Reef Check Australia

Moreton Bay
Season Summary Report 2021-2022

REEF CHECK AUSTRALIA

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This project was made possible by a network of dedicated volunteers, generous dive operators, wise advisors, innovative collaborators and the Port of Brisbane.

Thank you to the dedicated citizen scientists who have contributed to survey activities within Moreton Bay and assisted with data entry: Paul Colquist, Terry Farr, Rachel McVeigh, Jodi Salmond and Julie Schubert.

Many of the images used within this document were taken by Reef Check Australia General Manager Jodi Salmond, and SEQ Survey Coordinator Julie Schubert. The image on the front was taken in Moreton Bay at Goat Island by Jodi Salmond.

Project activities were conducted on the traditional lands of the Quandamooka People, Kabi Kabi First Nation and Yugambeh People. We acknowledge the Traditional Custodians of the land, of Elders past, present and emerging.

This project is supported by Reef Check Australia, through funding from the Port of Brisbane.

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Also a big thank you to River to Bay and GO Dive Brisbane for supplying the boat and crew to access the sites.

REEF CHECK AUSTRALIA

Moreton Bay

Season Summary Report 2021-2022

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1.0 PROJECT INTRODUCTION

This report outlines the survey results documented at ten (10) Reef Check Australia Monitoring sites located at Mud Island (2), St Helena Island (2), Green Island (2) (Figure 1A), Goat Island (2) and Peel Island (2) (Figure 1B). Reef Check Australia has been monitoring these sites seasonally to detect changes related to seasonal variation and changes to substrate composition.

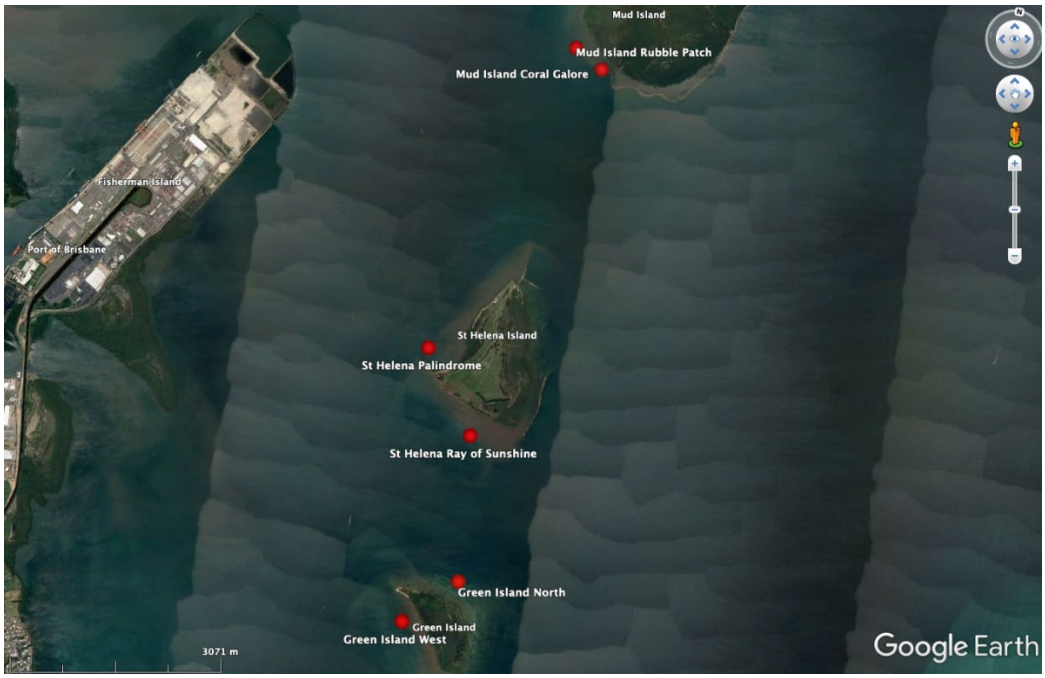

Figure 1A Location of Reef Check Australia monitoring sites: Mud Island, St Helena Island, Green Island.

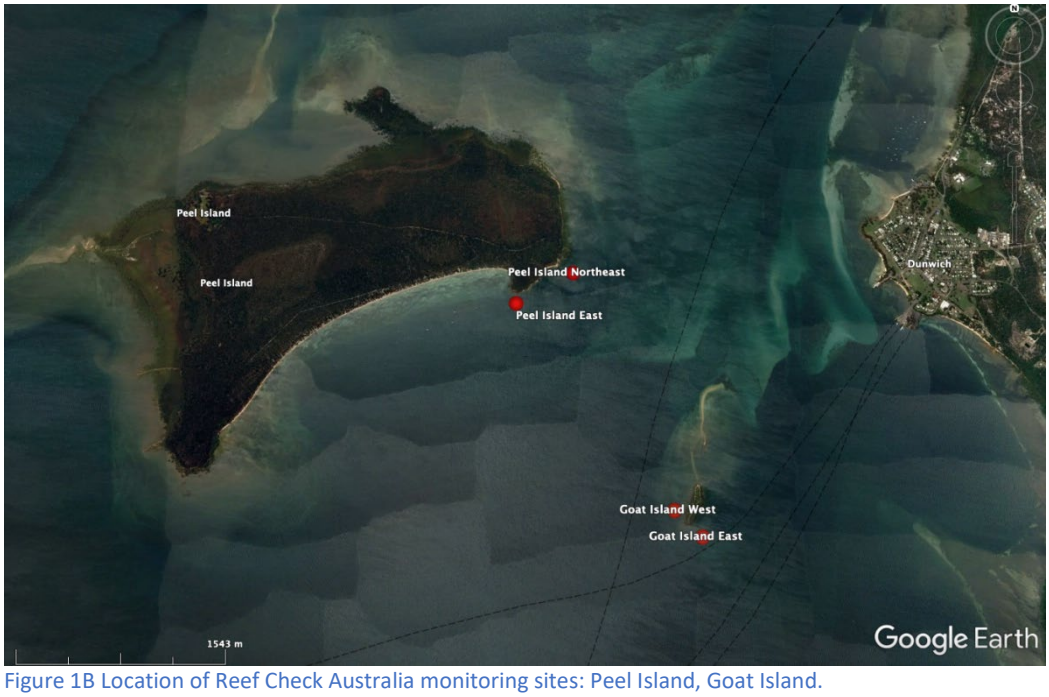

Figure 1B Location of Reef Check Australia monitoring sites: Peel Island, Goat Island.

