

# Annual Highlights



2023



# Who are we?

The Reef and Rainforest Research Centre (RRRC) is a not-for-profit company and consortium of research providers, industry associations, foundations, and environmental management organisations.

Responding to northern Australia's existing and emerging challenges, we undertake research and other projects collaboratively, with more than 80 partners. Our goals are healthy environments that support thriving communities and prosperous economies.

Our work builds knowledge, develops expertise, increases capacity, innovates solutions, and contributes to policy.

This report showcases some of our achievements in 2023.



# Over 80 partners



Great Barrier  
Reef Foundation



# From the Chair and Managing Director

For sixteen years, the RRRC has successfully worked at the intersection of applied research, conservation, policy, management, economic development and community wellbeing. Over this time, we have attracted over \$300 million into the north Queensland economy, and proficiently overseen numerous successful research programs and projects.

Our key skills are facilitation of applied research and translation of science into improved environmental policy, management approaches, and community outcomes – including jobs.

RRRC's ongoing success is generated by our: unique business model and associated agility; ability to bring a diversity of stakeholders and expertise together to work on problems; demonstrated capacity for innovative thinking; and, constructive disruption of traditional approaches.

These traits have served us well in the delivery of 2023's program and its outstanding achievements including:

- The National Banksia Biodiversity Award in recognition of years of work by RRRC and partners in establishing and applying an Integrated Pest Management approach to the control of a destructive Great Barrier Reef coral predator.
- The National Banksia Agriculture and Regional Development Award applauding our work in the Russell-Mulgrave catchment south of Cairns, supporting cane growers to measure and utilise fine-scale water quality data that informs on-farm decisions on issues with potential to impact water quality.
- Changed lives for First Nations' women through our Deadly Women Indigenous Leadership and Training program which has supported women from some of Australia's most disadvantaged communities to achieve formal qualifications that would otherwise have been out of reach.

- A decade milestone in delivering successful models of community development for villages in the Western Province in Papua New Guinea: villagers' lives and health have been significantly improved, and community capacity dramatically increased.

We are very proud of our successes this year and commend RRRC's team, members, contractors, and partners for their commitment and efforts. As we move into 2024, we are confident that together we will rise to new challenges and respond to the transformational changes that will likely affect northern Australia, and the rest of the world.

We hope you enjoy reading about this year's achievements.

Dr Andrew Ash  
Chair, RRRC Board

Sheriden Morris  
Managing Director, RRRC





# Projects with impact



# Our approach



**Applied research,  
engagement and  
capacity building**

Management  
Community wellbeing  
Conservation and NRM  
Economic development  
Policy



**Partnerships**

Community  
Industry  
Traditional Owners  
Policy makers  
Research institutions  
Philanthropy



**Impact**

Improved environment  
Enhanced livelihood  
Healthier communities



# Our objectives



Promote the protection, conservation, sustainable use and management of tropical environmental assets



Foster tropical knowledge and expertise



Foster an understanding of the interaction between natural resource management and community wellbeing and development

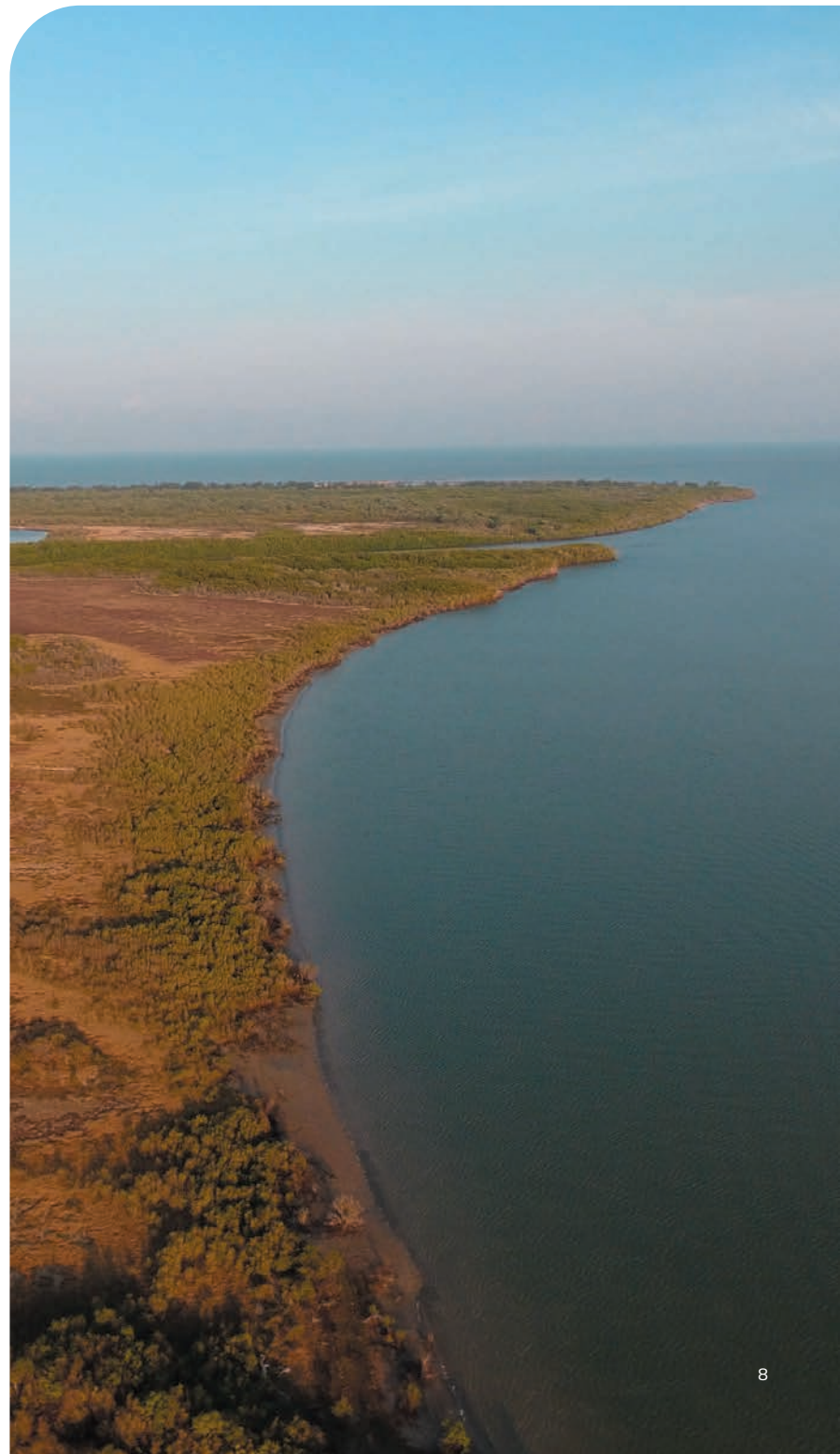
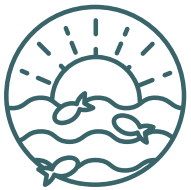


Facilitate capacity-building for sustainable natural resource management, in partnership with the community, managers, research institutions and policy makers



# Promote the protection, conservation, sustainable use and management of tropical environmental assets

- A strategy for protected area priority research
- Yanyuwa Sea Country mapped
- A roadmap for best-practice regional planning







## Foster tropical knowledge and expertise

- A pathway for up-scaling coastal and marine restoration
- Expanded and integrated seagrass data for managers
- New data on sawfish ecology to support conservation
- An expanded understanding of seagrass herbivory by turtles
- A simple method for seagrass herbivory for use by managers
- eAtlas seagrass resources for decision-makers



# Foster an understanding of the interaction between natural resource management and community wellbeing and development

- Offshore energy infrastructure decommissioning research needs identified
- Frameworks to select wetland restoration sites for carbon accounting
- Indigenous communities' participation in carbon markets supported
- Citizen science's utility improved







## Facilitate capacity building for sustainable natural resource management, in partnership with the community, managers, research institutions, and policy makers

- Innovative sawfish monitoring techniques tested and evaluated
- Fishers' participation in sawfish conservation science enabled
- A foundation in place for future Indigenous-led seagrass herbivory monitoring
- Indigenous inclusive approaches to marine and coastal restorations supported
- Indigenous-led research supported and progressed
- Better understanding of technologies for Indigenous-led research







Program update

## Crown-of-thorns Starfish Control





## COTS

### Integrated pest management

#### Program Managers

Dr Rick Abom – C<sub>2</sub>O Consulting

Vanessah Brown Program Implementer – INLOC

**“The Crown-of-Thorns Starfish population outbreaks are one of the major threats to the Great Barrier Reef and one that is most responsive to direct management action.”**

#### Program Progress

Crown-of-thorns starfish (COTS) (*Acanthaster cf. solaris*) are specialist hard coral feeders native to reefs in the Indo-Pacific region, including the Great Barrier Reef. Their ecological role is to control fast-growing corals, allowing slower-growing genera to thrive. Large-scale outbreaks of the Pacific species of COTS on the GBR led to an estimated 42% coral loss between 1986 and 2012.

RRRC, in collaboration with subcontractor INLOC, successfully implemented actions on 122 out of 124 reefs in the target list, incorporating reef surveillance by COTS control partners AIMS and FMP.

