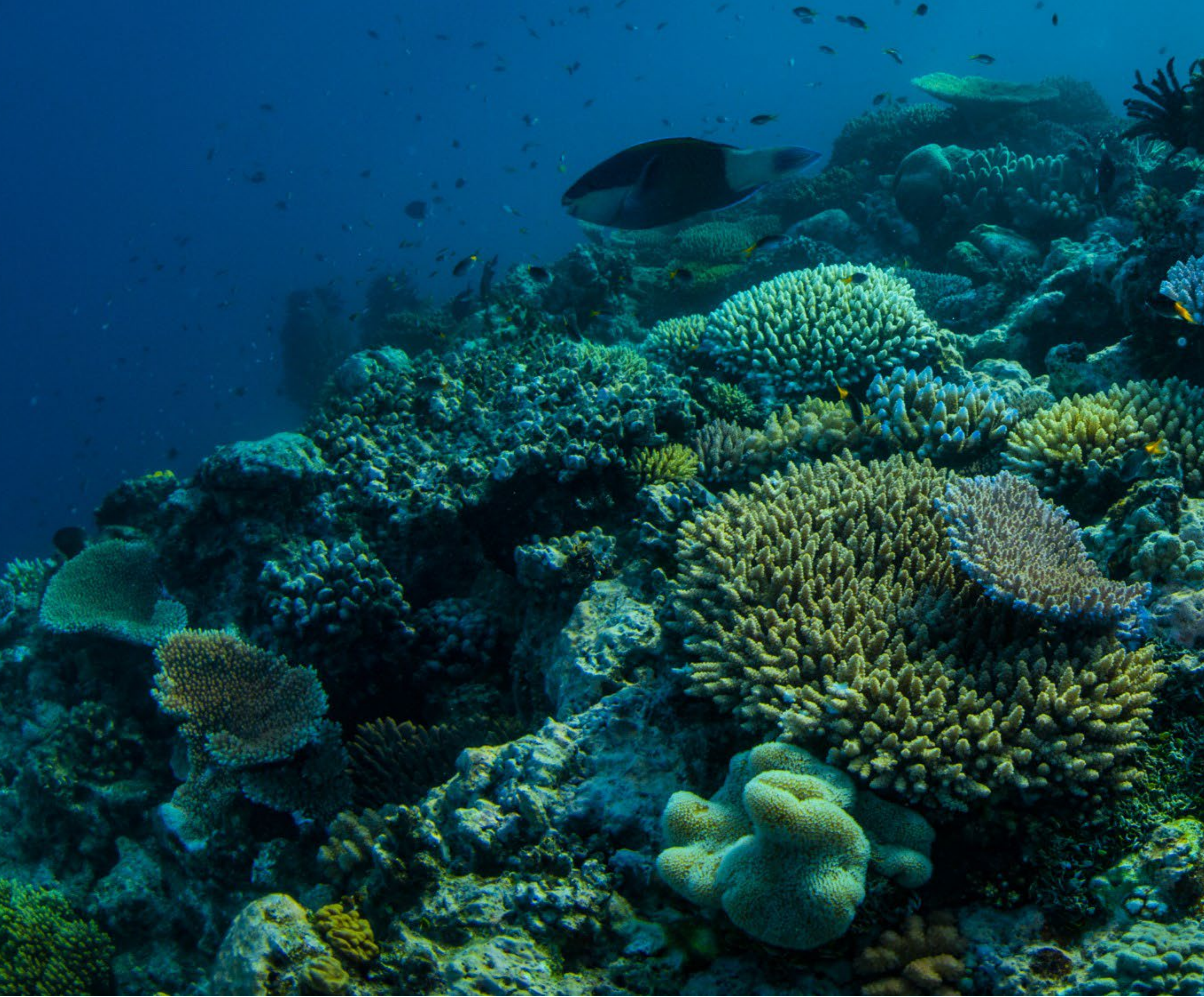
REEF RESTORATION & ADAPTATION PROGRAM

Sub-program Management, Field Program and Trials (CAD-03)

Final Report June 2025

Howlett, L., Forster, R., Molinaro, G., Randall, C.J., Severati, A. and Abdul Wahab, M.



