SCIENTIFIC COMMITTEE
TWENTIETH REGULAR SESSION

Nuku'alofa, Tonga
13 – 21 August 2025

Project 35b: WCPFC Pacific Marine Specimen Bank

WCPFC-SC21-2025/ RP-P35b-01_rev1

SPC-OFP[1]

Rev 1:

- **Correction of the years of proposed (2026) and indicatives (2027 and 2028) budgets, section 6. BUDGET**
- **Addition of a recommendation to SC21 (publication of a Working Paper on isotope, mercury, and other pollutant studies at SC22)**

[1] Oceanic Fisheries Programme of the Pacific Community

EXECUTIVE SUMMARY

The WCPFC Pacific Marine Specimen Bank (hereafter PMSB) operations are supported by the WCPFC through Project 35b. Under this project, the Scientific Services Provider (SPC) is tasked with maintaining, developing and expanding the PMSB. This paper updates SC21 on Project 35b activities undertaken since SC20 (as they pertain to the 2024-25 work plan endorsed by SC20). A work plan and budget for 2026, and indicative budgets for 2027 and 2028 are provided for this ongoing project. Key topics covered include:

Biological sampling and PMSB progress during the period 1 January 2024 to 12 December 2024

i. 112,535 new biological samples, taken from 49,128 fish, were added to PMSB holdings. SPC now houses 353,220 biological samples taken from 163,977 individual animal specimens.
ii. Training for observers, debriefers, and observer trainers continued. 43 staff undertook training in biological sample collection this year. In addition to PIRFO-related training, sampling training and refresher courses were run in Samoa, PNG, Tuvalu and New Caledonia.
iii. The renovation and extension of the PMSB laboratory in Nouméa commenced in June 2022. The new dry and wet laboratories are now operational.
iv. The biological sampling feature in the *OnShore* app is now being used in Fiji, Kiribati, Marshall Islands, Tonga, Vanuatu, New Zealand, Papua New Guinea, Solomon Islands, New Caledonia, Samoa, French Polynesia, Federated States of Micronesia and Philippines – its functionality continuing to evolve to cater to specific project needs (e.g. Close-Kin Mark-Recapture). The same biological sampling feature was developed in the *OLLO* app and is currently in use in Fiji, New Caledonia, Cook Islands and French Polynesia.

PMSB Access and Use during the period 1 January 2024 to 12 December 2024

Several enquiries have been received to organise the withdrawal of samples from the PMSB.

Twenty-one projects are classified as 'ongoing' in using PMSB samples for WCPFC-related work. Fifty-six projects are listed as 'completed' as at 31 December 2024. Seven Information Papers or Research Papers linked to the PMSB were submitted to SC20 in 2024. Twelve other books, peer-reviewed articles, conference papers or popular articles associated with PMSB work were published.

The following recommendations arise from this report. We invite SC21 to:

- Continue to support initiatives to increase rates of biological sampling, especially by fisheries observers at sea, noting that this contribution is essential to the ongoing success of the WCPFC's work.
- Incorporate the identified budget into the 2025 budget and the 2026-27 indicative budgets, as development of the WCPFC PMSB is intended to be ongoing and is considered essential.
- Endorse that the work plan in Section 4 of this report be pursued by the Scientific Services Provider, in addition to standard duties associated with maintenance and operation of the WCPFC PMSB in 2024-25.

1. INTRODUCTION

The WCPFC Pacific Marine Specimen Bank (PMSB) is a repository of biological samples from marine specimens collected from across the western and central Pacific Ocean (WCPO). The PMSB is focussed primarily on samples from bigeye, yellowfin, albacore and skipjack tunas, but also houses biological material from other pelagic species (e.g. swordfish, mahi mahi). The PMSB also contains a broad diversity of samples from micronekton, seabirds, deep-water benthic and coastal fishes, among other taxa. The PMSB web portal is accessible at www.spc.int/ofp/PacificSpecimenBank.

The PMSB was officially established in 2015 (SPC-OFP 2017, 2019), though samples have been systematically collected since 2001. Through the PMSB's creation, the WCPFC aimed to provide research institutions access to the biological samples needed to advance our understanding of the dynamics of tunas and related species in the WCPFC region. The initiative has proved highly successful, the PMSB and its associated Biological Data System (BioDaSys) database fostering inter-agency collaboration and strengthening research capacity across the region, as evidenced through ongoing and productive research partnerships involving PMSB samples (see ANNEX 1, Table A4 for examples).

PMSB operations are currently funded by the WCPFC through Project 35b. Under this project, SPC, as the Scientific Services Provider, is tasked with maintaining and developing the PMSB and with expanding the inventory of samples held through national and regional biological sampling programmes.

At SC20, the PMSB Steering Committee acknowledged that ongoing contributions to the PMSB was critical to the success of WCPFC's work, and recommended that financial support be continued to implement the 2024-25 work plan, as set out in the 2024 Report of the PMSB Steering Committee (PMSB Steering Committee 2023). SC20 endorsed the work plan for 2024-25, as well as the proposed 2025-2026 budget and indicative budgets for 2026-27.

Previous papers to the SC (SPC-OFP 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024) detail the history, developments and key objectives of Project 35b. This paper aims to update SC21 on Project 35b activities over 2024 (1 January 2024 to 12 December 2024, as agreed at the 2024 annual project steering committee meeting), as they relate to the agreed 2024-25 work plan, and outlines planned actions for the next phase of work.

2. BIOLOGICAL SAMPLING AND PMSB PROGRESS (2024)

This section summarises progress between 1 January 2024 to 12 December 2024 on:

1) sampling activities, and PMSB holdings as at December 31 2024;
2) training for biological sample collection;
3) the current status of the PMSB equipment and sample storage facilities;
4) recent developments regarding the BioDaSys database.

We refer readers to SPC-OFP (2024) [SC20-2024/RP-P35b-01] for background on sample collection protocols, associated observer training standards, and the key features of the BioDaSys database.

2.1 SAMPLING ACTIVITIES AND PMSB HOLDINGS

2.1.1 Overview

The number of samples collected in 2024 (n=112,535) considerably exceeds the number of samples collected in 2023 (n=29,135). The main species collected were, in decreasing order, albacore then yellowfin, skipjack and bigeye.

In 2024, 112,535 new biological samples were collected from 49,128 fish (compared to 11,199 fish in 2023) and added to the PMSB. Table 1 provides species-level breakdowns of the 2024 additions (Table 1a), together with total fish sample holdings as at 31 December 2024 (Table 1b). When all samples (e.g. seabirds, micronekton) are included, the PMSB now houses 353,220 biological samples taken from 163,977 individual animal specimens.

Table 1a. Additions to the PMSB between 1 January 2024 and 31 December 2024. Note that the number of samples may sometimes exceed the number of specimens (e.g. muscle samples for albacore tuna). This occurs when multiple samples of the same tissue are taken from one specimen.

