Wetlands-Related Citizen Science Projects in Queensland

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Queensland Government

EXECUTIVE SUMMARY

Introduction

The Reef 2050 Wetlands Strategy, as a part of the overarching Reef 2050 Plan, highlights the significance role of citizen science in advancing wetlands management. By following the ten (10) core principles, citizen science enables the active participation of public in research, thus providing valuable insights to scientists, policymakers, and communities. This approach is enhanced by technological advancements that facilitate extensive and long-term data collection.

The Wetlands Unit at DESI is driven by the potential of citizen science to significantly enhance the management of wetlands in Queensland. The Wetlands Unit is dedicated to assessing current citizen science initiatives within Queensland, with a focus on understanding the diversity of projects, geographic coverage and key organizations involved. The report's purpose is to evaluate citizen science initiatives related to wetlands in Queensland. It focuses on identifying the types of wetlands involved, the organizations leading these projects and offering strategic recommendations. These recommendations aim to enhance the engagement of citizen science in wetlands management, while also providing essential safety guidelines for activities conducted in these environments.

Key Findings

An intensive review of the relevant documents, websites and stakeholder consultations produced an inventory of wetlands-repeated citizen science activities that form the foundation of this study. The review indicates that citizen science activities, both related and unrelated to wetlands, are widespread across various fields at national and state levels. Numerous international, state and local groups are taking the lead in driving significant on-the-ground changes in response to urgent issues.

Queensland hosts a significant array of wetlands-related citizen science activities distributed throughout its twelve Natural Resource Management regions. A pattern is evident in the focus of citizen science across Queensland's NRM regions, where some areas received more attention than others, often influenced by factors such as population density. Similarly, marine wetlands tend to attract more focus compared to other wetland types. The review also identified various groups leading diverse citizen science initiatives, including specialized wetlands-focused organizations which present opportunities for collaboration.

While there is extensive information on these activities, there is also substantial insights into the barriers and challenges they face. The gaps and barriers encompass various aspects, including the types of activities, stakeholder engagement, and the application of technologies.

Gaps and barriers related to activity types often arise from a repeated emphasis on a single type of activity and a specific species, driven by factors such as convenience, weather conditions, available funding, and the influence of active groups. Additionally, concerns arise with the use of technology and mobile apps as the primary engagement medium where user-interface issues may create a divide, potentially skewing the date collected and impacting project outcomes. Further gaps and barriers are linked to challenges in meeting legal requirements and ensuring data quality.

Opportunities exist to address these gaps and barriers. An overemphasis on specific regions, species, or activities can be reframed as an opportunity to deepen understanding in these areas. Issues such as data longevity can be mitigated through collaborative partnerships, broader outreach, and greater community engagement. Additionally, challenges can be addressed by collaborating with local governments, leveraging social media, and utilizing existing grant programs for funding.

Conclusion

Implementing the strategic recommendations from this study will significantly enhance wetlands management in Queensland. This will offer innovative solutions to pressing challenges through the engagement of diverse stakeholders. It will also create pathways for future initiatives by systematically archiving lessons learned and outcomes from various projects undertaken by the Wetlands Unit.

Ultimately, the project will contribute to the Reef 2050 Plan by safeguarding wetlands that are vital to the Great Barrier Reef, which is under severe threat from global warming and climate change. The involvement of influential groups, local governments, and indigenous communities, each bringing essential on-the-ground impacts and local knowledge is crucial for driving actions that resonate at higher decision-making levels, accelerating actions, and securing fundings for critical projects. To effectively close these gaps and eliminate barriers mentioned before, the following recommendations are proposed:

Recommendations

- **Publish Citizen Science Information**: enhance public awareness of wetlands-related citizen science activities by publishing relevant citizen science information through the Wetland*Info,* to disseminate useful information related to the activities. **Integrate into Existing Programs**: Utilize recurring activities as a means to incorporate wetlands-related citizen science into established programs.
- **Expand Outreach through Collaboration:** Partner with influential groups and existing programs to extend the reach of wetlands-related citizen science.
- **Engage Indigenous Communities:** Collaborate with indigenous groups to incorporate local knowledge on previously underexplored wetlands.
- **Strengthen Local Government Partnerships:** Foster stronger ties with local governments to prioritize and enhance wetlands-related citizen science initiatives.
- **Leverage Funding Opportunities:** Utilize grants program across various departments to address funding challenges.
- **Align Programs with User Needs:** Ensure that all programs, tools and methods are user-appropriate, align with citizen science principles, and are optimized for maximum impact.

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1. INTRODUCTION

Scientific research is often limited by how much work a small team of scientists can complete. Engaging citizen scientists can speed up the research process, enable projects to cover large geographic areas, and existent projects over longer periods of time. The information collected in such projects can then be used for a range of activities which includes informing scientists, decision makers and communities.

With the emergence of new technologies, data can be rapidly collected, verified and collated to answer large-scale questions that would often be unachievable without the community's help. Citizen science also provides opportunities for scientists to mentor and coach science enthusiasts old and young. Citizen science can also empower communities to change their social behaviour and natural environments through the provision of information that may not be readily available through other means. As a consequence, citizen science provides benefits to the participants, the scientific community, and society as a whole.

Citizen science has been identified as an essential tool to deliver the outcomes of the *Reef 2050 Long-Term Sustainability Plan* (Reef 2050 Plan)[6]. The Reef 2050 Plan is a joint response of the Australian and Queensland government to the World Heritage Committee 's recommendation to develop a long-term plan to protect the Outstanding Universal Value of the Great Barrier Reef [7].

The *Reef 2050 Wetlands Strategy: a Strategy to manage wetlands in the Great Barrier Reef and its catchments* (Reef 2050 Wetlands Strategy) sits under the Reef 2050 Plan and is a joint commitment between the Australian and Queensland Governments. The Reef 2050 Wetlands Strategy provides direction for wetland science, planning, coordination and management in the Great Barrier Reef and its catchments[7]. The Reef 2050 Wetlands Strategy includes objectives for encouraging citizen science activities: an evaluation of the previous version of the Reef Wetlands 2050 Strategy highlighted citizen science initiatives as an area of improvement for wetlands management[7]. This report will be used as a tool to address this gap.

While promoting wetlands-related citizen science is important, health and safety concerns must be addressed. Since participants may be exposed to open water bodies or wildlife, such as insects and crocodiles, this report will also provide insights into safety guidelines for working in wetlands-related citizen science projects.

