Australian Government
Department of Agriculture and Water Resources

Submission for 'National Biosecurity Environmental Response Agreement (NEBRA) review'

Section A: General information

Purpose of this form	For individuals and organisations to provide input to the NEBRA review. You can make a 500 word submission online or submit a detailed submission via email.
Before applying	See the NEBRA Five Year Review Discussion Paper
Closing date	5pm AEDST 17 March 2017
To complete this form	**Electronically** Save the PDF file to your computer. You will need the latest version of Adobe Acrobat Reader to save changes to your document. **Manually** Use black or blue pen. Print in BLOCK LETTERS. Mark boxes with a tick or a cross.
Your submission must include	☑ a completed and signed submission coversheet ☑ a copy of your submission with, where relevant, all or part of the document marked 'In confidence' N/A ☑ where relevant, supporting information from organisations, written on their official letterhead.
Email your application	Email nebrareview@agiculture.gov.au

ok to go RT 17/3/17

Overview

Museums and herbaria are uniquely positioned to make authoritative biosecurity identifications based on the most current knowledge of species' biology. The Australian Museum is actively involved in enhancing Australia's biosecurity through its capabilities in morphological and molecular species identification based on its strength in research taxonomy, led by expert systematic biologists working with extensive research collections, and supported by state-of-the-art laboratory infrastructure, including our *Australian Centre for Wildlife Genomics* (NATA accredited under ISO17025).

We have restricted our response to key questions in the discussion paper overlapping our core business:

12) Do you think existing information sharing networks are utilised effectively for NEBRA-related matters? If not, how do you think this might be addressed?

The Museum recommends creating a streamlined pathway for identifications in a national system for information sharing on NEBRA related matters. We recommend a centrally-managed system for taxonomic identifications coordinated through museums and herbaria to expedite sample turnaround and speed detection. The system could be similar in principle to the Marine Invasives Taxonomic Service (MITS) operating in New Zealand (Gould & Ahyong, 2008). MITS, contracted by the New Zealand government, which provides a centralised end-to end system for identifications, specimen vouchering and databasing of all samples collected under that nation's marine biosecurity programs.

The Museum recommends the establishment of an accessible current and maintained database of national identification capability to support of a centrally-managed information system. The database would include names, contact details, and taxonomic groups of expertise for relevant taxonomic experts. It would formalise the existing informal biosecurity-related associations between museum experts and other government agencies at the institutional level to ensure timely communication. This would improve the efficient use of national expertise by avoiding duplication of efforts among states.

We also suggest that authoritative reference collections of invasive and potentially invasive species needs to be created. Such collections would be permanently curated at state museums and herbaria. The reference specimens will be supported by images and diagnostic DNA sequences, which together will enable rapid and accurate identification of suspect samples.

14) Do you think that the sharing of training and resources among jurisdictions and non-government stakeholders would help to increase preparedness for environmental biosecurity threats? If so, how might this be achieved?

Timely biosecurity responses depend on the recognition of alien species and an accurate diagnostic capability that provides reliable taxonomic identifications of these, whether they are detected in surveillance, border intercepts, or other sources. For most animal species, this capability resides almost exclusively within state natural history museums or herbaria through their taxonomic expertise and associated diagnostic facilities.

Ongoing surveillance is essential to early detection and needs to be resourced adequately across jurisdictions. This is especially important at high risk interfaces such as shipping ports and transport

hubs (air and road). The Australian coast is known to be susceptible to marine incursions possibly due to its large number of seaports (85 according to https://www.searates.com/maritime/australia.html). For some sedentary marine invertebrates (e.g. the notorious calcareous tubeworm *Hydroides elegans*, biofouling of ship hulls is known to be a major mode of dispersal. Transport of larvae in ballast water became an important means of the range expansion for marine organisms in the late 1980's with increased volume of shipping and the advent of container shipping.

Increasing the accessibility of the national taxonomic expertise held in museums and herbaria would minimise response times for dealing with environmental biosecurity threats. However, expertise in particular groups is distributed unevenly across jurisdictions and often resides in only a few. Therefore, it is important that processes that permit rapid determination of relevant taxonomic experts for a particular issue. This can be partly achieved by the establishment of an accessible current and maintained database of identification capability.

Improved cross-jurisdictional training including the provision of regular taxonomic workshops would increase the chances of early detection of new invasive species and would benefit the control of domestic translocation of established invasives into un-impacted areas. The latter process is likely become have increasingly important. Recent examples from snails and slugs highlight this point. (1) The introduced Liver Fluke Snail (*Pseudosuccinea columella*) is an intermediate host of the liver fluke, *Fasciola hepatica*, infecting livestock and humans (Molloy & Anderson, 2006). It was originally introduced to southeastern Australia and reached the Northern Territory through interstate movement of ornamental aquatic plants (Marshall & Cribb, 2004); fortunately, the NT population was noticed and successfully eradicated. (2) The Green Snail (*Cantareus apertus*), an important crop pest established in Western Australia since the 1980s, has recently become a pest in Victoria through translocation (Blacket *et al.*, 2016). (3) The invasive slug *Deroceras invadens* which was not previously known to occur on Norfolk Island although present on the Australian mainland (Hutchinson *et al.*, 2014) has recently been found on the island (Colgan, 2017).

15) What role could the non-government sector play in preparing for environmental biosecurity incidents? How could their involvement be facilitated?

