

C3 Report

Future Reefs

Contents

Our Team	05
Our Vision	08
Challenges	09
A Year in Review	10
Partners	11
Key Projects and Achievements	16
In the News	22
Publications	24
Awards and Achievements	26
Next Steps	30
Opportunities for Impact	32

Acknowledgement of Country

The Future Reefs Team acknowledges the Gadigal People of the Eora Nation, the Boorooberongal people of the Dharug Nation, the Bidiagal people and the Gamaygal people upon whose ancestral lands our university stands. The Future Reefs Team would also like acknowledge and extend our deepest respect to the Traditional Custodians of the land and sea country on which we live and work, from Sydney to the Whitsundays, to Cairns, Port Douglas, and the Groote Eylandt's. We recognise their continuing connection to land, sea and community and pay our respects to the Elders - past, present, and emerging - as the traditional custodians of knowledge, language, and culture.



Director's Report

Outcomes of the Future Reefs Team in 2023

I am pleased to present the outcomes of the Future Reefs Team for the year 2023, reflecting a year of significant progress and achievement in coral reef research and conservation. Throughout the year, the Future Reefs Team has expanded its partnerships and research initiatives, solidifying our position at the forefront of coral reef science. Key achievements include advancements in coral nutraceuticals, tackling ocean deoxygenation challenges, exploring extreme coral environments, and pioneering coral phenotyping techniques.

Central to our efforts has been the successful continuation of the Coral Nurture Program, with activities now extending to new reef sites, demonstrating our commitment to scalable conservation efforts.

Furthermore, the team has embarked on a groundbreaking project in collaboration with international experts, funded by the Coral Research & Development Accelerator Platform (CORAP), aimed at revolutionizing coral nutrition supplementation. These achievements underscore our dedication to innovative research and the sustainable management of coral reef ecosystems.

As we look towards the future, the Future Reefs Team remains steadfast in its mission to protect and restore coral reefs worldwide. Our strategic partnerships and pioneering research initiatives will continue to drive impactful change in coral reef conservation, ensuring the resilience and vitality of these critical ecosystems for generations to come. We thank all the supporters, collaborators, and donors for this critically important work.

**Prof Peter Ralph,
Executive Director, Climate
Change Cluster (C3), UTS**



Our Team

We are a diverse group of biogeochemists, ecophysiologicalists, and coral and marine biologists, investigating how environmental changes shape coral health and survival to develop coral reef restoration programs that are viable, ensuring improved reef resilience.

The Future Reefs team led by Dr. Emma Camp and deputy team leader Dr. Jen Matthews, consist of dedicated members including 4 post-doctoral researchers, 4 undergraduate students (including Honours students), 12 Higher Degree Researchers (HDR; PhD or Masters) students, and 4 affiliate researchers.



Honours, HDR students, and Postdocs play a pivotal role in the success of the Future Reefs Team. Their dedication and expertise not only bolstered the scientific output of the team in 2023 but also enriched its multidisciplinary approach and innovative solutions towards reef conservation and resilience.

Dr. Emma Camp



Supporting Future Leaders

Within the Future Reefs Team, Dr. Camp and Dr. Matthews prioritise fostering a safe and inclusive workplace that values and includes people with diverse backgrounds, beliefs, and experiences. The Future Reefs Team has developed a collaborative work environment where individuals feel safe and free to openly share their different views, ideas, and experiences. Honours, HDR students and Postdocs play a pivotal role in the success of the Future Reefs Team. These members have notably helped drive innovation in areas of coral nutrition, phenotyping, and coral restoration and management practises. These dedicated early career researchers significantly contributed to the Future Reefs Team scientific output in 2023, helping generate a large proportion of the total publications, and securing awards such as the “Society of Ecological Restoration Award” and “AINSEE Post Graduate Research Award”.

Left: Coral Nurture Program team members Christine Roper and Dr. Paige Strudwick.
Photo: John Edmondson



2023 has been a productive year for the Future Reefs team, with new collaborations, industry partners and successful funding applications that will expand the research portfolio of the team in 2024. Research expanded into the Northern Territory of Australia, with a new 5-year partnership with the Anindilyakwa Rangers to study corals of Groote island and contribute to a Sea Country Management plan. We look forward to welcoming a new UTS Chancellors Postdoctoral Research fellow in 2024, Dr. Ariel Pezner as we continue to grow our culture for research excellence and impact.

Dr. Emma Camp, Team Leader
emmafcamp.com





In the last year, our team has embarked on an exciting and impactful journey, from developing a specialised coral “baby food” that bolsters survival rates and enhances heat resilience, to uncovering the mechanisms by which corals can acclimate to cooler environments and unravelling the intricate chemical signals orchestrating coral synchronised mass spawning events. In addition, we had the privilege of collaborating with the Gungganyji and Yirrganydji traditional custodians in our coral larvae research, fostering meaningful partnerships rooted in respect and reciprocity. Our commitment to transparency and knowledge-sharing led us to disseminate our ground-breaking discoveries at various local, national, and international platforms, ensuring that our findings resonate far and wide.