By the end of the 2022-23 financial year, the dedicated crew had effectively culled more than 13,700 COTS over 11,898 hours, achieving an overall CPUE of 0.02 for the reporting period. This involved 866 on-water days, with 651 activity days specifically devoted to COTS control activities in the GBR Marine Park. Over 12,565 hours of dive time were dedicated to conducting culling, RHIS, and surveillance activities on 94 (76%) of the 124 target reefs.

In addition to culling, the crew completed 9,148 surveillance manta tows in 450 dive hours and conducted 938 RHIS over 204 hours. The hard coral cover from manta tow surveillance activities averaged around 12%, while RHIS surveys on actioned reefs across the far northern, northern, and central operational zones revealed a mean hard coral cover of 27%.

Furthermore, the teams provided 147 hours of research support for various research programs, significantly contributing to the Integrated Pest Management feedback cycle between science and impact for the COTS Control Program. This comprehensive approach demonstrates the commitment and effectiveness of the program in addressing the challenges posed by COTS outbreaks in the Great Barrier Reef.

Recognising the vital rights of First Nations Peoples to uphold and nurture cultural practices that strengthen spiritual, cultural, social, and economic ties to Sea-country is of utmost importance. In alignment with this recognition, RRRC and INLOC actively participated in a leadership training program generously funded by the Great Barrier Reef Foundation.

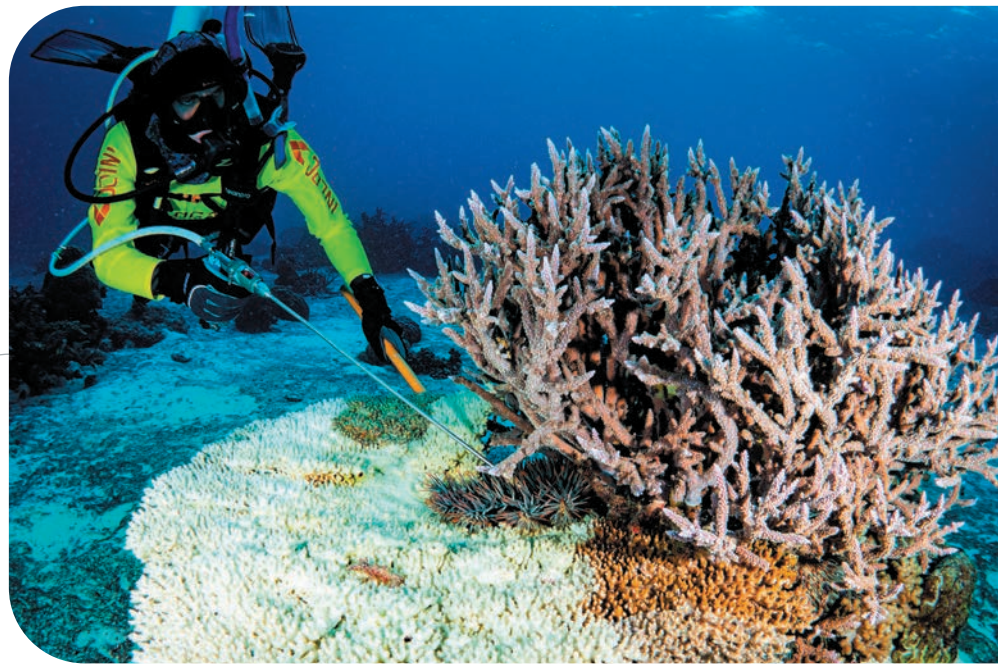
Specifically tailored for young Traditional Owners interested in controlling COTS in their sea countries, the program, named ‘TOPCOTS’, includes a Partnership COTS Control Course for Indigenous Sea Country Managers and Rangers. INLOC oversees the program, covering various marine vessel-related skills, such as operation, safety, maintenance, navigation, radio communications, and environmental regulations. Participants are also guided to obtain Recreational Marine Driver’s Licences.

Currently, nineteen individuals have successfully acquired PADI Open Water and Rescue Diver Certificates, with 16 earning Certificates 1 in Workplace Skills and Tourism, along with Certificate 3 in Conservation and Ecosystem Management. Notably, five have completed Dive Master training, and an additional six are committed to pursuing Coxswains’ certification training in the coming year.

**The success of the COTS Control program was recognised this year with the National Banksia Biodiversity Award**

The COTS Control Program Manager is Rick Abom. Funding is provided by the Australian Government and the Great Barrier Reef Foundation.









# Deadly Women



Program update





*"Learning is incredibly important for First Nations women, both to reach their personal goals, and to enable the social and economic advancement of First Nations communities. Many First Nations women have experienced discrimination within the mainstream education system, or even exclusion."*

*The Deadly Women program has empowered around 50 of these women to gain the skills, competencies, knowledge and confidence to reach their own goals, as well as to make decisions and take actions for positive social and economic change in their communities."*

*Lydia Miller, Project Leader*

## Deadly Women

### Formal qualifications for Indigenous women

#### Program Managers

The Deadly Women program is led by Ms Lydia Miller and implemented in partnership with the highly experienced Registered Training Organisation, INLOC.

#### Program Progress

For communities to thrive, people must be empowered to lead and initiate positive change. Women's contributions and perspectives are critical.

Recognising a shortfall in opportunities for Indigenous women to achieve formal qualifications and leadership confidence, RRRC conceived, and acquired funding for, our Remote Female Employment and Leadership Project, or 'Deadly Women'. It commenced in 2021 and continues to mid-2024.

Deadly Women supports and empowers disadvantaged and vulnerable First Nations Women living in remote and regional Far North Queensland, and the Northern Territory, to undertake culturally competent and safe training, and to gain nationally accredited Vocational Education and Training (VET) Certificates in workplace skills, tourism, business skills and leadership.

Training is community-based, and delivered by professional trainers, with First Nations professional women as mentors.

More than 50 women have been supported to achieve Certificate 1 in both Workplace Skills and Tourism (Australian Indigenous Culture) at training events at Thursday Island, Mapoon, Napranum and Cairns in Queensland, Alice Springs, Katherine and Jabiru in the Northern Territory.

The achievements of the Queensland participants were celebrated at a graduation ceremony and luncheon in Cairns, in August. Graduates were jubilant and spoke of their excitement in gaining qualifications. They were optimistic that they were a foundation for future achievement.

'I now feel like I can do anything!', said Candeka from Yarrabah. Other graduates are already using expertise gained through their training, including Ms Georgina Dorante of Thursday Island who operates a snack and beverage van in Torres Strait.

Deadly Women is funded by the Commonwealth Government's Office for Women in the Department of Prime Minister and Cabinet, and the Queensland Government's Department of Justice and Attorney-General. A generous donation was also contributed by Ann E. Miller AM.





Program update

## South Fly Resilience Program



## Building resilience in treaty villages

### Supporting our nearest neighbours

#### Project Manager

Dr Tammie Matson

#### Project Progress

The Torres Strait Treaty between Australia's and Papua New Guinea's governments includes 13 coastal Western Province settlements bordering Torres Strait. The Treaty recognises the traditional relationships, and often kin connections, of villagers with Australian Torres Strait Islanders, and their ongoing and historical interactions with the Strait's seas and islands.

To support Treaty villagers' participation in dugong and turtle management and conservation in the Torres Strait, RRRC's Managing Director Sheriden Morris visited Papua New Guinea in 2009.

Recognising that community disadvantage, infrastructure gaps, governance processes, capacity, and other issues were a significant impediment to participation in conservation work, Sheriden conceived and developed the South Fly Resilience Program. It has now been in operation for over a decade, supported by

the Department of Foreign Affairs and Trade (DFAT) and implemented in partnership with INLOC International.

The program is based on highly successful Indigenous Ranger programs that had already been piloted and refined in the Torres Strait and other remote parts of Australia. From humble beginnings in just the initial Treaty Villages, the program has expanded to provide services and change lives in around 40 Western Province villages.

To date, more than 180 community members have trained as Rangers, with most continuing in paid positions within the region. These Rangers implement programs in health, sanitation, plumbing, first aid, nutrition, disaster recovery, food preservation, construction, computer literacy, and many other critical issues. The program has led to measurable improvements in health.

One third of Rangers are women, and this has facilitated the delivery of women's reproductive health education and services, and sanitary product production and distribution through women's microbusinesses.







Great Barrier  
Reef Foundation

Program update

# Mulgrave-Russell Regional Water Quality Program





## Reef Trust

# Mulgrave-Russell Regional Water Quality

### Program Manager

Dr Rick Abom – C<sub>2</sub>O Consulting

### Program Progress

The Mulgrave-Russell catchment plays a significant role among the top five basins contributing anthropogenic dissolved inorganic nitrogen (DIN) loads to the Great Barrier Reef catchment area. The Mulgrave-Russell Regional Water Quality Program (MRRWQP) builds upon the insights gained from the RRRC-driven National Environmental Science Program's "Project 25." This suite of research implementation projects empowered growers in the catchment to monitor nitrogen leaving their farms in near-real-time using a network of fixed water quality monitoring stations.

The MRRWQP focuses on supporting and promoting improved land management practices and stewardship within the local sugar industry. The program's objective is to work collaboratively with 80 growers, enhancing their nutrient management practices with a specific emphasis on achieving a lasting reduction in end-of-catchment loads of dissolved inorganic nitrogen (DIN) by June 2024.

A substantial investment of \$6.2 million has been allocated to the MRRWQP to enhance water quality outcomes related to the management of DIN leaving cane farms. The program encompasses various activities, including identifying hotspot DIN sources across the Mulgrave-Russell catchments for targeted extension and intervention efforts. Additionally, there is a focus on improving the understanding of the impact of farming system changes on water quality.

