COMMISSION
SIXTEENTH REGULAR SESSION
Port Moresby, Papua New Guinea
5 - 11 December 2019

REFERENCE DOCUMENT FOR THE REVIEW OF CONSERVATION AND MANAGEMENT MEASURES ON SHARKS AND BYCATCH MITIGATION

WCPFC16-2019-26
15 November 2019

Paper prepared by the Secretariat

A. INTRODUCTION

1. The purpose of this paper is to provide a quick reference guide to the recommendations of the Scientific Committee (SC) and the Technical Compliance Committee (TCC) of relevance to the discussions in support of the review of sharks and bycatch mitigation measures. It highlights key recommendations drawn from the SC15 and TCC15 Summary Reports.

B. SCIENTIFIC COMMITTEE RECOMMENDATIONS

2. The relevant recommendations of the SC15, with appropriate referencing, on the review of conservation and management measures (CMMs) are listed below:

B1. SHARKS

STOCK ASSESSMENT FOR OCEANIC WHITETIP SHARK
(*Paragraphs 59 – 75, SC15 Outcomes Document*)

3. The following stock status and management advice are a brief summary of 2019 stock assessment. Details of the stock assessment results are in **Attachment 1**.

a. Stock status and trends

4. SC15 noted that the median level of spawning biomass depletion from the uncertainty grid was $SB_{recent}/SB_{0} =$ 0.04 (80% probability range: 0.03-0.05). While no limit reference point has been adopted, the depletion in spawning biomass is very high. The median level of recent spawning biomass relative to that leading to MSY was SB_{recent}/SB_{MSY} = 0.09 (range: 0.05–0.17).

5. SC15 noted that the recent relative fishing mortality was very high and the grid median F_{recent}/F_{MSY} was 3.94 (80% probability range: 2.67-5.89), and that there were no model runs in the grid where F_{recent}/F_{MSY} was below 1.

6. The key conclusions are that overfishing is occurring and the stock is in an overfished state relative to MSY and depletion-based reference points adopted for tunas. This conclusion is robust to uncertainties in key model assumptions.

b. Management advice and implications

7. SC15 noted that while the assessment estimates that overfishing is still occurring (F_{recent}/F_{MSY} was 3.94) the stock assessment also estimates a slight recovery in stock biomass in recent years (2013-2016). It remains unclear whether the stock status will continue to improve or perhaps decline in the future. To help clarify this issue SC15 recommends that stock projections based on the assessment are undertaken and presented to SC16.

8. SC15 noted that there now appear to be few if any major fisheries targeting oceanic whitetip. The greatest impact on the stock is attributed to bycatch from the longline fisheries, with lesser impact from purse seining.

9. Noting that there are existing CMMs directed at oceanic whitetip, SC15 recommended that further efforts to mitigate catch and improve handling and release practices are required to further reduce fishing mortality and improve stock status.

10. SC15 noted that the assessment would be improved with better data collection for longline fisheries, such as improved observer coverage, as these fisheries are the major component of fishing mortality and would provide additional information on interaction rates, mitigation options and the fate and condition at release. SC15 recommends that, as a minimum, CCM's meet the observer coverage specified in CMM 2018-05.

11. SC15 noted the need for improved estimates of age, growth and fecundity, as well as new length-length conversion factors that would allow for an improved assessment and the inclusion of a greater number of observed lengths.

12. SC15 noted that following the implementation of CMM 2011-04 and CMM 2014-05, the amount of scientific information available per year on oceanic whitetip sharks and other sharks species covered by a retention ban and the ban on shark lines or wire traces (e.g., bycatch estimates, length measurement, species and sex identification, and biological samples) has declined. SC15 also noted that the decline in information available for the oceanic whitetip shark assessment resulted in higher uncertainty in stock status, especially in more recent years since the introduction of these CMMs. This will also affect the capacity of SC to undertake future assessments if this decline in available information persists. SC15 recommends that WCPFC16 gives more consideration to the data needs for estimating reliable CPUE and other inputs into assessments when management measures are put in place, as these measures may have unintended consequences on continued availability and reliability of data. SC15 also recommended that WCPFC16 also take these considerations into account when reviewing the relevant sharks CMMs.

