Waipapa Taumata Rau University of Auckland

Te Herenga Auaha

**Faculty of Science**

# PhD Position

## Impact of extreme events on physical-biological interactions and primary productivity in Aotearoa's coastal ocean

### Description

The Institute of Marine Science at the University of Auckland is seeking a highly motivated PhD student to join the new Te Moana Mahana research team. This PhD is funded by the recently awarded 2025 MBIE Endeavour Research Programme *Te Moana Mahana* (https://te-moana-mahana.org) and will support the activities of the Ocean Impacts work package. The PhD project will develop research to understand the impact of extreme weather and ocean events on ocean physical-biological coupling in two coastal areas, the Hauraki Gulf Tīkapa Moana Te Moananui a Toi and the Otago shelf.

You'll join a collaborative, trans-institutional team of ocean and climate scientists working across observation and modelling over a range of scales relating to New Zealand's coastal oceans. The project offers access to a pool of oceanographic equipment and infrastructure as well as supercomputing resources and simulation archives. The work will include development of links to government, Māori, industry, and international partners.

### Candidate Requirements

- MSc/First-class Honours (or equivalent) in some form of environmental science – particularly physical, biological or chemical oceanography, climate science, or atmospheric science.
- Demonstrated interest in physical-biological interactions in the ocean.
- Aptitude for working with observational data and model outputs.
- Demonstrable skills in Python or Matlab for quantitative analysis.
- Good communication and writing skills

### What we offer

- Full PhD scholarship for 3.5 years (fees + stipend, subject to funding conditions). Please note the scholarship will not be extended beyond this.
- Access to world-class research facilities and mentorship.
- Opportunity to be part of a major research project funded by the New Zealand Ministry of Business, Innovation and Employment.
- Opportunities to collaborate with leading researchers in New Zealand and internationally.
- You will be supervised by Dr. Alice Della Penna, Assoc. Prof Melissa Bowen, Dr. Rob Smith at the University of Otago, and Dr. Charine Collins (Earth Sciences New Zealand).

## Application process

Interested applicants should email the following to Dr. Alice Della Penna (alice.penna@auckland.ac.nz):

1. A cover letter (1 page max) outlining:
   a. The reason for your interest in the topic.
   b. The reason for your interest in undertaking a PhD.
   c. Any relevant prior experience (professional and/or academic) in the field of research.
2. Curriculum Vitae including:
   a. Any prior professional, industry and/or academic experience.
   b. Any prior collaboration with research activities.
   c. The details and links on any publications.
3. Full academic transcripts.
4. Contact details of two academic referees.

**Please include the following in the email subject "CoastalPhyBio - Doctoral Application". Any email received**

**without this subject will not be considered.**

A selection panel comprising three representatives from the project team will assess all applications.

Shortlisted applicants will be invited to an online interview.

## Key dates

- **Closing dates for applications:** 15 July 2026, 4:00pm NZDT.
- **Early-August 2026:** interviews with shortlisted candidates.
- **End-August 2026:** candidate selected.
- **Candidature commencement date:** March 2027

## Contacts

For academic information about the PhD and the MBIE Research scholarship opportunity, please contact Dr. Alice Della Penna (alice.penna@auckland.ac.nz).

## Additional information on the project

The ocean around Aotearoa New Zealand is, in some regions, warming at a rate well more than the global average. In addition to increased background warming, the most recent IPCC report on impacts provides high confidence that this region will become increasingly vulnerable to extreme ocean temperature events–marine heatwaves (MHWs), at a range of spatio-temporal scales.

Coastal areas of Aotearoa New Zealand have been heavily impacted by these changes, with an increase in the number of marine heatwaves and more frequent storm events impacting wind and precipitation on the ocean and on land (Fig.1). These impact the biogeochemical properties and primary productivity supporting the health and economy of the coastal environment and its communities. Yet, the mechanisms underpinning the relationship between extreme events and coastal biogeochemistry and primary production are still relatively unknown, challenging our ability to predict and prepare for the future.

