

OUTCOMES OF THE 20th SESSION OF THE SCIENTIFIC COMMITTEE

PREPARED BY: IOTC SECRETARIAT¹, 27 AUGUST 2018

PURPOSE

To inform participants at the 14th Working Party on Ecosystems and Bycatch (WPEB14) of the recommendations arising from the 20th Session of the IOTC Scientific Committee (SC) held from 30 November -4 December 2017, specifically relating to the work of the WPEB.

BACKGROUND

At the 20th Session of the SC, the SC noted and considered the recommendations made by the WPEB in 2017 that included requests to address the deficiencies in data collection, monitoring and reporting by CPCs, as well as to carry out targeted research and analysis on the most commonly caught elasmobranch species.

List of the most commonly caught elasmobranch species

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

The recommendations on the deficiencies in data collection, monitoring and reporting by CPCs in relation to bycatch species will be discussed in paper IOTC–2018–WPEB14–07 and are therefore not presented in this paper.

Based on the recommendations arising from the WPEB13, the SC20 adopted a set of recommendations, provide at [Appendix A](#) of this paper.

The recommendations contained in [Appendix A](#) were provided to the Commission for consideration at its 22nd Session held in May 2018. A separate paper, IOTC–2018–WPEB14–04 addresses the responses and actions of the Commission.

In addition, the SC20 reviewed and endorsed a Program of Work for the WPEB, including a revised assessment schedule, as detailed in [Appendix B](#) and [Appendix C](#) respectively. A separate paper (IOTC–2018–WPEB14–10) will outline the review and development process for a *Program of Work* for the WPEB for the next five years (2018–2022).

DISCUSSION

In addition to the recommendations outlined in [Appendix A](#), [Appendix B](#) and [Appendix C](#), the following extracts from the SC20 Report (IOTC–2017–SC20–R) are provided here for the consideration and action of the WPEB14:

Review of the statistical data available for ecosystems and bycatch species

NOTING the highly aggregated nature of information requested on discards, the SC **AGREED** that the discard reporting form (Form 1DI) is updated to include seasonal (month) and spatial information (5 x 5 or 1 x 1) in a similar format to the catch and effort data reporting forms.

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Evaluation of the mitigation measures contained in Resolution 13/06 for Oceanic whitetip shark

The SC noted the ongoing compliance issue for those CPCs reporting nominal catch of oceanic whitetip sharks and **RECOMMENDED** that the Compliance Committee investigate these reported catches further and report the findings to the Commission.

Longline hook identification guide

NOTING the continued confusion in the terminology of various hook types being used in IOTC fisheries, (e.g. tuna hook vs. J-hook; definition of a circle hook), the SC reiterated its previous **RECOMMENDATION** (SC19.16; para. 55 of IOTC-2016-SC19-R) that the Commission allocate funds in the 2018 IOTC Budget to develop an identification guide for fishing hooks and pelagic fishing gears used in IOTC fisheries.

CPUE Collaborative study of shark CPUE from multiple Indian Ocean longline fleets

Noting the conflicting patterns in blue shark CPUE derived from different Indian Ocean longline fleets and considering the success of using joint analysis of operational catch and effort data to resolve such conflicts in other Working Parties, the SC **RECOMMENDED** initiating work on joint analysis of operational catch and effort data from multiple fleets, to further develop methods and to provide indices of abundance for sharks of interest to the IOTC. A consultant should be considered to conduct such work for a budget of around EUR45,000.

Future format of WPEB

The SC **NOTED** the issues with the format of WPEB meetings given the increasing scope of work to cover, and particularly high workload in assessment years and **AGREED** that the current approach has not proved successful, particularly in years when a stock assessment has been undertaken as the large number of papers submitted (~60) cannot be fully considered in the time available. The SC therefore **AGREED** that in future years when a stock assessment is planned, the meeting duration is extended by two days to more adequately accommodate the workplan, with some of the days dedicated exclusively to the stock assessment work.

The SC further **AGREED** that when a stock assessment is planned, some of the agenda in the year prior to the meeting should be dedicated to data preparation and review.

Review of mitigation measures in Resolution 12/04

The SC noted paper IOTC-2017-SC20-INF03 and **REQUESTED** the IOTC Secretariat to send out the version of IOTC-2017-SC20-INF03 Rev_1 revised by the SC as a data call to inform a review of the mitigation measures for marine turtles in Resolution 12/04 as requested by the Commission.

