



Exploring Antarctica's Coastal Biodiversity: Voyage of Discovery

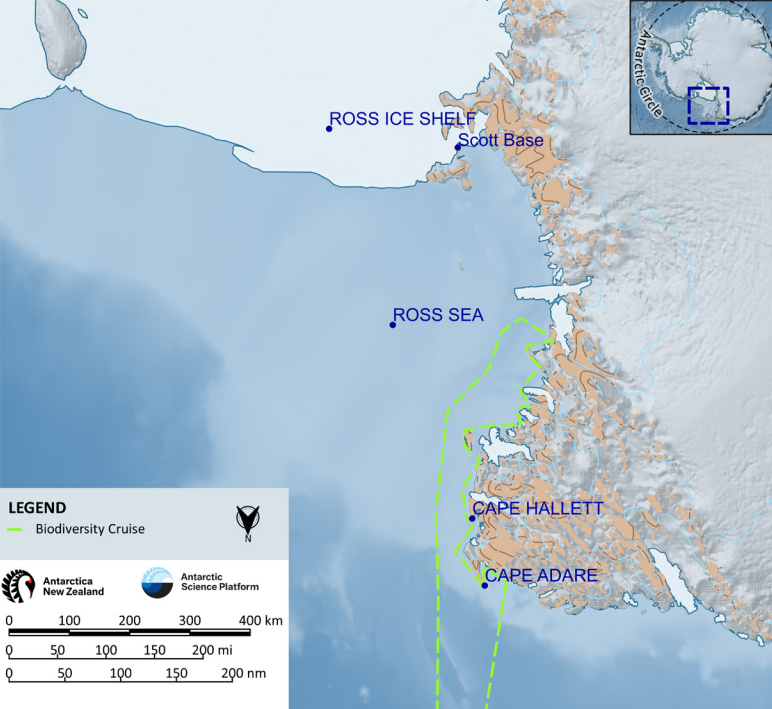
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New Zealand's Antarctic Science Platform seeks partners and funding for a sea voyage dedicated to revealing the undersea biodiversity and biogeography of Antarctica's nearshore coastal ecosystems.

- The links we discover between environmental conditions and the distribution of coastal marine organisms will be key to predicting their vulnerability and response to future climate change
- We propose an ambitious expedition to undertake extensive sampling of communities in the relatively unexplored and understudied northwest corner of the Ross Sea
- The New Zealand Government has invested \$49M in a platform of Antarctic research; \$900,000 is committed specifically towards this expedition and science delivery

WORLD CLASS RESEARCH

The voyage targets Northern Victoria Land, where nearshore biodiversity remains largely unexplored, undescribed and poorly understood. Many species live in limited and unique environmental niches, highly sensitive to changes in sea ice, ocean temperature and acidification, and increased freshwater flows from melting ice. Characterising the relationships between these niche communities and their environment is essential to understand their vulnerabilities to future climate change.



Map of the Ross Sea and Northern Victoria Land, including proposed voyage route.

WHY THE ROSS SEA?

- ▶ the Ross Sea plays a key role in global ocean circulation and ice volume processes
- ▶ the Ross Sea Marine Protected Area is the world's largest MPA
- ▶ New Zealand has a long-standing commitment to stewardship of this region

THE NICHE HABITAT OF ANTARCTICA'S BENTHIC (NEARSHORE) ORGANISMS:

- ▶ Temperature -1.8°C (29°F)
- ▶ Limited, pulsed food supplies; survival on stored energy reserves
- ▶ Habitat segmented by large glaciers
- ▶ Low nutrient supply from the land
- ▶ Long periods with extreme low light due to winter darkness and sea ice

A VOYAGE OF BIODISCOVERY

This ship-based expedition is a critical component of the Antarctic Science Platform, in turn supporting New Zealand's stewardship of the Ross Sea Region. We hope to catalyse an ongoing programme of nearshore biodiversity voyages, with global outreach possibilities.

Antarctica's coastal zone is a patchwork quilt of habitats, segmented by extensive outlet glaciers that override rocky substrates. Ship-based shallow-water research and in-situ sampling is essential for studying these environments, far removed from Antarctica's main research stations. A geographically-focused voyage will reveal species distribution by location and habitat (i.e. biogeography), and address the extent to which populations are constrained by ice and other features of Antarctica's extreme environment. Antarctica's benthic (nearshore) ecosystems are also one of the few remaining frontiers for discovering new species and functional interactions.

THE NEXT GENERATION

In accord with New Zealand's values, gender equity and participation of indigenous researchers are central to our planning and we see great opportunities for the Platform and voyages of discovery to increase the diversity of participants in the Antarctic research enterprise. We will ensure that over half of voyage participants, from all participating nations, are graduate students or early career researchers.

We will deploy modern technologies, such as remotely operated and autonomous vehicles, both in air and in water, for habitat and species mapping. Our team includes members of New Zealand's team of professionally-trained science divers experienced in polar conditions. Environmental data collection will be supplemented by remote sensing to extend observations through time. Genetic fingerprinting will allow identification of planktonic larvae, and the use of eDNA and gene-scaping approaches will discern connectivity of populations.

LOGISTICS & FUNDING

We propose a six-week voyage in early 2022. Up to fourteen nearshore shelf sites (20–200m depth) will be sampled for plant and animal biodiversity and community composition studies. Additional in-transit atmospheric and oceanographic measurements will be explored depending on the capacity of the vessel and our ability to raise supporting funds.

While funding is in place to support the core science, including post-voyage sample and data analysis, our logistical hurdle is funding to support a vessel able to operate safely and effectively in this largely unexplored region of the Ross Sea, and to extend our science portfolio beyond our core goals. We're exploring possible use of Ice Class 1A or 1B vessels already operating in the Ross Sea, and are open to alternate suggestions.

PARTNER WITH US

We are keen to negotiate partnerships to support this key infrastructure, as well as additional funding to support personnel, analytical costs and to promote involvement by international scientists and students.

We welcome your advice and experience in the design and delivery of this ambitious biodiversity-focussed sea voyage.

The New Zealand contracting entity for this voyage is the University of Waikato.

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