

2020- 2021

YEAR IN REVIEW

Creating a better
future for coral reefs



Great Barrier
Reef Foundation

ACKNOWLEDGEMENT OF COUNTRY



The *Great Barrier Reef Foundation* extends its deepest respect and recognition to all Traditional Owners of the Great Barrier Reef and its Catchments, as First Nations Peoples holding the hopes, dreams, traditions and cultures of the Reef.

More than 70 Traditional Owner groups have deep and enduring connections spanning the length of the Reef along the Queensland coastline and beyond, from the Torres Strait Islands in the north to Bundaberg in the south.

'Great Barrier Reef' artwork by Melanie Hava, Mamu Aboriginal woman, Dugulbarra and Waribarra family groups, from the Johnstone River catchment of the Wet Tropics of Far North Queensland and the adjoining Great Barrier Reef Sea Country.

*Cover image: Reef manta ray being cleaned at Secret Bommie.
Image credit: Asia Haines.*

CONTENTS

The task at hand	4
Healing Country Statement	5
From the Chairman and Managing Director	6
Our impact	8
Australia's largest ever collective effort for coral reefs	10
Protecting biodiversity	12
Restoring habitats	16
Innovation in all we do	20
Thriving reefs, thriving communities	24
Building global reef resilience	28
Thank you for your support	30

THE TASK AT HAND

The Great Barrier Reef is one of the most spectacular icons of the natural world. But the cumulative impacts of climate change, poor water quality and crown-of-thorns starfish outbreaks are having a dramatic and dire effect on the outlook of our Reef.

Tackling climate change at its root cause by reducing global emissions and building the resilience of coral reefs to the impacts of climate change that are already locked in, are the highest priorities to ensure a future for the world's coral reefs. Without action on both fronts simultaneously, the science clearly points to a catastrophic decline of coral reefs this century.

Saving our Reef is fast becoming the challenge of our age with these issues affecting not only our Reef, but coral ecosystems globally.

Our task remains to bring together the best and the boldest – scientists, academics, researchers, engineers, Traditional Owners, innovators, industries and community – to deliver solutions to the challenges facing the Reef.



Image credit: Gary Cranitch, Queensland Museum.

HEALING COUNTRY STATEMENT BY GREAT BARRIER REEF TRADITIONAL CUSTODIANS



Heart of the Reef – A Call for Healing

If there was ever a time for us to come together that time is now.

If there was ever a time for the voice of Traditional Custodians to be heard – this is that time.

There has been so much damage to our Country and she is struggling to recover from threats on a scale never faced before.

Country is stressed, Country is crying.

Country is land, sea, air, stars, rocks, plants and animals – all things living and non-living. She is our spirituality. Country is Us.

*The Reef is Country.
The Reef is our Heart and
the water is the life-blood
that connects us all.*

She is our Family. The Reef is an extension of Us and we are an extension of Her.

The Reef looks after us, feeds and protects us, and keeps us healthy.

She's the keeper of our stories, our Lore.

Without her we will suffer irreversible effects to our identity.

For millennia, Country and People were healthy.

We lived harmoniously according to our cultural Lore.

Our collective connections were strong and balanced through our songlines and interactions with each other.

We looked after Country according to our seasonal calendars and she looked after us.

Today Country is sick.

We are losing our culturally significant plants and animals and places.

For many of us, separation from Country has meant a loss in intricate connections and knowledge.

The imbalanced condition of Country is the result of the ongoing impacts of colonisation and climate change.

The seasons are changing beyond our control no matter how hard we try to help Country heal.

We are all suffering and we can't continue this way.

The world is now turning to Us, as Traditional Custodians, for our unique leadership, traditional knowledge and cultural practices.

And we call on you to listen to Us.

To learn from Us and to do it our way.

To recognise, respect and accept our LORES.

To understand that healing is about the relationship between Country and its People. That one can't heal without the other.

Country needs to hear our children running around – hear our laughter and happiness.

In some places this has been missing from our Country for many generations. This was not our choice and never will be.

We call on you to stop using the poison frameworks that have made Country and People sick. Frameworks that fragment Country and split families.

Learn how to holistically manage Country, People.

To honour everything as one.

We recognise that healing Country means starting with ourselves.

We need to rebuild pathways of connection between ourselves and Country.

There must be presence of mob on Country.

Families and Elders must come together. Hold each other dear.

It means placing our young ones at the heart of change.

It means using our own languages that tie us to our place on Country, where we belong and who we are.

It means recognising education, justice and health are all crucial parts of healing.

It means employment and opportunities that get you close to Country, to homeland and saltwater.

It's about being honest and seeing that we can't do it all on our own.

We need to see the real threats posed by climate change and face these challenges head on.

All Australians need to come together and show the Reef the respect she deserves. To help her heal and to make us who we are all meant to be.

We call on our Saltwater brothers and sisters across the Pacific and throughout the world to join and support us.

We need everyone's feet and mouth pointing in the same direction and we need talk to be followed by action.

The time to save our future is now.

We need to stand up as one mob, one Country, one spirit, one voice.

And heal.

HOW THIS STATEMENT CAME TO BE

At a workshop in 2021 to develop the guidelines for future Healing Country grants, discussions between Traditional Owners and the Foundation considered what it means to heal Country and what concerns, and, importantly, hope that Traditional Owners hold for Country and for people.

Truth telling was shared as the cornerstone to healing, which led to many stories and experiences being communicated, and the Heart of the Reef statement was shaped.

We include the Heart of the Reef statement in this Year in Review to mark the Foundation's respect for Traditional Owners, their voices and their knowledge, past, present and future. May we learn from the wisdom they share.

MESSAGE FROM THE CHAIRMAN AND MANAGING DIRECTOR

The world faced enormous challenges this past year, and it isn't yet clear when we will return to normal. What is clear is that we have learned and changed, as people and as a community, and that the global shift to face the impacts that we have on Nature is underway.

The pandemic has only intensified the Foundation's resolve to create a better future for coral reefs, which are on the frontline of a changing climate. The science is clear; warming ocean temperatures are locked in, with emissions reductions no longer enough to safeguard coral reefs. At a rise of 2 degrees Celcius, we lose 99 per cent of coral reefs. There will be no healthy oceans without coral reefs; their role as a nursery for over a quarter of all ocean life is fundamental to ocean biodiversity.

In recognition of this, the United Nations has declared this decade the UN Decade of Ocean Science, and around the world during COP26 pledges towards climate action and in support of ocean regeneration have gained pace. The Foundation is pleased to have been endorsed as a founding member of the UN Decade of Ocean Science, with our Reef Recovery 2030 campaign a flagship action for the decade.

