



**SCIENTIFIC COMMITTEE  
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**Updated draft research plan for 'key' tuna species in the WCPO, 2022-2025**

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**WCPFC-SC18-2022/SA-IP-04  
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**OFP, SPC**

Pacific Community (SPC), Noumea, New Caledonia

## Executive Summary

This paper updates the draft 2021 Scientific Committee research plan for improving the stock assessments of 'key' WCPO tuna stocks: WCPO skipjack, bigeye and yellowfin and South Pacific albacore (SC17-SA-IP-05). At SC16 CCMs agreed to focus on the tuna research plan in 2021, however the online format of recent SC meetings has prevented this updated plan from being reviewed in detail and adopted; we therefore use this paper to refine and update the draft provided to previous SC meetings with the latest information, and to highlight some important potential research and development areas that SC may wish to consider.

Every stock assessment performed by SPC-OFP identifies areas for improvement and provides recommendations for future work by the Scientific Committee. Some recommendations are pointers for assessment scientists on areas to consider in subsequent assessments. Others indicate key gaps in fishery data and understanding of tuna biology and population structure that, if filled, may reduce both future model misspecification and uncertainty in assessment outcomes. Many of these cannot be directly rectified through improvements to the assessment model alone; to address these issues and to reduce uncertainty, ongoing efforts to improve regional fishery data collection and a well-structured and appropriately resourced and targeted programme of biological studies are needed.

Some of this work is undertaken by WCPFC members and the SPC-OFP through specific WCPFC research projects that arise directly from SC discussions on these issues. Other key work is undertaken by WCPFC members or SPC-OFP through other funding sources and capturing these efforts within the plan will enhance SC's research planning.

The Scientific Committee tuna research plan aims to:

- More formally capture key research and development recommendations arising from stock assessments;
- Allows prioritization of that required research and development prior to subsequent assessments of that stock;
- Clearly indicate how ongoing SC Projects support improved assessment-based advice for tuna stocks;
- Capture research being undertaken outside WCPFC's direct funding by all WCPFC members that will contribute to improvements in assessments;
- Allow SC and the Commission to better prioritise the research budget needed for improved assessment advice;
- Identify gaps in funding that can be the subject of proposals external to WCPFC;
- Enables the SC to review activities and progress over time.

The plan currently focusses on activities and projects specifically relevant to key tuna stock assessments. For example:

- Developments to the MULTIFAN-CL assessment platform;
- Research on biological inputs into stock assessments, to reflect the need to improve and update our understanding of these inputs, as demonstrated in all tuna assessments in recent years;

- Data gaps and areas for improved fishery data collection;
- Development of inputs into stock assessments, for example models used for the standardization of CPUE, tagging information, etc.; and
- Work undertaken to address specific requests by WCPFC SC members.

The tuna research plan would be reviewed by SC each year to reflect progress, capture research and development recommendations identified in the latest adopted tuna assessments, identify key emerging areas, plan activities, and document requests. As a result, it would be a living document, which SC can use to prioritise key activities for subsequent years.

Development and delivery of the research plan does have implications and must reflect the available capacity of SC members and the SPC-OFP, balancing the delivery of key stock assessments with the developments planned around those assessments and the budget available. SC may consider the development of an 'urgent and important' matrix to aid prioritization and budgetary discussions, relative to the planned tuna assessment timetable.

Many of the enhancements to MULTIFAN-CL and key tuna stock assessments arose through the independent peer review of the bigeye stock assessment undertaken in 2012 (Ianelli et al., 2012). SC has scheduled an external review of the current yellowfin (and bigeye) tuna assessment for 2022 (see SC17-SA-WP-06), and key recommendations arising from that review can be captured in future iterations of this research plan.

As with the shark research plan, the tuna research plan is viewed as a document for SC's focus. Implications for Commission decision making would arise through budgetary requests. If the plan is demonstrated as an aid to work and budget planning, the SC may also wish to consider developing similar research plans for its other themes (Data and Statistics, Ecosystems and Bycatch, Management Issues) in the coming years. The proposed billfish research plan (Project X1 of SC16), development of which was deferred, is noted.

We invite WCPFC-SC18 to:

- Continue to discuss the concept of a tuna research plan and suggest modifications to the approach.
- Provide feedback on potential gaps in or improvements to the plan, including better capturing SC member activities and plans.
- Task the WCPFC Secretariat, with the assistance of the SSP, to review and update the draft tuna research plan for formal discussion at SC19.