Dr. Jen Matthews, Deputy Team Leader



Our Vision

The Future Reefs Teams' goal is to understand how environmental conditions influence the coral 'holobiont' (the coral and its associated microbial communities) and therefore how local stressors and climate change impact coral reefs. Achieving our mission of sustainable change requires genuine connections across all levels of industry, government, and civil society.

Our research ranges from organism scale molecular signatures to broad scale ecological interaction. Our team specialises in advancing technical solutions to meet our goal. Our research outcomes directly inform how reefs will look and function into the future, but also how to better preserve and re-build "healthy reefs" of tomorrow. We work hard to build and foster innovative, robust and effective collaborations focused on mutual learning that informs and adds value to our research. Our approach is to build restoration programs that facilitate collective community action.



Our work aligns with the United Nations' Sustainable Development Goals (SDG), 13 and 14, to support achieving a better and more sustainable future for all.

Challenges

Coral reefs are some of the most biodiverse and beautiful ecosystems on the planet. It is thought that a quarter of all marine life, including more than 4,000 species of fish, are dependent on them to breed and survive.

Reefs also support human life, approximately 1 billion people directly or indirectly derive some benefit from the ecosystem services provided by coral reefs (i.e. food, and tourism). However, it has become increasingly clear in recent years that coral reefs are in critical danger. It is predicted if global temperatures continue to increase (by 1.5°C), this will result in losses of up to 70–90% of reef building corals. Due to the sheer size and complexity of coral reefs, saving the worlds reefs is only possible with effective global action on climate change, in addition to continuing the existing management of fishing, and runoff. However, it is a devastating reality that even with immediate climate action, more reefs are likely to be lost.

Due to climate change server coral bleaching events are becoming more frequent. During these events coral expel the symbiotic bacteria that provide them with their vibrant colour and food, resulting in coral starvation and eventually death. In April 2024 the US National Oceanic and Atmospheric Administration declared the world is experiencing its 4th Mass Coral Bleaching Event, with the devastating effects of record ocean heats being felt across the Great Barrier Reef. This marks the 5th coral bleaching event reported for the Great Barrier Reef in the last 8 years. On the current trajectory there is a great possibility that the Great Barrier Reef as we know it will be lost. Imagine knowing that we are responsible for the demise of one of the biggest living structures on the planet!

These current events support how critical programs such as our Coral Nurture Program (CNP) are. The CNP demonstrates how partnerships and collective community action can lead to the successful

restoration of high value reef sites, like the Great Barrier Reef. The success of this program is thanks to our unique approach of developing innovative, affordable, and effective tools and workflows that enable stakeholders and custodians to actively participate in reef restoration and management.

Our team focuses on developing the knowledge to buy time at a scale that helps coral at the most valuable (ecological and economic) locations. A main goal is improving reef resilience and health, but not necessarily to any given pre-defined ecological state. For example, we are pioneering innovative solutions such as a universal coral super supplement, to improve coral resilience to change and stressors (i.e. heat), and hence adapt to the “reefs of tomorrow”. Our findings and knowledge have the potential to be transcribed cross the globe, and be implemented into existing restoration workflows, which further supports the wide-scale restoration of our ocean’s reefs.

While the task of maintaining and restoring the health of the world’s reefs is a huge challenge requiring concerted effort from governments and industry, our team shows what can be achieved using novel technologies and when communities work collectively to benefit the reef and the many stakeholders that rely on reef resources.

An underwater photograph of a coral reef. In the foreground, there is a large, branching coral structure with a reddish-brown hue. Numerous small, blue fish are swimming around the coral. The background is a deep blue, with more coral and fish visible in the distance. A large, dark circular graphic is overlaid on the left side of the image, containing the title text.

A Year in Review

1. Partners

2. Key Projects and Achievements

3. In the News

Nursery of Coral Nurture Program.
Photo: Dr. Emma Camp

Right: Dr. Paige Strudwick Coral Nurture
Program Postdoctoral Researcher.
Photo: John Edmondson



Partners

Our unique partnerships consistently deliver tangible outcomes that significantly contribute to global efforts in reef restoration.

Monsoon Aquatics

“Working with Dr. Emma Camp and the Future Reefs Team has been nothing short of exceptional, their approach to collaborating with commercial partners has been a such a positive experience resulting in an international CORDAP grant that will see real on the ground outcomes for global reef restoration”.

Daniel Kimberley,
Founding Director



The Coral Research & Development Accelerator Platform (CORDAP)

CORDAP is a G20 initiative, focused on fast tracking research and development solutions that benefit the worlds coral reefs. CORDAP brings together world experts in a multiterminal and transdisciplinary approach to accelerate and up scale the development of new technologies that support international coral conservation efforts that are required to secure a future for corals.





Prof. David Suggett
planting out a coral.
Photo: Dr. Emma Camp

Great Barrier Reef Foundation (GBRF)

The GBRF focuses on helping the great barrier reef build resistance to stressor such as increasing sea water temperatures. The GBRF partnered with the Future Reefs team to support reef restoration on reefs located in the Whitsundays and Cairns QLD. The GBRF supported the Future Reefs team and the CNP in developing the “Coralclip®”. Coralclip® is a low-cost clip that enables quick deployed of coral fragments and has improved the survivability of planted corals.