Noting the findings of the Pacific workshop regarding the effectiveness of large circle hooks, finfish bait and the removal of the first and/or second hooks next to the floats for mitigating sea turtle interactions and mortalities in Pacific longline fisheries, the SC **AGREED** that further consideration of these mitigation techniques for Indian Ocean fisheries is warranted. Such a study should attempt to develop findings regarding the consequences of various mitigation techniques, primarily with regard to impacts on target and non-turtle bycatch species catch rates, to the extent possible based on data availability and quality. The SC therefore **RECOMMENDED** that the potential for a similar workshop to be held in the Indian Ocean is explored with potential funding from the Commission and/or from the Common Oceans ABNJ Tuna Project. The SC noted this is included in the WPEB workplan and **REQUESTED** the WPEB Chairperson work with the Secretariat to pursue this idea further with potential participants and funding sources.

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

The SC noted paper IOTC–2017–SC20–06 which provided the SC with the opportunity to consider, update and comment on the current status of development and implementation of national plans of action for seabirds and sharks, and implementation of the FAO guidelines to reduce marine turtle mortality in fishing operations, by each IOTC CPC.

The SC **RECOMMENDED** that the Commission note the current status of development and implementation of National Plans of Action (NPOAs) for sharks and seabirds, and the implementation of the FAO guidelines to reduce marine turtle mortality in fishing operations, by each CPC as provided in Appendix V, recalling that the IPOA-Seabirds and IPOA-Sharks were adopted by the FAO in 1999 and 2000, respectively, and required the development of NPOAs.

Update: Ecosystem Based Fisheries Management (EBFM) joint meeting of tRFMOs in 2016

The SC noted the need for training and capacity building as the first step to moving forward with developing goals and strategies for the implementation of EBFM and therefore **RECOMMENDED** that a workshop is held to explain the key elements of EBFM so that a plan for implementation of EBFM in the IOTC Area of Competence can be developed by 2019.

The SC noted the limited extent to which ecosystem considerations have so far been analysed by the WPEB. Work on topics such as climate change and socio-economic considerations are yet to begin and will likely be extremely challenging, however, progress has begun with the development of a template for an ecosystem report card (IOTC-2016-SC19-12). Noting that this work is ongoing, the SC **REQUESTED** that the authors provide an update to the WPEB14 in 2018.

The SC noted the presentation of the report of the joint tRFMO meeting on EBFM that took place in December 2016 and was attended by the SC Chair, the WPEB Chair and the IOTC Secretariat (IOTC-2017-SC20-INF02).

The SC discussed the importance of developing a long term strategy for the operationalisation of EBFM. While the IOTC is currently making progress in some areas such as the development of management advice for target species as well as for some bycatch species, holistic ecosystem analyses such as the use of ecosystem models have not been undertaken. Nevertheless, there is consideration of environmental influence on stock assessments and some work is undertaken on high risk topics, such as sensitive species, despite the lack of an overall EBFM framework.

The SC noted that the difficulties of operationalising EBFM within the current institutional setting where management advice is considered through the provision of HCRs in which it is difficult to incorporate ecosystem considerations.

The SC **AGREED** that the development of the ecosystem report card is a first step in developing the approach. Initiating the process with the development and monitoring of simple indicators and then linking these to management objectives and actions is an iterative process where the data collection and research activities are based on higher level guidance from the Commission. The SC noted that the consideration of socioeconomic dimensions are specifically mentioned in the IOTC Agreement and so the scientific subsidiary bodies are therefore mandated to work on these issues as well.

The SC **AGREED** that the WPEB is the best forum to initiate the detailed technical discussions and **AGREED** that the item should be given a higher priority in the programme of work and agenda..

APPENDICES

Appendix A: Consolidated set of recommendations of the 19th Session of the Scientific Committee to the Commission, relevant to the Working Party on Ecosystems and Bycatch.

Appendix B: Program of Work (2017–2021) for the IOTC Working Party on Ecosystems and Bycatch (WPEB).

Appendix C: Schedule of stock assessment for the WPEB (2017–2021).

