



**SCIENTIFIC COMMITTEE  
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**Tuna Assessment Research Plan (TARP) for 'Key' Tuna Species Assessments in the WCPO, 2025-2028**

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## Executive Summary

This paper updates the Scientific Committee (SC) research plan for improving the stock assessments of 'key' WCPO tuna stocks: WCPO skipjack, bigeye and yellowfin and South Pacific albacore, and highlights some important potential research and development areas that SC may wish to consider for submission as SC projects into the meeting's prioritization process.

Every stock assessment performed by SPC-OFP identifies areas for improvement and provides recommendations for future work. Some recommendations focus on areas to consider in future assessments. Others indicate key gaps in fishery data and understanding of biology and population structure that, if filled, may reduce both model misspecification and uncertainty in assessment outcomes. Many of these cannot be directly rectified through improvements to the assessment model alone; ongoing efforts to improve regional fishery data collection and a well-structured and appropriately resourced programme of biological studies that target the areas required to reduce stock assessment uncertainty are needed. Furthermore, 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 ([lanelli et al., 2012](#)) while the 2022 yellowfin assessment review ([Punt et al. 2023](#)) identified further recommendations, and relevant issues are captured in this TARP.

Some of this work is undertaken by WCPFC members and the SPC-OFP through specific SC 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 and facilitate the identification of gaps to be filled.

The Scientific Committee tuna assessment research plan aims to:

- Capture key research and development recommendations arising from stock assessments;
- Enable SC prioritization of research prior to subsequent assessments of a stock;
- Clearly indicate how ongoing SC Projects support improvements to tuna stock assessments;
- Capture relevant WCPFC-member research on key tuna stocks being undertaken outside WCPFC's direct funding that will contribute to improvements in assessments;
- Allow the SC and 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;
- Enable the SC to review activities and progress over time. To this end, an appendix capturing completed elements has been included, with hyperlinks to relevant documentation for reference/auditing purposes.

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

- Developments to the MULTIFAN-CL assessment platform, including future proofing WCPO stock assessments through the scoping of the next generation of tuna stock assessment software;

- Research into appropriate assessment model specifications;
- Research on biological inputs into stock assessments, the need for which has been demonstrated in all tuna assessments in recent years;
- Data gaps and areas for improved fishery data collection;
- Development of data inputs into stock assessments, for example models used for the standardization of CPUE, tagging information, age at length data etc.; and
- Work undertaken to address specific requests by WCPFC SC members.

The TARP has been reviewed to reflect progress and the latest SC projects, and to capture research and development recommendations identified in the latest adopted tuna assessments, allowing SC to identify key emerging areas, plan activities, and document requests. As with the shark research plan (e.g. [Brouwer and Hamer, 2024](#)) and billfish research plan ([Brouwer et al., 2024](#)), the tuna assessment research plan is viewed as a document for SC's focus. Implications for Commission decision making would arise through prioritised budgetary requests.

Development and delivery of the TARP does have implications for 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. Planning should take into account the 2-3 year time lag between e.g. SC project prioritization and the delivery of project results for incorporation into stock assessments.

We invite WCPFC-SC21 to:

- Discuss and refine the tuna assessment research plan.
- Provide feedback on potential gaps in or improvements to the plan, including approaches to better capture SC member activities and plans.
- Consider convening a small working group during SC21 to:
  - assess the TARP and fill identified gaps,
  - identify priority work areas for the development of new SC project proposals for consideration at SC21.
- Task the WCPFC Secretariat, with the assistance of the SSP, to review and update the tuna assessment research plan annually.

**Table 1. WCPFC stock assessment schedule for 2025-2028 – ‘key’ tuna**

Species	Stock	Last assessment	2025	2026	2027	2028
Bigeye tuna	WCPO	2023		X		
Skipjack tuna	WCPO	2022	X			X
Yellowfin tuna	WCPO	2023		X		
Albacore	S Pacific	2024			X	

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

Shaded cells in the species’ section indicate the year of next scheduled assessment. Note that timescales are to be refined/prioritised by SC. ‘Lead’ is indicative and does not exclude the involvement of any Scientific Committee member. Specific yellowfin tuna (YFT)-peer review research area paragraphs noted in parentheses. With respect to timescale, (X) (X in parentheses) indicates years in which work is desirable but cannot yet be undertaken without specific funding. For ongoing projects, an X is subject to the decisions of SC and the Commission regarding funding priorities.