Growers actively participate in localised water quality monitoring activities, gaining firsthand knowledge of the impact they have on water quality in real time. This

knowledge empowers growers to make necessary changes to their individual farming operations, fostering practice changes that lead to water quality improvements.

The program also addresses water quality remediation strategies, utilising existing agricultural drainage systems to selectively target, divert, and treat early wet season, high nitrate 'first flushes.' This intervention aligns with other catchment management initiatives such as wetland and riparian restoration.

Various factors influencing water quality, such as soil variation, crop class variations, temporal and spatial climate variations, and the form, placement, and timing of application of inorganic N fertilisers, are considered. Additionally, the program acknowledges the behavioral science factors influencing farmers' willingness to adapt their nutrient management and integrates aspects of individual farmers' crop agronomy and capacity.

Furthermore, the program collaborates closely with the Madjandji's, who are enthusiastic about leading water quality assessments and responses on their lands. The program actively engages with Angela Guerrero QUT to study how social networks influence the adoption of agricultural practices in the Great Barrier Reef catchments, involving both project-engaged and disengaged growers in the research.

The Mulgrave-Russell Regional Water Quality Program is funded through a partnership between the Australian Government's Reef Trust and the Great Barrier Reef Foundation. This year, the program received the National Banksia Sustainability Awards' national Agriculture and Regional Development Award, recognising its excellent science and partnership approach.





**Project update**

**Muugar Saltwater Foundation**





## Muugar Saltwater Foundation

### Looking after coral reef Country

#### Foundation Coordinator

Duane Fraser – Wulgurukaba and Bidjara  
Traditional Owner

#### Project Progress

More than 70 Aboriginal groups have custodial duties to Muugar – coral reef Country.

Many skilfully manage their marine estates, using established infrastructure, knowledge, organisations, and funding streams, to support their work. Other groups are yet to develop this capacity and are still to achieve their particular management goals.

The Indigenous-led Muugar Saltwater Foundation supports these groups.

Hosted by the Reef and Rainforest Research Centre, Foundation Coordinator Mr Duane Fraser utilises the RRRC's network to create opportunities, and foster productive, collaborative partnerships with researchers, government, industry and non-government organisations.

The work of Muugar Saltwater Foundation aligns with the government's stated goals within Reef Plan 2050 for strategic actions to: increase opportunities for Traditional Owner co-management and co-governance of the Reef; develop a Sea Country Alliance; strengthen involvement in Sea Country and Reef governance; and increase capacity and involvement in protection and management.





Marine  
and Coastal

National Environmental Science Program



Program update

# National Environmental Science Program



# Marine and Coastal Hub – Northern Node

The Australian Government's National Environmental Science Program (NESP) funds environmental and climate change research, within four Hubs: Resilient Landscapes, Sustainable Communities and Waste, Climate Systems, and Marine and Coastal.

Marine and Coastal Hub's research supports the sustainable use, conservation, and recovery of Australia's coastal and marine environments for maximum social, cultural and economic benefit.

Three Impact Areas guide project design and implementation so that they have real-world application and impact.

The RRRC oversees the Northern Node of the Marine and Coastal Hub under leadership of Professor Damien Burrows, supported by Knowledge Broker, Dr Yvette Williams.

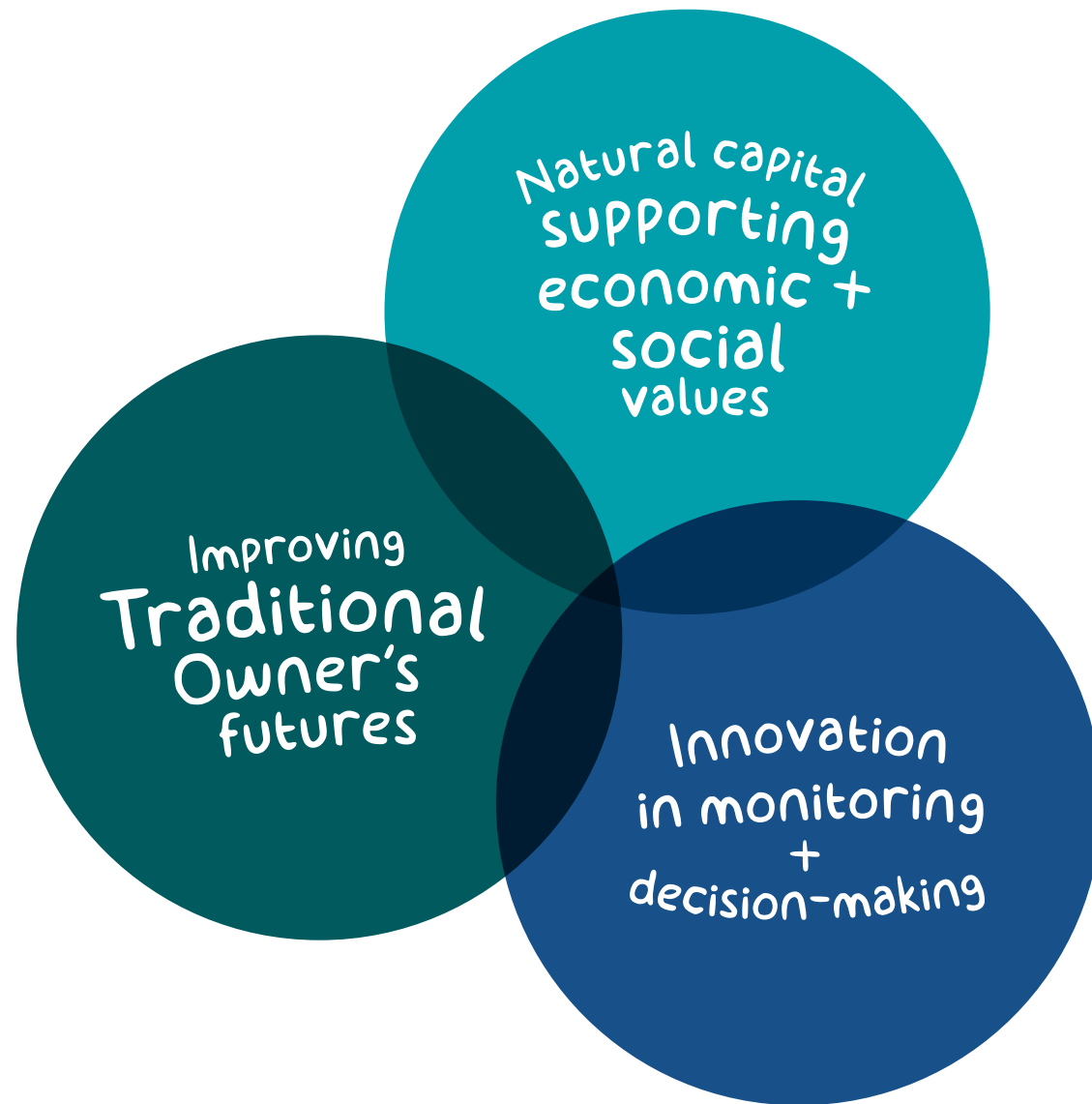
Research projects are implemented by teams from twelve research organisations, supported by many associates.

This year, thirteen 2021-initiated research projects were finalised. Thirteen 2023 Projects have commenced, and several new 2024 Projects are ready to begin.





# Impact areas





An aerial photograph of clear, turquoise water, likely a shallow reef or lagoon. The water is so clear that the sandy bottom and some small rocks are visible. In the bottom left corner, there is a dark teal circle containing white text.

Natural capital  
supporting  
economic +  
social  
values



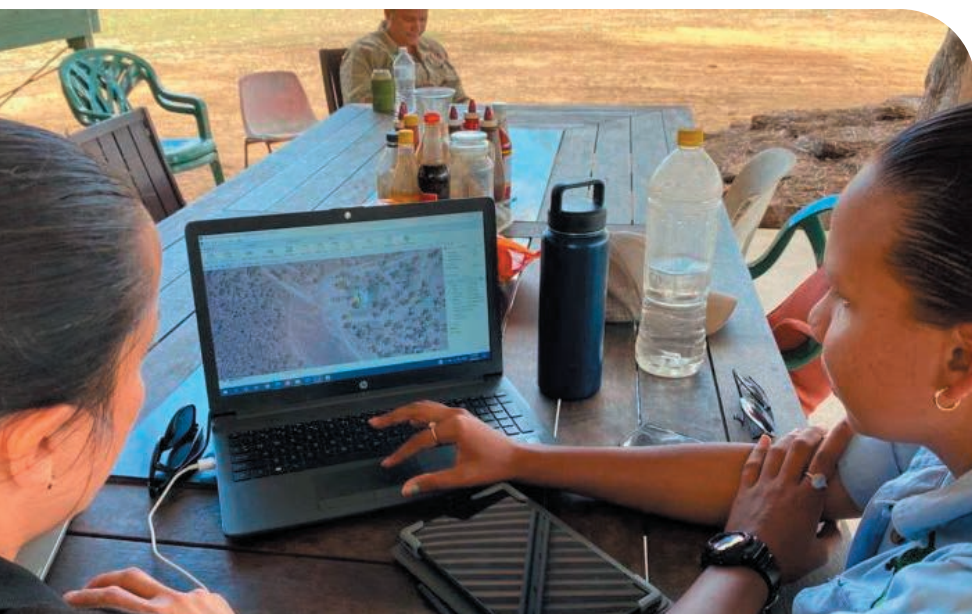
Natural environments are the foundation for community prosperity. Unfortunately, many are under pressure from human activities, and at risk of decline.