APPENDIX A

CONSOLIDATED SET OF RECOMMENDATIONS OF THE 20th SESSION OF THE SCIENTIFIC COMMITTEE TO THE COMMISSION RELEVANT TO THE WORKING PARTY ON ECOSYSTEMS AND BYCATCH

Extract of the Report of the 20th Session of the Scientific Committee

(IOTC–2017–SC20–R; Appendix XXXIX, Page 224)

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

Status of Marine Turtles, Seabirds and Sharks in the Indian Ocean

Sharks

- SC20.04 (para. 180) The SC **RECOMMENDED** that the Commission note the management advice developed for a subset of shark species commonly caught in IOTC fisheries for tuna and tuna-like species:
- Blue shark (*Prionace glauca*) – [Appendix XXIII](#)
 - Oceanic whitetip shark (*Carcharhinus longimanus*) – [Appendix XXIV](#)
 - Scalloped hammerhead shark (*Sphyrna lewini*) – [Appendix XXV](#)
 - Shortfin mako shark (*Isurus oxyrinchus*) – [Appendix XXVI](#)
 - Silky shark (*Carcharhinus falciformis*) – [Appendix XXVII](#)
 - Bigeye thresher shark (*Alopias superciliosus*) – [Appendix XXVIII](#)
 - Pelagic thresher shark (*Alopias pelagicus*) – [Appendix XXIX](#)

Marine turtles

- SC20.05 (para. 181) The SC **RECOMMENDED** that the Commission note the management advice developed for marine turtles, as provided in the Executive Summary encompassing all six species found in the Indian Ocean:
- Marine turtles – [Appendix XXX](#)

Seabirds

- SC20.06 (para. 182) The SC **RECOMMENDED** that the Commission note the management advice developed for seabirds, as provided in the Executive Summary encompassing all species commonly interacting with IOTC fisheries for tuna and tuna-like species:
- Seabirds – [Appendix XXXI](#)

Cetaceans

- SC20.07 (para. 183) The SC **RECOMMENDED** that the Commission note the management advice developed for cetaceans, as provided in the newly developed Executive Summary encompassing all species commonly interacting with IOTC fisheries for tuna and tuna-like species:
- Cetaceans – [Appendix XXXII](#)

GENERAL RECOMMENDATIONS TO THE COMMISSION

Evaluation of the mitigation measures contained in Resolution 13/06 for Oceanic whitetip shark

- SC20.20 (para. 61) The SC noted the ongoing compliance issue for those CPCs reporting nominal catch of oceanic whitetip sharks and **RECOMMENDED** that the Compliance Committee investigate these reported catches further and report the findings to the Commission.

Longline hook identification guide

- SC20.21 (para. 62) Noting the continued confusion in the terminology of various hook types being used in IOTC fisheries, (e.g. tuna hook vs. J-hook; definition of a circle hook), the SC reiterated its previous **RECOMMENDATION** (SC19.16; para. 55 of IOTC-2016-SC19-R) that the Commission allocate funds in the 2018 IOTC Budget to develop an identification guide for fishing hooks and pelagic fishing gears used in IOTC fisheries

CPUE Collaborative study of shark CPUE from multiple Indian Ocean longline fleets

- SC20.22 (para. 63) Noting the conflicting patterns in blue shark CPUE derived from different Indian Ocean longline fleets and considering the success of using joint analysis of operational catch and effort data to resolve such conflicts in other Working Parties, the SC **RECOMMENDED** initiating work on joint analysis of operational catch and effort data from multiple fleets, to further develop methods and to provide indices of abundance for sharks of interest to the IOTC. A consultant should be considered to conduct such work for a budget of around EUR45, 000.

Review of mitigation measures in Resolution 12/04

- SC20.23 (para. 67) Noting the findings of the Pacific workshop regarding the effectiveness of large circle hooks, finfish bait and the removal of the first and/or second hooks next to the floats for mitigating sea turtle interactions and mortalities in Pacific longline fisheries, the SC **AGREED** that further consideration of these mitigation techniques for Indian Ocean fisheries is warranted. Such a study should attempt to develop findings regarding the consequences of various mitigation techniques, primarily with regard to impacts on target and non-turtle bycatch species catch rates, to the extent possible based on data availability and quality. The SC therefore **RECOMMENDED** that the potential for a similar workshop to be held in the Indian Ocean is explored with potential funding from the Commission and/or from the Common Oceans ABNJ Tuna Project. The SC noted this is included in the WPEB workplan and **REQUESTED** the WPEB Chairperson work with the Secretariat to pursue this idea further with potential participants and funding sources.

