

Reef Check Australia

South East Queensland Season Summary Report 2021-2022



REEF CHECK AUSTRALIA

www.reefcheckaustralia.org

This report should be cited as: J. Salmond and J Schubert. Reef Check Australia South East Queensland Season Summary Report 2021-2022. Reef Check Foundation Ltd.

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



This project was made possible by a network of dedicated volunteers, generous dive operators, wise advisors, innovative collaborators and supportive funding agencies.

Thank you to the dedicated citizen scientists who have contributed to survey activities and entered data: Tania Alajo, Ashleigh Borra, Ilha Byrne, Paul Colquist, Philip Dunbavan, Terry Farr, Rachel McVeigh, Jodi Salmond and Julie Schubert.

A special note of acknowledgement to our trainers, professional volunteers and staff: 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 by Gary Cranitch.

Project activities were conducted on the traditional lands of the Quandamooka People, Kabi Kabi First Nation and Yugambah People. We acknowledge and pay respect to the past, present and future Traditional Custodians and Elders of this nation and the continuation of cultural, spiritual and educational practices of Aboriginal and Torres Strait Islander peoples

This project is supported by Reef Check Australia, through funding from the City of Gold Coast, Port of Brisbane, and the Sunshine Coast Council.



This report should be cited as: J. Salmond and J Schubert
Reef Check Australia South East Queensland Season Summary Report 2021-2022.
Reef Check Foundation Ltd.

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



Message from our General Manager

Around the world, reefs are under pressure from pollution, development, climate change and heavy human use of ocean environments. This past year has seen an increase in the frequency and intensity of heavy rainfall, increased winds and the after affects that come from them, including floods, pollution, increased sedimentation and nutrients, all leading to changes in coral community assemblages.

Climate change continues to be the greatest threat to the future of coral reefs around the world, however we continue to do what we can to inspire, educate and engage those around us to make the best possible choices for the health of our oceans, and the future of our planet.

This season proved difficult for a variety of reasons including ongoing weather issues as mentioned above, combined with an increase in the occurrence of staff and volunteer illness, and a decrease in volunteer capacity. In a world where we are able to communicate quickly at all times of the day, everyone is getting busier, which results in even less capacity. These combined 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 30 reef health surveys throughout the year at key long term reef health monitoring sites within the Sunshine Coast, Moreton Bay, and the Gold Coast.

The floods from February 2022 saw thousands of tonnes of debris exit the Brisbane River, making its way north to the Fraser and Sunshine Coasts, south to the Gold Coast, and east throughout Moreton Bay. Coastal development and runoff lead to sedimentation, which directly impacts coral recruitment, growth, mortality, and the ecosystem services that coral reefs provide. Previous floods have had devastating effects on the ongoing health of southeast Queensland reef systems, so it was important for Reef Check Australia to take the opportunity to monitor and document changes in the health of reefs we could access in the pockets of decent weather prior to and shortly after this major disturbance. Stay tuned as we continue to monitor these sites and report on their health amongst the wet weather over the coming months.

As we look back on the past year, and look forward to the next one, I want to take a moment to say thank you for sticking with us. Thank you to every individual, community group, business and volunteer that has helped us all get to where we are. It is due to the outstanding support of funding partners, and the dedicated efforts of everyone behind the scenes that make up Reef Check Australia that we are able to continue to do what we all love; better understand, appreciate and work to protect our marine ecosystems. I am truly thankful to be surrounded by such an amazing team, and community. Thank you to each and every one of you for your support, kind words and dedication to our reefs and oceans.

To find out more about our activities, how you can be involved, or how to donate, please visit our website: www.reefcheckaustralia.org.

Jodi Salmond

General Manager, Reef Check Australia

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



A big Thank you to industry supporters who provided in-kind support during this survey season for surveys, volunteer training events and advice including: GO Dive Brisbane, River to Bay, Subsurface Scuba and OzDive.



REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



Table of Contents

Message from our General Manager	3
1.0 PROJECT INTRODUCTION	7
1.1 MONITORING SITES.....	9
1.2 KEY FINDINGS FROM 2021-2022 SURVEYS:	11
1.2.1 SUBSTRATE	11
1.2.2 IMPACTS: CORAL BLEACHING	12
1.2.3 IMPACTS: CORAL DAMAGE	15
1.2.4 IMPACTS: CORAL DISEASE.....	15
1.2.5 IMPACTS: MARINE DEBRIS.....	15
1.2.6 IMPACTS: CORAL SCARRING	15
1.2.7 INVERTEBRATE ABUNDANCE.....	17
1.2.8 FISH ABUNDANCE	18
1.2.9 RARE ANIMALS.....	18
2.0 SUNSHINE COAST SITE REPORTS	19
2.1 BULCOCK BEACH, THE BOARDWALK.....	19
2.2 CURRIMUNDI REEF, SITE 1	20
2.3 CURRIMUNDI REEF, SITE 2	21
2.4 INNER GNEERINGS, THE CAVES; SITE 1	22
2.5 INNER GNEERINGS, THE CAVES; SITE 2	23
2.6 KINGS BEACH.....	24
2.7 MOOLOOLABA RIVER, LA Balsa NORTH.....	25
2.8 MUDJIMBA ISLAND, NORTHWEST	26
2.9 MUDJIMBA ISLAND, THE LEDGE; S1.....	27
2.10 MUDJIMBA ISLAND, THE LEDGE; S2.....	28
2.11 MUDJIMBA ISLAND, THE LEDGE; S3.....	29
3.0 INSHORE MORETON BAY SITE REPORTS:	30
3.1 AMITY POINT, SITE 2	30
3.2 GREEN ISLAND NORTH, SITE 1	31
3.3 GREEN ISLAND WEST, SITE 1	32
3.4 MUD ISLAND, CORAL GALORE	33
3.5 MUD ISLAND, RUBBLE PATCH.....	34
3.6 ST HELENA, PALINDROME.....	35

