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Progress against the 2021-2030 Shark Research Plan - 2024

WCPFC-SC20-2024/SA-IP-10 rev 1

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Revision 1
This revision includes updates to the shark research plan based on the discussions in the ISG-Sharks at SC20. These changes appear as track changes within the document. We also include the project terms of reference for the project "Fishery characterisation and CPUE analysis of thresher and hammerhead sharks in the WCPO".

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Introduction

The report of Project 97 (Shark Research Plan 2021-2025 (Brouwer and Hamer 2020)) was adopted by SC16 and endorsed by WCPFC17 in December 2020. The 2021-2025 Shark Research Plan (SRP) is the 3rd phase of the WCPFC's SRP that builds on the previous two plans. The 2021 – 2025 SRP is a living document that can evolve based on the information needs and priorities of the WCPFC. This plan had a mid-term review in 2023 (Brouwer and Hamer 2023) and as part of that review the SC19 recommended that the current SRP be extended to 2030 with shorter annual reviews to evaluate the progress and ensure that the next years' work remains relevant and required. In addition, it was agreed that shark assessments would be carried over two years. The first year (which is in reality is 4-5 months duration from contracting the work with the WCPFC secretariat in February to the SC paper delivery at end July) provides time to collate the data undertake fishery characterisations, develop catch reconstructions and provide SC with a recommendation on the possibility and approaches that might be suitable for a stock assessment. The second year of the assessment projects for sharks focuses on the actual stock assessment, which now also includes risk assessment methods, as agreed by SC19 and WCPFC20.

The purpose of this document is to review progress against the SRP tasks to facilitate future planning of WCPFC shark research. At SC19 the SC reviewed the proposed work in the SRP and updated the research plan. These updates on the 2021 - 2030 SRP as well as the work progressed against that project list are included in Table 1. In addition, Table 2 is provided to update the Scientific Committees assessment schedule for sharks. It is suggested that data rich assessments be attempted for blue, shortfin mako, silky and oceanic whitetip sharks, with the remainder being evaluated through fishery characterisations and/or low information estimations of fishing mortality (F). A new assessment for southwest Pacific blue shark was due to start with the data exploration work beginning in 2025, however, we suggested that the start date be moved to 2026 to better fit with the rest of the stock assessment schedule and to avoid the first year of new shark assessments overlapping with the second year of other shark assessments. There have been four changes to the assessment schedule: The ISC has proposed to undertake indicator analyses for north Pacific blue and north Pacific shortfin mako sharks in 2025 and 2026 respectively. The ISC have also identified several uncertainties that will require more work to resolve and have proposed moving the next north Pacific blue shark assessment from 2026 to 2027. The project to conduct fishery characterisation of manta and mobulid rays and whale sharks was moved by WCPFC20 from 2024 to 2025.

Under Table 1 section c(i) there is an item to *Include data poor assessment metrics as standard outputs for data rich assessments where possible*, this is a standing item currently and these metrics have been included in SP-blue sharks, SP-shortfin mako and silky shark assessments. The SC20 ISG-Sharks may want to review these and provide a specific list for future assessments. If they are able to do that then this item could be removed from the list, if not it should remain until such time as firm recommendations on these metrics are accepted by the SC.

For SC20 three projects have been completed, and there are three projects that are scheduled to start pending agreement at SC20 ISG-Sharks and approval of the budget at WCPFC21. The new projects have a draft project specification included in Appendix 1 for review by SC20 ISG-Sharks. In addition, a new project *Oceanic whitetip and silky shark in longline fisheries between 20N and 20S and outside the area to evaluate CMM 2022-04* has been completed (SC20-EB-WP-05) [This has been added in a new section to Table 1 - section 5 Management advice].

Recommendations

1. SC20 ISG-Sharks review the work plan and project list for the 2024/25 year, and make recommendations to SC20 for any changes the SC may want to consider.
2. SC20 ISG-Sharks review the proposed amendments to the stock assessment schedule and make recommendations to SC20.
3. SC20 ISG-Sharks review the project specifications and make any changes for SC20's review.
4. SC20 ISG-Sharks consider if there is enough information to provide the SC with advice on the use of data poor metrics in shark assessments, and their future use for low information stock assessments.

