



SCIENTIFIC COMMITTEE
TWENTY-SECOND REGULAR SESSION
11-19 August 2026
Apia, Samoa (Hybrid)

[DRAFT] TERMS OF REFERENCE FOR PROPOSED PROJECTS FOR 2027 - 2029

WCPFC-SC22-2026-GN-WP04
11 August 2026

Compiled by the Secretariat

Project P22X09 TOR is added at the end of this document.

NOTES

This draft provides the existing project TORs, some of which will be updated by the proposers.

1. Projects are divided into two sections based on whether priority score ranking is required.
2. Essential projects are ongoing projects that have made significant contributions to the scientific work of the Commission over the years.
3. Projects in the “Scoring Required” section include both ongoing and new projects that require priority score ranking.
4. **All proposers should submit their TORs or updated TORs to SC22@wcpfc.int by the end of Sunday, 16 August.**
5. A revised List of Project TORs will be posted by Monday morning for discussion that afternoon.

Terms of Reference for Proposed Projects for 2027 – 2029

Summary Table (Priority ranking required: No / Yes)

No.	I. Project priority ranking – NOT required	
1	Project 35B	WCPFC Pacific Marine Specimen Bank (PMSB)
2	Project 42	Pacific Tuna Tagging Programme (PTTP)
3	Project 120	Updated reproductive biology of tropical tunas
4	Project 130	Joint bycatch assessment workshop for billfish and sharks
5	Project 131	Southwest Pacific swordfish management strategy evaluation
No.	II. Project priority ranking – Required	
1	Project 100d	Application of CKMR methods to SP albacore and cost-benefit evaluation and prioritisation of CKMR to WCPFC stocks (tuna, billfish, sharks)
2	Project 121	Ecosystem and Climate Indicators
3	Project 123	Scoping the next generation of tuna stock assessment software (2 nd phase)
4	Project 125	Biology of South Pacific striped marlin, blue marlin, black marlin, shortbill spearfish and sailfish in the WCPO from longline fisheries
5	Project P128a	Initial analyses to support investigations of the connectivity of key tuna species between the Western Pacific and East Asia (WPEA) region and the broader WCPFC-CA
6	Project 129	Building an age-length data stream for tuna assessments
7	Project P22X01	Characterisation of vessel gear interactions and stock trend evaluation of false killer whales (<i>Pseudorca crassidens</i>) and rough-toothed dolphins (<i>Steno bredanensis</i>)
8	Project P22X02	Assessment of the SW Pacific blue shark stock (Phase 1)
9	Project P22X03	Southwest Pacific swordfish epigenetics and stock structure
10	Project P22X04	Southwest Pacific mako shark epigenetics and stock structure
11	Project P22X05	Fishery characterisation of low information sharks and mobulids
12	Project P22X06	Post-release survival of oceanic whitetip sharks from WCPO longline fisheries
13	Project P22X07	Estimation of seabird mortality and risk across the WCPFC Convention Area
14	Project P22X08	Maintenance of the Bycatch Mitigation Information System (BMIS)
15	Project P22X09	Technical workshop on approaches to utilising tagging data within regional stock assessments to support best available science

No Priority Ranking Projects

Project 35B	WCPFC Pacific Marine Specimen Bank (PMSB) – TOR to be updated (SPC)
Ongoing	Essential project – No Priority Ranking
Objectives	The objective of the project is to maintain the Pacific Marine Specimen Bank with particular emphasis on WCPO bigeye, yellowfin, albacore and skipjack tunas, and swordfish, and, to facilitate transmission of samples to specified researchers with due cognizance of the WCPFC Pacific Marine Specimen Bank (“Tuna Tissue Bank”) Access Protocol.
Scope	The scope of ongoing work will include, but not limited to, the following: 1. Maintain and develop: ○ the public SPC webpage (www.spc.int/ofp/PacificSpecimenBank) informing interested parties of the tissue bank, including the rules of procedure to access samples from the tissue bank; ○ a secure web-accessed database holding non-public data; ○ a relational database that catalogues the samples to include sampling metadata; ○ The Noumea (SPC) storage site is maintained and expended as required; and ○ the Brisbane (CSIRO) storage site 2. Tissue sample utilisation and a record of outcomes/outputs will also be detailed in the relational database. 3. Subject to approval by the WCPFC Executive Director: ○ metadata will be made available to institutions or organizations responsible for providing scientific advice in fisheries through the web-accessible component of the database, and subsequently, and ○ SPC-OFP will facilitate the transmission of requested samples to specified researchers/organisations, and the return of unused and/or processed samples to the relevant storage facility. 4. Australia has provided access to their quarantine and sample storage infrastructure through CSIRO. Under current funding, samples are curated at the Brisbane site on an ongoing basis. CSIRO have committed to the in-kind contribution of maintaining space and transfer of specimens. The specific work is to: ○ Sort specimens on arrival and reconcile with quarantine data; ○ Enter data describing specimens received into BioDaSys; ○ Store specimens systematically so that they can be retrieved when requested; and ○ Laboratory and storage materials to complete curation. 5. As agreed at the annual project steering committee meeting (SC18-RP-P35b-02), in addition to maintaining and operating the WCPFC Tuna Tissue Bank in 2024, the Scientific Services Provider will: ○ continue to support initiatives to increase rates of observer biological sampling, noting that this contribution is essential to the ongoing success of WCPFC’s work; and ○ pursue the proposed enhancement work listed in Section <i>Work Plan 2023</i> in the <i>Report of the Tuna Tissue Bank Steering Committee</i> (WCPFC-SC18-2020/RP-P35b-02).
Timeframe	January – December 2027

Budget	USD 113,945
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Project 42	Pacific Tuna Tagging Programme (PTTP) – TOR to be updated (SPC)
Ongoing	Essential project – No Priority Ranking
Objectives	To assist operations and activities related with the PTTP including new tag releases, tag recovery, and preparation of the 2024 PTTP Steering Committee meeting.
Scope	Conduct elements in the work plan as identified in the Report of the PTTP Steering Committee (SC19-RP-PTTP-01), including, but not limited to: • Subject to the decision by the PTTP Advisory Committee, support for the agreed tag-release cruise(s) for conventional and archival tagging and biological sampling in the western and central equatorial Pacific during 2024, targeting the agreed tropical tuna species: ○ including the chartering of FV Soltai 105 and/or FV Gutsy Lady 4 as preferred vessels for tagging to maintain consistency with previous tagging operations in the western and central equatorial Pacific. SPC should consult with the WCPFC Science Manager on alternatives if these vessels are not available or alternate vessels are proposed. • While the exact composition of tags to be deployed will be confirmed prior to the cruise (via the PTTP Cruise Planning Advisory Committee), the design of the PTTP requires the use of the following tag types and suppliers: ○ Hallprint™ conventional tags for all tagged fish; ○ Wildlife Computers™, Vemco™ and Lotek™ tags for archival and satellite tagged marine organisms. ○ Vemco™ and Lotek™ acoustic transmitters (and receivers). SPC should consult with the WCPFC Science Manager on alternatives if these tags are not available; • Support identification of solutions for ensuring regional capability to implement tuna-tagging experiments in the longer term; • Maintain and enhance as appropriate the tag recovery network and pay tag rewards including via cash or t-shirt (or similar). Where appropriate, engage third-parties, such as WCPFC member fisheries authorities, industry associations and other fisheries service providers to act as agents for tag recovery. Third-party agents should be reimbursed for tag rewards dispensed plus any costs and expenses incurred in assisting with tag recovery; • Conduct PTTP data verification with VMS and Logbook, and cannery data; • Continue consolidation of the web-tagging database, recapture information and tagging database frameworks; • Conduct data analyses on tag reporting and seeding, fishing and natural mortality, tagging mortality, movement and tag simulation; • Facilitate conduct of PTTP Cruise Planning Advisory Committee meetings in 2023; • Support for the development and implementation of a work plan for 2024 tagging activities as outlined in the 2023 PTTP report to SC19; and • Preparation of PTTP Steering Committee meeting in conjunction with SC20 and production of the PTTP Progress Report and the 2024 Steering Committee Report.

Timeframe	January – December 2027
Budget	USD 950,000

Project 120	Updated reproductive biology of tropical tunas – to be updated (SPC) – extension of the project?
Ongoing	EU Project – No priority ranking
Objective	1. Provide updated estimates on the reproductive biology of tropical tunas in the WCPO to improve WCPFC stock assessments. 2. Establish baselines of reproductive potential for tropical tunas in the WCPO for monitoring the impacts of climate change.
Rationale	A significant challenge for WCPFC tropical tuna stocks assessments is the estimation of spawning potential. Uncertainty in estimates of the parameters used to define spawning potential can decrease the precision of spawning biomass estimates that are used to assist management decision making. Spawning potential for tropical tuna is affected by a number of intrinsic factors, including size-related, age-related, and spatial changes in: sex ratio, annual fecundity per kg (spawning fraction x batch fecundity), and egg viability. Previous studies on the reproductive biology of tropical tunas have been limited in their geographic coverage, but a compilation of these studies indicates that the parameters used to estimate spawning potential vary with longitude and latitude. The last study to examine the reproductive biology across a broad spatial range for yellowfin tuna was published in 2000 (Itano, 2000). No such study has been undertaken for bigeye or skipjack tuna in the WCPO. Spawning potential is also expected to be strongly influenced by climate change, however, without baseline estimates the ability to detect and attribute change is limited.
Assumptions	1. Gonads stored in the Pacific Marine Specimen Bank are suitable for histological analyses. 2. Gaps in geographic locations * fish size * species can be filled through additional observer and port sampling in the first year of the study.
Scope	Year 1 • QC the gonads held in the PMSB for histological analyses and identify key gaps in spatial representation. • Quantify and resolve uncertainties associated with maturation staging from frozen samples (multiple-reader quality assessment). • Sample collection to fill key gaps. • Commence histological and laboratory analyses. Year 2 • Histological and laboratory analyses. Year 3 • Updated estimates of reproductive biology.
Timeframe	2024-2026
Budget	Euro40,000 (WCPFC co-finance contribution to access Euro200,000 via the European Maritime, Fisheries and Aquaculture Fund)
Reference	SC19-SA-WP-17

Project P131	Southwest Pacific swordfish management strategy evaluation – to be updated (Australia) No priority ranking
Objectives	To develop a management strategy evaluation framework for Southwest Pacific swordfish and to develop and evaluate candidate management procedures.
Rationale	This new project scope responds to the following decisions and guidance provided by WCPFC21 in December 2024: <i>458. The Commission agreed to develop a management strategy evaluation framework to evaluate candidate management procedures for Southwest Pacific swordfish and to consider developing a Harvest Strategy. This will commence following the 2025 stock assessment and be conducted in a transparent and inclusive manner.</i> <i>459. The Commission requested in accordance with the SC’s Billfish Research Plan, Australia and the EU to develop a project scope and workplan for the consideration of SC21. That project shall be considered as a formal project of the Commission and shall be managed by the SSP and supervised by the SC. The research scope and workplan will include explicit consideration of the existence of bycatch and target fisheries with differing impacts on the stock and the need to consider the implications when developing a future Harvest Strategy for SPSWO, as well as the resources needed.</i> <i>460. The Commission noted that this should not distract from the critical work progressing the development of harvest strategies for key tuna stocks and is therefore not included in the indicative Harvest Strategy Workplan for key tuna stocks at this stage. The Commission noted that Australia and the EU are considering funding options to support this work of the Commission, and as noted in the Billfish Research Plan, no funding for this work is sought in 2025.</i>
Assumptions	• an updated stock assessment for Southwest Pacific swordfish is provided to SC21 for review. • Relevant stock assessment data and models can be provided to the research providers. • Suitable software is available to undertake MSE using stock synthesis 3 as the operating model basis (the NOAA tool “Management Strategy Evaluation for SS3 – SSMSE” may be appropriate). • Funding is made available, and research providers are available and able to undertake this work.

Scope/Plan	It is proposed that the project be managed through the Scientific Services Provider (SSP), acknowledging that the work may be commissioned to an external provider in accordance with usual SSP practice and process. It is proposed that the work to develop the 2025 SW Pacific swordfish stock assessment be used to inform the development of the operating model reference set. Additional axes of uncertainty or one-off sensitivities may be incorporated as needed (in the reference or robustness set) with a view to properly representing uncertainty but also constraining the model count for tractability. SW Pacific swordfish is taken in both targeted longline fisheries and also as an important (and generally retained) economic bycatch in longline fisheries targeting tuna. The catch level in bycatch fishery generally exceed the level in targeted fisheries. The design of candidate management procedures, and ultimately the design of the Commission management/implementing arrangements, will need to account for both of these sectors. No specific target reference point (TRP) has been adopted for SW Pacific swordfish, while noting that the WCPFC Convention requires that all WCPFC stocks should be maintained at least at levels that can produce MSY. The MSE process will serve to evaluate alternative candidate TRPs through their incorporation into alternative candidate MPs as has been the case in since 2025 for albacore and bigeye tunas. At project commencement it is proposed that candidate targets be based on a variety of biomass depletions relative to a reference period (including that which corresponds to the MSY level), pending Commission guidance. Consideration of an appropriate monitoring strategy would occur in the latter half of the project. A draft overall indicative workplan for the development of a Southwest Pacific swordfish is provided in Attachment 1. It contains a broader set of items required for developing the harvest strategy, some of which are beyond the project scope. The Commission has noted that the development of this management procedure should not distract from the critical work progressing the development of harvest strategies for key tuna stocks. Further, noting that swordfish is a byproduct for most fleets, it is desirable that the workload of the Commission and its subsidiary bodies is efficient and constrained to a reasonable level. It is also desirable that candidate MPs be simple in design, avoid excessive management intervention, and be simple to run and translate directly into management implementation. It is suggested that, subject to MSE, the MP be run in a four-year cycle in appropriate synchronisation with the stock assessment. MSE Project Plan
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	2026	Year1. Project commencement. OM Development and initial development of candidate MPs for evaluation. • Provide analysis to allow SC to consider the operating models for MSE. • Provide analysis to allow SC and Commission to consider and advise on candidate management procedures to evaluate.																											
	2027	Year 2. Evaluation of candidate MPs. • Provide analysis to allow SC to provide advice on performance of candidate management procedures. • Provide analysis to allow Commission to consider and refine a candidate set of management procedures.																											
	2028	Year 3. Adoption (finalising) of MSE operating models and provision of candidate MPs to Commission. • Provide analysis to allow SC to formally agree the operating models for MSE. • Provide analysis to allow SC to provide advice on performance of candidate management procedures. • Provide analysis to allow Commission to consider and refine a candidate set of management procedures.																											
	2029	Pending																											
	2030	Pending																											
Indicative Time frame	3-5 years starting from 2026. There is the potential for extension to support Commission decision making as needed.																												
Indicative Budget	<table><tr><td></td><td>Staffing</td><td>SC attendance</td><td>Overheads</td><td>Total USD</td></tr><tr><td>2026</td><td>\$99,000</td><td>\$6,000</td><td>\$15,750</td><td>\$120,750</td></tr><tr><td>2027</td><td>\$101,970</td><td>\$6,180</td><td>\$16,223</td><td>\$124,373</td></tr><tr><td>2028</td><td>\$104,940</td><td>\$6,365</td><td>\$16,696</td><td>\$128,001</td></tr><tr><td></td><td></td><td></td><td>TOTAL</td><td>\$373,124</td></tr></table> <i>Budget covers stock assessment scientist together with SC travel costs and SPC overheads.</i> <i>Australia, EU and French Polynesia are considering funding options to support this work. Support from other interested CCMs and fishery participants is appreciated.</i>					Staffing	SC attendance	Overheads	Total USD	2026	\$99,000	\$6,000	\$15,750	\$120,750	2027	\$101,970	\$6,180	\$16,223	\$124,373	2028	\$104,940	\$6,365	\$16,696	\$128,001				TOTAL	\$373,124
	Staffing	SC attendance	Overheads	Total USD																									
2026	\$99,000	\$6,000	\$15,750	\$120,750																									
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2028	\$104,940	\$6,365	\$16,696	\$128,001																									
			TOTAL	\$373,124																									
References	WCPFC SC21-SA-WP-05, Stock assessment of Southwest Pacific swordfish WCPFC19-2022-IP08, Catch and effort data summaries to support discussions on the new South-west Pacific SWORDFISH CMM. WCPFC19-2022-IP09, Southwest Pacific swordfish stock projections.																												