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



3.7 ST HELENA, RAY OF SUNSHINE.....	36
3.8 PEEL ISLAND, EAST	37
3.9 PEEL ISLAND, NORTH-EAST	38
3.10 GOAT ISLAND, EAST.....	39
3.11 GOAT ISLAND, WEST	40
4.0 GOLD COAST SITE REPORTS:	41
4.1 PALM BEACH REEF, SITE 1	41
4.2 PALM BEACH REEF, SITE 2	42
4.3 GOLD COAST SEAWAY, SOUTHWEST WALL; SITE 1	43
4.4 GOLD COAST SEAWAY, THE PIPE; SITE 1.....	44
4.5 NARROWNECK REEF; SITE 1	45
4.6 WAVEBREAK ISLAND; SITE 1	46
4.7 KIRRA REEF; SITE 1.....	47
4.8 COOK ISLAND; SITE 1.....	48
5.0 DISCUSSION AND NOTES	49
6.0 TEAM PHOTOS	51
7.0 FURTHER INFORMATION	53
7.1 REFERENCES.....	53

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



1.0 PROJECT INTRODUCTION

Since 2001, Reef Check Australia (RCA) has supported citizen science reef monitoring projects on reefs around Australia. For the past 20 years, our surveys have helped with the collection of long-term data relating to reef health at a local, national and global scale.

RCA's survey methods collect quantitative data for substrate cover, key invertebrate species, target fish species, as well as anthropogenic and natural impacts in reef habitats.

This report presents a summary of the findings for surveys conducted in South East Queensland (SEQ) during the 2021-2022 season. Teams of trained volunteers monitored a total of 30 locations on 18 different reefs, which included survey sites ranging from Mudjimba Island on the Sunshine Coast to Cook Island south of the Gold Coast. Of these 30 locations, 2 reefs were surveyed twice annually (Mud Island – Coral Galore and Rubble Patch), all remaining sites were only surveyed once. Green Island and St Helena Island are typically surveyed twice annually, however the flood event this year prevented the summer surveys from taking place. 12,000m² of reef habitat was surveyed in total during the 2021-2022 season (where one survey covers 400m²), resulting in more than 4800 pieces of substrate data collected, and more than 1,440 hours donated by trained volunteers.



Image 1A Surveyor in action – Mudjimba Island



Image 1B Juvenile Lionfish

The SEQ region is divided into the five sub-regions: Noosa, Sunshine Coast, Outer Moreton Bay, Inshore Moreton Bay and Gold Coast. Some existing RCA monitoring locations were not visited during the 2021-2022 survey season due to a down-turn in funding resources. Survey site locations are documented in Table 1 below and those not surveyed in 2021-2022 are shown in *italics*.

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



Table 1. List of all RCA survey reefs in South East Queensland by Sub-region. Reefs not visited during the 2021-2022 survey season are represented in *italics*.

NOOSA	SUNSHINE COAST	INSHORE MORETON BAY	OUTER MORETON BAY	GOLD COAST
<i>Granite Bay</i>	Bulcock Reef	Amity Point	<i>Flat Rock Island</i>	Cook Island
<i>Hancocks Shoal</i>	Currimundi Reef	Goat Island	<i>Flinders Reef</i>	Gold Coast Seaway
<i>Jew Shoal</i>	<i>Dead Mans Reef</i>	Green Island	<i>Hutchinsons Shoal</i>	Kirra Reef
<i>Little Halls Reef</i>	Inner Gneerings	<i>Macleay Island</i>	<i>Marietta Dal</i>	Narrowneck Reef
<i>The Caves</i>	Kings Beach	Mud Island	<i>Shag Rock Island</i>	Palm Beach Reef
	Mooloolah River	<i>Myora Reef</i>		<i>Palm Beach Artificial Reef</i>
	Mudjimba (Old Woman) Island	Peel Island		Wavebreak Island
		St Helena Island		

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



1.1 MONITORING SITES

In the 2021-2022 season, RCA monitored sites along the SEQ coast from Mudjimba Island off the Sunshine Coast all the way to Cook Island south of the Gold Coast (see Figure 1.1 for map locations). Reef habitats at the survey sites varied from inshore to offshore areas, and included reef flats, crests and slopes. Sites also spanned protected (marine national park, no-take zones) and non-protected areas. Of the 18 reefs surveyed, six were within the Moreton Bay Marine Park.



Figure 1: Map of South East Queensland survey sites from Google Earth, A: Noosa; B: Sunshine Coast; C: Moreton Bay; D: Gold Coast. Note that Noosa, Flinders Reef and a number of inner and outer Moreton Bay sites were not surveyed this season due to funding constraints.

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



Table 2: Table of RCA monitoring locations from Mudjimba Island to Gold Coast visited in the 2021-2022 SEQ season, including site number, location, depth, year of initial survey and site designation. Site designation includes four zones within the Moreton Bay Marine Park: Marine National Park (MNP), Conservation Park (CP), Habitat Protection (HP) and Ramsar Wetland site status (Ramsar).