References

Brouwer, S. and Hamer, P. 2020. Brouwer, S. and Hamer, P. (2020). 2021-2025 Shark Research Plan. SC16-EB-IP-01 Rev1.

Brouwer, S. and Hamer, P. 2023. Shark research plan 2021-2025 mid-term review. SC19-EB-WP-06.

ISC. 2024. Stock Assessment of Shortfin Mako Shark in the North Pacific Ocean through 2022. SC20-SA-WP-14.

Relevant recent publications from outside of the WCPFC

Moore, B.R.; Finucci, B. (2024). Estimation of release survival of pelagic sharks and fish in New Zealand commercial fisheries. *New Zealand Fisheries Assessment Report 2024/07.* 129 p

Table 1: *The 2021-2030 shark work as agreed at SC19 (TABLE SHK-01), and updated for 2024.*

1. Stock assessment				
Title	**Priority**	**Start year**	**End year**	**Comments**
(a) Determine the stock status for WCPFC key sharks				
i) Southwest Pacific blue shark assessment	High	2026	2027	
ii) North Pacific blue shark assessment	High	2026	2027	
iii) Southwest Pacific shortfin mako shark assessment	High	2027	2028	
iv) North Pacific shortfin mako shark assessment	High	2023	2024	Year-1 completed (Data preparatory meeting in November 2023) Year-2 submitted for SC evaluation papers (SC20-SA-WP-14).
v) WCPO silky shark assessment	High	2023	2024	Year-1 completed (papers for SC19-SA-WP-103 and SC19-SA-IP-094) Year 2 submitted for SC evaluation (papers SC20-SA-WP-04)
vi) WCPO oceanic whitetip shark assessment	High	2024	2025	1-year submitted for SC evaluation (papers SC20-SA-WP-11 and SC20-SA-IP-23) Proposed that if phase I was evaluated by SC20 as successful commit to Phase II (undertaking the stock assessment). There was 100% agreement with this project at SC19. Draft project specification in Appendix 1.
vii) Fishery characterisation of manta and mobulid rays and whale sharks	High	2026	2025	There was 91% agreement with this project at SC19. Draft project specification in Appendix 1.
viii) Fishery characterisation of hammerhead and thresher sharks	Medium	2026	2026	SC19 survey 86% medium and agree on start date. Draft project specification in Appendix 1. ~~Needs project spec~~
(b) Develop reliable catch histories, assessment methods and data input improvements				

i) Redefining the fleets currently assumed in the BSH NP stock assessment	Medium	2021	2022	Work completed (ISC/21/SHARKWG-2/I-01) the results indicate that no change to the fleet composition used in the assessment was required.
ii) Developing a statistically robust and spatial/temporal optimized sampling strategy for biological data collection – consider ISC's approach	High	2025	2025	There was 100% agreement with this project at SC19. Draft project specification in Appendix 1. This project should be completed prior to any biological sampling commencing.
iii) Future options for assessments with less data due to ongoing reduction in retention of sharks iv) (i.e., degradation of data for CPUE and estimation of catch)	Medium	2027	2027	SC19 survey 64% medium start date 2024-2027 chose the mid
v) Spatio-temporal abundance patterns and drivers of abundance indices for SP shortfin mako	Medium	2026	2026	SC19 survey 55% medium start date 2025
vi) Satellite tagging of mako sharks (juveniles and adults) in NZ, AU and the high seas east of NZ (genetic analysis also mentioned regarding natal homing)	Medium	2025	2027	SC19 survey 75% medium start 2025 (need 2 years for this work)
vii) Feasibility of tag-recapture methods to obtain estimates of M (for SP shortfin mako)	Medium	2026	2026	SC19 survey 60% medium start date 2025
(c) Test and improve medium and data poor assessment methods to inform management decisions				
i) Include data poor assessment metrics as standard outputs for data rich assessments where possible	High	Ongoing	Ongoing	Done in SP-BSH, SP-mako(?) and FAL - SC Shark ISG may want to review these and provide a specific list for future assessments
(d) Assess the success of management				
Review the impact of CMM 2022-04	High	2028	2028	SC19 survey 100% agreement on priority and start date

