OUTCOMES OF THE 19th SESSION OF THE SCIENTIFIC COMMITTEE

PREPARED BY: IOTC SECRETARIAT[1], 9 AUGUST 2017

PURPOSE

To inform participants at the 13th Working Party on Ecosystems and Bycatch (WPEB13) of the recommendations arising from the 19th Session of the IOTC Scientific Committee (SC) held from 1-5 December 2016, specifically relating to the work of the WPEB.

BACKGROUND

At the 19th Session of the SC, the SC noted and considered the recommendations made by the WPEB in 2016 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	*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

The recommendations on the deficiencies in data collection, monitoring and reporting by CPCs in relation to bycatch species will be discussed in paper IOTC–2017–WPEB13–07 and are therefore not presented in this paper.

Based on the recommendations arising from the WPEB13, the SC19 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 21th Session held in May 2017. A separate paper, IOTC–2017–WPEB13–04 addresses the responses and actions of the Commission.

In addition, the SC19 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–2017–WPEB13–10) will outline the review and development process for a *Program of Work* for the WPEB for the next five years (2017–2021).

DISCUSSION

In addition to the recommendations outlined in Appendix A, Appendix B and Appendix C, the following extracts from the SC19 Report (IOTC–2016–SC19–R) are provided here for the consideration and action of the WPEB13:

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

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

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

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> *(Para 3): "Notwithstanding paragraphs 1 and 2, CPCs shall prohibit, as an interim pilot measure, all fishing vessels flying their flag and on the IOTC Record of Authorised Vessels, or authorised to fish for tuna or tuna-like species managed by the IOTC on the high seas to retain onboard, tranship, land or store any part or whole carcass of oceanic whitetip sharks with the exception of paragraph 7. The provisions of this measure do not apply to artisanal fisheries operating exclusively in their respective Exclusive Economic Zone (EEZ) for the purpose of local consumption".*
>
> *(Para 9); "The provisional measures stipulated in this Resolution shall be evaluated in 2016 by the IOTC Scientific Committee to deliver more appropriate advice on the conservation and management of the stocks for the consideration of the Commission".*

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

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

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

Review of seabird mitigation measures in Resolution 12/06

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

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

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

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

> (Para. 8): "*The IOTC Scientific Committee, based notably on the work of the WPEB and information from CPCs, will analyse the impact of this Resolution on seabird bycatch no later than for the 2016 meeting of the Commission. It shall advise the Commission on any modifications that are required, based on experience to date of the operation of the Resolution and/or further international studies, research or advice on best practice on the issue, in order to make the Resolution more effective".*

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

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

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

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

Executive summaries for marine turtles, seabirds and shark species

The SC also adopted revised Executive Summaries for bycatch and other species that can be found as appendices to the SC19 report, and which can be downloaded from the IOTC website's new **Stock Status Dashboard**, in English and French:

English: http://iotc.org/science/status-summary-species-tuna-and-tuna-species-under-iotc-mandate-well-other-species-impacted-iotc

French: http://iotc.org/fr/science/r%C3%A9sum%C3%A9-de-l%C3%A9tat-des-stocks

RECOMMENDATION

That the WPEB:

1) **NOTE** paper IOTC–2017–WPEB13–03 which outlined the main outcomes of the 19th Session of the Scientific Committee, specifically related to the work of the WPEB.
2) **CONSIDER** how best to progress these issues at the present meeting.

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 (2016–2020) for the IOTC Working Party on Ecosystems and Bycatch (WPEB).
Appendix C: Schedule of stock assessment for the WPEB (2016–2020).