Species	**No. of specimens**	**Hard parts**		**Reproduction**	**Multi-purpose**				**Diet**	
		Otolith	Spine	Gonad	Blood	Muscle	Liver	Fin	Stomach	Fatmeter*
Albacore	25548	359	128	523	55	25733	418	0	422	0
Yellowfin	17178	476	404	475	33	17238	507	0	508	0
Skipjack	3895	1924	1923	1882	2	3614	1929	0	1931	0
Bigeye	2448	67	67	60	1	2449	69	0	69	0
Swordfish	24	2	3	3	0	24	3	0	3	0
Wahoo	16	1	1	2	0	16	2	0	2	0
Blue Marlin	9	0	12	8	6	12	8	0	8	0
Unspecified	5	0	0	0	0	5	0	0	0	0
Mahi mahi	3	0	1	3	0	3	3	0	3	0
Sailfish	1	0	0	0	0	1	0	0	0	0
Striped marlin	1	1	1	1	0	1	1	0	1	0
Total	**49128**	**2830**	**2540**	**2957**	**97**	**49096**	**2940**	**0**	**2947**	**0**

*Fatmeter is a measurement of percentage of fat, not a type of sample. Fatmeter data are included in the table but not counted as a sample

Table 1b. Samples available in the PMSB (at 31 December 2024). Note that Other* species are micronekton samples from scientific cruises.

Species	No. of specimens	Hard parts		Reproduction	Multi-purpose				Diet		Other samples*
		Otolith	Spine	Gonad	Blood	Muscle	Liver	Fin	Stomach	Fatmeter **	
Yellowfin	44216	6158	3667	7415	197	20359	2173	88	1633	638	46
Skipjack	36423	11942	7997	14105	305	26216	11247	214	8427	1844	125
Albacore	21869	11965	11265	12027	118	18665	14507	351	11096	3057	1105
Bigeye	10669	5176	2161	5244	141	8266	3113	116	2025	503	101
Mahi mahi	702	192	28	155	12	564	338	0	179	0	0
Wahoo	509	147	36	134	1	372	350	0	142	0	13
Rainbow runner	423	22	1	56	0	305	301	0	87	0	13
Striped marlin	186	27	31	69	29	133	109	2	35	0	10
Swordfish	171	22	16	44	9	80	105	24	51	0	12
Other species #	48809	906	72	3323	61	2077	898	965	118	1	40875
Total	163977	36557	25274	42572	873	77037	33141	1760	23793	6043	42300

includes: 153 species from 60 different families (Acanthuridae, Alepisauridae, Alopiidae, Anoplogastridae, Apogonidae, Balistidae, Berycidae, Blenniidae, Bramidae, Carangidae, Carcharhinidae, Caristiidae, Chiasmodontidae, Dactylopteridae, Dalatiidae, Dasyatidae, Diodontidae, Echeneidae, Emmelichthyidae, Engraulidae, Ephippidae, Exocoetidae, Fistulariidae, Fregatidae, Gempylidae, Holocentridae, Istiophoridae, Kyphosidae, Lamnidae, Lampridae, Lethrinidae, Lobotidae, Lophotidae, Lutjanidae, Malacanthidae, Mobulidae, Molidae, Monacanthidae, Myliobatidae, Nemichthyidae, Nomeidae, Octopodidae, Ommastrephidae, Ostraciidae, Paralepididae, Pomacentridae, Procellariidae, Pseudocarchariidae, Scombridae, Scombrolabracidae, Scopelarchidae, Serranidae, Sphyraenidae, Sphyrnidae, Sulidae, Syngnathidae, Tetraodontidae, Trachipteridae, Trichiuridae) as well as forage, micronekton and zooplankton samples

* includes: Blood red cells, Beak, Blood plasma, Brain, Bird regurgitate, Eye, Feather, Gill, Gut lining, Guano, Heart, Stomach prey juice, Jaw, Kidney, Stomach muco-juice, Stomach mucus, Stomach mixed content, Otolith asteriscus, Otolith lapillus, Prey community, Pleopod, Skeleton, Skin, Vertebra, Whole community, Whole specimen, Whole community partial, Whole specimen partial

** Fatmeter is a measurement of percentage of fat, not a type of sample. Fatmeter data are included in the table but not counted as a sample

2.1.2 Observer-based sampling

Annual figures on the total number of fish sampled by observers, of the number of observer trips on which biological sampling occurred, and of changes in mean sampling rate per trip compiled over the past ten years, are shown in Figure 1.

Since 2023, significant efforts were made by the SPC and the Fisheries Authorities in countries to revitalize the biological sampling programme by Fisheries observers. In particular, the development of new Letters of Agreement (LOAs) with national agencies and a strong focus on capacity building have already contributed to tangible improvements. It is important to note that sampling by observers at sea allows access to species that are subsequently discarded and that are not therefore disembarked and cannot be sampled at port. Observers also have access to freshly-caught specimens and can hence access samples that cannot be collected from fish preserved on ice or frozen such as blood. The objective for 2025 is to maintain the increasing trend and collect more biological samples than in 2024.

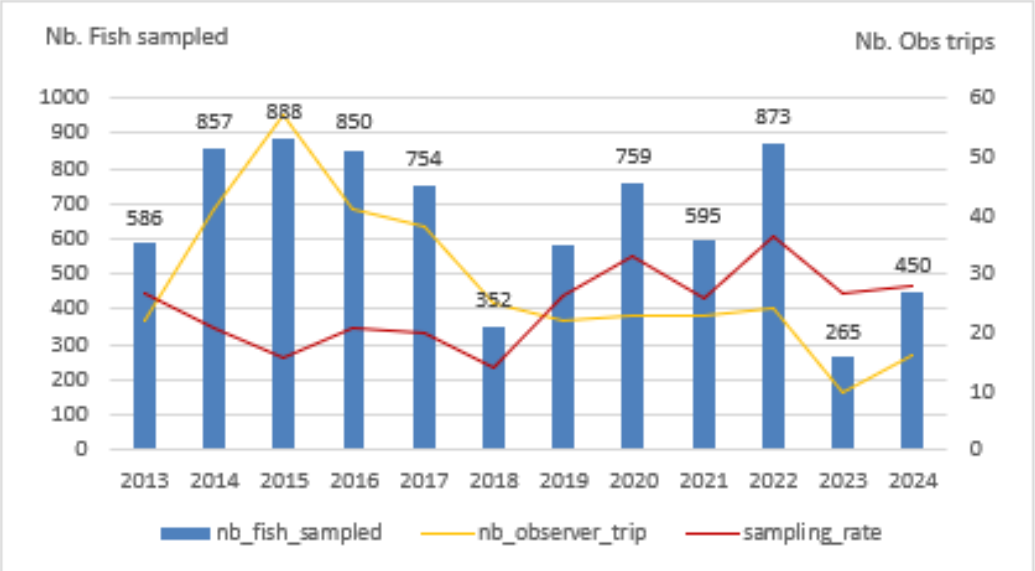

Figure 1. Total number of fish sampled by **observers** (blue histogram and numbers above), the number of observer trips during which biological samples were collected (orange line), and the mean sampling rate per trip (i.e. mean number of fish sampled/trip) (red line) calculated annually between 2013 and 2024. Note that the number of observer trips and sampling rate relate to the secondary y-axis.