The Coral Nurture Program (CNP)

The CNP is a unique partnership between the Future Reefs Team, Researchers and Tour Operators to develop novel “stewardship” based management of economically high value Great Barrier Reef locations, with the goal to transform both ecological and social resilience to environmental change. At its core, this program is about undertaking novel research with the purpose to advance community-based restoration. Through this science-practitioner partnership the program is developing tools, methods and novel solutions to replenish reef sites and enhance the reef’s resilience.



DIAGEO

Diageo is one of the largest multinational producers of spirits and beers. Diageo is committed to environmental sustainability and engages with community development initiatives that generate positive impacts on society and the environment. In 2021 Diageo developed the “Reeftips Drinks Co.” with 10% of profits donated to the coral reef program to support its expansion.



Pure Ocean

Pure Ocean is an organization focused on ocean conservation. Their work supports a variety of activities aimed at protecting marine environments and promoting sustainable practices including marine conservation, pollution reduction and marine research. Pure Ocean supported the Future Reefs team’s work on developing of a lipid cocktail for coral larvae that increased their survival and temperature resilience.





Christine Roper and
Dr. Paige Strudwick.
Photo: John Edmondson

Anindilyakwa Land Council

“It has been an extremely exciting opportunity for the ranger team to work alongside the team at UTS to help us better understand the Sea Country around Groote Eylandt. It has, so far, been a very engaging project, exposing rangers to new technology, as well as sampling and survey methods that we can incorporate into some of our other work. We look forward to more two-way learning in this ongoing collaboration.”

Annabelle Doheny, IPA Operations Coordinator



Rolex

Rolex supports researchers that initiate extraordinary projects that have the potential to transform lives and communities. Rolex supports the Future Reefs teams innovative work on “Extreme corals”, research that investigates corals that inhabit extreme unfavourable environments, as they represent hotspots for resilience. Rolex also support the Coral Nurture Program through their perpetual planet initiative.



Susan and David Rockefeller

In 2023, Susan and David Rockefeller generously donated to the Future Reefs Team, supporting research that augments coral restoration and conservation efforts at the most valuable locations.

Right: Surveying sites in partnership with the Anindilyakwa land council. Photo: Hadley England





Key Projects and Achievements

The portfolio of Future Reefs research is collectively contributing new knowledge and solutions to improve reef resilience.

Resolving the Threat of Ocean Deoxygenation to Coral Resilience

This project aimed to uncover the role low oxygen plays in shaping healthy corals over space and time. Climate change and land use development are rapidly deoxygenating shallow water coral reefs, however there is no knowledge of how less oxygen availability affects critical life factors that govern coral resilience, such as growth, reproduction, and stress tolerance. This project united a multidisciplinary team of experts, to transform our understanding of oxygen thresholds that can be diagnostic of reduced coral competitive fitness across life stages (adults, juveniles, larvae).

In 2023 deoxygenation experiments were conducted at the Australian Institute of Marine Science (AIMS), testing the effect of hypoxia tolerance of larva relative to their parents. The team completed multiple tests of various species at different life stages. The experiment has also included a review of current practises that evaluate the effect of deoxygenation and are preparing new recommendations for the wider community. This work will help transform our understanding of oxygen thresholds, which can be utilised as an indication of coral competitive fitness across life stages (adults, juveniles, larvae). Understanding coral fitness is vital to understanding reef ecosystem health.

Above: Dr. Caitlin Lawson.
Photo: Andy Roberts

Extreme Environments and Super Corals

Future Reefs Leader, Dr. Emma Camp's discovery of corals living in extreme environments, such as in mangrove sites with temperatures often 1-2 °C above reef temperatures, has changed the world's understanding of what conditions corals can survive under. The study of these "Super Corals" is vital to uncover what enables them to survive in conditions that emulate the predicted future conditions within reef systems.

In 2023 the Future Reefs Team completed a coral reciprocal transplantation study between the Woody Isles mangrove lagoon and Low Isles reef on the Great Barrier Reef. Analysis of this study will reveal whether super tolerant mangrove corals can retain superior thermal tolerance after a 1-year period on the reef where conditions are more benign. This work builds on prior work of the Future Reefs team, revealing different skeletal structure and reduced genetic diversity of the mangrove corals (Nature Communications; Scucchia et al., 2023). Study of these extreme corals can provide insight into how these corals survive when reefs globally are degrading and dying due to extreme weather variations as a result of climate change.

Unveiling the Diversity of the Groote Eylandt's Sea Country

This collaboration unites the Anindilyakwa people and the Future Reefs Team to document Groote Eylandt's unique underwater ecosystem in the Gulf of Carpentaria, Australia. The urgency of exploring and documenting this unique ecosystem has been underscored by ever increasing mass coral bleaching events, with 90% of reefs projected extinct by 2050. Protecting marine diversity is vital; for the Anindilyakwa, this loss would be catastrophic. For thousands of years they, like many other coastal peoples, have relied on their sea country for food, trade and as a symbol of cultural identity. Using a co-design approach with the Anindilyakwa people, our team endeavours to map the true extent of marine diversity of Groote Eylandt's sea country via advanced underwater remotely operated vehicles (ROV). Our team has conducted its first trip to the Groote Eylandt's to meet and discuss with rangers their interests, assess reef sites, and to develop groundwork protocols. Results from the project will contribute to developing a Sea Country management plan for Groote Eylandt.