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

Extract of the Report of the 19th Session of the Scientific Committee

(IOTC–2016–SC19–R; Appendix XXXVII, Page 209)

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

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

Sharks

SC19.04 (para. 146) The SC **RECOMMENDED** that the Commission note the management advice developed for a subset of shark species commonly caught in IOTC fisheries for tuna and tuna-like species:

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

Marine turtles

SC19.05 (para. 147) The SC **RECOMMENDED** that the Commission note the management advice developed for marine turtles, as provided in the Executive Summary encompassing all six species found in the Indian Ocean:

- Marine turtles – Appendix XXX

Seabirds

SC19.06 (para. 148) The SC **RECOMMENDED** that the Commission note the management advice developed for seabirds, as provided in the Executive Summary encompassing all species commonly interacting with IOTC fisheries for tuna and tuna-like species:

- Seabirds – Appendix XXXI
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GENERAL RECOMMENDATIONS TO THE COMMISSION

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

Identification guides for fishing gear

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

Regional observer scheme

SC19.17 (para. 56) **RECALLING** the SC18 (IOTC–2015–SC18–R, para. 134):

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

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

SC19.18 (para. 57) **RECALLING** the objectives of Resolution 11/04 on a regional observer scheme as follows: "*Para 1: The objective of the IOTC Observer Scheme shall be to collect verified catch data and other scientific data related to the fisheries for tuna and tuna-like species in the IOTC area of competence*", and **NOTING** that the objective of the ROS contained in Resolution 11/04, and the rules contained in Resolution 12/02 "*On data confidentiality policy and procedures"* make no reference to the data collected not being used for compliance purposes, the SC reiterated its **RECOMMENDATION** that at the next revision of Resolution 11/04, it be clearly stated that the data collected shall only be used for scientific purposes.

Bycatch data exchange protocol (BDEP)

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

Gillnet fisheries

SC19.20 (para. 59) **NOTING** that gillnets are regularly being used with lengths in excess of 4,000 m (and up to 7,000 m) within and occasionally into the high seas, and that those used within the EEZ may sometimes drift onto the high seas in contravention of Resolution 12/12, the SC reiterated it's previous **RECOMMENDATION** that the Commission should consider if a ban on large scale gillnets should also apply within IOTC CPC EEZ. This would be especially important given the negative ecological impacts of large scale drifting gillnets in areas frequented by marine mammals and turtles.

Data collection opportunities

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

ACAP best practice advice: update

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

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

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

SC19.24 (para. 82) The SC **RECOMMENDED** that the Commission note the current status of development and implementation of National Plans of Action (NPOAs) for sharks and seabirds, and the implementation of the FAO guidelines to reduce marine turtle mortality in fishing operations, by each CPC as provided at Appendix V, recalling that the IPOA-Seabirds and IPOA-Sharks were adopted by the FAO in 1999 and 2000, respectively, and required the development of NPOAs. Despite the time

that has elapsed since then, very few CPCs have developed NPOAs, or even carried out assessments to ascertain if the development of a Plan is warranted. Currently 16 of the 36 IOTC CPCs have an NPOA-Sharks (6 more in development), while only 7 CPCs have an NPOA-Seabirds (3 more in development). A single CPC has determined that an NPOA-Sharks is not needed, and 3 have similarly determined that an NPOA-Seabirds is not needed. Currently 10 CPCs have implemented the FAO guidelines to reduce marine turtle mortality in fishing operations, and two CPCs (European Union, France (OT)) have implemented a full NPOA.

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

Data collection and capacity building

SC19.34 (para. 121) The SC **AGREED** that, while external funding is helping the work of the Commission, funds allocated by the Commission to capacity building are still too low, considering the range of issues identified by the SC and its Working Parties, particularly in relation to the implementation of the Regional Observer Scheme and data collection and reporting for artisanal fisheries and **RECOMMENDED** that the Commission further increases the IOTC Capacity Building budget to fund these activities in the future.

Meeting participation fund

SC19.35 (para. 123) The SC reiterated its **RECOMMENDATION** that the IOTC Rules of Procedure (2014), for the administration of the Meeting Participation Fund be modified so that applications are due not later than 60 days, and that the full Draft paper be submitted no later than 45 days before the start of the relevant meeting. The aim is to allow the Selection Panel to review the full paper rather than just the abstract, and provide guidance on areas for improvement, as well as the suitability of the application to receive funding using the IOTC MPF. The earlier submission dates would also assist with Visa application procedures for candidates.