2. Objectives

The primary objective of this study is to provide a snapshot of wetlands-related citizen science projects/activities in Queensland based on the region of their natural resource management (NRM) groups. Secondary objectives for this project are as follows:

- Identify the most prevalent activities occurring and the subject/areas of focus.
- Identify a list of organisations/groups working in wetlands-related citizen science projects.
- Identify a list of organisations/groups specifically working in wetlands.
- Identify programs that involve wetlands where citizen science activities can be incorporated.
- Identify gaps, implications, and opportunities to be adopted for future activities.
- Identify guidelines for safe work practices in wetlands.

3. Methodology

A desktop review of a collection of resources and grey literature was carried out to obtain information in this report. The Australian Citizen Science Association website was explored to examine the types of projects. The search resulted in finding the Citizen Science Projects Queensland 2022 listing 112 citizen science projects in Australia. The search was further refined to Queensland and activities around wetlands using:

- The Office of the Chief Scientist website
- Wetland*Info* project search tool
- The Department of Environment, Science and Innovation (DESI) website
- SciStarter
- Atlas of Living Australia
- Australian Citizen Science Association
- CSIRO project search tools
- Stakeholder meetings

A total of 124 wetlands-related citizen science activities were identified from the search which is attached as **Annexure 1** to this report.

Sections 5 and beyond outlines the details of these activities based on which this report is informed.

4. Background

Citizen Science is defined by the Australian Citizen Science Association as “public participation and collaboration in scientific research with the aim to increase scientific knowledge”[2]; the Office of the Queensland Chief Scientist also uses this definition[12]. The first national citizen science workshop in Australia was held in Canberra in 2015 where this field of science was officially recognised for expanding scientific knowledge and discovery. Following the workshop, in a media release, the Australian Chief Scientist highlighted the significant role that the general members of the community played in collecting data to help solve real world problems[1]. Citizen science is guided by ten working principles for good practice which are as follows[2]:

1. **Citizen science projects actively involve citizens in scientific endeavour that generates new knowledge or understanding.** Citizens may act as contributors, collaborators, or as project leader and have a meaningful role in the project.
2. **Citizen science projects have a genuine science outcome.** For example, answering a research question, informing conservation action, or facilitating policy decisions.
3. **Citizen science provides benefits to both science and society.** Benefits may include learning opportunities, personal enjoyment, social benefits, the publication of research outputs, contributing to scientific evidence that can influence policy on many scales (locally, nationally, and internationally), and connecting the wider community with science.
4. **Citizen scientists may participate in various stages of the scientific process.** This may include developing research questions, designing methods, gathering and analysing data, and communicating results.
5. **Citizen scientists receive feedback from the project.** For example, how their data are being used and the

research, policy or societal outcomes.

6. **Citizen science, as with all forms of scientific inquiry, has limitations and biases that should be considered and controlled for.** However, unlike traditional research approaches, citizen science provides greater opportunity for public engagement and participation, increasing accessibility of science in society.
7. **Where possible and suitable, project data and meta-data from citizen science projects are made publicly available and results are published in an open access format.** Data sharing may occur during or after the project, unless there are security or privacy concerns that prevent this from occurring.
8. **Citizen scientists are suitably acknowledged by projects.** This may include acknowledgement in project communications, result reporting and publications.
9. **Citizen science programs offer a range of benefits and outcomes which should be acknowledged and considered in project evaluation.** Communication and evaluation of projects could include scientific outputs, data quality, participant experience and learning, knowledge sharing, social benefits, capacity building, new ways of science engagement, enhanced stakeholder dialogue, and wider societal or policy impact.
10. **The leaders of citizen science projects take into consideration legal and ethical considerations of the project.** These considerations include copyright, intellectual property, data sharing agreements, confidentiality, attribution, participant safety and wellbeing, traditional owner consultation, and the environmental impact of any activities.

There are various citizen science activities happening across Australia, undertaken by renowned organizations. For example, MangroveWatch is a non-profit organization which focuses on the research, education and conservation of mangrove and tidal wetland environments[7]. It runs the MangroveWatch program which conducts environmental health monitoring programs for shorelines wetlands such as mangrove, saltmarsh, and saltpans. The program uses the partnerships between community volunteers, traditional owners, industry, government managers and scientists to cultivate a wider reach of the effective application of sustainable management and environmental conservation practices[7]. Likewise, Seagrass Watch is another not-for-profit organization that accurately monitors the status and trends in seagrass condition. It works with universities and research institutions, government, and non-government organisations, bringing together like-minded citizens for marine conservation[15]. Together, these groups address the concerns of the coastal communities about the conditions and loss of sea grass in their local area[15]. Various other organizations and groups also undertake BioBlitz citizen science projects. BioBlitz is a concerted effort to discover and record as many living things as possible within a set location over a limited period[1]. Organisations and groups arrange and operate their own BioBlitz activities in accordance with the Australian Guide to Running the BioBlitz[1]. Other notable citizen science activities also include Dugong Watch, Water Watch, Australian Marine Debris Initiative, and Creek Watch.

Queensland recognizes citizen science as an important area of scientific research. The Office of the Queensland Chief Scientist in its *Queensland Citizen Science Strategy* report highlights that citizen science helps to maximise the scope of scientific information by providing valuable data, skills, knowledge and advice for scientific research[14]. Citizen science at the larger scale strengthens Queensland's research capacity by building partnerships between scientists, public and the community, solving real world problems[3].

The application of citizen science is diverse, with the potential to make substantial advancements across various disciplines resulting in people's awareness of science. Harnessing the power of new technologies and social media, data can be rapidly collected, verified and collated to answer large scale questions[14]. Citizen science creates projects that cover wide geographic areas and time periods offering more data and informed results[5]. This opens pathways for communities in Queensland to complement science and management efforts often resulting in changes to policy and practice[14].

Figure 1. Spindles of mangrove roots under water, by Gary Cranitch © Queensland Museum

Citizen scientists also gain personal benefits by learning new skills, collaborating with scientists and organizations, and engaging with government, not-for-profit, community and academic institutions[14]. These experiences provide immersive, inspiring opportunities that enhance critical thinking, expand scientific knowledge, and shift perspectives.

