

RECOVERY OF THE GREAT BARRIER REEF

IMPACT REPORT 2012 – 2025

A long-term partnership between Mitsubishi Corporation, Earthwatch Australia and James Cook University



RECOVERY OF THE GREAT BARRIER REEF

A GLOBAL CORAL REEF CONSERVATION PROJECT IN AUSTRALIA

A 14-year journey of science, resilience and partnership

Since 2012, Mitsubishi Corporation (MC) has supported Earthwatch Australia and James Cook University (JCU) to better understand, protect, and restore the Great Barrier Reef (GBR) through the Coral Reef Research Gift Agreement.

The project began with mapping the recovery of reefs around Orpheus Island following the devastating impacts of Cyclone Yasi, forming the foundation for long-term research into reef health and resilience. Over time, it has grown into one of Australia's first multi-year, multi-faceted reef restoration trials, centred on macroalgal removal ("sea-weeding") on Magnetic Island. The program is now informing similar efforts in small island states and developing countries, where local reefs face comparable pressures.

This project has engaged hundreds of people, trained future scientists, supported Indigenous and community-led stewardship, and contributed to global innovation in reef restoration science.

KEY IMPACT HIGHLIGHTS



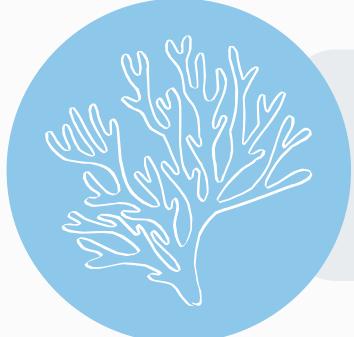
43 peer-reviewed publications
68 students supported



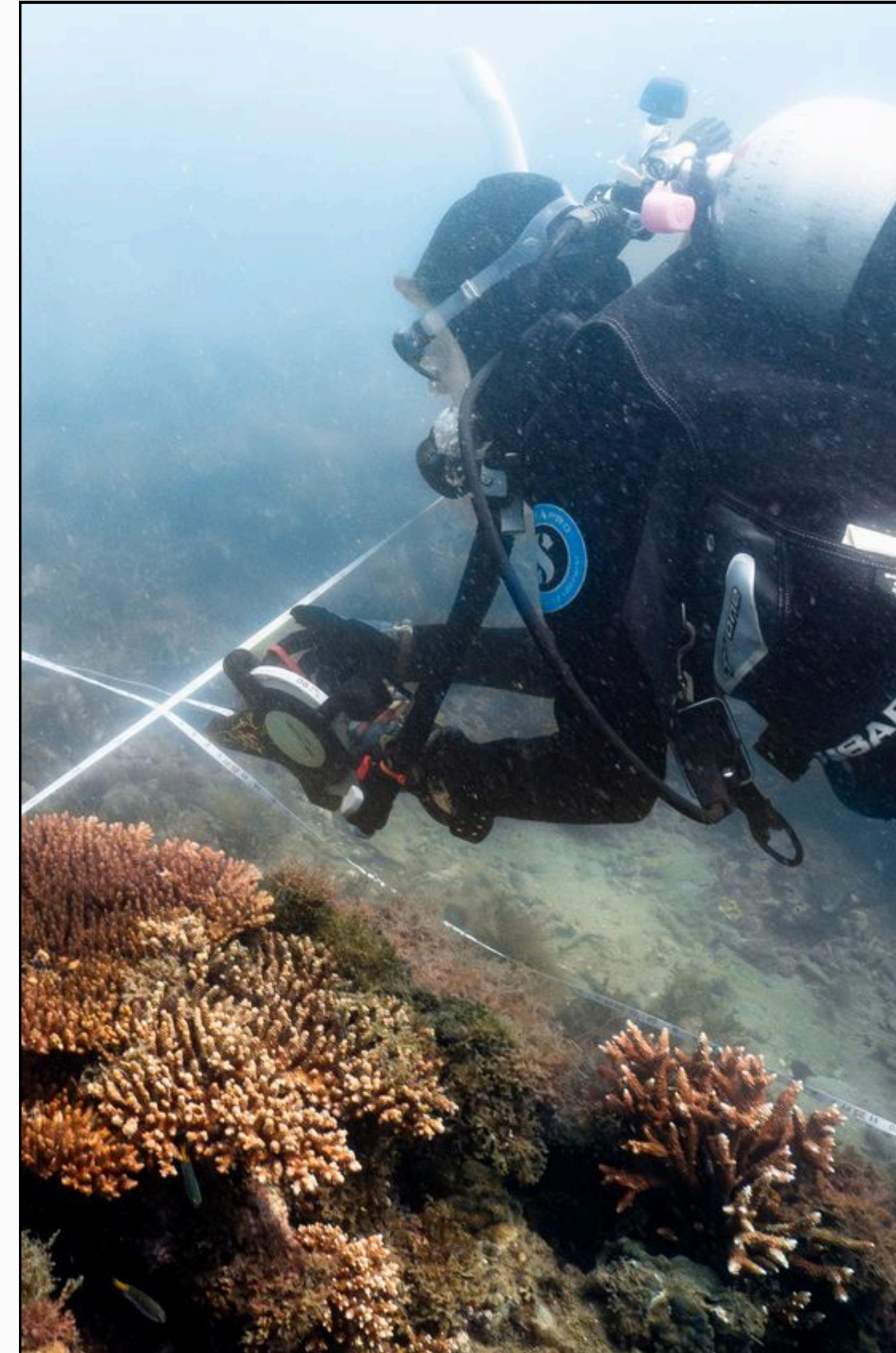
25,000 m² of reef surveyed
3,500+ kg of algae removed
4,700 coral recruits recorded