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

- SC20.24 (para. 69) The SC **RECOMMENDED** that the Commission note the current status of development and implementation of National Plans of Action (NPOAs) for sharks and seabirds, and the implementation of the FAO guidelines to reduce marine turtle mortality in fishing operations, by each CPC as provided in [Appendix V](#), recalling that the IPOA-Seabirds and IPOA-Sharks were adopted by the FAO in 1999 and 2000, respectively, and required the development of NPOAs.

Update: Ecosystem Based Fisheries Management (EBFM) joint meeting of tRFMOs in 2016

- SC20.25 (para. 70) The SC noted the need for training and capacity building as the first step to moving forward with developing goals and strategies for the implementation of EBFM and therefore **RECOMMENDED** that a workshop is held to explain the key elements of EBFM so that a plan for implementation of EBFM in the IOTC Area of Competence can be developed by 2019.

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

- SC20.39 (para. 122) The SC **AGREED** that, while external funding is helping the work of the Commission, funds allocated by the Commission to capacity building are still too low, considering the range of issues identified by the SC and its Working Parties, particularly in relation to the implementation of the Regional Observer Scheme and data collection and reporting for artisanal fisheries and **RECOMMENDED** that the Commission further increases the IOTC Capacity Building budget to fund these activities in the future.

Invited Expert(s) at the WP meetings

- SC20.40 (para. 124) Given the importance of external peer review for working party meetings, the SC **RECOMMENDED** that the Commission continues to allocate sufficient budget for an invited expert to be regularly invited to all scientific WP meetings.

Meeting participation fund

- SC20.41 (para. 126) The SC reiterated its **RECOMMENDATION** that the IOTC Rules of Procedure (2014), for the administration of the Meeting Participation Fund be modified so that applications are due not later than 60 days, and that the full Draft paper be submitted no later than 45 days before the start of the relevant meeting. The aim is to allow the Selection Panel to review the full paper rather than just the abstract, and provide guidance on areas for improvement, as well as the suitability of the application to receive funding using the IOTC MPF. The earlier submission dates would also assist with visa application procedures for candidates.

IOTC species identification guides: Tuna and tuna-like species

SC20.42 (para. 127) The SC reiterated its **RECOMMENDATION** that the Commission allocates budget towards continuing the translation and printing of the IOTC species ID guides so that hard copies of the identification cards can continue to be printed as many CPCs scientific observers, both on board and port, still do not have smart phone technology/hardware access and need to have hard copies on board.

IOTC Secretariat staffing

SC20.43 (para. 128) Noting the very heavy workload at the IOTC Secretariat and the ever increasing demands by the Commission and the Scientific Committee, and also the capacity to respond to requests for assistance by countries, the SC **RECOMMENDED** that the recommendation from the Performance Review PRIOTC02.07(g) is implemented, and that permanent staff of the IOTC Data and Science Section be increased by two (2) (1 x P4 and 1 x P3 level positions), supplemented by additional short-term consultants, to commence work by late-2018 or earlier, and that funding for these new positions should come from both the IOTC regular budget and from external sources to reduce the financial burden on the IOTC membership.

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

SC20.44 (para. 132) SC **RECOMMENDED** that the Commission note and endorse the Chairpersons and Vice-Chairpersons for the SC and its subsidiary bodies for the coming years, as provided in [Appendix VII](#).

OUTCOMES OF THE IOTC AND JOINT T-RFMO FAD WORKING GROUP

SC20.45 (para. 150) Noting that Resolution 17/08 provides a start date for the implementation of non-entangling FADs, but no end date, the SC **RECOMMENDED** that this Resolution is revised to include a date by which non-entangling FADs should be fully implemented.

“To reduce the entanglement of sharks, marine turtles or any other species, the design and deployment of FADs shall be based on the principles set out in Annex III, which will be applied gradually from 2014” (Resolution 17/08, para. 13).

BIODEGRADABLE FAD (BIOFAD) PROJECT

SC20.46 (para. 163) The SC noted the challenges in conducting studies on biodegradable FADs (for example the limit on the number of active FADs per purse seine vessel in the Indian Ocean that may hinder the deployment of BIOFADs following experimental sampling designs, and also engagement with the fleet to deploy BIOFADs that may not be successful for fishing). Thus, the SC **RECOMMENDED** the Commission consider special allocations for experimental FADs deployed for the collection of scientific data for vessels willing to participate in biodegradable FAD testing under protocols reviewed and endorsed by the Scientific Committee.