The wide-ranging benefits of citizen science have fostered a variety of activities in Queensland, both on land and in aquatic environments. Land-based efforts focus on conservation, sustainable land management, and activities like weed removal, creek rehabilitation, fencing around wetlands, debris cleanup, erosion control, and educational programs. In aquatic environments, initiatives include marine debris cleanup, water quality monitoring, and studying aquatic species. These efforts also involve underwater biodiversity surveys, seagrass and mangrove monitoring, eDNA sampling, all aimed at protecting marine ecosystems.

All these activities occur across Queensland's twelve Natural Resource Management (NRM) regions. There are twelve (12) NRM regions in Queensland (see Figure 1). In the north, regions include Cape York, Torres Strait Authority and Northern Gulf Region (Gulf Savannah) and Wet Tropics. The eastern regions are managed by the Fitzroy Basin Association, Burdekin Dry Tropics, Mackay Whitsunday Isaac and Burnett Mary Regional Group. In the west, Southern Gulf Regions and Desert Channels oversee the natural resources, while Southeast Queensland and Southern Queensland Landscapes manage the south[9]. This report organizes activities based on their occurrence within these NRM regions.

5. A Snapshot of Wetlands-Related Citizen Science Activities

Across Queensland, there are around 124 wetlands-related citizen science projects that cover a breadth of topics, across several NRM regions (although not across all of them), and a diverse range of species. There are three models based on which citizen science activities can be categorised[6],contributory, collaborative, and co-created. Contributory citizen science is where citizens collect data for professional scientists. Collaborative citizen science takes a step further by involving citizens in work beyond data collection such as project design, analysis, and communication. Co-created citizen science is a much broader approach where citizens and scientists collaborate in all aspects of the scientific process.

Many of the activities identified in Queensland fall under the contributory citizen science category, where the participation of citizens is limited to data collection for professional scientists. Technology use is a crucial part of the projects where citizens use various mobile phone apps to record and upload their data.

Table 1 briefly summarises the types of wetlands-related citizen science activities in Queensland occurring in the natural resource management regions. It is important to note that there may be citizen science activities occurring in the Desert Channels, the Southern Gulf, Southern Queensland Landscapes, and Torres Strait Regional Authority

NRM regions, but the data is not readily available.

Table 1. Summary of the types of wetlands-related citizen science activities in Queensland categorised by natural resource management regions.

Sl. No	NRM Region	Number of Activities	Activity Type	Subject of focus
1	Burnett-Mary Regional Group	7	Weed control, marine debris collection, water quality monitoring, underwater biodiversity, planting trees, shorebirds, fencing.	Creek, underwater biodiversity, shorebirds, platypus.
2	Cape York	7	Marine debris removal, tree planting, fencing, weed management.	Beaches and creek clean up
3	Desert Channels	0	-	-
4	Central Queensland (Fitzroy Basin Association)	14	Turtle nest protection, fish passage improvement, water quality monitoring	Fish and turtles
5	Northern Gulf Region (Gulf Savannah)	1	Water quality monitoring.	Creek health
6	Southeast Queensland	30	Nest box for birds, survey reporting, turtle watch, platypus watch, coral monitoring, reef monitoring, water quality monitoring, pest and weed management, rehabilitation and re-vegetation in creeks, stormwater quality monitoring, revegetation, fencing, flora and fauna surveys, fencing of riparian vegetation, mangrove monitoring, underwater clean up.	Bird population, whale and dolphins, platypus, manta rays, dugongs, cane toad, turtles, corals, reefs, creek health, erosion control, whales, stabilising high erosion risk areas, weed management and control (invasive), creek bank stabilisation, grazing management, education.
7	Burdekin Dry Tropics (North Queensland Dry Tropics)	11	Wetland and coastal restoration, weed removal, erosion and water quality monitoring, aquatic weed removal.	Coastal habitat health
8	Mackay Whitsunday Isaac	9	Removal of weed matting, water quality monitoring, fish sampling, bird observations, fencing of outlet, sediment removal, water quality monitoring in creeks.	Restoration, protect and rehabilitate coastal wetland habitats, creek health.
9	Southern Gulf	0	-	-
10	Southern Queensland Landscapes	0	-	-
11	Terrain/Wet Tropics/Far North Queensland	11	Monitoring of estuaries for mangrove health, survey to collect floral and faunal data, frog identification and location reporting, restoration actions, weed removal.	Mangrove health, mitigate frog degrading environments, re-establish ecological processes, weed control and management.
12	Torres Strait Regional Authority	0	-	-

13	GBR wide	13	Restoration, water quality monitoring, reef health assessment and monitoring, wetlands assessment.	Fish, crustacean, coral, seagrass, mangroves, saltmarsh, coral reef monitoring and education, CoralWatch, monitoring and assessment, sawfish, water quality, mangroves and saltmarsh
14	Queensland wide	21	Marine life sightings, fish tagging, seagrass watch (education, monitoring, compilation), water surveys, analysing reef images, key source reef identification, identification of refugia and direct Crown of Thorns starfish, control vessel, marine debris cleaning, monitoring the density of clown fish and anemones, collect sighting reports and tissues of yellow-bellied sea snakes, blue carbon monitoring, monitoring freshwater, grey nurse shark spotting.	Fish, manta rays, seagrass watch, education, water quality, starfish, clown fish, anemones, sea snakes, blue carbon, grey nurse sharks.

Figure 2. An Overview of a Sandy Marine Wetland, by Gary Cranitch © Queensland Museum