LOCATION	SITE #	SITE	DEPTH (m)	1 st SURVEY	SITE ZONING
Sunshine Coast	1	Bulcock Beach, Boardwalk	4	2018	MNP, Ramsar
Sunshine Coast	1	Currimundi Reef	9	2009	
Sunshine Coast	2	Currimundi Reef	9	2009	MNP, Ramsar
Sunshine Coast	1	Inner Gneerings, The Caves	9	2009	
Sunshine Coast	2	Inner Gneerings, The Caves	9	2013	
Sunshine Coast	1	Kings Beach	5	2009	
Sunshine Coast	1	Mooloolah River, La Balsa	5	2018	
Sunshine Coast	1	Mudjimba Island, NW Reef	9	2013	
Sunshine Coast	1	Mudjimba Island, The Ledge	5	2007	
Sunshine Coast	2	Mudjimba Island, The Ledge	9	2013	
Sunshine Coast	3	Mudjimba Island, The Ledge	6	2013	
Inshore Moreton Bay	2	Amity Point	5	2016	CP, Ramsar
Inshore Moreton Bay	1	Green Island, North	5	2015	CP, Ramsar
Inshore Moreton Bay	1	Green Island, West	5	2017	CP, Ramsar
Inshore Moreton Bay	1	Mud Island, Coral Galore	5	2017	HP, Ramsar
Inshore Moreton Bay	1	Mud Island, Rubble Patch	5	2017	HP, Ramsar
Inshore Moreton Bay	1	St Helena, Palindrome	5	2018	MNP, Ramsar
Inshore Moreton Bay	1	St Helena, Ray of Sunshine	5	2018	MNP, Ramsar
Inshore Moreton Bay	1	Goat Island, East	5	2009	CP, Ramsar
Inshore Moreton Bay	1	Goat Island, West	5	2014	CP, Ramsar
Inshore Moreton Bay	1	Peel Island, North-east	5	2014	CP, Ramsar
Inshore Moreton Bay	1	Peel Island, East	5	2009	CP, Ramsar
Gold Coast	1	Gold Coast Seaway, SW Wall	5	2007	Aquatic Reserve
Gold Coast	1	Gold Coast Seaway, The Pipe	5	2015	
Gold Coast	1	Palm Beach Reef	9	2007	
Gold Coast	2	Palm Beach Reef	9	2009	
Gold Coast	1	Wavebreak Island	9	2019	
Gold Coast	1	Narrowneck Reef	9	2007	
Gold Coast	1	Kirra Reef	5	2016	
Gold Coast	1	Cook Island	7	2019	

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



1.2 KEY FINDINGS FROM 2021-2022 SURVEYS:

The 2021-2022 season included surveys at 30 monitoring locations.

1.2.1 SUBSTRATE

Of the 30 locations surveyed, most remained relatively stable in hard coral cover with most changes of less than 10%. The most notable changes were a 10% increase at Cook Island and a 15% decrease at Mudjimba Island Northwest Reef. Soft coral remained relatively stable, with an increase above 10% at Mudjimba Island Site 1 (14%) and a decrease of 12% at Mudjimba Island Site 2.

Hard coral cover ranged from 0% found at Bulcock Beach, Gold Coast Seaway South West Wall & The Pipe; Kirra Reef; Narrownneck Artificial Reef and Wavebreak Island to 41% at Mudjimba Island, The Ledge Site 1. The average hard coral cover across all surveyed locations was 16% (not including sites with no hard coral recorded). This overall regional average is consistent with previous years.

The most predominant substrate type recorded across all 32 survey sites was rock, attributing 41% of the benthos surveyed (this includes all RCA rock categories; rock (RC), rock covered with coralline algae (RCCA) and rock covered with turf algae (RCTA). Rubble accounted for the second most abundant substrate, at 23%, with silt at 22%, sand made up 16%, whilst soft coral made up 8%. These percentages are based on the number of sites on which these substrate categories were recorded. High levels of silt were recorded during the substrate point survey at Bulcock Beach (100%), St Helena Ray of Sunshine (45%), Green Island North (42%), Amity Point (29%) and Green Island West (26%). Higher than average levels of silt were also noted at Peel Island and Goat Island in September 2022, months after the February floods.



Image 1.2.1A Goat Island (Gary Cranitch)



Image 1.2.1B Happy surveyors at Amity Point



Image 1.2.1C Sunset off the Sunshine Coast

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



1.2.2 IMPACTS: CORAL BLEACHING

Coral bleaching was recorded on 17 of the 30 survey sites (56% of survey sites) which is a reduction from 2020/2021 (66%) and a continuing downward trend from previous years. On average, <1.5% of the coral population was affected, with individual colonies suffering an average of 29% surface bleaching. The highest population bleaching (8.75%) was recorded at Peel Island Northeast.

Figures 2 to 5 below depict changes in coral cover, and coral bleaching, over time at each site, and are categorised by sub-regions.

Sunshine Coast Regional Summary of Coral Trends and Bleaching

Hard coral coverage has remained relatively constant over the years on the Sunshine Coast. Mudjimba, The Ledge, Site 2 again exhibited the highest percentage of coral bleaching recorded on the point-intercept substrate survey, at 4% of the population which is an increase from last year. Bleaching recorded on the impact survey ranged from 0% to 1% of the population, whilst individual colonies ranged from 2.5% to 83% of the surface bleached.