2. Mitigation				
Title	**Priority**	**Start year**	**End year**	**Comments**
(a) Provide advice on mitigation Sharks with non-retention policies and unwanted elasmobranchs				

i)	Investigate effective mitigation for WCPFC Key Sharks	Medium	2023	2025	To do – still planned project scheduled for proposal at SC19. Was not funded by WCPFC20. Postponed for evaluation at SC20 ISG-Sharks.
ii)	Investigate mitigation method trade-offs between mitigation methods for sharks, seabirds and sea turtles	Medium	2023	2025	To do – still planned project scheduled for proposal at SC19. Was not funded by WCPFC20. Postponed for evaluation at SC20 ISG-Sharks.
(b) Provide advice on safe release methods and assess release survival of WCPFC Key Sharks					
i)	Estimate silky and oceanic whitetip shark post release survival from WCPO longline fisheries	High	2025	2026	SC19 survey 50% low
ii)	Estimate whale shark post release survival from WCPO purse seine fisheries	TBD	TBD	TBD	
iii)	Estimate the retention time of elasmobranchs entangled in FADs	Low	2025	2027	

3. Biology					
Title		**Priority**	**Start year**	**End year**	**Comments**
(a) Increase the understanding of important biological parameters of WCPFC Key Sharks					
i)	Silky shark and oceanic whitetip shark reproductive biology and longevity	High	2027	2030	To do – still planned but probably delayed due to COVID delays for observer training in biological data collection. Schedule work once enough samples have been collected.
ii)	Biology and life history of hammerhead sharks	High	2025	2027	To do – still planned but probably delayed due to COVID delays for observer training in biological data collection. Schedule work once enough samples have been collected.
iii)	Resolving blue shark reproductive biology and reproductive schedule	Medium	2025	2027	To do – still planned but probably delayed due to COVID delays for observer training in biological data collection. Schedule work once enough samples have been collected.

iv)	Biology of the longfin mako shark	Medium	2025	2027	To do – still planned but probably delayed due to COVID delays for observer training in biological data collection. Schedule work once enough samples have been collected.
v)	Life history of thresher sharks	Medium	2025	2027	If not assessment, this can get a lower priority
vi)	Validated life history, biology, and stock structure of the shortfin make in the South Pacific	Medium	2025	2027	To do – still planned but probably delayed due to COVID delays for observer training in biological data collection. Schedule work once
vii)	Age validation and stock structure of the silky shark and oceanic whitetip shark	Low	2025	2027	To do – still planned but probably delayed due to COVID delays for observer training in biological data collection. Schedule work once enough samples have been collected.
~~viii)~~	~~Stock structure and life history of southern hemisphere porbeagle shark~~	~~Low~~			Proposed at SC19 that this is best undertaken by CCSBT where most of the catch occurs. This project should be removed from the list.
ix)	Biology of manta and mobulid rays	High	2027	2030	SC19 survey 45% high (35% medium and 20% low) start date most 2027
x)	Stock structure of manta and mobulid rays	High	2027	2028	SC19 survey 50% high
xi)	Stock structure of hammerhead sharks	Low	2026	2030	SC19 survey 55% low
xii)	Genetic CKMR (and stock structure and natal homing) scoping study all species	Medium	2026	2027	82% medium with a start date of 2026
xiii)	Review of non-lethal approaches to collect life-history data (e.g., reproductive status from blood samples) to inform observer training	Medium	2025	2026	45% medium (35% high 20% low)