Attachment 1

Indicative Workplan for Developing a Southwest Pacific Swordfish Harvest Strategy

- This attachment provided a draft workplan developed in accordance with CMM 2022-03). It sets out a schedule of technical work and Commission decision making for the development from 2026 to 2020. The workplan is a living document and will be updated as needed to reflect actual progress as well as other needs and developments. It is acknowledged that delays in the execution of the workplan may occur, noting the complexity of developing harvest strategies for multiple species within the multilateral WCPFC environment.
- This workplan simply schedules decisions noting that it is the Commission's decision as whether they may be 'interim' in nature.
- The term "Management Procedure" is defined as a formal specification of data collection, the associated estimation model (e.g. the estimation of stock status through an analytical or empirical method) together with a Harvest Control Rule. Together these clearly define what management actions are to be made in response to changes in the stock or fishery condition.
- Note: The table below refers to the elements contained in CMM 2022-03 (a. Objectives, b. Reference Points, c. Acceptable Levels of Risk, d. Monitoring, e. Harvest Control Rules/Management Procedure and f. MSE). Items in brackets are related to harvest strategy development and so are part of the plan but are not one of these six elements.

Broader indicative Workplan for Developing a Southwest Pacific Swordfish Harvest Strategy. Note some items (in blue) are outside of the MSE project scope so will need to be progressed separately.

2025	[Scheduled SW Pacific swordfish stock assessment]
2026	SC consider the operating models for use in Management Strategy Evaluation (MSE). SC provide any advice on potential Management Procedures (MP) to evaluate. Commission consider Objectives for the management of the stock. Commission provide advice on candidate management procedures to evaluate.
2027	SC consider a set of Performance Indicators for evaluating candidate MPs. SC consider the performance of candidate MPs and provide technical advice for subsequent work. SC consider candidate Limit Reference Point or set of reference points for southwest Pacific swordfish. Commission record the set of Objectives for the management of the stock and a set of Performance Indicators for evaluating candidate MPs. Commission consider candidate TRPs to be evaluated within candidate MPs.
2028	SC formally agree the operating models for MSE. SC provide advice to the Commission on performance of candidate MPs including their associated candidate TRP. Commission consider and refine candidate set of MPs including their associated candidate TRP.

	Commission consider adopting a Limit Reference Point or set of reference points for Southwest Pacific swordfish together with acceptable levels of risk.
2029	SC provide advice to the Commission on performance of candidate management procedures. SC consider appropriate monitoring strategy elements. Commission consider adopting a MP together with required implementing arrangements. [Scheduled SW Pacific swordfish stock assessment]
2030	SC provide advice to the Commission the monitoring strategy. Commission consider adopting a MP together with required implementing arrangements.

Project 130 No cost extension	Joint bycatch assessment workshop for billfish and sharks – to be updated as needed (SPC)
Part A: Administrative Summary	
1. Project Title	Joint bycatch assessment workshop for billfish and sharks
2. Organization	<i>Submitted by the BRP</i>
3. Administrative Contact	<i>TBD - SPC</i>
4. Principal Investigator (PI) and CV	<i>TBD - SPC</i>
5. Commencement and Completion Date	<i>1 March 2026 - 31 August 2026</i>
6. Project Budget Summary	<i>Overview of major cost categories:</i> ○ Costs for invited experts and facilitator - \$50,000 ○ Travel to SC22 \$10,000 ○ Operating Costs (e.g., equipment, supplies) - NA ○ Other Costs (e.g., sub-contracts, dissemination) - NA
Part B: Project Proposal Description	
1. Project Title	<i>As above</i>
2. Background and Need	<i>See Rationale</i>
3. Objectives and Benefits	<i>See scope of work</i>
4. Note	<i>NA</i>
5. Rationale	<i>The BRP and the SRP have both highlighted the need for a workshop to standardise and find the most appropriate stock assessment model types to evaluate bycatch billfish shark stocks. Furthermore, for low information stocks some guidance would be useful for outputs for fishery characterisations.</i> The BRP suggested that Stock assessment project 6 be repurposed as a ToR for a stock assessment methods workshop. Given the difficulty in running billfish assessments the BRP indicated that there would be

	value in conducting a review of stock assessment methods for billfish. This should include low and high information stocks as well as multi-model approaches (low and high information for the same stock) and Bayesian assessment methods as is done in the shark assessments. This would preferably be done as an in-person workshop and would benefit from including people who have successfully completed this type of approach for sharks. The review should be Pacific wide and include participation from IATTC and ISC. There would be most value in having the workshop as a joint bycatch assessment workshop for billfish and sharks. The focus should be pan-Pacific but could also invite experts from other tuna RFMOs.
6. Assumptions	<i>Personnel are available to undertake this work. A venue can be found to host the workshop.</i>
7. Scope of Work	<i>1. Host a workshop to assess the best approaches for assessing lower information bycatch species.</i> <i>2. Invite experts who have undertaken successful stock assessments of billfish and sharks, and those involved in the assessment of these stocks in other RFMOs particularly the IATTC.</i> <i>3. Review assessments that are considered to be successful for billfish and sharks in tuna RFMOs, including CKMR possibilities.</i> <i>4. Evaluate successes and failures.</i> <i>5. Recommend assessment methods for bycatch billfish and sharks.</i> <i>6. Summarise the best practice for these assessments and list potential reference points for reporting stock status for these species.</i> <i>7. Note that not all stocks would have the same level of information available to them and as such a tiered approach based on the certainty of the data available for the assessment may be required.</i> <i>8. Include low information characterisations and provide information as to what information would be useful for inclusion in these fishery characterisations.</i> <i>9. Provide input to the stock assessment schedule including any commentary on aligning north and south Pacific assessments.</i>
8. Activity Schedule	<i>Identify experts and venue (March 2026)</i> <i>Run the workshop (April/May 2026)</i> <i>Compile the report and submit to SC22 (June/July 2026)</i>
9. Project Outcomes	<i>Report document and presentation to SC22.</i>
10. Forms of Results	<i>Report document and presentation to SC22.</i>
11. Methods	<i>TBD</i>
12. Data Management Plan / Data Sets Required	<i>NA</i>
13. Other Related Projects	<i>NA</i>
14. Collaborations	<i>TBD</i>
15. Project Staff and CVs	<i>TBD</i>
16. Risks of Project Not	<i>Not all experts may be available for the workshop.</i>

Achieving Objectives	
17. Timeframe	<i>As above</i>
18. Budget	<i>As above</i>
19. References	SC21-SA-IP-17 SC21-SA-IP-18

Priority Ranking Required

Project 100d	Application of CKMR methods to SP albacore and cost-benefit evaluation and prioritisation of CKMR to WCPFC stocks (tuna, billfish, sharks) – to be updated for extension (SPC)		
Ongoing	Priority ranking		
Part A	Administrative Summary		
Project Title	Application of close-kin-mark-recapture methods to South Pacific albacore and Cost-benefit evaluation and prioritisation of close-kin-mark-recapture to WCPFC stocks (tuna, billfish, sharks)		
Organization	Pacific Community		
Administrative Contact	Dr Graham Pilling (Deputy Director, Fisheries Aquaculture and Marie Ecosystems Division, grahamp@spc.int)		
Principal Investigator	Dr Giulia Anderon (SPC), Dr Pierre Feutry (CSIRO)		
Commencement and Completion Date	1 January 2026 – 30 November 2027		
Project Budget Summary (USD)			
	WCPFC	Co-finance	Total
Salaries	100,000	280,000	380,000
Travel		20,000	20,000
Operating Costs	30,000	195,000	225,000
Other Costs	370,000	855,000	1,225,000
Total	500,000	1,350,000	1,850,000
Part B	Project Proposal Description		
Project Title	Project 100c (continued) (i) Application of close-kin-mark-recapture methods to south Pacific albacore (ii) Cost-benefit evaluation and prioritisation of close-kin-mark-recapture to WCPFC stocks (tuna, billfish, sharks)		
Background and Need	Project 100c (P100c) established the foundations for the application of Close-Kin-Mark-Recapture to WCPFC stocks with a focus on south Pacific Albacore (see SA-WP-09).		

	(i) P100c demonstrated that the logistics of sample collection and identification of kin are feasible for applying CKMR to this species. This continuance of the P100c will provide the CKMR estimates for the next south Pacific albacore assessment (scheduled for 2027). (ii) Following discussions at SC21, a second activity of this continuance to P100c will be to provide WCPFC with a detailed cost-benefit evaluation of CKMR application for WCPFC stocks (tuna, billfish, sharks) that will guide future SC discussion on which species, when and approximate costs associated with its application to each species.
Objectives	Provide CKMR estimated demographic parameters for use in the 2027 south Pacific Albacore stock assessment. Provide guidance to WCPFC-SC on future CKMR applications to WCPFC stocks.
Note	There are no caveats for WCPFC to consider
Rationale	(i) The foundation work for south Pacific albacore has been completed allowing for a straightforward application for South Pacific albacore. (ii) The assessments for WCPFC stocks, plus the design studies (P117,P118, P125,P126) provide sufficient information on the number of samples likely required, logistics of sampling together with the findings of P100c allows for an evaluation of the cost-benefits of CKMR application for each WCPFC stock.
Assumptions	(i) The capacity for sample collection established in P100c is maintained. Co-finance contributions to the proposal require a contribution by WCPFC. (ii) CKMR remains an approach WCPFC considers applicable to reducing uncertainty in stock assessment outputs
Scope of Work	(i) A further 50,000 tissue samples of south Pacific albacore are required to meet the 84,000 maximum estimated by SC20-SA-IP-24. Genotyping of up to 69,000 samples is required to identify the number of kin for CKMR estimation with a CV of 15% (ie . 15,000 have already been genotyped by P100c). Bioinformatics for the genotyped samples is required to identify kin which will then be embedded into a population dynamics model and used to estimate absolute adult abundance, mortality rates, and connectivity. The CKMR population dynamics model will need to be adapted to fit the life-history of south Pacific albacore. The genotyping will also allow conformation of the number of genetic groups (see SC21-SA-10). (ii) The second part of P100c continuance requires a desktop evaluation of future potential CKMR application. The study will draw on the global experience to provide WCPFC-SC with a guide on the approximate number of samples that need to be collected per WCPFC stock, the number of years of collection needed to obtain a first estimate, the logistical issues with

	collection, any genomic assay development needed, and expected costs to achieve the first estimate and then subsequent estimates.		
Activity Schedule	2026		2027
	January-March	- Collection of 50,000 samples - Confirmation of Genetic Groups - Evaluation of CKMR priorities	- Sequencing of remaining 35500 samples (or less depending on number of kin previously identified) - Kin Bioinformatics - CKMR demographic parameter estimates
	April-June	- Sequencing of 35,500 samples - Kin bioinformatics - SC22 review of CKMR data - SC22 review on future CKMR priorities	(April) Delivery of final CKMR derived estimates for the stock assessment
	July-September	Preparation of SP Alb CKMR model	SC23 Review
	October-December	- Collection of remaining 21,000 samples - Testing of SP Alb CKMR model	Final Report to WCPFC Secretariat
Project Outcomes	(i) CKMR population estimate of absolute adult abundance, mortality rates, and connectivity for application in the 2027 south Pacific albacore stock status assessment (ii) Provide SC22 with a document to guide its discussion on CKMR applications to wider WCPFC stocks.		
Forms of Results	(i) Dataset, parameter estimates, SC presentation (ii) Report, SC presentation		
Methods	(i) dataset (ii) Report		
Data Management Plan / Data Sets Required	(i) No specific data requests. Datasets produced will be stored by the SSP for WCPFC application (ii) No data requests		
Other Related Projects	WCPFC Stock Assessments		
Collaborations	SSP, CSIRO		