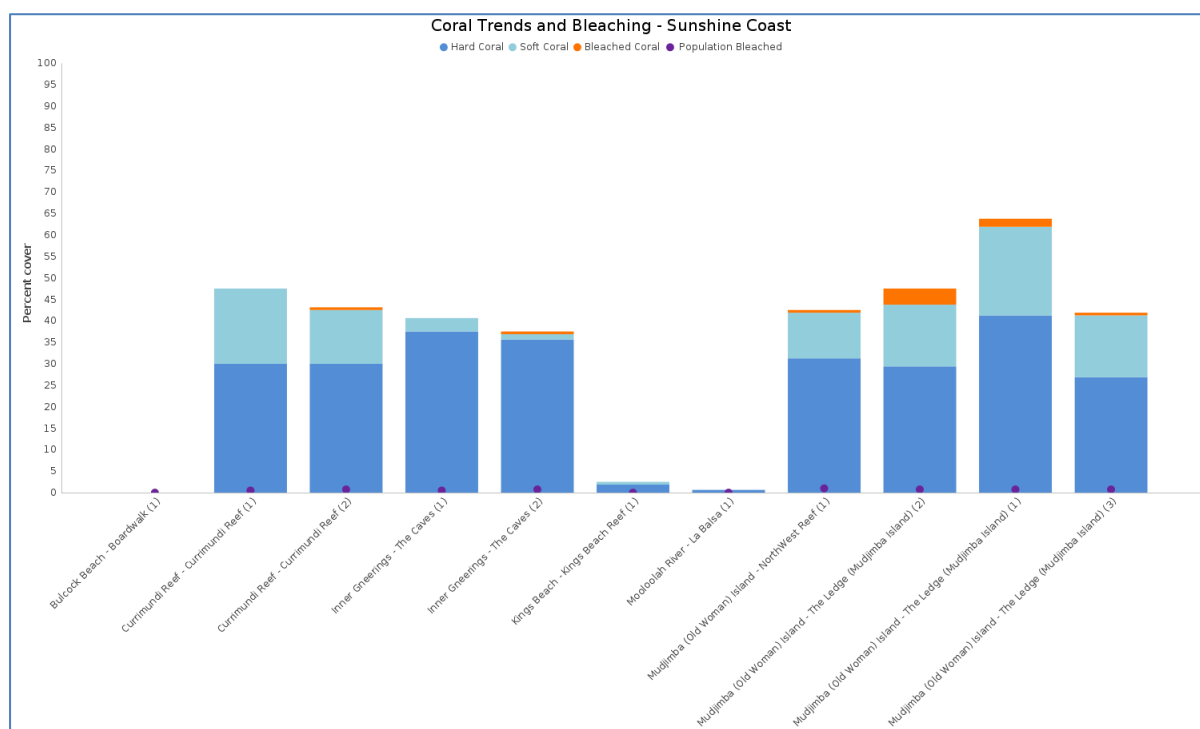


Figure 2: Percent cover of hard coral (blue), soft coral (light blue) and bleached coral (orange) for current survey year at Sunshine Coast Reef Check Australia reef health monitoring locations, as per point-intercept substrate surveys for benthic composition. Percentage of the coral population exhibiting bleaching (purple dot) as documented on belt transect survey for reef health impacts, is included where available.

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



Inner Moreton Bay Regional Summary of Coral Trends and Bleaching

Hard coral coverage has remained reasonably consistent at most sites in Inner Moreton Bay. However, a noticeable decrease was recorded at Goat Island East, down from 36% in 2020 to less than 5% in 2022. Bleaching recorded during the point-intercept substrate survey was limited to both sites at Peel Island, at 1.25% of the coral population. Levels of bleaching recorded during the impact survey ranged from 0% to 8.75% of the population bleached with individual colonies varying from 2.75% to 50% bleached.

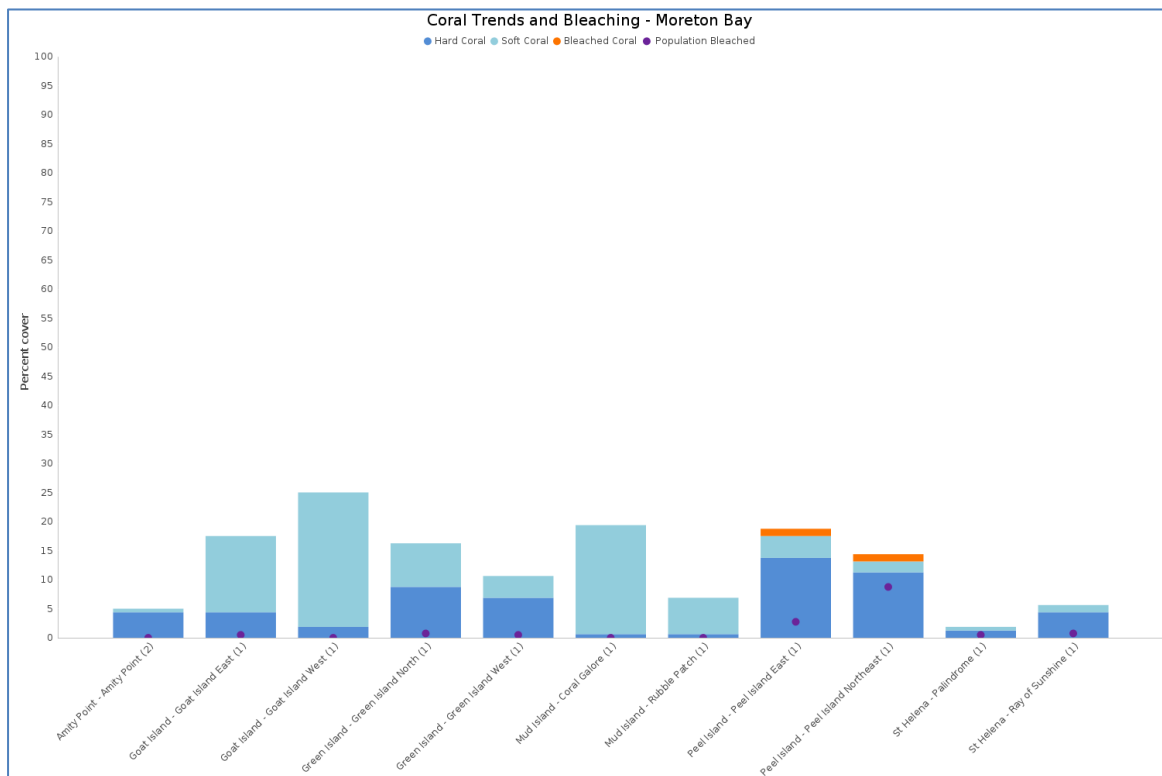


Figure 3: Percent cover of hard coral (blue), soft coral (light blue) and bleached coral (orange) for current survey year at Inner Moreton Bay Reef Check Australia reef health monitoring locations, as per point-intercept substrate surveys for benthic composition. Percentage of the coral population exhibiting bleaching (purple dot) as documented on belt transect survey for reef health impacts, is included where available.

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



Gold Coast Regional Summary of Coral Trends and Bleaching

Hard coral coverage was only found in noticeable quantities at Palm Beach S1 & S2 and Cook Island, with Kirra Reef dominated by soft corals. Hard coral cover at Cook Island increased back to levels similar to 2019, with increases also noted at both sites at Palm Beach. Bleaching was not detected at either of these reefs during the substrate or impacts surveys. Bleaching was not recorded at 4 of the sites however no coral was recorded at these sites.