4. Observer data				
Title	**Priority**	**Start year**	**End year**	**Comments**
(a) Improve spatio-temporal observer data for informing scientific needs				
i) Training observers in the WCPO to be proficient in species identification	High	ongoing	ongoing	Material developed by SPC: Park T., Marshall L., Desurmont A., Colas B. and Smith N. 2019. Shark and ray identification manual for observers and crew of the western and central Pacific tuna fisheries. Noumea, New California: Pacific Community . 79p. Observer training ongoing
ii) Training observers for extraction and storage of vertebrae and shark reproductive material	High	2021	ongoing	SPC currently getting the protocols developed for shark biological sampling through a consultant. This work is underway. This should also ensure that observer training covers good sampling practices for genetic tissue sampling to reduce cross-contamination.
iii) Training observers for on-deck reproductive staging of elasmobranchs	High	2021	ongoing	SPC currently getting the protocols developed for shark biological sampling through a consultant. This work is underway.
iv) Measuring elasmobranchs on purse seine and longline vessels for length-length and length-weight conversion factor development	High	ongoing	ongoing	ROP training conversion factor measurements have just been introduced – COVID delay.

5. Management advice				
i) Oceanic whitetip and silky shark in longline fisheries between 20N and 20S and outside the area to evaluate CMM 2022-04)	NA	2024	2024	Completed - SC20-EB-WP-05

Table 2: Shark stock assessment table. Note this includes all assessment types from data rich to low information assessment models. The assessment type will be determined by the SC ISG-Sharks for each successive year. Shark assessments are currently scheduled 5-yearly. A = Assessment; I = Indicator analysis; L/C = Low information assessment or characterisation. ~~Red letters indicate proposed change from the SRP or additions.~~

Species	Stock	Last assessment	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Blue shark	Southwest Pacific	2021	A					A				
	North Pacific	2022		A			I		A			
Shortfin mako	Southwest Pacific	2022		A				LC				
	North Pacific	2024			A				I	A		
Silky shark	WCPO	2024			A					A		
Oceanic whitetip shark	WCPO	2019				A						A
Pelagic thresher	WCPO	-					L/C					L/C
Bigeye thresher	Pacific	2017					L/C					L/C
Common thresher	WCPO	-					L/C					L/C
Greater hammerhead	WCPO	-					L/C					L/C
Smooth hammerhead	WCPO	-					L/C					L/C
Scalloped hammerhead	WCPO						L/C					L/C
Winghead shark	WCPO	-					L/C					L/C
Whale shark	WCPO	-					L/C					L/C
Giant manta	WCPO	-					L/C					L/C
Reef manta	WCPO	-					L/C					L/C
Spinetail devil ray	WCPO	-					L/C					L/C

Appendix 1 – Draft project specifications for 2025 projects for evaluation and completion by SC20 ISG-Sharks

Project P19X9	**Fishery characterisation of manta and mobulid rays and whale sharks**
Objectives	To evaluate trends in manta and mobulid and whale shark populations in the WCPO
Notes	At SC19 heads of delegations were surveyed and there was 91% agreement with this project by the SC19 survey respondents and when asked to rank projects within the Shark Research Plan (SRP) this work was given a high priority within the SRP. ~~There was 91% agreement with this project at SC19 and this work was given a high priority.~~
Rationale	While whale shark populations in the WCPO have been evaluated to some extent (WCPFCSC9-2013/EB-WP-01; WCPFC-SC14-2018/SA-WP-12 (rev.1); and WCPFC-SC11-2015/EB-WP-03) there has been little focused evaluations on manta and mobulid rays but some general characterisations of the data have been undertaken (WCPFC-SC12-2016/EB-WP-08) and methods for assessment have been proposed (WCPFC-SC16-2020/SA-IP-12). These species are all listed on CITES Appendix II and are considered to be globally endangered mantas by IUCN. There are relatively high observed longline catches of mantas and mobulids and some whale shark unintended interactions with the purse seine fishery.
Assumptions	• Much of the existing fisheries and biological data are readily available from the WCPO. • Personnel are available to undertake this work.
Scope	• Reviewing the previous work in the WCPO to assess and improve on methods and update the information on stock trends. • Present a characterisation of the fisheries catching these species. • Attempt to develop WCPO abundance indices using observer data. • Attempt to present the stock status in terms of the metrics outlined in the 2021-2025 Shark Research Plan. • Prepare a report containing the above results for SC21.
Timeframe	March 2025- August 2025
Budget	Standalone assessment: 0.5 FTE ($50,000) Travel to SC21 ($10,000) Total: $60,000
References	WCPFC-SC09-2013/EB-WP-01 WCPFC-SC11-2015/EB-WP-03 WCPFC-SC12-2016/EB-WP-08 WCPFC-SC14-2018/SA-WP-12 (rev.1) WCPFC-SC16-2020/SA-IP-12