NESP Marine and Coastal Hub research seeks to understand these pressures, and ways of managing people and environments, so ecosystems are healthy and species thrive.



Indigenous Australians own or have other rights over 57% of Australia's land, and large tracts of ocean. This vast resource should bestow great economic, social and cultural advantage. However, for many communities this is not the case. Progress is hampered by inadequate research into Country and culture-based economic opportunities, and relevant ecosystem science.

NESP Marine and Coastal Hub research is acquiring this knowledge in collaboration with, and under the guidance of, Indigenous leaders, facilitators, researchers, managers and communities.



Improving  
Traditional  
Owner's  
futures



A photograph of a long bridge stretching over a body of water under a clear blue sky. The bridge has a paved road and metal railings. A series of tall, modern streetlights line the left side of the bridge. In the upper right, a dark blue circle contains white text.

## Innovation in monitoring + decision-making

Australia's prosperity rests on the expansion of current industries, new enterprises, and thriving communities. Planning for these must include careful consideration of people, the economy and the environment. All decisions must be supported by appropriate scientific research. To achieve this, at the required scale, innovations in planning processes and monitoring technologies are needed.

NESP Marine and Coastal Hub research is testing and improving technologies and refining planning and decision-making systems.







# 2021 Projects



## Project 1.1

# A research strategy for protected area management

### Project Leader

Professor Iain Gordon, CQUniversity

### Challenge

Australia's National Reserve System requires informed, skillful management, supported by scientific data. More information is needed to find solutions to the declines detected in some ecosystems and species, despite best efforts by reserve managers.

To design appropriate research to develop these solutions, issues of concern to managers, and knowledge shortfalls, needed to be identified.

### Approach

More than 70 protected area stakeholders were consulted. Their input was collated, reviewed and compiled into the NESP Protected Place Management Research Strategy 2021–2023.

### Findings

This new Strategy identifies three desired outcome areas, a pathway to achieve them, and priority research topics and projects. It will support the identification and prioritisation of future research projects across all four NESP research hubs.

Outcome themes to guide and prioritise future research and projects are:

1. Indigenous people supported to lead and disseminate Indigenous scientific knowledge
2. A strong, supportive evidence base to support adaptive protected place management
3. Evidence-based management options utilised, aligned with national objectives
4. NESP Marine and Coastal Hub research that tests and improves technologies, and refines planning and decision-making systems



## Project 1.6

# A roadmap for landscape-scale coastal and marine ecosystem restorations

### Project Leader

Dr Megan Saunders, CSIRO

### Challenge

Australian coastal and marine ecosystems underpin community prosperity through fisheries, tourism, and recreation. They also protect shorelines and remove carbon dioxide from the atmosphere. Human pressures and climate change are undermining the health of these ecosystems and modifying their structure.

Small-scale restoration works are under way in many areas in Australia, but work on a much greater scale is needed. As well as environmental benefits, expanded efforts will provide communities with jobs and social benefits.

### Approach

This project undertook a collaborative and consultative scoping exercise to determine the issues that require more information

to support and progress large-scale restorations. Combining consultation, formal surveys and literature reviews, it explored: restoration limitations and opportunities; the utility of existing spatial models to predict flood and erosion benefits; available scientific data; and, the research needed to support up-scaling.

### Findings

Scaling-up restoration work requires new economic models that blend government funding with private sector and philanthropic investment, supported by a national-scale science-based plan that considers social, economic, ecological and climate change outcomes. Traditional Owner participation should occur at all stages.

Information gaps impeding restoration decision-making and implementation are: the viabilities of nature-based solutions for coastal hazard management; models to inform actions under specific circumstances; and, a restoration prioritisation system.







## Project 1.12

# Mapping the benthic habitats of Yanyuwa Sea Country

### Project Leader

Dr Rachel Groom, Charles Darwin University

### Challenge

The Yanyuwa Traditional Owners, li-Anthawirriyarra Sea Ranger Unit, manages ma-Ihanngu (sea country) in the south-west Gulf of Carpentaria, including Northern Territory's most significant maraman (seagrass habitat).

To better understand maraman, Sea Rangers needed more scientific data on meadow distribution and characteristics. To gain this, they teamed with scientists to implement regional benthic (seabed) surveys.

### Approach

Surveys were conducted from low-hovering helicopters by observers, at 3248 intertidal and subtidal sites along 130 km of mainland and island coastline. Each 10 m diameter plot was assessed for cover by seagrass, benthic macro-invertebrates, and algae. Tethered quadrats were dropped to assess species and biomass.

Data were compiled and organised into a computerised Geographic Information System (GIS) and made publicly available on the internet, at the eAtlas website.

### Findings

Maraman was present at 44% of the survey sites, and a total of 16,000 ha of seagrass were mapped, comprising 180 defined meadows. Seven seagrass species were recorded: *Halodule uninervis*, a disturbance adapted species preferred by dugongs and turtles, was dominant.

Baseline records for Yanyuwa ma-Ihanngu coastal benthic habitats are now available to Sea Rangers and others. These will allow detection of change over time, and help understand what drives variation.

As well as gaining new data, the project benefited partners through information exchange, and increased li-Anthawirriyarra Rangers' capacity to undertake coastal planning, implement surveys, design research, and engage with GIS technologies. A strong foundation is in place for future monitoring work.

## Project 1.13

# Integrating four decades of seagrass data from Torres Strait and the Gulf of Carpentaria

### Project Leaders

Dr Alex Carter, James Cook University – TropWATER

Skye McKenna, James Cook University – TropWATER

### Challenge

Seagrass mapping and monitoring has occurred in the Gulf of Carpentaria since the 1980s, and in Torres Strait since the early 2000s. This work has increasingly used geographic information systems (GIS) for collecting, storing and analysing Torres Strait and Gulf spatial (location) records of seagrasses, and associated measurements.

Despite the breadth and high-value of this information for developing a comprehensive understanding of seagrass ecosystem change over time, its usefulness has been very limited as it was held in many forms by numerous individuals and organisations, and has therefore been largely inaccessible.

### Approach

This project addressed this problem by compiling, validating, standardising, and integrating more than 50 historical Torres Strait and Gulf region data sets from studies between 1983 and 2022, into a publicly accessible spatial database on the eAtlas website.

### Findings

Supported by eAtlas the data is a now combined into a valuable, readily-accessible, interactive long-term spatial data resource, covering 1,465,000 ha of seagrass.

Management agencies, rangers, Traditional Owners, ports, industries, and researchers can use it to understand meadow ranges through time, and associated species characteristics, knowledge that will guide management decisions.

The project also revealed a number of information gaps. As most survey data came from the more easily accessible tidal shallows or inter-tidal areas, rather than deeper water surveys, there are still vast areas of the seabed still to be surveyed.





## Project 1.14

# The effects of dugong and turtle grazing on seagrass meadows in Torres Strait

### Project Leaders

Dr Abigail Scott, James Cook University – TropWATER

Dr Michael Rasheed, James Cook University – TropWATER

### Challenge

The extensive seagrass meadows of Torres Strait protect coasts from erosion, hold substrates together, and store carbon. Culturally important to regional communities, the meadows provide habitat and food for many species, including large numbers of green turtles (*Chelonia mydas*) and dugongs (*Dugong dugon*).

In 2019 and 2020 the Torres Strait Seagrass Monitoring Program's researchers were concerned to detect dramatic declines in seagrass meadow condition, at a number of locations. There was no evidence of disease or significant environmental change, but there were unusually large numbers of grazing green turtles and dugongs. It was suspected they were a likely cause. Project 1.14 tested this hypothesis.

### Approach

Researchers selected two study areas where seagrass had obviously declined and used two-metre square exclusion cages to prevent green turtles and dugongs from grazing inside. Measurements of a range of seagrass characteristics were taken both

inside and outside the cages over seven months, and compared.

### Findings

It was very clear that grazing impacted seagrass at both study areas. At the Orman Reef site, seagrass was almost twice as tall and biomass over five times greater inside the exclusion cages after seven months. At the Mabuiag Island site, both height and biomass were double by the end of the study. An absence of characteristic dugong feeding trails outside the cages, suggested green turtles were responsible.

This project confirmed that grazing pressures are a key element shaping seagrass dynamics in Torres Strait. However, despite appearing to be in a 'poor' state to human observers, these meadows evolved with intense herbivory, and may still be productive and the plant-herbivore dynamic in balance. The point where grazing exceeds the threshold recovery balance, requires better understanding.

More data is also needed to better understand: regional mega-herbivore movements and any associated changes in meadow distribution; and other potential drivers of change.

Long-term monitoring will reveal whether the sparseness of seagrass outside the cages during the study are part of a normal cycle.

## Project 1.15

# Coastal wetland restoration for carbon accounting

### Project Leader

Dr Valerie Hagger, University of Queensland – Centre for Biodiversity and Conservation Science

### Challenge

Many of Australia's original coastal wetlands have been modified by drains and tidal barriers to allow agriculture and other uses, disrupting or destroying ecosystems, and their cultural values.

Emerging global carbon markets provide a potential opportunity to generate funds for broadscale wetland restoration. Participation in the markets is not possible, however, until the carbon-capture potential of restored wetlands is known, and feasibilities assessed.