The Foundation is privileged to sit at the intersection of investment and impact. Our conviction that we will act to save the Reef is grounded by the action and the innovations we see taking place every day, right across the Reef at a scale and pace never before seen. From completely reprofiling remote islands to save the world's largest green turtle rookery, to working on ways to catalyse new restoration techniques at a scale never seen before, the work being done is inspiring, grounded in science and the learnings can be applied to coral reefs globally.

This report shares stories of impact with you, our supporters and partners, and we hope they inspire you as much as they do us.

The largest collective effort on the planet is underway and starting to show results. Your commitment to this work galvanises us in challenging circumstances and on behalf of all the team here at the Great Barrier Reef Foundation, please accept our heartfelt thanks.



Dr John Schubert AO, Chair



**Anna Marsden,
Managing Director**



Image credit: Katerina Katopis, Ocean Image Bank.



The sea floor at Heron Island. Image credit: Gary Cranitch, Queensland Museum.

OUR IMPACT

Right now, the Great Barrier Reef Foundation is creating a better future for coral reefs and their marine life through our innovative projects and global advocacy efforts.

Our projects are disruptive, system-wide game changers. And we don't do it alone – we work with world-leading researchers, organisations and communities.

AUSTRALIA'S LARGEST EVER COLLECTIVE EFFORT FOR CORAL REEFS

We're delivering a \$443m portfolio to tackle the threats facing our Reef by accelerating impact, improving collaboration and innovating for the future.

PROTECTING BIODIVERSITY

We're protecting the Reef's vulnerable species – such as the endangered green turtle by restoring the world's largest nesting area on Raine Island, and coral by creating the world's largest frozen coral bank using cryopreservation technologies.

RESTORING HABITATS

We're restoring critical Reef habitats to protect ecosystems and save the vulnerable species that depend on them.



GLOBAL LEADERSHIP

We're leading the world's first global program that brings local communities, reef managers and global experts together to support five World Heritage sites – and the communities that depend on them – to respond and adapt to climate change and local threats.

INNOVATION IN ALL WE DO

We're working with Australia's – and the world's – brightest minds and pioneering cutting-edge science and technologies to find new and improved ways to save our Reef.

THRIVING REEFS, THRIVING COMMUNITIES

We recognise that there is no healthy reef without healthy communities. We're partnering with Reef Traditional Owners to care for Country. And we're joining with communities along the Reef to be actively involved in the Reef's protection.

Green sea turtle at Lighthouse Bommies. Image credit: Asia Haines.

AUSTRALIA'S LARGEST EVER COLLECTIVE EFFORT FOR CORAL REEFS

The Reef Trust Partnership is a six-year, \$443m partnership between the Australian Government's Reef Trust and the Great Barrier Reef Foundation.

As at 30 June 2021 (the Partnership midway point), 200 projects are underway with over 400 partners. And we are on track to deliver against the Partnership's objective of achieving significant, measurable improvement in the health of the Great Barrier Reef.

Partnership duration



Grant funding committed



Leveraging target



The Partnership is tackling the threats facing the Reef by:

- Delivering the world's largest Reef restoration program, buying the Reef time to recover from the impacts of a changing climate by developing a toolkit of scalable coral restoration and adaptation activities.
- Improving the quality of water flowing onto the Reef by accelerating the scale and pace of investment into proven on-ground measures to reduce pollutants across the Reef's highest priority catchments.
- Protecting coral from predation by crown-of-thorns starfish (COTS) outbreaks, with a team of 100 divers protecting 253 high-value reefs.
- Investing in on-ground, community-led local action to protect and restore the Reef, working with hundreds of community groups to accelerate effort and inform Reef management.
- Supporting Reef decision-making by filling critical monitoring gaps, building a system to integrate Reef data and developing next generation monitoring technologies.
- Recognising the significance of Traditional Owners' inherent rights, interests and capacity, we are working in partnership with Traditional Owners to co-design and co-deliver the largest ever investment in Traditional Owner-led Reef protection activities.
- Inviting investors and donors around the globe to take an active part in Reef conservation efforts by contributing to Reef Recovery 2030, the Foundation's fundraising campaign to turn the tide on coral reef decline.

“*The scale of the partnership is unprecedented, this is the largest effort globally to help an ecosystem withstand the impacts of climate changes and local stresses.*”

Anna Marsden, Managing Director & Dr John Schubert AO, Chair, Great Barrier Reef Foundation

PARTNERSHIP PROGRESS

Lockhart



19,194 community members taking part in local action, 71% for the first time and 40% under the age of 25

Cairns



Highest priority catchments under water quality management (equivalent to the size of Ireland)

100 divers protecting 253 high-value reefs from COTS, 276,615 coral-eating starfish culled



22 field trips with 270 days at sea for the Reef Restoration and Adaptation program



Townsville



150 reefs surveyed, over 40 vessels and citizen scientists collecting 13,000 images

35 Traditional Owner groups engaged



570 children engaged in Junior Ranger activities



Mackay



800 farmers and graziers working across 1.28m hectares have improved management to support sustainable and productive farming

41 gullies and 6.95km of streambank rehabilitated to prevent sediment run-off



Rockhampton

Bundaberg

Sunshine Coast

Figures as at 30 September 2021

PROTECTING BIODIVERSITY

The Reef is home to thousands of species of marine life, including fish, dolphins and six of the world's seven species of marine turtle. With our partners, we're delivering projects to save the Reef's vulnerable and endangered species to ensure a healthy ecosystem for generations to come.

Raine Island Recovery Project recognised at the 2021 Queensland Reconciliation Awards

This year, the Raine Island Recovery Project team was awarded Highly Commended at the Queensland Reconciliation Awards in the partnership category for the project's commitment to working alongside Traditional Owners to protect and restore Raine Island's critical green turtle and seabird habitat.

Nowhere on Earth do more green turtles come to nest than Raine Island, with 90 per cent of the northern Great Barrier Reef green turtle population migrating to the island. Raine Island is also the most important seabird rookery in the Great Barrier Reef World Heritage Area and is a significant cultural and story place for Aboriginal peoples and Torres Strait Islander peoples.

For more than 30 years, Raine Island's green turtle population was in decline. Changes in the island's landscape caused nests to flood and adult turtles perished, falling from treacherous cliffs and becoming trapped in rocks.

In 2015, Wuthathi and Meriam Nation (Ugar, Mer, Erub) Traditional Owners, the Great Barrier Reef Foundation, BHP, the Queensland Government and the Great Barrier Reef Marine Park Authority formed an innovative partnership to deliver the Raine Island Recovery Project. This ambitious



Baby turtle on Raine Island. Image credit: Gary Cranitch, Queensland Museum.

world-first conservation program aimed to restore this critical nesting area and pave the way for co-management between reef managers and Traditional Owners in the Great Barrier Reef.

The 2020-21 year was the final year of the Raine Island Recovery Project and, thanks to this collaboration, an extra 640,000 turtle hatchlings have begun life on the Reef and millions more are expected to be born over the next decade.