Corals surviving in extreme mangrove environments.
Photo: Dr. Emma Camp

The Coral Nurture Program (CNP)

The Coral Nurture Program is a unique collaborative partnership between Great Barrier Reef tourism, traditional owners and scientists, with the goal to transform both ecological and social resilience to environmental change. A key part of the continuous work within the CNP is ongoing site assessment and management of the numerous reef locations. Additionally, the program developed a proactive plan to the 2024 bleaching event, which involved active monitoring and experiments to learn as much as possible from this bleaching to inform proactive, opposed to reactive future reef conservation frameworks. The CNPs three-pillars are to optimise site stewardship by utilising innovative science at high value reef sites on the Great Barrier Reef.

The CNP now operate across 10 Australian locations:

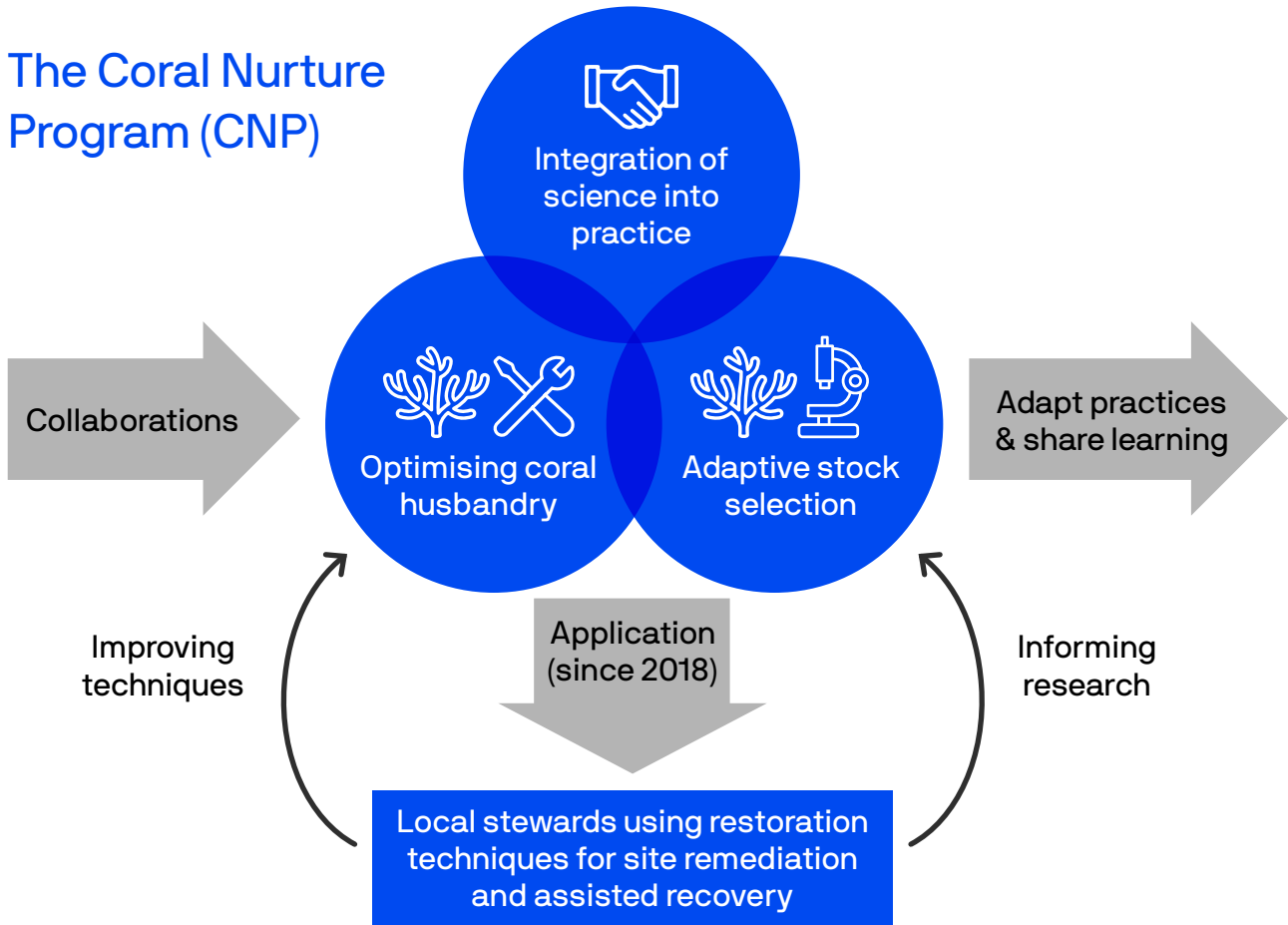
1. Mackay Reef
2. Opal Reef
3. Tongue Reef
4. Low Isles Reef
5. Hastings Reef
6. Upolu Reef
7. Moore Reef
8. Black Island
9. Luncheon Bay, Hook Island
10. Blue Pearl Bay, Hayman Island