Stock/Focus area	Research need	Activity	Funding (incl. SC budget lines)	Timescale				Lead
				2025 <sup>1</sup>	2026	2027	2028	
Common across stocks	Improved stock assessment software performance and features suited to WCPFC tuna assessments	Refinement of MULTIFAN-CL: e.g. addressing 1) remaining Ianelli et al. (2012) recommendations (and ongoing testing), 2) addressing relevant outcomes of 2022 YFT assessment review (report Section E3), 3) implementation of alternative growth models (2024 SPA assessment)	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.	Existing WCPFC SC ‘additional resourcing SPC’ funding line.	X	X	X	X	SSP

		Explore approaches to capture spatial patterns and variation in biological parameters into assessments	<b>Not currently resourced</b> (related to Project 123 “ <i>Next generation of tuna stock assessment software</i> ”)	(X)	(X)	(X)	(X)	TBD
		Continued development and support of features to progress harvest strategy MSE	Existing WCPFC SC ‘additional resourcing SPC’ funding line	X	X	X	X	SSP
		Investigation of approaches to ensure WCPO assessment software remains fit-for-purpose, including enhancing existing or developing and testing new/alternative modelling software	Existing WCPFC SC ‘additional resourcing SPC’ funding line; SC project 123 “ <i>Next generation of tuna stock assessment software</i> ” <b>(Additional funding will be required)</b>	X	X	(X)	(X)	SSP/SC
	General	Developments to improve model stability and convergence, including alternative model structures and reduced model complexity	Existing ‘Scientific Services (SPC)’ funding line	X	X	X	X	SPC
	Improved provision of advice	Review and recommend approaches for characterising stock assessment uncertainty	Existing ‘Scientific Services (SPC)’ funding line	X	X	X	X	SC
		Identification and approaches to resolve data conflicts affecting assessment outcomes	Existing ‘Scientific Services (SPC)’ funding line,	X	X	X	X	SSP
		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	X	SSP
	Improved abundance indices	Further development of geostatistical and other relevant approaches for CPUE analyses (E1(6))	Existing WCPFC SC ‘additional resourcing SPC’ funding line, EU PEUMP project (ends 2025; potential PEUMP2 starting by 2026)	X	X	X		SSP/SC
		Proposal for a cross-tuna-RFMO workshop on abundance indices modelling (focussed on longline) to apply good practices, and to consider approaches for standardisation of size composition data for the CPUE index fisheries.	<b>Not currently directly resourced;</b> remaining funds from P122 “ <i>Longline Effort Creep in the WCPO</i> ” were carried over to 2025. Request for remaining funds to be carried to 2026, with additional funding request to support the	(X)	(X)			SC

			cross RFMO workshop (considerable co-funds already sourced - see Project 122 report).					
		Improved understanding of oceanographic influences related to gear deployment and tuna behaviour (e.g. 'habitat-based models) to inform CPUE modelling	Existing WCPFC SC 'additional resourcing SPC' funding line, EU PEUMP project (ends 2025; potential PEUMP2 starting by 2026) <b>additional resources required post 2025. Note this type of issue would be considered in the proposed cross RFMO workshop on longline CPUE analysis.</b>	(X)	(X)			SSP/SC
	Evaluation of model spatial structure	Investigation of tuna stock and sub-population structure (e.g. through genetics, otolith chemistry etc.)	EU PEUMP project (ends 2025; potential PEUMP2 starting by 2026); existing SPC resourcing, <b>additional resources required post 2025.</b> Note that Project 128 <i>"Understanding connectivity of the yellowfin and skipjack stocks in the Western Pacific and East Asia region with the WCPFC Convention Area"</i> is relevant and important under this need. A TOR for additional funds to continue this project will be submitted to SC21 as part of the scoping phase.	X	(X)	(X)	(X)	SSP
		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, SC Project 117 <i>"WCPFC Tuna Biological Sampling Plan"</i> .	X	X	X		SSP/SC
	Tagging and tag modelling	Examination and review of tagging programme design (WPO, CPO), e.g. cf model spatial structure	SC Project 42 <i>"Pacific Tuna Tagging Project"</i> , other SPC resources	X	X	X		SSP/SC
		Further investigation of release event-specific tag mixing rates and approaches to better deal with tag mixing assumptions in stock assessment models (E2(7))	SC Project 42, other SPC resources	X	X	X	X	SSP

