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Using vessel movements to forecast invasive seaweed spread

Images are available [here](#).

Examining the movements of vessels between locations helped to predict where an invasive seaweed spread, researchers led by the Australian Institute of Marine Science (AIMS) have revealed.

Invasive *Caulerpa* species (*Caulerpa brachypus* and *Caulerpa parvifolia*) are a major concern in New Zealand's coastal areas, spreading rapidly via boat gear or anchor entanglement, and causing long lasting ecological and economic damage.

Documented in two research papers, scientists created tools to map how vessel movements connect different parts of the coast, then applied that framework to the spread of *Caulerpa*.

By analysing the vessel networks, they identified:

- High-risk locations that should be prioritised for surveillance and early detection.
- The most likely routes for *Caulerpa* to spread from sites where it was already present.
- How widely *Caulerpa* could spread across New Zealand in a worst-case scenario.

Lead author and Perth-based AIMS experimental scientist Cal Faubel said the *Caulerpa* movement predictions provided valuable insight at a critical time.

“During the course of this research, *Caulerpa* was detected in Northland, north of Auckland, giving us the opportunity to test and apply the vessel network approach in a real-world setting,” said Mr Faubel.

“The findings helped inform where surveillance efforts would be most effective and helped validate the approach as a practical tool for supporting biosecurity response and decision making.

“The work demonstrates how network analysis can move beyond theory and provide immediate, actionable guidance in the fight against invasive marine species.”

The exotic *Caulerpa* species at the centre of this research shares growth and life history characteristics with other notorious invasive species, such as *Caulerpa taxifolia*, which has invaded and altered coastal ecosystems in Australia and the Mediterranean. They form large monoculture mats that outcompete native seaweeds and seagrasses, reduce the diversity of fauna, and smother shellfish beds. *Caulerpa* can also grow from tiny fragments.

Given that the species may be able to survive for 10 days out of water if entangled on boat gear, the research found that *Caulerpa* has the potential to be transported in a viable state across the entire country.

Using automated identification systems fitted to boats, along with recreational boater surveys, the scientists identified 4,000 anchorage events in the Northland region that originated from infested areas, and identified 13 high risk sites within the Northland region and The Bay of Islands area.

Kaeden Leonard, Marine Biosecurity Manager at Northland Regional Council and a contributing author on the study, said the research reinforced confidence in current surveillance efforts.

“The analysis validated our highest-risk areas, where fortunately no new *Caulerpa* infestations have been detected,” said Mr Leonard.

“These sites are popular with boaties, which highlights the ongoing need for continued surveillance and public awareness.”

A senior scientist on the studies, Dr Eric Trembl from AIMS, said one of the key challenges for marine biosecurity management, particularly for Australia, is how to prioritise marine pest surveillance with limited resources.

“Network approaches may be particularly suitable for prioritising cost-effective surveillance and enabling early detection because it can help to identify hubs of connectivity, thereby improving the incursion response following the initial detection of high-risk marine invasive species,” said Dr Trembl.

The research has been published in *Biological Conservation*: [Prioritising domestic locations for marine biosecurity management within a regional vessel network - ScienceDirect](https://doi.org/10.1111/1365-2664.70371), and in the *Journal of Applied Ecology*: <https://besjournals.onlinelibrary.wiley.com/doi/10.1111/1365-2664.70371> .

On the *Biological Conservation* paper, co authoring institutions were AIMS, Deakin University, Cawthron Institute, The University of Western Australia Oceans Institute and LandWaterPeople (LWP) Ltd.

On the *Journal of Applied Ecology* paper, co-authoring institutions were AIMS, The University of Western Australia Oceans Institute, Deakin University, Cawthron Institute, Northland Regional Council, Starboard Maritime Intelligence, Auckland Council, Biosecurity New Zealand and LWP Ltd.

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Images are available [here](#).

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