13. Noting that no limit reference points have been adopted for oceanic whitetip sharks, as well as other WCPO shark species, SC15 recommends that WCPFC16 consider identifying appropriate limit reference points for WCPO sharks.

14. No stock assessments were conducted in 2019 for other sharks such as Silky shark (*Carcharhinus falciformis*); South Pacific blue shark (*Prionace glauca*); North Pacific blue shark (*Prionace glauca*); North Pacific shortfin mako (*Isurus oxyrinchus*); Pacific bigeye thresher shark (*Alopias superciliosus*); Porbeagle shark (*Lamna nasus*); whale shark (*Rhincodon typus*).

LIMIT REFERENCE POINTS FOR WCPFC SHARKS
(*Paragraph 140, SC15 Outcomes Document*)

15. Noting the final report of the project "*Identifying appropriate reference points for elasmobranchs within the WCPFC*" (SC15-MI-IP-04), the outcomes of the stock assessments for oceanic whitetip sharks reviewed by this meeting, but an inability to fully consider this agenda item due to time constraints, SC15 deferred consideration of appropriate limit reference points for elasmobranchs for the WCPFC to SC16. SC15 recommends that the key conclusions of SC15-MI-IP-04 and previous reports are summarized and presented to SC16 together with any other relevant information. Nevertheless, SC15 recommends that WCPFC16 note the conclusions of the above report and the ongoing need to identify appropriate limit reference points for WCPO elasmobranchs.

REVIEW OF CMMS
(*Paragraph 159, SC15 Outcomes Document*)

16. Related to CMM 2010-07 (CMM for Sharks), SC15 recommends that:

> TCC15 and WCPFC16 note that since the adoption of the CMM 2010-07, SC has been unable to confirm the validity of using a 5% fin-to-carcass ratio, that an evaluation of the 5% ratio is not currently possible due to insufficient or inconclusive information, and that there is still no mechanism for generating the data necessary to review the fin-to-carcass ratio if such a ratio is to be used as a tool for promoting the full utilization of sharks in the WCPFC.

SAFE RELEASE GUIDELINES
(*Paragraphs 160 – 161, SC15 Outcomes Document*)

17. SC15 suggests that WCPFC note that:

- Together, SC15-EB-WP-01 and SC15-EB-WP-04 provide more robust estimates of post release mortality within the longline fisheries and the shark handling and release factors that influence this.
- There is good evidence across the five shark species examined in SC15-EB-WP-01 and SC15-EB-WP-04 that minimising the trailing line (ideally leaving less than 0.5 meters of line attached to the animal) results in a significant reduction in post-release mortality, as noted in SC15-EB-IP-02.
- SC15-EB-WP-04 provides evidence that releasing by cutting the shark from the line while it is still in the water results in a lower mortality than bringing the shark on board and removing the gear.
- It is also important to take into account the safety of fishermen and flexibility for handling sharks and consider vessel size and operational fishing practices when the safe release guidelines are next updated.

18. SC15 recommends to WCPFC that:

- When the safe release guidelines are next updated they should properly reflect the findings in SC15- EB-WP-01 and SC15-EB-WP-04 and subsequent research on post release mortality mitigation, noting some CCMs expressed concerns that research mentioned in SC15-EB-WP-04 only applies to six fleets (New Zealand, Fiji, , Marshall Islands, New Caledonia, American Samoa, and Hawaii) and that there might be other choices of better safe release methods.
- The Monte Carlo analysis undertaken in 2015 (SC11-EB-WP-02) for oceanic whitetip and silky sharks be updated and amended as necessary using the latest results on post-release mortality under different handling and release practices. This analysis should explore and quantify the impact of different combinations of gear, mitigation and handling practices on fishing related mortality. The example R code to conduct this analysis is provided as an appendix to SC15-EB-WP-01.

