SCIENTIFIC COMMITTEE
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PROGRESS ON THE WCPFC STOCK ASSESSMENTS AND SHARK RESEARCH PLAN (SUMMARY TABLE)

WCPFC-SC12-2016/EB-IP-16

Secretariat

The Secretariat prepared an overview matrix for the progress of the Shark Research Plan based on Table 1 and Table 2 in Attachment H of the SC11 Summary Report. SC12 is invited to review, update and recommend a refined stock assessment schedule and projects for the Commission's consideration.

For explanations of the intent of the work outlined in the Tables 1 and 2, refer to the Shark Research Plan (SC11-EB-WP-01) and to Appendix A.

The Secretariat prepared **Appendix A,** outlining potential scopes of work for 2017. The 2017 work programme will be reviewed by an Informal Small Group which is also asked to provide associated indicative budgets for each project, to guide WCPFC Science Research Sub-Committee's deliberations.

Table 1. Schedule and progress of WCPFC stock assessments and analyses. (X = scheduled by SC and ? = be confirmed by SC)

Species	Stock	Last assessment	2016	2017	2018	2019	2020	Remarks
Bigeye tuna	WCPO	2014		X			X	
	Pacific-wide	-						
Skipjack tuna	WCPO	2014	SC12-SA-WP-04			X		
Yellowfin tuna	WCPO	2014		X			X	
Albacore	South Pacific	2012			X			
Striped marlin	Southwest Pacific	2012			X			
	Northwest Pacific	2012			X?			
Swordfish	Southwest Pacific	2013		X				
Silky shark	WCPO	2013		Stock Assessment? (Appendix A, #2) Post-release mortality studies? (Appendix A, #3)	Post-release mortality studies? (Appendix A, #3)			
	Pacific-wide	-				Stock discrimination?	Stock discrimination?	
Oceanic whitetip shark	WCPO	2012		Post-release mortality studies? (Appendix A, #3)	Post-release mortality studies? (Appendix A, #3)	X?		
Blue shark	Southwest Pacific	-	SC12-SA-WP-08 SC12-SA-WP-09					SPC core shark funding
	South Pacific-wide			Stock Assessment? (Appendix A, #1)				
	Northwest Pacific	2014		X (Appendix A, #4)				ISC
Mako shark (shortfin)	Southwest Pacific	-			X?			
	Northwest Pacific	2015 (Indicator analysis)			X			ISC
Porbeagle	Pacific-wide (southern hemisphere)	-	X	X (completion)				ABNJ stock assessment
Bigeye thresher		-						
	Pacific-wide	-	X					ABNJ stock assessment
Hammerhead	WCPO	-			Update catch history?	Stock determination?	Stock determination?	
	Pacific-wide	-			Biological research to determine species specific age, growth and reproductive parameters?	Biological research to determine species specific age, growth and reproductive parameters?	Biological research to determine species specific age, growth and reproductive parameters?	
Whaleshark	WCPO	-			Stock determination?	Stock determination?		
	Pacific-wide	-						
General shark work	WCPO			Shark Data Improvement? (Appendix A, #5) Fleet Histories? (Appendix A, #6) Shark Biology Studies Plan? (Appendix A, #7)	Assess spawner recruit relationships?; SRP mid-term review?		Develop a 2021-2025 shark research plan to be presented to SC16 in 2020?	

Table 2. Schedule and progress of WCPFC stock assessments and analyses. (X = scheduled by SC; ? = be confirmed by SC)

Project title	Organization	Budget	2016	2017	2018	Remarks
Length-weight conversion factor review			FAC9 dropped 10K (priority=1)			
Develop proposed limit reference points for elasmobranchs		$25,000	SC12 adopt TOR			
Monte Carlo analysis of mitigation approaches: extension of longline analysis and develop model for purse seine	SPC-OFP		SC12-EB-WP-03; SC12-EB-WP-06			
Maternal length and litter size in shortfin mako sharks						
Post-release survival of silky and oceanic whitetip sharks from longline sets						
Post release mortality of sharks and rays from longline and purse seine vessels		EU				
Experimental assessment of hook type and branchline leader material on shark catch						
Observer form re-development to collect data on handling and release of sharks	SPC-OFP + FFA					Through inclusion of sharks on GEN2 form and training of observers, this has begun and will be progressed through the DCC process
Review data for non-key sharks elasmobranchs	SPC-OFP		SC12-EB-WP-08			SPC core shark funding

Appendix A

Shark Project Sheets

WCPFC Secretariat

Last updated 26 July 2016

PREFACE

Since 2010 the Pacific Community (SPC), as the Scientific Services Provider to the WCPFC, has prepared and reported progress against a WCPFC Shark Research Plan. The current version of the Shark Research Plan was adopted by SC11 in 2015 and contains a provisional schedule of work for 2016-2020. Although there is no progress report on the Shark Research Plan this year, the Secretariat has developed the attached shark project sheets to facilitate development of the 2016-2017 WCPFC Scientific Committee Work Programme and Budget. Other projects can be considered, but should be presented in the same format in order to allow for balanced comparison and prioritization.