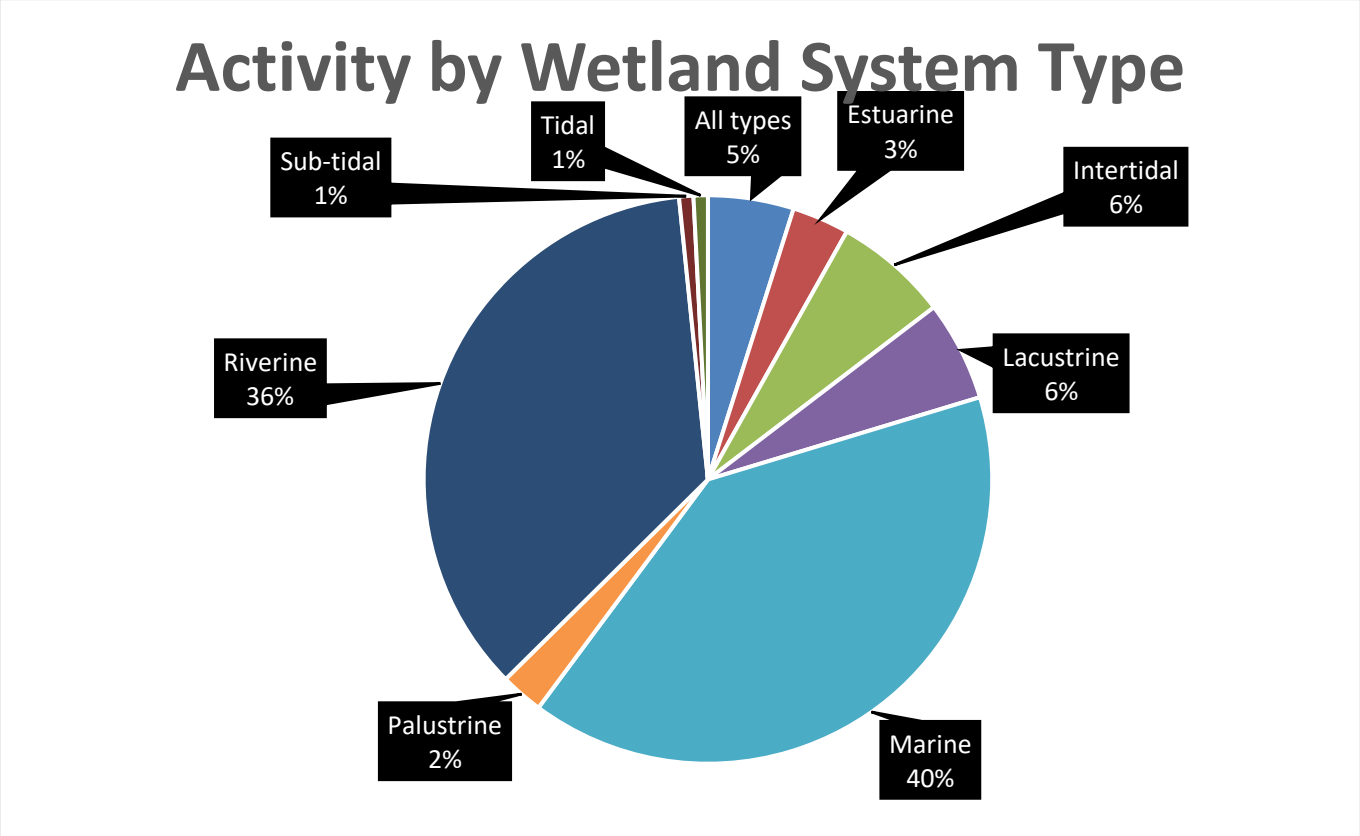

Figure 3. Wetland system types where citizen science activities occur by their percentage

In terms of wetland types, the activities seem to be taking place mostly in marine (40%) and riverine (36%) wetland types (see Figure 3). Although there are activities occurring in other wetland types as well, the occurrence is not as much. The reasons to why this difference in the distribution of activities occurs across the wetland systems is discussed in section 8 of the report.

Note1: The wetland classification followed for the above figure is in line with the Queensland Wetland Classification Scheme.

Note 2: “All Types” in the figure is the percent of citizen activities in the project where there was focus on all types of wetlands.

6. Safe Working Practices in Queensland

Citizen science activities related to wetlands often require physical presence for tasks, making safety guidelines essential. Although not the focus of this report, there are several comprehensive, activity-specific guidelines to help ensure safe practices. These includes the Australian Guide to Running a Bioblitz Guide from BioBlitz Australia[11], In Safe Hands Toolkit from Conservation Volunteers Australia [9], the Australian Code for the Care and Use of Animals for Science[12], and Be Crocwise in Croc Country[10]. These resources provide important guidance for conducting wetlands-related activities safely and responsibly.