RRAP Sub-program Management, Field Program Trials (CAD-03) Final Report June 2025

Enquiries should be addressed to:

Dr Lorna Howlett, lh.howlett@aims.gov.au;

Dr Muhammad Abdul Wahab, m.abdulwahab@aims.gov.au

Cover Page: Coral reef, Credit: Gary Cranitch, Queensland Museum

This report should be cited as

Howlett, L., Forster, R., Molinaro, G., Randall, C.J., Severati, A. and Abdul Wahab, M. (2025) Reef Restoration and Adaptation Program – Sub-Program Management, Field Program and Trials (CAD-03) Final Report 2025. (18pp).

Copyright and Disclaimer

This report summarises work undertaken under *Sub-Program Management, Field Program and Trials (CAD-03)* in accordance with the Reef Restoration and Adaptation Program's *Coral Aquaculture and Deployment* Project Agreements. It provides a summarised, point-in-time synopsis of activities, methods, findings and outcomes completed in accordance with the approved project scope up to 30 June 2025.

All information reflects project scope and outcomes as of May-June 2025. Subsequent updates, analyses, or scientific developments are not included. This report should be read alongside any associated and publicly available technical reports, datasets, and publications for full detail. This report does not provide scientific inferences, policy guidance or operational instructions beyond the project's defined scope and duration.

Acknowledgement

This work was undertaken for the Reef Restoration and Adaptation Program (RRAP). Funded by the partnership between the Australian Government's Reef Trust and the Great Barrier Reef Foundation, partners include: the Australian Institute of Marine Science, CSIRO, the Great Barrier Reef Foundation, Southern Cross University, the University of Queensland, Queensland University of Technology and James Cook University.

The RRAP partners acknowledge Aboriginal and Torres Strait Islander Peoples as the first marine scientists and carers of Country. We acknowledge the Traditional Owners of the places where RRAP works, both on land and in sea Country. We pay our respects to elders; past, present, and future; and their continuing culture, knowledge, beliefs, and spiritual connections to land and sea Country.

We specifically acknowledge and thank the following Traditional Owners of sea Country that this report relates to:

Location	Traditional Owner Group
Davies Reef	Bindal
Palm Island Group	Manbarra
John Brewer Reef	Manbarra
Moore Reef	Gungandji

Table of Contents

List of Tables

1 Executive Summary

The overall aim of the Reef Restoration and Adaptation Program (RRAP) Sub-program Management, Field Program and Trials (CAD-03) Project was to enhance management, collaboration and co-ordination across the RRAP Enhanced Corals and Treatments (ECT) and Coral Aquaculture and Deployment (CAD) Sub-programs and partner institutions, including the Australian Institute of Marine Science (AIMS), University of Queensland (UQ), Queensland University of Technology (QUT), Griffith University, the Royal Melbourne Institute of Technology (RMIT), James Cook University (JCU), Macquarie University and University of Melbourne. This was achieved via three distinct sub-projects:

- CAD-03.1: Sub-program Leadership,
- CAD-03.2: Field Program, and
- CAD-03.3: Large Field Trials.