The project has also made a considerable contribution towards enabling Traditional Owners to take ownership of the long-term management of Raine Island. There have been more than 1,000 days of funded Traditional Owner employment and the project has supported two-way information sharing, building the capacity of Indigenous rangers and providing opportunities for Traditional Owners to share traditional knowledge and cultural heritage advice.

“A deep commitment to meaningful engagement with Traditional Owners was a clear goal of the project from the outset. My belief is that this goal was unequivocally achieved.

Dr Scott Smithers, James Cook University

Preserving our coral reefs

It is a stark fact that the Great Barrier Reef may never again have as much genetic diversity as it does right now. We are losing coral cover across the Reef due to coral bleaching, and this loss is predicted to continue with warming ocean temperatures due to climate change. Preserving that biodiversity is critical so that coral restoration efforts can take place in the future at scale and with enough genetic diversity to ensure fully functional reefs.

As part of the Reef Restoration and Adaptation Program, researchers from Taronga Conservation Society are researching and developing advanced coral cryopreservation technologies to create the world's largest frozen 'coral bank' located at Taronga Western Plains Zoo in Dubbo. The team collecting and cryopreserving the sperm and eggs of different coral species, along with other coral tissues, which we may be able to use in the future to help restore the Great Barrier Reef.

Under the Reef Restoration and Adaptation Program, cryopreservation collections have occurred during two spawning seasons, with great success. Species that are essential to the structure and function of the Reef were targeted for cryopreservation. Taronga's Cryopreservation team has, to date, banked sperm and embryonic cells from 29 species of coral from the Great Barrier Reef. Some cells have also been thawed to advance and support high-throughput aquaculture techniques.

This work will be critical to developing large-scale coral restoration techniques.

Over a
TRILLION

sperm have been
cryobanked

29

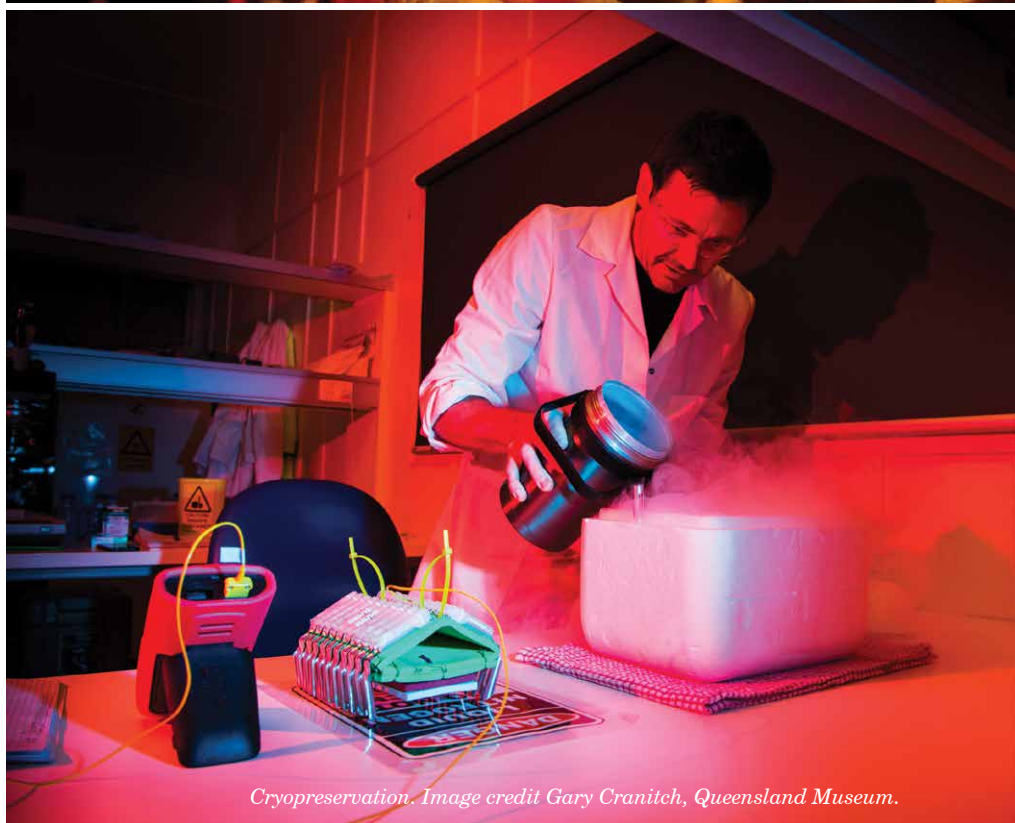
different coral
species have been
cryobanked

3

new coral species were
collected and added into
the Cryo Bank in the
2020 spawning season



Coral spawning. Image credit: Gary Cranitch, Queensland Museum.



Cryopreservation. Image credit Gary Cranitch, Queensland Museum.

Insights into Lady Elliot Island's biodiversity from Leaf to Reef

Islands are highly vulnerable to the impacts of climate change with their low-lying terrain and delicate ecosystems. These modern day 'arks' provide protection and safety for an extraordinary diversity of wildlife.

Lady Elliot Island is home to more than 1,200 different animal species including manta rays, turtles, seabirds, dolphins and fish. The island's biodiversity is predicted to change over the next two decades as northern species drift south to escape rising ocean temperatures due to climate change.

The Reef Islands Initiative's four-year Leaf to Reef research program focuses on protecting Lady Elliot Island's precious and unique marine life from climate change. The Foundation is working with research partner University of the Sunshine Coast to set a benchmark to measure change from local and global climate pressures on the island's habitats and critical reef species.

As well as assessing Lady Elliot Island's biodiversity and how species are responding to climate change, the program is achieving an increased understanding of the impact that island restoration work is having on ecosystems both on land and in water.



Image credit: Leaf to Reef.

“Our overarching goal is to fill this critical knowledge gap to support resilience-based management for the island and its surrounding reef, giving us strategies to future-proof this important ecological and economic region.

Dr Kathy Townsend, University of the Sunshine Coast

The Leaf to Reef team on the island for their research trip in June 2021. Image credit: Leaf to Reef.



Mapping of the vegetation and reef flat is complete, to 1cm resolution, making Lady Elliot Island the best mapped reef on the Great Barrier Reef.

Following successful trips to the island in 2020-21, our researchers, led by the University of the Sunshine Coast, are happy to report this incredible marine haven on the southern tip of the Reef is teeming with marine and island life.

As a global leader in island restoration, the Reef Islands Initiative will be sharing our research with the global science community to help inform and support resilience-based management of reefs and reef islands.