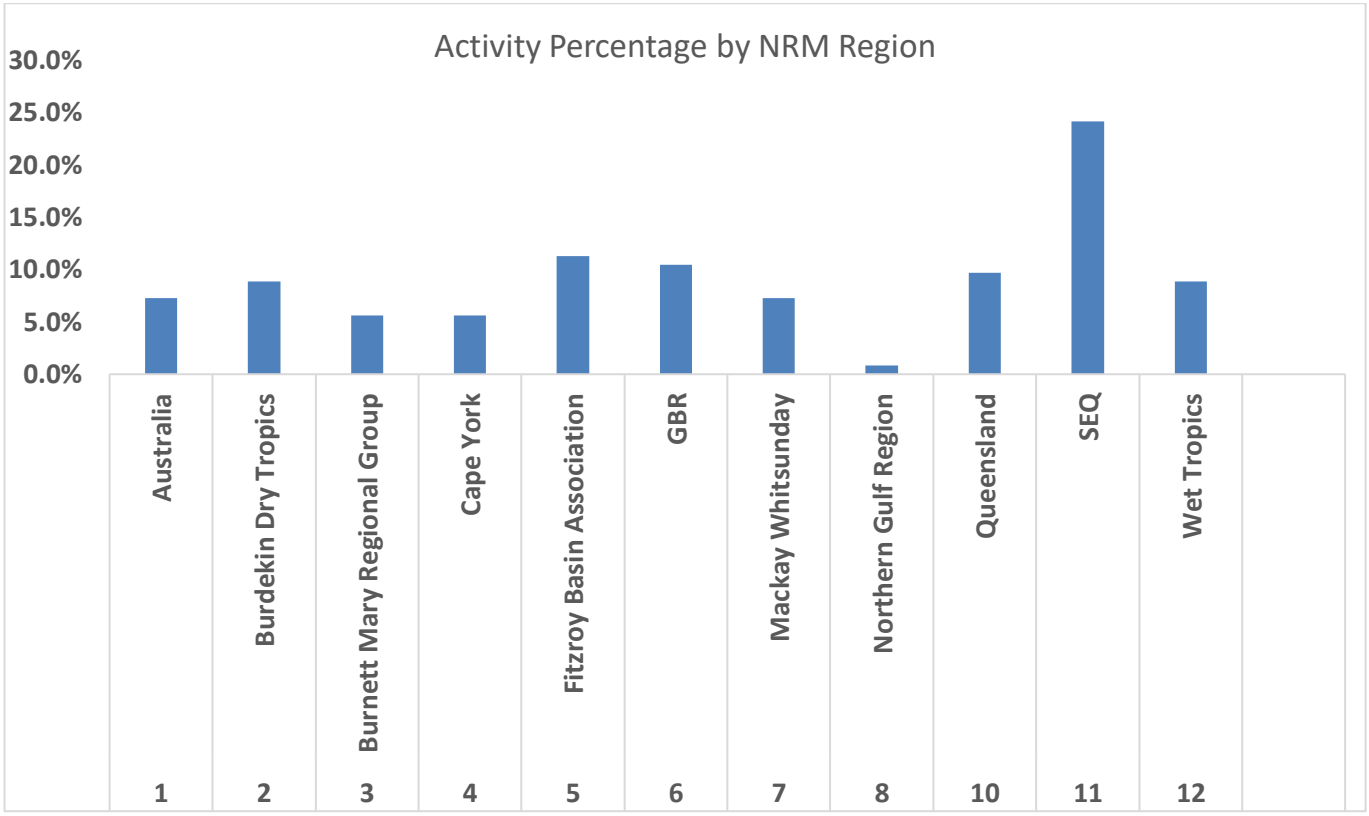

Figure 4. Occurrence of citizen science activities based on NRM regions

Although activities are diverse (see Table 1), a significant number of activities out of 124 focus on: debris cleaning, restoration and rehabilitation of creeks, fencing around wetlands, weed and pest control, water quality monitoring, erosion control and land stabilisation. Most of these activities physically happen outside wetlands (e.g., on the shore or land surrounding the wetland). In the space of species, shorebirds, turtles, sharks, whales, dolphins, corals, reefs, mangroves, and frogs dominate the area of focus (see Annexure 1 for more information). These activities cover the domain of wetlands protection and rehabilitation.

Figure 5. Invaded by lilies, by Gary Carnitch © Queensland Museum

Activities are largely concentrated in Southeast Queensland (SEQ), with 24% of the 124 activities occurring in this NRM region. This is followed by the Fitzroy Basin Association (11.3%), Wet Tropics and the Burdekin Dry Tropics, both at 8.9%. While there are also a few activities happening in Cape York and Northern Gulf regions, other NRM regions like the Torres Strait Regional Authority, Desert Channels, Southern Gulf and Southern Queensland Landscapes lack information about citizen science activities. Additionally, 10.5% of wetlands-related citizen activities are focused in the GBR, while others occur more broadly across Queensland (9.7%) and Australia (7.3%).

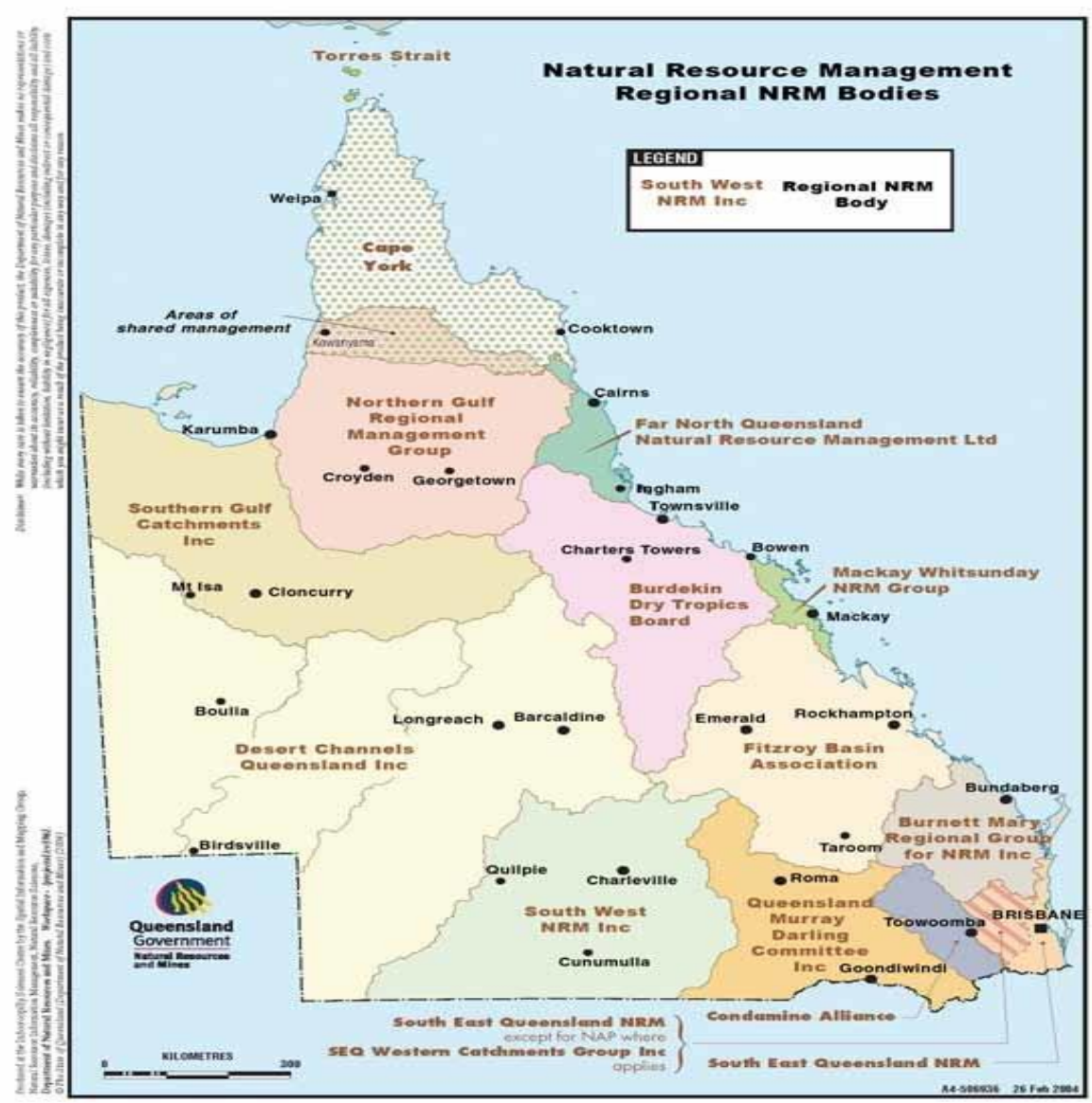

Figure 6. NRM regions of Queensland

7. Organisations/Groups in Citizen Sciences

Many organisations run citizen science projects across different fields in Queensland, with several focused specifically on wetlands. Umbrella organizations like the Australian Citizen Science Association aim to advance citizen science by promoting meaningful participation, fostering inclusive partnerships, and supporting the development of tools and resources that enhance best practices. They also ensure that the value and impact of citizen science are realized through knowledge sharing, collaboration, capacity building, and advocacy. Several organisations operate citizen science projects across many different spheres while others run projects solely focused on wetlands [3].