Over the past five years of RRAP, the Sub-Program Leadership sub-project played a pivotal role in managing many projects within the RRAP ECT and CAD Sub-programs by establishing robust project management systems. A core leadership team facilitated project planning through regular workshops, check-in meetings, and the development of practical tools such as "How To" guides and centralised milestone tracking tables. The regular check-in meetings ensured efficient scheduling of experimental spaces like SeaSim and field trips, while reporting templates captured deliverables, milestones, and risks. A comprehensive and evolving Data Management Plan, supported by the AIMS Pearl database, guided data storage and evidence cataloguing. Sub-program leadership collaborated with the AIMS Indigenous Partnerships team to embed culturally appropriate engagement practices, including Free, Prior and Informed Consent (FPIC), and ensured consistent communication with Traditional Owners via near annual meetings, presentations, and updates. Leadership efforts also supported the expansion of research into new initiatives like the Pilot Deployments Program (PDP), ReefSeed, the development of an automated Device Assembly Machine, and facilitated planning for business development. The team fostered academic growth, supporting 31 higher degree research (HDR) students and organising professional development activities, while also delivering Traditional Owner internships. In addition, industry and cross-sub-program collaboration was enhanced through monthly integration meetings and contributions to events like the 2024 and 2025 PDP Industry Information Sessions, and the RRAP Independent Risk Review Group (IRRG) meetings and workshops, reinforcing multidisciplinary engagement across RRAP.

The Field Program and Large Field Trials (LFT) also successfully coordinated and executed >60 field trips across the Great Barrier Reef (GBR), ranging from day trips to land-based and research station visits, to large vessel expeditions. Field efforts were designed collaboratively between the RRAP Enhanced Corals and Treatments (ECT) and Coral Aquaculture and Deployment (CAD) teams, with site selection and experimental planning structured to optimise shared logistics, deployment, and resurvey activities. The LFT sub-project deployed >16,000 experimental devices across four years to test various design and performance variables. For LFT Year One, 1,200 devices were deployed across 10 sites at Moore Reef to assess deployment device performance across wave energy gradients. LFT Year Two saw 2,250 devices deployed across nine sites at Davies Reef to evaluate efficacy and identify upscaling bottlenecks. For LFT Year Three, 9,514 devices were deployed across 24 sites at three reefs involving six coral species, representing a fully collaborative deployment between ECT and CAD teams (across 13 experimental research streams); data collected from these experiments are currently being analysed, with an integrated framework document that could be applied for future large-scale deployments in development. Despite the impact of Tropical Cyclones Kirrily and Jasper in 2024, LFT Year Four achieved the deployment of 3,070 devices across 21 sites at four reefs. All field activities were managed under Great Barrier Reef Marine Park Permits.

Through cataloguing lessons learnt from the RRAP Sub-program Management, Field Program and Trials (CAD-03) Project over the last five years, key recommendations have been identified to enhance future management workflows, fieldwork coordination, and large-scale collaborative field experiments. Establishing sub-project or large-scale deployment leadership teams at an early stage would streamline planning for future research. Additionally, workshops involving representative personnel from each partner or institution would help identify synergies and potential efficiencies in deployments and resurvey trips. Engaging partners from all institutions from the beginning and throughout the life cycle of future projects will ensure collaborators feel confident contributing to both planning and delivery, particularly if fieldwork and leadership work packages are managed by a single partner.

For large-scale field trials, it is recommended that future efforts focus on validating model-based site selection. These field trials should assess coral survival across various environmental gradients and spatial scales. Experimental hubs have also been suggested as potential designs to improve the efficacy of fieldwork and resurveys across multiple sub-programs. For instance, having multiple experimental plots within reefs, replicated across latitudes within eco-regions, would enable EcoRRAP (Ecological Intelligence for Reef Restoration, another RRAP Sub-program) sites to serve as controls for nearby deployment and genetic monitoring sites.

2 Background and Justification for the Research

The RRAP Sub-program Management, Field Program and Trials (CAD-03) project contains three sub-projects that deliver:

- Leadership of the RRAP Coral Aquaculture and Deployment (CAD) and RRAP Enhanced Coral and Treatments (ECT) Sub-programs including comprehensive research business, engagement and communication plans, and reports updated annually.
- The integrated field program for RRAP Projects - Coral Propagation and Deployment (CAD-01), Engineering Large Scale Coral Aquaculture (CAD-02), Genetic Basis of Key Traits (ECT-01), Assisted Evolution (ECT-02), Prokaryotes Treatments and Coral Nutrition (ECT-03), and Ecological and Genetic Adaptation (ECO-03), including communication products and updated procedures curated to Program standards.
- Two large demonstration field trials in years two and four including all aspects of planning, execution and communication in collaboration with RRAP and project teams, research partners and other stakeholders.