1.1 KEY FINDINGS FROM 2021-2022 SURVEYS

1.1.1 SURVEY CONDITIONS

Another extreme flooding event this year caused massive delays to our surveys. Fortunately, the Mud Island summer survey was completed before the rains arrived, however the summer surveys at St Helena Island and Green Island were unable to be completed due to continued poor visibility and/or strong winds. Once again dense algae was observed during the summer survey but the levels of macroalgae reduced considerably during the winter surveys. Visibility was better during the winter surveys, although still turbid. This season we were able to revisit sites at Peel Island and Goat Island but were surprised to observe much of the branching coral at Goat Island dead and covered in algae; both turf algae, and *Colpomenia sinuosa*; commonly known as 'sinuous ballweed', 'cornflake seaweed' or the 'oyster thief' algae; a brown algae that smothers the substrate below it. This algae is listed as common and widespread in tropical and temperate zones around the world, however this algae has not previously been not recorded at this site, and not at any existing Reef Check Australia surveys in the Moreton Bay region.

1.1.2 SUBSTRATE

Hard coral cover remained consistent at most sites except at Goat Island where the western site reduced from 15% in 2020 to <2% in 2022 and the eastern side reduced from 36% in 2020 to 4% in 2022. Soft coral cover has remained relatively consistent with silt levels predominantly medium to high.

Due to the low volume of corals, levels of bleaching are generally less than 1% of the coral population with the exception of Peel Island North-east recording an average of 45% of the individual colonies and 9% of the population.

1.1.3 IMPACTS

Levels of impact remain low with the highest recorded impact being 3 incidents of coral disease at Goat Island East. The highest level of marine debris recorded was 31 counts at Peel Island East and 26 counts at Peel Island North-east, which was predominantly fishing line. The count on other sites ranged from 1-4.

1.1.4 INVERTEBRATE ABUNDANCE

Invertebrate abundance remains low across all sites. *Drupella* snails were the main target invertebrate observed during our surveys, with the most recorded during summer (10 at Mud Island Rubble Patch and 15 at Mud Island Coral Galore). One (1) banded coral shrimp was observed at Goat Island West and one (1) anemone at Peel Island East.

1.1.5 FISH ABUNDANCE

Numbers of target fish were low, with butterflyfish being the most sighted, followed by snapper. Other species observed include grouper and sweetlips, although numerous non-target species, such as bream, wrasse, cardinal fish and blennies were also observed on most surveys.

Refer to Tables 1 and 2 for summary of site data and section 2 for individual site reports.

Table 1: Summary table of RCA monitoring findings for surveys conducted in Inner Moreton Bay in 2021-2022 season. Information includes a basic site summary of average hard and soft coral cover (%), total macroalgae (MA) abundance, nutrient indicator algae (NIA) cover (%), and silt levels (N=none, L=low, M=medium, H=high). All figures showing a count, rather than a percentage, are a total across all 4 transects at the site (i.e. at total across 80m).

Basic site summary										
	Hard Coral Coverage (%)	Trend 2021-2022	Soft Coral Coverage (%)	Trend 2021-2022	Macroalgae (#) per 80m transect	Trend 2021-2022	Nutrient Indicator Algae (%)	Trend 2021-2022	Silt Loading	Trend 2021-2022
Green Island, North, Site 1 (Winter)	8.7	↑	7.5	↓	10	↑	6.2	↓	M	↑
Green Island, West (Winter)	6.9	↓	3.7	↓	16	↑	10	↓	M	↔
Mud Island, Coral Galore (Summer)	0	↓	0	↓	42	↑	26	↓	L	↔
Mud Island, Coral Galore (Winter)	0.6	↓	18.8	↑	16	↑	15	↓	L	↔
Mud Island, Rubble Patch (Summer)	0	↔	0	↔	36	↓	22.5	↓	L	↓
Mud Island, Rubble Patch (Winter)	0.6	↓	6.3	↑	7	↓	19	↓	M	↑
St Helena, Palindrome (Winter)	1.2	↓	0.6	↑	14	↑	13.7	↑	M	↔
St Helena, Ray of Sunshine (Winter)	4.4	↑	1.2	↑	3	↓	1.9	↓	M	↓
Peel Island, East	13.7	↑	3.7	↓	0	↓	12.5	↑	M	↑
Peel Island, North-east	11.2	↑	11.2	↑	0	↓	19.4	↑	L	↔
Goat Island, East	4.4	↓	13.1	↓	0	↔	8.1	↑	H	↑
Goat Island, West	2.0	↓	23.1	↑	0	↔	0	↔	L	↔

Blue arrow indicates change of <10%, red arrow indicates change of >10% since the last survey.

Table 2: Summary table of RCA monitoring findings for surveys conducted in Inner Moreton Bay in 2021-2022 season. Information includes a basic site summary of the impacts at each site: average coral bleaching of the population (%) and abundance of reef impacts (coral disease, marine debris, coral damage, and scars). All figures showing a count, rather than a percentage, are a total across all 4 transects at the site (i.e. at total across 80m).