Coral Nurture Team conducting work within the Great Barrier Reef. Photo: John Edmondson

Key Projects and Achievements

The Coral Nurture Program (CNP)



CNP number crunch

105,430

The number of corals planted through the Coral Nurture Program

71

Diversity of corals planted (total number of species) through the program

316

The number of weeks the Coral Nurture Program has been operational

30

The number of Great Barrier Reef sites currently engaged with the program

2,273

Total number of corals currently in nurseries on the reef

124

The number of coral nursery platforms established on the reef

37

Diversity of corals (total number of species) currently in nurseries

1,840

Number of staff and volunteer planting hours in the program

Source: coralnurtureprogram.org

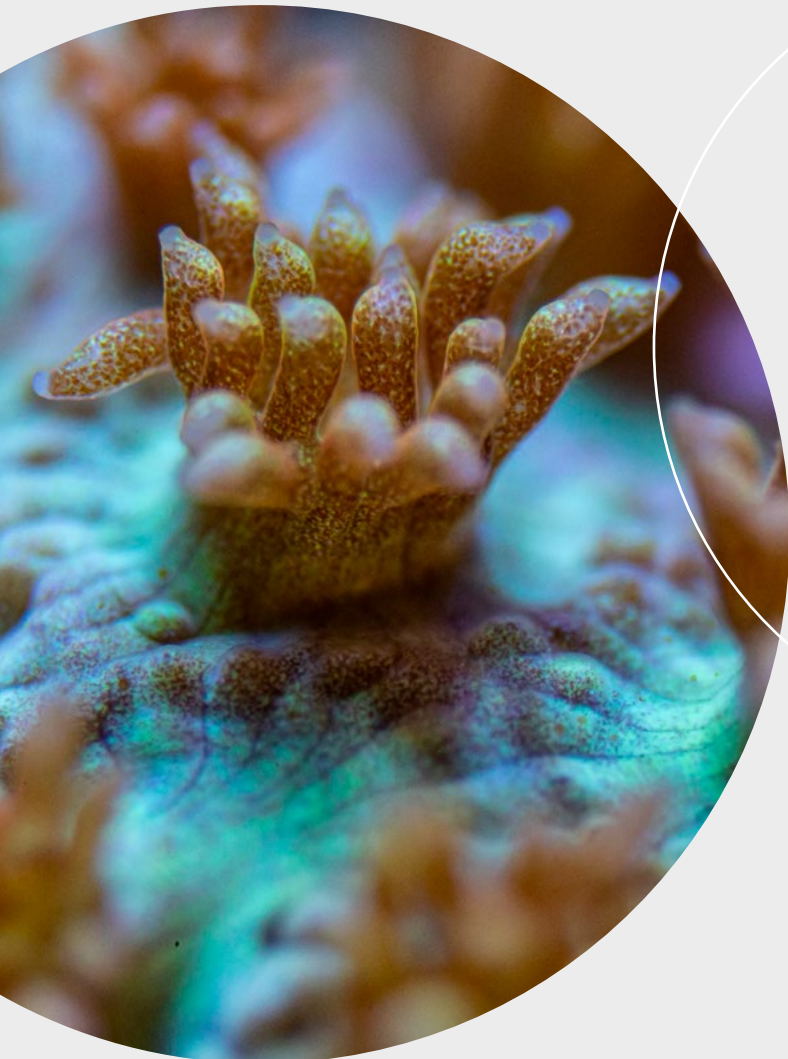
Key Projects and Achievements

Coral Nutrition

Super Supplement: Boosting coral resilience through nutritional subsidies

This project aims to develop a customized coral super supplement, to improve coral resilience to thermal stress. In 2022–2023 our pioneering work on the coral elementome (i.e., the amount and stoichiometry of elements required by an organism) revealed novel biomarkers of stress tolerance. Our work has also increased our understanding of the effect of quality of nutrients opposed to the quantity available to corals. Our findings revealed that by tailoring nutritional supplements at different life-history stages

such as providing lipids during larval phase and antioxidants during adult phase can improve coral fitness. These findings have been critical in the development of the next phase of this project focusing on identifying a network of trace elements, antioxidants and lipids that boost coral fitness during thermal stress, and optimisation of nutrient delivery to corals. During this phase the team aims to develop a universally applicable nutrient supplement that complements existing conservation practices.



Over

3 million

**coral larvae were
successfully nourished
with our specialized coral
baby food formulation.**

Left: Study of coral polyps.
Photo: Hadley England

Coral “Baby Food”

Coral larvae are crucial for reef vitality, but nutrient depletion remains a key contributor to larval mortality, challenging natural reef restoration and the effectiveness of reseeded initiatives. By supplying larvae with our coral baby food, we were able to significantly improve survival and even bolster heat resilience. In collaboration with local tourism stakeholders Reef Magic, Great Barrier Reef biology and the Reef Cooperative, and Traditional Owner groups and custodians of Moore Reef (the Yirrkandji and Gunggandji people), we successfully fed over 3 million coral larvae with our coral baby food. Given the impact and importance of this project, we have been grateful to have several outreach opportunities across the lifetime of the project, at local (e.g., Sydney’s Volvo Ocean Lovers Festival), national (e.g., ABC news) and international (e.g., ASBMB Today) scales.