2.1 CAD-03.1: Sub-program Leadership

The leadership team aimed to assemble teams of experts to develop and execute a sub-program level plan of research and development (R&D) to address core objectives of the RRAP program. This encompassed a high level of research project management including planning, scheduling and reporting of contracts, permits etc. The positions within this sub-project also encompassed leadership to develop a positive and dynamic environment of collaboration and innovation through meetings, discussion groups, workshops, and think-tanks. This was supported by business development to attract additional third-party investment into research, capacity building and training.

The key objectives of CAD-03.1 were:

- Implementation of project management systems for the projects within the RRAP Coral Aquaculture and Deployment (CAD) and RRAP Enhanced Coral and Treatments (ECT) Sub-programs.
- Facilitation of quarterly reporting, including the curation of metadata and document records.
- Sub-program plans for Traditional Owner and other stakeholder engagement, data management, collaboration and communication.
- Sub-program plans for education and training, and business development.
- Annual engagement, communication, or collaboration activity.
- Annual Report for the RRAP CAD and ECT Sub-programs.

2.2 CAD-03.2: Field Program

This sub-project provided coordinated access to reefs across latitudinal (regions) and longitudinal (cross shelf) gradients on the GBR multiple times per year. The annual cruise plan met the field access needs of numerous RRAP projects (CAD-01, CAD-02, ECT-01, ECT-02, ECT-03, and ECO-03). The Field Program supported coral collections across large geographic scales including collections of corals for spawning, fragmentation, and experiments across the projects within the RRAP ECT and CAD Sub-programs, and for other RRAP sub-programs such as Cryopreservation (CP-01). The program also supported the deployment of coral recruits and fragments for research and to make multiple measurements per year on local reefs.

Two full time field technicians facilitated permitting, organisation and planning of field trips, as well as writing and testing standard operations for deployment, sampling, and data collection. The technicians focussed on optimising data collection and analysis methods, and development associated Standard Operating Procedures (SOPs). The central coordination of field work enabled multiple projects to work concurrently and offered the most effective and efficient approach to meet the field requirements of projects across the RRAP ECT and CAD Sub-programs.

2.3 CAD-03.3: Large Field Trials

Ecological modelling conducted during the early stages of RRAP indicated that for coral propagation-based interventions to have meaningful ecological impact, deployment would need to occur at medium to large spatial scales. Medium-scale deployment was defined as restoration activities across multiple reef clusters (up to 50 reefs) with the annual production and deployment of 10 to 100 million coral propagules. Large-scale deployment was defined as supporting broader ecosystem recovery across more than 200 reefs, requiring the annual production and deployment of over 100 million coral propagules. At the start of RRAP, neither of these scales of intervention had been attempted in practice.

The rationale behind the project objectives is based on the need for a structured and integrated approach to sub-program management (for the RRAP CAD and ECT Sub-programs), consistent and efficient field operations, and the progressive demonstration of large-scale deployment feasibility. By implementing a leadership team and project management systems, facilitating stakeholder engagement, and delivering coordinated reef access and research support, this project aimed to streamline the logistical, operational, and collaborative foundations of the sub-program. In addition, the Large Field Trials were critical to determine the efficacy and real-world applications of the RRAP CAD and ECT Sub-programs research interventions, ultimately contributing to the knowledge, capability, and risk assessments needed to scale these interventions to ecologically meaningful levels across the GBR.

3 Research Objectives and Key Findings

A current list of project outputs are listed on the RRAP website: gbrrestoration.org. Key research objectives and findings are detailed below.