	Presence of Impacts														
	Coral Population Bleaching (%)	Trend 2021-2022	Coral Disease (#)	Trend 2021-2022	Fishing Line (#)	Trend 2021-2022	Marine Debris (General) (#)	Trend 2021-2022	Anchor Damage (#)	Trend 2021-2022	Coral Damage (#) (Unknown Causes)	Trend 2021-2022	*Drupella* Scar (#)	Trend 2021-2022	Unknown Scar (#)	Trend 2021-2022
Green Island, North, Site 1 (Winter)	0.75	↓	0	↔	1	↓	2	↑	0	↔	0	↔	0	↔	0	↔
Green Island, West (Winter)	0.50	↓	0	↔	1	↑	1	↓	0	↔	0	↓	0	↔	0	↓
Mud Island, Coral Galore (Summer)	0	↓	0	↓	0	↔	0	↔	0	↔	0	↔	0	↔	0	↔
Mud Island, Coral Galore (Winter)	0.5	↔	0	↔	1	↓	0	↔	0	↔	1	↑	0	↔	0	↔
Mud Island, Rubble Patch (Summer)	0.75	↓	0	↓	0	↓	0	↓	0	↔	0	↓	0	↔	0	↔
Mud Island, Rubble Patch (Winter)	0.25	↑	0	↔	0	↓	0	↓	0	↔	0	↔	0	↔	0	↔
St Helena, Palindrome (Winter)	0.5	↔	0	↔	0	↓	1	↓	0	↔	0	↔	0	↔	2	↑
St Helena, Ray of Sunshine (Winter)	0.75	↔	0	↔	1	↑	3	↑	0	↔	0	↔	0	↔	0	↔
Peel Island, East	2.75	↓	0	↓	27	↑	4	↑	0	↔	0	↔	0	↔	0	↓
Peel Island, North-east	8.75	↑	1	↓	21	↑	5	↓	0	↔	0	↔	0	↔	1	↑
Goat Island, East	0.5	↓	3	↑	0	↓	0	↓	0	↔	1	↓	0	↔	0	↓
Goat Island, West	0	↓	0	↓	1	↑	1	↓	0	↔	0	↔	0	↔	0	↓

Blue arrow indicates change of <10%, red arrow indicates change of >10% since the last survey.

2.0 SITE REPORTS

2.1 GREEN ISLAND NORTH, SITE 1

This site is located on the northern side of Green Island. The site was established in 2015 and sits at a depth of 5m. The weather conditions this year presented challenges and a summer survey was not completed for this site due to the flooding reducing visibility.

During the winter survey silt (42%) dominated the substrate followed by rubble (24%), rock (18%) and soft coral (7%) (Figure 2.1.1). The level of silt was consistent with those observed in 2019.

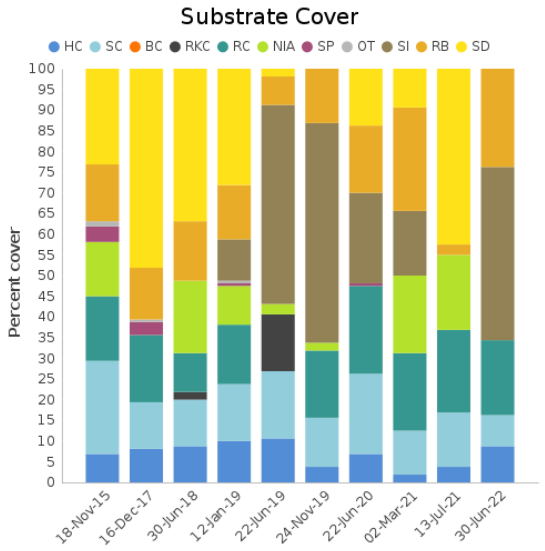

Figure 2.1.1. Benthic type and percent cover: Green Island North, Site 1, 2015 - 2022

Coral bleaching was observed to be less than 1% of the coral population, with an average of 10% of any individual colony bleached.

Coral damage was not recorded and only one item of fishing debris and two of general marine debris was recorded. Target invertebrates were not recorded and very few live molluscs were observed. Turf algae, sargassum and padina were the dominant algae.

Fish surveys were conducted with one butterflyfish and one snapper recorded. However non-target fish were observed utilising the habitat.

Image 2.1A Hard coral

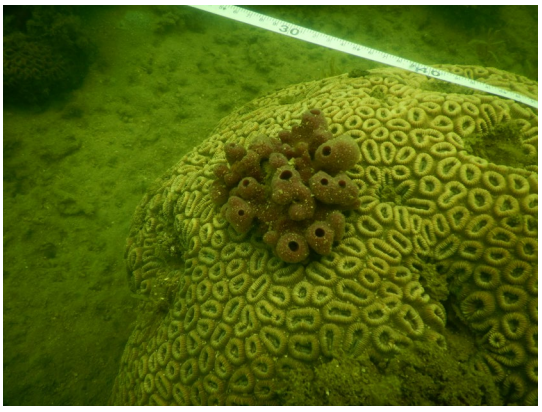

Image 2.1B Sponge and Massive hard coral

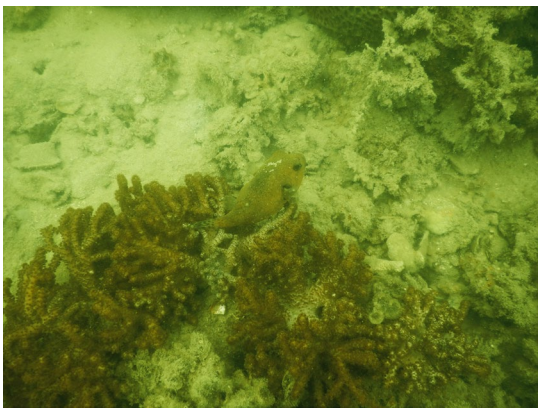

Image 2.1C Puffer fish and soft corals

2.2 GREEN ISLAND WEST, SITE 1

This site is located on the western side of green island on the edge of the reef flat. The site was established in 2017 and site at a depth of 5m. This site hosts patchy hard and soft coral on a soft sediment benthos.