Project P19X10	**Pacific oceanic whitetip shark assessment – phase II**
Objectives	Undertake a stock assessment of oceanic whitetip sharks in the Pacific Ocean
Notes	At SC19 heads of delegations were surveyed and there was 100% agreement with this project by the SC19 survey respondents and when asked to rank projects within the Shark Research Plan (SRP) this work was given a high priority within the SRP. ~~There was 100% agreement with this project at SC19 and this work was given a high priority.~~ This project could include alternative assessment types as presented for silky sharks in SC20-SA-WP-04. The alternative approaches will be included as two options in the budget.
Rationale	This stock was last assessed in 2019 (WCPFC-SC15-2019/SA-WP-06) using data from 1995-2016. Since the last assessment, more catch and effort data as well as observer data are available. The observer data will be an important component of this assessment as since CMM 2013-08 came into force, oceanic whitetip sharks in the WCPO have had a non-retention policy and the catch data should therefore be absent from July 2014, but some observer data included releases which may be informative. This project is designed to assess the stock status of oceanic whitetip sharks in the Pacific Ocean using the most informative approach with respect to the available data. The assessment should assess the stock status against conventional stock assessment metrics as well as those suggested in the WCPFC 2021-2025 Shark Research Plan (SC16-EB-IP-01 rev1).
Assumptions	• Much of the existing fisheries and biological data are readily available from the WCPO. • Assessment personnel are available to undertake this work.
Scope	• Reviewing the previous assessment in the WCPO to assess and improve on methods to increase the understanding of data strengths and weaknesses, and update stock status. • Update WCPO longline catch estimates and abundance indices using recent observer data. • Present the stock status in terms of the metrics outlined in the 2021-2025 Shark Research Plan. • Prepare a report containing the above results for SC21. • If the data are too poor to undertake a full quantitative assessment, then a medium data assessment may be appropriate.
Timeframe	12 months (March 2024 – August 2025) PHASE I: March 2024-August 2024 (data compilation, fishery characterization and catch reconstructions) **PHASS II: March 2025-August 2025 (Stock assessment)**
Budget	Standalone assessment: 0.7 FTE ($70,000 – 2025) Travel to SC21 ($10,000) Total: $80,000 Inclusion of other risk assessment methods $0.3 FTE $30,000

References	WCPFC-SC16-2020/EB-IP-01 rev1 WCPFC-SC15-2019/SA-WP-06 WCPFC-SC20-2024/SA-WP-04
Project P19X11	**Developing a statistically robust and spatial/temporal optimized sampling strategy for biological data collection – consider ISC's approach**
Objectives	To identify sampling gaps in biological data stored within the SPC Tissue Bank and to develop a biological sampling plan to collect information for WCPFC shark species which address those sampling gaps.
Notes	At SC19 heads of delegations were surveyed and there was 100% agreement with this project by the SC19 survey respondents and when asked to rank projects within the Shark Research Plan (SRP) this work was given a high priority within the SRP. ~~There was 100% agreement with this project at SC19 and this work was given a high priority.~~
Rationale	Biological information are a key component of integrated age-structured assessment models, and data-limited assessment approaches and it is essential that the collection of these data is conducted in a manner that reflects the population as a whole. Much of the shark sampling of biological data are from discrete areas within the Pacific Ocean and may not represent the population structure for almost all shark species. The ISC has developed a length-based proportional international billfish biological sampling (IBBS) program for north Pacific billfish species (Kinney et al., 2023), the aim of which is to develop a data set to develop robust biological parameters including growth and maturity estimates and to begin interrogating the issue of spatially varying biological characteristics. This project should attempt to replicate Kinney et al. (2023), to the extent practical, for WCPO sharks. To ensure appropriate sample collection.
Assumptions	• Much of the existing fisheries and biological data are readily available from the WCPO. • Personnel are available to undertake this work.

