Te Ara Paerangi – Future Pathways Green Paper 2021

Submission on the collections funded from NSCD / SSIF infrastructure funding.

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I currently work as the Portfolio Leader for Biota which includes the five NSCD biological collections held at Manaaki Whenua Landcare Research. I have also spent the last 40 years working in and around biological collections in New Zealand. This submission is based on my experiences as well as talking with managers of the biological collections and associated information systems in New Zealand.

This submission is not to comment on Te Ara Paerangi as a whole or to address the specific questions that MBIE has posed. Rather, it is to address the specific question of the biological collections and their associated information systems (including but not limited to databases).

Te Ara Paerangi addresses the collections and associated information systems on pages 44-45.

> *The 2020 Te Pae Kahurangi report recommended that dedicated funding should be provided for critical research functions, high-priority services, emergency responses and databases and collections. The underpinning concept is that certain functions or services exist that developed countries and small advanced economies, such as New Zealand, expect their governments to perform that deliver a standard of living that distinguishes them from other nations. Where these functions are identified, government should fund them and specifically ensure their viability in the same way as, for example, a tax system or police force. One possible model for this is the way the Government funds the Measurement Standards Laboratory, which is part of Callaghan Innovation, but has its own dedicated, ring-fenced budget and supporting legislation.*
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> *We consider at least three categories of activity exist that could meet the test of being a 'core function':*
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> *3 Databases, collections and monitoring: data are necessary to understand the status and health of resources, to support research and to serve various other functions. For example, weather data have both commercial and public good value, and type specimen collections support national biosecurity and biodiversity conservation systems.*

We believe that Te Ara Paerangi provides an opportunity to consider the role and function of the biological collections and associated information systems funded as NSCDs. There has not been any significant discussion since before the CRIs were formed and any discussions that have been had included scientific research, principally systematics and taxonomy, and the maintenance of taxonomic capability. This has confounded and hidden the discussion that needs to be had about the physical collections, both living and preserved, and the storage and retrieval of the associated metadata in information systems.

Collections

Collections have a long history stretching back to the eighteenth century and have gone through distinct phases of development:

1. Initially, or phase one, involved enthusiastic systematists and taxonomists making biological collections as personal / private collections in a professional or amateur capacity. The

founders of these collections were both the managers and curators, and they personally funded their maintenance.

2. Usually on the retirement or death of the collections' founder they would be gifted to institutions who could look after them. Many of the most important institutional collections around the world began in this way. For instance, Sir Joseph Banks' collections were gifted to the British Natural History Museum. In New Zealand many of the collections started as small working collections of research scientists and these became the bases of the NSCDs. In this institution phase, phase 2, the collections are still managed and curated by systematists and taxonomists but usually in a part time capacity and as the collections grow[1], they may be allocated full time technical assistance. These collections are also usually managed as an adjunct to a research programme or some other institutional function such as education, as in the case of museums.
3. When collection become very large in phase three, they need a full-time collection manager and technical assistance and often access to systematists for scientific curation. They also need the involvement of professional IT specialists to manage and make available the digitised metadata that is associated with objects in the collections. The size of these data is large but it is small compared to the amount of data that will be created in the coming years using new omics technologies such as genomics, phenomics and metabolomics. These omics tools are needed to secure future ready food, feed and fibre as well protecting environment and natural resources.

Te Ara Paerangi provides an opportunity for the collections of Aotearoa to begin a transition into a new phase which is outlined below. This submission is to encourage a discussion as to what a phase four collection might look like and the advantages that it provides in contrast to maintaining the NSDC at phase three i.e., the status quo. The fundamental difference between phase three and four is the recognition of the collections as Essential Public Infrastructure and Collections (EPICs) and managed and developed as such.

It is important to note that my submission is not offering a solution however, it is offering a strawman for discussion. My major concern is that the CRI submission and research scientist working with and within the collection will tend to advocate for the status quo albeit with increased funding. The current structures have not allowed the collections and the associated research to develop to its full potential This can be partly accounted for by minimal increases in funding over time that does not account for inflation or escalating CRI overheads. The collections have also seen a continuous decrease in capability resulting from unsympathetic and commercially driven boards as well in some cases CEOs and senior management.