The weather conditions this year presented challenges and a summer survey was not completed for this site due to the flooding reducing visibility. During the winter survey rock (41%) was the dominant substrate (an increase from last year) followed by silt (26%), sand (12%), rubble (10%) and soft coral (4%), (Figure 2.2.1).

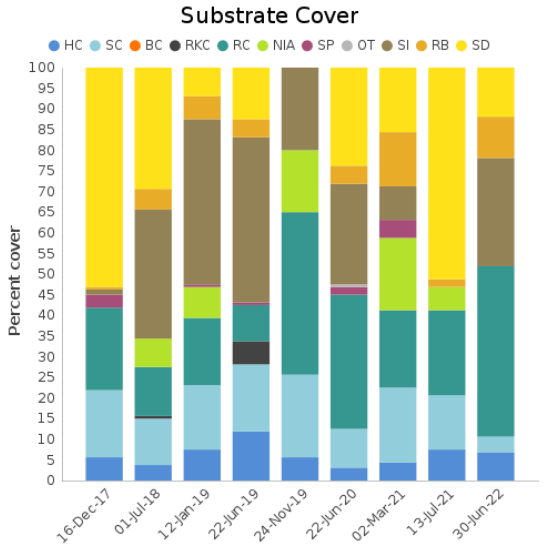

Figure 2.2.1. Benthic type and percent cover: Green Island West, Site 1, 2017 - 2022

Coral bleaching averaged 15% of each colony observed as bleached, with an average of <1% of the coral population bleached.

Damage and disease were not observed and only one item of general trash and one item of fishing line were recorded. One snapper was observed during the fish survey, and very few fish were observed overall.

Image 2.2A *Asparagopsis* algae

Image 2.2B Bleached coral

Image 2.2C Nudibranch – *Hypselodoris obscura*

2.3 MUD ISLAND, CORAL GALORE

Mud Island is situated between the Port of Brisbane and Moreton Island and was historically used as anchorage for ships that were unable to access the shallow Brisbane River. This site is situated on a rocky slope and supports a population of corals, in contrast to the neighbouring survey site called Rubble Patch (See Section 3.5).

Rubble made up 55% and rock made up 42% of the substrate in January 2022. Sand attributed the remaining 3% of the total substrate. There was a high level of *Sargassum* algae observed during this survey, with a count of 42 during the substrate survey. During the winter survey rock (34%) was the dominant substrate, followed by rubble (23%), soft coral (19%) and sand (14%). Hard coral contributed <1% with nutrient indicator algae at 5%, silt (3%), sponge just over 1% and other <1% making up the balance of the substrate. (Figure 2.3.1).

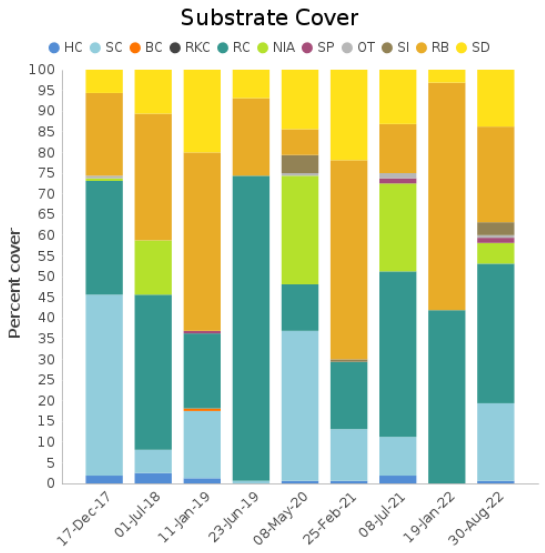

Figure 2.3.1. Benthic type and percent cover: Mud Island, Coral Galore, 2017 - 2022

Impacts were not observed during the summer survey. However, bleaching of 1% of the population was recorded in winter with one incidence of anchor damage and one item of fishing line recorded.

Fifteen *Drupella* snails were recorded in summer, with five recorded in winter.

Fish surveys were conducted but no target fish were recorded in summer. Only one butterflyfish was recorded in winter, but other non-target fish were observed.

Image 2.3A Hard coral

Image 2.3B Site photo

Image 2.3C Summertime dominant algae - *Sargassum*

2.4 MUD ISLAND, RUBBLE PATCH

This site at Mud Island consists primarily of unconsolidated coral rubble, sparse soft coral and algae fields. This site was first surveyed in 2017.

Hard and soft coral were not detected on the substrate transect during the summer survey. Rubble made up 55% of the substrate, with rock making up 32% and sand 12%. During the winter survey, rubble dominated at 32%, followed by rock (24%). Nutrient indicator algae made up 15%, sand 16%, with soft coral at 6%, silt at 6% and hard coral just under 1%. (Figure 2.4.1).

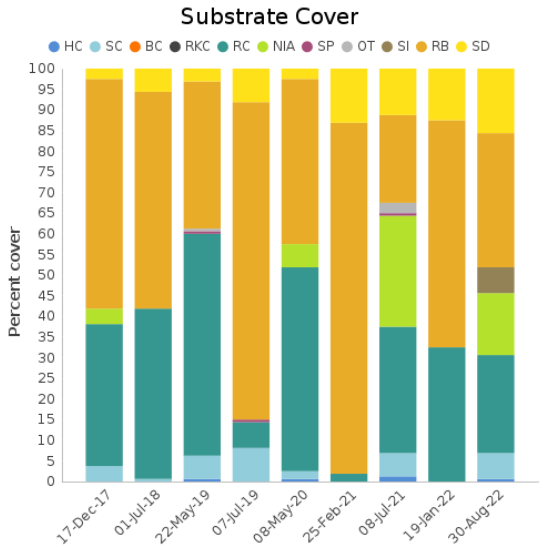

Figure 2.4.1. Benthic type and percent cover: Mud Island, Rubble Patch, 2017 - 2022

Bleaching was not observed and no other impacts were recorded in summer. The winter survey saw 1% of the coral population bleached on one transect only. There were three items of fishing line and one piece of fishing net recorded. Invertebrates were not observed in summer and only one *Drupella* observed in winter during the invertebrate survey.