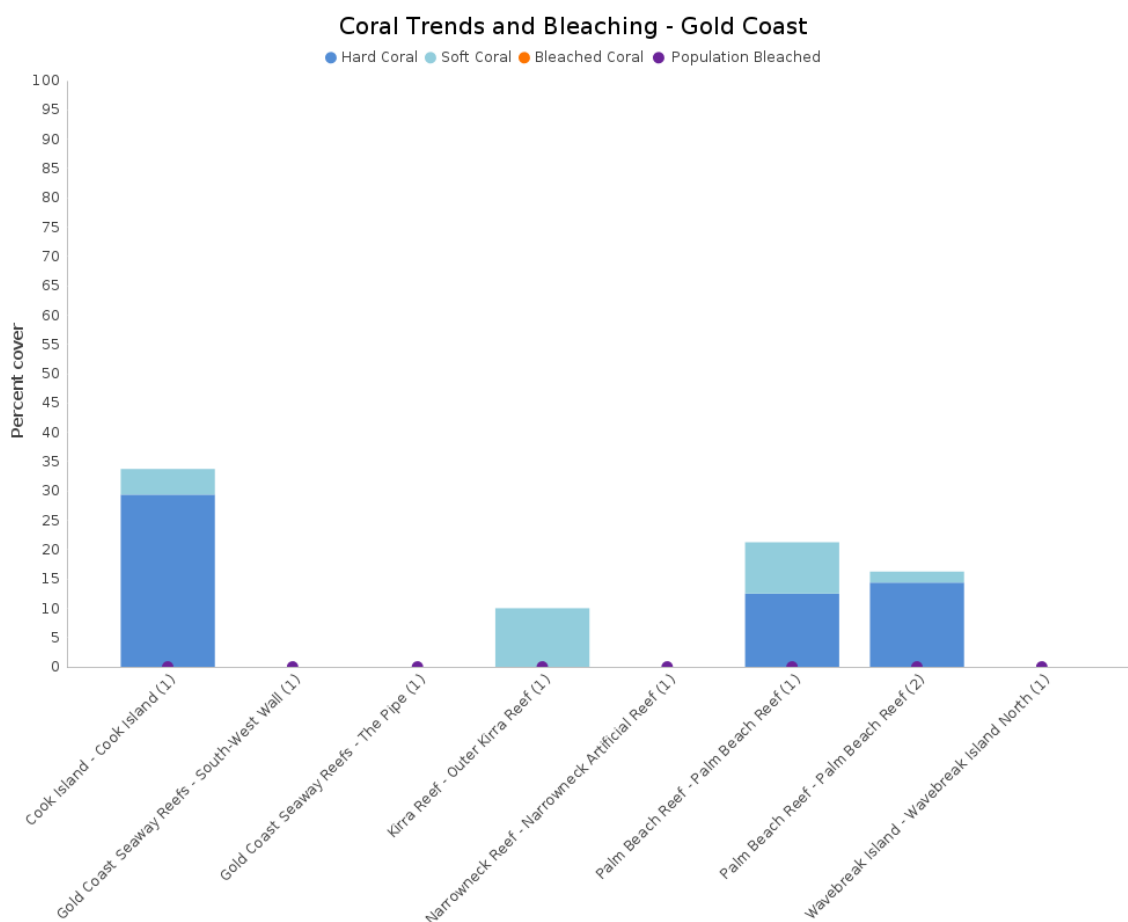


Figure 5: Percent cover of hard coral (blue), soft coral (light blue) and bleached coral (orange) for current survey year at Gold Coast Reef Check Australia reef health monitoring locations, as per point-intercept substrate surveys for benthic composition. Percentage of the coral population exhibiting bleaching (purple dot) as documented on belt transect survey for reef health impacts, is included where available.

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



1.2.3 IMPACTS: CORAL DAMAGE

Coral damage (due to unknown causes) was recorded on 10 of the 30 survey sites. The highest recordings for coral damage was at Mudjimba Island Northwest Reef with a count of 28 incidences, followed Mudjimba Island – The Ledge Site 3 at 13 incidences. A total of 55 incidences of coral damage were recorded this season, which is lower than last season (132).

1.2.4 IMPACTS: CORAL DISEASE

A total of 53 incidences of coral disease were recorded during the season, a reduction from last season. Of these, the highest recording (26) was at Mudjimba Island Northwest Reef, followed by the Inner Gneerings – The Caves Site 1 (13 incidences).

1.2.5 IMPACTS: MARINE DEBRIS

There were 775 incidences of marine debris recorded this season, primarily fishing debris. The highest recordings of marine debris was 364 and this was found at Bulcock Beach (which also recorded the highest number last season). Gold Coast Seaway reefs recorded 124 (south-west wall) and 74 (the pipe) and Mooloolah River also 74 incidences.

1.2.6 IMPACTS: CORAL SCARRING

Only 111 scars were recorded this season, slightly down from 135 last season. Unknown scars accounted for 56 of the scars and *Drupella* accounted for the remaining 55. The highest recording of unknown scars (26) and *Drupella* scars (27) was at Mudjimba Island Northwest Reef.

Tables 3 and 4 on the subsequent pages display these key findings by survey name and sub-region.



Image 1.2.3 Coral damage



Image 1.2.4 Coral disease



Image 1.2.5 Trash



Image 1.2.6 Unknown scar

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



Table 3: Summary table of RCA monitoring findings for surveys conducted on the Sunshine Coast and 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), as well as a 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. a total across 80m).