45 Mitsubishi Corporation participants



144 community members and students engaged



PROJECT TIMELINE

REEF RECOVERY RESEARCH PHASE

PHASE 1
2012-2018

2012

Data used in reef health & recovery assessments by GBR management authority

Outcomes from 5 years of monitoring published

Demonstrated patterns of coral recovery & recruitment

Data reported to GBRMP Authority

13 expeditions
24 MC staff
62 community participants

Black Band Disease (BBD) outbreak processes identified

COMMUNITY REEF RESTORATION PHASE

PHASE 2
2019-2021

2019

10 postgraduate students engaged
2 theses complete

Over 1,600 kg of macroalgae removed

PHASE 3
2022-2024

2021

246 fielding days
21 MC fellows
144 citizen scientists

Over 2,500 kg of macroalgae removed

PHASE 4
2025

2022

2024

2025

Hillary Smith appointed Nat Geo Explorer

Macroalgal removal increases coral recruitment

600% coral cover increase through sea-weeding

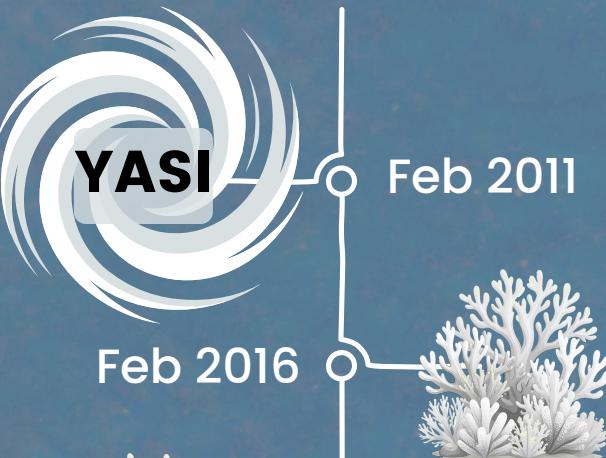
43 peer-reviewed publications
12 conference presentations

1,000% increase in coral cover in weeded plots

Sea-weeding manual developed for adoption by local communities

Throughout the course of the project, several natural events have impacted the reefs under study, providing a unique opportunity to document and analyze their effects on the reefs and their recovery. By monitoring natural recovery at Orpheus and assisted recovery at Magnetic Island, we've been able to compare how reefs respond over time. This has revealed both the individual and combined effects of these disturbances on reef resilience.

IMPACT EVENTS



TIMELINE KEY

-  TROPICAL CYCLONE
-  MASS BLEACHING EVENT

PROJECT RESEARCHERS



Prof. David Bourne

Principal Investigator

David Bourne holds joint positions at James Cook University in Townsville and the Australian Institute of Marine Science (AIMS). His training is in the area of molecular microbial ecology with his research focused on investigation of microbial diversity, structure and function in complex ecosystems. Over the last 15 years his research has focused on understanding microbial interactions with corals. This work is divided essentially into two areas, the first investigating the normal microbial communities associated with corals and their functional roles in maintaining coral fitness. The second research focus is to elucidate pathogens and mechanism of disease onset in corals and the implications this has on a stressed reef ecosystem in light of climate change being a major driver of coral reef degradation.



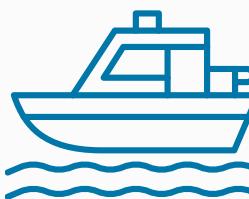
Hillary Smith

Senior Research Officer

Hillary Smith is a Senior Research Scientist and Lecturer at James Cook University. Her research examines how human-driven pressures and management interventions shape ecological processes in coastal and reef systems, and is broadly focussed on coral reefs of the future: reefs with significant impact, high human use, and altered ecosystem dynamics. She is particularly interested in how novel ecosystems reshaped by anthropogenic disturbance respond to intervention. These include mechanisms and persistence of ecological shifts from anthropogenic stress (e.g., macroalgal overgrowth), low-tech methods to reverse those shifts, alongside emerging molecular considerations of ecosystem restoration (e.g., genetic diversity and chimerism in coral aquaculture).

PHASE 1 – POST-CYCLONE REEF RECOVERY RESEARCH

Following the devastating impacts of Cyclone Yasi, the focus of this phase is on understanding how the reefs around Orpheus Island recovered. This work established the project's long-term monitoring framework and provided essential insights into patterns of coral loss, regrowth, and ecosystem resilience over time. The Orpheus Island dataset has since become a baseline for tracking change and informing subsequent restoration research.



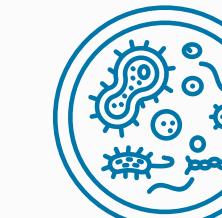
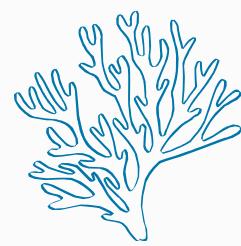
13 field expeditions