Project 1.15 initiated the work required to address these shortfalls.

### Approach

Historically modified wetland regions were examined in the Fitzroy Basin in central-east Queensland; the Peel-Harvey and South West catchments in south-west Western Australia; and the Ord River floodplain in east Kimberly, north-east Western Australia.

Analyses of sequestration potential, costs, co-benefits and a range of other factors were undertaken for sites at each location, under various carbon credit price scenarios.



### Findings

A new selection process for carbon market eligible wetland restoration work was developed. Using this, 13,874 ha within the Fitzroy Basin and 348 ha within the Peel-Harvey case study region were identified as potentially restorable by removing artificial drains and tidal barriers and allowing rewetting. This would achieve a net carbon abatement of 162,000 Mg CO<sub>2</sub>-e yr<sup>-1</sup> and 4312 CO<sub>2</sub>-e yr<sup>-1</sup>, respectively.

In the Ord River region, no restoration sites were feasible by rewetting, but 24,123 ha could potentially be recovered by cattle removal, abating 7237 Mg CO<sub>2</sub>-e yr<sup>-1</sup>. However, under the current average carbon price it would not be economically feasible.

The case studies confirmed that there are significant opportunities to incentivise coastal wetland restoration under blue carbon markets, and thereby enhance Australia's carbon storage while also achieving rich ecological and cultural co-benefits. Feasibilities increase significantly with the projected one metre sea-level rise by 2100, and anticipated rises in carbon credit value.





## Project 1.19

# Research priorities for decommissioning offshore oil and gas infrastructure

### Project Leader

Associate Professor Peter McCreadie,  
Deakin University

### Challenge

Some of Australia's offshore gas and oil platforms are near the end of their operational life. Decommissioning must proceed safely, and achieve good outcomes for the environment, community, and the economy. With 12,000 platforms worldwide, and many ageing, this is a global issue.

Full scientific evidence to support best-practice decommissioning is currently not available, and this project began a process to address this shortfall.

### Approach

Thirty-five experts from multiple relevant disciplines and geographic regions were requested to identify what they considered to be the most critical unanswered decommissioning questions, and the associated required research.

### Findings

The researchers and experts collaborative identified ten essential research topics.

1. Assessment of contaminant impacts and acceptable limits, to reduce ecological harm.
2. Risk and acceptability threshold definitions within policy and governance.
3. Liability issue characterisation, including ongoing costs and responsibilities.
4. Quantification of impacts to ecosystem services.
5. Quantification of ecological connectivity.
6. Assessments of marine life productivity.
7. Determination of infrastructure reuse feasibilities.
8. Identification of stakeholder views and values.
9. Quantification of greenhouse gas emissions.
10. Development of a transdisciplinary decommissioning decision-making process.

There is now a clear research pathway to obtain the critical knowledge needed by decommission managers. As most issues apply across geographic regions and research disciplines, cross regional collaborations and inter-disciplinary teamwork will expedite outcomes and enhance cost effectiveness.

## Project 1.24

# Sawfish tracking using satellite tag technology

### Project Leaders

Dr Adrian Gleiss, Murdoch University

### Challenge

Sawfishes are among the world's most endangered species. Globally, regional populations are in decline, or extinct. Australia's populations are relatively healthy, but number declines and range contractions have also been observed here, making them a high priority for conservation efforts. Unfortunately, managers don't have enough data to understand what factors affect sawfish population health.

Among the biggest knowledge gaps is lack of data on the movements of mature sawfish after they leave coastal nursery areas. Satellite telemetry, the attachment of transmitter 'tags' to free-moving animals, is the most promising method for collecting this data.

This project refined and tested telemetry tagging techniques and analysed the data to better understand sawfish movement ecology.

### Approach

Eight sawfishes of two species were tagged at intertidal sites in northern Western Australia. Three different tag-types were used: a towed ARGOS PTT; a satellite-linked miniPAT pop-up tag; and, a SPLASH hybrid tag. All were programmed to transmit data, then attached using loop harnesses to the animals' dorsal fins.

### Findings

The study demonstrated that telemetry tags are an excellent tool for collecting sawfish data and providing information on their habits. During the study, tagged individuals stayed in shallow subtidal and intertidal habitats; had high 'site fidelity' (didn't move far); moved with the tide; and, never swam deeper than eight metres.

Dwarf sawfish, *Pristis clavata*, were only associated with mangrove-lined creeks; whilst green sawfish, *Pristis zijsron*, moved widely across their bay habitat.

The valuable learnings from this project have since been applied to the tagging of a total of 40 sawfish, by researchers and fishers, and new data is coming in continuously. Recently, much to everyone's surprise, tag telemetry revealed that a tagged 5.7 m green sawfish had swum over 1000 km from the Western Gulf of Carpentaria to McCluer Island near Gove. There is clearly still much to learn about sawfish.





## Project 1.25

# Sawfish bycatch reporting in northern Australian fisheries

### Project Leaders

Dr Richard Pillans, CSIRO

Dr Toby Patterson, CSIRO

### Challenge

Endangered sawfish species are sometimes accidentally caught as 'bycatch' by trawl and gillnet fishers and some die as a result. How many, and the percentage that survive after release is unknown. Fishers are best-placed to collect this information, and other data, and many already record capture-release and other sawfish interaction information, for researchers.

In collaboration with the fishing industry, this project aimed to find ways of reducing sawfish bycatch, and better ways to support fisher reporting.

### Approach

Fishers, researchers, marine managers, and regional planners joined together at a workshop to identify ways of increasing data collection and prioritise potential research topics to support sawfish recovery and sustainability. Input was also sought on their participation in tissue sampling to allow assessment of genetic relationships, a method known as close-kin mark-recapture (CKMR).

### Findings

Workshop attendees outlined the following potential improvements: better reporting processes; more clarity on data use and goals; better communications; fisher training programs; and, the development of time-efficient methods for sawfish release from nets.

Collectively participants agreed on the value of the proposed CKMR study of abundance and genetic relationships and fishers agreed to participate. They also decided that research on potential methods to reduce sawfish bycatch, such as green LED lights on nets and net flaps, were a priority. The need for greater involvement by Traditional Owner groups in sawfish research in the future was also identified.

Along with clarifying a path forward, the workshop founded relationships between the 50 participants representing 24 organisations, half from the fishing industry.







## Project 1.29

# Innovative marine monitoring for Indigenous managers

### Project Leader

Professor Damien Burrows, James Cook University – TropWATER

### Challenge

Indigenous Land and Sea managers oversee vast tracts of northern Australia's coasts and waters. They use scientific data for decision-making, planning and management. Unfortunately, many locations and species are un-monitored and not studied, leaving numerous information gaps.

When scientific data is available, it is usually controlled by the non-indigenous scientists who have selected study sites and research topics, and collected and interpreted the data. This is exceptionally frustrating for Indigenous Land and Sea Managers.

### Approach

To support the progress and evolution of more Indigenous-led environmental research, this project evaluated data collection and analysis approaches, of potential use to Indigenous researchers.

### Findings

#### Pathways and barriers to emerging technology

Emerging technologies have great potential to assist in data collection and analysis, and it is critical that aspects of

technology that either support or exclude Indigenous researchers are understood.

Key principles for greater uptake were identified as Indigenous-controlled research topic selection; co-design and implementation; upgradeable data systems; appropriate training; and clear meaningful outputs for managers. A pathway to achieve these must include: simplification of data collection technologies and a process for evaluating them in remote settings; development of local skills and expertise; and, a process for clarifying the real cost of building, managing and improving technology solutions.

#### Drone imaging

Drone-supported imaging is already used in many on-Country locations, and has great potential to cost-effectively address monitoring and mapping requirements elsewhere.

Through studying the literature, a suite of uptake barriers was identified. These were: limitations in technology; analytical and processing; regulatory; cost; safety; social; wildlife impacts; and, suitability for the task. The findings set the foundation for further evaluations of issues associated with drone use for research and management purposes, and provide a first step toward the development of potential mitigation strategies.

#### Citizen science

Citizen science is data collected by non-expert volunteers as written or

photographic records, for a data-base designed by an overseeing organisation. Opportunities and limitations of citizen science were assessed by consulting with marine managers, scientists and others experienced in collecting, collating and utilising this type of data.

Experts agreed that citizen science data is still an emerging research field, and there are problems to resolve before it can be confidently used by managers and other end-users. Inherent biases exist within the data that are largely unknowable because of the diverse condition under which the data is collected. Citizen science is potentially very useful, however, for filling gaps within systematic surveys, and in strengthening population trend analyses, at relatively low cost.

#### Computer learning accuracy

Great Reef Census' photographic records of coral cover and reef structure, were collected by volunteers, and then utilised to test the accuracy of interpretative computer learning (artificial intelligence).

Computer learning has good levels of interpretative accuracy under certain conditions. In most cases, it has a high statistical accuracy of  $\pm 5\%$  when using just 20 images. Lesser accuracy occurs when coral cover is relatively high, but this can likely be rectified by obtaining more images at a particular location. Despite this, it has great potential for producing reliable interpretative outputs from the vast Census data set.