Project Staff and CVs	SSP and CSIRO technical experts																																																						
Risks of Project Not Achieving Objectives	2027 south Pacific albacore does not include CKMR derived data or priors to inform population scale																																																						
Timeframe	The key outputs of the assignment will be: • Submission of a progress report to the WCPFC Secretariat for review at SC22 and SC23 by 30 days prior to the start of each SC meetings; • Presentation of the progress report to SC22 and SC23 (no travel cost required for the contractors’ presentation); • Submission of the final project report to the WCPFC Secretariat by 30 November 2027.																																																						
Budget	<table><tr><td>Yr 2026</td><td></td><td></td><td></td></tr><tr><td></td><td>WCPFC</td><td>Co-finance</td><td>Total</td></tr><tr><td>Salaries</td><td>50,000</td><td>190,000</td><td>240,000</td></tr><tr><td>Travel</td><td></td><td>10,000</td><td>10,000</td></tr><tr><td>Operating Costs</td><td>10,000</td><td>120,000</td><td>130,000</td></tr><tr><td>Other Costs</td><td>190,000</td><td>480,000</td><td>670,000</td></tr><tr><td>Yr 2027</td><td></td><td></td><td></td></tr><tr><td>Salaries</td><td>50,000</td><td>90,000</td><td>140,000</td></tr><tr><td>Travel</td><td></td><td>10,000</td><td>10,000</td></tr><tr><td>Operating Costs</td><td>20,000</td><td>75,000</td><td>95,000</td></tr><tr><td>Other Costs</td><td>180,000</td><td>375,000</td><td>555,000</td></tr><tr><td>Total</td><td></td><td></td><td></td></tr><tr><td></td><td>500,000</td><td>1,350,000</td><td>1,850,000</td></tr></table>			Yr 2026					WCPFC	Co-finance	Total	Salaries	50,000	190,000	240,000	Travel		10,000	10,000	Operating Costs	10,000	120,000	130,000	Other Costs	190,000	480,000	670,000	Yr 2027				Salaries	50,000	90,000	140,000	Travel		10,000	10,000	Operating Costs	20,000	75,000	95,000	Other Costs	180,000	375,000	555,000	Total					500,000	1,350,000	1,850,000
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References	Bravington, M.V., Skaug, H.J. and Anderson, E.C. (2016). Close-Kin Mark-Recapture. Statistical Science 2016, Vol. 31(2), 259–274. DOI: 10.1214/16-STS5522. SC21-SA-WP-09. Project 100c: Progress towards a Close-Kin-Mark-Recapture application to South Pacific Albacore																																																						

Project 121	Ecosystem and Climate Indicators – to be updated for extension (SPC)
Ongoing	Priority Ranking

Objectives	• Develop and test candidate ecosystem and climate indicators to track the impact of climate and ecosystem changes on WCPFC fisheries and ecosystems. • Provide technical advice to the Scientific Committee on the suitability of criteria used for testing and evaluating the performance of candidate indicators. • Support the Scientific Committee in developing tools to communicate ecosystem and climate change impacts to WCPFC and external stakeholders and interest group.
Note	
Rationale	Fisheries management decisions are, at their simplest, informed risk management. Data describing fisheries are collected. Scientists, economists, compliance analysts, and the like derive information from the data and bring their respective knowledge to bear to put that in front of fisheries managers. Those managers are then able to use that knowledge and make decisions which minimise risk – on many issues including for example stock sustainability, the population status of species of special interest, and fishers’ incomes. In stock assessment we are constantly striving – through obtaining better data, developing a greater understanding of the ecology of the target species, and improving our modelling approaches – to develop greater precision as to stock status and at the same time reduce the biases in our predictions of stock status. With greater precision we are able to both better specify the range of plausible outcomes resulting from decisions, and reduce the risk in those decisions. But tuna do not live in isolation from the ecosystem which supports them. At its simplest, if the system in which they live is sick, the tuna population cannot thrive despite the wisest decisions based on single-species stock assessment. To make truly wise decisions we need to consider the ecosystem with the stock. Even in their simplest implementation ecosystem indicators should enable more precise specification of the range of decisions leading to desired or effective outcomes, and reduce the risk of bad outcomes from those decisions through better understanding of the cause of potential stock assessment biases. Especially for the longer-lived tunas, ecosystem indicators should increasingly provide early warning of when issues may arise. Such forecasts allow time for management response in near real-time rather than trying to catch up years later. This will be particularly important as we move to making decisions in a Harvest Strategy framework and detecting when climate and ecosystem changes fall outside the ranges of uncertainty against which a management procedure was tested, and whether broader ecosystem objectives are being met. WCPFC has already recognised the importance of preparing the region to adapt to the emerging impacts of climate change (see Resolution 2019-01 “Resolution on Climate Change as it relates to the Western and Central Pacific Fisheries Commission”). Well-designed climate indicators should provide information on the pace at which physical properties of the WCPO are approaching climate change-induced tipping points. This will not only be important for adapting the region’s tuna fisheries to the impacts of climate change but also provide necessary information for WCPFC members to voice the impact of climate change on tuna fisheries at global forums such as UNFCCC. In addition to the role that ecosystem and climate indicators play in assisting with the formulation of management advice and decisions, they can also be effective in communicating information within WCPFC’s membership and to external stakeholders and interest groups.

Assumptions	- WCPFC and the Scientific Committee continue to require the development of ecosystem and climate indicators. - External funds remain available to support the development, testing and analyses of ecosystem and climate indicators.					
Scope	- Technical analyses to develop and test candidate indicators. - WCPFC member and expert workshops to refine indicators. - Scientific Committee Reporting. - Routine preparation of adopted indicators - Development of tools for communication to WCPFC and wider stakeholders					
Activities	Task	Activity	Schedule			
			SC20	SC21	SC22	SC23
	Initial screening of candidate indicators	Apply criteria endorsed at SC12 to candidate indicators that are relevant for monitoring impacts on purse seine and long-line fisheries and tuna species productivity				
	Test candidate indicators	Fully develop methodology for developing and testing candidate indicators				
		Test candidate indicators				
		Expert Workshop				
		Adoption Workshop				
	Indicator validation	SC review and evaluation that adopted				
	Communication tools	Report cards				
		Dashboards				
		TFAR1				
Timeframe	A timeframe of five-years is proposed for this project, after which preparation of adopted indicators should be regularised into the work of the Scientific Committee or an alternative approach will need to be considered to progress the work (if minimal progress has been achieved).					
Budget	This is a no-cost project for 2023. Any budgetary support required by the SSP or members beyond 2023 is subject to approval once specific workplans and proposal are reviewed and prioritised by the Scientific Committee. A budget of US\$20,000 per year is required for 2024 and 2025 to support participation in workshops by WCPFC experts. A further budget of US\$15,000 per year is required for 2026 and 2027 to support SSP work to validate adopted indicators and support communication tools.					
References	SC19-EB-WP-01					

Project 123	Project 123: Scoping the Next Generation of Tuna Stock Assessment Software, year 3 – to be updated for the 2nd phase (SPC)
Ongoing	Priority ranking
Part A: Administrative Summary	

¹ Tuna Fisheries Assessment Report

1. Project Title	Project 123: Scoping the Next Generation of Tuna Stock Assessment Software, year 3.										
2. Organization	SPC										
3. Administrative Contact	Paul Hamer <paulh@spc.int>										
4. Principal Investigator (PI) and CV	Arni Magnusson <arnim@spc.int>										
5. Commencement and Completion Date	Project 123, year 3: From 1 January to 31 December 2026 Project 123 commenced in Feb 2024										
6. Project Budget Summary	<u>Salaries</u> Consultant to support/advise on the initial design phase of SPC-IATTC tuna assessment software development: 20 K USD Consultant(s) at the Technical University of Denmark (DTU) to apply the spatio-temporal model to analyze WCPO skipjack tagging data to produce abundance indices: 15 K USD SPC staff time and project management, steering group facilitation 15K USD <u>Total</u> 50 K USD This TOR would require a budget of 50 K USD from the Commission. <table border="1"> <thead> <tr> <th>Component</th><th>Cost (USD)</th></tr> </thead> <tbody> <tr> <td>SPC-IATTC new assessment software design phase work</td><td>20 K</td></tr> <tr> <td>Analyze WCPO skipjack tags</td><td>15 K</td></tr> <tr> <td>SPC staff and management</td><td>15 K</td></tr> <tr> <td>Total</td><td>50 K</td></tr> </tbody> </table>	Component	Cost (USD)	SPC-IATTC new assessment software design phase work	20 K	Analyze WCPO skipjack tags	15 K	SPC staff and management	15 K	Total	50 K
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SPC-IATTC new assessment software design phase work	20 K										
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SPC staff and management	15 K										
Total	50 K										

Part B: Project Proposal Description

1. Project Title	Scoping the Next Generation of Tuna Stock Assessment Software
2. Background and Need	Following the retirement of the lead developer of MULTIFAN-CL (MFCL), Dave Fournier, future advances to the MFCL software are not expected to deliver the same pace of innovation as they were in the past. Additionally, MFCL lacks some core functionality identified as desirable in modern stock assessment models. While this does not render MFCL obsolete in the medium term, it flags the need to plan and identify whether alternative existing software exists, or new software must be developed in the longer term, to continue to support the specificities and future requirements of WCPFC tuna stock assessments.
3. Objectives and Benefits	Ensure that WCPFC stock assessments are of the highest possible quality of science, forming the basis of advice for sustainable management of tuna, billfish, and shark stocks.
4. Note	The scoping project was launched in 2024, scheduled to run from 1 February 2024 to 31 December 2026. Progress is on track and this current proposal is for the last year of the scoping project, 2026. A larger development project is anticipated to be launched in 2027, with an initial design phase in 2026, along with the beginning of software coding depending on resources. This development project would be described in more detail with a full development plan and costing provided to SC22.

5. Rationale	Over the next 5 years there is a need to transition from MFCL to alternative software that can provide similar and, importantly, enhanced capabilities for stock assessment of tuna into the future. Project 123 is a scoping phase with the main objective to provide the pathway and plan to achieve this outcome. Project 123 has three years of funding allocated (50K US/year), and the TORs for each successive year of funds are discussed at SC and supported through the Informal Small Group (ISG) discussions. At SC21 the ISG supported two key development work streams to be the focused in 2026, (1) SPC-IATTC new tuna assessment software and (2) DTU spatio-temporal analysis of tagging data. The scientists leading the initial design of the SPC-IATTC tuna assessment software (Mark Maunder, IATTC, and Arni Magnusson, SPC) and the application of the DTU spatio-temporal model (Tobias Mildenberger and Anders Nielsen, DTU) are widely recognized for their high-impact contributions in fisheries science and fisheries analysis software development. SPC has been engaging with IATTC and DTU over the last several years of this project. It seems likely that the management of many tuna stocks around the world could benefit from a dedicated software development project to build a new tuna targeted assessment package based on RTMB (this was clearly expressed at the ISG for this project at SC21) drawing from these initiatives and the many features in pre-existing software packages, such as MFCL and Stock Synthesis, both of which the development is being scaled back and will soon cease altogether.
6. Assumptions	IATTC will commit staff time in 2026, but unlikely to have access to funding at this stage. Their staff time is assumed to be sufficient, especially from Mark Maunder who will take a key role in advising on the initial design needs, and take a long-term role in the steering group of the subsequent development project. Staff at DTU will be able to successfully complete the required tag analysis. SPC project staff have sufficient time to continue to manage the project in 2026. A suitable consultant can be sourced to provide external expert advice on software development design.
7. Scope of Work	The work on the SPC-IATTC tuna software development will focus on the initial software development design, following the outcomes from the CAPAM online workshop in December 2025. This initial design work is expected to deliver functional prototype components (core model objects) containing the population, observed data, and model predictions, depending on resources and the outcomes of the December workshop. A software repository containing source code, examples, and documentation, describing the functional prototype components of the software project will be produced in 2026. The work on the analysis of WCPO skipjack tagging data will focus on producing abundance indices and a corresponding write-up of the methods, results and utility for stock assessments. The deliverables will

	be a repository containing the analysis and a short technical report describing the analysis for SC22. A proposal will be developed for SC22 describing the next phase of work.																																												
8. Activity Schedule	<table><tr><th rowspan="2">Activity</th><th colspan="4">2026</th></tr><tr><th>Q1</th><th>Q2</th><th>Q3</th><th>Q4</th></tr><tr><td>SPC-IATTC work on software development design</td><td>x</td><td>x</td><td>x</td><td>x</td></tr><tr><td>SPC-IATTC status update for SC22</td><td></td><td></td><td>x</td><td></td></tr><tr><td>SPC-IATTC 2026 deliverables (see 7)</td><td></td><td></td><td></td><td>x</td></tr><tr><td>DTU spatio-temporal tagging analysis</td><td>x</td><td>x</td><td>x</td><td>x</td></tr><tr><td>DTU status update for SC22</td><td></td><td></td><td>x</td><td></td></tr><tr><td>DTU 2026 deliverables (see 7)</td><td></td><td></td><td></td><td>x</td></tr><tr><td>Development project proposal for SC22</td><td>x</td><td>x</td><td></td><td></td></tr></table>	Activity	2026				Q1	Q2	Q3	Q4	SPC-IATTC work on software development design	x	x	x	x	SPC-IATTC status update for SC22			x		SPC-IATTC 2026 deliverables (see 7)				x	DTU spatio-temporal tagging analysis	x	x	x	x	DTU status update for SC22			x		DTU 2026 deliverables (see 7)				x	Development project proposal for SC22	x	x		
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DTU 2026 deliverables (see 7)				x																																									
Development project proposal for SC22	x	x																																											
9. Project Outcomes	By the end of 2026, the SPC-IATTC software project will have initiated code development and have a well-defined design plan, allowing SPC-IATTC scientists start exploring examples and understand the early design and structure of model objects. Software development will continue in 2027. It is difficult to set a timeline for the completion of a prototype model with key desired feature, but the modularized approach will be design to allow additional functionality to be added over time. By the end of 2026, the DTU analysis of tagging data will have calculated abundance indices for WCPO skipjack and a write-up describing the analysis and guidance to application in stock assessment. Further refinements of the abundance indices might continue in 2027 if needed. The analytical scripts should be reproducible, allowing SPC scientists to rerun the DTU analysis. Ideally, SPC scientists will be able to understand the analytical method well enough to be able to analyze new data as they become available. A proposal for the next phase of work will be developed and presented to SC22.																																												
10. Forms of Results	Results will be presented to SC22 as a Working Paper. A final project report will be provided to the WCPFC Secretariat by December 2026. A proposal for the next phase of work will be developed for consideration at SC22.																																												
11. Methods	The results will have the form of written reports and presentations at SC (see item 10), as well as GitHub repositories containing the SPC-IATTC software and DTU analyses.																																												
12. Data Management Plan / Data Sets Required	The SPC-IATTC tuna software development will require examples of the data used in WCPFC tuna assessments. The TAF repository for YFT 2023, for example, demonstrates all the data types required for the early software development: catches, CPUE, length comps, weight comps, otoliths, and tagging data. TAF repositories from previous assessments are already online and available. Additionally, simulated datasets from																																												