Table 2 presents the names and associated programs of the organisations/groups working in wetlands-related citizen science activities in Queensland.

Table 3 presents the names and associated programs of the organisations/groups working in citizen science

activities in Queensland more broadly.

Table 2. Organisations solely focused on wetlands-related citizen science activities in Queensland.

Name of Organisation	Program	NRM Region
Cooloola Coastcare Association Inc	Cooloola BioBlitz, Marine Debris Collection, TurtleCare, Water Watch Water Quality Monitoring.	Burnett Mary Region
Bulimba Creek Catchment Coordinating Committee	Water Watch, Cane Toad Challenge	SEQ
Reef Check Australia	Grey Nurse Shark Watch	Queensland wide
Humpback and High-Rises	Whale and Dolphin Protection Through Research, Education and Outreach	SEQ
InfoFish Australia	Crystal Bowl Fisheries Forecasts and Analysis, Track My Fish	Queensland wide
Sharks and Rays Australia	Assessment of the Abundance and Distribution of Four Species of Sawfish	Far North Queensland
Coral Watch	Coral Watch Program	The Great Barrier Reef
Great Barrier Reef Marine Park Authority	Eye on the Reef	The Great Barrier Reef
Citizens of the Reef	The Great Reef Census	The Great Barrier Reef
Gulf Savannah NRM	A Drop in the Bucket Project	Northern Gulf Region
Fitzroy Water Watch	Fitzroy WaterWatch	Central Queensland
Federation University Australia	National Waterbug Blitz	Queensland
Earthwatch Institute Australia	Blue Carbon: Countering Climate Change Understanding Queensland's Blue Carbon Resource Wetlands not Wastelands Protecting Wetlands for the Future, Wetlands Education Resources Wetlands Education Resources	Queensland
Great Barrier Reef Foundation	Green Nourishment Program, Starcke River Catchment Collaborative Research Plan, Community Mangrove Watch Monitoring to Enhance Tidal Wetlands	The Great Barrier Reef
Boondall Wetlands Environment Centre	Information Site	Southeast Queensland
Cattanna Wetlands Environmental Park	Information Site	Cairns Regional Council, Wet Tropics
Queensland Wader Study Group	Information Site	90 sites within Queensland from Cairns to the Tweed River.
Birdlife Australia	Australian Bittern Listening Surveys, Aussie Bird Count, Beach-nesting Birds	Queensland
The Australian New Guinea Fishes Association (ANGFA)	Information Site	Australia
Wildlife Queensland Coastal Citizen	Logan River MangroveWatch Program,	SEQ

Science	Port of Brisbane Bulimba Creek-Brisbane River	

Table 3. Organisations working in citizen science activities more broadly in Queensland.

Name of Organisation	Program	NRM Region
Redmap	Range Extension Database and Mapping Project	All coastal Queensland
Fitzroy Basin Association	Marine Turtle Conservation	FBA, Central Queensland
Watergum Community for Environment	Platypus Watch, Water Monitoring, Cane Toad Challenge, Turtle Watch and Waterbugs Gold Coast Program	Southeast Queensland
Harbour Watch	Water Quality Project	FBA, Central Queensland Wetlands
Sarina Landcare Catchment Management Association Inc	Sarina Catchment WaterWatch, Rehabilitation of Carmila Beach Reserve, Rehabilitation of Louisa Creek Reserve, Tedlands Wetland Fish Assessment	Mackay Whitsunday
Kuranda Envirocare Inc	Frog Monitoring Project	Wet Tropics
Wildlife Preservation Society of QLD	Platypus Watch	Southeast Queensland
Tangaroa Blue Foundation	Australian Marine Debris Initiative	Queensland
IC-Anemone	Saving Nemo	Queensland
OzFish	Programs in Goondiwindi, Noosa, Mackay, North Queensland, Maroochy, Central Moreton Bay, Cairns, North Moreton and Gold Coast, Scaling Up Seagrass Restoration With Citizen Science	Queensland

The following case studies will demonstrate not only the significance of involving organizations in citizen science projects, but also how citizen science helps bridge identified gaps and contributes to the success of these projects. By engaging diverse stakeholders, citizen science plays a crucial role in addressing challenges, enhancing collaboration, and driving effective outcomes in various initiatives.

Case Studies

1. **Community caring for mangroves in the Wet Tropics: A case study on building citizen science pathways for impact**

Project Location: Wet Tropics

Date: Mid 2019-Mid 2021

Background

Mangroves, which are the guardians of the Great Barrier Reef, are a highly connected matrix of habitats serving multiple ecosystem functions. It provides regulating services such as water filtration for water coming from the catchment, supporting services such as homes and nurseries for wildlife and protection of shorelines. It also provides cultural and provisioning services such as retaining irreplaceable cultural values and places for local fishing and boating. Tidal wetlands, inclusive of mangroves sequester and store significant blue carbon which helps mitigate climate change.

Protecting these vital ecosystems requires current understanding of the conditions, trends and actions for improvement and better care. As such, the Wet Tropics Waterways, the partnership that produces the waterways health card report identified a monitoring gap in condition for mangroves and other tidal wetlands.

Who was involved in the project?

To address this gap, Cairns and Far North Environment Centre (CAFNEC), MangroveWatch and Earthwatch teamed with local partners building networks to monitor tidal wetlands and delivered actions through partnerships with Traditional Owners, community groups, education centres and Wet Tropics Waterways. The collaborative approach crafted through partnership with grassroots helped build readiness, trust and capacity for the work.

What activities were undertaken?

The project was designed to address the identified gap of monitoring the condition of mangroves. The collaborative project took off in 2019, with the expansion of the MangroveWatch across seven estuaries within the Wet Tropics and the Southern Cape York region. Using the long-standing method of MangroveWatch, the project actively engaged Traditional owners strengthening the ways of working together. This backed by peer review, the technical reviewers then used georeferenced video data to analyse and support the findings of their report.

What was the outcome of the project and what has been achieved?