Web-based species pages/profiles may be excellent public resources, but need regular updating, especially if they are to function as passive surveillance tools. High quality images need to be provided for such sites, and clear identification marks given for potential biosecurity threats. Whilst the mapping and analysis tools of the Atlas of Living Australia (http://www.ala.org.au/) have significant potential for assisting biosecurity but more targeted web-based identification tools are needed.

The web-based guide developed at the Australian Museum which aims to help distinguishing Australian native and potentially invasive polychaetes (http://polychaetes.australianmuseum.net.au/) is a good model of such a public resource. The guide is fully illustrated with high-quality original photographs and is intended for use by not only biologists and environmental consultants, but also by quarantine officers and port management authorities, who may lack special knowledge in taxonomy. The "Polychaete Identifier" can be extended to include other potentially invasive groups of marine organisms, subject to funding availability.

Engaging and educating the non-government sector in passive surveillance as well as other semi-publicly funded programs such as "Streamwatch" in more active surveillance will increase the

likelihood of early detection of new or expanding incursions. The Museum is currently conducting a trial with a community based identification tool, "Australasian Fishes", which has already passed 11,000 observations in four months. This model has considerable potential for community engagement in dealing with picking up new invasives.

16) Do you think it is feasible to develop a list of Australia's priority environmental pests and diseases? If so, how might this be achieved?

The Museum considers that it is feasible to develop a list of Australia's priority environmental pests. We note, however, that the utility of such lists is critically dependent on timely assessment of whether to include particular species on them (and recognising that species may have become major biosecurity threats before they can be included on the lists), expert input from taxonomists and the capacity for regional differences in priority to be accommodated.

The use of priority lists in resource allocation would require careful consideration, especially in contingency planning for particular potential invasives. Despite repeated incursions the priority-listed invasive bivalve *Perna canaliculus* and *Perna viridis* have not become established in Australia (Wells, in press). Expending extensive resources in developing a particular contingency plan for these species and neglecting others may not be justified. Efficient resource use may favour developing generic plans, say for terrestrial slugs, terrestrial snails or freshwater snails rather than at the species-level. Species-specific action can be implemented once an incursion is suspected. We emphasise that the initial and critical step is to confirm the identity of the suspect species with specialists.

Conversely, the lists would be useful in directing resource allocation in surveillance, especially of domestic translocations of established invasives. Regular ongoing surveillance of major ports may have detected the incursion of the invasive European Fan Worm (*Sabella spallanzanii*) in Botany Bay at an early stage enabling the most effective response. The incursion which was detected in 2013 by the Australian Museum (Murray and Keable, 2013) was only accidentally discovered, although it had been predicted by a NSW DPI risk assessment (Glasby and Lobb, 2008).

Consultation with the appropriate systematists is essential for the correct identification of biosecurity threat species. This can be problematic when in areas with diversity or areas with numerous undescribed native species. The difficulties of this are increased because so much of Australia's biodiversity remains undescribed and because introduced species may belong to a genus which also contains native Australian species. Consultation with taxonomists would improve the lists by identifying taxa that are potentially invasive. For example, the South American apple snails include at least two major agricultural pests, the Golden Apple snail (*Pomacea canaliculata*), and the Island Apple snail (*P. maculata*, also known as *P. insularum*) (Cowie, 2005; Hayes *et al.*, 2012). The Golden Apple Snail is named as a priority risk to Australia (EFSA Panel on Plant Health, 2012) because of the major threat it poses to rice-growing. *P. maculata* is not listed although it is this species that has established itself as an uncontrolled pest of the rice-growing areas of the Ebro delta in Spain (López *et al.*, 2010). As another example, known high risk marine invasives such as the amphipod *Caprella mutica* and crab *Hemigrapsus takanoi* (possibly more significant than the listed species, *Hemigraspus sanguineus*) are not included in the 56 priority marine species identified in the *Species Biofouling Risk Assessment* (Hewitt *et al.*, 2011a) as likely to arrive in Australian and do harm.

The Museum considers that lists need to be supported by both advanced modelling and direct field sampling. Current biofouling risk assessments based on vessel movements and modelling based on

biological and physical parameters are invaluable (e.g., Hewitt *et al.*, 2011a,b) but need to be calibrated against actual species arriving as biofouling and against estimates of propagule pressure derived from levels of fouling.

The Museum, through its ongoing participation in the global biodiversity observation network, GEO BON, has co-developed a framework of "essential biodiversity variables" (EBVs) for monitoring (Perreira *et al.*, 2013). This framework includes EBVs for invasive and pest species. Australian work has pioneered further developments of this approach (http://geobon.org/essential-biodiversity-variables/ebv-for-invasion-monitoring/) that are aimed at development of a global system of harmonised observations for assessing and tracking the status of biological invasions (McGeoch *et al.*, 2006; McGeoch *et al.*, 2010). The Museum considers that inclusion of this approach would benefit the utility of listing of pest and invasive species. Further, such a standardised coordinated approach addresses needs raised in Question 14.

If priority lists are to be developed, particular attention should be paid to species that are reported as both widely-distributed (even cosmopolitan) and reported and reported as problematic invasives. The fact that a taxon is easily translocated to new does not guarantee that it constitutes a single species. Often as a result of a dedicated study a widely distributed invasive species dissolves into a complex of morphologically distinct species, a number of cryptic genetically distinct species, or a combination of both.

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