	the Indian Ocean YFT study (Goethel et al. 2024) can be used as a basis for the SPC-IATTC software development, especially for evaluating the estimation performance of the statistical methods. The DTU tagging analysis requires WCPO skipjack tagging data, environmental variables, and back-calculated effort data from the CPUE analysis. SPC scientists provided the DTU team with tagging data and environmental variables at the May 2025 workshop in Copenhagen, which will be updated for the 2026 tagging analysis. The back-calculated effort from the CPUE analysis has not been calculated yet, but will be done by SPC scientists. The primary objective of the DTU tagging analysis is on WCPO SKJ tagging data and the assessment due in 2028, but the simulated datasets from the Indian Ocean YFT study (Goethel et al. 2024) can be used as a basis for evaluating the performance of the DTU spatio-temporal model to estimate temporal stock trends from tagging data. Data will be stored in GitHub repositories (small to medium size data), GitHub release assets (large data), or other data repositories (very large data).
13. Other Related Projects	The 2026 work will be conducted using the budget of the P123 scoping project. If additional funds are sourced from external sources this could facilitate greater progress in developing the SPC-IATTC tuna model in 2026, and potential development of an operating model/data generator against which to test performance of the new tuna model as it is developed and refined. Full development work is expected to be conducted in a software development project with a larger budget. A project proposal for the software development project (2027-2030) will be submitted to SC22.
14. Collaborations	The SPC-IATTC tuna model development is based on collaboration with IATTC, with Mark Maunder in a strategic and technical lead role, along with Arni Magnussons and Nick Davies (SPC), along with selected partners and consultants to design the model. The DTU tagging analysis is based on collaboration with the Technical University of Denmark (DTU), where Tobias Mildenberger and Anders Nielsen are the lead authors and conduct most of the work. The United States will provide technical contributions to the SPC-IATTC software development stream, including the development of a simulation testing framework to evaluate model performance.
15. Project Staff and CVs	SPC: Arni Magnusson and Nick Davies coordinate and contribute to the work. Paul Hamer and Graham Pilling provide guidance, oversight and support. IATTC: Mark Mauder, others to be determined
16. Risks of Project Not Achieving Objectives	Risk is low (technical work is achievable) but does depend on suitable funding for the full development phase (2027 onwards). If project objectives turn out to be infeasible or cost-prohibitive (unlikely), other development options will be identified and pursued to meet the overriding objective.

17. Timeframe	The steering group will develop a realistic time frame in discussion with consultants. However, an expected time frame for completion on a new prototype tuna assessment model would be within 5 years. The current TORs is specifically for work in 2026.										
18. Budget	This TOR would require a budget of 50 K USD from the Commission. <table> <tr> <th>Component</th><th>Cost (USD)</th></tr> <tr> <td>SPC-IATTC new assessment software design phase work</td><td>20 K</td></tr> <tr> <td>Analyze WCPO skipjack tags</td><td>15 K</td></tr> <tr> <td>SPC staff and management</td><td>15 K</td></tr> <tr> <td>Total</td><td>50 K</td></tr> </table>	Component	Cost (USD)	SPC-IATTC new assessment software design phase work	20 K	Analyze WCPO skipjack tags	15 K	SPC staff and management	15 K	Total	50 K
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19. References	<u>SPC-IATTC tuna software</u> Magnusson, A., N. Davies, G. Pilling, and P. Hamer. 2025. Scoping the next generation of tuna stock assessment software: Progress report (Project 123). WCPFC-SC21-2025/SA-WP-01. <u>DTU tagging analysis</u> Mildenberger, T., A. Nielsen, and M. Maunder. 2024. A spatiotemporal Petersen-type model for skipjack in the EPO. IATTC Doc. SAC-15 INF-G. <u>Indian Ocean simulation study</u> Goethel, D.R. et al. 2024. 'Drivin' with your eyes closed': Results from an international, blinded simulation experiment to evaluate spatial stock assessments. Fish and Fisheries 25:471-490. https://doi.org/10.1111/faf.12819 <u>Scoping project website</u> https://github.com/PacificCommunity/ofp-sam-transition-plan										

Project P125	Biology of South Pacific striped marlin, blue marlin, black marlin, shortbill spearfish and sailfish in the WCPO from longline fisheries – to be updated for extension (SPC)
Ongoing	Priority ranking
Objectives	Collect biological samples from billfish in the WCPO and analyse them to get estimates for growth and maturity.
Notes	At SC19 heads of delegations were surveyed SC19 survey respondents were asked to rank projects within the Billfish Research Plan (BRP) this work was given a high priority within the BRP.
Rationale	Collect samples (fin spines and otoliths, maturity stages) and then undertake age growth and reproductive analyses to improve growth and maturity parameters to inform productivity rates of this species. Length-weight and length-length conversion factor data collection for billfish to improve conversion factor information across all five species.
Assumptions	Observers can be trained and deployed to collect these data in the relevant areas, noting the difficulty in extraction of otoliths from billfish.

	Materials can be sent back to SPC for analysis.
Scope	Use the results from SC20-SA-IP-13 to plan the spatio-temporal data collection. Ensure that data collection is stratified across the WCPO and cover all sex and size classes for each species. Collect fin spines, otoliths, maturity stages information from billfish. Collect length-weight and length-length conversion factor data for all billfish. Undertake age and growth and reproductive analyses to inform productivity rates of this species. Present annual updates to the SC in 2025, 2026 and 2027; and a final report in 2028.
Timeframe	2025-2028
Budget	USD 40,000
References	SC20-SA-IP-13

Project P128a	Initial analyses to support investigations of the connectivity of key tuna species between the Western Pacific and East Asia (WPEA) region and the broader WCPFC-CA – TOR is updated (CSIRO, Indonesia, Philippines, Vietnam, and SPC)								
Ongoing	Priority ranking								
Part A: Administrative Summary									
1. Project Title	Initial analyses to support investigations of the connectivity of key tuna species between the Western Pacific and East Asia (WPEA) region and broader WCPFC-CA								
2. Organization	CSIRO, Indonesia, Philippines, Vietnam, SPC								
3. Administrative Contact	Bradley Moore, Senior Research Scientist, CSIRO bradley.moore@csiro.au Ph +61 3 6232 5222 Jessica Farley, Research Group Leader, CSIRO Jessica.farley@csiro.au Ph +61 3 6232 5189								
4. Principal Investigator (PI) and CV	CSIRO								
5. Commencement and Completion Date	30 January 2027 – 30 December 2027								
6. Project Budget Summary	This TOR would require a budget of 125k USD from the Commission. <table><tr><th>Component</th><th>Cost (USD)</th></tr><tr><td>Stock assessment modelling</td><td>\$10,000</td></tr><tr><td>Low Coverage Whole Genome Sequencing and analysis</td><td>\$90,000</td></tr><tr><td>Stakeholder workshop¹</td><td>\$25,000</td></tr></table> ¹ Budgeted as an in-person, 3-day workshop occurring in Australia with two participants from each of IDN, PHL, VNM, and SPC attending.	Component	Cost (USD)	Stock assessment modelling	\$10,000	Low Coverage Whole Genome Sequencing and analysis	\$90,000	Stakeholder workshop ¹	\$25,000
Component	Cost (USD)								
Stock assessment modelling	\$10,000								
Low Coverage Whole Genome Sequencing and analysis	\$90,000								
Stakeholder workshop ¹	\$25,000								
Part B: Project Proposal Description									

1. Project Title	Initial analyses to support investigations of the connectivity of key tuna species between the Western Pacific and East Asia (WPEA) region and broader WCPFC-CA.
2. Background and Need	The WPEA region supports valuable fisheries for skipjack tuna (<i>Katsuwonus pelamis</i>; SKJ) and yellowfin tuna (<i>Thunnus albacares</i>; YFT), collectively accounting for over 30% of the annual catch of tuna species in the WCPFC-CA. These fisheries are assumed to form part of a larger Western and Central Pacific Ocean (WCPO) stock for assessment and management purposes. However, evidence suggests SKJ and YFT in at least some areas of the WPEA region may represent separate demographic stocks from those in the broader WCPO (see Proctor et al. 2019, Moore et al. 2020, Hamer et al. 2023). Dedicated studies are required to address this hypothesis. In 2025, WCPFC Project 128 (SC21-SA-WP-13) presented a Terms of Reference to SC21 for a project designed to improve understanding of connectivity of the SKJ and YFT stocks between the WPEA region and the broader WCPFC Convention Area (WCPFC-CA) using a novel genetics approach – Low Coverage Whole Genome Sequencing (LCWGS). SC21-SA-WP-13 recommended that before embarking on a costly field sampling project, preliminary analyses should be undertaken to 1) understand the influence of different connectivity scenarios between the WPEA region and the broader WCPFC-CA under the current stock assessment framework and resulting management advice for SKJ and YFT in the WCPO, and 2) assess the feasibility of using the proposed genetics approach for detecting connectivity based on existing samples (including sample size and analytical requirements) to ensure the suggested sampling program is robust.
3. Objectives and Benefits	The aim of this project is to undertake analyses to: 1) understand the influence of different connectivity scenarios for YFT, and possibly SKJ, between the WPEA region and the broader WCPFC-CA on regional stock assessments in the WCPO and 2) assess the feasibility of using a novel genomic approach – Low Coverage Whole Genome Sequencing (LCWGS) – for assessing connectivity (including minimum sample size and analytical requirements). The specific objectives are to: i. Undertake modelling to assess the impact of different connectivity assumptions between the WPEA region and broader WCPFC-CA on the results of regional stock assessments for YFT (and possibly SKJ). ii. Undertake a preliminary examination of the utility and sample size requirements of using LCWGS for investigating connectivity of YFT as a test species within the WPEA region and adjacent waters using existing genetic samples.
4. Note	This proposed TOR is a recommendation from WCPFC Project 128: Understanding connectivity of key tuna species in the Western Pacific and East Asia region with the WCPFC-CA (see SC21-SA-WP-13; https://meetings.wcpfc.int/node/26654).

5. Rationale	The waters of the WPEA region, i.e. those surrounding Indonesia, Philippines, and Vietnam, support valuable fisheries for SKJ and YFT. Millions of people in coastal communities across Indonesia, Philippines, and Vietnam are involved with tuna fisheries for food security, a source of employment and livelihood, or social endeavours (McDonald 2021). Collectively, catches from the three countries represent around 30% of the annual catches of key tuna species in the WCPO, including 40% of the total YFT catch (McDonald 2021). However, a lack of understanding of the degree of connectivity between the WPEA region and broader WCPFC-CA has been highlighted as a key area of uncertainty in WCPO stock assessments for several years. At present, YFT and SKJ in the WCPO are considered to represent single biological stocks for assessment and management purposes (Castillo Jordán et al 2022; Magnusson et al. 2023). However, there is some evidence to suggest YFT, SKJ and BET in at least some areas of the WPEA region may exhibit more spatial structure than is currently assumed. Differences in genetic markers have been observed between YFT and BET from within Indonesia's archipelagic waters and the adjacent WCPO (Proctor et al. 2019), suggesting long-term reproductive isolation. Biological differences between Indonesia/Philippines and the broader WCPO have also been reported (Itano 2000, Farley et al. 2018), suggesting populations in these regions are demographically disconnected. Tagging data from the WCPO, largely restricted to smaller fish, indicate that while individual SKJ and YFT are capable of long-range movement, most individuals are generally recaptured within the region in which they were initially tagged (Moore et al. 2020a). An improved understanding of connectivity among the WPEA region and the broader WCPO would greatly help to reduce uncertainty in WCPO stock assessments and resulting management advice, including the development and testing of management procedures for harvest strategies. Such knowledge would also help to further develop spatial management and harvest strategies in each of the three WPEA countries and address open questions on whether collaborative management among them is required. An improved understanding of connectivity would also help to improve modelling work designed to estimate the impacts of climate change on tuna ecology and distribution in the WCPO and better inform the design of studies planned to mitigate the impacts of climate change on tuna stocks. The proposed analyses constitute the necessary first steps recommended by SC21-SA-WP-13 to support further proposal development and external funding acquisition for work on connectivity of key tuna species in the WPEA region with the WCPFC-CA, including: 1) understanding the influence of different connectivity scenarios on regional stock assessments; 2) examining of the feasibility of LCWGS as an approach for assessing connectivity in Pacific tuna species, including
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	refinement of minimum sample size requirements for genetic analyses and the resulting cost estimates involved with sample processing.																																												
6. Assumptions	Personnel are available to undertake this work.																																												
7. Scope of Work	The proposed activities include: (i) Modelling to assess the impact of different connectivity hypotheses on the results of the regional YFT (and potentially SKJ) stock assessments and subsequent management advice. (ii) LCWGS sequencing and analysis of resulting data from a subset of existing YFT samples, collected at key locations during ACIAR project FIS/2009/059, using LCWGS (up to 50 samples from each of Maldives, Palabuhanratu (IDN), Kendari (IDN), Ambon (IDN), Bitung (IDN), Jayapura (IDN), and Noro (SLB)). (iii) An in-person stakeholder workshop involving participants from each of IDN, PHL, VNM, SPC, and CSIRO to discuss results of (i) and (ii) above and progress full project proposal development. (iv) Preparation and presentation of project results to SC23 in the form of a Working Paper and presentation, and submission of a final report to the WCPFC Secretariat.																																												
8. Activity Schedule	<table><tr><th rowspan="2">Activity</th><th colspan="4">2027</th></tr><tr><th>Q1</th><th>Q2</th><th>Q3</th><th>Q4</th></tr><tr><td>i. Stock assessment modelling</td><td></td><td></td><td></td><td></td></tr><tr><td>ii. Low Coverage Whole Genome Sequencing trials</td><td></td><td></td><td></td><td></td></tr><tr><td> a. Processing of samples</td><td></td><td></td><td></td><td></td></tr><tr><td> b. Analysis</td><td></td><td></td><td></td><td></td></tr><tr><td>iii. In-person workshop</td><td></td><td></td><td></td><td></td></tr><tr><td>iv. Presentation of project results to SC23</td><td></td><td></td><td></td><td></td></tr><tr><td>v. Final report to WCPFC Secretariat</td><td></td><td></td><td></td><td></td></tr></table>	Activity	2027				Q1	Q2	Q3	Q4	i. Stock assessment modelling					ii. Low Coverage Whole Genome Sequencing trials					a. Processing of samples					b. Analysis					iii. In-person workshop					iv. Presentation of project results to SC23					v. Final report to WCPFC Secretariat				
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9. Project Outcomes	The expected outputs from this work will be a Working Paper and presentation to SC23, with a final report delivered to the WCPFC Secretariat. The expected outcomes from this project are: 1. Improved understanding of the impact of different connectivity scenarios on the regional stock assessment for YFT (and possibly SKJ). 2. Improved understanding of the use of LCWGS for assessing connectivity in Pacific tuna species, using YFT as a test case. 3. Improved direction, scope, and budget to help further proposal develop for work examining connectivity of YFT and SKJ between the WPEA region and broader WCPFC-CA to support external funding acquisition.																																												
10. Forms of Results	Results will be presented to SC23 as a Working Paper and presentation. A final project report will be provided to the WCPFC Secretariat in December 2027.																																												
11. Methods	Stock assessment modelling: Sensitivity scenarios exploring assumptions																																												