Fish surveys were conducted but no target fish were recorded in summer, although other fish such as stripeys, weedy wrasse and sergeant fish were observed.

During the winter survey, one butterflyfish, two grouper and one snapper were recorded.

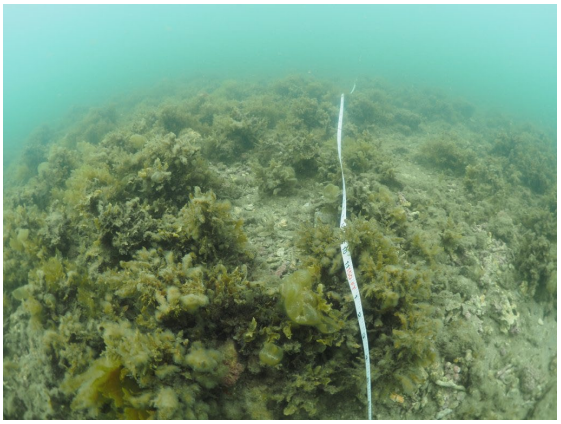

Image 2.4A Site photo

Image 2.4B Soft coral

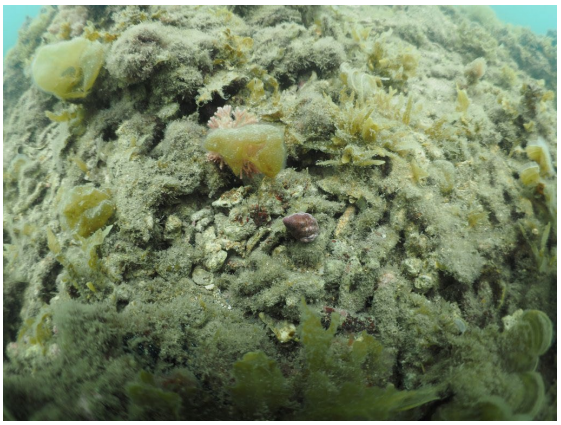

Image 2.4C *Drupella* snail

2.5 ST HELENA, PALINDROME

This site at St Helena Island is located in close proximity to the jetty and runs parallel to the shore. The substrate is generally soft sediment and sand with patchy coral cover.

The weather conditions this year presented challenges and a summer survey was not completed for this site due to the flooding reducing visibility. Rubble dominated (79%) during the winter survey. Silt (9%), rock (5%), nutrient indicator algae (5%), hard coral at 1% and soft coral and sponge at just under 1% each made up the balance of the substrate (Figure 2.5.1).

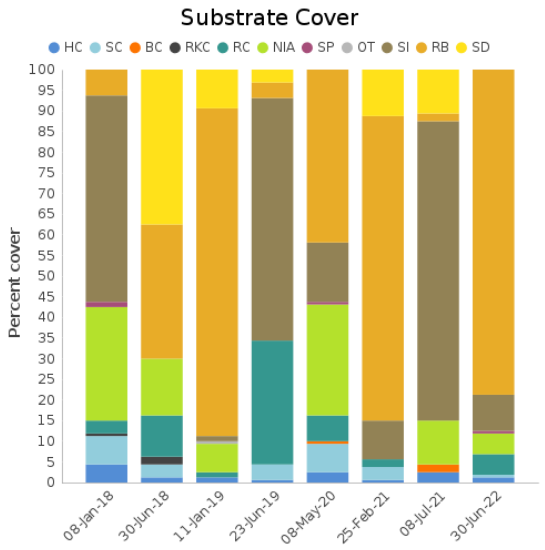

Figure 2.5.1. Benthic type and percent cover: St Helena Island, Palindrome, 2018 – 2022.

Coral bleaching averaged 5% of coral colonies and 1% of the population during the winter survey. Two unknown scars and one item of marine debris were also recorded.

Fish surveys were conducted but no target fish were recorded during the winter survey.

Image 2.5A Hard coral

Image 2.5B Unknown scar

Image 2.5C Bottle with ascidians

2.6 ST HELENA, RAY OF SUNSHINE

This site at St Helena Island is located off the southern end of the island. The substrate is generally soft sediment and sand with patchy coral cover; however it has a greater cover of coral than Palindrome.

The weather conditions this year presented challenges and a summer survey was not completed for this site due to the flooding reducing visibility. During the winter survey silt made up 45% of the substrate, with rubble making up a further 26%. Rock attributed 24%, and soft coral at just over 1% made up the balance of the substrate. (Figure 2.6.1).

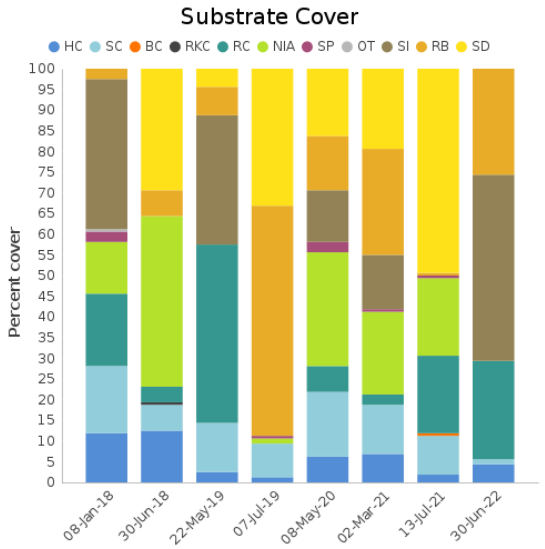

Figure 2.6.1. Benthic type and percent cover: St Helena Island, Ray of Sunshine, 2018 - 2022

Bleaching affected less than 1% of the total coral population with an average of 20% of any individual colony being bleached. No other incidents of damage or disease were recorded, but one item of fishing line and three of general marine debris, including a wire cage were recorded. No invertebrates were recorded and no live molluscs with the exception of one nudibranch were observed.

