10th SPC Heads of Fisheries Meeting
Noumea, New Caledonia, 14–17 March 2017

Information Paper 7

Original: English

Developing a Pacific Community Marine Specimen Bank

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Purpose

1. The Pacific Community (SPC) is looking to establish a regional specimen bank for marine flora and fauna. A specimen bank is a safe repository for biological samples (e.g. fish muscle tissue, otoliths). Specimen bank samples are analysed to provide critical information to support natural resource management (e.g. the age and growth rate of fish as a key input to stock assessments, genetic analyses for stock structure). Maintained over the long-term, historic samples can be compared with recent samples to understand important changes in key biological processes over time (e.g. increased mercury levels in fish due to climate change).

2. This regional specimen bank is a significant and strategic science capacity and capability initiative. The idea has received in principle support among SPC and some potential institutional partners in New Zealand and Australia. The next step is to obtain seed funding to fully explore the business case and outline a plan for operationalising a Pacific Community Marine Specimen Bank.

3. The purpose of this information paper is to:

- Briefly outline the concept of a regional Pacific Community Marine Specimen Bank;
- Highlight the drivers for a regional bank and the benefits which could be derived from a regional bank; and
- Outline the proposed next steps in developing the concept into a full-scale proposal.

Concept

4. The SPC is looking to establish a regional environmental specimen bank for marine flora and fauna. The core to the concept of a Pacific Community Marine Specimen Bank is that it is Pacific owned and operated. While other specimen banks exist, including those containing specimens from the Pacific, what is different about this bank is that it will be in the Pacific; a regional asset where the biological capital of the bank will be used to invest in its people for a sustainable return on investment. It also has the advantage of providing biological capital insurance for regional partners at the same time.

5. In this context a tissue bank would include the ability to curate and store a broad range of samples over long time periods (decades rather than years). Importantly it would include the associated science resources to analyse and interpret specimens and also to act as a teaching facility for the development of regional capability.

6. The initiative aligns with SPC strategic priorities. The Pacific Community Marine Specimen Bank will provide biological information and knowledge to contribute to increases in economic and food security benefits from sustainable fisheries in the Pacific. There is also potential for the Bank to contribute to benefit sharing among Pacific Island countries and territories (PICTs) from the use of marine genetic resources as part of biological diversity beyond national jurisdiction (BBNJ) negotiations / United Nations Convention of the Law of the Sea. It will also improve regional capability and availability of information to monitor and adapt to the environmental impacts of climate change. Further, through careful design and the use of modular 'green' freezer technology, the bank will advance the use of renewable energy technologies in the Pacific, a key regional need.

7. It is therefore anticipated that a Pacific Community Marine Specimen Bank has the capacity to make significant impact in the region, both in the short-term, but also in coming decades through building preparedness for the incredible scientific challenges to come for the region. Specifically, through preserving and conserving biodiversity, developing regional solutions to ecosystem scale challenges, capacity development of Pacific scientists, increasing the scientific basis for climate change adaptation and resilience, supporting enhanced food security and nutrition, and future thinking about the finances of climate and biodiversity.

Drivers for a Pacific Community Marine Specimen Bank

8. The core to the concept of a Pacific Marine Specimen Bank is that it is of the people and for the people. Other specimen banks exist, including those containing specimens from the Pacific. What is different about this bank is that it will be in the Pacific, owned and governed by the Pacific Community, and it will be the Pacific Community that uses the biological capital of the bank to invest in its people for a sustainable return on investment. It has the advantage of providing biological capital insurance for regional partners at the same time.

9. SPC currently operates the WCPFC Tuna Tissue Bank (TTB), funded by the WCPFC since 2015. Since 2001, SPC's Oceanic Fisheries Programme (OFP) has been coordinating the collection of biological samples of pelagic species from across the Pacific Community. The current TTB is the result of collaboration between SPC and its member countries, the Commonwealth Scientific and Industrial Research Organisation (CSIRO), WCPFC, the University of Hawai'i, the National Research Institute of Far Seas Fisheries and the French Institute for Research and Development.

10. The concept of a Pacific Community Marine Specimen Bank has evolved from the successful WCPFC TTB which now has ongoing operational funding from WCPFC. The funding is to maintain the WCPFC TTB with particular emphasis on WCPO bigeye, yellowfin, albacore and skipjack tunas, and swordfish, and, to facilitate transmission of samples to specified researchers within the WCPFC TTB Access Protocols. SPC, as the Scientific Services Provider, is tasked to maintain and develop the WCPFC TTB and through the biological sampling programme expand the inventory of samples held.