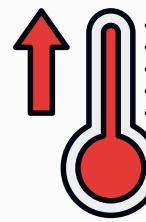
24 MC participants



10,000 m² of reef substrate surveyed



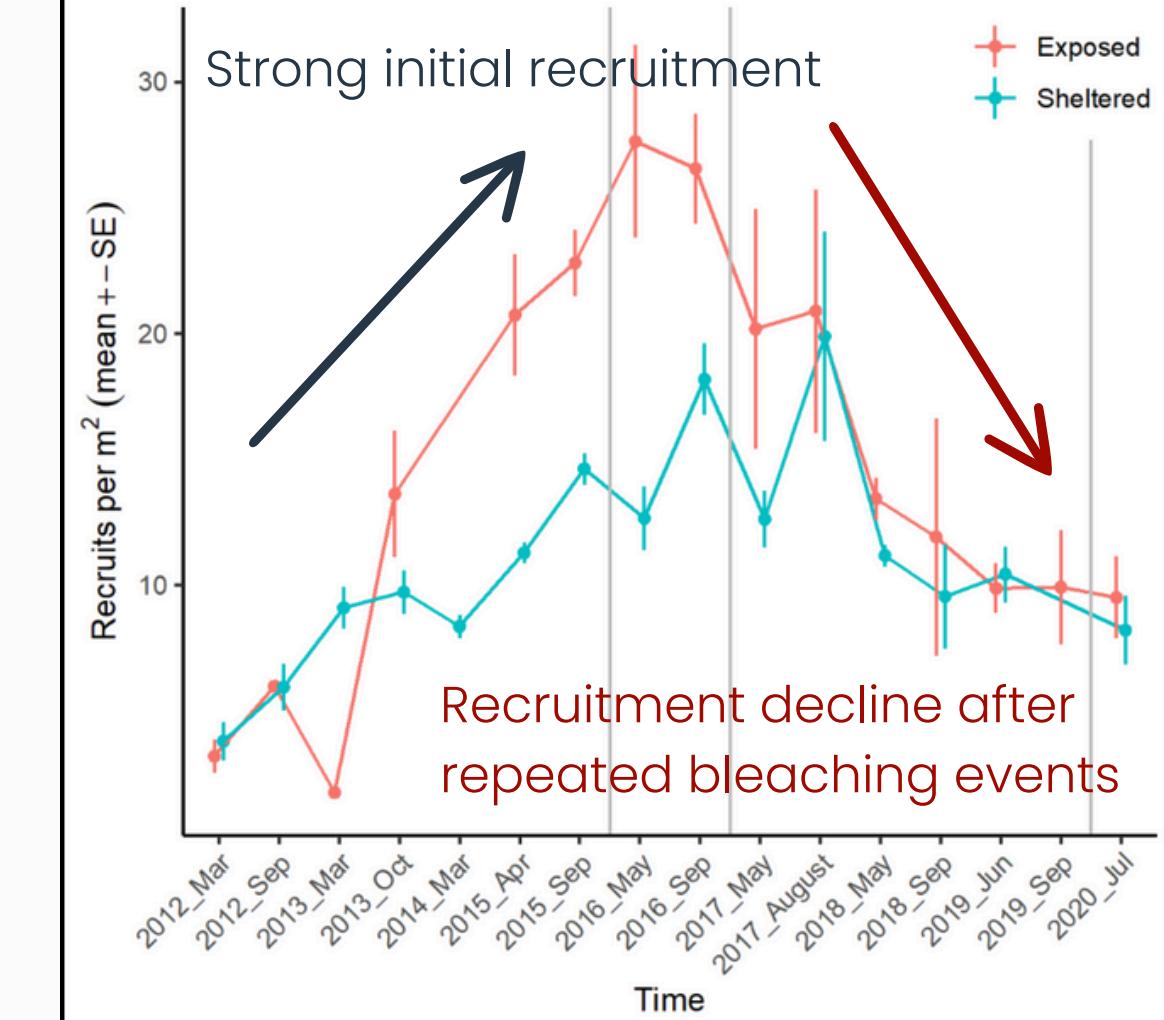
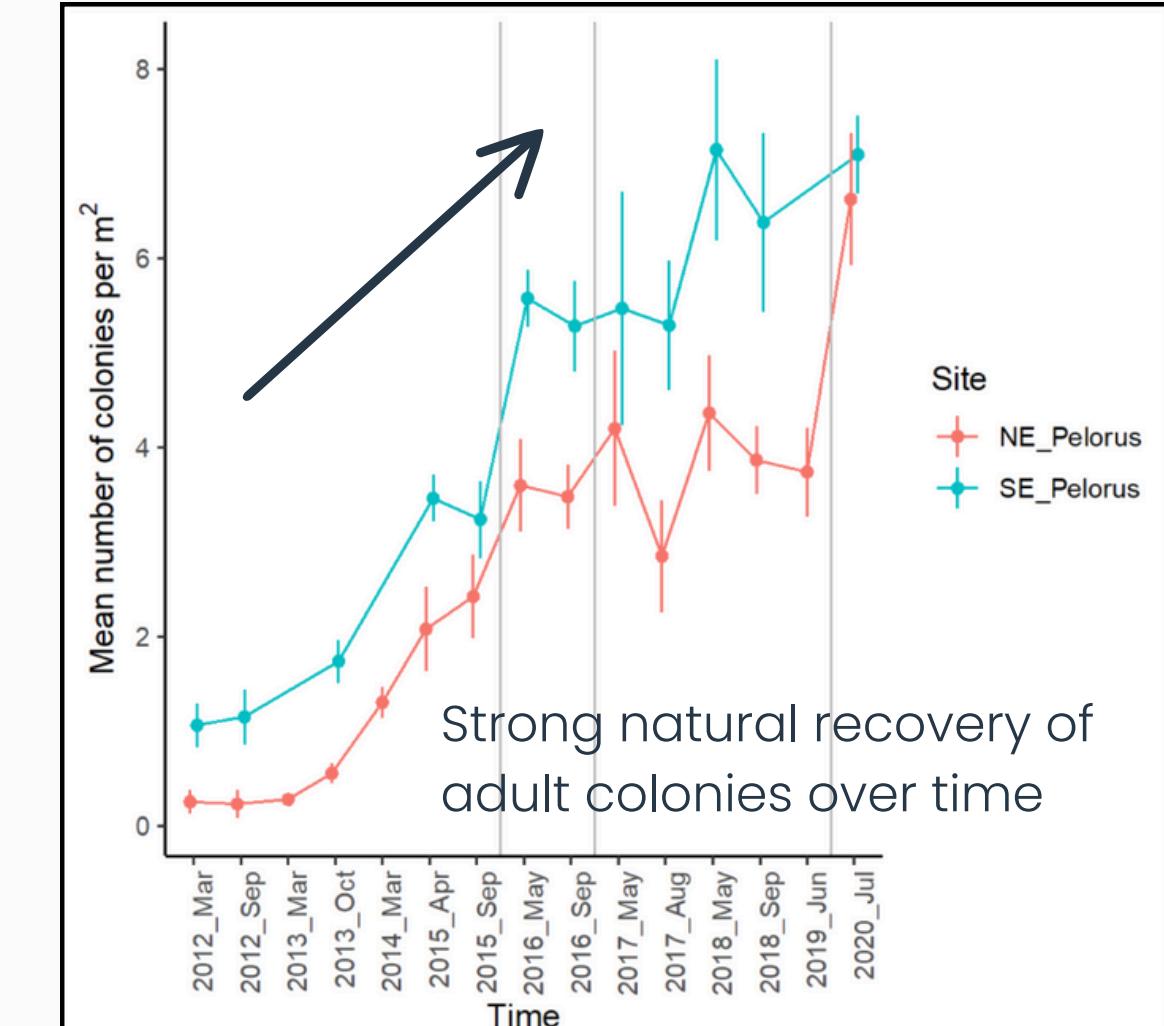
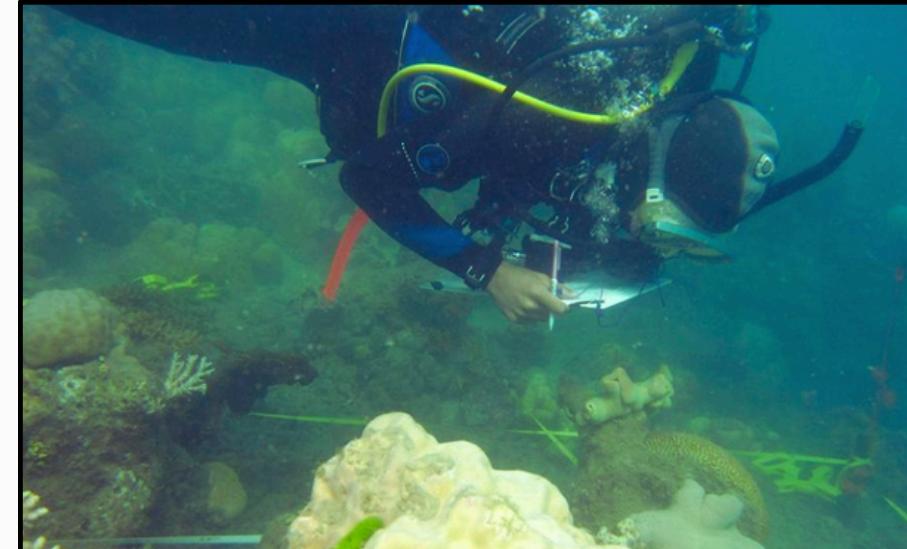
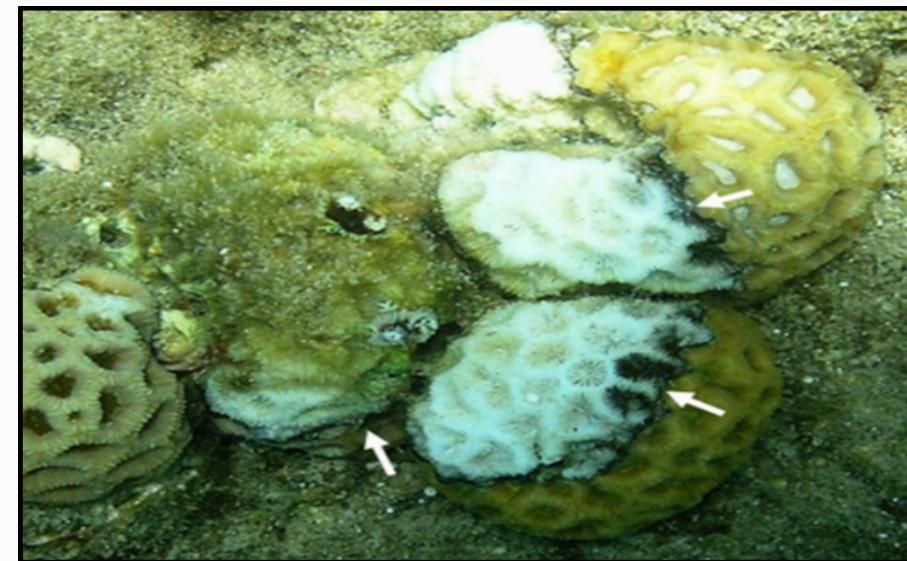
Black Band Disease (BBD) is caused by a variety of bacteria