UPDATE OF SHARK RESEARCH PLAN
(*Paragraph 162, SC15 Outcomes Document*)

19. SC15 accepted the outputs of ISG-08 and the Shark Research Plan, which is in **Attachment 2**.

B2. SEABIRDS

(*Paragraphs 163 – 164, SC15 Outcomes Document*)

20. SC15 notes the following in making its recommendations to WCPFC:

- the annual mortalities of seabirds in WCPFC longline and purse seine fisheries from 2015 to 2018 were estimated between 13,000 and 19,000 individuals (SC15-EB-WP-03). Longline fisheries north of 20°N accounted for approximately two-thirds of this total while longline fisheries south of 30°S accounted for approximately one-quarter of mortalities. Available data suggest that seabird mortalities in the purse seine fishery are negligible.
- that these are subject to large uncertainties because of limited data coverage, including the absence of some fleets from the analysis due to low coverage or missing observer data, and likely underestimated because cryptic seabird mortality is not considered.
- the concern over the very high estimated mortality of seabirds by longline fishing within a concentrated area of two 5x5 degree grids to the east of Tasmania and south of 40°S (Figure EB-01). This relatively small area is estimated to account for around 60% of the longline seabird bycatch south of 30°S and 15% of the total seabird bycatch in the WCPFC Convention Area, noting that this longline effort includes fleets targeting southern bluefin tuna managed by CCSBT or species managed by the WCPFC.
- the concern over the large number of seabirds incidentally caught in WCPFC fisheries in the northern WCPO and the need to understand the long-term impact of these mortalities on the sustainability of the populations concerned, noting that no clear evidence of decline in such populations has been observed in the recent period..
- the Southern hemisphere seabird species estimated to be most frequently captured are the white-capped albatross and Buller's albatrosses with highly vulnerable species including Antipodean and Gibson's albatrosses, Westland petrel and black petrel all in the top ten most frequently captured seabird species, noting that the level of identification of seabird catches varies between fleets.
- the low or absent observer coverage in key longline fleets in high latitude areas (both north and south) precludes accurate estimation of seabird bycatch inclusive of spatial and temporal

trends. The estimation of annual trend of seabird mortality since the first WCPFC seabird CMM (CMM-2006-02) is not possible with the extent of currently available data.

- that some seabirds are captured and released alive, with higher chances of survival when safe handling procedures are implemented.
- the need for continued support for research on seabird bycatch mitigation methods in longline fisheries, noting successful accumulation of relevant information material in BMIS.
- The importance of improved observer coverage and the potential use of electronic monitoring in order to better estimate bycatch rates over time and over a wider geographic range.
- that longline fisheries operating in the area where the seabird CMM applies are one of the largest threats to some seabird populations, in particular albatrosses and petrels in the Southern hemisphere**.**