The Corals of Sydney

There are significant knowledge gaps regarding the coral landscape in Sydney, NSW. It is crucial aspects of corals responses to environmental change are understood, in order to predict their survival in elevated temperatures or relatively cooler temperatures like what is experienced in Sydney compared to northern areas of Australia. Our team in partnership with the Sydney Institute of Marine Science, revealed subtropical corals adjust their fat content to adapt to environmental changes such as cool temperatures and low light. This finding helped us establish a fat-enriched food to nourish corals and enhance their resilience against temperature-induced stress events.

Optimising Coral Spawning

Mass coral spawning is a remarkable event that is a response to environmental signals (i.e. temperature). However, with environmental fluctuations on the rise, it is increasingly apparent that these cues may not solely determine spawning timing. Therefore, by using a novel approach, integrated ‘omics analyses, we successfully identified a chemical cue that can initiate spawning. This work shows significant promise in optimising coral spawning events to improve the genetic diversity of coral offspring which could revolutionise reef reseeded restoration efforts.



Development of a Novel Portable Multi-Taxa Phenotyping Device

This project focuses on understanding the intricate interactions of environmental stressors like light and temperature and photosynthetic organisms, vital for marine ecosystem health. Understanding these dynamics is key for predicting organism fitness, survival, and distribution. While phenotyping tools exist, they are typically developed for analysis of organisms within terrestrial environments. Thus, our team pioneered a portable, high-throughput technology—the Multi-Taxa Phenotyping system (MTP). The MTP integrates three established technologies, allowing the assessment of both partial and whole organisms, enabling phenotyping of a broader range of organisms (i.e. holobionts). The MTP enables users to predict key aquatic organisms’ responses to environmental shifts, hence providing a crucial tool for marine management and stakeholders.

Above: PhD student Hadley England using the coral phenotplate system. Photo: Christine Roper

In the News

Future Reefs research has been drawing significant interest. Our wide-ranging research efforts are not only expanding our understanding but also innovating solutions to enhance reef resilience.

The Straight Times [→](#)

She's unlocking the secrets of hardy corals to help restore marine life



Forbes [→](#)

Can Resilient 'Super Corals' Save Bleached and Boiled Coral Reefs?



ABC News [→](#)

Australia's largest coral farm focuses on spawning as scientists search for the most resilient species



ABC News [→](#)

Sydney scientists are feeding 'little fat balls' to coral to boost their survival in warming waters



UTS



Global action on ecosystem restoration



Cosmo



Great Barrier Reef not off the danger list yet



Photo: Adobe stock

Escape



Amazing people I met while travelling in 2023



Scuba Diver



Coralpalooza Day of Action for Coral Reefs



Newsport



Coral Nurture Program hits remarkable milestone: Over 100,000 new corals planted in Great Barrier Reef



Drift



Christmas Reef Relief: T'is the season to marvel at Reef Resilience post Tropical Cyclone Jasper



Publications

Highlighting the Research Categories associated with the Future Reefs Teams publications in 2023-2024.





Key Publications

Priorities for progress towards Sustainable Development Goal 14 'Life below water'

Lubchenco et al., 2023; <https://doi.org/10.1038/s41559-023-02208-4>

Bacterial communities associated with corals out-planted on the Great Barrier Reef are inherently dynamic over space and time

Strudwick et al., 2023; <https://doi.org/10.1007/s00227-023-04235-y>

An integrative framework for sustainable coral reef restoration

Suggett et al., 2023, <https://doi.org/10.1016/j.oneear.2023.05.007>

The role and risks of selective adaptation in extreme coral habitats

Scucchia et al., 2023, <https://doi.org/10.1038/s41467-023-39651-7>

Diversity of lipid profiles of Symbiodiniaceae under temperature and nutrient stress

La Motta et al., 2024, <https://doi.org/10.3389/frpro.2024.1320353>

Multi-Chemical Omics Analysis of the Symbiodiniaceae *Durusdinium trenchii* under Heat Stress

Matthews et al., 2024; <https://doi.org/10.3390/microorganisms12020317>

Cost-effectiveness of tourism-led coral planting at scale on the northern Great Barrier Reef

Scott et al., 2024; <https://doi.org/10.1111/rec.14137>

From 2023-2024
Future Reefs published

31

Publications

81

Citations

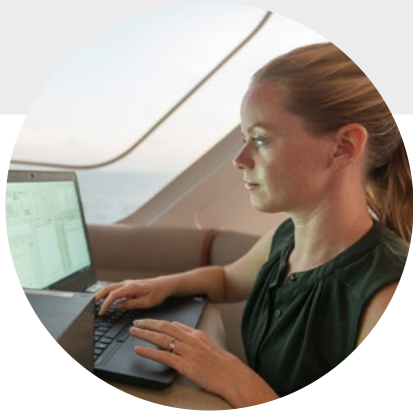
Above: Nursery of Coral Nurture Program.
Photo: Dr. Emma Camp

Awards and Achievements

Celebrating some of our Future Reefs Team members' awards and achievements.