Main drivers are high temperatures and nutrient levels

KEY INSIGHTS

- Strong recovery after cyclone Yasi: natural reef resilience
 - Adult coral densities rebounded to and even surpassed pre-cyclone levels (73–122% recovery)
- Back-to-back bleaching events disrupt the recovery
 - Adult coral abundance fell to 10–36% below pre-bleaching levels
 - Juvenile recruitment crash, long-term decline onset
 - Shifts in coral communities after multiple impacts
 - **Up to 50% regional coral mortality observed**
- Short-term recovery occurs, but repeated disturbances suppress long-term stability and recovery
- BBD progression linked to shifts in microbial metabolism – knowledge is essential for predicting disease outbreaks
- **The need for new restoration strategies becomes clear – transition to sea-weeding method trials**

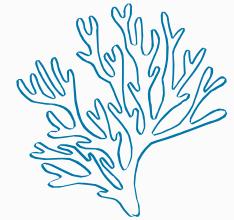


PHASES 2 & 3 – SEA-WEEDING FOR REEF RESTORATION

Environmental disturbances are becoming more frequent, limiting the reef's ability to recover. As a result, inshore reefs around Magnetic Island are shifting toward algae-dominated ecosystems. This section of the project focused on developing sea-weeding as a scientifically validated restoration method for these reefs.



