird is being caught
Madagascar	Res. 10/02 and earlier resolution, plus other related resolutions (R.05/05; 09/06 and 10/06): On Mandatory Statistical Requirements.	Catch of sharks – Reported NC shark data aggregated in 2005. Bycatch of marine turtles – Data not submitted. Bycatch of seabirds - Data not submitted.
	Res. 10/03 (PS) & Res. 08/04 (LL) On the Recording of catch by fishing vessels.	Has not provided information on the level of implementation.
	Res. 10/06 On Reducing incidental bycatch of sea-birds in longline fisheries.	Has not reported information for 2009 and 2010
Maldives	Res. 10/02 and earlier resolution, plus other related resolutions (R.05/05; 09/06 and 10/06): On Mandatory Statistical Requirements.	Catch of sharks –. Reported NC shark data aggregated in 2008, 2009 and 2010.
		Bycatch of marine turtles – Data not submitted. Bycatch of seabirds - Data not submitted
	Res. 10/03 (PS) & Res. 08/04 (LL) On the Recording of catch by fishing vessels.	Has not provided information on the level of implementation. *Aggregated data have not been* submitted for foreign licensed vessels.
	Res. 10/06 On Reducing incidental bycatch of sea-birds in longline fisheries.	Has provided information on the level of implementation in 2010, but no longliners at the moment.
Mauritius	Res. 10/02 and earlier resolution, plus other related resolutions (R.05/05; 09/06 and 10/06): On Mandatory Statistical Requirements.	Catch of sharks – Reported NC shark data aggregated from 2001 to 2010.
		Bycatch of marine turtles – Data not submitted. Bycatch of seabirds - Data not submitted.
	Res. 10/03 (PS) & Res. 08/04 (LL) On the Recording of catch by fishing vessels.	Has provided information on the level of implementation and logbook forms used on domestic vessels. *Logbook forms and aggregated data have been* submitted for foreign licensed vessels.
	Res. 10/06 On Reducing incidental bycatch of sea-birds in longline fisheries.	Has reported information for 2009 and 2010
Malaysia	Res. 10/02 and earlier resolution, plus other related resolutions (R.05/05; 09/06 and 10/06):	Catch of sharks – Reported NC shark data aggregated in 1999

CPC	Resolutions relating to bycatch data	Observations
	On Mandatory Statistical Requirements.	Bycatch of marine turtles – Data not submitted. Bycatch of seabirds - Data not submitted.
	Res. 10/03 (PS) & Res. 08/04 (LL) On the Recording of catch by fishing vessels.	Has reported information in 2010 on Res.10/03 Provided list of foreign vessels for 2010
	Res. 10/06 On Reducing incidental bycatch of sea-birds in longline fisheries.	Has not provided information on the level of implementation but promoted the use of circle hooks.
Mozambique	Res. 10/02 and earlier resolution, plus other related resolutions (R.05/05; 09/06 and 10/06): On Mandatory Statistical Requirements.	Catch of sharks - No data submitted
		Bycatch of marine turtles – Data not submitted. Bycatch of seabirds - Data not submitted.
	Res. 10/03 (PS) & Res. 08/04 (LL) On the Recording of catch by fishing vessels.	Has not provided information on the level of implementation. *Aggregated data have not been* submitted for foreign licensed vessels. Provided list of foreign vessels only for year 2010
	Res. 10/06 On Reducing incidental bycatch of sea-birds in longline fisheries.	Has not reported information for 2009
Oman	Res. 10/02 and earlier resolution, plus other related resolutions (R.05/05; 09/06 and 10/06): On Mandatory Statistical Requirements.	Catch of sharks –. Reported NC shark data aggregated data from 1997-2008.
		Bycatch of marine turtles – Data not submitted. Bycatch of seabirds - Data not submitted.
	Res. 10/03 (PS) & Res. 08/04 (LL) On the Recording of catch by fishing vessels.	Has not provided information on the level of implementation. Has provided logbook forms used on domestic vessels. *Aggregated data have not been* submitted for foreign licensed vessels.
	Res. 10/06 On Reducing incidental bycatch of sea-birds in longline fisheries.	Has reported information on level of implementation but no incidental catch is reported.
Pakistan	Res. 10/02 and earlier resolution, plus other related resolutions (R.05/05; 09/06 and 10/06): On Mandatory Statistical Requirements.	Catch of sharks – Reported NC shark data aggregated 1992-2004 and in 2008. Bycatch of marine turtles – Data not submitted. Bycatch of seabirds - Data not submitted.
	Res. 10/03 (PS) & Res. 08/04 (LL) On the Recording of catch by fishing vessels.	Has not provided information on the level of implementation. Has not provided logbook forms used on domestic vessels. *Aggregated data have not been* submitted for foreign licensed vessels.
	Res. 10/06 On Reducing incidental bycatch of sea-birds in longline fisheries.	Does not have a longline fleet
Philippines	Res. 10/02 and earlier resolution, plus other related resolutions (R.05/05; 09/06 and 10/06): On Mandatory Statistical Requirements.	Catch of sharks –. Reported some NC shark data by species in 2010. Bycatch of marine turtles – Data not submitted. Bycatch of seabirds - Data not submitted.
	Res. 10/03 (PS) & Res. 08/04 (LL) On the Recording of catch by fishing vessels.	Has not provided information on the level of implementation.
	Res. 10/06 On Reducing incidental bycatch of sea-birds in longline fisheries.	Reported that they encourage fishermen to ensure that the hook sink beyond the reach of seabirds
Senegal	Res. 10/02 and earlier resolution, plus other related resolutions (R.05/05; 09/06 and 10/06): On Mandatory Statistical Requirements.	Catch of sharks – Reported NC catch data by species for 2003-2005. Bycatch of marine turtles – Data not submitted. Bycatch of seabirds - Data not submitted