Location on Great Barrier Reef where the team conducts coral spawning experiments.
Photo: Laura La Motta



Dr. Jen Matthews: Lead Editor for a Special Issue on Holobiont Interactions in Frontiers of Ecology and Evolution

Jen's top 10 research topic for 2022 aims to explore holobionts, a framework to describe complex host/microbiota relationships. This concept is essential to understand the dynamics that contribute to coral health and its role in the ecosystem.



Dr. Emma Camp: Women of Discovery Award - WINGS World Quest

The WINGS Women of Discovery Annual Award, celebrates and showcases the ground-breaking expeditions of women scientists and explorers, whose discoveries advance scientific inquiry, stimulate conservation, and lead to better understanding of our world.

<https://wingswomenofdiscovery.org/explorer/camp/>



Society of Ecological Restoration Award

Coral Nurture Program received the 2023 Regional Award from the Society of Ecological restoration. CNP supported by Rolex's Perpetual Planet initiative also began work to select and integrate heat tolerant individuals into the propagation practice. www.ser.org/page/2023-Awards#Coral



Jen Matthews: NSW Young Tall Poppy Science Award

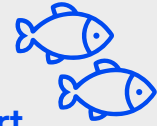
The Young Tall Poppy Science Awards is an initiative of the Australian Institute of Policy and Science. The award aims to recognise excellence in research as well as enthusiasm for communicating science beyond the walls of the laboratory.

<https://aips.net.au/tall-poppies/2023-new-south-wales-award-winner/dr-jennifer-matthews/>



Dr. Emma Camp: Reef Futures Round Table Report

Dr. Emma camp was invited to participate and edit the Australian Academy of Science Round Table Reef Futures Report. www.science.org.au/files/userfiles/support/reports-and-plans/2023/reef-futures-roundtable-report-aug-2023.pdf



Coral reefs support a quarter of all marine life including more than

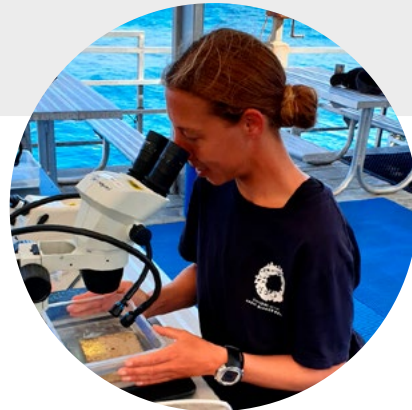
4,000 species of fish,

highlighting the critical importance of research into coral reefs for sustaining ocean ecosystems.



Dr. Ariel Pezner: Chancellors Postdoctoral Researcher

In 2024, Dr. Pezner will be joining the Future Reefs Team to continue work on drivers of low oxygen tolerance in extreme reef habitats over space and time.



Caitlin Younis: 2023 AINSEE Post Graduate Research Award

Caitlin was awarded this award by The Australian institute of Nuclear Science and Engineering to support her Ph.D. studies with the Future Reefs Team.



“

On the current trajectory there is a great possibility that the Great Barrier Reef as we know it will be lost. Imagine knowing that we are responsible for the demise of one of the biggest living structures on the planet.

”

Aerial view of the Great Barrier Reef.
Photo: Adobe stock

Next

Steps

Corals on the Great Barrier Reef. Photo: Dr. Paige Strudwick

Key Priorities for 2023-2028



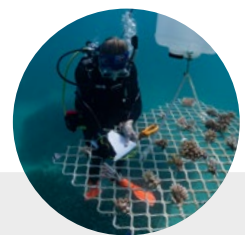
Future Proofing
Community
Restoration



Assessing Long
term Ecological
Impact of
Restoration



Optimising
Community
Restoration
Practises



Supporting
Grass Root
Restoration with
a Focus on the
Indo-Pacific

The Coral Nurture Program: Key Priorities for 2023-2028

The CNP develops innovative tools and simplistic workflows that can be integrated into day-to-day stakeholder operations. In 2023 the CNP finalised phase 3 of the project timeline at the Cairns and Port Douglas locations, which focused on establishment of simplistic community-based restoration workflows.

In 2023-2024 the CNP will focus on commencing phase 4 of the project, where community restoration practises will shift from a reactive approach to proactive. This phase has a key focus on understanding the genetic suitability of corals to a site in efforts to optimise propagation and reef resilience.

Coral reef conservation extends beyond coral management and restoration, it is critical climate emissions are also addressed to prevent continuous increases in seawater temperatures. However, it is a sad reality even with fast climate action that some reefs are still going to be lost. The CNP collaborations highlight the critical need for proactive planning such as the development of a loss-recovery cycle that incorporates effective restoration frameworks.

“

It is a sad reality even with fast climate action that some reefs are still going to be lost.

”

Super Supplement: A UTS - CORDAP Project

Thanks to the revolutionary work conducted in 2023 on coral nutrition our team has partnered with a team of transdisciplinary and international experts combing 70+ years of knowledge on coral nutrition to customise a nutritional super supplement. The project, funded by CORDAP, aims to develop “CoraBoost” to administer to corals to boost their resilience to thermal stress. CoraBoost is comparable to supplements humans take to sustain or boost their health. This project will combine laboratory studies and trials across different reefs to optimise the supplement.