IOTC species identification guides: Tuna and tuna-like species

SC19.36 (para. 124) The SC **RECOMMENDED** that the Commission allocates budget towards continuing the translation and printing of the IOTC species ID guides so that hard copies of the identification cards can continue to be printed as many CPCs scientific observers, both on board and port, still do not have smart phone technology/hardware access and need to have hard copies on board.

IOTC Secretariat staffing

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

Collaborative Longline CPUE

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

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

SC19.39 (para. 128) The SC **RECOMMENDED** that the Commission note and endorse the Chairpersons and Vice-Chairpersons for the SC and its subsidiary bodies for the coming years, as provided in Appendix VII.

Implementation of the Regional Observer Scheme

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

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

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

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

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

Consultants

SC19.42 (para. 179) **NOTING** the highly beneficial and relevant work done by IOTC stock assessment consultants in 2016 and in previous years, the SC **RECOMMENDED** that the engagement of consultants be continued for each coming year based on the Program of Work. Consultants will be hired to supplement the skill set available within the IOTC Secretariat and CPCs. The draft budget provided in Table 5, shall be incorporated into the overall IOTC Science budget for the consideration of the Commission.

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

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

APPENDIX B
PROGRAM OF WORK (2017–2021) 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 XXXIV. The Chairpersons and Vice-Chairpersons of each working party shall ensure that the efforts of their working party are focused on the core areas contained within the appendix, taking into account any new research priorities identified by the Commission at its next Session (IOTC–2016–SC19–R, Para. 170).

Working Party on Ecosystems and Bycatch (WPEB)

(Extracts from IOTC–2016–SC19–R: Appendix XXXIVd, *Page 188)*

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

Topic	Sub-topic and project	Priority ranking	Lead	Est. budget (potential source)	Timing				
					2017	2018	2019	2020	2021
SHARKS									
1. Stock structure (connectivity and diversity)	1.1 Genetic research to determine the connectivity of select shark species throughout their distribution (including in adjacent Pacific and Atlantic waters as appropriate) and the effective population size.	High (13)	CSIRO/AZTI /IRD/RITF	1.3 m Euro: (European Union; 20% additional co-financing)					
	1.1.1 Next Generation Sequencing (NGS) to determine the degree of shared stocks for select shark species (highest priority species: blue shark, scalloped hammerhead shark, oceanic whitetip shark and shortfin mako shark) in the Indian Ocean with the southern Atlantic Ocean and Pacific Ocean, as appropriate. Population genetic analyses to decipher inter- and intraspecific evolutionary relationships, levels of gene flow (genetic exchange rate), genetic divergence, and effective population sizes.								
	1.1.2 Nuclear markers (i.e. microsatellite) to determine the degree of shared stocks for select shark species (highest								

Topic	Sub-topic and project	Priority ranking	Lead	Est. budget (potential source)	Timing				
					2017	2018	2019	2020	2021
	priority species: blue shark, scalloped hammerhead shark and oceanic whitetip shark) in the Indian Ocean with the southern Atlantic Ocean and Pacific Ocean, as appropriate.								
	1.2 Connectivity, movements and habitat use								
	1.2.1 Connectivity, movements, and habitat use, including identification of hotspots and investigate associated environmental conditions affecting the sharks distribution, making use of conventional and electronic tagging (PSAT).	High (1)	AZTI, IRD, Others	US$80K each species (TBD)	BSH SMA OCS	SMA OCS			
	1.2.2 Whale sharks (RHN): Connectivity, movements, and habitat use, including identification of hotspots and investigate associated environmental conditions affecting distribution, making use of conventional and electronic tagging (P-SAT).	High (24)	IRD	US$50,000 (available from IRD)	RHN				
2. Fisheries data collection	2.1 Historical data mining for the key species and IOTC fleets (e.g. as artisanal gillnet and longline coastal fisheries) and implementation of Regional Observer Schemes, including:								
	2.1.1 Capacity building of fisheries observers (including the provision of ID guides, training, etc.)	High (20)	WWF-Pakistan/ ACAP (seabirds)	US$?? (TBD)					
	2.1.2 Define observer scheme (including minimum requirements) for fleets which are believed to have large catches on pelagic sharks (i.e. various longline and gillnet coastal fisheries) and where those statistics are mostly absent	High (21)		US$?? (TBD)					
	2.1.3 Historical data mining for the key species, including the collection of information about catch, effort and spatial distribution of those species and fleets catching them	High (5)	TBD	US$80K (CITES)					