Table 1: Key findings of the Project aligned to the overarching and specific research questions for each sub-project.

Objective		Key Findings and/or Outcomes
1. CAD-03.1: Sub-program leadership		
1 (a)	Implementation of project management systems for RRAP CAD and ECT Projects	As part of the CAD-03.1 objective to manage multiple projects within the RRAP ECT and CAD Sub-programs, comprehensive project management systems were established. A core leadership team was formed to provide strategic oversight, complemented by facilitated planning workshops and regular check-in meetings to ensure continued alignment on sub-program and project goals, timelines, and resource allocation. Practical “How To” guides were developed to assist staff and students with scheduling experiments and sea time and managing field and SeaSim budgets. Fieldtrip and SeaSim users’ meetings were regularly held to support coordinated use of experimental space and resources based on evolving project needs. Several centralised summary tables were also created and maintained throughout the project’s duration, capturing all active projects and sub-projects, their cost codes, associated staff and students, affiliations, and contact information. These systems and resources were updated over the five-year period to ensure accuracy, usability, and support for collaborative research within the RRAP ECT ad CAD Sub-programs, spread over several institutions, including AIMS, QUT, the University of Queensland, Southern Cross University (SCU), Griffith University, RMIT, James Cook University, and Macquarie University.
1 (b)	Facilitation of quarterly reporting, including the curation of metadata and document records	Quarterly reporting processes were run via the development and application of Microsoft Excel reporting templates to capture deliverables, milestones, highlights, and potential issues from all projects. A comprehensive Data Management Plan for the RRAP ECT and CAD Sub-programs was created early in the program to establish file and variable nomenclatures. This plan was actively updated throughout the five-year period to reflect evolving data types, storage protocols, and access requirements. Long-term storage of data was primarily managed through the AIMS Pearl database. These document management practices were applied to catalogue evidence, including research outputs, Standard Operating Procedures, and field activity reports, in alignment with reporting cycles and projects. These efforts supported accurate sub-program-level reporting and enhanced information accessibility for partners and leadership.
1 (c)	Sub-program plans for Traditional Owner and other stakeholder	Sub-program-level planning was implemented to support coordinated and effective Traditional Owner engagement, stakeholder communication, data management, and collaboration. The sub-program leadership team established collaborations with the AIMS Indigenous Partnerships (IP) team, who facilitated processes to obtain Free, Prior and Informed Consent (FPIC) for all fieldwork, including opportunities for participation in

Objective		Key Findings and/or Outcomes
	engagement, data management, collaboration and communication	project planning, research activities, and knowledge sharing. A formal Communication Plan and a Data Management Plan were both established early in the sub-program and actively updated throughout the first phase of RRAP. The Communication Plan provided the RRAP and AIMS communications teams' information on the research plans, objectives and key findings to maintain consistent, transparent interactions with stakeholders, while the Data Management Plan outlined protocols for data handling, metadata curation, and long-term storage, primarily using the AIMS Pearl database. Both documents then assisted Project Coordinators within CAD-03.1 to create and share research updates with Traditional Owner groups as required. Collaboration across projects was supported through shared Microsoft Teams channels and files, regular cross-team coordination meetings, and the use of summary documentation tracking project details, team members, and contacts.
1 (d)	Sub-program plans for education and training, and business development	Sub-program planning supported a range of business development activities across new programs and projects emerging from RRAP research, including the Pilot Deployments Program (PDP), future phases of RRAP, OceanUs, AIMS Appropriation Projects, technical support for the McLaren and Great Barrier Reef Foundation collaboration, Coral Research and Development Accelerator Platform (CORDAP), ReefSeed, and the Technology, Entertainment, Design (TED) Audacious Projects. Planning teams and dedicated working groups were established within ECT and CAD and across RRAP Sub-programs and AIMS to guide development and delivery, supported by targeted workshops and planning meetings that helped define project directions and integrate multi-disciplinary expertise. Within the RRAP ECT and CAD Sub-programs, 31 HDR students completed research projects and theses, supported by sub-program leadership via supervision within AIMS and across external institutes, administrative and fieldwork support, and the organisation of writing retreats and professional development courses, such as Australian Diver Accreditation Scheme (ADAS) certifications and Coxswains certificates. Traditional Owner internships and training placements were designed and implemented to build capacity for Traditional Owner groups..
1 (e)	Annual engagement, communication and collaboration activities	The RRAP ECT and CAD sub-program leadership teams, in collaboration with the AIMS Indigenous Partnerships (IP) team, delivered a range of engagement and communication activities throughout the year. Researchers regularly presented fieldwork plans and research goals to Traditional Owner groups, supporting the Free, Prior and Informed Consent (FPIC) process on an ongoing, near-annual basis. Team members also shared research outcomes with national and international scientific audiences. Industry engagement activities included presentations on the RRAP CAD Sub-program aquaculture and deployment methods during the 2025 Pilot Deployments Program (PDP) Industry Information Session. To further support collaboration, Project Coordinators facilitated monthly cross-sub-program meetings involving PDP, and RRAP CAD, ECT, and Translation to Deployment (T2D) project teams, promoting integration and knowledge exchange across disciplines and institutions.