The following ongoing or planned work has been taken into consideration:

- ABNJ Tuna Project (see WCPFC-SC12-2016/RP-ABNJ-01) which runs through Jan 2019:
  - The southern hemisphere porbeagle assessment will be completed in early 2017
  - The Pacific-wide bigeye thresher assessment will be completed shortly
  - Two further Pacific-wide shark stock assessments (TBD) are planned (indicative budget: 100,000 USD@)
  - A post-release mortality tagging study (indicative budget: 250,000 USD)
  - A pair of international workshops planned to focus on post-release mortality tagging sampling designs and analysis (first planned for Jan 2017; all funding allocated to travel for developing coastal States and invited experts)
- ISC Shark Working Group (see WCPFC-SC12-2016/GN-IP-02):
  - A north Pacific blue shark assessment is in progress for completion in 2017
  - A north Pacific shortfin mako shark assessment is planned for 2018
- JIMAR, NOAA and ISSF are conducting a study of post-release mortality under different handling and discard practices for blue, silky, oceanic whitetip and bigeye thresher sharks (n=112 tags with n=51 deployed to date; see WCPFC-SC12-2016/EB-WP-07)
- IATTC is conducting a post-release mortality study of silky sharks in Ecuador and Costa Rica (n=10, all deployed) with EU funding
- NOAA, SPC and ABNJ are conducting a post-release mortality tagging study of whale sharks in Papua New Guinea (n=10, none deployed yet)
- Researchers from James Cook University are proposing to tag and take genetic samples from 20 silky and 20 oceanic whitetip sharks in the Cook Islands to evaluate the effectiveness of spatial management measures (see WCPFC-SC12-2016/EB-IP-15)
- ISSF is conducting work on FADs and sharks including entanglement and safe release

Other work can be listed and considered if notified. The following project descriptions are intended to represent a starting point and budgets are indicative only.

Sheet Number	1
Project	South Pacific-wide blue shark assessment
Objectives	Revisit the 2016 South Pacific blue shark assessment, using the full year to resolve some of the existing issues and expand the scope to the entire South Pacific, thereby developing new methods and producing results that can be used for management.
Rationale	• Builds upon the momentum of SPC's 2016 work to complete the assessment and provide information for management • Leverages ABNJ funds to incorporate Eastern Pacific data • Results will be more realistic and robust if EPO catches are considered • Will complement the North Pacific-wide assessment by ISC • Provides the opportunity to apply other models useful for sharks
Assumptions	• Eastern Pacific data can be accessed and will improve estimation • Models such as SS3 or BSP can be applied • Existing assessment can be improved with an additional year's work • SPC's workload would allow them to lead this assessment
Scope	Revise the existing South Pacific blue shark stock assessment (WCPFC-SC12-2016/SA-WP-08) so that it addresses the following key points: • Covers the entire range of fishing impact on the stock, i.e. accounts for Eastern Pacific fisheries • Applies at least 2 stock assessment models, at least one of which was applied in the most recent ISC North Pacific blue shark assessment, i.e. BSP or SS3 • Modifies the models as necessary to account for the special characteristics of sharks, i.e. stock-recruit functions, prior on K, etc. • Conduct further work on rescuing, mining, accessing or estimating catch, effort, catch rate and other useful historical data from all sources • Monitor developments in the ISC North Pacific blue shark assessment to share and benefit from methods innovations • Prepare a revised assessment for SC13
Budget	1 FTE at SPC (ABNJ can contribute up to 100,000 USD with priority on EPO extension work)