Topic	Sub-topic and project	Priority ranking	Lead	Est. budget (potential source)	Timing				
					2017	2018	2019	2020	2021
	2.1.4 Integration of data mining with observer programs to reconstruct species composition and catches of sharks	Medium (26)		US$15k (EU)					
	2.1.5 Electronic monitoring (NOTING the recommendation from the Scientific Committee (SC17.43) that the Commission considers assigning the IOTC Secretariat, in consultation with interested IOTC scientists, to develop a project on electronic monitoring in the IOTC area of competence, the Commission NOTED that a concept note/proposal should be developed to allow an evaluation of the efficacy of electronic monitoring in the collection of information on catch, discards and fishing effort as a means to supplement scientific observer coverage for large-scale gillnet vessels. The concept note should include a detailed budget and be communicated to a range of potential funding organisations. (para. 41 of the S19 report))	High (12)		US$?? (TBD)					
	2.1.6 Resolution 16/04 On the development of a pilot project for the Regional Observer Scheme. Development of a proposal for review by the SC19	High (X)							
3. Biological and ecological information (incl. parameters for stock assessment)	3.1 Age and growth research (Priority species: blue shark (BSH), shortfin mako shark (SMA) and oceanic whitetip shark (OCS); Silky shark (FAL))			US$?? (TBD)					
	3.1.1 CPCs to provide further research reports on shark biology, namely age and growth studies including through the use of vertebrae or other means, either from data collected through observer programs or other research programs.	High (4)	CPCs directly	US$?? (TBD)	SMA OCS	OCS			
	3.2 Post-release mortality								
	3.2.1 Post-release mortality (electronic tagging), to assess the efficiency of management resolutions on no retention species (i.e. oceanic whitetip shark (OCS) and thresher	High (2)	IRD/ NRIFSF	US$170K per species (EU)	OCS	BSH, SMK			

Topic	Sub-topic and project	Priority ranking	Lead	Est. budget (potential source)	Timing				
					2017	2018	2019	2020	2021
	sharks), shortfin mako shark SMA) ranked as the most vulnerable species to longline fisheries, and blue shark as the most frequent in catches.								
	3.2.2 Post-release mortality (electronic tagging), to assess the efficiency of management resolutions on no retention species (i.e. oceanic whitetip shark (OCS) for purse seine fisheries	High (3)	IRD/AZTI	US$80K (TBD)	OCS				
	3.2.3 Post-release survivorship (electronic tagging) on whale shark to assess the effect of unintended interaction and efficiency of management resolution of non-intentioned encirclement on purse seine	High (23)	IRD/AZTI	US$50,000 IRD (commenced)	RHN				
	3.3 Reproduction research Priority species: blue shark (BSH), shortfin mako shark (SMA) and oceanic whitetip shark (OCS), and silky shark (FAL))	High (11)	CPCs directly	US$?? (TBD)	SMA OCS FAL	OCS			
	3.4 Ecological Risk Assessment	High (X)			Prep	Full			
4. Shark bycatch mitigation measures	4.1 Develop studies on shark mitigation measures (operational, technological aspects and best practices)								
	4.1.1 Longline selectivity, to assess the effects of hooks styles, bait types and trace materials on shark catch rates, hooking-mortality, bite-offs and fishing yield (socio-economics)	High (14)		US$?? (TBD)					
	4.1.2 Gillnet selectivity, to assess the effect of mesh size, hanging ratio and net twine on sharks catches composition (i.e. species and size), and fishing yield (socio-economics)	High (15)	WWF-Pakistan	US$?? (WWF)					
	4.1.3 Develop guidelines and protocols for safe handling and release of sharks caught on longlines and gillnets fisheries	Med (25)							