While the aim of the project was to produce the **Mangrove Health Report Card**, there were many unintended outstanding outcomes. Citizen science involved the community and enabled it to collect valuable information on Reef care which provided pathways to translate that information into impact and action. The Healthy Waterways Report produced annually for the Wet Tropics launched the first citizen science assessment of mangrove and tidal wetland condition for Wet Tropics in 2020 because of the project. The indicators of the mangrove health in the report, which underwent a rigorous peer review process, were developed using the data collected by the citizen science groups. These indicators are now being adopted and used in report cards of other regions. The formal data reporting system which was established as a part of this program resulted in four Local Action Plans to monitor and identify community-led actions for effective mangrove care, protection and recovery in the face of climate change and other local threats. This involves the Local Action Plans in identifying tangible, fundable projects informed by citizen science.

Apart from the set objectives, citizen science also led to the initiation of numerous associated outcomes in the project. The volunteers as a part of this project, recorded a new species of mangrove, the *Nypa fruticans* (mangrove palms) for the Johnstone River and Barron River. The Wet Tropics MangroveWatch network and their data supported the restoration of an important community asset, the Jack Barnes Broadwalk. Likewise, the citizen science project also strengthened the local stewardship network for coastal resilience by helping CAFNEC better understand the tidal wetlands and identify potential conservation projects.

In addition to all the above, the stories and learnings of the project can offer interesting insights that can be shared as a model for community Reef Care.

2. Shellfish Restoration in the Maroochy River and Moreton Bay

Project Location: Maroochy River and Moreton Bay, South-East Queensland

Date: 2020-2023

Background

An adult oyster is said to filter one bathtub of water per day by taking in nitrogen and pollutants out of the water column. Yet, it is estimated that between 96-99% of oysters have vanished from the Moreton Bay. This project funded by the Australian Government's National Landcare Program was therefore, executed to restore shellfish reefs in the Maroochy River. Currently, Robust Oyster Baskets (ROBs), which are heavy, weighing around 20 kgs, expensive and time consuming to construct, are used to restore shellfish populations. The ROBs although very effective in creating vertical relief from the sea floor, have sharp hazardous edges. As an alternative and modification to the current restoration project design, the project piloted the use of sustainably sourced biopolymers, made from 100 percent natural materials (BESEs) to grow oyster clusters in the Maroochy River and Moreton Bay. There are also other alternatives but BESEs are a great alternative as it is biodegradable. Additionally, the project also aims for the 3-D structure of the biopolymer to provide habitat for fish and other organisms, thereby improving instream habitat.

Who was involved in the project?

OzFish, Australia's fish conservation charity, teamed up with Healthy Land and Water through the National Landcare Program and the Bunya Bunya Country Aboriginal Corporation to test out the pilot project. Additionally, it engaged 50 recreational fishers[9].

What activities were undertaken?

The project tested to see if BESEs can grow oyster clusters in the Maroochy River and Moreton Bay. The volunteers filled the mesh bags which come in a 100-meter length using a bucket and a shovel. The team of OzFish volunteers and Bunya Bunya Country Aboriginal Corporation members placed 90 bags each in the intertidal

areas at oyster leases across the project sites. The team then monitored the mesh for the next 6-12 months.

What was the outcome of the project and what has been achieved?

The dedicated efforts helped safeguard 8 hectares of saltmarsh and monitoring over the next 12 months saw significant improvement in the health of the saltmarsh. This was evident in the resilient recovery and growth of previously damaged areas and water quality improved.

Learnings from both the case studies: Both the case studies highlight the significance of citizen science in solving wetlands related problems. There was evidence that growing local knowledge, collaborating with the local community and networking with other partnerships can bring positive changes in any project. Such changes can drive critical actions that can better manage wetlands or other ecosystems. The Wet Tropics case study shows that trust in citizen science project can be garnered by involving peer review in conjunction with the project to increase credibility of the data. Furthermore, citizen science projects can provide opportunities to drive action and investment for partners and networks in future projects. Another thing these case studies teach us is the importance of the design of the citizen science project. The testimonials from participants in the Wet Tropics Project demonstrate that citizen scientists felt motivated when they learnt that the data they collected was used in robust information management. All in all, these case studies teach us that growing partnerships to drive action and investment in protecting and regenerating coastal tidal wetlands is critical.

Figure 7. Birds on the shore of a riverine wetlands, by Gary Cranitch © Queensland Museum

8. Gaps and Barriers

8.1 Diversity and Over-emphasis

The diversity in the citizen science activities occurring in wetlands, both within and outside the wetlands confirms public awareness in wetlands protection. These activities are diverse relating to data collection of flora and fauna in wetlands, on-ground activities of restoration and rehabilitation, community engagement, land management practices, education, and capacity building. Several others exist in water quality monitoring, marine debris cleanup and WaterWatch which align with the goals of the Reef 2050 Wetlands Strategy. However, grouping of activities in a particular category is a gap that shifts focus away from categories that requires urgent attention. For example, while there is so much focus on charismatic species such as turtles, platypus, dugongs, shorebirds, seagrass and the reef, or pests such as cane toads, the shellfish restoration in the Maroochy River has shown the significant role that non-charismatic species play in the ecosystem, which is often overlooked in favour of charismatic species where focus and attention is high.

8.2 Trends and Engagement Driving Factors

Other gaps relate to the trends and the driving factors in which such wetlands-related citizen science activities occur. Activities are more highly concentrated in marine wetlands than other wetland systems. Likewise, a significant number of activities take place in the South-East Queensland than in other NRM regions.

Stakeholders and NRM groups have identified several reasons behind this variation in engagement. One of the reasons is that people prefer charismatic species, species that are larger (e.g. whales, dolphins), and cuter and attractive species, and habitats, e.g. coral reefs that are prettier than marshes (M. Neil, personal communication, September 4, 2024).

Other reasons depend on the number NRM human populations (e.g. higher population areas have more activities as seen in SEQ), and places where they live in, iconic destinations where people go for holidays, First Nations people's country, local peoples' priorities, reasons which are fundamentally associated with people's convenience and intrinsic values (Darrly Ebenezer, personal communication, September 10, 2024).

Factors like humidity, weather, fear of danger (e.g. crocodiles) also affect the distribution and the occurrence of activities (Darryl Ebenezer, personal communication, September 10, 2024). Deeper underlying factors relate to the number of active groups/organisations present in an NRM, funding which drives the location of the projects, government priority and passion of the groups that carry out the projects (Darryl Ebenezer, personal communication, September 10, 2024).