Currently, there are limited solutions for enhancing corals natural capacities to tolerate stress that can be applied in both the laboratory and across diverse reef types. The development of an optimal nutritional supplement such as “CoraBoost” aims to confer resilience to corals, and provide a universal, novel tool that compliments existing conservation practises. The innovation of “CoraBoost” will be unique in combing not one but three key nutrients including trace metal, lipid, and antioxidant additives for universal use across key coral taxa.

This project will operate over 3 years, with the first experiments in 2023 conducted at Monsoon in Bundaberg, assessing the timing and dosage of metal supplementation to coral under heat stress. Over the next few years, the project aims to optimise the quantity, time and mode of dosing “CoraBoost”, to tailor the nutrient consortium for various coral types such as tropical and cold-water corals and upscale experiments to in situ deployment. This project will lay the foundations to enhance natural reef fitness across global locations.

Opportunities for Impact

The following are developing projects within the Future Reefs Teams portfolio. If you are passionate and would like to contribute to the restoration of coral reefs there is the opportunity to be involved via partial, full, or similar themed funding.



\$502,400 per year

Assessing Long Term Impacts of Restoration: How coral restoration can positively enhance coral diversity and resilience

Due to the current success of the Coral Nurture Program (CNP), we strive to continue our work to improve knowledge of how coral restoration can positively enhance local coral cover, diversity, resilience and sustain reef functions. We will assess the effects of out-planting corals over a 10-year period, conducting ecological and functional assessments. Continuing CNP efforts will improve our ability to identify environmental factors governing coral restoration success, such as growth and survivorship and functional retention.




Photo: Unsplash Marek Okon



\$380,600
over 3 years

Micro Fragmentation: Optimizing community restoration practices

This project will bring together, scientists, communities and stakeholders to improve the diversity of corals that can be propagated within the CNP. Diversity on the reef is fundamental in supporting long term ecological resilience. Hence, we are developing and optimising propagation methods for underrepresented corals. Central to this project is improving community education and engagement regarding coral restoration. Once optimal prototype moulds are designed, they can be distributed to interested citizen science organisations (e.g. schools) for manufacturing of propagation plugs. This project will improve the ability to propagate a diverse range of corals and generate new knowledge on the role diversity plays in restoration success.

A close-up photograph of a yellow-striped cardinalfish swimming in a coral reef. The fish has a yellow body with several horizontal white stripes. It is positioned in the center of the frame, facing right. The background is a blurred view of the reef, showing various shades of brown, red, and blue. The lighting is natural, highlighting the texture of the fish's scales and the surrounding coral.

Yellow-striped cardinalfish taking refuge inside a porites coral at Opal Reef on the northern Great Barrier Reef. Photo: Dr. Paige Strudwick

“

By protecting coral reefs, we work to prevent the loss of ecosystem services that support the well-being and livelihoods of over 1 billion people, including some of the most vulnerable in our society.

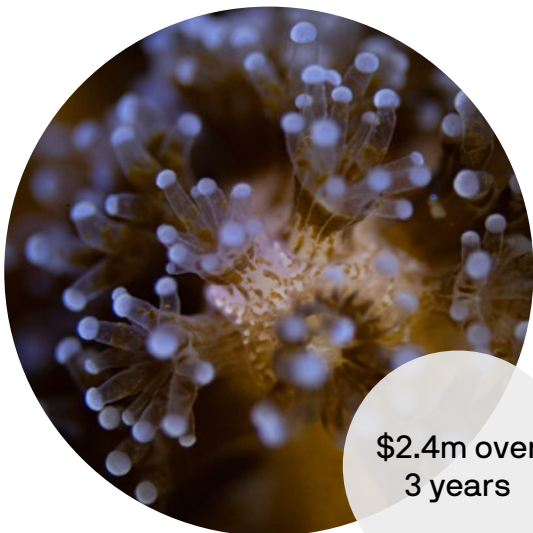
”



\$802,000
over 3 years

Future Proofing Restoration:
Maximising community restoration success by pro-active planning.

We aim to maximize community restoration success by pro-active planning for future environmental stress. Key to the success of restoration is the correct identification of how, what, where and when to act. We will trial and integrate innovative technology to optimize the genetic and phenotypic selection of thermal tolerant species. Additionally, this project aims to identify and create locations that have higher resistance and or resilience to environmental disturbances. This project will improve site and societal resilience to change, enhancing coral survival.



\$2.4m over
3 years

Coral Nutraceutical: Tailored nutrition delivery supporting stress tolerance.

This project is working to understand the natural nutrient dynamics on reefs, under both ambient and stress conditions. This project will integrate and trial innovative techniques to develop ways to deliver nutrition tailored to support corals to withstand stress. This work is critical in improving coral survival, and resilience when under stress conditions.

This page: Photo: Hadley England



Further information

If your passion aligns with the Future Reefs Teams' there is opportunity to be involved via partial, full, or similar themed funding.

For more detail about the content of this report, please contact:

Dr. Alex Thomson,
C3 Industry Engagement Manager,
Alexandra.Thomson@uts.edu.au