## Project 1.30

### Citizen science to detect marine species' range shifts

#### Project Leader

Professor Gretta Pecl, University of Tasmania – Institute for Marine and Antarctic Studies

#### Challenge

Global climate change is affecting our oceans. Overall, they are 1–2°C warmer than in 1970. For some marine species, warmer temperatures are harmful. They disrupt physiology and behaviours, causing the deaths of individuals, and sometimes whole populations. Over time, this drives southward shifts in the ranges of southern-hemisphere marine species into cooler waters. Range shifts have been detected in 198 Australian marine species. New approaches to data collection are needed to acquire understanding of range shifts across all marine species.

#### Approach

This project examined the usefulness of 'citizen science' to detect range shifts in

marine species by looking at 200 target marine species' records in three existing citizen science databases: Redmap, iNaturalist Australasian Fishes Project, and Reef Life Survey.

#### Findings

There were 76,000 individual records of 197 of the target species that were outside their historically-known range. Species on-the-move included anemones, corals, crabs, lobsters, sea urchins, sharks, rays, dolphins, and fish. The average southern shift in range demonstrated within this data was 316 km. The maximum change was 1474 km by the Atlantic blue marlin (*Makaira nigricans*).

Citizen science is clearly capable of providing valuable and unique data on species' range shifts and is therefore highly complementary to traditionally collected science, for detecting and understanding climate-driven species redistributions in Australian marine systems. Carefully planned expansion of current programs will be useful, alongside platforms for making the data widely accessible.



## Project 1.31

### Research for Indigenous communities

#### Project Leader

Ricky Archer, NAILSMA

#### Challenge

The Indigenous Estate covers nearly 80% of Northern Australia, a vast resource that should bestow boundless economic, social and cultural advantages. However, these have not been realised to any significant extent, in large part, due to inadequate research into Country and culture-based economic opportunities, and associated ecosystem science. This is largely due to both under-representation of Indigenous researchers in the mainstream organisations, and limited access to the processes of research prioritisation and design.

#### Approach

The goal of this project was to understand how to increase Indigenous people's participation in NESP research, and more broadly. To achieve this, 80 attendees of the 2022 Australian Marine Association's Indigenous Workshop were asked to contribute their perspectives, and to identify the marine and coastal research priorities of Indigenous communities and organisations across Australia. Relevant literature was

also consulted.

#### Findings

Indigenous peoples' research priorities fit within four themes:

1. Governance and decision-making
2. Data collection and management
3. Restoration of coastal ecosystems
4. Economic development

There was universal agreement that Indigenous organisations and communities should be fully involved in identifying, developing and implementing research projects. Integration of cultural knowledge alongside new science approaches, and cultural protocols within research and decision-making is essential. Utilisation of research projects for the training of young people will build sustainability and capacity.

A National Indigenous Environmental Research Network (NIERN) of Indigenous-led practitioners was considered the best way forward to enable and prescribe research participation, influence the Australian research agenda, and oversee relevant governance. Such a body could also facilitate the realisation of much needed economic, social, cultural and environmental benefits to Indigenous people, Australia-wide.







## Project 1.32

# Supporting northern Australia's regional planning: A scoping study

### Project Leader

Professor Allan Dale, James Cook University  
– Cairns Institute

### Challenge

The prosperity of northern Australian communities rests on the expansion of current industries and new enterprises. For best outcomes, and to be sustainable, planning for this economic development must include careful consideration of people, the economy, and the environment.

Despite ongoing government commitment to a sustainable-development agenda, a range of challenges and obstacles have so far limited the ability of private and public decision-makers to make headway.

### Approach

By analysing regional planning processes and practices in Queensland, Northern Territory and Western Australia, this project built a better understanding of the challenges and obstacles, and recommended a way forward.

It examined current planning frameworks; interviewed planners, and others with specific interests; identified information deficits; assessed data storage and access issues; and, reviewed planning case studies.

### Findings

Barriers to best-practice development planning were identified to be: limited emphasis on the development of durable, adaptive, planning partnerships; poorly defined processes; lack of alignment between agencies; ill-defined outcome standards; laws that are not always fit-for-purpose; data gaps; and, limited data sharing between agencies and stakeholders.

'Preconditions' for successful development planning were identified as: planning standards and processes that are aligned at all government levels; clear national outcome standards for community, culture, environment and the economy; integrated data systems; and independent monitoring of governance systems for improved place-based partnerships.







# 2023 Projects





### Project 3.1

## Planning for ecologically sustainable development in northern Australia

### Project Leader

Professor Allan Dale, James Cook University – Cairns Institute

### Challenge

Project 1.32 and other reviews, concluded that development planning for industries and communities in northern Australia has not always been done well, and that there are many obstacles to best-practice. Without solving these, northern environments, people and economies cannot achieve full potential.

### Approach

Project 3.2 will address these barriers by establishing a strong regional planning network; analysing and informing new regional planning efforts; and, ensuring quality practice from the outset. Integral, will be: Indigenous and general community inclusion; the incorporation of environmental and social sciences; knowledge sharing events; and, targeted capacity building. The work will be focussed through 'sentinel' case studies to obtain learnings for application in future planning.

### Project 3.2

## Developing a National Indigenous Environmental Research Network

### Project Leaders

Ricky Archer, NAILSMA

Dr Leah Talbot, NAILSMA

### Challenge

NESP research Project 1.31 identified Traditional Owner Managers' priority needs and recognised that these are often overlooked in favour of research that is championed by stronger non-indigenous voices. It also concluded that Traditional Knowledge is insufficiently recognised by mainstream researchers, and Indigenous people seldom participate in research planning and implementation, nor in the interpretation of findings.

### Approach

To overcome these obstacles, Project 3.1 will progress the establishment of a National Indigenous Environmental Research Network (NIERN) to advocate, support, facilitate and streamline Indigenous-led, inclusive and relevant research. Collaboratively, it will: enable the formation of a Steering Committee; analyse current research for factors of inclusion or exclusion; use research case studies to develop and test approaches and concepts; outline a protocol for cultural and intellectual property agreements, and consent; and, build Network structures and expertise.

### Project 3.4

## Building knowledge for healthy northern Australian catchments and coasts

### Project Leader

Professor Michele Burford, Griffith University

### Challenge

Economic development in northern Australia brings greatest benefits to northern communities when there are no adverse effects on river catchments, estuaries and marine waters. To achieve this, the potential environmental impacts of developments must be understood, predicted, and included in economic and regional planning deliberations and decisions. In many cases this information is not available so decision-makers must proceed without a high degree of certainty regarding the impacts of developments on these environments.

### Approach

Project 3.1 will address the environmental data shortfalls for: the Flinders and Gilbert catchment in Queensland; the Daly catchment in the Northern Territory; and the Keep catchment, in both the Northern Territory and Western Australia. Components of the study will include: analyses of the effects of catchment run-off on marine systems; calculation of flows and sediment plumes; mangrove distribution change analysis; and the contribution of groundwaters to estuarine flow. Collaborative workshops with Traditional Owners, land managers and other stakeholders will facilitate learning and knowledge exchange.



## Project 3.5

# Partnerships for seagrass research and protection

### Project Leaders

Dr Alex Carter, James Cook University – TropWATER

Dr Catherine Collier, James Cook University – TropWATER

Dr Rachel Groom, Charles Darwin University

Associate Professor Kathryn McMahon, Edith Cowan University

### Challenge

Northern Australian seagrass meadows support dugongs, green turtles, fish, prawns and many other important species. Understanding their distribution and health over time is essential so regional planners have the right information to make the right decisions about community activities and economic development. Unfortunately, for large areas of the coast, data on these important habitats are lacking. Few large-scale surveys have been done, and only a handful of ongoing seagrass monitoring programs exist.

### Approach

Project 3.5 will work collaboratively with Traditional Owners, Indigenous Rangers, managers, and others to collect and analyse existing data to understand seagrass distribution across northern Australia. It will prioritise regions where there is no data, or minimal information, then undertake field surveys by helicopter, drone or boat. During these, emerging monitoring technologies will be evaluated, alongside associated innovations in modelling and analysis. Accessibility and useability of data will be enabled through a purpose-built website, and associated information products will be developed and made widely available through information sharing and learning events, and other avenues.

## Project 3.8

# Feral-ungulate control to reduce greenhouse gas emissions from wetlands

### Project Leaders

Professor Catherine Lovelock, University of Queensland

Dr Valerie Hagger, University of Queensland – Centre for Biodiversity and Conservation Science

### Challenge

Large populations of ungulates (feral pigs, cattle, and buffalo) roam across northern Australia. They damage the structure and function of native ecosystems that are not adapted to the animals' foraging and drinking behaviours, nor their hard hooves. Scarcity of funding has limited the consistency, and therefore success, of ungulate control efforts so far. However, if feral ungulate control can be developed and justified as a novel carbon abatement methodology, the current funding shortfall can likely be addressed via the Emission Reduction Fund and Nature Repair Market frameworks.

### Approach

This project aims to provide this justification by quantifying greenhouse gas emissions under various ungulate impact and control scenarios, and determine the feasibility of participation in environmental markets through calculation of profits and benefits, versus the cost and effort. In collaboration with Traditional Owner organisations and others, project researchers will: measure greenhouse gas emissions from different types of wetlands; compare emissions from different levels of ungulate disturbance; measure carbon and environmental characteristics; assess current and past control methods and programs; and cost various control measures.



## Project 3.9

# Establishing Indigenous-led feral-ungulate control in northern Australia

### Project Leader

Dr Justin Perry, NAILSMA

### Challenge

Indigenous-led northern Australian ungulate control must have strong governance, effective coordination, and well-designed monitoring, alongside an evidence-base and funding. Social and cultural values must be included in planning and operations.