CPC	Resolutions relating to bycatch data	Observations
	Res. 10/03 (PS) & Res. 08/04 (LL) On the Recording of catch by fishing vessels.	Has not provided information on the level of implementation.
	Res. 10/06 On Reducing incidental bycatch of sea-birds in longline fisheries.	Has not reported information for 2009.
Sudan	Res. 10/02 and earlier resolution, plus other related resolutions (R.05/05; 09/06 and 10/06): On Mandatory Statistical Requirements.	Catch of sharks – Data not submitted. Bycatch of marine turtles – Data not submitted. Bycatch of seabirds - Data not submitted. *Sudan does not have an authorised fleet.*
	Res. 10/03 (PS) & Res. 08/04 (LL) On the Recording of catch by fishing vessels	Has not provided information on the level of implementation.
	Res. 10/06 On Reducing incidental bycatch of sea-birds in longline fisheries	Has not reported information
Sierra Leone	Res. 10/02 and earlier resolution, plus other related resolutions (R.05/05; 09/06 and 10/06): On Mandatory Statistical Requirements.	*Does not have an active fleet in the IOTC Area.*
	Res. 10/03 (PS) & Res. 08/04 (LL) On the Recording of catch by fishing vessels	*Does not have an active fleet in the IOTC Area.*
	Res. 10/06 On Reducing incidental bycatch of sea-birds in longline fisheries	*Does not have an active fleet in the IOTC Area.*
Seychelles	Res. 10/02 and earlier resolution, plus other related resolutions (R.05/05; 09/06 and 10/06): On Mandatory Statistical Requirements.	Catch of sharks –. Report NC shark data aggregated for 1997-2007 and by species in 2008, 2009 and 2010 for its longline fleet. Bycatch of marine turtles – Data not submitted. Bycatch of seabirds - Data not submitted.
	Res. 10/03 (PS) & Res. 08/04 (LL) On the Recording of catch by fishing vessels.	Has not provided information on the level of implementation. *Aggregated data have not been* submitted for foreign licensed vessels
	Res. 10/06 On Reducing incidental bycatch of sea-birds in longline fisheries.	Has not reported information for 2009 and 2010.
South Africa	Res. 10/02 and earlier resolution, plus other related resolutions (R.05/05; 09/06 and 10/06): On Mandatory Statistical Requirements.	Catch of sharks – Data submitted. Reported NC shark data by species for 1985-2010 Bycatch of marine turtles – Data submitted by species. Bycatch of seabirds - Data submitted
	Res. 10/03 (PS) & Res. 08/04 (LL) On the Recording of catch by fishing vessels.	Has provided information on the level of implementation and logbook forms used on its vessels. Submitted for foreign vessels (Japan) 2010
	Res. 10/06 On Reducing incidental bycatch of sea-birds in longline fisheries.	Has reported information for 2009 but not in 2010.
Tanzania	Res. 10/02 and earlier resolution, plus other related resolutions (R.05/05; 09/06 and 10/06): On Mandatory Statistical Requirements.	Catch of sharks – Reported some NC catch data from 1971-1989. Bycatch of marine turtles – Data not submitted. Bycatch of seabirds - Data not submitted.
	Res. 10/03 (PS) & Res. 08/04 (LL) On the Recording of catch by fishing vessels.	Has not provided information on the level of implementation. *Aggregated data have not been* submitted for foreign licensed vessels
	Res. 10/06 On Reducing incidental bycatch of sea-birds in longline fisheries.	Has reported information for 2010 for foreign licensed vessel.

