



Pacific
Community
Communauté
du Pacifique

Project 100d

**Applying CKMR to South Pacific Albacore & Evaluating Its Future Across
WCPFC Tuna, Billfish, and Shark Stocks**

SPC & CSIRO



Tasks

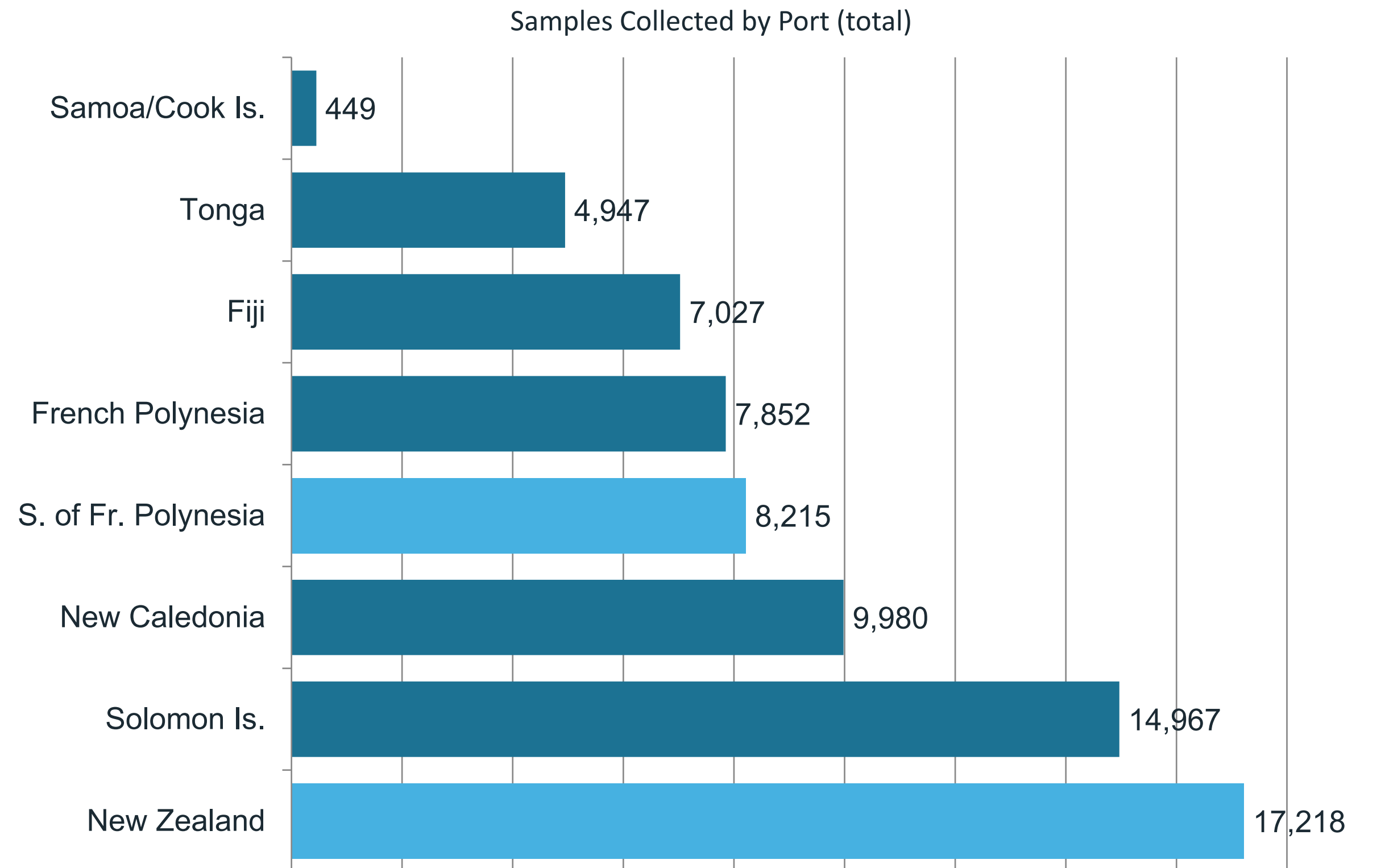
- (i) Deliver a CKMR abundance estimate for south Pacific albacore to support the 2027 stock assessment.
 - a. Complete tissue sampling
 - b. Complete sequencing
 - c. Prepare CKMR model
 - d. Provide CKMR estimates to SC23
- (ii) Evaluate the cost and feasibility of extending CKMR to other WCPFC tuna, billfish, and shark stocks
 - a. Desktop triage on current foundations for CKMR application
- (iii) P100c hangover