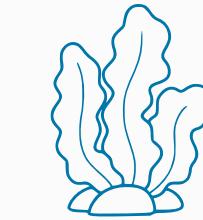
20 field expeditions



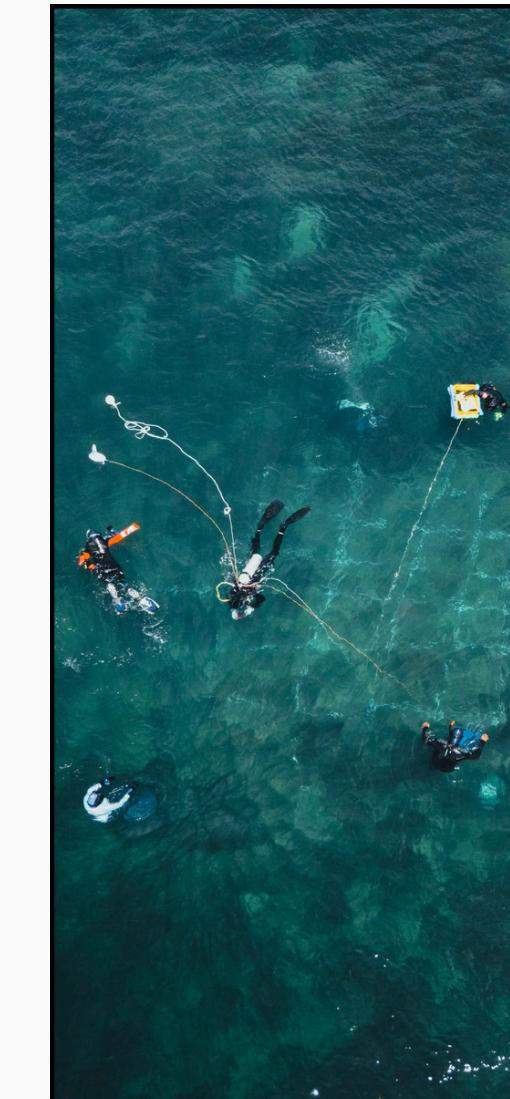
15,000 m² surveyed
1,000% increase in
coral cover



21 MC participants

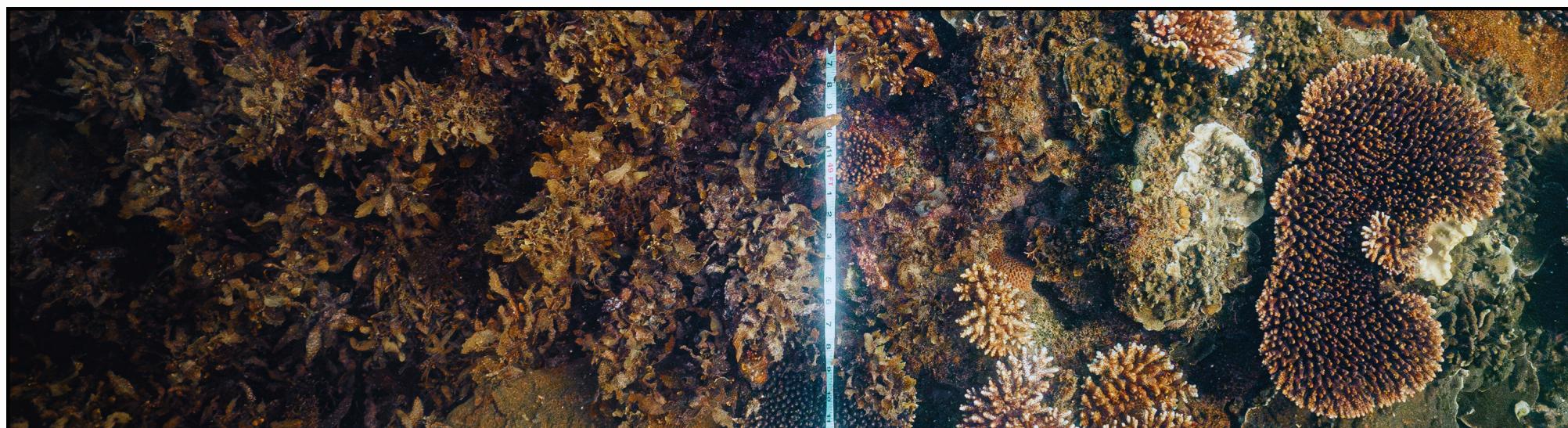


3,584 kg of algae
removed



KEY INSIGHTS

- Macroalgae removal plots recorded more juvenile corals
 - Recruitment declined after bleaching events and cyclone impacts, highlighting the fragility of early life stages
- Removing algae opens space for coral larvae, reduces competition, and provides clearer settlement areas
- Coral communities show signs of recovery after repeated impacts
- The technique is simple, low-cost, and can be adapted locally