Our impact this year

20 juvenile green turtles and

3 hawksbill turtles tagged

10 manta rays,

3 tiger sharks and

2 grey reef sharks tagged

Sighting of a

50+ year-old manta ray – the oldest recorded manta ray in the world

4 acoustic listening stations deployed to monitor tagged animals in range of the island

UNDERWATER SOUNDTRAP DEPLOYED

enabling us to “listen” to the Reef, pick up on its inhabitants and detect rare animals passing by, like dwarf minke whales

Increase in known bird species from

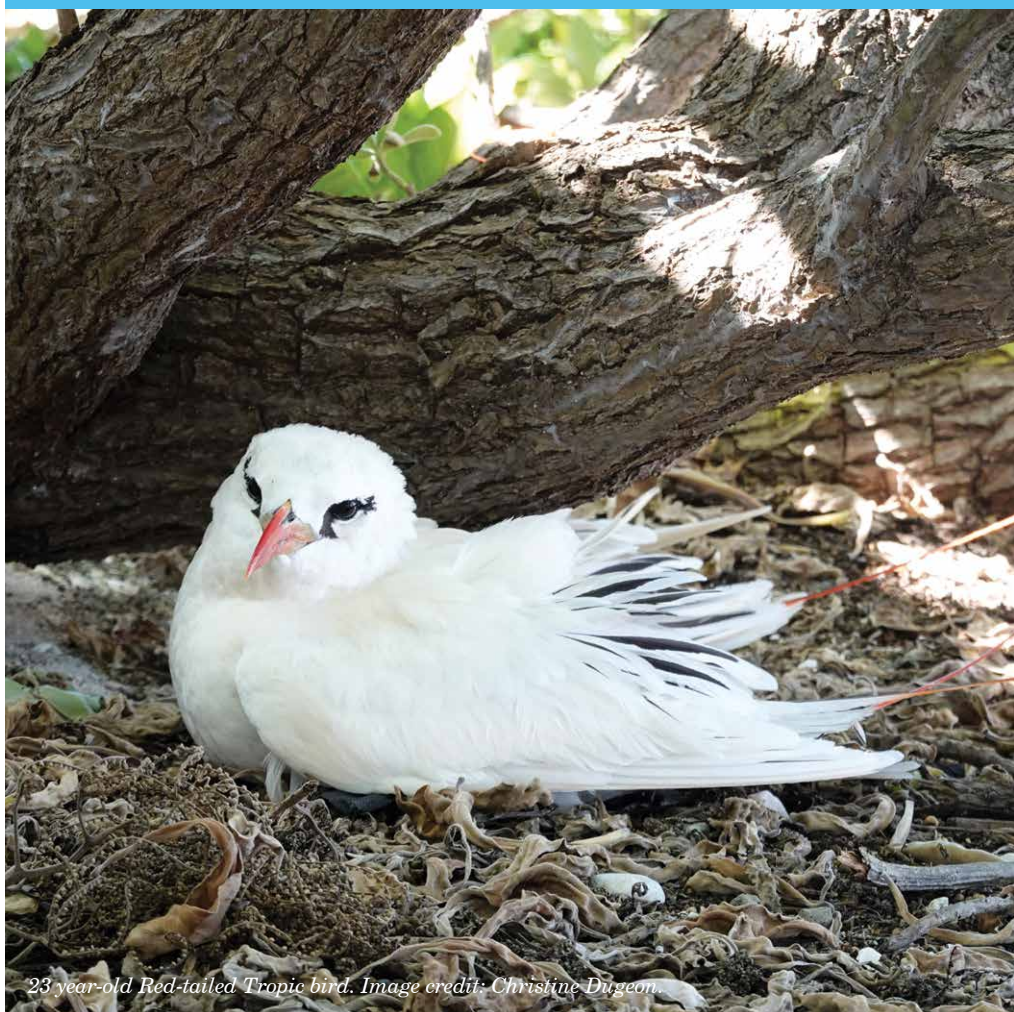
85 to 99

The case of Whoopi Old Bird

Discovered on Lady Elliot Island, Whoopi Old Bird is the oldest known nesting Red-tailed Tropic Bird at 23 years of age.

Rarely seen on land, this endangered seabird species spends most of its life at sea, only venturing on land to nest and raise its young.

Whoopi Old Bird was tagged as a chick back in 1997 and was rediscovered nesting with another bird last year. At that time, and without genetic analysis, the gender of the two nesting birds was unknown. This year, the Leaf to Reef team managed to photograph Whoopi’s partner laying an egg, confirming he is the male of the pair.



23 year-old Red-tailed Tropic bird. Image credit: Christine Dugeon.

RESTORING HABITATS

Globally, we know there can be no healthy oceans without healthy reef ecosystems – they are a nursery for over a quarter of all ocean life. The Great Barrier Reef is made up of many different types of habitat, from interconnected reefs, islands and seagrass meadows to coastal mangroves, supporting some of the richest biodiversity on the planet. Animals rely on these habitats for shelter, food, safety and for breeding.

Protecting and restoring key habitats is essential to protect the vulnerable marine and terrestrial species that call them home.

Nurturing coral through partnerships

The brainchild of scientists at the University of Technology Sydney, the Coral Nurture Program launched in 2018 to support widespread coral planting following mass bleaching across the Great Barrier Reef. It focuses on sites that are critical to overall Reef health, as well as the tourism industry.

The innovative program is working with six local tourism operators to plant 100,000 healthy corals on reefs in the Cairns and Port Douglas region – an unprecedented scale for this technique on the Great Barrier Reef. The corals, grown in underwater nurseries from salvaged broken fragments, are being attached using Coralclip® – an innovative device that fast-tracks coral restoration.

Coralclip® joins coral fragments together without the need for chemical bonding agents, fast-tracking coral attachment and growth. It is faster and cheaper than traditional out-planting methods and has contributed to a planted coral survival rate of 85 per cent.

Bringing together science and tourism is key to the program's success, delivering local coral restoration through combining the knowledge of marine science experts and the resources and experience of the local tourism industry.

Image credit: Coral Nurture Program.



Lady Elliot Island Volunteer Program

This year marked the first anniversary of our Lady Elliot Island Volunteer Program as part of the Reef Islands Initiative. This large-scale seven-year revegetation program includes removing invasive species across the entire island, revegetating the island with native species, and aims to increase nesting seabirds and turtle populations in the southern Great Barrier Reef.

For decades, Lady Elliot Island was a degraded landscape of bare rock after guano mining destroyed native vegetation. Volunteers are building on the work of past and present custodians, rolling up their sleeves, planting and weeding tirelessly to re-establish the island's natural coral cay ecosystem.

Citizen scientists also play a significant role in recording marine species sighting, contributing towards Leaf to Reef's scientific research program.



Volunteers in action on Lady Elliot Island.