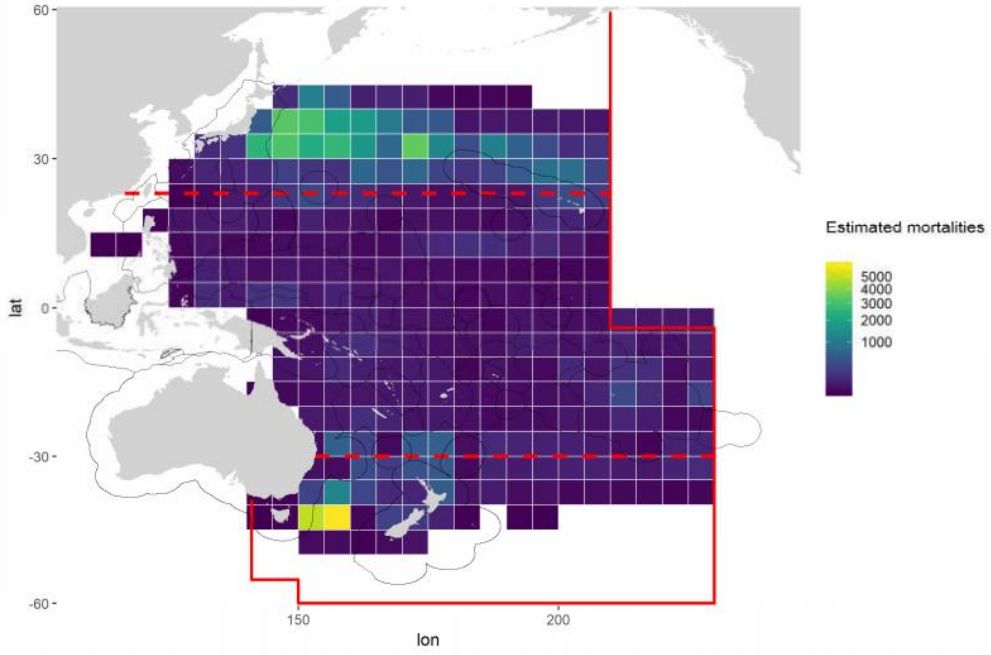

Figure EB-01. Estimated seabird mortalities at-vessel (individuals) by longline fisheries, 2015-2018. The red lines show the WCPFC convention boundaries and the red dashed lines show the 30°S and 23°N lines of longitude.

21. SC15 recommends that:

- TCC and WCPFC pay particular attention to assessing compliance against the requirements of the seabird mitigation measure CMM 2018-03.
- WCPFC adopt the ACAP best practice on hook removal from seabirds as a safe handling guideline across all WCPFC longline, and other hook fisheries (SC15-EB-WP-10).
- WCPFC notes that, in view of analyzing the effectiveness of night setting within the seabird bycatch mitigation measure, the Coordinated Universal Time (UTC) set time will need to be provided or obtainable from the WCPFC ROP longline data field.
- WCPFC consider supporting the analysis of overlap between fishing effort distribution and species-specific seabird distribution (as outlined in SP15-EB-WP-03) to both the WCPO Southern and Northern Hemispheres and to support an assessment of risk to populations resulting from fisheries- induced mortalities.
- WCPFC requests CCMs to meet their obligations with respect to the minimum levels of observer coverage required by CMM 2018-05**.**

B3. SEA TURTLES

22. No recommendation was made for sea turtles.

C. TECHNICAL AND COMPLIANCE COMMITTEE RECOMMENDATIONS

B1. SHARKS

23. TCC commended the work done by the Shark IWG and gave general support for the current text to be considered at WCPFC16 with necessary amendments. *(TCC15 draft summary report, para 371)*

24. TCC recommended that WCPFC16 notes that the obligation under CMM 2010-07 para 7 has not been assessed under the CMS process during the last two years. *(TCC15 draft summary report, para 372)*

25. TCC15 encouraged any CCM with information on alternative options to submit any relevant supporting information to WCPFC16 for its consideration. *(TCC15 draft summary report, para 373)*

26. TCC15 encouraged CCMs to provide any comments on the proposed options to the Shark IWG Chair ahead of WCPFC16. *(TCC15 draft summary report, para 374)*

B2. NON-FISH BYCATCH

27. TCC15 recommended that WCPFC16 tasks the Secretariat to work with interested parties during the intersessional period with the view to producing additional tables in the ROP annual report showing at least five-year trends on non-fish bycatch as reported by observers. *(TCC15 draft summary report, para 248)*

Attachment 1

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Fifteenth Regular Session

Pohnpei, Federated States of Micronesia
12 – 20 August 2019

UPDATE OF SHARK RESEARCH PLAN

(Attachment A, SC15 Outcomes Document)

The Informal Small Group on the Shark Research Plan (ISG-08) met in the margins of SC15. The updated Shark Research Plan is annexed in Table A1 and Table A2 below.