**Table 1. WCPFC stock assessment schedule for 2022-2025 – ‘key’ tuna**

Species	Stock	Last assessment	2022	2023	2024	2025
Bigeye tuna	WCPO	2020		X		
Skipjack tuna	WCPO	2019	X			X
Yellowfin tuna	WCPO	2020		X		
Albacore	S Pacific	2021			X	

**Table 2. Research plan for WCPO ‘key’ tuna stocks**

Shaded cells in the species section indicate the year of next scheduled assessment. Note timescales are to be refined/prioritised by SC. ‘Lead’ is indicative; all activities are anticipated to involve Scientific Committee members to different degrees.

Stock/Focus area	Research need	Activity	Funding (incl. SC budget lines)	Timescale				Lead
				2022 <sup>1</sup>	2023	2024	2025	
Common across stocks	Improved stock assessment software performance and features suited to WCPFC tuna assessments <sup>2</sup>	Refinement of MULTIFAN-CL: e.g. addressing 1) remaining Ianelli et al. (2012) recommendations (and ongoing testing), 2) relevant outcomes of 2022 YFT assessment review	Existing WCPFC SC ‘additional resourcing SPC’ funding line	X	X	X	X	SSP
		Testing of newly developed MULTIFAN-CL features for assessments, with a focus on those to reduce model complexity. Exploration of alternative model software and approaches.	Existing WCPFC SC ‘additional resourcing SPC’ funding line	X	X	X	X	SSP
		Examine approaches to capture spatial patterns and variation in biological features into assessments	<b>Not currently resourced</b>		(X)	(X)	(X)	-
		Continued development and support of features to progress harvest strategy MSE	Existing WCPFC SC ‘additional resourcing SPC’ funding line	X	X	X	X	SSP
Improved provision of advice	Review and recommend approaches for characterising stock assessment	Existing ‘Scientific Services (SPC)’ funding		X	X		SC	

Stock/Focus area	Research need	Activity	Funding (incl. SC budget lines)	Timescale				Lead
				2022 <sup>1</sup>	2023	2024	2025	
		uncertainty, building on SC17-SA-WP-05	line, SC project 17X4 (pending funding decision; see SC18-SA-IP-09)					
		Improved diagnostic presentation approaches for all grid models and ability to characterise output uncertainty	Existing WCPFC SC 'additional resourcing SPC' funding line	X	X	X		SSP
	Improved abundance indices	Further development of geostatistical and other relevant approaches for CPUE analyses	Existing WCPFC SC 'additional resourcing SPC' funding line, EU PEUMP project	X	X	X	X	SSP/SC
		Proposal for a cross-tuna-RFMO workshop on abundance indices modelling to apply best practice, and discuss alternative indicators of stock trends	<b>Not currently resourced</b>		(X)	(X)		SC
		Improved understanding of oceanographic influences related to gear deployment and tuna behaviour to inform modelling	Existing WCPFC SC 'additional resourcing SPC' funding line, EU PEUMP project	X	X	X		SSP/SC
		Evaluate size-based approaches to CPUE index standardisation (from SPA assessment recommendations)	Existing WCPFC SC 'additional resourcing SPC' funding line, EU PEUMP project		X	X		
		Improved CPUE through archival tagging to define school and behavioural influences	Other SPC resources, SC Project 42	X	X	X		SSP/SC
		Evaluation of model spatial structure	Investigation of tuna stock structure (e.g. through genetics, otolith chemistry etc.)	EU PEUMP project; existing SPC resourcing, <b>additional resources required post 2024</b>	X	X	X	(X)
	Examination of data needs to support existing model spatial structures, and re-evaluate spatial structures where necessary to improve model fits		Existing 'Scientific Services (SPC)' funding line	X	X	X		SSP/SC
	Tagging and tag modelling	Examination of tagging programme design (WPO, CPO), e.g. cf model spatial structure	SC Project 42, other SPC resources	X	X	X		SSP/SC