Sheet Number	2
Project	Update of silky shark status as a Pacific-wide assessment
Objectives	Revisit the 2013 silky shark assessment working with IATTC* to explore stock definitions and new methods to account for potential regional patterns across the Pacific.
Rationale	• This species has been identified by both WCPFC and IATTC as being depleted and in need of management (and is currently proposed for CITES) • Assessment of this species is a priority shark research topic for IATTC • Leverages ABNJ funds • Four years have passed since the last WCPO assessment and two years since the implementation of WCPFC no-retention measures • Builds on previous assessment work for this species • Promotes useful cooperation with IATTC
Assumptions	• Much of the existing data are readily available • SPC and IATTC can collaborate and share data • Combined data prep work identifies a viable Pacific-wide assessment strategy • No-retention measures have not seriously degraded the information content of recent data • SPC workload can support undertaking this work
Scope	Revisit the existing silky shark assessment (WCPFC-SC9-2013/SA-WP-03) in collaboration with IATTC to improve methods, increase understanding of data strengths and weaknesses, and update stock status. Specifically: • Explore a combined data set to determine appropriate methods • Explore ways of developing purse seine-based indices of abundance for WCPO data • Compare WCPO and IATTC indices of abundance that overlap in time and space in order to evaluate trends and define stock boundaries • Update WCPO LL catch estimates and abundance indices using recent observer data • Re-run SS3 model to compare to 2013 results • Consider what might be appropriate limit reference points • Prepare a report containing the above results for SC13
Budget	1 FTE at SPC (ABNJ can contribute up to 100,000 USD with priority on EPO extension work)

* subject to further discussions with IATTC staff scientists

Sheet Number	3
Project	Post-release mortality tagging study
Objectives	Obtain better estimates of post-release mortality, especially for oceanic whitetip and silky sharks, across a broader range of longline fisheries.
Rationale	• The data obtained will be useful for assessments as well as for evaluating the effectiveness of mitigation measures • This work can be focused on the shark species of greatest conservation and management interest • This work can reinforce several ongoing studies in other fisheries (see Preface) • Leverages ABNJ funds (funding already confirmed)
Assumptions	• Tags can be deployed using observers (thereby avoiding vessel costs) • Sufficient catches by vessels with trained observers onboard • Study design to be developed during an early 2017 workshop to be supported by the ABNJ Tuna Project
Scope	The ABNJ Tuna Project plans an early 2017 expert workshop to develop a sampling programme. Scope is somewhat flexible in terms of fisheries and species but at present is aimed toward longline fisheries with a priority on oceanic whitetip and silky sharks. It will be important to consider shark condition and handling practices as key factors when attaching tags, i.e. there may be a need for observers to record additional information or use different codes. ABNJ Tuna Project funding has been budgeted to buy up to 50 tags; contributions from other sources could increase the statistical power of the design. Compatibility with similar programmes in other fisheries should be maximized. This work is expected to begin in 2017 and be completed in 2018.
Budget	ABNJ has 250,000 USD budgeted for this study (other contributions welcome)

Sheet Number	4
Project	Participation in ISC North Pacific blue shark stock assessment activities
Objectives	Contribute to and learn from ISC work toward revising the North Pacific blue shark stock assessment, thereby aiding methods development for other WCPO shark stocks.
Rationale	• The ISC is currently conducting an update of the North Pacific blue shark stock assessment of 2014 • The ISC assessment would benefit from the contribution of additional blue shark observer data in the North Pacific • Participation in this collaborative stock assessment may lead to the development of new methods and/or new data insights • Cooperation between the WCPFC and its Northern Committee could be strengthened
Assumptions	• If SPC were available to participate, it would contribute its blue shark data holdings • If the Secretariat or ABNJ participates, fewer data can be contributed • ISC is able and willing to incorporate these contributions to its work • ISC meetings avoid scheduling conflicts with other work
Scope	Available WCPO data would be compiled, formatted and analysed to produce data products that could be contributed to ISC Shark Working Group (SWG) meetings (no raw data would be contributed; this is similar to the contributions of ISC member countries). It is assumed that participation in two ISC SWG meetings would be required (the FTE estimate is intended to account for travel costs). Total time input including data handling and analysis, ISC SWG meetings and other tasks, and report review is estimated at ~2.5 months. The ISC SWG aims to complete its North Pacific blue shark stock assessment in the first half of 2017.
Budget	0.2 FTE