Macroalgae

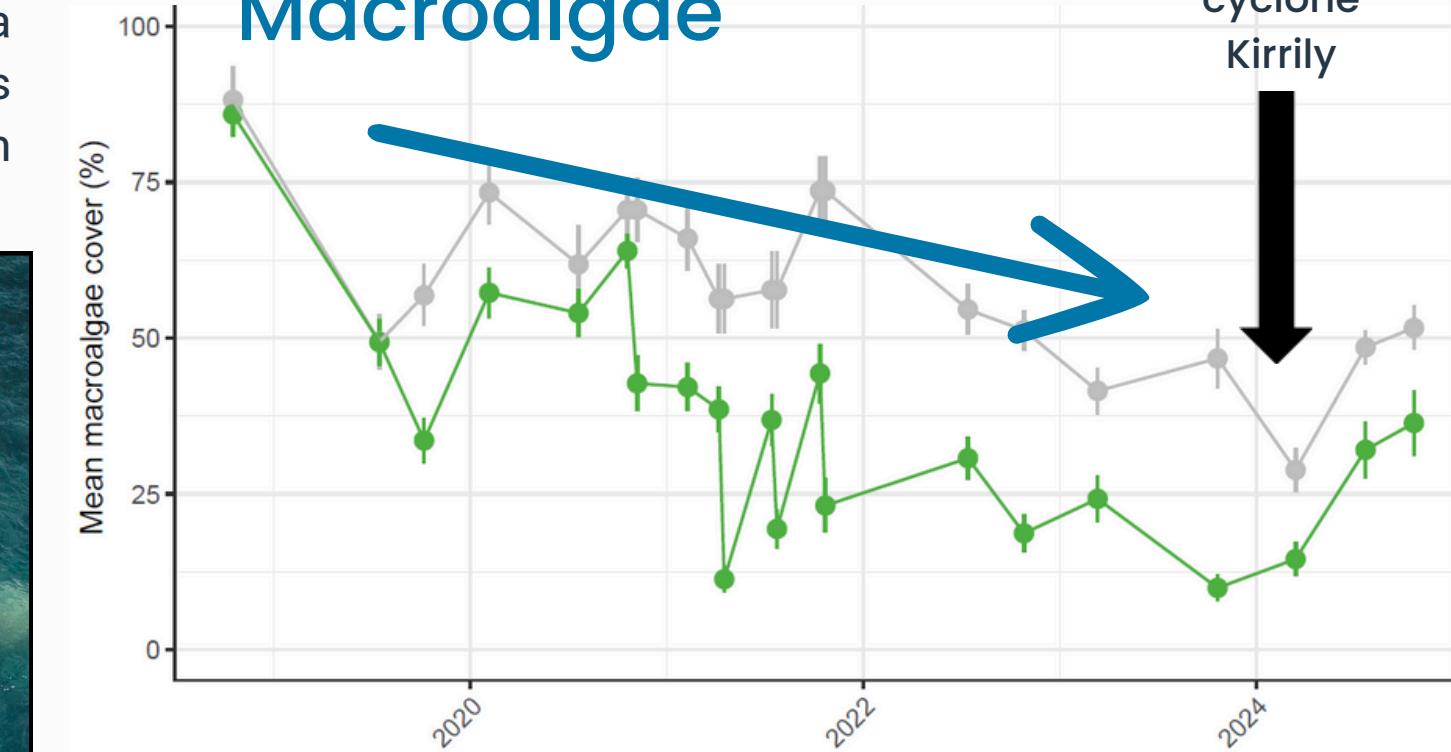


Figure 1. Mean macroalgae percent cover through time. Black arrow indicates Cyclone Kirrily, with rapid and significant growth occurring following the cyclone.

Coral cover

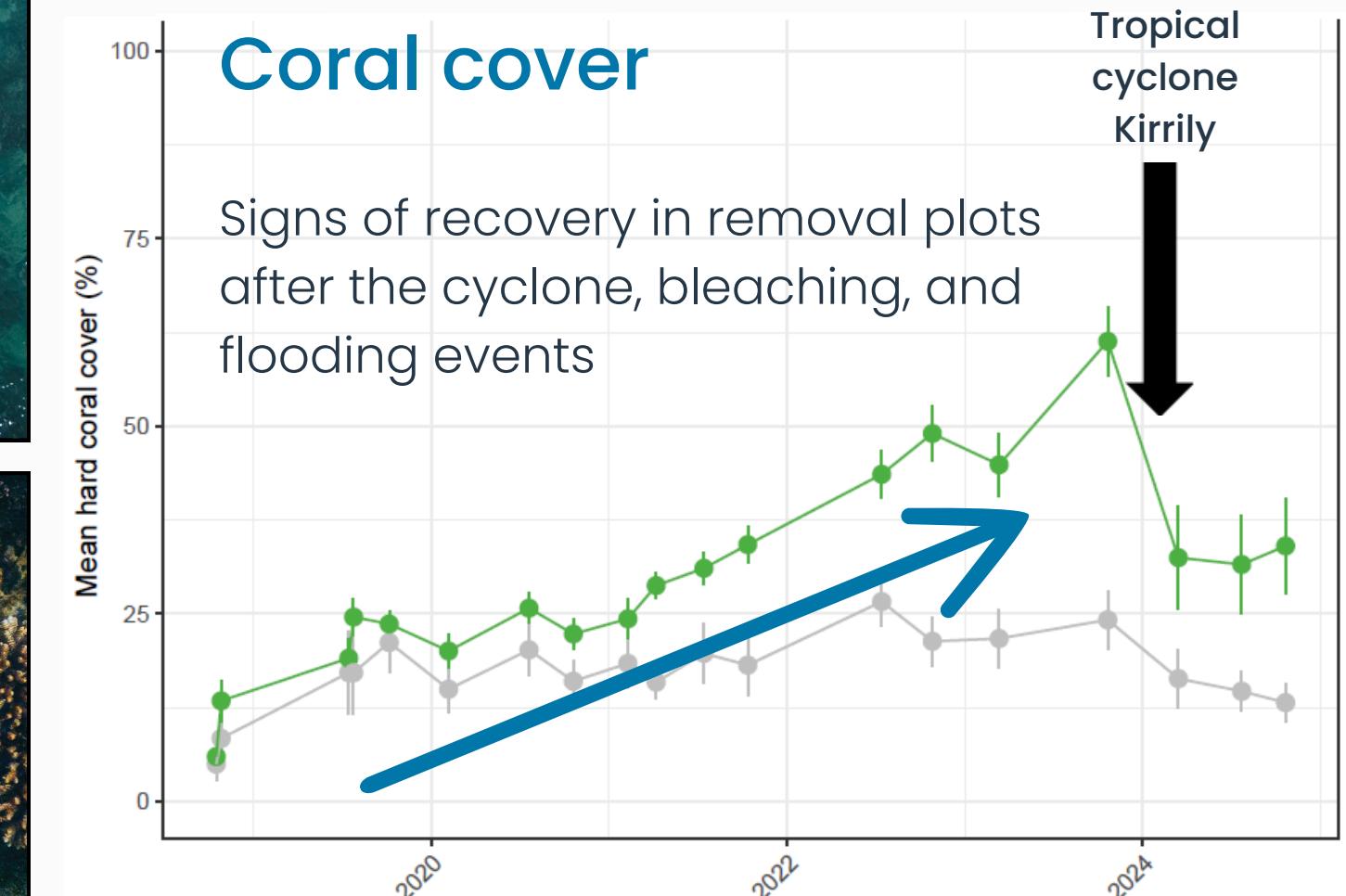


Figure 2. Mean coral percent cover through time. Black arrow indicates cyclone Kirrily, with significant losses of corals following the cyclone, but early signs of recovery in removal plots.