Scope	This proposal seeks to leverage the existing efforts and experience within the WCPFC region in order to: (a) Develop a robust, statistically structured biological sampling plan for the WCPFC to collect biological information (e.g., length composition, age, growth, maturity and genetic data) for the WCPFC key shark species; (b) Evaluate the existing biological samples contained within the SPC Tuna Tissue Bank relative to the sampling plan developed in (a); (c) Conduct a gap analysis to identify additional samples that need to be collected (e.g., spatiotemporal strata, size bins, sexes, etc.); (d) Within a simulation framework, evaluate the robustness of the sampling plan developed in (a) to anticipated logistical challenges of implementing the plan across the WCPO, and to understand the limitations of the existing data following the gap analysis in (c). A subsequent phase would consist of the implementation of (a) with the collection of the additional samples defined in (c).
Timeframe	March 2024-August 2024, including a presentation to the PAW and SC21
Budget	0.3 FTE ($30,000) Travel to SC21 ($10,000) Total: $40,000
References	Kinney et al., 2023. *Length-Based Proportional Sampling for Life History Research: Establishing Uniform Sampling for North Pacific Billfish Species*. WCPFC-SC19-2023/SA-IP-11

Project XXX	Fishery characterisation and CPUE analysis of thresher and hammerhead sharks in the WCPO
Objectives	To evaluate trends in thresher and hammerhead shark populations at a species level in the WCPO and assess the level of/trends in the fishing impacts on these stocks
Notes	At SC19 heads of delegations were surveyed and there was 86% agreement with this project by the SC19 survey respondents and when asked to rank projects within the Shark Research Plan (SRP) this work was given a medium priority within the SRP. There are three thresher and four hammerhead sharks listed as key sharks within the WCPFC. This analysis would have to undertake the analyses for each species separately.
Rationale	Bigeye thresher shark populations in the WCPO have been evaluated with a risk assessment (WCPFC-SC13-2017/SC13-SA-WP-11) but there is no quantitative information on the other thresher species nor hammerhead sharks. The WCPFC shark research plan (WCPFC-SC16-2020/EB-IP-01 Rev1) indicated that data on thresher sharks may be less sparse than the hammerhead sharks which are caught at low rates and historic reporting has been poor. Some general risk assessment analyses have been undertaken which include information on thresher and hammerhead sharks (eg WCPFC-2007-SC3-EB SWG/WP-03). However, since that work has been completed, risk assessment methods and low information stock assessment methods have advanced, and data collection has improved. The WCPFC has some length, distribution and catch data, mostly from 2003 onwards but some data sets extend back to 1995. There is little to no information on the impacts of the WCPFC fisheries on these stocks there are on standardised CPUE trends nor estimates of fishing mortality.
Assumptions	• Much of the existing fisheries and biological data are readily available from the WCPO. • Personnel are available to undertake this work.
Scope	• Reviewing the previous work in the WCPO to assess and improve on methods and update the information on stock trends. • Present a characterisation of the fisheries catching these species. • Attempt to develop WCPO abundance indices using observer data. • Attempt to present the stock status in terms of the metrics outlined in the 2021-2025 Shark Research Plan for low and medium information stocks. • Prepare a report containing the above results for SC21.
Timeframe	March 2025- August 2025
Budget	Standalone assessment: 0.5 FTE ($50,000) Travel to SC21 ($10,000) Total: $60,000

References	SC03-EB SWG/WP-03 SC13-SA-WP-11 SC16-2020/EB-IP-01 Rev1