### Approach

Project 3.9 is supporting Indigenous organisations, Indigenous Carbon Industry Network and other relevant stakeholders to evaluate and consider the components of each of these issues, to create an informed 'roadmap' of the way to achieve coordinated Indigenous-led feral animal management across northern Australia. Inherent in this process will be: mapping the Indigenous land tenures; collation of information on the Indigenous estate and management organisations; assessment of available spatial data; consideration of potential tenure constraints; skills audits; incorporation of cultural governance and values; and definition of governance, and resource requirements.



## Project 3.10

# Partnerships and novel technologies for improved dugong research

### Project Leaders

Dr Christophe Cleguer, James Cook University – TropWATER

Dr Holly Raudino, Western Australia Department of Biodiversity, Conservation and Attractions

Dr Rachel Groom, Charles Darwin University

### Challenge

Dugongs are an iconic species of great interest to the Australian community and are of cultural significance to northern Australia's Indigenous peoples. Dugongs are protected and have high national and international conservation value. Many factors are known to affect the health and survival of dugong populations, for example accidental capture by fishers and habitat loss. However, much is still to be learned about them, and current knowledge gaps limit Land and Sea Managers' and communities' abilities to plan and manage those activities that might potentially impact their habitat, numbers and health. Emerging technologies provide great opportunities to address these data shortfalls, at lower cost, and with greater efficiency than ever before.

### Approach

In collaboration, scientists, managers and Indigenous Rangers will develop and test better ways to undertake dugong focused research, with particular emphasis on useability for non-experts. In particular the project will: develop drone and plane-based aerial photography protocols; refine artificial intelligence systems to count dugongs in aerial images; explore remote measurements of dugong morphology; align old and new survey methods; use genetic methods to understand how individuals and populations mix and move; and, develop an Indigenous community-led monitoring program across northern Australia.







## Project 3.11

### Sawfish monitoring: Improved collection of fisher bycatch data

#### Project Leaders

Dr Richard Pillans, CSIRO

Dr Toby Patterson, CSIRO

Dr Peter Kyne, Charles Darwin University

#### Challenge

Conservation managers of the endangered sawfish need much more information in order to effectively protect them within Australian waters. In particular, they need to better understand the impacts of the gillnet and trawl fisheries which unintentionally catch sawfish alongside target species. NESP Project 1.25 identified a range of reasons for under reporting of sawfish captures and subsequent releases or capture-related deaths.

#### Approach

Project 3.11 is building on the collaborative work undertaken with the northern commercial fishing industry in Project 1.25, to refine and improve sawfish data collection methods, processes, and analyses. This will support and facilitate the systematic collection of the robust scientific data needed to tailor management actions for sawfish population recovery. Components of the work include: establishing industry-led tissue sampling and data collection, with associated education and training; co-development of reporting processes; creating methods to collaboratively process and analyse 'close-kin mark-recapture' (CKMR) data; and, continued building of trust and cooperation between industry and conservation efforts.

## Project 3.12

### Sea snake monitoring: Improved collection of fisher bycatch data

#### Project Leaders

Associate Professor Kate Sanders, University of Adelaide

Dr Vinay Udyawer, AIMS

#### Challenge

Northern Australian waters are inhabited by at least 20 species of sea snakes. All are classified as Protected Marine Species, and two are Critically Endangered. Sea snake numbers are believed to be in decline, but why this is happening is not well understood. What is certain, is that many are caught as bycatch by trawlers and trap fishers; which species and how many are unknown. Although fishers should record all interactions with sea snakes in a Species of Conservation Interest logbook (SOCI), this doesn't always happen. For many fishers, quick removal of the venomous reptiles is an occupational health and safety priority that surpasses the recording of sea snake data.

#### Approach

Project 3.12 is working to improve sea snake bycatch reporting through a process of consultation, collaboration, and co-design. The goal is to create a strong, committed and skilled network of trawl and trap fishers, actively collecting sea snake data, who over the course of the project will collect information for better understanding of sea snake encounters, species, genetic relationships and ecology. This will be achieved by designing and establishing a clear, standardised crew member observation program, and training crew members in handling, collecting samples and measuring. A process of ongoing review will refine processes, and bycatch data from fishery and fishery-independent collectors will be compared.



## Project 3.17

# Identifying the un-mapped reefs of the northern Australian seascape

### Project Leaders

Dr Eric Lawrey, AIMS

Associate Professor Chris Roelfsema, University of Queensland

### Challenge

There are hundreds of reefs and shoals in northern Australia's coastal waters that support a vast array of marine creatures. Many remain unmapped as they are remote and difficult to see in the turbid, sediment rich waters typical of the region. These 'missing' reefs can't be considered for protection by planners when deciding how economic and other developments should proceed and be regulated.

### Approach

This project reveals these hidden reef by creating maps, and associated information, that show their location and habitat features. It will create new, more accurate maps using improved satellite imaging selection techniques that provide a clearer view of the marine areas than has been achievable to-date. This will be achieved by: reviewing 30 years of satellite imagery for cloud free images and clearer water occurrences; utilising field data to refine geomorphic and benthic habitat maps; and, improving the Allen Coral Atlas through new imagery and improved machine learning. The upgraded maps will provide higher levels of confidence to conservation and development planners, and thus ensure better outcomes for the protection of coral reefs.

## Project 3.18

# Citizen science: Reef monitoring for management

### Project Leaders

Professor Peter Mumby, University of Queensland

Dr Kate Chartrand, James Cook University – TropWATER

### Challenge

Traditionally, reef monitoring has been conducted by scientists at relatively small subsets of locations. 'Citizen science', research conducted by enthusiastic community members. However, not all reef managers and scientists are convinced of the worth of citizen science data. Existing citizen science data sets provide an opportunity to identify shortfalls and increase its usefulness and relevance of the data for scientists and managers.

### Approach

This study will assess the Great Reef Census, an initiative of Citizens of the Great Barrier Reef. It comprises more than 80,000 seascape photos, uploaded over three years via a web portal. The study aims to: optimise the Census' survey design; maximise the quality of in-water data collection through co-design of sampling methods to meet multiple defined management objectives; develop a protocol for selecting sampling sites and subjects for specific needs; and, build improved artificial intelligence/human approaches to undertake image analysis. It will also investigate the development of targeted census activities to deliver information relevant to priority management concerns.







## Project 3.19

### Addressing Kakadu's strategic research needs

#### Project Leader

Dr Rachel Groom, Charles Darwin University

#### Challenge

Kakadu National Park is owned by both the Bininj and Mungguy peoples, and jointly managed in collaboration with Parks Australia. The Park features diverse landscapes, high biodiversity, and endemic species. It also has great cultural values associated with over 50,000 years of habitation. To continually improve the care and management of this unique, valuable place, lots of information and targeted scientific monitoring is needed. The Kakadu Indigenous Research Committee is building this information base from a number of collaborative research projects, under guidance of the Kakadu Research and Management Advisory Committee. Specialist guidance is required to develop the marine and coastal component of the research program.

#### Approach

NESP Project 3.19 will assist in the identification of marine and coastal issues that require better understanding, and support the development of an appropriate research strategy to address them. It will: systematically compile and analyse existing information; identify knowledge gaps and research priorities; consider Traditional Knowledge and newer science together; consider both culture and environment; update research protocols; co-design research projects to address short and longer-term priorities; and, draft this information into a research strategy.

## Project 3.20

### Supporting Indigenous people's participation in environmental markets

#### Project Leader

Dr Rachel Groom, Charles Darwin University

#### Challenge

The carbon and nature repair markets as they apply to coastal ecosystems present important opportunities for coastal Indigenous communities to support land and sea country management, improving the long-term health and sustainability of these important ecosystems. However, for Indigenous organisations to participate in these markets, they must be empowered to navigate legislation, regulations, land tenures, resource ownership, co-benefits, and informed consent; with confidence, and through clearly defined processes. It is timely for these complex issues to be considered and investigated, to ensure that a lack of readiness and enabling environments does not exclude Indigenous land and sea managers from these rapidly evolving markets.

#### Approach

The project aims to establish foundational knowledge, networks, and processes for engagement in Blue Carbon and coastal environmental repair markets through a collaborative program. This includes addressing knowledge gaps, co-designing participation processes and guides, outlining information on Indigenous people's interests and rights for public awareness, generating region-specific information products such as maps and reports, defining protocols for free, prior, and informed consent, and aligning components pertinent to both Blue Carbon and Environmental markets.