Stakeholder engagement and recruitment is driven by the intent of the projects. Science driven projects for example, is likely to engage or recruit science professionals, whereas, citizen science driven projects, are likely to engage the public. Stakeholders' engagement is also motivated by the length and longevity of the project (Darryl Ebenezer, personal communication, September 10, 2024).

8.3 Technology and Mobile Apps

Technology, smartphones, GPS and sensors which is now part and parcel our everyday lives is also a major component of citizen projects providing them the opportunity to contribute[15]. Some of the most popular apps currently being used in the citizen science are iNaturalist, Waterbug App, and NatureMapr. The Queensland government has also developed the Wetland Spotter, and the Qld Fishing 2.0 apps. The proposed Wetlands-to-Visit app can become a part of this system, potentially functioning as a directory app to promote wetlands within Queensland and beyond, while linking to other citizen science functions.

Despite popularity, technology is also identified as a barrier in stakeholder engagement. Mobile apps, which is the most popular medium of data collection in citizen science projects pose barriers which stems from user-interface of the technology requiring storage of personal data. This gives rise to a digital divide where older participants who generally have good knowledge about the activity subjects retreat from sharing data due privacy concerns, while younger participants who are eager dominate participation in the activities (M. Neil, personal communication, September 4, 2024). The user-interface variation across different apps is also another challenge for participants due to the resulting difficulty in usage.

8.4 Common Barriers Identified by Stakeholders

Stakeholders spoken to for the project identified common barriers which prevent people from getting involved in projects. Some of these barriers emerge from longevity of the data collection (e.g. people want to know where their data is going and how it is being used), which is often not known in many citizen science projects due to lack of follow up on the lessons and outcomes of the project. Legal requirements to fulfil the criteria of data collection and submission also deters people from partaking in activities. Trust issues around the reliability of the data collected by citizens, inability of find links to interested scientist groups, lack of recognition for participation, not being able to fully engage are other factors identified.

9. Opportunities

Where there are gaps, there are also opportunities to overcome these barriers. Attraction to charismatic species can be an opportunity to integrate wetlands-related citizen science activities into existing programs. Doing so can reduce the existing bias by providing opportunity to collaborate with Indigenous groups to gain insights into local knowledge and broaden the scope into non-charismatic but ecologically important species in wetlands (M. Neil, personal communication, September 04, 2024).

The diversity in the activities can be seized as an opportunity to increase the depth of understanding Southeast Queensland and marine wetlands where there is already a huge focus. There are far greater opportunities in regions where activities are currently scarce as projects can be developed based on learnings of activity-

concentrated regions. This could be done by establishing a wetlands-related citizen science community where lessons and outcomes of project are shared or updated regularly for long-term projects.

Other underlying factors which drive the motivation and intent of public engagement such as personal preference, passion and demographic dynamics (e.g population and citizen science groups present in the NRM) can be overcome by working with existing citizen science programs and organisations that have influence, wider public outreach and rich knowledge on such projects. This can cut down the additional costs of having to run new programs and engage stakeholder groups from scratch.

The highest level of governance at the local level is the local government who is responsible for coordination and rolling out of projects. Reluctance from locals in taking part in activities can emerge due to varying priorities between the local government and the people. This could be addressed by collaborating with local government which can strengthen networks with the local people to incorporate and prioritise wetlands-related citizen science programs (N. Connolly, personal communication, September 2, 2024).

Traditional owner groups are involved in initiatives run by larger organizations, such as mangrove restoration projects in the Wet Tropics, EarthWatch, and MangroveWatch. However, there is potential to deepen this collaboration beyond basic participation. These projects can serve as a platform to harness the local ecological knowledge of traditional owners, allowing future initiatives to be adapted and co-designed to incorporate their methods (M. Neil, personal communication, 2024). This would not only enhance their engagement but also offer valuable insights into traditional wetland management practices, creating opportunities to integrate modern science with Indigenous knowledge for more effective outcomes.

To learn about relevancy and public interest of the current point in time, information and links of citizen science can be floated on the Wetland*Info* website to establish where public interest lies. Social media and business platforms such as X, Instagram, Facebook, Tik Tok and LinkedIn can also be used to invite partnerships and promote programs for engagement.

Various grants program sitting under different departments can also be sought after to fund citizen science projects where there is lack of focus currently. For example, a recreational fisheries related program is supported by the Department of Agriculture through its Fisheries Community Fishing Grants.

10. Conclusion

Citizen science in wetlands is an important avenue for research, protection and promotion of wetlands in Queensland. The diverse range of wetlands-related citizen science activities in existence and the various organizations and groups running programs is a testament of public interest in wetlands. These are attractive avenues to promote citizen science activities which can deliver the goals of the Reef 2050 Plan and the Reef 2050 Wetlands Strategy. Nevertheless, there are gaps and barriers as there are opportunities, pertaining to people's convenience, passion, local environment and settings which cause differences in the distribution of the activities.

These gaps and barriers can be particularly overcome by coordination and collaboration with citizen science organisations/groups (listed in Table 2 and 3) to expand a wider outreach. Additionally, programs offered by Office of the Chief Scientist, NRM groups, the Great Barrier Reef Foundation, the Department of Climate Change, Energy, the Environment and Water are avenues for collaboration amongst stakeholders and DESI. Such collaborations are pivotal in achieving the objectives of the Reef 2050 Wetlands Strategy.

Recommendations

It is recommended that the Wetlands Unit

- Publish citizen science information on Wetland*Info* on to raise awareness, provide resources, and link users to existing programs as well as DESI programs as they develop.
- Integrate important wetlands-related citizen science activities into existing programs.
- Work with existing citizen science programs and organisations that have influence, wider public outreach and rich knowledge on such projects
- Collaborate with indigenous groups to gain local knowledge and broaden the scope into non-charismatic but ecologically important species in wetlands.
- Collaborate with local government to strengthen networks with the local people and prioritise wetlands-related citizen science programs
- Use grants programs sitting under different departments to overcome funding challenges.
- Ensure that the programs, tools, and methods developed are appropriate for the users and align with the citizen science principles to maximise the uptake and usefulness of wetland citizen science programs.

Figure 8. Muddy sediments on the coast of a marine wetland, by Gary Cranitch © Queensland Museum.

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