Sheet Number	5
Project	In depth shark data evaluation and improvement
Objectives	Implement recent recommendations regarding the need to evaluate and improve existing logsheet and observer shark data for more effective application of stock assessments.
Rationale	• Implements recommendations from the South Pacific blue shark, the 2016 SPC data gaps paper and the BDEP paper regarding the need to inspect and clean existing shark data holdings • Assessments usually do not have time for this type of work, and general data management budgets do not provide for this depth of focus • This effort may not only improving existing data, it might generate additional recommendations for data improvements going forward
Assumptions	• SPC would undertake this work so that all data holdings that are usually accessed for stock assessments can be included • There is additional value to be gained from existing data if they are better cleaned, filtered, weighted, etc.
Scope	This study should be conducted by a scientist familiar with shark biology and assessment methods (not by a data management generalist). The review should cover all WCPFC key species and include: • Assessing the spatial and temporal coverage of observer data and propose methods (e.g. weighting, extrapolation, etc) to adjust for identified biases • Comparing observer and logsheet data with a view to identifying and adjusting for under-reporting, discarding, non-species specific recording and other missing data • Advise on methods for producing catch series, including cases of full, lagged or partial observer data reporting • Investigating data reporting patterns by fleet including whether i) annual catches and discards are reported for all key species; ii) whether operational or aggregated logsheet data are provided for all key species; and iii) the extent to which the provided data are estimated and how that might affect their precision • Investigating potential sources of new historical data • Produce a paper containing recommendations, and revised datasets as appropriate, for SC13
Budget	0.3 FTE

Sheet Number	6
Project	Operational and management histories for WCPO longline fleets
Objectives	Compile timelines and brief descriptions for major longline fleets detailing the history of management measures and operational practices
Rationale	• This project addresses an SC11 (and prior) discussion about how to interpret changes in CPUE indices and the potential biases in constructing indices of stock abundance based on standardised CPUE from various fleets' data without knowing and adequately accounting for operational and management changes over time. • As indices of stock abundance are one of the key inputs to stock assessment models, adequately accounting for changes in operational practices that may influence CPUE is a high priority. • Australia has produced a simple fleet history that can serve as a template for other CCMs (WCPFC-SC12-2016/SA-IP-11). • These histories would serve as a resource not only for WCPFC analyses but for any analyses of Pacific shark data
Assumptions	• The information exists and can be located in a reasonable timeframe • CCMs are willing to assist with producing their own fleet histories • Funding is available to assist CCMs in producing their summaries (if they wish)
Scope	The fleet histories should, in the first instance, focus on longline fleets as it is these data that are often used as indices of stock abundance. Separate fleet histories for purse seine fleets could also be prepared as resources allow. The fleet histories should include details on management measures, fishing strategies, gears and sampling regimes over time. It is anticipated that each history would be up to 3 pages of text with key events described in sequence, with a few key figures and an excel spreadsheet version of the timeline. A coordinator should be appointed to compile and assist with the fleet histories. For those CCMs that are willing to produce their own fleet histories, the coordinator would just be involved in editing and formatting. For those CCMs that are willing to have a fleet history produced but cannot undertake it themselves the coordinator could assist in writing up information or interviews facilitated by the CCM for approval by the CCM. At a minimum, the coordinator could research and pull together public domain information for each fleet. A collection of fleet histories would be presented by the coordinator to SC13, with the potential for CCMs to update or replace them over time.
Budget	0.3 FTE

Sheet Number	7
Project	Operational planning for shark biological data improvement
Objectives	Collect, review and prioritize a list of biological data gaps for the WCPFC key shark species and propose a scalable and practical plan for filling them
Rationale	• The Pacific Shark Life History Expert Panel Workshop urged the t-RFMOs to be more proactive in setting a research agenda for life history and stock structure research • ISC and ICCAT have developed mechanisms for this type of work, but there is little shark biological work being done by the WCPFC • Various recommendations for further studies have been made by the Shark Research Plan, various stock assessments and the Expert Panel itself. • The regional observer programme and SPC tissue bank provide opportunities for sample collection and access • It is difficult to begin filling data gaps without a focused, practical plan that can be proposed and costed • This project will develop such a plan, thereby spinning-off implementable projects that can proceed if funded
Assumptions	• There are cost-effective ways of gathering the necessary data and conducting the appropriate analyses • CCMs may be able to assist with sample collection or other research coordination • SPC or another regional body is willing to act as the focal point • At least some of the projects developed can be funded through WCPFC or other sources
Scope	Review the Shark Research Plan, shark stock assessments in the WCPO and elsewhere, the report of the Pacific Shark Life History Expert Panel Workshop to develop a list of biological studies necessary to support conservation and management for WCPFC key shark species, potentially including: • Stock discrimination • Age and growth sampling • Inter-laboratory calibration of ageing methods • Validation/verification of ageing methods • Reproductive sampling • Length-length and length-weight relationships • Movement/migration Prioritize these studies based on the usefulness of the information, ease of sample access and cost and develop practical plans (including a budget) such that priority studies can proceed as soon as funding is sourced. A minimum of three studies should be fully developed, organized and costed and tabled at SC13.
Budget	0.2 FTE