Through the program

11 hectares

on Lady Elliot Island have been revegetated, with weeds cleared and native coral cay species planted

7 conservation groups and 60+

people participated in the volunteer program

Image credit: Coral Nuture Program.



Vital turtle nesting site chosen as next climate change refuge

Building on the success of the Reef Islands Initiative's first two sites at Lady Elliot Island and the Whitsundays, this year we began work to restore and protect the vital turtle nesting site, Avoid Island.

Avoid Island is the second largest nesting site for the vulnerable flatback turtle, which is only found on the Great Barrier Reef. Protecting nesting habits on Avoid Island is crucial for the survival of the species, with coastal development being one of the key threats to their survival.

With our partners Queensland Trust for Nature and Koinmerburra Aboriginal Corporation, we're transforming the island into a hub for education and citizen science.

We're developing opportunities for visitors to assist in the protection of important ecosystems, home to flatback turtles, over 80 species of birds and a diverse range of marine life.

By restoring Avoid Island, we're adding to a crucial network of climate change refuges that protect surrounding ecosystems and help save vulnerable species.



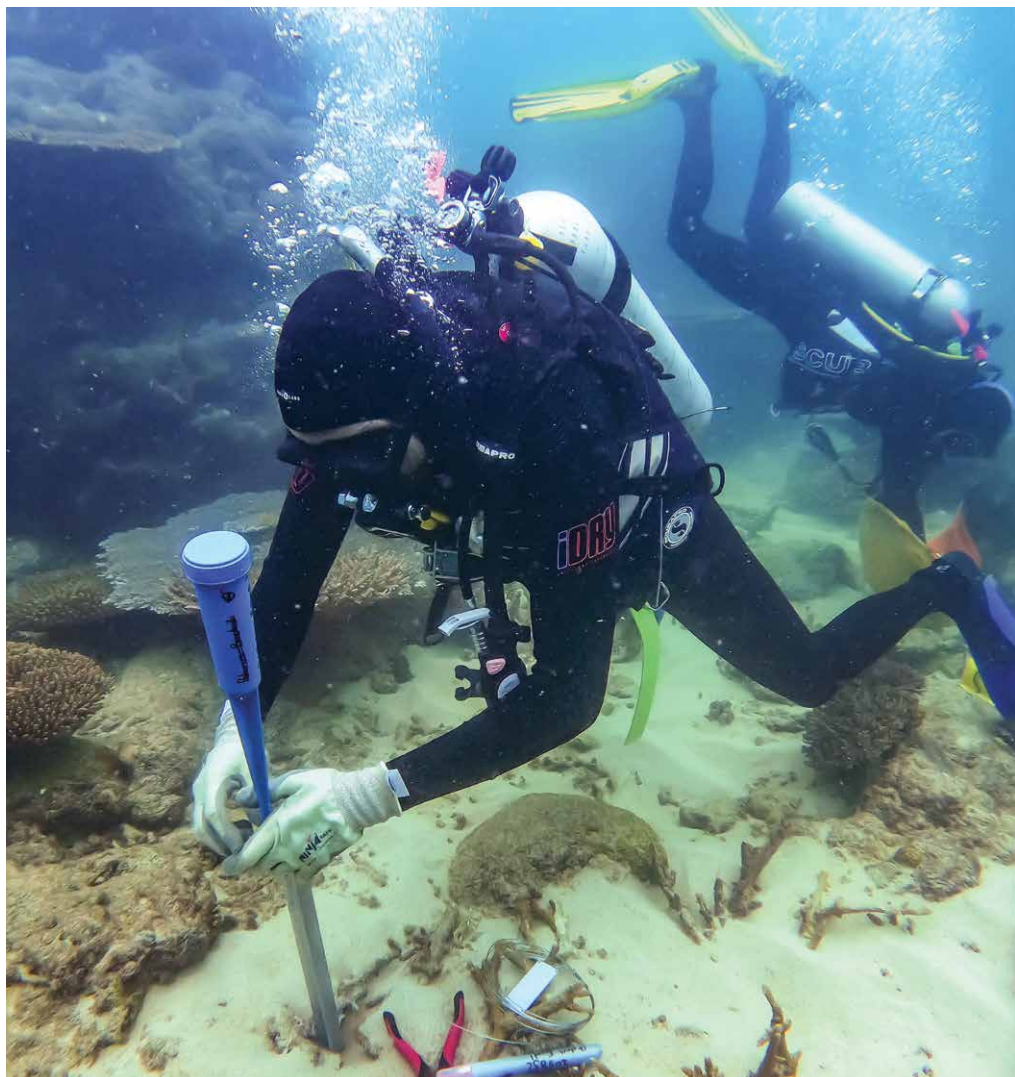
Nesting flatback turtle returning to sea on Avoid Island. Image credit: Georgie Braun.

Reference Reefs Established

The scale of the Great Barrier Reef is extraordinary, and while well mapped and managed, there is still much we don't know about the Reef, and how to best protect it from the impacts of climate change and local threats. This year, we established a series of 'Reference Reefs' as part of an ambitious fieldwork program on the Great Barrier Reef, through the Reef Restoration and Adaptation Program (RRAP).

This work, led by AIMS, is providing crucial baseline data to inform future Reef interventions to help protect it. Scientists from the Ecological Intelligence for Reef Restoration (EcoRRAP) teams are using 70 reference sites on 16 reefs in five regions to gather data that will enable scientists to model and understand the likely impact of future restoration and adaptation efforts up and down the Reef.

The natural recovery processes of the reefs are being studied in detail, including using 3D maps of the reef through a specialised underwater photography technique called 3D photogrammetry, which captures coral growth and reef ecosystem change in its minutia. Each reference reef location provides unique data, including environmental variation, biological diversity and ecological processes. This will help the RRAP and reef managers to determine where and when to most effectively target restoration efforts.



EcoRRAP divers establishing reference reef sites at Orpheus Island. Image credit: Marie Roman.



*The EcoRRAP team.
Image credit: Marie Roman.*

INNOVATION IN ALL WE DO

Scaling up coral restoration

Marine heatwaves have already triggered three mass coral bleaching events on the Great Barrier Reef in just five years, reducing shallow water coral reefs by as much as 50 per cent. Coral reefs can recover from bleaching over time, but only if temperatures drop and conditions return to normal. Nature needs our assistance to recover. Coral IVF does just that.

In a world-first, the Whitsundays region is leading the charge in locally-led Reef restoration with the Boats4Corals project. Local tourism operators are joining the Foundation and its partners, including the Australian Institute of Marine Science (AIMS), to deploy coral larvae on priority reefs.

Coral IVF consists of capturing coral eggs and sperm from wild coral spawn slicks and rearing millions of baby corals in specially-designed nursery pools, before delivering them onto target areas of damaged reefs to restore and repopulate them.