	of movement between the WPEA and the rest of the WCPO will be performed based on the 2026 regional YFT stock assessment. Possible scenario examples include modifying assumptions about recruitment and movement between the assessment regions. Genetic analyses: YFT samples collected under ACIAR project F/S/2009/059 from Maldives (as an out-group), Indonesia (up to 5 locations) and Solomon Islands (1 location) will be sequenced using LCWGS using relevant laboratory practices. The sequencing data will be quality filtered, and genotype likelihood estimated prior to performing population structure analyses, which will be conducted using purpose-built analytical pipelines.				
12. Data Management Plan / Data Sets Required	This project will utilize existing data and samples. Input assessment files from the 2026 YFT stock assessment available from SPC will be used to run sensitivity scenarios. YFT samples used for the genetic analyses are stored at CSIRO Marine Laboratories, Hobart.				
13. Other Related Projects	This proposed TOR is a recommendation from WCPFC Project 128: Understanding connectivity of key tuna species in the Western Pacific and East Asia region with the WCPFC Convention Area (see SC21-SA-WP-13; https://meetings.wcpfc.int/node/26654). The work builds upon samples collected and lessons learned by CSIRO and Indonesia under the Australian Centre for International Agricultural Research (ACIAR) project FIS/2009/059 (Proctor et al. 2019), discussions at the 2018 workshop on the stock structure of Pacific tuna species (Moore et al. 2020a,b), and recent advances in genetic analyses of Pacific tuna species by CSIRO (e.g. SC21-SA-WP10, SC21-SA-WP-14).				
14. Collaborations	This project will be implemented by CSIRO, SPC, Indonesia, Philippines, Vietnam, and the WPEA project coordinator.				
15. Project Staff and CVs	Staff for this proposed project: CSIRO: Brad Moore, Pierre Feutry, Peter Grewe, Jessica Farley and Campbell Davies Indonesia: Fayakun Satria and Lilis Sadiyah Philippines: Suzette Barcoma and Casiano Choresca Vietnam: Vu Duyen Hai WPEA: Lars Olsen SPC: Paul Hamer, Giulia Anderson, stock assessment scientist TBD				
16. Risks of Project Not Achieving Objectives	The main risk associated with the stock assessment modelling component of this work is a lack of model convergence under different movement coefficients. The LCWGS analyses are considered low risk with respect to delivery, as this component is based on existing samples that have been shown to be of high DNA quality and free of cross-contamination.				
17. Timeframe	Please refer to the Gantt chart provided in Item 8: Activity Schedule for details on timeframes of the activities.				
18. Budget	This TOR would require a budget of 125k USD from the Commission. <table border="1"> <thead> <tr> <th>Component</th><th>Cost (USD)</th></tr> </thead> <tbody> <tr> <td>Stock assessment modelling</td><td>\$10,000</td></tr> </tbody> </table>	Component	Cost (USD)	Stock assessment modelling	\$10,000
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Stock assessment modelling	\$10,000				

	<table border="1"> <tr> <td data-bbox="557 191 1242 226">Low Coverage Whole Genome Sequencing and analysis</td><td data-bbox="1242 191 1412 226">\$90,000</td></tr> <tr> <td data-bbox="557 226 1242 262">Stakeholder workshop¹</td><td data-bbox="1242 226 1412 262">\$25,000</td></tr> </table> ¹ Budgeted as an in-person, 3-day workshop occurring in Australia with two participants from each of IDN, PHL, VNM, and SPC attending.	Low Coverage Whole Genome Sequencing and analysis	\$90,000	Stakeholder workshop ¹	\$25,000
Low Coverage Whole Genome Sequencing and analysis	\$90,000				
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19. References	Castillo Jordán C, Teears T, Hampton J, Davies N, Scutt Phillips J, McKechnie S, Peatman T, Macdonald J, Day J, Magnusson A, Scott R, Scott F, Pilling G, Hamer P (2022). Stock assessment of skipjack tuna in the western and central Pacific Ocean: 2022 – Rev.05. Working paper WCPFC-SC18-2022/SA-WP-01 (Rev 5) presented to the 18th Regular Session of the Scientific Committee of the Western and Central Pacific Fisheries Commission, online meeting, 10–18 August 2022. https://meetings.wcpfc.int/node/16242. CSIRO, Indonesia, Philippines, Vietnam, and SPC (2025). Understanding connectivity of key tuna species in the Western Pacific and East Asia region with the WCPFC Convention Area: results of Project 128. Working Paper WCPFC-SC21-2025/SA-WP-13 presented to the 21st Regular Session of the Scientific Committee of the Western and Central Pacific Fisheries Commission, Nuku'alofa, Tonga. https://meetings.wcpfc.int/node/26654 Farley J, Krusic-Golub K, Clear N, Eveson P, Smith N (2018). Progress on yellowfin tuna age and growth in the WCPO – WCPFC Project 82. Working Paper WCPFC-SC14-2018/SA-WP-13 presented to the 14th Regular Session of the Scientific Committee of the Western and Central Pacific Fisheries Commission, Busan, Republic of Korea. https://meetings.wcpfc.int/node/10726. Hamer P, Macdonald J, Potts J, Vidal T, Teears T, Senina I. (2023). Review and analyses to inform conceptual models of population structure and spatial stratification of bigeye and yellowfin tuna assessments in the Western and Central Pacific Ocean. Working Paper WCPFC-SC19-SA-WP-02 presented to the 19th Regular Session of the Scientific Committee of the Western and Central Pacific Fisheries Commission, Koror, Palau. https://meetings.wcpfc.int/node/19350 Itano DG (2000). The reproductive biology of yellowfin tuna (<i>Thunnus albacares</i>) in Hawaiian waters and the western tropical Pacific Ocean: project summary. SOEST 00–01, JIMAR Contribution 00–328. Pelagic Fisheries Research Program, JIMAR, University of Hawaii, HI, USA. https://www.soest.hawaii.edu/PFRP/biology/itano/itano_yft.pdf. Magnusson A, Day J, Teears T, Hampton J, Davies N, Castillo Jordán C, Peatman T, Scott R, Scutt Phillips J, McKechnie S, Scott F, Yao N, Natadra R, Pilling G, Williams P, Hamer P (2023). Stock assessment of yellowfin tuna in the western and central Pacific Ocean: 2023. Working Paper WCPFC-SC19-2023/SA-WP-04 (Rev 2) presented to				

	the 19th Regular Session of the Scientific Committee of the Western and Central Pacific Fisheries Commission, Koror, Palau, 16–24 August 2023. https://meetings.wcpfc.int/node/19352 McDonald A (2021). WPEA-ITM project update. Research project report WCPFC-SC17-2021/RP-WPEA-01(Rev.01) presented to the 17th Regular Session of the Scientific Committee of the Western and Central Pacific Fisheries Commission. Moore BR, Bell JD, Evans K, Farley JH, Grewe P, Hampton J, Marie AD, Minte-Vera CV, Nicol S, Pilling G, Scutt Phillips J, Tremblay-Boyer L, Williams A, Smith N (2020a). Defining the stock structure of key commercial tunas in the Pacific Ocean I: Current knowledge and main uncertainties. <i>Fisheries Research</i> 230: 105525. https://doi.org/10.1016/j.fishres.2020.105525 Moore BR, Adams T, Allain V, Bell JD, Bigler M, Bromhead D, Clark S, Davies C, Evans K et al. (2020b). Defining the stock structure of key commercial tunas in the Pacific Ocean II: Sampling considerations and future directions. <i>Fisheries Research</i> 230: 105524. https://doi.org/10.1016/j.fishres.2020.105524. Proctor C, Lester RJG, Clear NP, Grewe PM, Moore B, Eveson JP, et al. (2019). Population structure of yellowfin tuna (<i>Thunnus albacares</i>) and bigeye tuna (<i>T. obesus</i>) in the Indonesian region. Final Report as output of ACIAR Project FIS/2009/059. Australian Centre for International Agricultural Research, Canberra, 139 pp. https://www.aciar.gov.au/sites/default/files/project-page-docs/fis-2009-059_popstructurestudy_final_report.pdf
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Project 129	Building an age-length data stream for tuna assessments – to be updated as needed for extension (SPC)
Ongoing	Priority ranking
Part A: Administrative Summary	
1. Project Title	Building an age-length data stream for tuna assessments
2. Organization	Pacific Community (SPC)
3. Administrative Contact	Dr Paul Hamer, Principal Scientist, Stock Assessment and Modelling
4. Principal Investigator (PI) and CV	Dr Corey Wakefield
5. Commencement and Completion Date	Year 1: February 2026 – December 2026 <i>Potential multi-year development program across 4 years (50-100K per year depending on annual TOR reviews).</i>
6. Project Budget Summary	<i>Overview of major cost categories:</i> ○ Salaries ○ Travel

	○ Operating Costs (e.g., equipment, supplies) ○ Other Costs (e.g., sub-contracts, dissemination) Costing for year 1 (2026) (year's 2, 3, 4 – minimum 60K/year) This TOR would require a budget of 80K USD from the Commission. <table border="1" data-bbox="565 443 1354 627"> <thead> <tr> <th>Component</th><th>Cost (USD)</th></tr> </thead> <tbody> <tr> <td>Salary</td><td>20K</td></tr> <tr> <td>Travel</td><td>20K</td></tr> <tr> <td>Operating</td><td>20K</td></tr> <tr> <td>Consultants</td><td>20K</td></tr> </tbody> </table>	Component	Cost (USD)	Salary	20K	Travel	20K	Operating	20K	Consultants	20K
Component	Cost (USD)										
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Travel	20K										
Operating	20K										
Consultants	20K										
Part B: Project Proposal Description											
1. Project Title	<i>Building an age-length data stream for tuna assessments</i>										
2. Background and Need	Stock assessment of bigeye, yellowfin, albacore and skipjack tuna presented to SC routinely include recommendations to improve information on growth and age composition. The assessments typically note the very limited historic collections of hard parts (i.e. otoliths) for growth and age composition and the lack of strategic ongoing sampling programs for collecting age-at-length data for assessments. The reason why the assessment teams make these recommendations is that the stock assessment models attempt to reconstruct the population age structures but mostly based on size data and an assumed ‘static’ growth model to relate size compositions of catches to ages. However, external growth curves are almost certainly biased due to the sampling processes and fisheries selectivity that is not accounted for with external growth curves. Further, growth is variable in space and time, and a better way to relate size compositions of catches to age compositions is within the stock assessment model use internal age-length keys based on regular collections of age-length data for the model regions and key fisheries. This is typical practice for many groundfish species, but not routinely done for tunas, and is recognized as a major deficiency in tuna assessments that apply length-based age structured population models. Growth is a key uncertainty in all tuna assessments, and applying static, likely biased, growth information can be influential on estimation of management quantities. SPC is in the process of developing rapid tuna aging methods based on whole otolith weight and simple morphometric measurements, with current research focused on yellowfin, but clear potential for bigeye and other tuna species. While progress is being made towards epigenetic aging for albacore, this approach is species specific, and while it has the advantage in terms of ease of sample collections (once validated only requires tissue samples and length from individuals), rapid whole otolith aging is incredible fast and cheap, but has the disadvantage that paired otolith and length data are required,										

	and large scale otolith collections from tuna is difficult in practice. We envisage that multiple methods will be important in building a program to collect ongoing age-length data across the key tuna species. We believe that increased inclusion of paired age-length data (referred to as conditional age at length (CAAL) data) will have considerable benefits for reducing uncertainty and increasing the reliability of management quantities from tuna stock assessments. Ongoing age-length data collections will also contribute to increased understanding of spatial and temporal growth variation, including influences of oceanographic dynamics and climate variation/change.
3. Objectives and Benefits	1. To further develop rapid aging methods for key WCPFC managed tuna species. 2. To develop sampling strategies and a feasible program design to provide ongoing age-length data for WCPFC tuna assessments 3. To implement a sample collection program within 4 years. Benefits will be to improve the reliability of stock status advice for the key tuna stocks managed by WCPFC (yellowfin, bigeye, south Pacific albacore, potentially skipjack pending development of validated ageing methods)
4. Note	Inclusion of skipjack in the implementation of a sampling program depends on a suitably reliable rapid aging method being developed.
5. Rationale	Methods for rapid aging have been a key barrier to large scale data collection on age-length of tuna, but these barriers appear likely to be removed in the coming years with new methods such as whole otolith morphometrics and epigenetic aging. The background section explains the importance of age-length data for improving reliability of stock status information from stock assessments. This project will provide the important role of taking these new methods from the 'proof of concept laboratory stage' to a meaningful scale to impact stock assessments and management advice.
6. Assumptions	Ongoing work on otolith morphometrics and epigenetics will deliver the suitably precise rapid aging methods. WCPFC CCMs will support the ongoing collection of paired otoliths/tissues and length data at a much-expanded level than currently being conducted and will be prepared to implement and follow structured sampling protocols.
7. Scope of Work	Phase 1: 2026 1. Support increased resources to fast-track work on rapid aging from otolith morphometrics, yellowfin and bigeye focus (noting albacore is progressing with epigenetics under WCPFC project 100c – morphometrics could be considered later, skipjack still needs a validated aging methodology.) 2. Conduct analysis and review of sampling capabilities and