COMMUNITY ENGAGEMENT

PARTNERING WITH TRADITIONAL OWNERS

Since 2019, the project takes place on Yunbenun - Magnetic Island, Wulgurukaba Sea Country. Engagement activities have included:

- Workshops with Wulgurukaba Elders Brian, Lyle, Shirley and Troy Johnson
- Regular updates on project outcomes
- Integration of local knowledge into project planning
- Involvement in discussions on future community-led restoration

The research team is also planning to co-author a publication with the Elders on recent genetic findings, which mirror the traditional stories describing the connection between Yunbenun and the Palm Islands group. Traditional guidance continues to shape how and where sea-weeding may expand.

Healthy reefs rely on local champions.

By involving community groups and Traditional Owners early, the project strengthens long-term care for reefs and lays the foundation for community-driven sea-weeding guidelines

COMMUNITY PARTICIPATION

Throughout the project, more than 200 people have participated through:

- Earthwatch expeditions
- Community presentations
- Public forums, media events, and citizen science workshops

These experiences build awareness, inspire stewardship, and connect people directly to reef recovery.



THE VOICES OF MC PARTICIPANTS – PHASE 1

“

The opportunity to participate in the Earthwatch 'Recovery of the Reef' project has given me a wonderful appreciation for the CSR that MC do within the global community. It has also given me an understanding of the work being done on the Great Barrier Reef.

The work being done by the team is essential to the continued preservation and research on and of the GBR. I have a great sense of having helped to preserve and provided assistance into the research to sustain the reef.

”

- D.B., Mitsubishi Australia Ltd., March 2013

“

Deciding to join this project is easily one of the best decisions I've ever made in my life. I can clearly see how beneficial this project can be not only to our local community but also to the whole world.

Thank you MC and Earthwatch for giving me such a great opportunity to gain more knowledge and experience that I can use to improve myself.

”

- S.T., Isuzu UTE Australia Pty Ltd., March 2014

“

As a volunteer in the trip, but also being an executive at MAL working with MC to coordinate and select such funding projects, I was very impressed with the structure and workings of this project.

In my view, an experience with the Earthwatch Mitsubishi Coral Reef Recovery project reinvigorates an individual's interest and hope in creating change to support the environment. I would like to congratulate Mitsubishi Corporation for funding such an important scientific project – this project made me feel very proud to be part of the Mitsubishi family.

”

- M.T., Mitsubishi Australia Ltd., September 2016

“

It was a great experience for me to participate into the actual field research activity. As an employee involved to coal industry, my awareness to sustainability has increased and I would like to keep thinking what we can do for our industry to be more environmentally friendly.

”

- T.A., Mitsubishi Development Pty Ltd., September 2018

THE VOICES OF MC PARTICIPANTS – PHASES 2 & 3

“ I would like to express my gratitude to Earthwatch, Mitsubishi and James Cook University for giving me the opportunity to be part of this important research initiative. The expedition was a very rewarding and eye-opening experience; I saw the patience and dedication of scientists and volunteers collecting the data; and most importantly, I felt the fulfilment and accomplishment after seeing the result.

The impact of witnessing the before/after result of the macroalgae removal over the corals was very gratifying. This project has given me the opportunity to truly experience how marine science research is undertaken.

- V.T., Mitsubishi Development Pty Ltd., October 2024

“ What an incredible experience it was, learning about corals and coral reefs, seeing how Mitsubishi Corporation's funding has contributed to conservation of the Great Barrier Reef, and getting to know the very capable team of JCU and Earthwatch.

- T.H., Mitsubishi Australia Ltd., July 2024

“ I hope Mitsubishi Corporation will continue to support this program. It has once again given me the opportunity to realise the fragile state of coral reefs, triggered by climate change and also human impact. Throughout this experience it reaffirmed to me the significance of these research projects and how one project can take a significant amount of effort from researchers and volunteers.

- T.M., Mitsubishi Australia Ltd., May 2019

“ It was such an honour to be part of the team with a number of passionate and professional people. It was definitely a life-changing experience for me.

I feel proud being an employee of MC and the valuable environmental contribution MC makes through this program as it states in one of the Three Corporate Principles, 'ShokiHoko' (Corporate Responsibility to Society). This experience reminded me that taking an action is what matters, not the size of the action.