2.1.3 Port sampling

Data on the number of port sampling events and samples collected are provided in Figure 2. As mentioned in previous Scientific Committee reports, SPC's plan was to increase efforts on biological sampling at port to compensate for the uncertainty around at-sea sample collection, particularly in the COVID-context. Since then, the number of fish sampled increased exponentially to reach 47,967 fish sampled in 2024. These achievements were possible thanks to our partnerships with NIWA, MRAG Asia Pacific Pty, Soltuna Cannery in the Solomon Islands, DR Fishing Ltd in Papua New Guinea, SOCSKARGEN Federation of Fisheries and Allied Industry Inc. / Bureau of Fisheries and Aquatic Resources (SFFAII/BFAR) in the Philippines, Westport Seafood in the USA and Territory Seafood in Canada.

Note that the increasing sampling rate (i.e. mean number of fish sampled per event) and increasing number of fish sampled since 2022, and particularly in 2024, is mostly due to the implementation of the CKMR sampling procedure (SC20-SA-WP-09). Indeed, for this project, only a muscle biopsy is required. That allows the sampling of many fish in a short time.

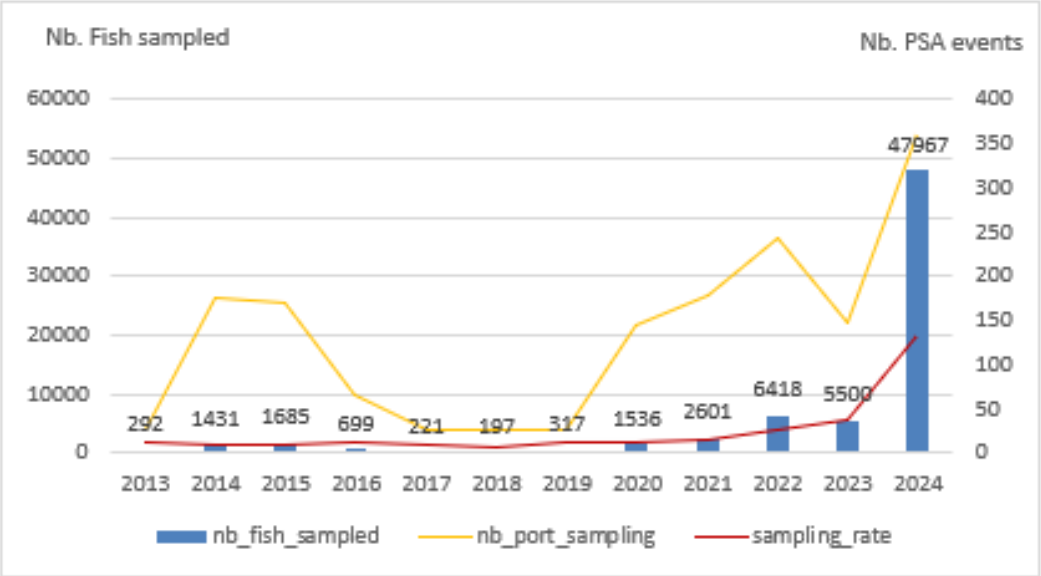

Figure 2. Total number of fish sampled by **port samplers** (blue histogram and numbers above), the number of port sampling events during which biological samples were collected (orange line), and the mean sampling rate per event (i.e. mean number fish sampled/event) (red line) calculated annually between 2013 and 2024. Note that the number of port sampling events and sampling rate relate to the secondary y-axis.

2.1.4 Tagging cruises

Tagging cruises continue to be an important source of biological samples for PMSB holdings, contributing 44,049 samples to date. As at December 31, 2024, a total of 13,336 fish have been sampled during various SPC-led cruises, from which 13,319 samples have been analysed (ANNEX 1, Table A1). For the PMSB as a whole, SPC's tuna tagging cruises conducted through the Pacific Tuna Tagging Programme (PTTP) (see SPC-OFP 2025 for the latest update on the PTTP progress under WCPFC Project 42) have supplied 12.29% of the total fish specimens sampled and 8.17% of the total samples collected, with 27% of the analyses conducted for biological or ecological applications to date making use of tagging cruise-related samples.

There was no tagging activity in 2024, but an ambitious biological sampling plan has been developed for the 2025 CP17 tagging voyage (WCPFC-SC21-2025/RP-PTTP-01).

2.2 TRAINING OBSERVERS, DEBRIEFERS, TRAINERS AND OTHER SAMPLERS

In 2024, 43 observers, port samplers, fisheries officers and fishermen undertook training in biological sample collection. In addition to PIRFO training, samplers are also trained by local fisheries officers and fisheries scientists for specific projects. Trainings were run in Samoa, PNG, New Caledonia and Tuvalu. PIRFO Training material is now hosted on Moodle and each country has a platform that they can administer. A debriefing checklist was developed and Standard Operating Procedures for trainers in delivering PIRFO biological sampling training is still under development. Training data, including details of the training (date, location of training, trainer's name) and information on units completed by the trainees and associated scores, is now hosted on BioDaSys.

2.3 SAMPLE STORAGE INFRASTRUCTURE AND EQUIPMENT

The PMSB is curated at SPC Headquarters in Nouméa, New Caledonia, and at CSIRO in Brisbane and in Hobart, Australia (Portal et al. 2020).