The group discussed the following key points to be included in the next Shark Research Plan:

1. Identify expectations of what needs to be reported in a shark stock assessment to improve budgeting (e.g. are projections required?);
2. Prepare an assessment schedule for all key species;
3. Map out the steps involved in undertaking a fully integrated assessment and alternative assessment methods for key shark species (e.g. Mobula spp.)
    a. Prepare a chart timeline to fill any data gaps identified in step 3. This will also inform step 2.

Table A1. WCPFC's stock assessment schedule[1] for 2019-2023.

Species	Stock	Last assessment	2019	2020	2021	2022	2023
Bigeye tuna	WCPO	2018		X			X
	Pacific-wide	2015					
Skipjack tuna	WCPO	2016	Stock assessment (SC15-SA-WP-05) SPC			X	
Yellowfin tuna	WCPO	2017		X			X
Albacore	S Pacific	2018			X		
	N Pacific	2017		X			X
Pacific bluefin	N Pacific	2016	??			X	
Striped marlin	SW Pacific	2012	Stock assessment (SC15-SA-WP-07) SPC				X
	NW Pacific	2012	Stock assessment (SC15-SA-WP-09) ISC				X
Swordfish	SW Pacific	2017			X		
	N Pacific	2018				X	
Silky Shark	WCPO	2018					X
Oceanic whitetip shark	WCPO	2012	Stock assessment (SC15-SA-WP-06) SPC				

[1] Tuna scheduled for assessment every 3 years, billfish, every 4 years and sharks every 5 years.

Species	Stock	Last assessment	2019	2020	2021	2022	2023
Blue shark	S Pacific	2016			X		
	NW Pacific	2017				X	
Mako	NW Pacific	2018					X
Bigeye thresher	Pacific-wide	2017				X	
Porbeagle	S Pacific	2017				X	

Table 2A. WCPFC Shark Research Plan. Two new projects are proposed for 2020 (Project #5 and #9). The TOR for Project #5 is annexed to this table and the TOR for Project #9 is in Project 97, Attachment B of this document. For 2019, work submitted to SC15 with reports or project updates are indicated in red with the corresponding SC15 paper number for ease of reference. Projects listed in green were listed in 2018 but did not receive WCPFC funding for 2019 and were not undertaken. H, M and L are the research priorities assigned by ISG7 in 2018 (refer to SC15-EB-WP-02 for the details).

Note for ISG: this table could be split into two 1) WCPFC work; and 2) a table that notes other non-WCPFC work so that WCPFC does not duplicate work going on elsewhere.

Species	Stock	Last assessment	2019	2020	2021	2022	2023
Research plan - Sharks							
Silky shark	WCPO - H	2018	Post release mortality update (SC15-EB-WP01) ABNJ/SPC				
	Pacific - H	2018	Stock discrimination ? Note: Maybe better directed at another species? PSAT tagging underway in the Cook Islands and Niue (see also EBWP-09)	Stock discrimination?			Assessment
Oceanic whitetip shark	WCPO - H	2012	Stock assessment (SC15-SA-WP-06) SPC (see general work below SC15-SA-WP-13)				
Blue shark	E Pacific - H	-					
	SW Pacific - H	2016		Assessment data preparation	Assessment (if data supports)		
	S Pacific - H	-	Data preparation to support assessment (SC15-SA-IP14)	Assessment	Assessment (if data supports)		
	N Pacific - H	2017		Assessment (ISC-tentative)			
Mako shark (shortfin)	SE Pacific - H	-	Data preparation to support assessment (SC15-SA-IP-14)				
	SW Pacific - H	-	Post release mortality update (SC15-EB-WP01) ABNJ/SPC		Assessment (if data supports) #2		
	N Pacific - H	2018			Assessment (tentative)		
	S Pacific - H	-	Data preparation to support assessment		Assessment (if data supports)		
Mako shark (longfin)	Pacific - L	-					
Porbeagle	S Pacific - L	2017				X	
Thresher (bigeye)	Pacific - M	2017				X	
Thresher (pelagic)	Pacific wide - L	-					
Thresher (common)	Pacific wide - L	-					
Hammerhead	WCPO - L					Biological research to determine species-specific age, growth and reproductive parameters? #3	Stock discrimination? Biological research to determine