The Boats4Corals project, part of the Foundation's Reef Islands Initiative, is scaling this Coral IVF technique. The aim is to develop standard operating procedures alongside standardised sets of equipment that can be used more broadly by the tourism industry and citizen scientists to restore coral reefs.

“The incredible work being done by the Great Barrier Reef Foundation's Reef Island Initiative in partnership with organisations like Reef Ecologic and local marine operators is outstanding. Not only are we seeing amazing results from the outplanted corals, but the initiative is also helping to engage our marine operators in the education and restoration of the stunning fringing reefs the Whitsundays is so well known for.

We want to continue to build on this amazing work and be known for having an incredibly diverse inshore reef that visitors will be able to enjoy.

Tash Wheeler, CEO Tourism Whitsundays

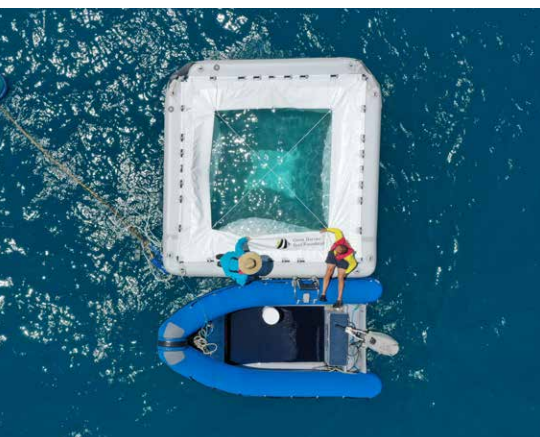


Image credit: Boats4Corals.



Image credit: Adam Smith, Grumpy Turtle Creative.



Innovation in detecting and managing COTS outbreaks

Outbreaks of coral-eating crown-of-thorns starfish (COTS) cause significant coral decline and are a major threat to the long-term health of the Great Barrier Reef. Culling COTS is one of the most scalable and feasible interventions available today to enhance the Reef's resilience in the face of climate change. With increasing frequency of mass bleaching events, a current outbreak still spreading across the central and southern regions of the Reef, and the next outbreak already beginning to develop in the northern region, there is an urgent need to invest in innovative approaches to protect coral from COTS now and into the future.

This year, the Reef Trust Partnership established a collaborative research and development program partnering with AIMS, CSIRO, James Cook University and the University of Queensland (UQ) to deliver innovative solutions in COTS surveillance and control.

The Partnership is investing \$8.3m in projects that will catalyse a step-change in how COTS are detected and managed, including:

- **Detecting outbreaks early**, like the COTS eDNA project, developed in partnership with AIMS to apply a novel way of using environmental DNA sampling for early detection

of COTS. If successful, this method will be one of the most sensitive early-warning monitoring tools in our toolbox for fighting COTS outbreaks.

- **Managing outbreaks using new technology**, like the COTS pheromone project, developed in partnership with AIMS and UQ. This project will understand and exploit the chemical communication between COTS, uncovering their Achilles Heel to enable the development of COTS-attracting baits.

The world's largest reef restoration program

Protecting the coral reefs we have and helping them adapt to a changing climate is key to ensuring their future.

The global community does not currently have at its disposal techniques to protect and sustain corals on a meaningful scale. Worldwide, the coral restoration industry is establishing less than 100,000 corals per year, the majority of which do not possess thermal tolerance to rising water temperatures. To ensure the future of a vast and complex system like the Great Barrier Reef, made up of over 3,000 individual reefs, we must massively scale and accelerate our capacity to protect, restore and adapt corals.

In late 2020, the Great Barrier Reef Foundation, with the support of the Australian Government's Reef Trust, catalysed and seed funded the world's largest and most ambitious coral reef climate adaptation and restoration effort – the Reef Restoration and Adaptation Program (RRAP).

This multi-decadal national mission is a partnership with six leading Australian research institutions – the Australian Institute of Marine Science, CSIRO, James Cook University, Southern Cross University, QUT and University of Queensland.

Collectively, it is the largest single effort to give corals a fighting chance to adapt to warmer temperatures and actively rebuild resilient reefs to sustain long-term recovery and critical ecosystem services in the face of a changing climate.

Through RRAP, we are working with our partners to develop and deploy a toolkit of scalable coral restoration and adaptation solutions:

- **Protecting remaining reefs** from the threat of coral bleaching by investigating and deploying cooling and shading options

- **Restoring lost diversity** by deploying stabilising reef structures and large numbers of corals onto highly connected priority reefs
- **Helping corals adapt to the changing environment** by selectively breeding and seeding climate ready corals using engineering and automation to achieve a scale not yet accomplished.

Our long-term goal is to seed over 10 million thermally tolerant corals per year across the most connected reefs for a period of 20 to 30 years, outstripping current global production. Recognising the global nature of the challenge, we are committed to making the technologies and knowledge generated by our research openly available to the rest of the world. Succeeding on the Great Barrier Reef, the largest reef system in the world, would mean that these solutions could help other reefs globally.

Taking to the skies to shade corals

Through the Reef Restoration and Adaptation Program, the Great Barrier Reef Foundation, together with research lead Southern Cross University, is investigating whether it is possible to cool and shade the waters of the Reef by enhancing the clouds above to reflect more sunlight and heat. This is known as Marine Cloud Brightening.

The technique aims to prevent coral bleaching by spraying microscopic seawater particles into the clouds above the Reef to enhance or 'brighten' them. If we are able to enhance the clouds, we could help them to reflect solar energy away from the Reef, ultimately protecting coral from the impacts of marine summertime heatwaves.

An initial trial of the prototype cloud brightening equipment in 2020 proved it is feasible to pump seawater and atomise it into tiny droplets at a rate of hundreds of trillions per second. A second trial gathered critical data on the behaviour of the atmosphere over the Reef during the peak months when corals are most at risk of bleaching. The project team also mapped the movement of the atomised sea salt plume to better understand how cloud brightening could be most effectively deployed over the Reef.

“What’s unique about this technique is that it can be used intermittently when required as an emergency response to protect corals from bleaching during marine heatwaves.

Dr Daniel Harrison, Senior Lecturer, Southern Cross University and Lead, Cooling and Shading Subprogram, RRAP



Image credit: Southern Cross University.



Image credit: Brendan Kelaher, Southern Cross University.

Innovation in improving water quality

The Great Barrier Reef receives run-off from a large area of Queensland – more than 42 million hectares of land across 35 major river basins. Within this run-off are millions of tonnes of fine sediment, nutrients and, in some areas, pesticides that flow through our waterways and can pollute our Reef – contributing to the poor health of many of our coastal and marine ecosystems.

Poor water quality is a significant threat to the long-term health of the Reef, and a step-change is needed in how we design, fund and deliver water quality improvements.