Fish surveys were conducted but no target fish were recorded.

Image 2.6A Foliose coral

Image 2.6B Cage with rope

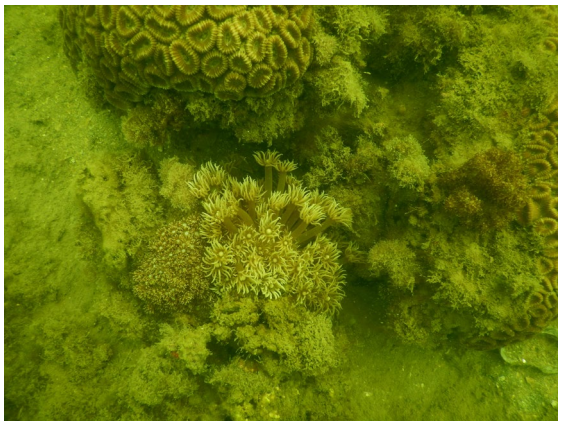

Image 2.6C Corals

2.7 PEEL ISLAND, EAST

This site at Peel Island is located close to the popular Horseshoe Bay boating area. This site features massive and foliose hard coral forms along with a varied soft coral community.

This site was not surveyed in 2021 but hard coral cover has increased since 2020, making up 14% of the substrate. Rock is the dominant substrate at 29%, with sand at 17%, silt (16%), and nutrient indicator algae (12%) making up the remaining majority. Soft coral and rubble each contributed 4%, with sponge (2%) and bleached coral (1%) making up the balance of the substrate. (Figure 2.7.1).

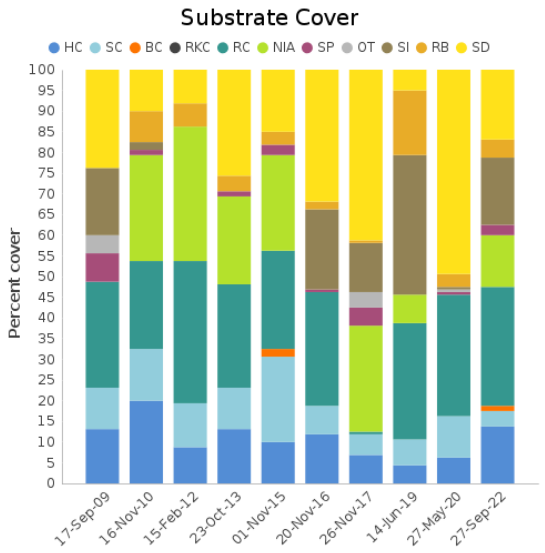

Figure 2.7.1. Benthic type and percent cover: Peel Island, East, 2009 - 2022

Bleaching affected less than 2.75% of the total coral population with an average of 50% of any individual colony being bleached. No other incidents of coral damage or disease were recorded, but 27 items of fishing line and four of general marine debris were recorded. One anemone without fish was recorded on the invertebrate survey.

A fish survey was conducted and eight butterflyfish and two snapper were recorded.

A shovelnose ray was also observed during the survey.

Image 2.7A Site photo

Image 2.7B Bleached soft coral

Image 2.7C Shovel nose ray

2.8 PEEL ISLAND, NORTH-EAST

This site at Peel Island is located on a shallow fringing reef to the north of the Platypus wreck. It hosts patchy hard coral on a sandy rubble bottom and was established in 2014.

Rubble dominated the substrate at 31% followed by rock (23%), nutrient indicator algae (19%) and sand (10%). Soft coral and sponge each made up just under 2%, with bleached coral (1%), other (<1%) and silt (<1%) making up the balance (Figure 2.8.1).

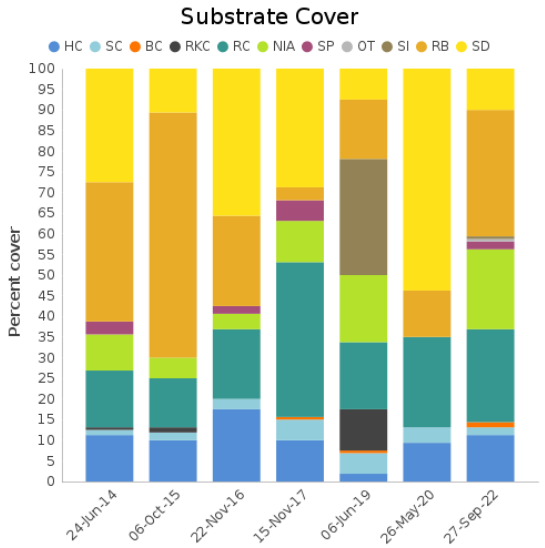

Figure 2.8.1. Benthic type and percent cover: Peel Island, North-east, 2014 - 2022

Bleaching affected 9% of the total coral population with an average of 45% of any individual colony being bleached. One incident of coral disease was recorded, and 21 items of fishing line and five of general marine debris, were recorded. No invertebrates were recorded during the invertebrate survey.

A fish survey was conducted and six butterfly fish and three snapper were recorded.