		Improved data and modelling of release event, shedding and tagging induced mortalities (E1(5))	SC Project 42, other SPC resources,	X	X	X	X	SSP
		Increase tag seeding experiments to get better estimates of reporting rates (E4(3))	SC Project 42, other SPC resources	X	X	X		SSP/SC
		Review of wider options to maximise the utility of tag/recapture data for assessments, including the analysis of tag/recapture data external to the assessment model.	Existing ‘Scientific Services (SPC)’ funding line, EU PEUMP project (ends 2025; potential PEUMP2 starting by 2026), SC Project 42. Project 123 also contributing through external tag data analysis, including the 2025 workshop at Technical University of Denmark (DTU).	X	X	X		SSP
	Improved cross-stock biological understanding and fishery independent estimates of biomass	Explore 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 100c, other SPC resources and additional AU support	X	X	X	X	SSP/AU
	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 (E1(7))	NZ SPF project, Project 128	X	X	X		WCPFC Sec/SSP CSIRO
		Enhanced data collection, auditing and validation processes, incl. species ID	Existing SPC resourcing, SC member activities	X	X	X		SC
		Collection of processor (cannery) time series data for the validation of tuna species composition	<b>Not currently resourced</b> (SC project 114 “Improved coverage of cannery receipt data” not directly resourced in 2025)	(X)	(X)			SSP
		Improved accounting for discards and longline depredation losses in stock assessments	<b>Not currently resourced</b>	(X)	(X)			TBD

		Enhanced approaches to input data weighting within models	Existing SPC resourcing	X	X	X		SSP
		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
	Biological inputs	Improved length-weight relationship (e.g. E1(8))	SC Project 90 “ <i>Better data on fish weights and lengths for scientific analyses</i> ”	X				SSP/SC
		Evaluation of alternative appropriate natural mortality models	Existing SPC resourcing	X	X	X		SSP
		Enhanced collection of fish hard parts and measurements from across the WCPO region for all relevant stocks, with a focus on age-length data (E4(6)) (2024 SPA assessment)	SC Project 35b “ <i>Pacific Marine Specimen Bank</i> ”, SC Project 117 “ <i>WCPFC Tuna Biological Sampling Plan</i> ”, <b>additional resources required</b>	(X)	(X)	(X)		SSP/SC
		Re-evaluation of and monitoring for non-stationarity in key life history parameters (reproductive biology, growth) for all stocks (see also species-specific areas below)	EU PEUMP project (ends 2025; potential PEUMP2 starting by 2026), SC Project 35b, EU and SC funding through Project 120 “ <i>Updated reproductive biology of tropical tunas</i> ”	X	X	(X)		SSP/SC
		Further investigation of input size composition data, with review of all size composition data for tuna assessments (E1(1); E1(2); E1(3))	Existing SPC resourcing, SC Project 127 “ <i>Reconciliation of size composition data for stock assessments</i> ”. Work will continue in 2025 after SC21. 2 <sup>nd</sup> phase of technical work envisaged through to SC22 in 2026 (i.e. size data preparation and database improvements for stock assessments, dealing with multi-fleet data and spatiotemporal standardization of size data), which may require additional resources for consultant support.	X	(X)	(X)		SSP



Skipjack	Biological inputs	Update estimates of reproductive potential (E4(4))	EU and SC funding through Project 120	X	X			SSP
		Validate growth and improve growth estimates	Other resourcing, <b>additional resourcing may be required</b>	(X)	(X)			AU/SSP
		Better understanding of the connectivity between the western tropical and wider WCPO regions	SC Project 128, <b>additional resourcing may be required</b>	X	(X)	(X)	(X)	WPEA/AU
	Fishery inputs	Ongoing development of alternative PS-based CPUE abundance indices	EU PEUMP project (ends 2025; potential PEUMP2 starting by 2026) <b>additional resourcing may be required</b>	X	(X)	(X)		SSP
		Evaluation of tagging mortality and school cohesion analyses	Other SPC resourcing, SC Project 42	X	X	X		SSP
		Better account for effort creep in stock assessment and CPUE indices	EU PEUMP project (ends 2025; potential PEUMP2 starting by 2026). Ongoing explorations and modelling following Project 115.	(X)	(X)			SSP/JP/SC
Bigeye	Biological inputs	Age validation and improved growth estimates	(SC Project 105 complete) <b>Additional resourcing required</b>	(X)	(X)			TBD
		Epigenetic ageing evaluation	EU and SC Project 100c “ <i>Application of Close-Kin-Mark-Recapture</i> ” methods and additional AU support	X				SSP/AU
		Update reproductive biology estimates (E4(4))	EU and SC funding through Project 120	X	X			SSP
		Improved weight conversion factors (e.g. G&G to whole wt) (E4(5))	SC Project 90, Project 127. <b>Additional resourcing required</b>	X	(X)			SSP/SC
	Fishery inputs	Investigation of effort creep in fisheries used for abundance indices (E2(9))	EU PEUMP project (ends 2025; potential PEUMP2 starting by 2026)	(X)	(X)	(X)		SSP/JP/SC
Yellowfin	Biological inputs	Age validation and improved growth estimates	<b>Additional resourcing required.</b> Assessments need regular age compositions, which requires rapid aging methods.	(X)	(X)			TBD
		Epigenetic ageing evaluation	Additional resourcing required (not part of SC Project 100c TOR), critical to advance this technique.		X	X		SSP/AU