- M.H., Mitsubishi Australia Ltd., July 2023

COMMUNITY-LED REEF RESTORATION – PHASE 4

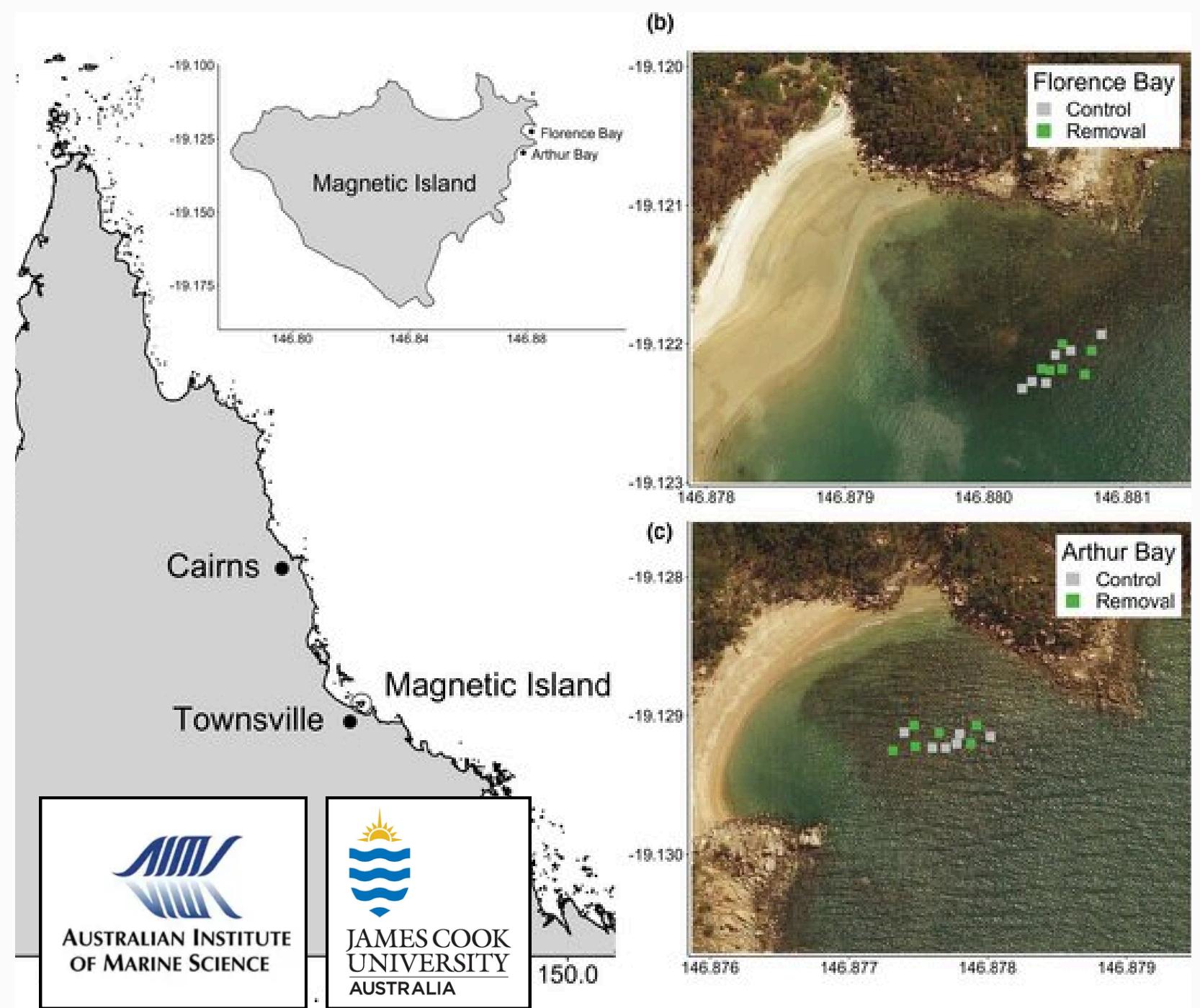
DEVELOPING A COMMUNITY SEA-WEEDING MANUAL

In 2025, Phase 4 focused on translating more than a decade of research into a practical resource to support community-led reef restoration. Through MC's funding, the team began developing a sea-weeding manual designed to guide safe, effective adoption of this method by local communities. This work includes developing clear guidelines, identifying priority sites across Australia, and working alongside Traditional Owners and local groups to build the skills needed to lead this work on Sea Country.

EXPLORING COMMUNITY ADOPTION PATHWAYS

Opportunities are currently being explored with community groups that have expressed interest in adopting sea-weeding as a restoration practice for their reefs. Early conversations are helping to understand where this approach may be most suitable, what local priorities need to be taken into consideration, and how community participation could be supported in the future.

Phase 4 is about turning science into practical guidance, supporting communities to restore their reefs, and extending the impact of Mitsubishi Corporation's long-term support to other areas in Australia and overseas



Yeppoon

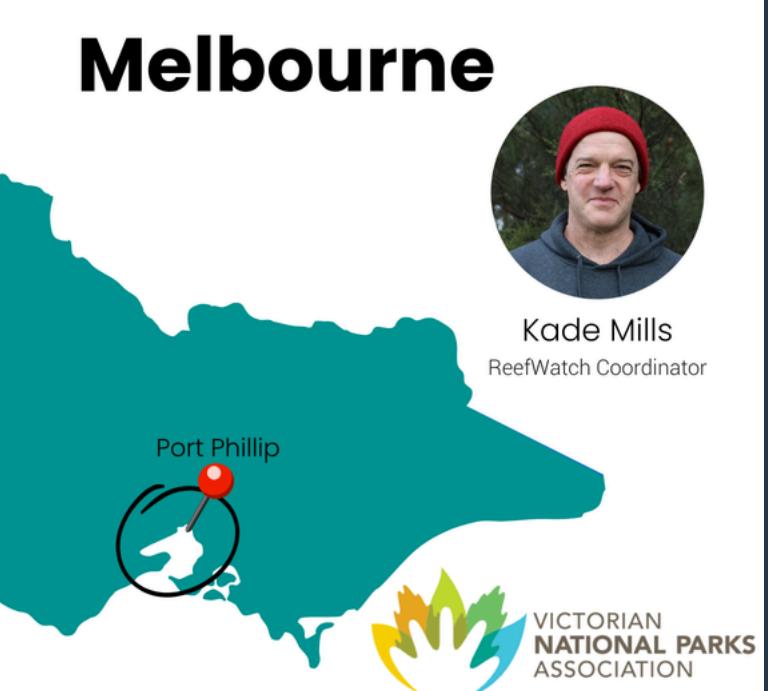


Bob Muir
Indigenous Partnership Coordinator (AIMS)



Keppel Islands

Yeppoon



Kade Mills
ReefWatch Coordinator

Acknowledgements

Earthwatch and James Cook University thank all the participants who have contributed to the program. We thank our dedicated field and research teams who have contributed countless hours toward the success of field operations. This work would no be possible without you.

We acknowledge and thank the community and businesses across Yunbenun (Magnetic Island) who continue to support our work.

Special thanks to Wulgurukaba Traditional Owner group, and Yunbenun elders Lyle Johnson and Brian Johnson for their ongoing support for this research.

We acknowledge the Traditional Owners of Magnetic Island as the custodians of the land on which we work and pay respects to Elders past, present and emerging.

Earthwatch and James Cook University sincerely thank Mitsubishi Corporation for their ongoing support of this program

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Image photography by Jose Freyre, Hillary Smith and previous participants