Basic site summary						Presence of Impacts							
	Hard Coral Coverage (%)	Soft Coral Coverage (%)	Macroalgae (#) per 80m transect	Nutrient Indicator Algae (%)	Silt Loading	Coral Population Bleaching (%)	Coral Disease (#)	Fishing Line (#)	Marine Debris (General) (#)	Anchor Damage (#)	Coral Damage (#) (Unknown Causes)	<i>Drupella</i> Scar (#)	Unknown Scar (#)
SUNSHINE COAST													
Bulcock Beach	0.0	0.0	0	0	H	0	0	351	13	0	0	0	0
Currimundi S1	30.0	17.5	0	0	L	0.50	3	1	0	0	3	0	1
Currimundi S2	30.0	12.5	0	0	N	0.75	0	0	0	0	1	0	0
Inner Gneerings S1	37.5	3.1	1	1	N	0.50	13	4	0	0	1	0	0
Inner Gneerings S2	35.6	1.2	8	5	N	0.75	1	1	0	0	4	2	9
Kings Beach	1.9	0.6	2	38.7	N	0	0	4	0	0	0	0	0
Mooloolah River	0.6	0	0	5.6	L	0	0	66	8	0	0	0	0
Mudjimba Island, North West S1	31.2	10.6	0	0	L	1	26	0	0	0	28	27	26
Mudjimba Island, The Ledge S1	41.2	20.6	0	0	N	0.75	6	5	0	0	2	8	8
Mudjimba Island, The Ledge S2	29.4	14.4	0	0	M	0.75	0	1	0	0	1	0	0
Mudjimba Island, The Ledge S3	26.9	14.4	4	2.5	M	0.75	0	4	0	0	13	15	6
INNER MORETON BAY													
Amity S2	4.4	0.6	0	0	M	0	0	25	6	0	0	3	0
Green Island, North, Site 1 (Winter)	8.7	7.5	10	6.2	M	0.75	0	1	2	0	0	0	0
Green Island, West (Winter)	6.9	3.7	16	10	M	0.50	0	1	1	0	0	0	0
Mud Island, Coral Galore (Summer)	0	0	42	26	L	0	0	0	0	0	0	0	0
Mud Island, Coral Galore (Winter)	0.6	18.8	16	15	L	0.5	0	1	0	0	1	0	0
Mud Island, Rubble Patch (Summer)	0	0	36	22.5	L	0.75	0	0	0	0	0	0	0
Mud Island, Rubble Patch (Winter)	0.6	6.3	7	19	M	0.25	0	0	0	0	0	0	0
St Helena, Palindrome (Winter)	1.2	0.6	14	13.7	M	0.5	0	0	1	0	0	0	2
St Helena, Ray of Sunshine (Winter)	4.4	1.2	3	1.9	M	0.75	0	1	3	0	0	0	0
Peel Island, East	13.7	3.7	0	12.5	M	2.75	0	27	4	0	0	0	0
Peel Island, North-east	11.2	11.2	0	19.4	L	8.75	1	21	5	0	0	0	1
Goat Island, East	4.4	13.1	0	8.1	H	0.5	3	0	0	0	1	0	0
Goat Island, West	2.0	23.1	0	0	L	0	0	1	1	0	0	0	0

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



Table 4: Summary table of RCA monitoring findings for surveys conducted on the Gold Coast 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), as well as a 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. a total across 80m).

Basic site summary						Presence of Impacts							
Hard Coral Coverage (%)	Soft Coral Coverage (%)	Macroalgae (#) per 80m transect	Nutrient Indicator Algae (%)	Silt Loading		Coral Population Bleaching (%)	Coral Disease (#)	Fishing Line (#)	Marine Debris (General) (#)	Anchor Damage (#)	Coral Damage (#) (Unknown Causes)	<i>Drupella</i> Scar (#)	Unknown Scar (#)
GOLD COAST													
GC Seaway, SW Wall	0	0	0	0	M	0	0	113	9	0	0	0	0
GC Seaway, The Pipe	0	0	0	0	L	0	0	73	1	0	0	0	0
Palm Beach S1	12.5	8.8	2	1.9	N	0	0	1	1	0	0	0	2
Palm Beach S2	14.4	1.9	5	3.1	N	0	0	2	0	0	0	0	0
Narrowneck Reef	0	0	0	53	N	0	0	0	0	0	0	0	0
Wavebreak Island	0	0	0	0	L	0	0	2	2	0	0	0	0
Kirra Reef	0	10	0	1.3	N	0	0	4	2	0	0	0	0
Cook Island	29.4	4.3	0	1.9	N	0	0	0	0	0	0	0	1

1.2.7 INVERTEBRATE ABUNDANCE

Invertebrate surveys were carried out at all locations visited. The most abundant indicator invertebrate were anemones (with or without fish), with 667 individuals recorded this season. The vast majority of these were recorded at Palm Beach S1 (315), Palm Beach S2 (193), Kirra Reef (69) and Cook Island (67).

Drupella snails were the second most abundant invertebrate with a total of 383 recorded. The highest numbers recorded were at Mudjimba Island - The Ledge S3 (182) and Mudjimba Island - The Ledge S1 (60). Urchins totalled 265, with 109 recorded at Amity Point, followed by a total of 70 for Palm Beach sites.

Across the 30 survey sites, two banded coral shrimp, 11 lobsters, and one *Trochus* snail were recorded. No Crown of Thorns Starfish (COTS), target sea cucumbers or tritons were recorded on transect during the 2021-2022 survey season.

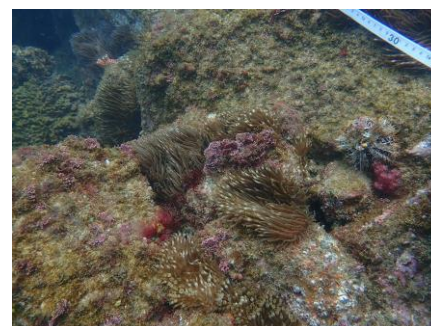


Image 1.2.7A Anemones

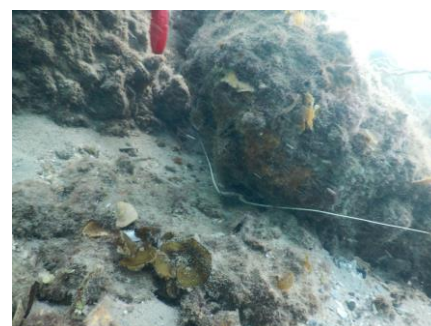


Image 1.2.7B Juvenile lobster

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



1.2.8 FISH ABUNDANCE

Fish surveys were carried out on all surveys. Again, butterflyfish were the most abundant target fish species with a total of 111 sightings across all surveys (down from last season). The highest number recorded was 23 at Mooloolah River. Also recorded were 27 snapper, 26 moray eels, 23 sweetlips, two grouper and five parrotfish. Of interest two Blue Grouper (*Achoerodus viridis*) were observed at Cook Island.

1.2.9 RARE ANIMALS

Many rare animals were sighted during the surveys this season, some of which include wobbegong sharks, stingrays, turtles and octopuses.