P100c Hangover

- Epigenetic Ageing
 - i. Bespoke epigenetic ageing clocks are feasible
 - ii. High throughput and low cost method remains a work in progress
- Swordfish Age Validation
 - i. Applied bomb-14C in collaboration with ICCAT
 - ii. bomb-14C validation supports reliable growth-zone reading
- Yellowfin scoping complete
 - i. 40,000 samples/yr × 3 yrs, or 35,000/yr × 4 yrs, expected to yield ≥50 pairs each of HSPs and POPs across most scenarios tested
 - ii. Sampling-at-age matters: matching the catch-at-age distribution outperforms current port-sample age profiles, which skew toward younger adults
 - iii. Sample sizes appear logistically feasible, based on lessons from the albacore program
 - iv. At-sea observer sampling will still be needed for some age classes/areas

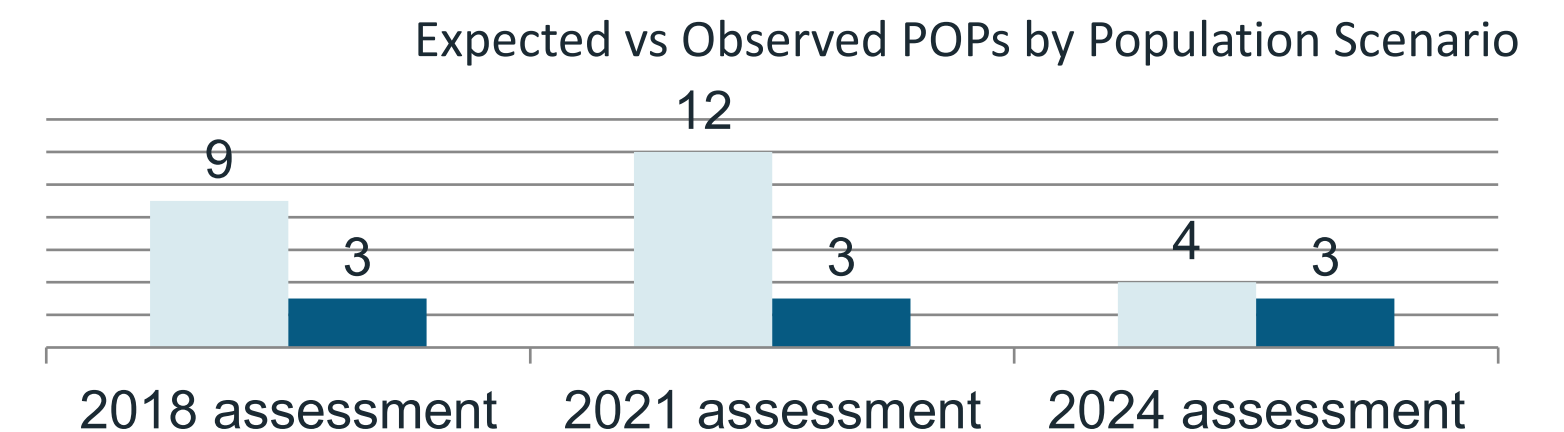
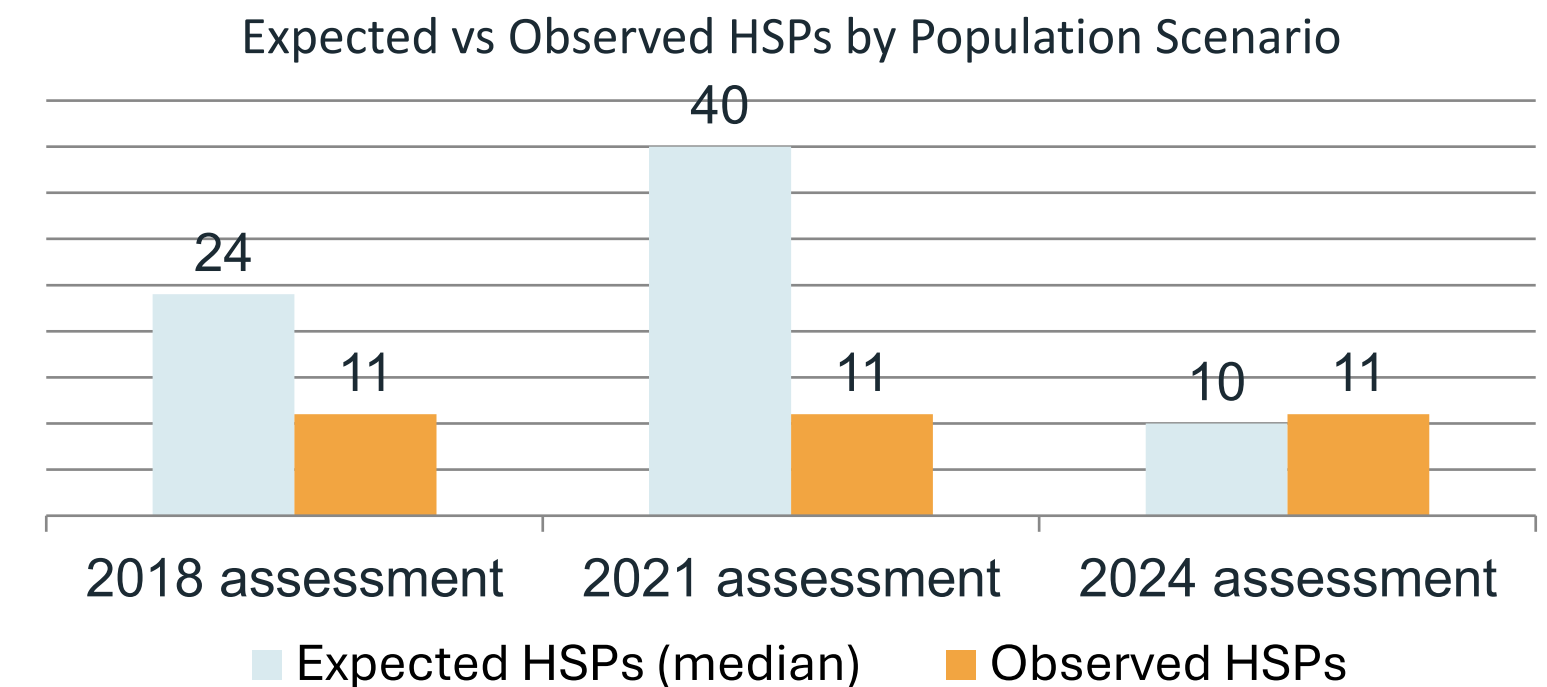
P100d South Pacific Albacore Sampling