CPC	Resolutions relating to bycatch data	Observations
Thailand	Res. 10/02 and earlier resolution, plus other related resolutions (R.05/05; 09/06 and 10/06): On Mandatory Statistical Requirements.	Catch of sharks – Reported NC shark data aggregated in 2001 and 2002 Bycatch of marine turtles – Data not submitted. Bycatch of seabirds - Data not submitted.
	Res. 10/03 (PS) & Res. 08/04 (LL) On the Recording of catch by fishing vessels.	Has provided information on the level of implementation.
	Res. 10/06 On Reducing incidental bycatch of sea-birds in longline fisheries.	Has reported information for 2010
UK (OT)	Res. 10/02 and earlier resolution, plus other related resolutions (R.05/05; 09/06 and 10/06): On Mandatory Statistical Requirements.	*UK (OT) does not have a fleet. Information reported under these resolutions relate to the recreational fishery.*
	Res. 10/03 (PS) & Res. 08/04 (LL) On the Recording of catch by fishing vessels.	*UK (OT) has reported it does not have a fleet.* *Total catches has been submitted by vessel.*
	Res. 10/06 On Reducing incidental bycatch of sea-birds in longline fisheries.	*UK (OT) has reported it does not have a fleet.*
Vanuatu	Res. 10/02 and earlier resolution, plus other related resolutions (R.05/05; 09/06 and 10/06): On Mandatory Statistical Requirements.	Catch of sharks – Data not submitted Bycatch of marine turtles – Data not submitted. Bycatch of seabirds - Data not submitted
	Res. 10/03 (PS) & Res. 08/04 (LL) On the Recording of catch by fishing vessels.	No information submitted
	Res. 10/06 On Reducing incidental bycatch of sea-birds in longline fisheries.	No information submitted

APPENDIX IX
IMPLEMENTATION OF THE REGIONAL OBSERVER SCHEME

CPCs	Progress	List of accredited observers submitted	Observer Trip Reports submitted
MEMBERS			
Australia	Australia has implemented an observer programme that complies with the IOTC Regional Observer Scheme.	**No**	**No**
Belize	No information received by the Secretariat.	**No**	**No**
China –Taiwan,China	China has an observer programme. No information received by the Secretariat.	**No** **No**	**YES: 1** **No**
Comoros	Comoros does not have vessel more than 24m on which observer should be placed. 3 observers were trained under the IOC Regional Monitoring Project.	**No**	**No**
Eritrea	No information received by the Secretariat.	**No**	**No**
European Union	EU has an observer programme on-board its purse-seine fleets, however the programme is limited due to the piracy activity in the western Indian Ocean. EU has or is developing observer programmes on-board its longline fleets, i.e. La Réunion, Spanish and Portuguese fleets.	Partial: EU,Portugal: 3	**No**
France (territories)	No information received by the Secretariat.	**No**	**No**
Guinea	No information received by the Secretariat.	**No**	**No**
India	India has not developed any observer programme so far.	**No**	**No**
Indonesia	No information received by the Secretariat.	**No**	**No**
Iran, Islamic Republic of	No information received by the Secretariat.	**No**	**No**
Japan	Japan has started its observer programme on the 1st of July 2010, and 14 observers are currently being deployed in the Indian Ocean.	**YES: 14**	**No**
Kenya	Kenya is developing an observer programme and 5 observers have been trained under the SWIOFP training.	**No**	**No**
Korea, Republic of	Korea has an observer programme since 2002 with 3 observers being deployed in the Indian Ocean giving a14.5% coverage of the fishing operation in 2009.	**No**	**No**
Madagascar	Madagascar is developing an observer programme. Five and three observers have been trained respectively under the SWIOFP and the IOC projects.	**YES: 8**	**No**
Malaysia	No information received by the Secretariat.	**No**	**No**
Maldives, Republic of	Maldives vessels are monitored by field samplers at landing sites. Have in excess of 250 vessels larger than 24m.	**No**	**No**
Mauritius	Mauritius has not developed an observer programme, however, 5 and 3 observers have been trained respectively under the SWIOFP and the IOC projects.	**No**	**No**
Oman, Sultinate of	No information received by the Secretariat.	**No**	**No**
Pakistan	No information received by the Secretariat.	**No**	**No**
Philippines	No information received by the Secretariat.	**No**	**No**
Seychelles, Republic of	Seychelles is developing an observer programme. Four and three observers have been trained respectively under the SWIOFP and the IOC projects.	**YES: 7**	**No**
Sierra Leone	No information received by the Secretariat.	**No**	**No**
Sri Lanka	No information received by the Secretariat.	**No**	**No**
Sudan	No information received by the Secretariat.	**No**	**No**
Tanzania, United Republic of	No information received by the Secretariat.	**No**	**No**
Thailand	Thailand has not developed an observer programme so far.	**No**	**No**
United Kingdom	UK does not have any active vessels in the Indian Ocean.	N/A	N/A
Vanuatu	No information received by the Secretariat.	**No**	**No**
COOPERATING NON-CONTRACTING PARTIES			
Mozambique	No information received by the Secretariat.	**No**	**No**
Senegal	No information received by the Secretariat.	**No**	**No**
South Africa, Republic of	No information received by the Secretariat.	**No**	**No**