Collectively, the PMSB is equipped with:

- For taxonomy and general biology: 1 microscope, 4 stereomicroscopes, 1 Leica camera for stereomicroscope 1 X-ray machine and associated computer for fish examination, 2 fume hoods to manipulate solvents, 1 chemical cabinet, 1 high-precision scale, 2 low-precision weighing scales, 1 photographic system, 2 fatmeters, 1 freeze-dryer, 1 label printer with QR code generator + QR code scanner, 1 graphic tablet, 1 micropipette 5 mL (all in Nouméa)
- For sclerochronology: 1 low-speed, diamond-blade cutting saw to section otoliths; 1 fume hood to manipulate solvents; 1 high-precision micro-balance weighing scale; 1 MicroMill, 1 compound and 1 dissecting microscope fitted with a camera for interpreting otolith sections and image analyses, 1 low-speed grinder-polisher for otolith preparation (all in Nouméa)
- For genetics: 1 fume hood to manipulate solvents; 1 autoclave, 1 centrifuge, 1 fluorometer, 1 spectrophotometer, 1 gel documentation system, 1 ultrapure water system, 2 thermal cycler, 1 Automated microfluidic capillary electrophoresis separation system, 2 Liquid Handling Robots for DNA extraction and Sequencing Library Preparations; 1 MinION Hi-throughput Sequencing Platform for short and long read sequencing; 1 Drying Oven / Incubator; 1 Flake Ice Maker; two -30°C Laboratory Freezers; 4 Adjustable electronic multichannel pipettes; 1 Thermal Block Mixer, 1 Illumina Sequencer MiSeq, 1 Centrifuge Vortex for PCR Plate (all in Nouméa)
- For sample storage:
    - 4 solvent cabinets (2 in Nouméa, 2 in Hobart);
    - 5 dry cabinets for otolith storage (4 in Nouméa and 1 in Hobart);
    - 1 compactus storage for collection specimens in ethanol (1 in Nouméa):
    - 2 dry cabinets to store gonads in paraffin and gonads and otoliths mounted on slides (1 in Nouméa, 1 in Hobart);
    - 1 dry cabinet to store dorsal spines (1 in Hobart);
    - 2 ultra-cold -80°C freezers to guarantee long-term quality of samples for genetic analyses (~1m^3 in Nouméa);
    - ~125m^3 of -20°C cold-storage facilities at SPC and CSIRO (103m^3 in Nouméa, 2m^3 in Hobart, 20m^3 in Brisbane); and
    - numerous short-term/staging -20°C storage facilities in the key ports of the WCPO (ANNEX 1, Table A3).

The laboratory in Nouméa has been redeveloped since 2022. SPC now has 150m² of space available for housing PMSB samples, with new dedicated lab spaces constructed for genetics and genomics, otolith preparation and analysis and histological studies. The construction of the 90m² wet lab which includes another 30m² of cold storage space has been completed. The taxonomy lab, which was the oldest facility of the PMSB, has also been renovated. All facilities are now operational.

2.4 DEVELOPMENTS IN BioDaSys

2.4.1 Overview and access

A central feature of the PMSB repository is BioDaSys – a relational database that catalogues samples and their associated metadata, and records when changes in sample status occur, thus ensuring traceability of the work conducted. The key features of the database are reported in SPC-OFP (2019), including information and rules around access via the standalone web portal (www.spc.int/ofp/PacificSpecimenBank).

The website, which incorporates searching tools and interactive maps, is publicly accessible, including to WCPFC members and scientists, providing an interface for the BioDaSys database (see Fig. 7 in SPC-OFP 2019 for an example).

In agreement with WCPFC data access rules, certain information on each sample is unavailable to researchers outside of SPC-OFP, who must apply for a login (directly from SPC) to gain access. Even with a login, only those data fields necessary for designing research projects are accessible to authenticated

users. Moreover, any specific requests for samples still require approval via the access protocol outlined in Section 3.1 (below) and detailed in SPC-OFP 2019.

2.4.2 Electronic Reporting (ER) links to BioDaSys

The ER applications *OnShore* and *OLLO* are respectively used by port samplers to collect data at landing sites and by longline fisheries observers to collect data during at-sea missions. Data collected were initially limited to fish species, length and weight, but as of 2019, new features added to both *OnShore* and *OLLO* now allow users to record data about the biological samples collected for each specimen sampled.

Fourteen countries are currently using *OnShore* or *OLLO* on a regular basis for species/length data collection, eight are using the biological sampling feature in *OnShore*, three in *OLLO* (Table 2). Note that *OnShore* was also used in the United States of America and in Canada by SPC teams collecting biological samples for the Close-Kin Mark Recapture project (not counted in the countries using ER tools).

To facilitate the data management and improve data quality control, SPC is increasingly encouraging the collection of biological sampling data through ER (Figure 3). In 2024, 98% of the fish sampled by port-samplers were entered using *OnShore* and 51% of the fish sampled by observers at sea were entered using *Ollo.* SPC continue to generalise the use of biological sampling ER by developing a new application that allows the data collection of fish sampled on purse seiners and during scientific cruises. The objective in the next few years is to have data for all biological samples that are collected entered through these applications.

Table 2. *OnShore* and *OLLO* usage per country

Country	Use *OnShore*?	Use the biological sampling feature in *OnShore*?	Use *OLLO*?	Use the biological sampling feature in *OLLO*?
Canada	Yes	Yes	No	No
Cook Islands	No	No	Yes	Yes
Fiji	Yes	Yes	Yes	Yes
Fed. States of Micronesia	Yes	Yes	No	No
Kiribati	Yes	Yes	No	No
Marshall Islands	Yes	Yes	No	No
New Caledonia	Yes	Yes	Yes	Yes
New Zealand	Yes	Yes	No	No
French Polynesia	Yes	Yes	Yes	Yes
Papua New Guinea	Yes	Yes	Yes	No
Philippines	Yes	Yes	No	No
Solomon Islands	Yes	Yes	Yes	No
Tonga	Yes	Yes	Yes	No
USA	Yes	Yes	No	No
Vanuatu	Yes	No	No	No
Samoa	Yes	Yes	Yes	No

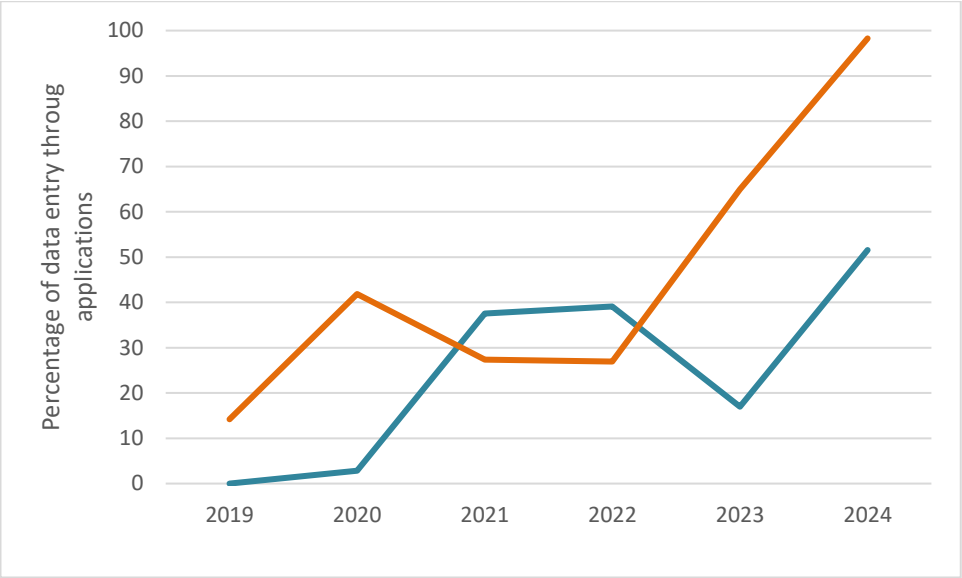

Figure 3. Percentage of data entry through Onshore for port sampling (orange line) and OLLO for observer at sea (blue line).