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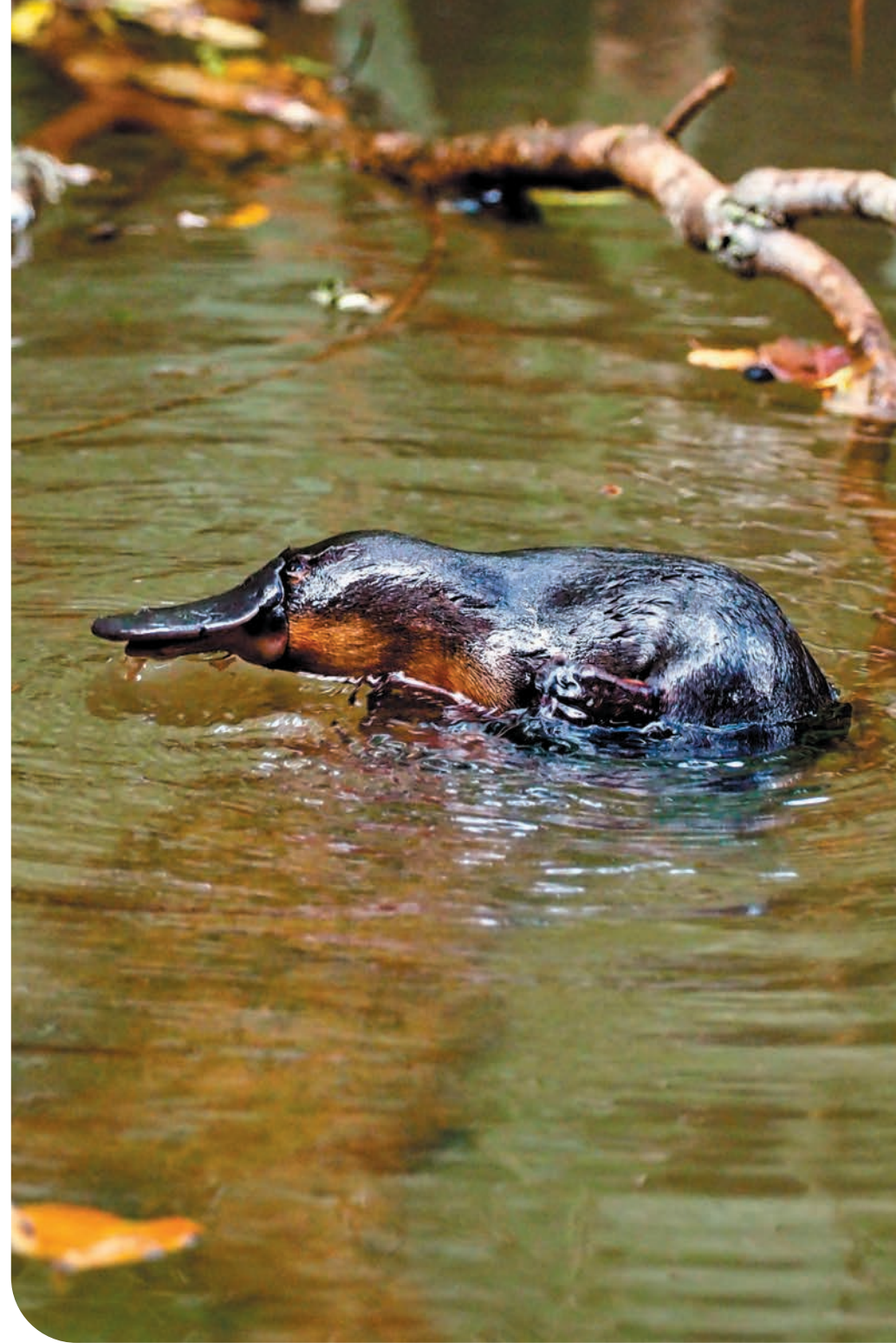


# Image credits

1	COTS diver culling crown-of-thorns starfish on the Great Barrier Reef	Rick Abom / C2O Consulting	18	As a partner in implementing the South Fly Resilience Program, INLOC has an expanded implementation force of 180 Rangers, and has been tasked to deliver on-ground projects	INLOC
2	Tropical rainforest	Suzanne Long	19	Catfish nests in the Mulgrave-Russell River	Rick Abom / C2O Consulting
5	Citizens of the GBR Field collection snorkeller for Great Reef Census	Nicole McLachlan	20	TropWATER scientist checking a Mulgrave-Russell River water quality monitoring station	Rick Abom / C2O Consulting
7	Daintree River bends in the Daintree Rainforest, Australia	Michael / AdobeStock	20	Community workshop for Program managers and farmers for the Mulgrave-Russell Regional Water Quality Program	Rick Abom / C2O Consulting
8	Gulf estuary scene	Stephen Faggotter	20	Rain on a creek that feeds into the Mulgrave-Russell River	Rick Abom / C2O Consulting
9	Green turtle in seagrass meadow	TropWATER / JCU	20	Pacific Marine Group with the Banksia Award for their COTS control and research activities	Rick Abom / C2O Consulting
10	Assessing greenhouse gas emissions from damaged wetland soils	Alex Pearce	21	Eelgrass bed	divedog / AdobeStock
11	A commercial fisher releasing a 2.5 m long freshwater sawfish from a gillnet in the Gulf of Carpentaria. Sawfish survive captured in gillnets when care is taken to release them	Richard Pillans / CSIRO	22	Great Barrier Reef, Queensland, Australia	filipefrazao / iStock
12	COTS diver culling crown-of-thorns starfish on the Great Barrier Reef	Rick Abom / C2O Consulting	22	Great Barrier Reef, Queensland, Australia	Janelle / AdobeStock
13	COTS diver culling crown-of-thorns starfish on the Great Barrier Reef	Rick Abom / C2O Consulting	22	Green turtle	ArtHouse Studio / Pexels
14	COTS diver culling crown-of-thorns starfish on the Great Barrier Reef	Rick Abom / C2O Consulting	23	Anthias are a peaceful community fish that are usually seen swimming in large groups amongst coral reefs	Rick Abom / C2O Consulting
14	Blue Planet Marine with the Banksia Award for their COTS control and research activities	Rick Abom / C2O Consulting	24	Oblique-banded sweetlips	Gretta Pecl
14	Paul York from TropWater providing training on water quality monitoring on the mid-shelf and outer reefs	Rick Abom / C2O Consulting	26	Orman reef turtles	TropWATER / JCU
15	Deadly Women graduates at the 2023 Deadly Women graduation ceremony with RRRM Managing Director & Company Secretary Sheriden Morris and Deadly Women Program Manager Lydia Miller	Elliot Bairstow / Danae Jones Consulting	26	A north Queensland floodplain	Nathan Waltham
16	Deadly Women graduates at the 2023 Deadly Women graduation ceremony with RRRM Managing Director & Company Secretary Sheriden Morris and Deadly Women Program Manager Lydia Miller	Elliot Bairstow / Danae Jones Consulting	27	Bininj Traditional Owners in Kakadu National Park using an interactive data dashboard to explore changes coverage of weeds after management	NAILSMA
17	Training of 52 Community Rangers (40 male and 12 female candidates) for Treaty Village Resilience Program	RRRC	27	NAILSMA team members Raph Clarke and Marius Clarke out on country with Aak Puul Ngantam Rangers and Traditional Owners	NAILSMA
18	Waidana Gauso (far left), a ranger support officer (RSO) from Mabaduan village, welcomes three new female RSOs living with a disability to the BRTV program	RRRC	28	Potato cod	Rick Abom / C2O Consulting
18	Dorothy, Lesia, Yawan and Dani hold birthing kits used during childbirth in their villages of Mari and Tais in the South Fly	RRRC	28	Weipa Mission River bridge	Suzanne Long
18	Building Resilience in Treaty Villages (BRTV) program	RRRC	29	Gary Fry and Richard Pillans untangling a green sawfish from a gillnet in the Skardon River, Queensland	Josh Lyon
			29	Oyster	Rick Abom / C2O Consulting
			29	White sandy beach in Far North Queensland	Suzanne Long
			30	Coral cod on the Great Barrier Reef	Rick Abom / C2O Consulting
			30	A north Queensland river	Nathan Waltham



31	Seagrass meadows fringing the Port of Weipa	TropWATER / JCU
31	Intertidal seagrass in Yanyuwa Sea Country	TropWATER / JCU
32	Macquarie University master's student Oscar Jones collects Rakay above-ground biomass in a pig exclusion plot on the Gurumurr Floodplain in East Arnhem Land, Northern Territory	Emilie Ens
33	Researchers attaching a miniPAT satellite tracker on a Largetooth sawfish	Richard Pillans / CSIRO
33	Offshore oil platform	Ira Bowman / Pexels
34	Neonate <i>Pristis pristis</i>	Levi Rich
34	Satellite tagging a largetooth sawfish	Richard Pillans / CSIRO
35	Minke whale	Christian / AdobeStock
36	Dugong	Christophe Cleguer
36	Citizensof the GBR Analysing AI-Human Eye Approach for the Great Reef Census	NicoleMcLachlan
37	Poor coastal planning resulted in a failed Port Hinchinbrook resort that got wiped out by Cyclone Yasi	Suzanne Long
37	Yanyuwa sea country	Google Earth
38	John Clark conducts a verification interview with Mapoon rangers Sarah Barkly and Jason Jia AbCF	Indigenous Carbon Industry Network
38	Recapture in June 2023 of an olive-headed sea snake trawled and tagged in September 2022, Exmouth Gulf	Laura Murray
38	Feral pig control event in Far North Queensland	Suzanne Long
39	Survey of Shark Bay on 9 June 2023	Christophe Cleguer
40	Feral pig control event in Far North Queensland	Suzanne Long
41	Survey of Shark Bay on 8 June 2023	Christophe Cleguer
42	Short-nosed sea snake bycatch	James Nankivell
43	Feather stars are a type of marine invertebrate with featherlike arms that radiate from a central body	Rick Abom / C2O Consulting
44	Flooded wetlands at Kakadu, Northern Territory, Australia	Andrew / AdobeStock
47	Platypus	Rick Abom / C2O Consulting
48	Whitetip reef shark	Rick Abom / C2O Consulting







We acknowledge the Traditional Owners and Custodians of the Country where we work and pay our respects to all Traditional Owners of Australia past, present and emerging.

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