	requirements for an age-length data sampling program of a suitably meaningful scale. Will require discussions with Distant Water Fishing Nations, other CCMs (AU/NZ/USA/EU) and Regional Observer Program coordinators. Note: this could be a stop/go, if key CCMs are unable/unwilling to support sample collections on a meaningful scale, we would review the continuation of the project. Phase 2: 2027 1. Rapid ageing methods expected to be at a stage where peer reviewed, and aging error well characterized. Sampling numbers by species are defined. Training programs for sampling developed and training workshops provided along with written sampling guides and protocols in multiple languages, 2. Development of sample pipeline logistics (i.e. data recording and sample transport logistics to SPC tissue bank) 3. Estimate costs of regular sampling programs by species. Phase 3: 2028 1. Trial implementation – conduct a trial implementation year. Phase 4: 2029 1. Refinements and full implementation phase.																								
8. Activity Schedule	For 2026 only: <table><tr><th rowspan="2">Activity</th><th colspan="4">2026</th></tr><tr><th>Q1</th><th>Q2</th><th>Q3</th><th>Q4</th></tr><tr><td>Otolith morphometric aging research – yellowfin and bigeye</td><td>x</td><td>x</td><td>x</td><td>x</td></tr><tr><td>Conduct analysis and review of sampling capabilities and requirements, scoping workshops with DWFNs, ROP coordinators and other CCMs regarding sampling capabilities and willingness to commit to a longer-term program.</td><td></td><td>x</td><td>x</td><td>x</td></tr><tr><td>Progress report to SC22, and year 2 TOR.</td><td></td><td></td><td>x</td><td></td></tr></table>	Activity	2026				Q1	Q2	Q3	Q4	Otolith morphometric aging research – yellowfin and bigeye	x	x	x	x	Conduct analysis and review of sampling capabilities and requirements, scoping workshops with DWFNs, ROP coordinators and other CCMs regarding sampling capabilities and willingness to commit to a longer-term program.		x	x	x	Progress report to SC22, and year 2 TOR.			x	
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	Q1	Q2	Q3	Q4																					
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Progress report to SC22, and year 2 TOR.			x																						
9. Project Outcomes	2026 only 1. Published peer reviewed paper(s) on rapid aging methods using whole otolith morphometrics for tropical tunas (yellowfin, perhaps also bigeye) 2. Understanding sampling requirements and feasibility of sampling at a meaningful scale.																								
10. Forms of Results	Results will be presented to SC22 as a Working Papers. Peer review journal articles. Workshop records.																								
11. Methods	Written reports and journal papers.																								

12. Data Management Plan / Data Sets Required	All data required is available within SPC, additional data may be sort from CCMs to consider potential sampling capabilities/rates for their sampling programs.										
13. Other Related Projects	Project 117 “WCPFC Tuna Biological Sampling Plan” – has conducted analysis regards samples size for growth curves – could be some synergies with this work in relation to estimating sample requirements age-length data. Project 35b “Pacific Marine Specimen Bank”, SC Project 117 “WCPFC Tuna Biological Sampling Plan” – provide the facility for sample collection archiving and storage.										
14. Collaborations	<i>Potential collaborators could include tuna aging expertise (i.e. Fish Ageing Services, CSIRO etc., other). Selected CMMs who are willing to collaborate and commit resources to sampling, support workshops etc.</i>										
15. Project Staff and CVs	Corey Wakefield (SPC) Paul Hamer (SPC) Joe Scutt Phillips (SPC) Thom Teears (SPC) Technical assistant										
16. Risks of Project Not Achieving Objectives	The 2026 objectives have low risk of not being achieved.										
17. Timeframe	Described above – planned as a staged 4-year project. The 2026 year is required before being able to plan the scheduling of the years 2-4.										
18. Budget	Costing for year 1 (2026) (year’s 2, 3, 4 – minimum 60K/year) This TOR would require a budget of 80K USD from the Commission. <table border="1"> <thead> <tr> <th>Component</th><th>Cost (USD)</th></tr> </thead> <tbody> <tr> <td>Salary</td><td>20K</td></tr> <tr> <td>Travel</td><td>20K</td></tr> <tr> <td>Operating</td><td>20K</td></tr> <tr> <td>Consultants</td><td>20K</td></tr> </tbody> </table>	Component	Cost (USD)	Salary	20K	Travel	20K	Operating	20K	Consultants	20K
Component	Cost (USD)										
Salary	20K										
Travel	20K										
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19. References											

Project P22X01	Characterisation of vessel gear interactions and stock trend evaluation of false killer whales (<i>Pseudorca crassidens</i>) and rough-toothed dolphins (<i>Steno bredanensis</i>) – to be updated as needed for resubmission (SPC/PNA)
New project	

	Priority ranking
Part A: Administrative Summary	
1. Project Title	<i>Characterisation of vessel gear interactions and stock trend evaluation of false killer whales (<i>Pseudorca crassidens</i>) and rough-toothed dolphins (<i>Steno bredanensis</i>)</i>
2. Organization	<i>Submitted by PNA Members</i>
3. Administrative Contact	<i>TBD – SPC</i>
4. Principal Investigator (PI) and CV	<i>TBD – SPC</i>
5. Commencement and Completion Date	<i>1 March 2026 - 31 August 2026</i>
6. Project Budget Summary	<i>Overview of major cost categories:</i> ○ 0.5 FTE \$50,000 ○ Travel to SC22 \$10,000 ○ Operating Costs (e.g., equipment, supplies) - NA ○ Other Costs (e.g., sub-contracts, dissemination) - NA
Part B: Project Proposal Description	
1. Project Title	<i>As above</i>
2. Background and Need	<i>See Rationale</i>
3. Objectives and Benefits	<i>See Scope of work</i>
4. Note	<i>NA</i>
5. Rationale	<i>Cetaceans are occasionally, inadvertently, encircled during purse seine fishing operations and get entangled in longline fishing gear. False killer whales (<i>Pseudorca crassidens</i>) and rough-toothed dolphins (<i>Steno bredanensis</i>) are two of the odontocetids that are the most regularly encountered. Some of these encounters result in mortalities particularly for rough-toothed dolphins. The reasons for these mortalities and the impacts on the populations are currently unknown.</i> <i>This analysis will investigate trends in the populations over time as well as assess any trends in the species-fishery interactions with longline and purse seine fishing gear.</i>
6. Assumptions	<i>Sufficient existing fisheries and biological data are readily available from the WCPO or other sources.</i> <i>Personnel are available to undertake this work.</i>
7. Scope of Work	<i>1. Reviewing any previous work in the WCPO and elsewhere to assess and improve on methods to evaluate the stock trends of rough-toothed dolphins and false killer whales.</i> <i>2. Summarise the biological information for these two species.</i> <i>3. Summarise the fate of encountered individuals and assess the condition information from both species in both fisheries.</i> <i>4. Develop population models to assess trends in rough-toothed dolphin and false killer whale populations using all Pacific purse seine and longline observer data.</i> <i>5. Evaluate trends in encounter rates and trends in distribution changes.</i> <i>6. Develop a plan to assess the reasons leading to their mortality in purse seine and longline operations, if possible;</i>

	7. <i>Propose strategies to mitigate mortality if possible.</i> 8. <i>Prepare a report containing the above results for SC22.</i>
8. Activity Schedule	<i>Timeline showing key activities and milestones, possibly in a table or Gantt chart format.</i>
9. Project Outcomes	<i>Report document and presentation to SC22.</i>
10. Forms of Results	<i>Report document and presentation to SC22.</i>
11. Methods	<i>TBD</i>
12. Data Management Plan / Data Sets Required	1. <i>WCPFC data extract of all longline and purse seine marine mammal catch and effort as well as interaction data.</i> 2. <i>These data exist in the observer data base.</i> 3. <i>Include how data will be stored, secured, and shared - TBD.</i>
13. Other Related Projects	<i>WCPFC-SC16-ST IP-12</i> <i>WCPFC-SC17-ST IP-10</i> <i>WCPFC-SC21-ST-WP-08</i> <i>WCPFC-SC21-EB-IP-07</i>
14. Collaborations	<i>TBD</i>
15. Project Staff and CVs	<i>TBD</i>
16. Risks of Project Not Achieving Objectives	<i>Preliminary analysis if data held by the PNA members suggest that the data exist and the methods used in WCPFC-SC21-EB-IP-07 can be replicated.</i>
17. Timeframe	<i>Six months to complete the work include=g report writing and presentation to the SC.</i>
18. Budget	○ <i>As above</i>
19. References	<i>WCPFC-SC16-ST IP-12</i> <i>WCPFC-SC17-ST IP-10</i> <i>WCPFC-SC21-ST-WP-08</i> <i>WCPFC-SC21-EB-IP-07</i>

Project P22X02	Assessment of the SW Pacific blue shark stock (Phase 1) – to be updated as needed for resubmission (Steve Brouwer)
New Project	Priority ranking
Part A: Administrative Summary	
1. Project Title	Assessment of the SW Pacific blue shark stock (Phase 1)
2. Organization	<i>Submitted by the SRP</i>
3. Administrative Contact	<i>Dr Graham Pilling (Deputy Director, Fisheries Aquaculture and Marie Ecosystems Division, graham.p@spc.int)</i>
4. Principal Investigator (PI) and CV	<i>TBD – SPC</i>
5. Commencement and Completion Date	<i>1 March 2026 - 31 August 2026</i>
6. Project Budget Summary	<i>Overview of major cost categories:</i> Phase 1 only ○ 0.5 FTE \$55,000 ○ Travel to SC22 \$10,000 ○ Operating Costs (e.g., equipment, supplies) - NA

	Other Costs (e.g., sub-contracts, dissemination) - NA
Part B: Project Proposal Description	
1. Project Title	<i>As above</i>
2. Background and Need	<i>See Rationale</i>
3. Objectives and Benefits	Undertake appropriate stock assessment of SW Pacific blue shark following the two-phase (two-year) process endorsed by WCPFC SC for shark assessments.
4. Note	
5. Rationale	This stock was last assessed in 2021 (WCPFC-SC17-SA-WP-03) using data from 1995-2020 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. This project is designed to assess the stock status of south Pacific blue sharks 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). <i>This assessment will utilise a 2-phase approach.</i>
6. Assumptions	- Much of the existing fisheries and biological data are readily available from the WCPO. - Personnel are available to undertake this work.
7. Scope of Work	Phase 1 (2026) - Review the previous SW Pacific blue shark and other subsequent shark assessments in the WCPO to assess whether improved methods have been developed and can be applied, and to increase the understanding of data strengths and weaknesses. - Review and describe challenges and methods to deal with the input data for SW Pacific blue shark (presented to a dedicated agenda item at the 2026 PAW), including key uncertainties that will need to be considered. - Provide a data and fishery characterisation, data compilation and catch reconstruction analyses. - Update WCPO catch reconstruction estimates and abundance indices using recent observer data (noting these may be preliminary and be further refined in Phase 2). - Prepare a report containing the above results and present it at SC22. Phase 2 (2027) - Building from the work in the Phase 1 conduct an integrated assessment (if considered feasible and supported by SC) of the SW Pacific blue shark stock. - Conduct a risk analysis/assessment using a chosen/proven method to provide risk-based advice for the stock and fishery impacts in the WCPO. - Update WCPO longline catch estimates and abundance indices using recent observer data, as required.

	• Present the stock status in terms of the metrics outlined in the 2021-2030 Shark Research Plan. • Prepare a report containing the stock assessment/risk analysis results for SC23. • Present the outcomes of the assessment and/or risk analysis to SC23 (in person or online if physical attendance is not possible).
8. Activity Schedule	<i>TBD</i>
9. Project Outcomes	<i>Report document and presentation to SC23.</i>
10. Forms of Results	<i>Report document and presentation to SC23.</i>
11. Methods	<i>TBD</i>
12. Data Management Plan / Data Sets Required	<i>TBD</i>
13. Other Related Projects	<i>Proposed joint billfish shark assessment methods workshop.</i>
14. Collaborations	<i>TBD</i>
15. Project Staff and CVs	<i>TBD</i>
16. Risks of Project Not Achieving Objectives	<i>Not enough fish will get sampled to provide informative results.</i>
17. Timeframe	The key outputs of the assignment will be: Year 1 - Phase 1 (2026): • Submission of a progress presentation for discussion at SPC's PAW meeting (March 2026); • Submission of a Phase 1 report/SC paper for Project xxx (<i>SW Pacific blue shark stock assessment in the WCPO: Phase 1</i>) to the WCPFC Secretariat (SungKwon.Soh@wcpfc.int; Elaine.Garvilles@wcpfc.int) by xx July 2026; and • Presentation of the Phase 1 Project xx report to SC22 (travel cost included in the project budget), August 2026. Year 2 - Phase 2 (2027): • Submission of a progress report and its presentation for discussion at 2027 SPC's PAW meeting (dates TBC); • Submission of a Phase 2 report for Project xx (<i>SW Pacific blue shark stock assessment in the WCPO: Phase 2</i>) to the WCPFC Secretariat (SungKwon.Soh@wcpfc.int; Elaine.Garvilles@wcpfc.int) by 25 days before the start of SC23; and • Presentation of the Phase 2 Project xx report to SC23 (travel cost for one presenter included in the project budget).
18. Budget	As above
19. References	WCPFC-SC17-SA-WP-03 SC16-EB-IP-01 rev1 SC17-SA-IP-06

Project P22X03	Southwest Pacific swordfish epigenetics and stock structure – to be updated for resubmission (Steve Brouwer, SPC)
New Project	Priority ranking

Part A: Administrative Summary	
1. Project Title	Southwest Pacific swordfish epigenetics and stock structure
2. Organization	Submitted by the BRP
3. Administrative Contact	TBD - SPC
4. Principal Investigator (PI) and CV	TBD - SPC
5. Commencement and Completion Date	1 March 2026 - 31 August 2027
6. Project Budget Summary	Overview of major cost categories: ○ 0.5 FTE \$50,000 ○ Travel to SC23 \$10,000 ○ Operating Costs (e.g., equipment, supplies) - \$40,000 ○ Other Costs (e.g., sub-contracts, dissemination) - NA
Part B: Project Proposal Description	
1. Project Title	As above
2. Background and Need	See Rationale
3. Objectives and Benefits	Using genetic samples collected by the ROP observers to evaluate the stock structure of southwest Pacific swordfish and develop length-at-age estimates using epigenetic analysis.
4. Note	Genetic samples can be used for both stock structure as well as epigenetic analysis. Ideally for stock structure a minimum of 80 fish from each stock would be required. Dividing the region into 4 parts south of the equator (NW, NE, SW, SE) this would mean at least 240 samples would be needed for stock structure. Fewer samples would be needed for epigenetic ageing work, but they would require a sister fin spine or otolith samples to verify the age clock from epigenetics.
5. Rationale	The Billfish research plan (BRP) has noted that there is a need to resolve the stock structure of swordfish, but also there is a need to get better age estimates. In 2025 the BRP suggested amending a project to tag and release swordfish to change the work into a generic analysis to evaluate stock structure as the results would likely have a greater utility and the work would be logistically easier and could sample more fish for the same price as tagging. Given the issues with getting age estimates and since a single sample could be used for both stock derivation and epigenetic ageing, it is suggested that both be evaluated. Epigenetics are used to estimate the chronological age of an organism. Epigenetic modifications, such as DNA methylation, accumulate in a predictable way as an organism ages. By analysing these modifications in a biological sample, an "epigenetic clock" is used to determine age. These can then be used to produce length-at-age estimates. The epigenetic clocks should be calibrated against otolith of fin spine derived age estimates.
6. Assumptions	Sufficient existing fisheries and biological data are readily available from the WCPO or other sources. See note for details. The biological material has been collected by the ROP observers. Personnel are available to undertake this work.

