Response to the Department of Innovation, Industry, Science and Research (DISSR) 2011 Strategic Roadmap for Australian Research Infrastructure Exposure Draft

Council of Biological Collections (CABC)

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General comments

CABC welcomes the inclusion of explicit capabilities in biological collections and biobanking and in digitisation (including of biological specimens and records). Investment in infrastructure in these capabilities will facilitate research across a wide range of fields including biodiversity and environmental science, human health, biotechnology, biodiscovery and biosecurity for Australia's agricultural and environmental assets. The exposure draft acknowledges the links between these research areas and biological collections and digitisation, however the links between capabilities could be made more explicit and in a more consistent manner.

It is concerning that the need to invest in soft infrastructure is not explicitly mentioned in several capabilities. Soft infrastructure is a critical component of biological collections as without the taxonomic and technical expertise to manage and curate these collections the valuable data is not able to be effectively made available or kept current. Taxonomy is not static and is continually updated to reflect improved knowledge and therefore improves the data available but only if it can be incorporated into the collections systems. We strongly support the view expressed in the earlier Roadmap Discussion paper that Australia needs to invest in building/mentoring the national capacity of Early Career Researchers to arrest the decline in the national taxonomic capability over the next decade. This taxonomic expertise is the integral "skilled technical support" that underpins the biological collections and biobanking infrastructure. It includes the ability to differentiate and enumerate biodiversity, to assess native from introduced species amongst other functions, as well as maintain, develop and provide access to biodiversity collections for future generations.

Digitisation infrastructure

CABC is delighted that the 2011 Roadmap Exposure draft embraces the critical issue of recognising digitisation infrastructure as a main theme, linked to outputs and outcomes contained within the other capabilities of integrated biological discovery, biological collections and biobanking, and integrated biosecurity.

We reinforce the need for investments in digitisation infrastructure for digitising biological collections material. The Atlas of Living Australia (ALA) has started to show success and significant promise as a tool for organising Australia's biodiversity information, supporting research and collection management, and addressing national and regional needs for organised data for environmental analysis.

The ALA has received positive feedback from the *National Research Infrastructure Council* (NRIC) as well as DIISR itself in terms of exposing Australia's vast biodiversity

collections to the global community, and is now potentially poised to expand/ join with other biological datasets and capabilities including 'omics, biodiscovery and other eResearch tools.

In its previous iteration the ALA was unfortunately constrained by its inability to use NCRIS or EIF funding for actual collection digitization, and as a consequence it does not currently represent a full or even adequate coverage of the Australian biota in terms of what was previously digitized and what is awaiting digitization within Australia's nationally distributed biodiversity collections. Consequently, there are substantial collections and datasets of the Australian biota still to be incorporated, new tools to be developed to organise and interrogate these data, and new generations of Citizen Science applications waiting to engage our diverse communities.

Integrated biological discovery

CABC supports the linkages made between biological collections and biobanking and integrated biological discovery. This partnership has significant potential, not only for the delivery of new biotechnology with commercial potential and advancements in human health, but also for biodiversity research and biological discovery. We believe that these linkages are critical as they provide a quality assurance link between biobanked material, specimens and names.

Biological collections and biobanking

CABC is pleased to note that biological collections and biobanking have been recognised as key capabilities for investing in Australia's research infrastructure. Biological collections provide a powerful tool to facilitate research in several of the key capacities including biological discovery, integrated biosecurity, population health and research platforms, marine environments and terrestrial environments. Biological collections provide valuable active research infrastructure for the discovery of species - with many more species still awaiting discovery in Australia. They also provide an important resource for biodiscovery, e.g. chemicals as potential pharmaceuticals and genomics. Many other areas of evidence-based environmental research also utilise the biological collections infrastructure, for example, research into the potential impacts of climate change on Australia's unique organisms.

In order to realise the potential of the biological collections and biobanking infrastructure it will be necessary to invest in the building/mentoring of the national capacity of taxonomic expertise in Early Career Researchers. This should include providing linkages for Early Career Researchers with the biodiversity collections (e.g. similar to the US model for the PEET grants). In this way, we could improve Australia's capacity in several areas of evidence-based research including taxonomic skills, natural products chemistry extraction and fractionation, and increasingly sophisticated molecular techniques. This in turn will improve Australia's ability to monitor potential environmental changes by detecting changes through environmental chemical signatures and metagenomics approaches. These signatures and sequence data will inform our understanding of the effects of climate change, and the ability of organisms to respond to change. Such capacity building also has the potential to contribute to commercial innovations through pharmaceutical developments.

Nationally funded curatorial support for the management and conservation of the nationally distributed biodiversity collections will be necessary to ensure the sustainability of this infrastructure. This could be done in a strategic way, such as prioritising existing significant collections of particular phyla that represent national research infrastructure strengths, and co-funding the curatorial support for these as "national treasures". Curatorial support should include the physical care, improved digital access, as well as value adding in terms of

escalating their exposure to genetic barcoding or other affordable "innovative techniques". Investment in barcoding projects will help to build the world's library of fingerprints as a step towards comprehensive genetic screening of existing biological collections.

Furthermore, there is a need to co-fund, improve, and standardize the protocols for the storage of tissue and DNA material, or other forms of subsamples, across the nationally distributed biodiversity collections. Such investment would improve access to these collections for biobanking and biosecurity.

Integrated biosecurity

CABC strongly supports the connections made between the integrated biosecurity capability and that of biological collections and biobanking. We emphasise the importance of the biological collections and integrated digital resources in enabling rapid and accurate identification of invasive pests and diseases. Furthermore, it is critical that Australia addresses the severe decline in taxonomic skills in order to maintain the necessary capacity and ability to accurately identify organisms which pose potential biosecurity threats.

Marine Environment

CABC welcomes the connections made between the marine environment capability and the biological collections and biobanking capability. We reinforce the importance of these connections for understanding our marine biodiversity and for research into marine ecology. In particular, biological collections provide an invaluable dataset for investigating temporal and spatial trends in marine organisms.

Terrestrial environments

CABC welcomes the connections made between the terrestrial environment capability and the biological collections and biobanking capability. As with the marine environment capability, we reinforce the importance of these connections for understanding our terrestrial biodiversity and for research into terrestrial ecology, noting that biological collections provide an invaluable dataset for investigating temporal and spatial trends in organisms.