Image 1.2.9 A green sea turtle watching survey divers at Mudjimba Island, Sunshine Coast.

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



2.0 SUNSHINE COAST SITE REPORTS

2.1 BULCOCK BEACH, THE BOARDWALK

Bulcock Beach, The Boardwalk, Site 1, was surveyed for the first time in 2018. Bulcock Beach is a popular coastal recreational area located in Caloundra. The boardwalk is a popular fishing spot. This site sits along a rock wall slope in approximately 4m depth. The site is a nursery for a variety of fish species in the area.

This site was heavily impacted by the flooding in the early part of the year and the entire site was covered in a heavy layer of silt. (Figure 2.1.1). No sessile benthic organisms such as sponge or ascidians were recorded on the substrate survey.

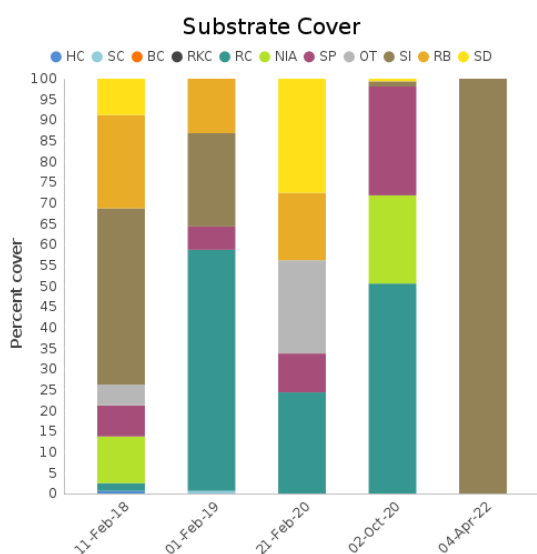


Figure 2.1.1 Benthic type and percentage cover, Bulcock Beach, The Boardwalk, Site 1, 2018-2022

Three hundred and sixty-four items of marine debris were recorded; primarily fishing debris. General rubbish items (13) were also recorded. This included a metal plate, large metal table and an A Frame sign.

Four *Drupella* snails were recorded on the invertebrate survey.

During the fish survey, two butterfly fish, three moray eels and one snapper were recorded.

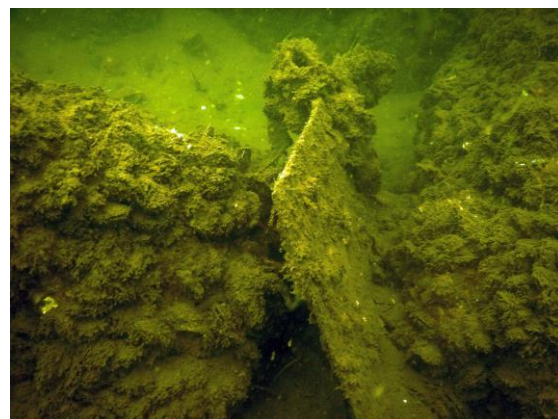


Image 2.1A Substrate



Image 2.1B Metal table



Image 2.1C Moray eel

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



2.2 CURRIMUNDI REEF, SITE 1

Currimundi Reef, Site 1, was surveyed for the first time in 2009. It is situated on the reef flat at nine metres on an exposed rocky outcrop. The reef in this area is reasonably flat although there are walls and rock pinnacles at various depths within the general area. This subtropical reef is not frequented by divers, however sections of Currimundi Reef are utilised by fishers.

Rock made up 42% of the substrate (including rock with turf algae and rock with coralline algae). Hard coral made up 30% of the total substrate (Figure 2.2.1). Soft coral attributed 17% to the substrate composition, with the balance being sand (4%), sponge (3%), rubble (2%) and other (hydroids) (1%). Turf algae was the dominant algae, with low levels of silt recorded.

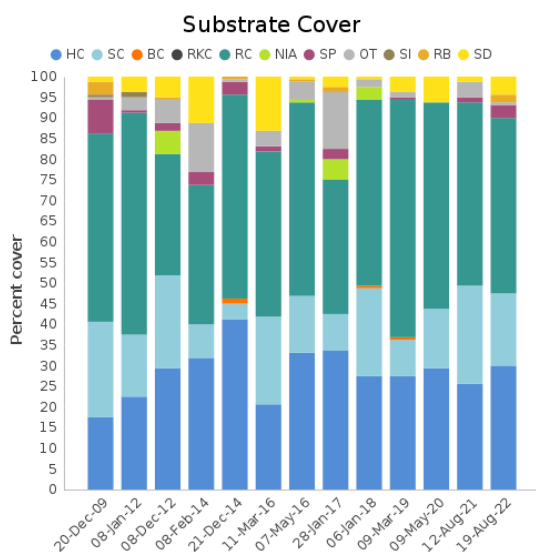


Figure 2.2.1 Benthic type and percentage cover, Currimundi Reef, Site 1, 2009-2022

Bleaching affected less than 1% of the total coral population with an average of 50% of any individual colony being bleached (with 2 soft corals almost entirely bleached). Three incidents each of coral disease and coral damage were recorded on the impact survey, with one unknown scar. Only one item of marine debris (fishing sinker) was recorded.

Three anemones (without fish) were observed on the invertebrate survey. A fish survey was conducted and three butterflyfish and one sweetlip were recorded.



Image 2.2A Site photograph



Image 2.2B Zooanthid

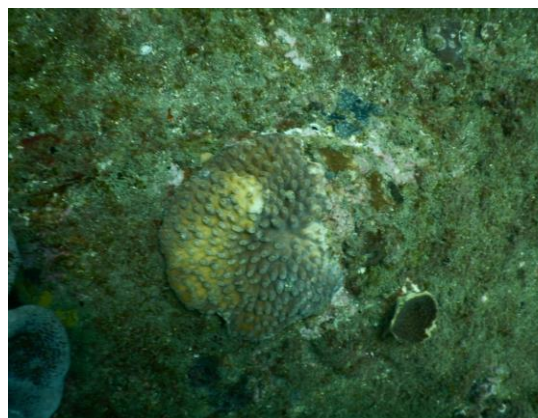


Image 2.2C Diseased hard coral

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



2.3 CURRIMUNDI REEF, SITE 2

Currimundi Reef, Site 2, is located adjacent to Site 1 and has a similar topography.