3. PMSB ACCESS AND USE

3.1 ACCESS PROTOCOLS

A protocol for accessing the PMSB for laboratory and data analyses by third party organisations was endorsed by the Commission in 2016 (Anon. 2016, SPC-OFP 2019).

A page dedicated to sample requests has been created to clarify the workflow and provide more details to future applicants, details of which are available here: https://www.spc.int/ofp/PacificSpecimenBank/Home/RequestSamples.

3.2 USE OF PMSB AND PMSB SAMPLES (2009-2024)

As of 31 December 2024, 14 projects are classified as 'pending' (i.e. work in progress) in accessing samples from the PMSB for WCPFC-related work, led by SPC and/or other national and international organisations (Table 3). Sixty-three projects utilising PMSB samples are 'completed' (ANNEX 1, Table A4).

Table 3. Projects that access the PMSB at 31 December 2024.

Leading organization	Project	Project category	WCPFC project
SPC - Noumea	SWO age validation	Age and growth	WCPFC 98
SPC - Noumea	SKJ age validation	Age and growth	WCPFC 98
IRD	Micronekton biochemical tracers	Ecosystem monitoring, Food safety / Trophic Ecology	
SPC - Noumea	Fatmeter	Food safety and tuna flesh characterisation	
IRD	MERTOX: Unravelling the origin of methylmercury toxin in marine ecosystems	Food safety and tuna flesh characterisation	
IRD Brest	Food safety and mercury toxicity	Food safety and tuna flesh characterisation	

Leading organization	Project	Project category	WCPFC project
IRD	VACOPA project	Movement / Food safety and tuna flesh characterisation	
SPC - Noumea	Albacore connectivity NC-PF	Stock structure	
SPC - Noumea	Close Kin Mark Recapture	Stock structure	
CSIRO - Hobart	ALB sex marker	Stock structure	
SPC - Noumea	Metabarcoding on tuna stomach contents	Taxonomy / other	
SPC - Noumea	Ecopath	Trophic dynamics	
IRD	OMEGA	Trophic dynamics / Food safety and tuna flesh characterisation	
SPC - Noumea	Tuna diet	Trophic Ecology	

Historically, SPC conducted numerous stomach content analyses for dietary studies, focusing particularly on morphological taxonomy, alongside age and growth research based on otolith examination. While ageing and morphological taxonomy still account for approximately one-third of all analyses, the expansion of genetic and genomic projects has made genetics the primary use of biological samples collected through the PMSB (Figure 4). This shift is expected to continue, driven by the establishment of SPC's new genetics laboratory, the implementation of Close-Kin Mark-Recapture and the launch of other genetics projects.

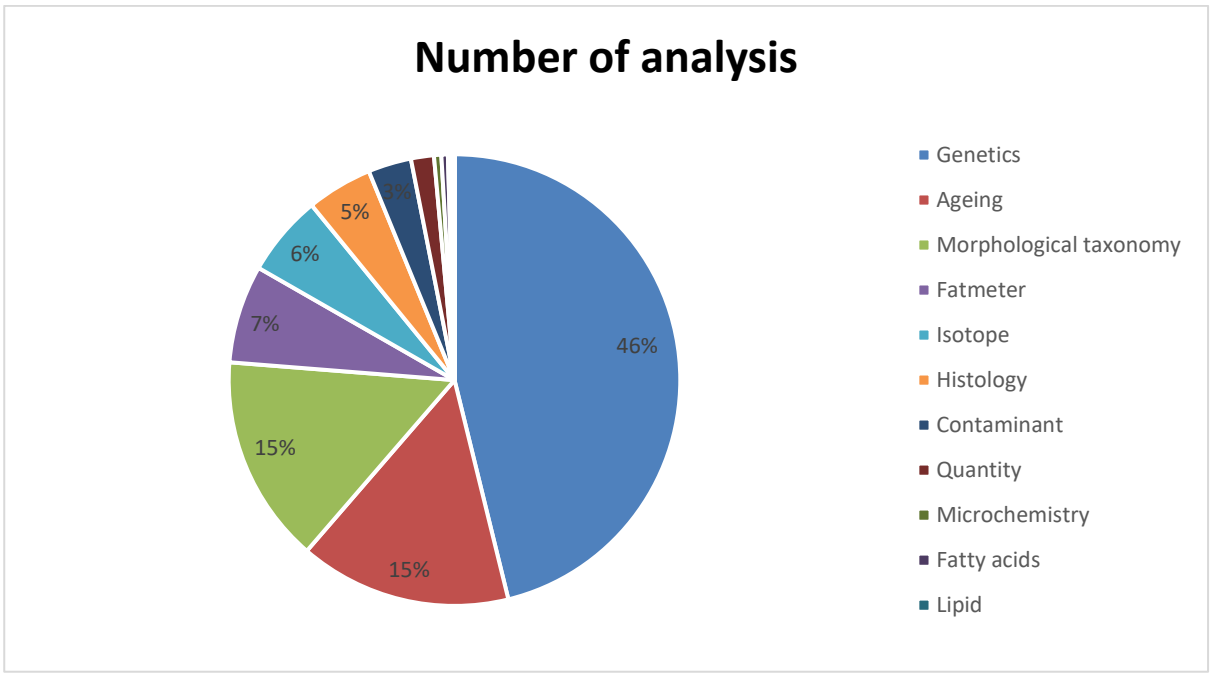

Figure 4. Distribution of samples sent for analysis, by analysis type.

3.3 ACCESS AND BENEFIT-SHARING COMPLIANCE FOR GENETIC RESEARCH

The Nagoya Protocol—or equivalent national legislation—typically governs access to biological material intended for genetic analysis, requiring prior authorization. The Pacific Marine Specimen Bank (PMSB) operates under two models: a prospective model, where samples are collected for a specific research project, and a banking model, where samples are collected without a predefined use. In the case of prospective collection for genetic studies, we should ensure compliance with national or regional

regulations before the project begins. For samples collected under the banking model, permissions must be sought retrospectively, should the material later be used for genetic research.

Given the increasing number of genetic studies involving PMSB samples, the long-term solution would be to obtain formal approval from all Pacific Island Countries and Territories (PICTs) for the use of both past and future PMSB collections in genetic research. Initial contact was made with the National Focal Points of Samoa, Tonga, New Zealand, Fiji, the Cook Islands, and New Caledonia. The objective was to introduce the CKMR project and broader PMSB activities, and to ensure that our work aligns with each country's vision for access and benefit-sharing of genetic data.