IMPLEMENTATION OF THE REGIONAL OBSERVER SCHEME

SC20.47 (para. 197) The SC therefore **RECOMMENDED** that the EMS standards presented for purse seine fisheries (IOTC-2016-SC19-15) are adopted and **REQUESTED** that draft standards are similarly proposed for the longline fleets by CPCs currently trialling and implementing EMS on these vessels and that draft standards are also developed for gillnet fleets through the ROS Pilot Project.

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

SC20.48 (para. 201) The SC **RECOMMENDED** that the Commission note the updates on progress regarding Resolution 16/03, as provided at [Appendix XXXIII](#).

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

Consultants

SC20.49 (para. 212) Noting the highly beneficial and relevant work done by IOTC stock assessment consultants in 2016 and in previous years, the SC **RECOMMENDED** that the engagement of consultants be continued for each coming year based on the Program of Work. Consultants will be hired to supplement the skill set available within the IOTC Secretariat and CPCs.

OTHER BUSINESS***Template for Invited Experts***

SC20.50 (para. 237) Noting the recommendation of the IOTC Performance Review (PRIOTC02.02d), the SC **AGREED** that a comprehensive, formal external peer review is sometimes important for important or contentious assessments. Thus, the SC **RECOMMENDED** that a process is established and that the Commission allocates funding for external peer review of stock assessments to take place periodically, based on priorities identified by the SC, and **REQUESTED** that the Secretariat develop ToRs for these, with input from the SC Chair and Vice-Chair, and potentially based on a framework similar to that established for the Center for Independent Experts.

APPENDIX B

PROGRAM OF WORK (2018–2022) FOR THE SCIENTIFIC COMMITTEE AND ITS SUBSIDIARY BODIES

The SC **NOTED** the proposed Program of Work and priorities for the Scientific Committee and each of the Working Parties and **AGREED** to a consolidated Program of Work as outlined in Appendix XXXVI. The Chairpersons and Vice-Chairpersons of each working party shall ensure that the efforts of their working party are focused on the core areas contained within the appendix, taking into account any new research priorities identified by the Commission at its next Session (IOTC-2017-SC20-R, Para. 204).

Working Party on Ecosystems and Bycatch (WPEB)

(Extracts from IOTC-2017-SC20-R: Appendix XXXVI, Page 201)

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

Topic	Sub-topic and project	Priority	Ranking	Lead	Est. budget (potential source)	Timing				
						2018	2019	2020	2021	2022
SHARKS										
1. Stock structure (connectivity and diversity)	1.1 Genetic research to determine the connectivity of select shark species throughout their distribution (including in adjacent Pacific and Atlantic waters as appropriate) and the effective population size. 1.1.1 Next Generation Sequencing (NGS) to determine the degree of shared stocks for select shark species (highest priority species: blue shark, scalloped hammerhead shark, oceanic whitetip shark and shortfin mako shark) in the Indian Ocean with the southern Atlantic Ocean and Pacific Ocean, as appropriate. Population genetic analyses to decipher inter- and intraspecific evolutionary relationships, levels of gene flow (genetic exchange rate), genetic divergence, and effective population sizes.	High	17	CSIRO/AZTI/IRD/RITF	Financed (1.3m Euro (EU + 20% additional co-financing))					

	<p>1.1.2 Nuclear markers (i.e. microsatellite) to determine the degree of shared stocks for select shark species (highest priority species: blue shark, scalloped hammerhead shark and oceanic whitetip shark) in the Indian Ocean with the southern Atlantic Ocean and Pacific Ocean, as appropriate.</p> <p>1.2 Connectivity, movements and habitat use</p> <p>1.2.1 Connectivity, movements, and habitat use, including identification of hotspots and investigate associated environmental conditions affecting the sharks distribution, making use of conventional and electronic tagging (PSAT).</p> <p>1.2.2 Whale sharks (RHN): Connectivity, movements, and habitat use, including identification of hotspots and investigate associated environmental conditions affecting distribution, making use of conventional and electronic tagging (P-SAT).</p>	<p>High</p> <p>3</p>	<p>AZTI, IRD, Others</p>	<p>Partially funded (153,000€ IOTC + 100.000€ EU/DCF)</p> <p>Funded (50,000€ EU/DCF)</p>	<p>BTH OCS</p> <p>RHN</p>	<p>SMA, PTH</p>			
<p>2. Fisheries data collection</p>	<p>2.1 Historical data mining for the key species and IOTC fleets (e.g. as artisanal gillnet and longline coastal fisheries) including:</p> <p>2.1.1 Capacity building of fisheries observers (including the provision of ID guides, training, etc.)</p> <p>2.1.3 Historical data mining for the key species, including the collection of information about catch, effort and spatial distribution of those species and fleets catching them</p> <p>2.2 Implementation of the Pilot Project (Resolution 16/04) for the Regional Observer Scheme</p> <p>2.2.1 Definition of minimum standards and development of a training package for the ROS to be reviewed and rolled out in voluntary CPCs (Sri Lanka, I.R.Iran, Tanzania)</p> <p>2.2.2 Development of a Regional Observer database and population with historic observer data</p>	<p>High</p> <p>1</p> <p>High</p> <p>4</p>	<p>WWF-Pakistan/ ACAP (seabirds)</p> <p>TBD</p>	<p>US\$20,000 (ID guides)</p> <p>Partially funded (EC)</p> <p>Funded (NOAA and EC)</p>					