		Update reproductive biology estimates (E4(4))	EU and SC funding through Project 120	X	X			SSP
		Improved weight conversion factors (e.g. G&G to whole wt) (E4(5))	SC Project 90, Project 127. <b>Additional resourcing required.</b> Many conversion factors still need updating, and many still have limited spatial coverage.	X	(X)			SSP/SC
		Better understanding of the connectivity between the western tropical and wider WCPO regions	SC Project 128, <b>additional resourcing will be required.</b>	X	(X)	(X)	(X)	WPEA/AU
	Fishery inputs	Evaluation of alternative selectivity assumptions	Existing 'Scientific Services (SPC)' funding line	X	X			SSP
		Ongoing development of alternative PS-based CPUE abundance indices	EU PEUMP project (ends 2025; potential PEUMP2 starting by 2026) <b>additional resourcing may be required.</b>	(X)	(X)			SSP
		Investigation of effort creep in fisheries used for abundance indices (E2(9))	EU PEUMP project (ends 2025; potential PEUMP2 starting by 2026). <b>Additional Project 122 funds requested for cross RFMO workshop.</b>	(X)	(X)	(X)		SSP/JP/SC
South Pacific albacore	Biological inputs	Sex-specific population modelling	Existing 'Scientific Services (SPC)' funding line	X	X			SSP
		Epigenetic ageing evaluation	EU and SC Project 100c and additional AU support	X				SSP
		Utility of close-kin mark-recapture approach for SPA to estimate population size and inform SPA stock assessments	EU and SC Project 100c and additional AU support	X				SSP/AU
		Ongoing NZ troll fishery characterisation and CPUE	Undertaken by NZ, <b>additional funding required</b>	(X)	(X)	(X)		NZ
	Fishery inputs	Investigation of effort creep in fisheries used for abundance indices (E2(9))	EU PEUMP project (ends 2025; potential PEUMP2 starting by 2026). <b>Project 122 top-up required for cross RFMO workshop.</b>	(X)	(X)	(X)		SSP/JP/SC
		Better understanding of movement rates and connectivity between	EU and SC Project 100c and additional AU support	X				SSP/AU

		WCPO and EPO for the South Pacific wide assessments						
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<sup>1</sup> Remainder of 2025

## Appendix: Completed tasks

Tasks completed since the first draft of the TARP in 2020 are captured here, with relevant references.

Stock/Focus area	Research need	Activity	Lead	Reference
Common across stocks	Improved cross-stock biological understanding and fishery independent estimates of biomass	Review approaches for estimating natural mortality and apply to the four key tuna stocks following the recent CAPAM meeting	SSP/SC	<a href="#">Articles in Fisheries Research</a>
	Tagging and tag modelling	External review of tag/recapture data treatment prior to input into stock assessments	SSP /SC	Online workshop undertaken
		Improved CPUE through archival tagging to define school and behavioural influences	-	Abandoned due to changes in AT production
Skipjack	Spatial dynamics	Updated SEAPODYM Reference model with fully integrated tagging data	SSP	Article in <a href="#">CJFAS</a>
	Biological inputs	Better understanding of recruitment trends estimated by stock assessment models – SC Project 115		<a href="#">SC20-SA-WP-06</a>
	Stock Structure	Preliminary Analyses of SKJ structure	USP/ SSP	Article in <a href="#">FMS</a>
	Fishery Inputs	Better account for effort creep in stock assessment and CPUE indices – SC Project 115		<a href="#">SC20-SA-WP-06</a>
Bigeye	Spatial dynamics	Updated SEAPODYM Reference model with fully integrated tagging data	SSP	<a href="#">SC17-EB-IP-08</a>
	Biological inputs	Age Validation – SC Project 105	US/JP/AU/ SSP	<a href="#">SC17-SA-IP-14a</a>
Yellowfin	Biological inputs	Age Validation – SC Project 105	US/JP/AU/ SSP	<a href="#">SC17-SA-IP-14a</a>
South Pacific albacore	Biological inputs	Evaluation of alternative growth model formulations	SPC	<a href="#">SC17-SA-WP-02</a>