The outreach will be extended to the remaining PICTs by the end of 2025.

3.4 OUTPUTS ASSOCIATED WITH THE PMSB

Seven papers, linked either directly or indirectly to the PMSB, were submitted to SC20 in 2024 as Information Papers or Research Papers, on CKMR project (SC20-SA-WP-09), billfish research plan (SC20-SA-IP-09), yellowfin tuna reproductive biology (SC20-SA-IP-11), biological sampling plan for tuna and billfish (SC20-SA-IP-12), origin and fate of mercury in tunas (SC20-EB-IP-32), sampling during tagging voyages (SC20-RP-PTTP-01) and the paper on the PMSB (SC20-RP-P35b-01). A total of twelve other books, peer-reviewed journal articles, conference papers or popular articles associated with PMSB work were published in 2024. These are Allain et al. (2024), Anderson and Ruibal -2024), Andrews et al. (2024), Andrews and Macdonald (2024), Dahl et al. (2024), Barbin (2024), Barbin et al. (2024), Hardy et al. (2024), Machful et al. (2024a ; 2024b), Medieu et al. (2024a, 2024b) and Walker et al. (2024).

4. SOME HIGHLIGHTS OF 2024

4.1 CKMR project

A Close-Kin Mark-Recapture (CKMR) assessment of South Pacific albacore is underway with the goal of producing a fisheries-independent estimate of the absolute abundance of the adult stock ahead of the 2027 stock assessment for that species. This project is the most ambitious CKMR assessment in the literature to date, as it is projected to require sampling between 36,000 and 84,000 individuals over three years to achieve an absolute abundance estimate with 15% CV or less. Since sampling began in 2023, the PMSB has collected roughly 36,000 high quality genetic samples. Please see SC21-SA-WP-09 for a more thorough update on Project 100c.

Apart from the central goal of producing an absolute abundance estimate, CKMR samples have already been used to conduct traditional population genetic structure analyses (which feed back into model development for the CKMR assessment and also inform stock structure models). Those results are available in SC12-SA-WP-11. The CKMR sampling infrastructure (staff trained on a genetics-specific sampling method, shipment and logistics support, etc) has also allowed for the proposition of other genetic projects, such as the proposed population genetic structure assessment of skipjack and yellowfin tunas within the Western Pacific East Asia region and between that region and the wider WCPO (full description in SC21-SA-WP-10).

Finally, the production of genetic information for tens of thousands of SP albacore from across the WCPO has prompted the design of a more formal genetic data housing plan as part of the PMSB, which until now has been managed *ad hoc* for small projects. At present, the expectation is to build a space for permanent storage of all raw genetic sequencing data into an upcoming SPC-FAME-wide data hub. Files per individual would then be accessed through BioDaSys via the PMSB website or could be restricted at the request of the member country from which the sample originated. This system of open access and member country-control is in the spirit of the Nagoya Protocol. However, it is acknowledged that the volume of data storage needed will eventually present a logistical and financial burden that will require additional funds to maintain.

4.2 TIPTOP project

Around a hundred PMSB samples were used to carry out a study on the contamination of skipjack and yellowfin tuna in New Caledonia and Papua New Guinea. Financed by the French Pacific Fund, the project's objectives were to provide knowledge on the bioaccumulation of persistent organic pollutants (POPs) such as pesticides, and on the presence of mercury, plastics and plastic additives in tuna from the south-west Pacific. The results will help to assess human exposure to these contaminants through seafood consumption. The results show:

- Tuna contamination by POPs exists in New Caledonia and Papua New Guinea, which is part of the global distribution of POPs, even in areas far from sources of pollution in the northern hemisphere.
- That levels of POP contamination in tuna remain low and that consumption of these fish currently poses no health risk in relation to these substances.
- That the stomachs of 6 out of 20 tuna contained plastic fragments or fibres >2mm, and that these synthetic materials were mainly polypropylene and polyester.
- That two plastic additives in particular have been detected in tuna, at levels comparable to those found in Spain. There are no health standards for these substances.
- That mercury concentrations are higher in New Caledonia than in Papua New Guinea, and that surprisingly in New Caledonia the values are higher in skipjack than in yellowfin tuna. All the values measured are below the health threshold.
- Kin the .

Even if the current levels of contaminants measured are relatively low for components for which standards exist (POPs, mercury), it is important to remain vigilant in order to preserve these marine resources, which are essential from both an ecological and socio-economic point of view, in the face of global change and the impact of increasing human activity. In addition, health standards have yet to be established for many compounds such as plastic additives. New methods are being developed to improve the results, in particular the quantification of microplastics.

Finally, we have confirmed that skipjack and yellowfin tuna remain important sources of fatty acids, particularly omega-3s, which are beneficial to human health.

5. PMSB 2025 WORK PLAN

Actions planned for 2025 include:

- Continue to update and improve training materials for biological sampling.
- Continue the development and enhancement of electronic recording ER apps and associated trainings.
- Continue the development of a WCPO-wide sampler network for the collection of tuna genetics samples.
- Continue the development of our Quality Management System to meet international standards.
- Development of the PMSB website to better highlight the use of the PMSB samples and associated outputs.
- Trial and implement a new, more systematic approach to biological sample collection.

6. BUDGET

The annual cost of supporting the WCPFC PMSB is USD 97,200 baselined in 2018, with an annual inflation adjustment agreed by the Commission in 2018 for outyears. The proposed budget for 2026 USD 109,522

and the indicative annual budgets for 2027 and 2028 are USD 111,712 and USD 113,947 respectively. This comprises 60% for PMSB coordination, information management and training for samplers, 23% for sampling fees and freight, and 17% for the additional storage facility in Brisbane.

7. RECOMMENDATIONS

The following recommendations arise from this report on the PMSB in 2024. We invite SC21 to:

- Continue to support initiatives to increase rates of biological sampling, especially by fisheries observers at sea, noting that this contribution is essential to the ongoing success of the WCPFC's work.
- Incorporate the identified budget into the 2026 budget and the 2027-28 indicative budgets, as development of the WCPFC PMSB is intended to be ongoing and is considered essential.
- Endorse that the work plan in Section 5 of this report should be pursued by the Scientific Services Provider, in addition to standard duties associated with maintenance and operation of the WCPFC PMSB in 2025-26.
- Endorse that a Working Paper should be presented at SC22 on isotope, mercury, and other pollutant studies.

8. ACKNOWLEDGEMENTS

The PMSB is principally funded by WCPFC through Project 35b with additional support provided by the Pacific Community, CSIRO and the European Union. Support is also provided through the provision of storage facilities and coordination services by the agencies identified in this report.