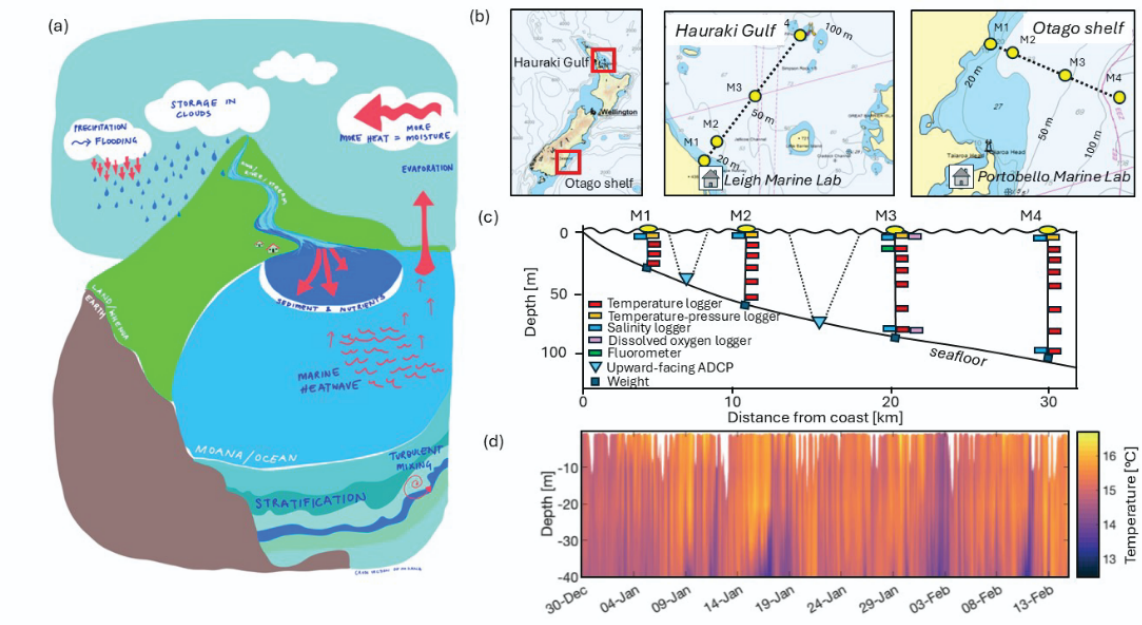


*Figure 1. (a) Schematic of the main processes in the coastal ocean (by Gabby O'Connor). (b) Hauraki Gulf and Otago shelf process studies (candidate mooring locations depicted as yellow circles). (c) Locations of instruments on the moorings, and (d) example of a temperature event captured by a similar array of instruments off the Otago shelf.*

In this project we aim to make detailed observations of two key regions of coastal Aotearoa New Zealand, the Hauraki Gulf and Otago Shelf, to assess the connection between extreme weather and ocean events and nutrients, oxygen and primary productivity. To do so, we will combine *in situ* observations from a glider survey, moorings, and modelling output from high resolution model for the two study regions.

**Further Reading**


Cook, F., Smith, R. O., Roughan, M., Cullen, N. J., Shears, N., & Bowen, M. (2022). Marine heatwaves in shallow coastal ecosystems are coupled with the atmosphere: Insights from half a century of daily in situ temperature records. *Frontiers in Climate*, *4*, 1012022. https://doi.org/10.3389/fclim.2022.1012022

Shears, N. T., Bowen, M. M., & Thoral, F. (2025). Long-term warming and record-breaking marine heatwaves in the Hauraki Gulf, northern New Zealand. *New Zealand Journal of Marine and Freshwater Research*, *59*(5), 1678–1689. https://doi.org/10.1080/00288330.2024.2319100

Macdonald, H., Collins, C., Plew, D., Zeldis, J., & Broekhuizen, N. (2023). Modelling the biogeochemical footprint of rivers in the Hauraki Gulf, New Zealand. *Frontiers in Marine Science*, *10*, 1117794. https://doi.org/10.3389/fmars.2023.1117794

Lhériau-Nice, A., Kozmian-Ledward, L., Milesi-Gaches, D. P., & Della Penna, A. (2025). Plankton distribution patterns across fine-scale fronts in the Tīkapa Moana Te Moana Nui a Toi Hauraki Gulf, Aotearoa New Zealand. *Marine and Freshwater Research*, *76*(15), MF24214. https://doi.org/10.1071/MF24214

Johnson, E. E., Suanda, S. H., Wing, S. R., Currie, K. I., & Smith, R. O. (2023). Episodic Summer Chlorophyll-a Blooms Driven by Along-Front Winds at Aotearoa's Southeast Shelf Break Front. *Journal of Geophysical Research: Oceans*, *128*(7), e2022JC019609. https://doi.org/10.1029/2022JC019609