	2.2.3 Development, piloting and implementation of an electronic reporting tool to facilitate data reporting				Funded (NOAA and EC)						
	2.2.4 Development and trial of Electronic Monitoring Systems for gillnet fleets				Partially funded (EC)						
	2.2.5 Port sampling protocols for artisanal fisheries				Funded (EC)						
3. Biological and ecological information (incl. parameters for stock assessment)	3.1 Age and growth research (Priority species: blue shark (BSH), shortfin mako shark (SMA) and oceanic whitetip shark (OCS); Silky shark (FAL))	High	6		US\$?? (TBD)						
	3.1.1 CPCs to provide further research reports on shark biology, namely age and growth studies including through the use of vertebrae or other means, either from data collected through observer programs or other research programs.			CPCs directly	US\$?? (TBD)	OCS					
	3.2 Post-release mortality	High	16								
	3.2.1 Post-release mortality (electronic tagging), to assess the efficiency of management resolutions on no retention species (i.e. oceanic whitetip shark (OCS) and thresher sharks), shortfin mako shark SMA) ranked as the most vulnerable species to longline fisheries, and blue shark as the most frequent in catches.			IRD/ NRIFSF	Partially funded (IOTC + EU/DCF)	OCS, BTH	SMA, PTH				
	3.2.2 Post-release mortality (electronic tagging), to assess the efficiency of management resolutions on no retention species (i.e. oceanic whitetip shark (OCS) for purse seine fisheries			IRD/AZTI	Funded (EU/DCF)	OCS					
	3.2.3 Post-release survivorship (electronic tagging) on whale shark to assess the effect of unintended interaction and efficiency of management resolution of non-intentioned encirclement on purse seine			IRD/AZTI	Funded (EU/DCF)						
	3.3 Reproduction research Priority species: blue shark (BSH), shortfin mako shark (SMA) and oceanic whitetip shark (OCS), and silky shark (FAL))	High	7	CPCs directly	US\$??(TBF)	OCS					

	3.4 Ecological Risk Assessment (sharks & rays)	High	2		TBD					
4. Shark bycatch mitigation measures	4.1 Develop studies on shark mitigation measures (operational, technological aspects and best practices)	High	14							
	4.1.1 Longline selectivity, to assess the effects of hooks styles, bait types and trace materials on shark catch rates, hooking-mortality, bite-offs and fishing yield (socio-economics)				US\$?? (TBD)					
	4.1.2 Gillnet selectivity, to assess the effect of mesh size, hanging ratio and net twine on sharks catches composition (i.e. species and size), and fishing yield (socio-economics)			WWF-Pakistan	US\$?? (ABNJ funding to WWF)					
	4.1.3 Develop guidelines and protocols for safe handling and release of sharks caught on longlines and gillnets fisheries									
	4.1.4 Biodegradable FADs testing and implementing biodegradable FADs in the IO Purse Seine fleet to reduce environmental footprint of the gear.			EU Consortium + ISSF	Funded					
5. CPUE standardisation / Stock Assessment / Other indicators	5.1 Develop standardised CPUE series for each key shark species and fishery in the Indian Ocean	High	13		US\$?? (TBD)					
	5.1.1 Blue shark: Priority fleets: TWN,CHN LL, EU,Spain LL, Japan LL; Indonesia LL; EU,Portugal LL			CPCs directly	US\$??					
	5.1.2 Shortfin mako shark: Priority fleets: Longline and Gillnet fleets			CPCs directly	US\$??					
	5.1.3 Oceanic whitetip shark: Priority fleets: Longline fleets; purse seine fleets			CPCs directly	US\$??					
	5.1.4 Silky shark: Priority fleets: Purse seine fleets			CPCs directly	US\$??					
	5.2 Joint CPUE standardization across the main LL fleets, using detailed operational data	High	11	Consult.	30,000 €					
5.3 Stock assessment and other indicators	High	12								