11. The operation of the WCPFC TTB has included the development of standards for training of observers in biological sampling (PIRFO), ongoing training of observers across the region in biological sampling data recording, sample handling and transportation. A web-based tool has been implemented to allow WCPFC members to track the collection of samples. It includes interactive maps where the user can obtain information on the number, type, species and length classes of samples collected from particular EEZ and high seas areas (www.spc.int/tagging/webtagging/BioDaSys) (Smith et al., 2016).

12. However, the current tissue bank is tuna focused, curation and storage focused, and the current method of storage for many tissues types will not ensure their longevity in the bank. In 2016, the WCPFC was informed of the need to design and seek funding for strategic investment in a super-cold storage facility required to ensure the longevity and relevance of the WCPFC TTB (Smith et al., 2016).

13. Subsequent relevant developments in 2016 were the expansion of collection of a range of non-tuna specimens from across the Pacific for ecosystem monitoring purposes (Allain and Vourey, 2017) and the recognition of the need for a similar facility for coastal fisheries science.

14. This proposal seeks to take a view not just about now, but also beyond the coming decades in terms of preparedness for the incredible scientific challenges to come. This proposal seeks to bring together several critical threads for preparedness in a centre of scientific excellence – preserving and conserving biodiversity, regional solutions to ecosystem scale challenges, capacity development of Pacific scientists, climate change adaptation and resilience, including especially food security and public health outcomes.

Benefits from a Pacific Community Marine Specimen Bank

15. The assumed benefits of this regional strategic science asset are many, and include enhanced science capacity and capability, economic, biosecurity, human health, conservation, sustainable use, global relevance and international leverage, Pacific culture and identity and enhanced scientific credibility and quality assurance. A critical benefit of any specimen bank is that once establishe, key scientific studies can begin immediately without having to await additional fieldwork – potentially over many years – before adequate specimens are available.

16. To put the value of the concept in a practical hypothetical oceanic example:

- Tuna tissue samples collected, curated and analysed through the Pacific Community Marine Specimen Bank in 2018 see a Pasifika student complete a PhD in 2021 and with that get a job lecturing at the University of the Pacific with their students using samples from the bank to study for MSc's in 2022;
- The PhD results show magnesium levels in tuna drop below those required for good human health with sea surface temperatures 1°C above current, as a result magnesium substitution public health guidelines are implemented in the affected member countries and territories; and
- The magnesium health supplements which are sensitive to temperatures above 20°C are able to be stored long-term in a carbon neutral modular cold store design off the technology developed in step one of the project.

17. Similarly to put the value of the concept in a practical hypothetical coastal example:

- Sea cucumber tissue samples collected, curated and analysed through the Pacific Community Marine Specimen Bank see a regional agreed taxonomy and associated identification guides agreed;
- With codified names market labelling requirements are able to be met and trade barriers reduced; and
- With advanced genetic techniques traceability to a specific EEZ or smaller scale can be established, as a result illegal fishers from outside the region are able to be prosecuted for harvesting inside members EEZs.

Proposed next steps

18. Despite these anticipated benefits, the nature and scale of investment required to establish a Pacific Community Marine Specimen Bank requires a comprehensive analysis of the business case and implementation arrangements to operationalise such a concept in order to maximise benefits for the region, both now and into the future.

19. Seed funding will be sought to fund a project to undertake research and analysis to develop a business case for a Pacific Community Marine Specimen Bank including a proposed model for how the bank could be operationalised in partnership with regional institutions. The business case would also explore and further define the scope of biological samples to be deposited in the bank including species selection, sample types and storage procedures.

20. The business case would be designed for a Pacific Community Marine Specimen Bank that would serve the region to achieve the following:

- Provide a regional strategic science asset, a storage facility to house biological specimens over the long-term and the supporting infrastructure to conduct associated scientific research;
- Significantly enhance the collection of a full range of relevant biological specimens from marine flora and fauna from across the region to ensure the bank has an ecosystem baseline, and the potential to monitor the impacts of future ecosystem changes;

- Curate, identify and analyse biological specimens in the bank across the full range of biological, physical, genetic and public health traits, and to store that information securely for future generations;
- Integrate data from the bank with data from other sources – fisheries, remote sensing, and climate science – to investigate relationships and potential impacts of climate change on the ecosystem, including with and without harvesting to provide scientific knowledge products for biodiversity conservation;
- Use the Pacific Community Marine Specimen Bank platform to educate a new generation of Pacific scientists to serve the region into the future; and
- Identify and develop reciprocal capacity sharing and biological insurance for institutional partners across the region.

21. New Zealand has identified a potential funding source, a Ministry of Foreign Affairs and Trade incubator fund, which may support this proposal. A proposal to that fund has been made by SPC.

References

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