Some \$10m has been set aside in our Water Quality program through the Reef Trust Partnership with the

Australian Government to invest in new ways of designing, funding and implementing water quality management through the use of new and novel technologies, funding prioritisation systems and examining how innovative finance may broaden funding sources.

Twenty-two projects are now underway to test new and improved practices, tools and approaches for farming, grazing and catchment restoration that can achieve better outcomes for both the Reef and landholders; investing in new systems that will help funders make better investment decisions; and creating more funding sources to support water quality improvement.



Image credit: Australian Seaweed Institute.

Our innovation projects are focused on:

- Finding nature-based solutions to big problems, like the **Seaweed Biofilter** project, developed in partnership with the Australian Seaweed Institute, which was recognised at the World Economic Forum in early 2021 as one of the top 10 innovations for protecting oceans. Removing nitrogen and carbon dioxide from the water by using seaweed biofilters may be a nature-based solution to decreasing pollutant run-off on the Reef, with the potential to generate an estimated \$200m in revenue and 2,500 jobs.
- Using science to deliver best practice on-ground management, like the **Robotic Weed Control** program, which is trialing the use of smart weed detection to better target herbicide application. This project could reduce herbicide usage on cane farms by up to 80%.
- Unleashing global capital from sustainable finance markets, like the **Farmland to Reef** regeneration project. A partnership with The Nature Conservancy and Kilter Rural,

together we are working to scope and catalyse a globally significant impact investment fund for the Reef, with a potential deployment of up to \$1bn to deliver Reef health protection outcomes.



Image credit: AutoWeed.

THRIVING REEFS, THRIVING COMMUNITIES

The power of individuals and community groups to affect positive change, and for Traditional Owners to inform management efforts, is critical to any conservation program. We are proud and privileged to work with an extraordinary army of volunteers, citizen scientists and Traditional Owners stretching the length of the Great Barrier Reef. Here are some inspiring stories of action to protect the Great Barrier Reef and recognise its Traditional Owner's inherent rights.

Communities taking action on Magnetic Island

Every day, community members are taking action to save our Reef. Individual efforts make a difference, but by harnessing and coordinating these efforts, the collective impact can be profound.

The scale and urgency of action required for the future health of the Reef prompts new approaches for working together to make change happen. Community Actions Plans (CAPs) are doing just that.

As part of the Reef Trust Partnership's Community Reef Protection component, regional CAPs are being developed along the length of the Reef. The plans connect community aspirations with regional and Reef-wide priorities by establishing shared goals for community Reef protection, designing better ways to work together, identifying critical projects, and measuring and celebrating community outcomes.

This year, members of Magnetic Island's close-knit community have been working collaboratively with their Community Action Plan Leader – Magnetic Island Community

Development Association (MICDA) – to develop the Magnetic Island (Yunbenun) CAP.

The Magnetic Island CAP has sparked a 'whole-of-island' approach to protect and restore the island's World Heritage Values. This includes 11 different working groups to enable the community to work more cooperatively together to pool resources and strengthen opportunities for funding. The CAP is enabling renewed and strengthened relationships between

Magnetic Island community, Traditional Owners, Council and industry partners and creating opportunities for different groups to work more closely.

In May 2021, Queensland Chief Scientist, Professor Hugh Possingham was welcomed on Country to find out more about the impact of the CAP Program, hear directly from the community about how their groups operate and the different challenges they are facing.



Magnetic Island's community groups and project partners during the Queensland Chief Scientist's visit.

“We’re proud to be listening and working closely with Traditional Owners to create a program that meets the needs of both the Reef and its First Peoples. This is an incredible opportunity to tackle transformative co-design in an authentic and genuine way.”

Liz Wren, Great Barrier Reef Foundation Traditional Owner Partnerships Director



Image credit: Gary Cranitch, Queensland Museum

Australia's largest Traditional Owner-led Reef protection program

Recognising the significance of Traditional Owners' inherent rights, interests and capacity, we are working in partnership with Traditional Owners to co-design and co-deliver the largest ever investment in Traditional Owner-led Reef protection activities.

The Reef Trust Partnership's Traditional Owner Reef Protection program is creating stronger Traditional Owner-led processes and the step-change needed for sustaining inclusive governance and management of the Reef, while recognising cultural values and diversity.

We are working with and learning from one another; Indigenous knowledge is being ethically and appropriately shared, considered and incorporated in decision-making within the Partnership. Through co-design, funding is being directed to programs that meet the needs of Traditional Owners. Program delivery is fit for purpose, providing opportunities for Traditional Owners to lead, innovate and participate – caring for Country and building capacity, ensuring an ongoing impact.

There are over 40 projects currently underway that support local planning and implementation of on-ground activities, junior rangers, leadership and capacity building, skills and training opportunities and, for the first time ever, Traditional Owner-led healthy waterway projects. This program has the potential to create an enduring outcome that extends far beyond the life of the Partnership in true collaboration with Traditional Owners.

“Community action and citizen science play a crucial role in our understanding and protection of the Reef. I was thoroughly impressed by the extensive knowledge and passion these community members displayed in the preservation of Magnetic Island. The rigour around the Community Action Plan is admirable and I wish everyone involved every success in now delivering on the plan.”

Professor Hugh Possingham, Queensland Chief Scientist

Inspiring the next generation to care for Country

There are at least 70 Traditional Owner groups with rich, ongoing connections, rights, interests and aspirations in Sea Country across the length of Australia's Great Barrier Reef. Junior ranger programs are a valuable way of transferring traditional knowledge to the younger generation and upskilling the rangers of the future. They inspire the next generation to care for Country and foster closer links within the community through both school-based and on-country learning.

The Great Barrier Reef Foundation is supporting Queensland's Indigenous Land and Sea Ranger program to partner with Indigenous communities to care for Land and Sea Country, provide jobs and training and engage future generations.

Land and Sea Rangers play an important role in leading youth engagement activities where learning about natural and cultural resource management is integrated with Indigenous perspectives, traditional knowledge and values about caring for Country. This year, more than 2,400 young people participated in over 235 youth engagement activities and community events across Queensland, including:

- the Conservation and Land Management course for senior students at Cooktown State School, supported by the Balnggarrawarra rangers. Students learned from rangers in the classroom and on Country about weed management, pest animal management, fire management and cultural
- heritage management, including practical experience in protecting and maintaining a significant rock art site on Country
- the Butchulla Junior Ranger Program, which was delivered for a second year at Urangan Point State School. The nine-session program taught Year 6 students about Butchulla country and culture, while encouraging the 'junior rangers' to care for country
- a re-engagement camp delivered by Pormpuraaw rangers for students who had been disengaged with the school for some time. The camp was an overwhelming success, with all students who attended the camp returning to school.