- Sampling rate is on track
 - 70,655 samples of 84,000 collected
 - 29,204 collected in last year
- Spatial bias in 2025/26 austral summer
 - Resolving through 2026/27 sampling
- 241 technicians trained in CKMR methods



Preparing the model for the first CKMR population estimate, planned for 2027

- 24,253 tissue samples analysed to date — early results are encouraging
 - i. 28 half-sibling pairs (HSPs) found
 - ii. 4 parent-offspring pairs (POPs) found
 - iii. Of these, 11 HSPs and 3 POPs were found within the 18,661 samples that met the assumptions of the original design model (i.e., excluding samples collected in the eastern Pacific, and only considering juvenile-juvenile comparisons for the HSPs).
 - iv. These numbers align closely with the 2024 stock assessment population scenario — the largest of the three scenarios tested — suggesting the sampling strategy and its underlying assumptions remain sound.



A New Challenge: No Epigenetic Ages (Yet)

- Since epigenetic ageing won't be ready for the 2027 estimate, adult age is inferred from length using a validated growth curve. Juveniles can still be assigned age with confidence, but adults are less certain — and this uncertainty flows into the CKMR estimate.
- What this means
 - i. Total reproductive output (TRO) is hit hardest by the switch to length-based age
 - ii. Adult biomass and mortality are more modestly affected — but only if an age-composition sample is also available
 - iii. At low (50%) sampling levels, adult biomass uncertainty nearly doubles
- **The Fix: A Modest Otolith Ageing Programme**
 - i. Otolith age from > 250 samples/year, spread across multiple sampling years, from at least one adult fishery – This is feasible from the PMSB (New Caledonia)
 - ii. 300-500 otolith collected from New Caledonia, Fiji, Samoa, Tonga, French Polynesia in remainder of 2026 as a backup

Desktop Species Feasibility Triage for CKMR application

Feasible now

- South Pacific albacore
- Yellowfin tuna
- Bigeye tuna
- SW Pacific swordfish
- SW Pacific striped marlin

Recommend further investment in foundations

- Skipjack tuna — huge budget & sample size required
- NP blue shark, oceanic whitetip, silky shark — CMM/observer constraints
- Blue & black marlin, spearfish, sailfish, mako sharks — life-history gaps, low observer coverage

Summary

- On track to achieve sampling requirements
- Sequencing on track to be completed in early 2027
- CKMR estimates are expected to be available for SC23
- SC22 encouragement requested for relevant CCMs to participate in otolith collections in remainder of 2026
- The budget request for 2027 is USD115k from WCPFC matched by USD685k co-funding from external sources.