Stock/Focus area	Research need	Activity	Funding (incl. SC budget lines)	Timescale				Lead
				2022 <sup>1</sup>	2023	2024	2025	
		Further investigation of release event-specific tag mixing rates	SC Project 42, other SPC resources	X	X			SSP
		Refinement of release event, shedding and tagging induced mortalities	SC Project 42, other SPC resources,	X	X			SSP
		External review of tag/recapture data treatment prior to input into stock assessments	Existing 'Scientific Services (SPC)' funding line, EU PEUMP project, SC Project 42	X	X			SSP
	Improved cross-stock biological understanding and fishery independent estimates of biomass	Utility of close-kin mark-recapture approaches to estimate absolute biomass, spawning biomass and reproductive potential for tuna stocks (see also SPA, below)	EU and SC Project (awaiting funding from EU) and additional AU support	X	X	X		SSP/AU
		Re-evaluation of and monitoring for non-stationarity in key life history parameters (reproductive biology, growth) for all stocks (see also YFT, below)	EU PEUMP project, SC Project 35b, <b>additional resourcing being sought</b>	X	X	X	(X)	SSP/SC
		Review approaches for estimating natural mortality and apply to the four key tuna following the recent CAPAM meeting	<u>Completed</u>					-
	Spatial dynamics	Examine ways to formally incorporate the spatial results of explicit movement models (e.g. SEAPODYM, IKAMOANA, archival tags) into assessments	Other SPC resources	X	X	X		SSP
	Improved fishery input data	Improved data for WPEA fisheries	NZ-funded WPEA project, <b>not currently resourced post March 2023</b>	X	(X)	(X)	(X)	WCPFC Sec
		Enhanced data collection, auditing and validation processes, incl species ID	Existing SPC resourcing, SC Project 60, SC member activities	X	X	X	X	SC
		Collection of processor (cannery) time series data for the validation of tuna species composition	<b>Potential new work under Project 60 (see SC18-ST-WP-01)</b>		(X)	(X)	(X)	
		Improved accounting for discards and longline depredation losses in stock assessments	<b>Not currently resourced</b>		(X)	(X)		-

Stock/Focus area	Research need	Activity	Funding (incl. SC budget lines)	Timescale				Lead
				2022 <sup>1</sup>	2023	2024	2025	
		Improved/enhanced collection of logbook and observer longline data, including the use of EM, to improve SC analyses (CPUE standardisation focus)	<b>Requires WCPFC mandate</b>	(X)	(X)	(X)		SC
	Assessment peer review	YFT focus, cuts across to BET and other stocks	SC funded (Project 65)	X	X			SC
Skipjack	Biological inputs	Improved length-weight relationship	SC Project 90	X	X			SSP
		Validate growth and improve growth estimates, e.g. evaluation of epigenetic ageing approaches	Other resourcing, <b>additional resourcing may be required</b>	X	X	(X)	(X)	AU/SSP
	Fishery inputs	Development of alternative PS-based CPUE time series inputs	EU PEUMP project <b>additional resourcing may be required</b>	X	X	X	(X)	SSP
		Evaluation of tagging mortality and school cohesion analyses	Other SPC resourcing, SC Project 42	X	X	X		SSP
Bigeye	Biological inputs	Improved length-weight relationship	SC Project 90	X	X			SSP/SC
		Age validation (incl. through bomb radiocarbon)	SC Project 105	X				JP/AU
		Epigenetic ageing evaluation	EU and SC Project (awaiting funding from EU) and additional AU support		X	X		SSP/AU
	Fishery inputs	Improved weight conversion factors (e.g. G&G to whole wt)	SC Project 90	X	X			SSP/SC
Yellowfin	Biological inputs	Improved length-weight relationship	SC Project 90	X	X			SSP/SC
		Age validation (incl. through bomb radiocarbon)	SC Project 105	X				JP/AU
		Revised growth models for stock assessment and validation studies (also relates to assessment peer review)	Existing 'Scientific Services (SPC)' funding line, SC Project 105, <b>additional resourcing may be required</b>	X	X			SSP/AU

Stock/Focus area	Research need	Activity	Funding (incl. SC budget lines)	Timescale				Lead
				2022 <sup>1</sup>	2023	2024	2025	
		Re-evaluation of reproductive biology	EU PEUMP project, SC Project 35b, <b>additional resourcing being sought</b>	X	X	X		SSP/SC
		Validate growth and improve growth estimates, e.g. evaluation of epigenetic ageing approaches	AU support, potential support through EU and SC Project (awaiting funding from EU)	X	X			AU
	Fishery inputs	Development of alternative PS-based CPUE time series inputs	EU PEUMP project	X	X			SSP
		Improved weight conversion factors (e.g. G&G to whole wt)	SC Project 90	X	X			SSP/SC
		Evaluation of alternative selectivity assumptions	Existing 'Scientific Services (SPC)' funding line	X	X			SSP
South Pacific albacore	Biological inputs	Evaluation of alternative growth model formulations	Addressed in 2021 assessment					SSP
		Sex-specific population modelling	Existing 'Scientific Services (SPC)' funding line		X	X		SSP
		Epigenetic ageing evaluation	EU and SC Project (awaiting funding from EU) and additional AU support		X	X		SSP
		Utility of close-kin mark-recapture approach for SPA to estimate population size and inform the spatial structure used in SPA stock assessments	EU and SC Project (awaiting funding from EU) and additional AU support		X	X		SSP/AU
	Fishery inputs	NZ troll fishery characterisation and CPUE			(X)	(X)		<b>TBD</b>

<sup>1</sup> Remainder of 2022

<sup>2</sup> see SC18-SA-IP-03 for further planned activities and timeline