Program **OCEANOMICS**



Increase effectiveness of marine management strategies by providing real-time advice on biodiversity hotspots and which species are most in need of protection

Understand at high resolution both rapidly and at large scales the health of ocean ecosystems and populations of species

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National/Global



FLOURISHING OCEANS

(Australia)

Vision

We aim to revolutionise ocean conservation through the development and application of next generation genomic tools, to allow for a massive increase in the collection and analysis of data for the monitoring and management of ocean wildlife, including endangered species.

Goal

Produce reliable data using breakthrough techniques that enable rapid, population-scale monitoring and conservation of marine wildlife.

Application and impact

Data produced as part of the OceanOmics program will be used primarily to:



Contribute to Australian and international policies that protect high-risk species, including keystone and over-exploited species and their habitats

Figure 1: Application and impact.

Genomics and the ocean

Genomics refers to the study of an organism's genetic material or its DNA, the molecule that contains the biological instructions that make each species unique.

Just like a fingerprint, every organism in the ocean leaves behind a trace of DNA. By testing seawater for the presence of these traces of genetic material, we can identify the organisms that have passed through an area. This genomic tool provides a rapid, non-invasive measure without visual observation, such as diving or video surveys.

The lack of reference genomic sequence information for marine life, against which to compare and identify environmentally sampled DNA traces, is currently a major roadblock to progress. In fact, only one per cent of the ~20,000 marine fish species have had their genomes fully sequenced and catalogued to date. The creation of a genome reference library for marine vertebrates as part of this program will enable these novel approaches to be implemented with unprecedented resolution, while unlocking the potential of genome-scale studies of populations of marine life.

Genomic tools have the potential to revolutionise ocean conservation, allowing us to:

- Take "snapshots" of entire ecological communities
- Monitor the status and stock structure of distinct marine species, including keystone and over-exploited species
- Detect adaptation to environmental change and make predictions about future resilience



Our approach

As one of Asia's largest philanthropic organisations, the Minderoo Foundation is uniquely positioned to develop innovative, long-term, and scalable solutions to the planet's biggest problems. We are accelerating ocean conservation through four overarching aims:

- Massively increase the genome reference libraries for marine vertebrates, in collaboration with leading international efforts
- Develop and augment novel sample collection, sequencing and computational methods that can rapidly answer population- or ecosystem-level conservation questions

- Integrate these methods and workflows across our shipboard and shore-based labs to measure the genetic diversity of the ocean at unprecedented speed and scale
- Support the broader goals of Minderoo Foundation's Flourishing Oceans initiative, using the knowledge to drive meaningful policy and protection measures for ocean conservation and sustainable fisheries programs.

Game-changing resources

OceanOmics ambition is accelerated by two catalysing resources:

- Australia's only shipboard, highthroughput sequencing laboratory
- The Minderoo OceanOmics Centre at The University of Western Australia, a world-leading marine genomics laboratory

For more information visit **minderoo.org/oceanomics** or scan the QR code below.