Currently the nationally significant collections are independent of each other as they are housed in different CRIs each of which have different visions and relationships with their collections. Infrastructure funding is optional funding compared with research funding. This means that the collections are diluted within CRIs' other activities. In some CRIs there is a pressure to convert the infrastructure funding to research funding because the collections do not fit in to the vision of a

[1] Collections may grow through the addition of newly collected samples, but they also continue to grow through the gifting of small phase one collection e.g. The Allan Herbarium acquired a significant proportion of both the Victoria University of Wellington and University of Canterbury's herbaria when these institutions disestablished them. Also, Margot Forde Germplasm Centre has received private collections after the passing of crop and forage collectors in New Zealand.

corporate CRI. In many cases they have no clearly articulated purpose beyond being 'important' and labelled infrastructure.

Strawman for discussion:

The nationally significant biological collections should be considered one single collection, albeit housed at many locations around the country and that they are a vital component of the nation's scientific infrastructure and cultural heritage with international significance and obligations. This national collection of biological objects is nationally significant, publicly funded and owned. It is very similar to the National Library of New Zealand. The major difference being its dynamism. Using the National Library as a model:

The Essential Public Infrastructure and Collections (EPIC)is here to provide access and use of the collective knowledge of biota for Aotearoa and the rest of the world.

The main purpose of the EPIC is to collect, connect, and co-create knowledge for the benefit of Aotearoa.

- **Collect**: The biota, both taonga and non-taonga, as living and preserved specimens and with its associated data and information are protected and accessible
- **Connect**: The people of Aotearoa can easily access these national resources through digital information systems
- **Co-create**: The people of Aotearoa working together to turn data and information into knowledge and wisdom for national (and international) benefit

Those collections held within the EPIC that belong to iwi/Māori (taonga) and therefore they will be partners in the governance of that material giving effect to Te Tiriti o Waitangi. Individual sub-collections will continue to be housed where they are now currently held. However, with time and resource these subsets of collections (e.g., Manaaki Whenua collections) will be rehoused regionally so that iwi/Māori can take a leading role in the operational management of their taonga[2]. This will provide opportunity for Māori to participate and be trained in the techniques and knowledge which will grow iwi Māori leadership and management of taonga. Māori will become a key contributor to the pool of talent for future recruitment. If Māori research institutes were to be established these could be sites to establish region sub-collections are enhance the existing research collections.

Most of the collections could be regionalised i.e., dry and/or preserved material (plant and fungal herbarium specimen, pinned and pickled arthropods, other pickled animal material, living plant germplasm, and fossil specimens). However, living seed collections and cryopreserved material might still need to be centralised because of the capital equipment required. Decentralisation could be seen to be a disadvantage for researcher having to travel to several locations to examine specimens. However, it creates a higher community profile and involvement which would encourage government financial support.

The establishment of EPIC bring integration and operation scale which is lacking in the current piecemeal system. Collective wisdom of the current unit managers and staff would be used to solve the common problems that collections have now. A national collection strategy would be developed to ensure that EPIC's purpose is achieved. This strategy would ensure that capability was maintained and not left to the whims of the individual CRI restrictions. It would also ensure that the collection

[2] Alternatively, the individual objects in the collection will be digitised and made available virtually to iwi Māori and others.

was maintained, developed and made available by professional collections managers and not merely as a small part of a scientist's job description as some collections are currently being managed.

The coalescence of the scattered collections of Aotearoa into a single national collection recognised and managed as national infrastructure will benefit iwi Māori tangata tiriti.

Other matters:

This strawman is focused on the biological collections held in CRIs and funded as Nationally Significant Collections and Databases as this is the focus of Te Ara Paerangi. However, it is applicable to all biological collection held in CRIs as well as those held in other publicly funded institutions. For example, the biological research collections held in Te Papa would better sit in an EPIC type of institution as its purpose would better fit a biological research collection than does the purpose of Te Papa to "preserves, protects, acquires and provides access to collections that are part of New Zealand's artistic, cultural, and natural heritage".

The EPICs would require having scientists on its staff which would include systematists, taxonomists and nomenclaturists as these would be essential in the scientific curation of the collection. However, there is need to other expertise such as agronomy, databasing, IT and programming as well as GIS experts if EPICs are to be used in their full capacity. Current funding levels would not allow the recruitment of these skills.

An integrated national umbrella database would also be needed to house all data from the EPICs and make it all available to the public and researchers. This database can be managed in coordination with an organisation such as New Zealand eScience Infrastructure (NeSI). AgResearch has already initiated joint data hosting and processing with NeSI and this can be expanded to all CRIs for their EPIC infrastructure.

As the data is seen as the most important content of the current NSCDs, the buildings and infrastructure for actually preserving the material, which is the core asset of these NSCDs has been neglected in many of the units. There is a need to fund and support this infrastructure development if consolidation of EPICs is happening in the future.