7. Scope of Work	Identify and collate the genetic samples housed on the WCPFC tissue bank. Phase 1 - 2026 1. Purchase biopsy punches, vials and other materials required to store and transport genetic samples, as well as RNALater solution. 2. Distribute these to the relevant observer programs. 3. Get observer to commence sampling and ship the samples back to SPC in Noumea. 4. Get observer to sample genetics and collect vertebral samples. Phase 2 - 2027 1. Once sufficient samples exist: a) undertake a genetic analysis to assess the stock structure and determine the genetic age of the fish sampled. b) Assess if genetic and otolith samples have been collected from the same fish. Where samples exist estimate the age from the otolith samples to calibrate the genetic age. 2. Produce length-at-age estimates.
8. Activity Schedule	<i>TBD</i>
9. Project Outcomes	<i>Report document and presentation to SC23.</i>
10. Forms of Results	<i>Report document and presentation to SC23.</i>
11. Methods	<i>TBD</i>
12. Data Management Plan / Data Sets Required	<i>TBD</i>
13. Other Related Projects	
14. Collaborations	<i>Requires samples to be collected and be made available from the RoP.</i>
15. Project Staff and CVs	<i>TBD</i>
16. Risks of Project Not Achieving Objectives	<i>Risk that genetic material will not be able to be collected and that otolith and/or fin spine samples cannot be collected from the same fish as the genetic samples. Requires samples to be collected and be made available from the RoP</i>
17. Timeframe	<i>As above</i>
18. Budget	<i>As above</i>
19. References	<i>SC21-SA-IP-18</i>

Project P22X04	Southwest Pacific mako shark epigenetics and stock structure – to be updated for resubmission (Steve Brouwer, SPC)
New project	Priority ranking
Part A: Administrative Summary	
1. Project Title	Southwest Pacific mako shark epigenetics and stock structure
2. Organization	<i>Submitted by the SRP - ISG</i>
3. Administrative Contact	<i>TBD - SPC</i>
4. Principal Investigator (PI) and CV	<i>TBD - SPC</i>

5. Commencement and Completion Date	<i>1 March 2026 - 31 August 2027</i>
6. Project Budget Summary	<i>Overview of major cost categories:</i> ○ 0.5 FTE \$50,000 ○ Travel to SC23 \$10,000 ○ Operating Costs (e.g., equipment, supplies) - \$40,000 ○ Other Costs (e.g., sub-contracts, dissemination) - NA
Part B: Project Proposal Description	
1. Project Title	<i>As above</i>
2. Background and Need	<i>Using genetic samples collected under the general shark biology sampling to evaluate the stock structure of southwest Pacific Mako sharks and develop length-at-age estimates using epigenetic analysis.</i>
3. Objectives and Benefits	<i>Estimate the length at age and stock structure of southwest Pacific Mako sharks</i>
4. Note	<i>Genetic samples can be used for both stock structure as well as epigenetic analysis. Ideally for stock structure a minimum of 80 fish from each stock would be required. Dividing the region into 4 parts south of the equator (NW, NE, SW, SE) this would mean at least 240 samples would be needed for stock structure. Fewer samples would be needed for epigenetic ageing work, but they would require a sister vertebral sample for a vertebra derived age estimate.</i>
5. Rationale	<i>The Shark research plan (CRP) has noted that there is a need to resolve the stock structure of southwest Pacific mako sharks as well as evaluate natal homing, but also there is a need to get better age estimates.</i> <i>In 2025 the SRP suggested amending a project to tag and release southwest Pacific mako sharks to change the work into a generic analysis to evaluate stock structure as the genetic analysis would likely have a greater utility; the work would be logistically easier; and we could sample more fish for the same price as tagging. Given the issues with getting age estimates and since a single sample could be used for both stock derivation and epigenetic ageing, it is suggested that both be evaluated. Epigenetics are used to estimate the chronological age of an organism. Epigenetic modifications, such as DNA methylation, accumulate in a predictable way as an organism ages. By analysing these modifications in a biological sample, an "epigenetic clock" is used to determine age. These can then be used to produce length-at-age estimates.</i> <i>The epigenetic clocks should be calibrated against sectioned vertebral age estimates.</i>
6. Assumptions	<i>Sufficient existing fisheries and biological data are readily available from the WCPO or other sources. See note for details.</i> <i>The biological material has been collected by the ROP observers.</i> <i>Personnel are available to undertake this work.</i>
7. Scope of Work	<i>Identify and collate the genetic samples housed on the WCPFC tissue bank.</i> Phase 1 - 2026 <i>1. Purchase biopsy punches, vials and other materials required to store and transport genetic samples, as well as RNALater solution.</i> <i>2. Distribute these to the relevant observer programs.</i>

	3. Get observer to commence sampling and ship the samples back to SPC in Noumea. 4. Get observer to sample genetics and collect vertebral samples. Phase 2 - 2027 Once sufficient samples have been collected, that is if samples have been collected from enough fish from a wide enough area, a) undertake a genetic analysis to assess the stock structure and determine the genetic age of the fish sampled. b) Assess if genetic and vertebral samples have been collected from the same fish. Where samples exist estimate the age from the vertebral samples to calibrate the genetic age. c) Produce length-at-age estimates.
8. Activity Schedule	.
9. Project Outcomes	Report document and presentation to SC23.
10. Forms of Results	Report document and presentation to SC23.
11. Methods	TBD
12. Data Management Plan / Data Sets Required	TBD
13. Other Related Projects	
14. Collaborations	Requires samples to be collected and be made available from the RoP.
15. Project Staff and CVs	TBD
16. Risks of Project Not Achieving Objectives	Risk that genetic material will not be able to be collected and that vertebral samples cannot be collected from the same fish as the genetic samples. Requires samples to be collected and be made available from the RoP.
17. Timeframe	As above
18. Budget	As above
19. References	SC21-SA-IP-19

Project P22X05	Fishery characterisation of low information sharks and mobulids – to be updated for resubmission (Steve Brouwer, SPC)
New project	Priority ranking
Part A: Administrative Summary	
1. Project Title	Fishery characterisation of low information sharks and mobulids
2. Organization	Submitted by the SRP
3. Administrative Contact	TBD - SPC
4. Principal Investigator (PI) and CV	TBD - SPC
5. Commencement and Completion Date	1 March 2026 - 31 August 2026
6. Project Budget Summary	Overview of major cost categories: ○ 0.5 FTE \$50,000 ○ Travel to SC22 \$10,000

	○ Operating Costs (e.g., equipment, supplies) - NA ○ Other Costs (e.g., sub-contracts, dissemination) - NA
Part B: Project Proposal Description	
1. Project Title	<i>As above</i>
2. Background and Need	<i>See Rationale</i>
3. Objectives and Benefits	To evaluate trends and characterise the fisheries catching low information shark and mobulid species in the WCPO, including all threshers, hammerhead sharks, mantas and whale sharks.
4. Note	<i>This project has merged two other projects and will need to be re-prioritised.</i>
5. Rationale	<i>While whale shark populations in the WCPO have been evaluated to some extent (WCPFC-SC9-2013/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 other species. 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). Some species are all listed on CITES Appendix II and mantas are considered to be globally endangered by IUCN. There are relatively high observed longline catches of mantas and mobulids and some whale shark unintended interactions with the purse seine fishery.</i> Other species such as hammerheads have unknown trends and fishery interactions.
6. Assumptions	<i>Sufficient existing fisheries and biological data are readily available from the WCPO or other sources.</i> <i>Personnel are available to undertake this work.</i>
7. Scope of Work	1. Reviewing the previous work in the WCPO to assess, and improve on, methods and update the information on stock trends. 2. Present a characterisation of the fisheries catching these species. 3. Attempt to develop WCPO abundance indices using observer data. 4. Attempt to present the stock status or trends in terms of the metrics outlined in the 2021-2025 Shark Research Plan to the extent possible. 5. Prepare a report containing the above results for SC22.
8. Activity Schedule	<i>TBD</i>
9. Project Outcomes	<i>Report document and presentation to SC22.</i>
10. Forms of Results	<i>Report document and presentation to SC22.</i>
11. Methods	<i>TBD</i>
12. Data Management Plan / Data Sets Required	<i>TBD</i>
13. Other Related Projects	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
14. Collaborations	<i>TBD</i>

15. Project Staff and CVs	TBD
16. Risks of Project Not Achieving Objectives	For some species the paucity of data may mean that some of the stock status trends may not be informative.
17. Timeframe	As above
18. Budget	As above
19. 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 P22X06	Post-release survival of oceanic whitetip sharks from WCPO longline fisheries - to be updated for resubmission (Steve Brouwer, SPC)
New project	Priority ranking
Part A: Administrative Summary	
1. Project Title	Post release survival of oceanic whitetip sharks from WCPO longline fisheries
2. Organization	Submitted by the SRP
3. Administrative Contact	TBD - SPC
4. Principal Investigator (PI) and CV	TBD - SPC
5. Commencement and Completion Date	1 March 2026 - 31 August 2028
6. Project Budget Summary	Overview of major cost categories: ○ 0.25 FTE \$25,000 ○ Travel to SC24 \$10,000 ○ Operating Costs (e.g., equipment, supplies) - \$50,000 pa (for 2 years) ○ Other Costs (e.g., sub-contracts, dissemination) - NA
Part B: Project Proposal Description	
1. Project Title	As above
2. Background and Need	See Rationale
3. Objectives and Benefits	Estimate the post release survival of oceanic whitetip sharks from longline fisheries in the WCPO
4. Note	The budget may limit the number of flagged vessels to undertake the work. If the ISG-Sharks in 2024 believed the many fleets need to be covered (if practicable) the budget would need to be amended.
5. Rationale	<i>Oceanic whitetip sharks are required to be released when inadvertently caught in fisheries management by the WCPO.</i> Some estimates exist for juvenile oceanic whitetip sharks from purse seine fisheries (Hutchinson 2015; Sabarros et al. 2023) but there are few reliable estimates from longline releases (Francis, <i>et al.</i> 2023). Post release survival estimates are included in, and influential for, the stock assessments of silky and oceanic whitetip sharks. Determining reliable estimates of post release mortality would reduce the uncertainty

	of the stock assessments, and contribute to the understanding of the effectiveness of non-retention in mitigating longline fishing mortality on these species.
6. Assumptions	• Access to sufficient numbers of sharks on board commercial longliners from the WCPO. • Suitable trained personnel, including observers, are available to undertake this work. • Technical staff resources are available to run the project and analyse the data.
7. Scope of Work	• Reviewing the previous work. Phase 1 - 2026 • Undertake tagging to estimate post-release mortality. ○ It is envisaged that this work would, be done by trained fishery observers, who will deploy Survivorship PAT tags (sPAT) on the sharks. ○ Tags will need to be deployed on sharks of varying life state classes (alive and healthy; injured; and lethargic). ○ The project should aim to deploy at least 10 tags per life state class. Phase 2 - 2027 • Assess the results and estimate post-release mortality/survival rates for the WCPO longline fisheries. Noting that these may vary between fleets and the work should be undertaken from different flagged vessels to the extent possible. • <i>Provide a report and presentation to SC23</i>
8. Activity Schedule	<i>TBD</i>
9. Project Outcomes	<i>Report document and presentation to SC23.</i>
10. Forms of Results	<i>Report document and presentation to SC23.</i>
11. Methods	<i>TBD</i>
12. Data Management Plan / Data Sets Required	<i>TBD</i>
13. Other Related Projects	
14. Collaborations	<i>TBD</i>
15. Project Staff and CVs	<i>TBD</i>
16. Risks of Project Not Achieving Objectives	<i>Not enough fish will get sampled to provide informative results.</i>
17. Timeframe	As above
18. Budget	As above
19. References	Francis, M.P. et al. 2023, Post-release survival of shortfin mako (<i>Isurus oxyrinchus</i>) and silky (<i>Carcharhinus falciformis</i>) sharks released from pelagic tuna longlines in the Pacific Ocean. Aquatic Conservation. Volume 33, Issue 4. https://doi.org/10.1002/aqc.3920 . Hutchinson, M.R., Itano, D.G., Muir, J.A. and Hilland, K.N. 2015. Post-release survival of juvenile silky sharks captured in a tropical tuna purse seine fishery. Mar Ecol Prog Ser 521:143-154. Sabarros, P.S., Mollier, E., Tolotti, M., Romanov, E.V. and Bach, P. 2023. Post-release mortality of oceanic whitetip sharks caught by purse