The PMSB is reliant on the observers, port samplers, debriefers, observer trainers and observer managers across the region. Support is also received from fishing companies across the region, and from research institutes for providing access to fish and support for observer-based biological sampling.

Material for this report was provided by: F. Roupsard, V. Allain, M. Ghergariu, G. Anderson, C. Sanchez, S. Nicol, A. Pons, C. Wakefield, I. De La Brosse, A. Portal, M. Cunningham, B. Gardner.

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ANNEX 1.

Table A1. Total number of samples collected from scientific tagging cruises and analysed to 31 December 2024.

Predator species		Fish collected	Samples collected	Blood	Gonad	Liver	Muscle	Otolith	Spine/fin	Stomach	Fat meter	Samples analysed	% analysed
ALB	Albacore	404	1801	0	269	276	277	259	188	245	287	1121	60%
BET	Bigeye	2315	8273	94	799	1089	2986	919	723	1084	504	1467	17%
BLT	Bullet tuna	3	9	0	0	2	3	0	1	3	0	0	0%
BSH	Blue shark	1	1	0	0	0	1	0	0	0	0	0	0%
BUM	Blue marlin	42	180	5	31	40	47	1	20	36	0	3	2%
CFW	Pompano dolphinfish	9	37	0	8	9	10	0	1	9	0	1	3%
CNT	Ocean triggerfish (spotted)	2	9	0	2	2	2	1	0	2	0	0	0%
DOL	Mahi mahi / dolphinfish	194	727	0	109	178	194	36	17	193	0	46	6%
EBS	Brilliant pomfret	2	10	0	2	2	2	0	2	2	0	0	0%
FAL	Silky shark	87	105	0	0	4	14	0	83	4	0	4	4%
FRI	Frigate tuna	99	309	0	4	99	99	3	4	99	1	96	31%
GBA	Great barracuda	1	4	0	1	1	1	0	0	1	0	0	0%
KAW	Kawakawa	137	327	0	2	98	98	2	0	126	1	118	36%
LAG	Moonfish / opah	2	10	0	1	2	2	1	2	2	0	0	0%
LEC	Escolar	7	41	0	7	7	8	5	7	7	0	0	0%
MLS	Striped marlin	10	45	0	7	8	12	2	8	8	0	0	0%
MSD	Mackerel scad / saba	5	15	0	0	5	5	0	0	5	0	5	33%
NXI	Giant trevally	1	1	0	0	0	0	0	0	1	0	1	100%
OCS	Oceanic white-tip shark	38	42	0	1	0	3	0	38	0	0	0	0%
PLS	Pelagic sting-ray	1	3	0	0	1	1	0	0	1	0	1	33%
RRU	Rainbow runner	213	722	0	56	206	212	22	1	212	0	125	17%
SKJ	Skipjack	5146	17322	1	847	3341	4376	985	926	3390	3057	5952	34%
SSP	Short-billed spearfish	4	20	0	3	4	5	1	3	4	0	0	0%
SWO	Swordfish	6	15	0	1	4	4	0	0	6	0	21	81%
TST	Sickle pomfret	2	13	0	2	2	3	2	2	2	0	0	0%
WAH	Wahoo	92	428	0	74	91	98	61	12	92	0	6	1%
YFT	Yellowfin	3454	12517	62	724	2584	3146	735	681	2670	1849	4338	34%
YTL	Amberjack (longfin yellowtail)	1	3	0	0	1	1	0	0	1	0	1	33%
OTH	Other	1059	1060	0	0	0	349	4	2	13	684	13	1%
Total		13337	44049	162	2950	8056	11959	3039	2721	8218	6383	13319	30%

¤ Fatmeter is a measurement of percentage of fat not a type of sample. Fatmeter is included in the table but not counted as a sample

Table A2. Total number of stomach samples collected during tagging cruises and analysed to 31 December 2024.

Predator species		Samples collected	Samples analysed	% analysed
ALB	Albacore	245	245	100%
BET	Bigeye	1084	504	46%
BLT	Bullet tuna	3	0	0%
BRZ	Pomfrets and ocean breams	3	3	100%
BUM	Blue marlin	36	3	8%
CFW	Pompano dolphinfish	10	2	20%
CNT	Ocean triggerfish (spotted)	2	0	0%
DOL	Mahi mahi / dolphinfish / dorado	193	46	24%
EBS	Brilliant pomfret	2	0	0%
FAL	Silky shark	4	4	100%
FRI	Frigate tuna	99	95	96%
GBA	Great barracuda	1	0	0%
KAW	Kawakawa	126	118	94%
LAG	Moonfish / opah	2	0	0%
LEC	Escolar	7	0	0%
MLS	Striped marlin	8	0	0%
MSD	Mackerel scad / saba	5	5	100%
NXI	Giant trevally	1	1	100%
PLS	Pelagic sting-ray	1	1	100%
RRU	Rainbow runner	212	125	59%
SKJ	Skipjack	3399	2748	81%
SSP	Short-billed spearfish	4	0	0%
SWO	Swordfish	6	6	100%
TST	Sickle pomfret	2	0	0%
WAH	Wahoo	92	6	7%
YFT	Yellowfin	2670	2180	82%
YTL	Amberjack (longfin yellowtail)	1	1	100%
Total		8217	6092	74%

Table A3. Locations and cold-storage capacity in key ports for the PMSB.

Port	Country	Freezer Capacity	Comments
Aiwo	Nauru	0.15 m^3 (-18^{o}C)	Fisheries and Marine Resources Authority
Apia	Samoa	0.5 m^3 (-18^{o}C)	Min. Agriculture and Fisheries
Brisbane	Australia	0.3 m^3 (-18^{o}C)	MRAG
General Santos	Philippines	0.5 m^3 (-18^{o}C)	SOCSKSARGEN Federation of Fishing and Allied Industries, Inc
		15 m^3 Blast Freezer (-30^{o}C)	Well-Delight Network Corporation
Honiara	Solomon Islands	0.7 m^3 (-18^{o}C)	Min. Fisheries and Marine Resources
Honolulu	USA	4 m^3 (-18^{o}C)	Chill Space (commercial storage)
Kavieng	Papua New Guinea	0.7 m^3 (-18^{o}C)	National Fisheries College
Koror	Palau	0.1 m^3 (-18^{o}C)	Natural Resources, Environment, Tourism
Lae	Papua New Guinea	0.36 m^3 (-18^{o}C)	National Fisheries Authority
		0.5 m3 (-18^{o}C)	Frabelle Ltd
Madang	Papua New Guinea	0.5 m^3 (-18^{o}C)	RDF Cannery
Majuro	Marshall Islands	0.7 m^3 (-18^{o}C)	Marshall Islands Marine Resources Authority
		15 m^3 Blast Freezer (-30^{o}C)	Marshall Islands Fishing Venture
		15 m^3 Blast Freezer (-30^{o}C)	Pan Pacific Foods cold storage
Noro	Solomon Islands	15 m^3 Blast freezer (-30^{o}C)	Soltuna Cannery
		0.3 m^3 (-18^{o}C)	NFD
Pago Pago	American Samoa	TBD	Starkist
Papeete	French Polynesia	0.7 m^3 (-18^{o}C)	Resources marine et minières
Pohnpei	FSM	0.7 m^3 (-18^{o}C)	National Oceanic Resources Management Authority
Port Moresby	Papua New Guinea	0.36 m^3 (-18^{o}C)	National Fisheries Authority
Port Villa	Vanuatu	0.2 m^3 (-18^{o}C)	Min. Agriculture, Livestock, Forestry, Fisheries Biosecurity
Rabaul	Papua New Guinea	0.3 m^3 (-18^{o}C)	National Fisheries Authority
Suva	Fiji	0.7 m^3 (-18^{o}C)	Min. Fisheries and Forests
Tarawa	Kiribati	15 m^3 Blast Freezer (-30^{o}C)	Kiribati Fish Limited
Wewak	Papua New Guinea	0.7 m^3 (-18^{o}C)	National Fisheries Authority
Yaizu	Japan	15 m^3 (-18^{o}C)	National Research Institute of Far Seas Fisheries, Shimizu