						Update catch history? Can be done as part of #4 SC13 #8 can be withdrawn if rolled into #4 Both projects above should be discussed pending the 2021-2025 SRP priorities	species-specific age, growth and reproductive parameters? #3 continued
Whale shark	WCPO - L	-		Stock discrimination (Project #5)	Stock discrimination ?		
	Pacific wide - L	2018 Risk assessment					X
Manta and mobulids	WCPO – M	-		Improve data collection and species identification Improved LHP, prm estimates for LL and PS fisheries (EB- IP-04)			
General shark work	WCPO	NA	Identifying (LRPs) for elasmobranchs (project 57) (SC15- MI-IP-04) SRP mid-term review (project 84 – not done as covered in Project 78 SC14-EB-WP-02) Testing the performance of alternative stock assessments approaches for oceanic whitetip shark. (project 92) (SC15-SA-WP-13) Post-release mortality (SC15-EB-WP-04) Study on operational planning for shark biological sampling (Project 91) (SC15-EB-IP-04) - H Graphics for Best Handling Practices for the Safe Release of Sharks (SC15-EB-WP-14) Shark and ray ID guide (ongoing) SPC/ABNJ	Develop a 2021-2025 shark research plan to be presented to SC16 in 2020 Project #9 – LH Develop future projections for OCS based on the 2019 stock assessment. Update 2015 monte carlo simulations of CMMs for OCS & FAL using new PRM scenarios presented in 2019 SC15-EB-WP-01, SC15-EB-WP-04	Operational and management histories #4 - L Updated indicator analysis? (Pending outcome of Project 78 and SC14 deliberations decide on scope and species to be covered) - L Shark modelling Project #6 - L Assess recruit relationships? #8 - L		
Review of shark CMM(s)	WCPFC key sharks - ?	Not previously undertaken	Potentially scheduled for 2023 if suggested review is retained in the CMM under development in 2019. However, some alternative suggestions in the text require review in 2021. This should be decided after any finalised shark CMM is agreed.				

Project #5	Whale shark stock discrimination
Objectives	Develop an understanding of the stock structure of whale sharks in the Pacific Ocean.
Rationale	The stock structure of whale sharks in the Pacific Ocean is not well understood and developing an understanding of a population's stock structure and connectivity is essential for effective management of any species, as it identifies the appropriate spatial context for management actions. Whale shark population connectivity have been assessed through photographic identification, however, whale sharks are observed only rarely throughout their range except for the few locations where seasonal aggregations of whale sharks occur. Satellite tags have been used in a few studies with either limited deployments or in discreet areas such as the Red Sea. Genetic analysis has indicated that whale sharks represent three major populations in the Pacific, Caribbean, and Indian Oceans. Within each ocean there is little genetic differentiation between animals, indicating historical gene flow between populations and well mixed populations within each Ocean. Both the tagging and genetic analyses have been based on low numbers of samples and have not covered the Pacific Ocean particularly well.
Assumptions	• Enough work has been undertaken elsewhere to evaluate effective tagging, genetic or other methods. • The personnel and budget are available to undertake this work.
Scope	This work should have two phases. Phase 1: determine the best and most cost effective method to assess whale shark stock structure in the Pacific Ocean; and Phase 2: pending approval from SC15, undertake the biological sampling and analysis proposed under Phase 1. Phase 1 of this project should be a desktop analysis to outline effective methods and design ways to undertake the analyses, provide full costings for each and identify potential difficulties with each method. This work should include potential costings of each method and be presented to SC15 for consideration of Phase 2. Note: at SC12 a review of the data availability, data quality and data gaps for sharks was proposed, the results of that work presented in SC13-EB-WP-07 and SC14-EB-WP-02 should to be considered prior to considering this project.
Budget	0.3 FTE