	seiners. IOTC-2023-WPEB19-18
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Project P22X07	Estimation of seabird mortality and risk across the WCPFC Convention Area – to be updated for resubmission (SPC)
New project	Priority ranking
Objectives	- Fulfil the requirement under the WCPFC seabird CMMs to estimate the total number of seabirds being killed per year in WCPFC fisheries. - Assess mortality per year over the ten years since the first WCPFC seabird CMM, as requested under CMM2006-02, CMM 2007-04 and CMM 2012-07, and assess whether there is any detectable trend. - Provide advice to the Scientific Committee on what data improvements are needed to enable better analyses to be made.
Rationale	Monitoring and enumerating the total number of seabirds being killed per year in WCPFC fisheries is a requirement under WCPFC's seabird CMMs. Project 68 has generated estimates of seabird mortalities in WCPO longline and purse seine fisheries for the time period 2015 to 2018 (Peatman et al., 2019). There have also been a number of global and regional assessments of risk to seabirds from tuna longline fisheries (e.g. Abraham et al., 2019; Birdlife South Africa, 2019; Ochi et al., 2018). Analyses of seabird bycatch have generally had to contend with incomplete or imbalanced observer coverage of key fleets as well as varying levels of species identification of seabird captures, leading to uncertainties in capture rates of seabird species. Peatman et al. (2019) recommended that further work include assessing the risk to seabird populations resulting from estimated seabird mortalities of WCPFC fisheries. To date there have been limited assessments of risk of WCPFC fisheries to north Pacific albatrosses, or the more equatorial seabird populations. This gap of coverage could be addressed by carrying out a WCPFC-wide risk assessment, potentially to a subset of seabird populations depending on the data available.
Assumptions	- There is additional seabird bycatch data available to warrant revisiting assessments of risk to seabird species from WCPFC fisheries in the southern hemisphere. - There is sufficient data held by WCPFC for estimating mortality and risk from WCPFC fisheries for northern hemisphere and equatorial seabirds. - CCMs and other partners and stakeholders are able to contribute data and expertise to the conducting of risk assessments for seabirds in the WCPFC jurisdiction. - IATTC is able to assist with estimates for straddling populations of seabirds. - CCSBT is able to assist with estimates for Southern Hemisphere seabird populations through the ongoing Southern Hemisphere Spatially Explicit Fisheries Risk Assessment lead by CCSBT.
Scope	- Identify the limitations in the data available. - Document what information is available on species that overlap with the WCPFC fisheries, their population status, any tracking data (or already established spatial distributions that are more complex than binary presence absence) and any estimates on their biological

	parameters such as Rmax (the theoretical maximum breeding rate). ○ Document current observer data to assess the level of coverage in each fishery, both spatially and temporally. • Estimate species-specific seabird mortalities (where feasible) and risks associated with interactions with WCPFC fisheries (where feasible). • Describe the methods used to estimate total mortalities including treatment of data gaps. • Provide advice to the Scientific Committee on the suitability of risk assessment approaches given the data available. • Generate advice on what further level of seabird assessment at species level can be conducted, given the amount and quality of data currently available.
Timeframe	2024 – Data Compilation, Gaps Analyses, and Risk Assessments 2025 - Reporting to WCPFC Scientific Committee
Budget	USD 75,000 <i>Note: Adapted from indicative budget from FAC16</i> • 2024: \$30,000 + \$10,000 provided by NZ • 2025: \$35,000
References	Abraham, E., Richard, Y., Walker, N., Gibson, W., Ochi, D., Tsuji, S., Kerwath, S., Winker, H., Parsa, M., Small, C., Waugh, S., 2019. Assessment of the risk of surface longline fisheries in the Southern Hemisphere to albatrosses and petrels, for 2016. Report prepared for the 13th Meeting of the Ecologically Related Species Working Group (ERSWG13) of the Commission for the Conservation of Southern Bluefin Tuna (CCSBT-ERS/1905/17). Birdlife South Africa, 2019. Report of the Final Global Seabird Bycatch Assessment Workshop. WCPFC-SC15-2019/EB-WP-07. Ochi, D., Abraham, E., Inoue, Y., Oshima, K., Walker, N., Richard, Y. & Tsuji, S., 2018. Preliminary assessment of the risk of albatrosses by longline fisheries. WCPFC-SC14-2018/EB-WP-09 Peatman, T., Abraham, E., Ochi, D., Webber, D. and Smith, N., 2019. Project 68: Estimation of seabird mortality across the WCPFC Convention Area. WCPFC-SC15-2019/EB-WP-03.

Project P22X08	Maintenance of the Bycatch Mitigation Information System (BMIS) – to be developed (SPC, L. Fitzsimmons)
New project	Priority ranking
Part A: Administrative Summary	
1. Project Title	<i>The official name of the project is concise yet descriptive</i>
2. Organization	<i>Name of the institution or organization submitting the proposal.</i>
3. Administrative Contact	<i>Primary point of contact for administrative matters (name, position, email, phone number).</i>
4. Principal Investigator (PI) and CV	<i>Lead researcher responsible for project execution. Attach a brief CV highlighting expertise relevant to the project.</i>
5. Commencement and Completion Date	<i>Planned project start and end dates (day/month/year).</i>

6. Project Budget Summary	<i>Overview of major cost categories:</i> ○ Salaries ○ Travel ○ Operating Costs (e.g., equipment, supplies) ○ Other Costs (e.g., sub-contracts, dissemination)
Part B: Project Proposal Description	
1. Project Title	<i>The official name of the project, concise yet descriptive</i>
2. Background and Need	<i>Overview of the problem or issue being addressed, its relevance to WCPFC, and why it needs to be investigated now.</i>
3. Objectives and Benefits	<i>Specific aims of the project and anticipated benefits for WCPFC fisheries management, stock assessment, compliance, or science.</i>
4. Note	<i>Important clarifications, caveats, or context the SC should know upfront.</i>
5. Rationale	<i>Explanation of why this project approach/methodology is appropriate. Include scientific reasoning and expected impact.</i>
6. Assumptions	<i>Any assumptions on which the project is based (e.g., data availability, stakeholder cooperation, funding conditions).</i>
7. Scope of Work	<i>Detailed description of tasks and deliverables. Clearly define the boundaries of what the project will and will not cover.</i>
8. Activity Schedule	<i>Timeline showing key activities and milestones, possibly in a table or Gantt chart format.</i>
9. Project Outcomes	<i>Expected tangible results (e.g., reports, models, improved data sets, advice for stock assessments).</i>
10. Forms of Results	<i>How the results will be presented (e.g., written reports, presentations at SC, datasets, policy recommendations).</i>
11. Methods	<i>How the results will be presented (e.g., written reports, presentations at SC, datasets, policy recommendations).</i>
12. Data Management Plan / Data Sets Required	4. <i>Specify data needed from WCPFC or SSP (Secretariat of the Pacific Community's Statistics and Science Programme).</i> 5. <i>Assess the feasibility of receiving/accessing the required WCPFC data in appropriate formats.</i> 6. <i>Include how data will be stored, secured, and shared.</i>
13. Other Related Projects	<i>Mention any existing or previous projects with similar objectives to ensure synergy or avoid duplication.</i>
14. Collaborations	<i>List project partners, contributors, and describe their roles. Include inter-agency collaborations if any.</i>
15. Project Staff and CVs	<i>List key project personnel and attach brief CVs focusing on relevant qualifications and experience.</i>
16. Risks of Project Not Achieving Objectives	<i>Identify major risks (e.g., delays in data provision, logistical challenges) and proposed mitigation measures.</i>
17. Timeframe	<i>Estimated duration for each major phase and final delivery, consistent with Activity Schedule.</i>
18. Budget	<i>Detailed budget breakdown, linked to project activities:</i> ○ Personnel ○ Travel ○ Operating ○ Other (include justification where needed)
19. References	<i>List scientific literature, reports, or data sources cited throughout the proposal.</i>

Project P22X09	Technical workshop on approaches to utilising tagging data within regional stock assessments to support best available science – TOR finalized
New project	Priority ranking
Part A: Administrative Summary	
1. Project Title	Technical workshop on approaches to utilising tagging data within regional stock assessments to support best available science
2. Organization	SPC-OFP
3. Administrative Contact	Graham Pilling (grahamp@spc.int)
4. Principal Investigator (PI) and CV	Paul Hamer (SPC)
5. Commencement and Completion Date	1/1/2027 to 31/12/2028
6. Project Budget Summary	Salary - The project requires a key technically proficient person (independent consultant, preferably external to the WCPO) to oversee and coordinate the production of the synthesis/review paper, and support the co-ordination and development of the technical inputs to the workshop: 65 K USD - Logistical organisation of the workshop will be provided in-kind through science staff supported by RFMOs and host venue support organisation. Operational - Catering for the meeting, 10K USD Contingency - Unforeseen operating expenses 10K USD Travel - Flights and subsistence for at least 4 independent experts: 40 K USD Publication fees - Publication costs: 10K USD Travel costs for the RFMO analysts would be expected to be covered from their own budgets. In-person attendance is essential, but hybrid sessions could be considered. Total: <u>135K USD</u> Co-funds sought Some SPC-OFP attendance would be supported through non-WCPFC funds.
Part B: Project Proposal Description	

1. Project Title	Technical workshop on approaches to utilising tagging data within regional stock assessments to support best available science
2. Background and Need	Tagging information is a critical data input to many WCPO tuna assessments, harvest strategy estimation methods, and models of climate impacts on tuna distribution, where they provide information on growth, mortality and movement, amongst other demographic parameters. Scientific work in the western and central Pacific Ocean benefits from a unique and extensive time series of tagging information for tropical tuna. A range of decisions must be made during the development of integrated stock assessments for tropical tuna on how data from these tagging programmes are dealt with, as a function of the structural assumptions of the assessment model being considered. This includes decisions on the length of assumed mixing periods, the level of tagging-induced mortality effects, tag reporting rates, recaptures occurring outside the model area, use of the tagging data in release-recapture or recapture-conditioned modes, etc. Many of these are defined through external analyses that develop the data sets being provided to the model. In turn, settings relating to the interpretation of tagging data must be defined within the model itself. Recent assessments have developed and refined approaches to the incorporation of tagging data and model settings. This work has identified key uncertainties such as tag mixing and the degree of potential overdispersion in the distribution of tag recaptures through time, to name two, which are either estimated or captured as key uncertainties within model uncertainty grids, particularly where they have implications for stock assessment outcomes. These decisions and settings will interact. Following focussed work on CPUE and size data inputs into regional assessment in the last few years and following the features identified in 2026 assessments, it is now important to bring a comparable level of focus on the tagging data – both the development and processing of these data sets to be introduced into the integrated model, and the model settings used.
3. Objectives and Benefits	• Conduct a comprehensive evaluation of the approaches and key decision points in the development of tagging data sets. • Review current practices and identify alternative approaches for the inclusion of tagging data sets within integrated models. • Review approaches that utilise tagging data external to integrated models. • Develop good practice approaches to the use of tagging data within regional tuna stock assessments.
4. Note	Detailed above
5. Rationale	Tagging data are a key input into a range of WCPFC assessments, as well as assessments for tuna and other species worldwide. Bringing together global experts and practitioners to discuss how to improve how these

	data are dealt with is timely and should benefit all relevant assessments.
6. Assumptions	• Relevant RFMOs commit and support the participation of their analysts • Relevant external experts are able to attend • Travel restrictions permit international participation • Co-funding partners can be found Suitable Timing: To be determined, but it is appropriate for this workshop to occur in 2027 prior to work being undertaken on the 2028 skipjack stock assessment.
7. Scope of Work	This project will support: 1. Convening a 5-day technical workshop on the development of tagging data sets and their incorporation within assessment models, attended by analysts involved in the modelling of tagging across relevant RFMOs, with invited experts in relevant modelling methods. 2. The workshop would cover key themes: ○ The nature and key uncertainties present in tagging data sets ○ Development of tagging data inputs for integrated assessments ○ Consideration of the assumptions that typically need to be made for tagging data to be used in integrated stock assessment models, and how those assumptions relate to tagging programme realities ○ ‘External’ methods to develop information from tagging data to input into integrated assessments (e.g. SEAPODYM, DTU Aqua spatiotemporal model) ○ Implementation, application, and strengths/weaknesses of these methods in stock assessment models, with a focus on the key sources of uncertainty and the role of assumptions (e.g., overdispersion (estimation or fixed), and including recapture rates in the mixing period calculations) 3. The outcomes of the workshop would include: ○ Synthesis paper reviewing current practices across relevant RFMOs ○ Good practice guidelines specific to the development and implementation of these data sets for tropical tuna assessments ○ Workshop report with actionable recommendations ○ Journal article/special edition (tbd) In a more general sense, the workshop’s discussions on potential future analyses will help inform the necessary logistics, experimental design and project management of tagging programmes. It will therefore feed into the discussions initiated considering SC22-SA-WP-04. A small informal steering committee of SPC and non-SPC personnel will be arranged to help develop and guide the workshop logistics and details

	and support development of outputs.
8. Activity Schedule	Phase 1 (5 months): Preparation and coordination • Literature review and RFMO consultation • Participant selection and workshop planning • Venue confirmation and logistics Phase 2 (Workshop): (potentially post SC23) Phase 3 (6 months): Follow-up and deliverables • Guidelines development • Implementation of key developments within the framework of the 2028 skipjack stock assessment Reporting to SC24
9. Project Outcomes	The outcomes of the workshop would include: ○ Synthesis paper reviewing current practices across relevant RFMOs ○ Good practice guidelines specific to the development and implementation of these data sets for tropical tuna assessments ○ Workshop report with actionable recommendations ○ Journal article/special edition (tbd)
10. Forms of Results	Report to SC24, relevant SPC PAW and consideration within 2028 SKJ assessment. Scientific publication.
11. Methods	See #10
12. Data Management Plan / Data Sets Required	Led by SPC under existing data policies and agreements
13. Other Related Projects	Following the same approach as P122a workshop on longline CPUE.
14. Collaborations	SPC IATTC Other RFMOs (e.g. CCAMLR, ICCAT, IOTC) CCMs Relevant NGOs
15. Project Staff and CVs	SPC staff External experts to be identified by small project steering committee (through correspondence)
16. Risks of Project Not Achieving Objectives	Sourcing of venue for workshop Non-funded parties have sufficient resources to cover their attendance (hybrid option not costed)
17. Timeframe	See details above
18. Budget	Salary • The project requires a key technically proficient person (independent consultant, preferably external to the WCPO) to oversee and coordinate the production of the synthesis/review paper, and support the co-ordination and development of the technical inputs to the workshop: 65 K USD

	- Logistical organisation of the workshop will be provided in-kind through science staff supported by RFMOs and host venue support organisation. Operational - Catering for the meeting, 10K USD Contingency - Unforeseen operating expenses 10K USD Travel - Flights and subsistence for at least 4 independent experts: 40 K USD Publication fees - Publication costs: 10K USD Travel costs for the RFMO analysts would be expected to be covered from their own budgets. In-person attendance is essential, but hybrid sessions could be considered. Total: <u>135K USD</u> Co-funds sought - Some SPC-OFP attendance would be supported through non-WCPFC funds.
19. References	SC22-SA-WP-04 SC22-SA-WP-05 SC22-SA-WP-06