Objective		Key Findings and/or Outcomes
2. CAD-03.2: Field Program		
2 (a)	Undertake multiple-day field access to key Reefs across the GBR, three times per year across four years	A total of 60 field trips were undertaken across the GBR within the four years. The field trips ranged from shared large ship trips, and land-based day trips to research-station based field trips. Where possible the RRAP ECT and CAD teams chose sites and experimental designs to facilitate shared resources, deployment and resurvey trips.
3. CAD-03.3: Large Field Trials		
3 (a)	Design collaborative experimental plan for the Large Field Trials (LFT) consistent with RRAP objectives	The below LFT experimental deployments were adapted (see below) to best fit science objectives: Year One - 1200 devices deployed across 10 sites at Moore Reef to test different device shapes across a wave energy gradient. Year Two - 2250 devices deployed across nine sites at Davies Reef to test star shaped device performance across an environmental gradient and to test deployment methods to identify pinch points for upscaling. Year Three – 9514 devices deployed across 24 sites at three reefs with six species. This was a collaboration of experimental questions within the RRAP ECT and CAD project teams. From this collaborative experimental design, a framework is being produced. Year Four – 3070 devices were deployed across 21 sites at four reefs. Again, a collaborative experimental design. Some questions were repeatedly tested as the previous deployment was affected by both Tropical Cyclones Kirrily and Jasper.
3 (b)	10,000 devices (20,000 to 60,000 coral propagules) are deployed in year two across multiple sites of one reef.	
3 (c)	100,000 devices (200,000 to 600,000 coral propagules) are deployed in year four across multiple reefs and multiple plots per reef.	
3 (d)	Coordination of data collection, analysis and interpretation with relevant RRAP ECT and CAD project teams.	Data collection is complete for the Year Three LFT deployments and analysis is underway. Shared oceanographic, benthic and device control data between the CAD and ECT experimental questions will make for more meaningful, integrative and efficient analysis.
3 (e)	Ensure all required permits and approvals are in place prior to field work.	The research permits for operations in the Great Barrier Reef Marine Park have annual reports that are submitted to the Reef Authority which keeps track of all the approved field work, equipment that is deployed and any collections. These permits are valid until the 31 August 2026.
3 (f)	Implement engagement and communications specific to the Large Field Trials.	CAD assisted the RRAP Stakeholder and Traditional Owner Engagement (ENG) Sub-program with communication activities to stakeholders within the Cairns-Port Douglas Reef Hub, specifically in relation to the Large Field Trials. This has resulted in a peer-reviewed publication (Curnock et al. 2024).

