

## Lord Howe Island Marine Park News

### Water Quality Research Collaboration

Reefs and marine ecosystems in the Lord Howe Island Marine Park (LHIMP) support thousands of species, many of which are unique to this location. Their persistence depends on regular supply and recycling of nutrients to facilitate growth, development and reproduction. In a pristine environment, nutrients may come from deep oceanic waters that periodically rise to the sea surface, or be transferred to the reef from the island itself.

Seabirds forage in the open ocean and transport nutrients to the island when they roost and feed chicks. Droppings, or guano, from these seabirds filter back to the reef through runoff, streams, tidal pumping and groundwater. The movement of nutrients to the reef via groundwater may be especially important in the LHIMP given locations like Sylphs and Comets Hole regularly show signs of freshwater input to the lagoon.

These same processes can also transfer nutrients from human waste and agriculture from islands onto nearby reefs, which can artificially inflate levels of some nutrients. Too many, or too few, nutrients can change the abundance and species of corals and algae on a reef, which can have flow-on effects for fish and invertebrates. Management of the marine environment therefore requires a robust understanding of nutrient sources and the processes that facilitate their transport.

In May of this year, a team of scientists from the Australian Institute of Marine Science (AIMS), Southern Cross University and the University of NSW worked closely with the LHIMP and the LHI Board to measure existing nutrient levels in waters around the island and determine their sources.

The team collected water from bores and beach seeps on the island, along with samples from the lagoon and offshore. Analysis and comparison of nutrients in these samples will provide an indication of nutrient input from groundwater and its importance relative to oceanic sources.

Nutrient levels can also fluctuate due to tidal cycles, rainfall, storm activity or changes in human waste, bird guano or agricultural input. Therefore, to help interpret them, these results will be put in to long-term context by sensors supplied by LHIMP and AIMS, which will be deployed at Sylphs Hole to record levels of nitrates, phosphates, salinity, temperature and currents as they change over time.

Samples of sea lettuce (*Ulva sp.*), a seaweed that grows in the intertidal zone, and paddle weed (*Holophila ovalis*), a seagrass often found in shallow subtidal sandy areas, were



*AIMS researchers sampling seawater (top) and deploying a nutrient sensor (bottom) in the LHIMP. Photo credit NSW DPI*

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also collected around the island to understand how marine species are uptaking these nutrients. Nutrient contents from these tissues will be compared with concentrations in nearby bore water, seepsand seawater.

Measuring the relative abundance of different nitrogen and carbon forms (isotopes) and lipids in sea lettuce and paddle weed will also provide insight into the source of these nutrients. Sea lettuce nutrient levels and isotopic signatures will be compared to data collected from the same species and sites in 2009, enabling exploration of how nutrient levels and sources may have changed over the past 15 years. The presence of pharmaceuticals in water samples will also be used to determine if nutrients are coming from humans, and where on the island human-derived nutrients are coming from.

Finally, the team conducted benthic surveys at sites where tissue and water samples were taken. These surveys will complement and bolster existing benthic monitoring programs to determine how these changes in nutrient concentrations and sources may influence the marine communities. They will also investigate the susceptibility and resilience of these communities to stress events, including recent coral bleaching.

In total, the team took just shy of 1000 samples during their 10-day fieldwork, which will be analysed in the respective collaborating laboratories in the coming months. The results from this combination of analyses will provide a sound basis for understanding the flow dynamics of nutrients from different sources in the LHIMP. Moreover, the findings will provide a useful benchmark of nutrient levels and sources that can be used to assess the effect of changing seabird populations, levels of agriculture and human waste on the marine ecosystem in the future.

### Lord Howe Island Marine Park community survey

A series of reports on the Marine Park have now been released:

- Community Survey - summary of findings (2024)
- Community Survey – full report (2024)
- Environmental values of the Lord Howe Island Marine Park (2022)
- Literature review of social, economic and cultural information for Lord Howe Island Marine Park (2023)..

The Lord Howe Island Marine Park Community Survey was completed by an independent contractor and involved a significant amount of work with the LHI and mainland community to identify the environmental, social, cultural and economic values of the Lord Howe Island Marine Park, and perceived threats to those values. We acknowledge and thank members of the LHI community that participated in the survey.

The two literature reviews have examined previously published work and supported the community survey.

The reports will inform the development of a management plan for Lord Howe Island Marine Park.

For further information please visit <https://www.marine.nsw.gov.au/marine-estate-programs/marine-park-management-planning>