WomanSpeak

In May 2021, 13 Traditional Owner women from across the Reef came together on Yirrganydji Country in far north Queensland to take part in an intensive public speaking course. In a culturally-safe and supportive environment, the women focused on developing the tools and abilities to speak their truth as part of a 12-month leadership capacity-building program.

Following an open call to current and aspiring Traditional Owner women leaders of the Reef, the Foundation was overwhelmed by the interest and commitment of those who joined.



By providing the space, content and immersive experience, these Traditional Owner women were given the support to become clear and deeply aligned on what their core ideas are and what they stand for – and own the value of both. They learned techniques to access the deep wisdom held within their bodies and to bring that wisdom forward in their messaging. They were offered a safe and nurturing space to take creative risks in developing their skill to articulate their vision.

Participants in the Great Barrier Reef Traditional Owner WomanSpeak Course with course leaders and staff from the Great Barrier Reef Foundation's Traditional Owner Partnership Team.

Every woman in the group was an active participant, with even our quietest leader finding her voice and speaking with courage.

These skills cannot be underestimated and have the potential to create inter-generational change and transformation.

The Great Reef Census

The Great Reef Census is a ground-breaking citizen science effort to survey the Great Barrier Reef at scale. The Census mobilises a global community to establish a broad snapshot of the status of the Great Barrier Reef in a way that is credible, scientifically sound and provides valuable insights for Reef management. The initiative has been designed to trial new ways of capturing large-scale reconnaissance data from across the Reef, helping to support research and Reef management in the face of climate change.

In 2020-2021, a research flotilla of more than 40 tourism boats, superyachts, fishing vessels and even a tugboat mobilised to capture data from across the 2,300km length of the Reef. More than 13,000 images were collected from over 150 reefs – including locations from the tip of Cape York to the remote southern Swains. At the close of 2020-2021, images were being analysed online by citizen scientists and researchers across the globe to identify how the data complements and strengthens existing monitoring and modelling programs.



The Great Reef Census is a Citizens of the Great Barrier Reef project, delivered in partnership with UQ, the Great Barrier Reef Marine Park Authority and the Australian Institute of Marine Science.

Master Reef Guide Michelle Barry taking part in the Great Reef Census. Image credit: Gabriel Guzman, Underwater Images.

“There is a need that is more than listening to women talk about the Reef – there is a need to help women find their voices, achieve clarity in their messages and build their confidence. Creating a safe space for women to understand how fear and anxiety can be managed through different mechanisms, so that their voice can be heard is also a critical factor.

Participant, Queensland Indigenous Women's Ranger Network Conference, 2020.

BUILDING GLOBAL REEF RESILIENCE

Millions of people around the world rely on coral reefs for their livelihoods and, with reefs on the front line of climate change, this represents not just an ecological crisis, but a humanitarian one. The solution to a thriving, resilient reef has people at its heart.

Resilient Reefs

The Great Barrier Reef Foundation's Resilient Reefs sites are crucial hubs of biological and cultural diversity from around the world. These spectacular places include the Rock Islands of Palau, Lagoons of New Caledonia, Belize Barrier Reef Reserve System, the Great Barrier Reef and the Ningaloo Coast. Collectively these sites hold 37 per cent of the carbon stored in World Heritage marine sites, according to a UNESCO report released this year.

The Great Barrier Reef Foundation is helping to protect these sites by partnering with local reef managers and communities. The Resilient Reefs Initiative (RRI) builds local capacity and partners on the design and delivery of integrated solutions that build the resilience of coral reefs and the communities that depend on them. The work is led and delivered by local governments and communities and is informed by global experts and the best science available.

As a result of their partnership with RRI, sites have a better understanding of their threats and opportunities, a pipeline of projects and clear plan of action for mitigating risk and building resilience, an engaged community in doing this work moving forward, and greater government capacity to develop partnerships with global funders and innovators.

In all of this work, partnerships are at the core. First and foremost are the local partners: local and state authorities who understand business as usual approaches to management are no longer sufficient and are ready to chart a new path forward. These local partners are supported by a global network that bring expertise in science, policy, finance and planning.

At the core of this work, we help local governments to embed resilience thinking into management to shift towards more integrated, nimble, and responsive local management.

Some of the highlights of our work in 2020-2021 included:

- Supporting Traditional Owners to map the cultural sites and practices of Nyinggulu Sea Country, to ensure the knowledge of Traditional Owners, who jointly manage the Ningaloo Coast with the Department of Biodiversity Conservation and Attractions, is preserved and shared with future generations.

*Whale Shark at Ningaloo.
Image credit: Joel Johnsson.*





The Ningaloo Coast. Image credit: Joel Johnsson.

- Training reef managers in New Caledonia about the connectivity between catchments and reefs and how upstream activities can be better managed.
- Facilitating more than 200 hours of technical support between global experts and local partners, on topics from innovative finance and insurance models, to best practice efforts to monitor bleaching, to behaviour change models.
- Delivering a Solution Exchange on Sustainable Tourism—a series of four workshops with more than 100 participants from our diverse global network, exploring strategies for rebuilding a more resilient tourism sector post-COVID.

Resilient Reefs was featured as a key innovation in *Rebuilding Coral Reefs: A Decadal Grand Challenge*, a global report developed by ICRS. Resilient Reefs is highlighted in the report as a key initiative to drive innovation and develop new approaches where current solutions are insufficient to tackle the emergency facing coral reefs.

Belize

This year, we launched our world-leading Resilient Reefs Initiative in Belize to help local communities and reef managers adapt to the effects of climate change and other local threats.

The Belize Barrier Reef is facing a number of local threats including coastal development, overfishing, invasive species, coral disease, as well as the multiple impacts of climate change such as coral bleaching, more severe storms and rising sea levels.

Belize has faced a range of shocks and stresses in recent years that have tested its resilience. On top of the humanitarian

and economic crisis caused by the COVID-19 pandemic, the country was impacted by three hurricanes and has recently seen the spread of Stony Coral Loss Tissue Disease which has affected coral reef systems throughout the Caribbean.

In the coming year, we will be working in partnership with the Coastal Zone Management Authority and Institute to design and implement a resilience strategy that responds to these threats and investigates new solutions to the challenges facing the reef, and the communities that depend on it.



THANK YOU FOR YOUR SUPPORT

The Great Barrier Reef holds a special place in the hearts of all Australians, and we are proud to be responsible for its care.

The challenge to save the Reef is truly the challenge of our time. We all have a role to play and we must work together if we are to ensure the future of our Reef and the animals that call it home.

The progress made in the next five years is critical to the future of the world's reefs and we will need your support to achieve our goals.

To all our partners and supporters, thank you for your important contributions to the long-term resilience of our extraordinary Reef. Your support enables us to rise to the environmental challenges the Reef faces with renewed confidence and determination.

Image credit (this page and back cover): Gary Cranitch, Queensland Museum.





Great Barrier
Reef Foundation