Adjustments to key research objectives

Table 2: Variation in the Project over time.

Initial Research Question	Explain when, how and why the research question changed
3(c) 100,000 devices (200,000 to 600,000 coral propagules) are deployed in year four across multiple reefs and multiple plots per reef.	This was an audacious target set out at the start of RRAP. Large Field Trials (LFT) Years One to Four were able to deploy >16,000 coral deployment devices, despite numerous setbacks resulting from cyclones, bleaching events, and larval mortality. Whilst these deployments weren't at the scale originally proposed, the LFTs allowed for multidisciplinary experiments across several environmental gradients to support the RRAP Modelling and Decision Support (M&DS) Sub-program and the Pilot Deployments Program, and provided critical process data that has resulted in year-on-year improvements in speed and scale of production.

4 Future Research Recommendations

4.1 CAD-03.1: Sub-program leadership

While this sub-project is not specifically a research project, lessons learnt throughout the first phase of RRAP with regards to managing multi-disciplinary and -institutional projects will be key to ensuring success and impact into the future:

- Future large-scale, multi-team coral deployments face significant logistical and coordination challenges if early planning, leadership alignment, and consistent project-wide communication are not prioritised. Based on lessons learnt from previous efforts, we recommend developing a preliminary experimental and deployment plan well ahead of any proposed field activities – at least six months in advance. This plan would assist in progressing permit discussions with regulatory authorities, such as the Reef Authority, even if the plan remains in draft form during early stages.
- If resourcing and project approvals allow, holding regular workshops in the lead-up to key biological windows (e.g. coral spawning) would help refine project objectives, identify risks and collaboration opportunities, and support more efficient allocation of shared resources across participating teams. These sessions have served as important forums during previous large-scale spawning and deployment activities, ensuring coordination and mutual understanding, particularly in multi-institutional contexts, and pre-empting issues.
- It would also be worth considering the establishment of a dedicated leadership and management group to guide large-scale deployments across multiple future projects. This group could include sub-program leads, researchers, postdoctoral fellows, and field technicians, and would support ongoing communication and decision-making throughout the deployment timeline. While this structure proved effective in past projects, its future implementation would depend on the scale of the work, available funding, and alignment across institutions. Adopting such a model could improve responsiveness and cohesion, and manage risk, although its suitability would need to be assessed in relation to specific project contexts.

4.2 CAD-03.2: Field Program

Again, this Field Program was not a research project per se, but rather an effective, collaborative platform to allow coordination of fieldwork across teams, sub-programs and institutions within the RRAP ECT, CAD and EcoRRAP Sub-programs. The following are some key lessons learnt, which would benefit future joint field programs within RRAP and beyond, where alignment of fieldwork and resources would improve efficacy and scientific rigour:

- Previous single-site coral deployments within eco-regions have demonstrated vulnerability to extreme weather events, often resulting in substantial loss of deployed corals and significant reductions in sample sizes. These outcomes highlight the need to deploy at multiple, spatially distributed sites within eco-regions, potentially across latitudinal gradients, to buffer against localised impacts from cyclones, freshwater bleaching, flood plumes, high winds, or extreme heat waves. Implementing such replication could improve the robustness and interpretability of field trials. However, current permitting arrangements may limit the ability to establish multiple sites. Where this is the case, it may be advisable to explore potential permitting changes well in advance, ideally at least a year prior to any proposed experimental deployments, to ensure adequate site coverage.
- When field programs involve multiple institutions but are led solely by one organisation, such as AIMS, there is a risk that other partners may feel excluded from planning processes or inadequately prepared to contribute. To address this, future programs could benefit from strengthened communication structures that include representatives from all participating institutions. Providing clear opportunities for input, questions, and collaborative planning, particularly at project inception,

may help foster greater cohesion. Early overviews of planning timelines, logistical frameworks, and institutional requirements would assist in aligning expectations and operational readiness across all stakeholders.