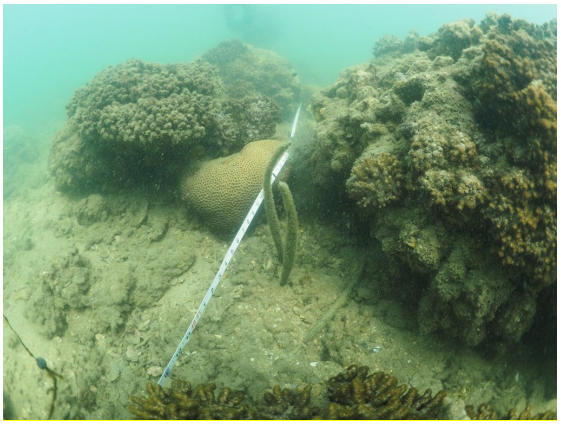

Image 2.8A Site photo

Image 2.8B Bleached hard coral

Image 2.8C Butterflyfish

2.9 GOAT ISLAND, EAST

This site sits on the eastern side of Goat Island, adjacent the channel used by the North Stradbroke Ferry. The site historically hosted between 20 and 30% hard coral, however much of this coral was observed to be dead and covered in turf algae this survey, with only 4% live hard coral cover recorded.

Rock (which includes dead coral covered in turf algae) dominated the substrate at 44%. Silt attributed 15%, soft coral 13%, rubble 9%, and nutrient indicator algae 8%. Hard coral (4%), recently killed coral (3%), sand (2%) and sponge (1%) made up the balance of the substrate. (Figure 2.9.1).

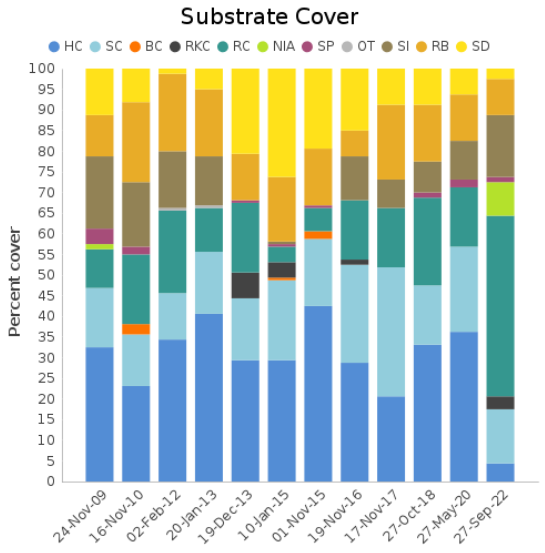

Figure 2.9.1. Benthic type and percent cover: Goat Island, East, 2009 - 2022

Bleaching affected less than 1% of the total coral population with an average of 100% of any individual colony being bleached. One incident of coral damage and three of disease were recorded. No fishing line or marine debris was recorded. No invertebrates were recorded except for non-target nudibranchs.

A fish survey was conducted and 12 butterflyfish, nine snapper and four sweetlip were recorded

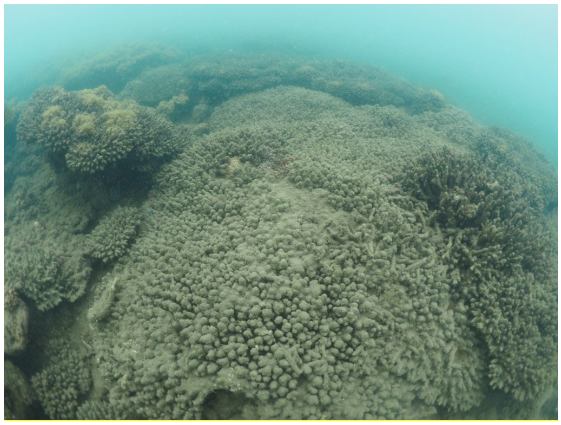

Image 2.9A Dead branching coral with turf algae

Image 2.9B Site photo

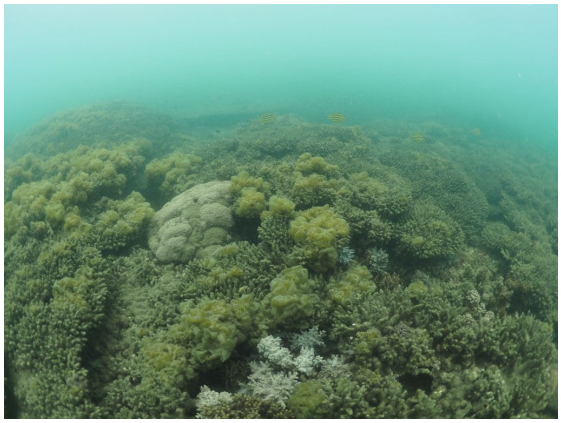

Image 2.9C Dominant algae

2.10 GOAT ISLAND, WEST

This site sits on the western side of Goat Island and like the eastern side has also suffered a decline in hard coral cover since our last monitoring event in 2020, reducing from 15% to less than 2%. However, the soft coral communities remain at consistent levels.

Rock (38%), soft coral at just over 23% and sand at 17% made up the majority of the substrate. Rubble (11%), silt (6%), hard coral (<2%) and sponge (<2%) made up the balance. (Figure 2.10.1).

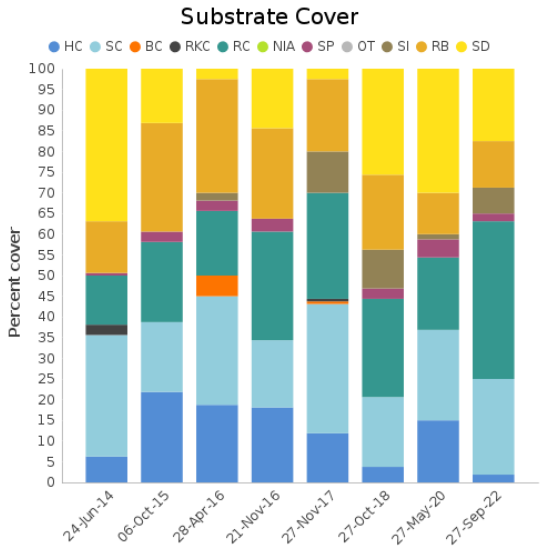

Figure 2.10.1. Benthic type and percent cover: Goat Island, West, 2014 - 2022

Bleaching was not observed at this site. No incidents of damage or disease were recorded, but one item of fishing line and one of general marine debris were recorded. One banded coral shrimp was recorded on the invertebrate survey.