Topic	Sub-topic and project	Priority ranking	Lead	Est. budget (potential source)	Timing				
					2017	2018	2019	2020	2021
5. CPUE standardisation / Stock Assessment / Other indicators	5.1 Develop standardised CPUE series for each key shark species and fishery in the Indian Ocean			US$?? (TBD)					
	5.1.1 Blue shark: Priority fleets: TWN,CHN LL, EU,Spain LL, Japan LL; Indonesia LL; EU,Portugal LL	High (17)	CPCs directly	US$?? (TBD)					
	5.1.2 Shortfin mako shark: Priority fleets: Longline and Gillnet fleets	High (19)	CPCs directly	US$?? (TBD)					
	5.1.3 Oceanic whitetip shark: Priority fleets: Longline fleets; purse seine fleets	High (18)	CPCs directly	US$?? (TBD)					
	5.1.4 Silky shark: Priority fleets: Purse seine fleets	Med (27)	CPCs directly	US$?? (TBD)					
	5.2 Stock assessment and other indicators								
	5.2.1 Develop and compare multiple assessment approaches to determining stock status for key shark species (see Table 2)	High (22)	TBD	Part of: 600K Euro (European Union)					

Topic	Sub-topic and project	Priority ranking	Lead	Est. budget (potential source)	Timing				
					2017	2018	2019	2020	2021
	MARINE TURTLES								
6. Marine turtle bycatch mitigation measures	6.1 Review of bycatch mitigation measures								
	6.1.1 Res. 12/04 (para. 11) Part I. The IOTC Scientific Committee shall request the IOTC Working Party on Ecosystems and Bycatch to: a) Develop recommendations on appropriate mitigation measures for gillnet, longline and purse seine fisheries in the IOTC area; [mostly completed for LL and PS] b) Develop regional standards covering data collection, data exchange and training; c) Develop improved FAD designs to reduce the incidence of entanglement of marine turtles, including the use of biodegradable materials. [partially completed for non-entangling FADS; ongoing or biodegradable FADs)]	High (9)	CPCs directly	US$?? (TBD)					
	6.1.2 Res. 12/04 (para. 11) Part II. The recommendations of the IOTC Working Party on Ecosystems and Bycatch shall be provided to the IOTC Scientific Committee for consideration at its annual session in 2012. In developing its recommendations, the IOTC Working Party on Ecosystems and Bycatch shall examine and take into account the information provided by CPCs in accordance with paragraph 10 of this measure, other research available on the effectiveness of various mitigation methods in the IOTC area, mitigation measures and guidelines adopted by other relevant organizations and, in particular, those of the Western and Central Pacific Fisheries Commission. The IOTC Working Party on Ecosystems and Bycatch will specifically consider the effects of circle hooks on target	Low (28)	CPCs directly	US$?? (TBD)					

Topic	Sub-topic and project	Priority ranking	Lead	Est. budget (potential source)	Timing				
					2017	2018	2019	2020	2021
	species catch rates, marine turtle mortalities and other bycatch species.								
	6.1.3 Res. 12/04 (para. 17) The IOTC Scientific Committee shall annually review the information reported by CPCs pursuant to this measure and, as necessary, provide recommendations to the Commission on ways to strengthen efforts to reduce marine turtle interactions with IOTC fisheries.	High (10)	CPCs directly	Nil					
	SEABIRDS								
7. Seabird bycatch mitigation measures	7.1 Review of bycatch mitigation measures								
	7.1.1 Res. 12/06 (para. 8) The IOTC Scientific Committee, based notably on the work of the WPEB and information from CPCs, will analyse the impact of this Resolution on seabird bycatch no later than for the 2016 meeting of the Commission. It shall advise the Commission on any modifications that are required, based on experience to date of the operation of the Resolution and/or further international studies, research or advice on best practice on the issue, in order to make the Resolution more effective.	High (6)	Rep. of Korea, Japan, Birdlife International	US$?? (TBD)					
	DISCARDS								
8. Bycatch mitigation measures	8.1 Review proposal on retention of non-targeted species								
	8.1.1 The Commission requested that the Scientific Committee review proposal IOTC–2014– S18–PropL Rev_1, and to make recommendations on the benefits of retaining non-targeted species catches, other than those prohibited via	High (8)	Consultant	US$?? (TBD)					