Table A4. Projects that have previously accessed the PMSB.

Leading organization	Project	Project category	WCPFC project
SPC - Noumea	14C YFT and BET age validation	Age and growth	WCPFC 98
National Research Institute of Far Seas Fisheries	C14 analysis of WCPO-BET otoliths	Age and growth	WCPFC 98
IRD	Role of larval dispersion	Age and growth / Movement / Taxonomy / Species description	
CSIRO - Hobart	BET and YFT epigenetic age estimation	Epigenetic age calibration	
CSIRO - Crawley	DWS epigenetic	Epigenetic age calibration	
University of Queensland	Mushy Tuna Syndrome	Food safety and tuna flesh characterisation	
IRD Brest	Global mercury YFT-BET	Food safety / Trophic Ecology	
University of Adelaïde	Indo-Pacific deepwater snapper	Movement	
SPC - Noumea	CKMR albacore feasibility assessment	Protocol development	
SPC - Noumea	Genetic cross-contamination quantification and sampling protocol development	Protocol development	
SPC - Noumea	Genetic sampling protocol extension	Protocol development	
Michigan State University	Genomic and AI tools for identifying tuna species	Species identification	
SPC - NOUMEA	Testing the panmixia hypothesis in WCPO SKJ	Stock structure	
Oregon State University	Genetic Structure of Pacific Albacore	Stock structure	
University of Queensland	Population structure of sailfish in the Indo-Pacific	Stock structure	
Oregon State University	ALB stock structure and sex-specific distribution patterns	Stock structure	
Nanyang Technological University, Singapore	Status and Future of Fisheries from the Indo-Pacific Region	Stock structure	
University of Bergen	Maurolicus phylogeography	Taxonomy	
NOAA Honolulu	Cryptic Etelis Discrimination using FT-NIRS	Taxonomy / Species description	
IRD	TIPTOP	Trophic dynamics / Food safety and tuna flesh characterisation	
University of Hawaii	Trophic dynamics of ocean sunfish	Trophic ecology	
IRD	RESCUE - Stranded marine mammals study	Trophic ecology	
CSIRO - Hobart	Yellowfin growth curve	Age and growth	WCPFC 82
CSIRO - Hobart	Bigeye growth curve	Age and growth	WCPFC 35 WCPFC 81
CSIRO - Hobart	Bigeye/yellowfin ageing comparison	Age and growth	
CSIRO - Hobart	Albacore growth curve	Age and growth	WCPFC 39

CSIRO - Hobart	Albacore growth curve - extension project	Age and growth	WCPFC 100b
SPC - Noumea	STRAMP	Age and growth	
SPC - Noumea	Procfish	Age and growth	
SPC - Noumea	SCTB 13	Age and growth	
CSIRO - Hobart	Swordfish growth curve	Age and growth	WCPFC 71
CSIRO - Hobart	Striped marlin ageing/maturity project	Age and growth/Reproductive biology	WCPFC 99
SPC - Noumea	Deepwater snapper project	Age and growth/Reproductive biology/Movement	
SPC - Noumea	Biopelagos	Ecosystem monitoring	
Thunen Institute of Fisheries Ecology	MARINEFOOD	Food safety	
University of Washington	Selenium and mercury in yellowfin and bigeye tuna	Food safety	
CSIRO - Hobart	Omega-3 Project, CSIRO Food Futures Flagship	Food Safety and tuna flesh characterisation	
Texas A&M University Galveston	PBT movement dynamics	Movement	
University of Melbourne	South Pacific Albacore movement	Movement	
SPC - Noumea	GEF-OFMP / PFRP tuna trophic & movement	Movement	
SPC - Noumea	DNA/microbiome	Movement	
CSIRO - Hobart	Albacore reproductive biology	Reproductive biology	WCPFC 39
CSIRO - Hobart	Bigeye maturity ogives	Reproductive biology	WCPFC 35
Oregon State University	ALB population genomic variation	Stock structure	
University of Queensland	GENOJAWS	Stock structure	
University of Queensland	Black marlin	Stock structure	
USP Fiji	WCPO tuna stock structure and movement	Stock structure	
CSIRO - Hobart	WCPO tuna stock structure	Stock structure	
SPC - Noumea	Albacore	Stock structure	
University of Bologna	Global tropical tuna stock structure	Stock structure	
CSIRO - Hobart	Indonesia-West Pacific tropical tuna stock structure	Stock structure	
CSIRO - Hobart	Blue & Mako Shark genetics	Stock structure	

SPC - Noumea	Morphological description of Bathysaurus mollis larva	Taxonomy / species description	
SPC - Noumea	Ecosystem effects of fishing	Trophic dynamics	WCPFC 37 WCPFC 46
SPC - Noumea	FAD and Tuna behaviour	Trophic dynamics	WCPFC 37
Rhodes University-IsoEnvironmental	Size-based Food Web	Trophic dynamics	
SPC - Noumea	Genetic sampling protocol extension - biopsy punch field test	Protocol development	
CSIRO - Hobart	Stock structure of tropical tunas in the Indo-Pacific	Stock structure	
Macquarie University	Blue Marlin trophic and spatial ecology	Stock structure	
SPC - Noumea	YFT population genetic structure 2019 re-analysis	Stock structure	
Oregon State University	Genetic structure of Pacific ALB	Stock structure	
CSIRO - Hobart	Resequencing	Stock structure	
University of Victoria	Diet diversity of the human predator	Trophic dynamics	