APPENDIX X
PROGRESS ON THE DEVELOPMENT AND IMPLEMENTATION OF NPOAS FOR SHARKS AND SEABIRDS

CPC	Sharks	Date of Implementation	Seabirds	Date of implementation	Comments
MEMBERS					
Australia		14-Apr-2004		2006	Sharks: 2nd NPOA-Sharks due to be released by end of 2011. Seabirds: Threat Abatement Plan (longline fishery only) in review. No Plan for purse seine or other gears.
Belize					Sharks: No information received by the Secretariat. Seabirds: No information received by the Secretariat.
China		–		–	Sharks: Development has not begun. Seabirds: Development has not begun.
–Taiwan,China		May 2006		May 2006	Sharks: No revision currently planned. Seabirds: No revision currently planned.
Comoros		–		–	Sharks: Development has not begun. Seabirds: Development has not begun.
Eritrea					Sharks: No information received by the Secretariat. Seabirds: No information received by the Secretariat.
European Union		5 Feb 2009		–	Sharks: Approved on 05-Feb-2009 and it is currently being implemented. Seabirds: Currently being finalised for adoption in the last quarter of 2011.
France (territories)					Sharks: Approved on 05-Feb-2009 but not yet implemented. Seabirds: No information received by the Secretariat.
Guinea					Sharks: No information received by the Secretariat. Seabirds: No information received by the Secretariat.
India					Sharks: Currently being drafted with the assistance of BOBP-IGO Seabirds: 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 to occur 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.
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.
Japan		03-Dec-2009		03-Dec-2009	Sharks: NPOA–Shark assessment report submitted to COFI in Jan. 2011 Seabirds: NPOA–Seabird implementation report submitted to COFI in Jan. 2011.

Kenya					Sharks: Development has not begun. Scheduled for development in 2012. Sharks are considered a target species by Kenya. Seabirds: Development has not begun. Scheduled for development in 2012. Kenya has a single longliner targeting swordfish and no seabird interactions have been reported to date.
Korea, Republic of		–		–	Sharks: Approved on 18/08/2011 but not yet implemented. Seabirds: Early stages of development.
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.
Malaysia		2006			Sharks: No update received by the Secretariat. Seabirds: No information received by the Secretariat.
Maldives, Republic of					Sharks: NPOA has been formulated and will be discussed with stakeholders in November 2011. Shark fishing was banned on 15th March 2010 based on scientific advice. The Government has spent ~US$5 million on a gear buyback scheme from Maldivian fishers. Seabirds: Development has not begun.
Mauritius					Sharks: Currently being drafted. Seabirds: Drafting will commence upon completion of NPOA–Sharks. In the meantime fishing companies have been requested to implement all mitigation measures as provided in the IOTC Resolutions.
Oman, Sultinate of					Sharks: No information received by the Secretariat. Seabirds: No information received by the Secretariat.
Pakistan					Sharks: No information received by the Secretariat. Seabirds: No information received by the Secretariat.
Philippines		Sept. 2009		–	Sharks: Under periodic review. Shark catches for 2010 provided to the Secretariat. Seabirds: Development has not begun. No seabird interactions recorded.
Seychelles, Republic of		Apr-2007		–	Sharks: NPOA-sharks to be reviewed in 2012. Seabirds: Development has not begun.
Sierra Leone					Sharks: No information received by the Secretariat. Seabirds: No information received by the Secretariat.
Sri Lanka					Sharks: No information received by the Secretariat. Seabirds: No information received by the Secretariat.
Sudan					Sharks: No information received by the Secretariat. Seabirds: 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.
Thailand		23-Nov-2005		–	Sharks: No revision currently planned. Seabirds: Development has not begun.
United Kingdom		–		–	Chagos waters are a MPA closed to fishing except recreational fishing around Diego