- There have also been instances where limited coordination between different RRAP Sub-programs, such as CAD, ECT and EcoRRAP, resulted in mismatches in design or site usage, thereby reducing opportunities for resource sharing. Joint planning workshops have indicated that closer integration of experimental designs and field programs could provide mutual benefits. For example, EcoRRAP sites may serve effectively as natural controls, while ECT/CAD sites would be for targeted deployments or genetic sampling. Such alignment would support more efficient use of field resources and increase scientific return.
- It has been proposed that critical longitudinal studies on a selected subset of EcoRRAP Reference Reefs be extended to improve replication for intervention testing, investigate the relationships among ecosystem function, environmental variability, and coral population dynamics, and establish natural disturbance baselines to serve as counterfactuals for intervention evaluation. Leveraging existing longitudinal data and applying emerging monitoring technologies may help evaluate the performance of different restoration approaches under varying environmental conditions, for instance, whether heat-tolerant corals exhibit greater resilience following mass bleaching events. A targeted subset of sites, potentially selected in consultation with intervention leads, could be surveyed annually and following disturbance events to generate insights into how coral vital rates and ecosystem functions respond across reef types and latitudes. These efforts may help guide future deployment strategies and inform broader upscaling considerations, subject to alignment with program priorities and resource availability.

4.3 CAD-03.3: Large Field Trials

The survival dynamics of early-stage corals deployed into reef environments are known to be complex, species-specific, and highly variable, even among sites located in close geographic proximity. This variability presents a challenge for the development of effective large-scale coral deployment strategies. While site selection is increasingly informed by predictive environmental models, these model outputs have yet to be validated through field-based testing. There is a need to further investigate how well these predictions apply across different coral species and spatial contexts, and how site-specific processes influence early survival outcomes.

- It is recommended that future work explore the validation of model-based site selection through field trials that assess coral survival across a range of environmental gradients and spatial scales. These trials could incorporate high-frequency censusing supported by field stations, with potential integration into existing monitoring frameworks such as those under the Joint Field Program. This would enable the collection of data related to broodstock, seeding device deployment, and offshore reef censusing, subject to resource availability.
- There may also be value in expanding current coral deployment trials involving heat-evolved photosymbionts. A possible approach could include lab-based selection and inoculation of corals with symbionts, followed by field deployments at multiple locations to evaluate phenotypic traits such as thermal tolerance and growth. Comparisons between corals inoculated with heat-evolved versus wild-type symbionts might provide insights into ecological performance and the potential spread of introduced symbionts under natural reef conditions.
- Establishing experimental hubs has been suggested as a means of supporting longer-term, multigenerational studies focused on coral thermal tolerance, growth, and fecundity. If pursued, these hubs could facilitate collaborations across multiple research areas, enabling detailed in situ observations, transplant experiments, and complementary laboratory work. Such efforts might also support the mapping of coral phenotypes and genotypes to guide the selection of heat-adapted broodstock. Expanding these investigations to include additional coral species and traits relevant to

restoration could help refine intervention strategies. Overall, characterising coral performance across environmental gradients, and better understanding the trade-offs involved in restoration interventions, would be valuable steps toward optimising large-scale deployment efforts.

5 References

Curnock, M.I., Arya, R., Chamberland, E., Chartrand, K., Edmondson, J., Fisher, E.E., Forster, R., Lockie, S., Loder, J., Nembhard, D. and Scott, A., 2024. Reef visitors' observation of assisted coral recovery devices in situ reduces concern about their use. *PloS one*, *19*(11), https://doi.org/10.1371/journal.pone.0313345

RRAP REEF RESTORATION & ADAPTATION PROGRAM

Australian Government | Reef Trust

Great Barrier Reef Foundation

Australian Government | Australian Institute of Marine Science

CSIRO

James Cook University Australia

QUT

Southern Cross University

The University of Queensland Australia