	5.3.1 Develop and compare multiple assessment approaches to determining stock status for key shark species (see Table 2)		TBD		Part of: 600K Euro (European Union)					
MARINE TURTLES										
6. Marine turtle bycatch mitigation measures	6.1 Review of bycatch mitigation measures	High	8							
	6.1.1 Res. 12/04 (para. 11) Part I. The IOTC Scientific Committee shall request the IOTC Working Party on Ecosystems and Bycatch to:			CPCs directly	US\$??					
	a) Develop recommendations on appropriate mitigation measures for gillnet, longline and purse seine fisheries in the IOTC area; [mostly completed for LL and PS]				(TBD)					
	b) Develop regional standards covering data collection, data exchange and training;									
	c) Develop improved FAD designs to reduce the incidence of entanglement of marine turtles, including the use of biodegradable materials. [partially completed for non-entangling FADS; ongoing or biodegradable FADS]									

	<p>6.1.2 Res. 12/04 (para. 11) Part II. The recommendations of the IOTC Working Party on Ecosystems and Bycatch shall be provided to the IOTC Scientific Committee for consideration at its annual session in 2012. In developing its recommendations, the IOTC Working Party on Ecosystems and Bycatch shall examine and take into account the information provided by CPCs in accordance with paragraph 10 of this measure, other research available on the effectiveness of various mitigation methods in the IOTC area, mitigation measures and guidelines adopted by other relevant organizations and, in particular, those of the Western and Central Pacific Fisheries Commission. The IOTC Working Party on Ecosystems and Bycatch will specifically consider the effects of circle hooks on target species catch rates, marine turtle mortalities and other bycatch species.</p>		CPCs directly	US\$?? (TBD)					
	<p>6.1.3 Res. 12/04 (para. 17) The IOTC Scientific Committee shall annually review the information reported by CPCs pursuant to this measure and, as necessary, provide recommendations to the Commission on ways to strengthen efforts to reduce marine turtle interactions with IOTC fisheries.</p>		CPCs directly	Nil					
	<p>6.1.4 ERA (turtles, including LL, PS and GIL)</p>			TBD					
SEABIRDS									
<p>7. Seabird bycatch mitigation measures</p>	<p>7.1 Review of bycatch mitigation measures</p>	<p>High</p>	<p>10</p>						

7.1.1 Res. 12/06 (para. 8) The IOTC Scientific Committee, based notably on the work of the WPEB and information from CPCs, will analyse the impact of this Resolution on seabird bycatch no later than for the 2016 meeting of the Commission. It shall advise the Commission on any modifications that are required, based on experience to date of the operation of the Resolution and/or further international studies, research or advice on best practice on the issue, in order to make the Resolution more effective.				Rep. of Korea, Japan, Birdlife Int.	US\$?? (TBD)				
7.1.2 ERA for sea-birds				ACAP, Birdlife					
CETACEANS									
8. Bycatch assessment and mitigation	8.1 Review and development of cetacean bycatch mitigation measures	High	9						
	8.1.1 Collate all data available on bycatch of key species interacting with all tuna fisheries in the IOTC area (tuna drift gillnets, longlines, purse seines)			Consultancy?	U.S.\$??				
	8.1.2 Creation of identification cards for cetacean species in IOTC Area of Competence			IOTC	IOTC / U.S. MM Commission (15k)				
	8.1.3 Conduct an ecological risk assessment for cetaceans in the IOTC area			Consultancy?	?				
	8.1.4 Collaborate with other organisations on the assessment of marine mammal abundance and collect data on marine mammal bycatch interactions with gillnets.			FIU/WWF-Pakistan?	U.S.\$? (IWC)				
	8.1.5 Testing mitigation methods for cetacean bycatch in tuna drift gillnet fisheries			WWF Pakistan	U.S. MM Commission? Others?				
DISCARDS									
9. Bycatch mitigation measures	9.1 Review proposal on retention of non-targeted species	High	5						