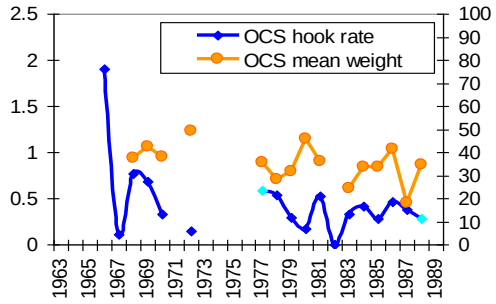
					Garcia. Section 7 (10) (e) of the Fisheries (Conservation and Management) Ordinance refers to recreational fishing and requires sharks to be released alive.
Vanuatu					Sharks: No information received by the Secretariat. Seabirds: No information received by the Secretariat.
COOPERATING NON-CONTRACTING PARTIES					
Mozambique		–		–	Sharks: Development has not begun. Seabirds: Development has not begun.
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.
South Africa, Republic of		–		2008	Sharks: Currently being drafted. Seabirds: Not currently under review.

Colour key	
NPOA Completed	
Drafting being finalised	
Drafting commenced	
Not begun	

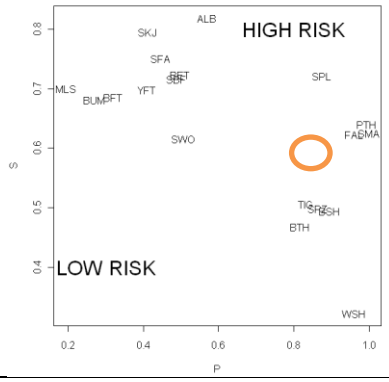
APPENDIX XI
SUMMARY OF AVAILABLE INFORMATION ON THE OCEANIC WHITETIP SHARK

Area	Data type	Period				Source
		1960s	1970s	1980s-1990s	2000s	
WIO	Purse seine catches			Commonly observed in all types of schools, USSR 1986-1992	Extremely rare, impossible to catch shark for tagging, EU 2000s	Evgeny Romanov (2011) pers. comm. Laurent Dagorn (2011) pers. comm.
WIO	Purse seine nominal catches				13% of sharks and rays species group for EU PS bycatch (this sharks and ray species group is 3.8t/1000t of production)	Amande et al. (2008) Chavance et al. (2011)
Maldives (north)	Shark longline catches			19.9% of shark catch in 1987-88	3.5% of catch in 2000-04	Anderson and Waheed (1990); Anderson et al. (2011)
Maldives	Fishermen's opinions			Common in 1980s	Rare in 2000s	Maldives Marine Research Centre scientists
Maldives	At-sea observations by researchers			Common in 1986-89	Very rare in 2008-2010	Maldives Marine Research Centre scientists
Andaman and Nicobar	Research longline catches			Pelagic shark (including OCS) CPUE approx. 1.1 sharks / 100 hooks, 1984-95	Pelagic shark (including OCS) CPUE approx. 0.3 sharks / 100 hooks, 1996-05	John and Varghese (2009)
WIO	Research longline catches; observer data, nominal CPUE	OCS, CPUE **0.75** sharks / 1000 hooks, 1966-70	OCS, CPUE **0.40** sharks / 1000 hooks, 1976-80 Declining mean weight of individuals	OCS, CPUE **0.34** sharks / 1000 hooks,, 1981-88 Declining mean weight of individuals	**0.16** sharks / 1000 hooks, 2008-2010[2]	Romanov et al. (2008) Pascal Bach (2011) pers. comm.
Reunion	Visual census at anchored FADs			Underwater visual census (UVC) 1980s 30-50% of dives presence of OCS	Underwater visual census (UVC) 2000s 0% of dives presence of OCS	Marc Taquet (2011) pers. comm.
Indian Ocean	Standarized longline CPUE				Std CPUE decline in 2004-2009 by 40%: 0.005 ind./1000 hooks to 0.003 ind./1000 hooks	Semba and Yokawa (2011)

[2] Surface longline Reunion



Long-term trends of nominal CPUE ind./1000 hooks (blue, left axis) and mean weight (orange, right axis) in the Soviet longline research cruises (WIO, pelagic zone outside of 1000 m isobath) (Romanov et al., 2008).



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