



# National Biodiversity DNA Library

Enabling world's best environmental monitoring

The National Biodiversity DNA Library (NBDL) is an initiative to generate authoritative DNA reference sequences for named species of Australian animals, plants and macroalgae and key invasive species, and make these data available publicly through an open access portal. It will transform how we monitor Australian ecosystems by enabling fast, accurate species identifications from environmental DNA (eDNA).

## The challenge

### Monitoring Australian species and pests

Understanding the distribution of plant and animal species in Australian ecosystems, and how they are changing over time, is critical information to a range of sectors including fisheries, conservation, agriculture, biosecurity, and tourism. But, monitoring Australia's vast, biodiverse environment with conventional approaches is expensive and often difficult.

eDNA technologies are poised to revolutionise environmental monitoring. Instead of more labour intensive approaches to sight and record the species present in an area, scientists can take samples of water, soil or air and identify species present in an area on the basis of DNA they have left behind in the environment. This is the same approach as that used for the detection of COVID-19 in wastewater. eDNA can similarly be used to monitor one species, for example to detect an invasive species before it becomes established, or many species present in a sample at once, to describe or detect changes in biodiversity.

Despite these advances, the uptake of eDNA methods is constrained by a lack of DNA reference sequences, which are needed to interpret the DNA recovered from the environment.

We currently have suitable DNA reference sequences to support these new methods for only a tiny fraction of Australia's plants and animals. This means that during eDNA surveys, many species go undetected because their eDNA can't be interpreted. Further, existing DNA reference data in public databases are of variable quality, and rarely provide the means to confirm the accuracy of the original identification.

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**'Even if 5-10% of reference sequences we use are inaccurate, it presents a high-risk rate for the nation. Ability to be able to link a specimen to a trusted identification is critical for biosecurity risk mitigation.'**

– Interviewed stakeholder

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Uptake of the NBDL for biosecurity surveillance: **an estimated \$5.80 of value returned for every \$1 spent.**



## Our response

### National infrastructure to enable species identifications

This long-standing global problem is now solvable using world-leading technology created by CSIRO, that allows us to generate large amounts of DNA reference sequence data suited to taxonomic identification from collection specimens, faster and cheaper than has previously been possible.

Using this technology, the NBDL is developing an open access, online DNA reference library for named Australian species and priority invasive species. This work will enable accurate identifications to support the uptake of eDNA biomonitoring in Australia, and support the broader scientific community for DNA-based identifications of Australian biota.

The initiative will support accurate identifications by sequencing specimens from Australia's network of biological collections that contain thousands of expertly identified animals and plants.

The NBDL is partnering with NGOs, industry, government, and the Australian collection community to create this significant national infrastructure. The first campaigns are generating sequences for marine vertebrates, invertebrates, macroalgae, seagrasses, and marine and terrestrial pest species. The data portal will launch in 2024.

As Australia's national science agency, CSIRO is solving the greatest challenges through innovative science and technology. CSIRO. Creating a better future for everyone.

## Future impacts

### Supporting decision making with efficient research and effective monitoring

The NBDL will form the backbone of eDNA-based biomonitoring in Australia for decades to come, creating enormous national benefit, supporting industries across fisheries, agriculture, biosecurity, environmental management and tourism.

A conservative analysis of the potential uptake of the NBDL for biosecurity surveillance alone estimated that for every \$1 spent \$5.80 of value will be returned.

Given the scope of applications the NBDL will support to describe and monitor biodiversity, and detect indicators of environmental change, this is just a fraction of the value the NBDL will generate.

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'If the NBDL facilitates preventing one serious incursion or the need for one substantial response, the investment will pay for itself very quickly, as responding to any threat is exorbitant and costs millions – billions of dollars.'

– Interviewed stakeholder

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