9.1.1 The Commission requested that the Scientific Committee review proposal IOTC-2014-S18-PropL Rev_1, and to make recommendations on the benefits of retaining non-targeted species catches, other than those prohibited via IOTC Resolutions, for consideration at the 19th Session of the Commission. (S18 Report, para. 143). Noting the lack of expertise and resources at the WPEB and the short timeframe to fulfil this task, the SC RECOMMENDED that a consultant be hired to conduct this work and present the results at the next WPEB meeting. The following tasks, necessary to address this issue, should be considered for the terms of reference, taking into account all species that are usually discarded on all major gears (i.e., purse-seines, longlines and gillnets), and fisheries that take place on the high seas and in coastal countries EEZs:

- i) Estimate species-specific quantities of discards to assess the importance and potential of this new product supply, integrating data available at the Secretariat from the regional observer programs,
- ii) Assess the species-specific percentage of discards that is captured dead versus alive, as well as the post-release mortality of species that are discarded alive, in order to estimate what will be the added fishing mortality to the populations, based on the best current information,iii) Assess the feasibility of full retention, taking into account the specificities of the fleets that operate with different gears and their fishing practices (e.g., transshipment, onboard storage capacity).
- iv) Assess the capacity of the landing port facilities to handle and process this catch.

Consultant

US\$??
(TBD)

<p>v) Assess the socio-economic impacts of retaining non-target species, including the feasibility to market those species that are usually not retained by those gears,</p> <p>vi) Assess the benefits in terms of improving the catch statistics through port-sampling programmes,</p> <p>vii) Evaluate the impacts of full retention on the conditions of work and data quality collected by onboard scientific observers, making sure that there is a strict distinction between scientific observer tasks and compliance issues.</p>											
ECOSYSTEMS											
10.	Ecosystems	10.1 Develop a plan for Ecosystem Based Fisheries Management (EBFM) approaches in the IOTC, in conjunction with the Common Oceans Tuna Project. 10.1.1 Training workshop for CPCs on EBFM system and discussion on ecological components and the elements that are needed (ideally in 2018). 10.1.2 Workshop for CPCs on developing strategic plan for formalized implementation of EBFM (2019). 10.1.3 Implementation of EBFM plan according to approved strategies and executive measures by the IOTC commission during 2020. 10.1.4 Evaluation of implemented EBFM plan in IOTC area of competence by the secretariat and review its elements, components and making corrective measures in 2021.	High	15	WPEB	US\$?? (TBD)					

APPENDIX C

SCHEDULE OF STOCK ASSESSMENTS FOR IOTC SPECIES AND SPECIES OF INTEREST FROM 2018–2022, AND FOR OTHER WORKING PARTY PRIORITIES

The SC **ADOPTED** a revised assessment schedule, ecological risk assessment and other core projects for 2018–22, for the tuna and tuna-like species under the IOTC mandate, as well as the current list of key shark species of interest, as outlined in [Appendix XXXVII](#) (IOTC–2017–SC20–R, Para. 210)

*Extract of the Report of the 20th Session of the Scientific Committee
(IOTC–2017–SC20–R; Appendix XXXVII, Page 221)*

<i>Working Party on Ecosystems and Bycatch</i>					
Species	2018	2019	2020	2021	2022
Blue shark	Revisit ERA		Indicators	Full assessment*	Indicators
Oceanic whitetip shark	Revisit ERA	Indicators	Full assessment*	Revisit ERA	Indicators
Scalloped hammerhead shark	Revisit ERA		–	Revisit ERA	Indicators
Shortfin mako shark	Revisit ERA	Indicators–	Full assessment*	Revisit ERA	–
Silky shark	Indicators; Revisit ERA	Full assessment*	–	Indicators; Revisit ERA	Full assessment*
Bigeye thresher shark	Revisit ERA	–	–	Revisit ERA	–
Pelagic thresher shark	Revisit ERA	–	–	Revisit ERA	–
Porbeagle shark	–	–	–	–	–
Marine turtles	Revisit ERA	–	Review of mitigation measures in Res. 12/04	Revisit ERA	–
Seabirds	–	ERA; Review of mitigation measures in Res. 12/06	–	–	Review of mitigation measures in Res. 12/06
Marine Mammals	Indicators; Results from Common Oceans Gillnets project	Report from the IWC	–	ERA	–
Ecosystem Based Fisheries Management (EBFM) approaches	Preliminary report cards	–	–	–	–

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