A fish survey was conducted but no target fish were recorded

Image 2.10A Surveyor in action

Image 2.10B Soft corals

Image 2.10C Trash

3.0 DISCUSSION AND NOTES

This season proved difficult for a variety of reasons including ongoing weather issues resulting in devastating floods early in 2022, combined with an increase in the occurrence of staff and volunteer illness, and a decrease in volunteer capacity over the length of this project. These challenges resulted in 86% of survey days being cancelled over the duration of 12 months. Regardless, a small and dedicated team of long-term volunteers completed 12 reef health surveys throughout the year, including 8 of the scheduled 12 winter/summer surveys, and 4 surveys conducted at additional reef areas within Moreton Bay, that had not been surveyed by Reef Check Australia since 2020.

The floods from February 2022 saw millions of tonnes of sediment exit the Brisbane River, making its way north to the Fraser and Sunshine Coasts, south to the Gold Coast, and east throughout Moreton Bay. Channel and gulley erosion runoff from the Brisbane River Catchment (primarily the Lockyer Valley) leads to sedimentation, which directly impacts coral recruitment, growth, mortality, and the ecosystem services that coral reefs provide. Moreton Bay reefs lie within mere kilometres of the Brisbane River mouth, and previous floods have had devastating effects on the ongoing health of these reefs, so it was important for Reef check Australia to take the opportunity to monitor and document changes in the health of Moreton Bay reefs prior to and shortly after this natural disturbance.

From the surveys conducted during the 2021-2022 season prior to the flooding event, hard and soft coral populations continue to remain low, but steady in number. Many of the corals of Moreton Bay have shown great resilience over time, thriving on 'the edge' of tolerable conditions. However initial results from surveys conducted after the February 2022 floods show longer lasting impacts including increased sediment loading, increased turbidity (meaning less availability of light), increased incidence of coral bleaching, and an increase in Nutrient Indicator Algal growth.

Sediment can affect corals throughout their life cycle. High levels of sediment exposure can depress coral health, condition, and survival. A reduction in light reduces photosynthesis by symbiotic algae, thus limiting corals' primary energy source. Corals also divert available energy toward sediment clearance behaviours such as mucus production/sloughing and tentacle movement, which can interfere with filter feeding. Thus, sediment may lead to sublethal responses, such as reduced rates of growth, productivity, and calcification, as well as bleaching, disease susceptibility, physical damage, and inability to regenerate following tissue damage. If the stress level continues and/or intensifies, corals may experience lethal effects including tissue necrosis and colony death, which if widespread, may lead to changes in coral-reef community structure and ecosystem health.

Goat Island is a small coral cay in the middle of Moreton Bay, surrounded by internationally recognised Ramsar wetlands and the Moreton Bay Marine Park. It sits just off the coast of the North Stradbroke Island (Minjerribah) town of Dunwich (Goompie). No surveys were conducted at Goat island in 2021, however the Reef Check Australia team did visit the site on several occasions throughout the past year to document hard coral growth and growth form diversity. In September this year the team revisited the site to conduct reef health surveys as a part of the Port of Brisbane Partnership. Large amounts of nutrient indicator algae, *Colpomenia spinuosa* (commonly referred to as Sinuous Ballweed, Cornflake seaweed or the Oyster Thief) was recorded covering large areas of branching hard coral, corresponding in a drop in hard coral cover from 36% to 4%, and an increase in 'Rock' from 14% to 44%, silt from 9% to 15% and nutrient indicator algae from zero to 8%. Images 3.1-3.3 show images taken in June 2020, and Images 3.4-3.6 are from the same site in September 2022.

This algae has not previously been recorded at this site. Nutrient indicator algae may suggest an increase in the amount of available nutrients in an area, and we will continue to monitor the site for any changes.

Understanding how our decisions and actions on land impact the health of reef habitats is crucial to reducing our impact on marine environments, and to good management and conservation of coral reefs.


Image 3.1 Goat Island East June 2020


Image 3.2 Goat Island East June 2020


Image 3.3 Goat Island East June 2020


Image 3.4 Goat Island East Sept 2022

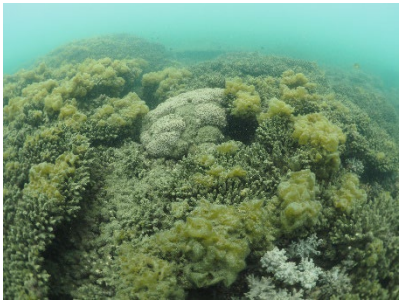
Image 3.5 Goat Island East Sept 2022

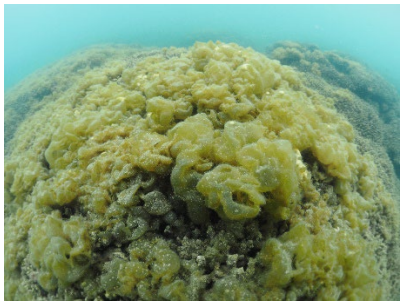
Image 3.6 Goat Island East Sept 2022

4.0 FURTHER INFORMATION

For more information on Reef Check Australia, survey methods, sites and previous reports, please go to www.reefcheckaustralia.org.

4.1 REFERENCES

Tuttle, L.J., Donahue, M.J. Effects of sediment exposure on corals: a systematic review of experimental studies. Environ Evid 11, 4 (2022).

5.0 ADDITIONAL IMAGES