Topic	Sub-topic and project	Priority ranking	Lead	Est. budget (potential source)	Timing				
					2017	2018	2019	2020	2021
	IOTC Resolutions, for consideration at the 19th Session of the Commission. (S18 Report, para. 143). Noting the lack of expertise and resources at the WPEB and the short timeframe to fulfil this task, the SC RECOMMENDED that a consultant be hired to conduct this work and present the results at the next WPEB meeting. The following tasks, necessary to address this issue, should be considered for the terms of reference, taking into account all species that are usually discarded on all major gears (i.e., purse-seines, longlines and gillnets), and fisheries that take place on the high seas and in coastal countries EEZs: i) Estimate species-specific quantities of discards to assess the importance and potential of this new product supply, integrating data available at the Secretariat from the regional observer programs, ii) Assess the species-specific percentage of discards that is captured dead versus alive, as well as the post-release mortality of species that are discarded alive, in order to estimate what will be the added fishing mortality to the populations, based on the best current information,iii) Assess the feasibility of full retention, taking into account the specificities of the fleets that operate with different gears and their fishing practices (e.g., transhipment, onboard storage capacity). iv) Assess the capacity of the landing port facilities to handle and process this catch. v) Assess the socio-economic impacts of retaining non-target species, including the feasibility to market those species that are usually not retained by those gears, vi) Assess the benefits in terms of improving the catch statistics through port-sampling programmes,								

Topic	Sub-topic and project	Priority ranking	Lead	Est. budget (potential source)	Timing				
					2017	2018	2019	2020	2021
	vii) Evaluate the impacts of full retention on the conditions of work and data quality collected by onboard scientific observers, making sure that there is a strict distinction between scientific observer tasks and compliance issues.								
9. Ecosystems	9.1 Develop a plan for Ecosystem Based Fisheries Management (EBFM) approaches in the IOTC	High (16)	WPEB	US$?? (TBD)					
	9.2 Create an ecosystem model (SEAPODYM) for the main shark species (BSH)	High (7)	Consultant CLS)	43,000€					
	9.3 Assessment of trophic relationships in pelagic bycatch using chemical tracers		SFA	50,000€					

APPENDIX C

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

The SC **ADOPTED** a revised assessment schedule, ecological risk assessment and other core projects for 2017–21, for the tuna and tuna-like species under the IOTC mandate, as well as the current list of key shark species of interest, as outlined in Appendix XXXV (IOTC–2016–SC19–R, Para. 177)

Extract of the Report of the 19th Session of the Scientific Committee

(IOTC–2016–SC19–R; Appendix XXXV, Page 206)

Working Party on Ecosystems and Bycatch					
Species	**2017**	**2018**	**2019**	**2020**	**2021**
Blue shark	**Full assessment***	Indicators; Revisit ERA	Indicators	Indicators	**Full assessment***
Oceanic whitetip shark	Indicators	Revisit ERA	Indicators	**Full assessment***	Revisit ERA
Scalloped hammerhead shark	Indicators	Revisit ERA	Indicators	–	Revisit ERA
Shortfin mako shark	Indicators	Revisit ERA	–	–	Revisit ERA
Silky shark	Indicators	Indicators; Revisit ERA	**Full assessment***	–	Indicators; Revisit ERA
Bigeye thresher shark		Revisit ERA	–	–	Revisit ERA
Pelagic thresher shark	Indicators	Revisit ERA	–	–	Revisit ERA
Porbeagle shark	tRFMO assessment	–	–	–	–
Marine turtles	Review of mitigation measures in Res. 12/04	Revisit ERA	–	Review of mitigation measures in Res. 12/04	Revisit ERA
Seabirds	–	–	Review of mitigation	–	-

			measures in Res. 12/06		
Marine Mammals	–	–	–	–	–
Ecosystem Based Fisheries Management (EBFM) approaches	**Results of joint tRFMO meeting**	–	–	–	–

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