Rock made up 45% of the substrate (including rock with turf algae and rock with coralline algae), however hard coral made up 30% of the total substrate (Figure 2.3.1). Soft coral attributed 12% to the substrate composition, with the balance being rubble (4%), sand (1%), and bleached coral, nutrient indicator algae and other at less than 1% each. Turf algae was the dominant algae.

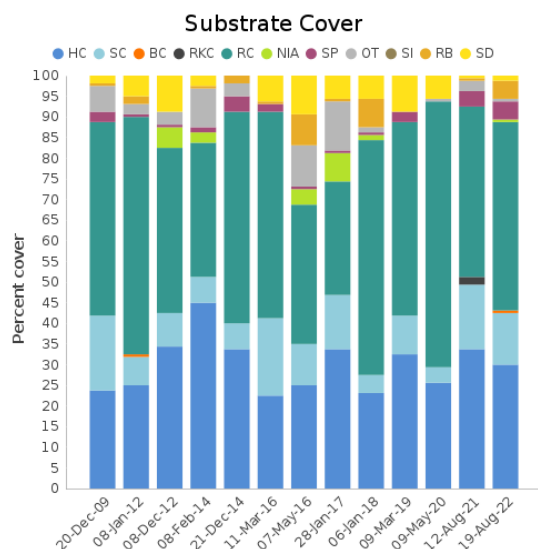


Figure 2.3.1 Benthic type and percentage cover, Currimundi Reef, Site 2, 2009-2022

Bleaching affected less than 1% of the total coral population with an average of 60% of any individual colony being bleached, although once again this was restricted to just a few corals. One incidence of unknown damage was the only other impact recorded on the impact survey. Items of marine debris were not recorded.

Four anemones without fish, one juvenile lobster and two *Drupella* snails were observed on the invertebrate survey.

A fish survey was conducted and eight butterfly fish were recorded on transect.



Image 2.3A Site photograph

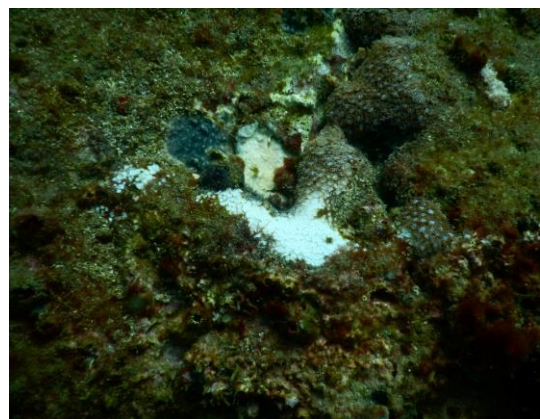


Image 2.3B Bleached coral

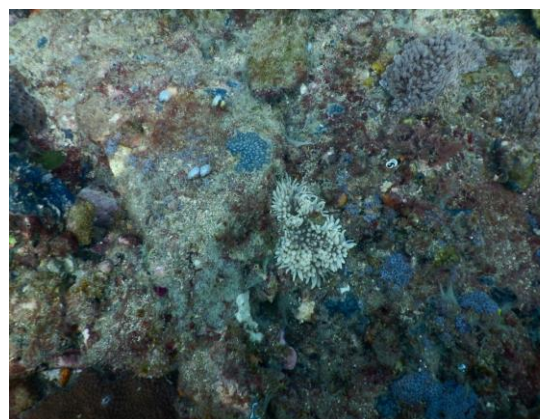


Image 2.3C Anemone

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



2.4 INNER GNEERINGS, THE CAVES; SITE 1

Inner Gneerings, the caves, is situated directly offshore from Mooloolaba and covers a wide range of depths from 10 to 25 m. It is a popular site for recreational fishing and diving. Site 1 is located at a depth of 10 m on the reef floor and is characterised by scattered rocky outcrops surrounded by coral, sponges and a collapsed cave structure. This site has been surveyed annually since 2009.

Rock (55%) was again the dominant substrate but hard coral increased again to 38%. Soft coral (3%) was lower than the previous survey. Sponge attributed 3% to the substrate and sand; 1% (Figure 2.4.1). Macroalgae was only recorded on one of the four transects.

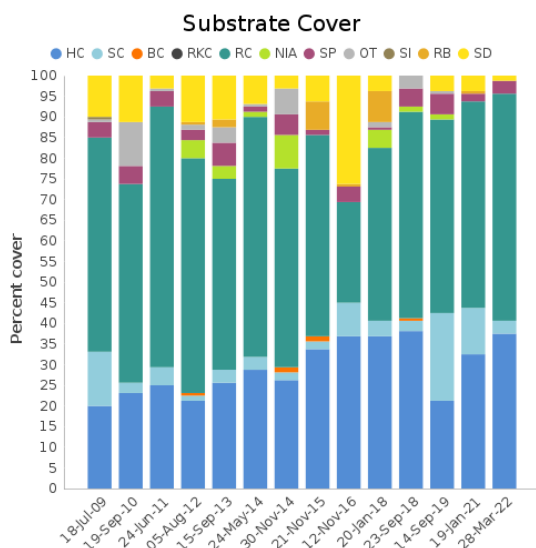


Figure 2.4.1 Benthic type and percentage cover, Inner Gneerings: The Caves, Site 1, 2009-2022

Six *Drupella* snails were the only invertebrates recorded during the invertebrate survey.

Coral bleaching was only observed on transect 4 and affected 2% of the total coral population, with an average of 10% of each colony showing surface bleaching. Except for unknown scars, impacts recorded increased from the previous survey.

Thirteen instances of coral disease, one *Drupella* scar, one instance of coral damage and four pieces of fishing line debris were recorded.

A fish survey was conducted and eight butterfly fish and one sweetlip were recorded.



Image 2.4A Substrate

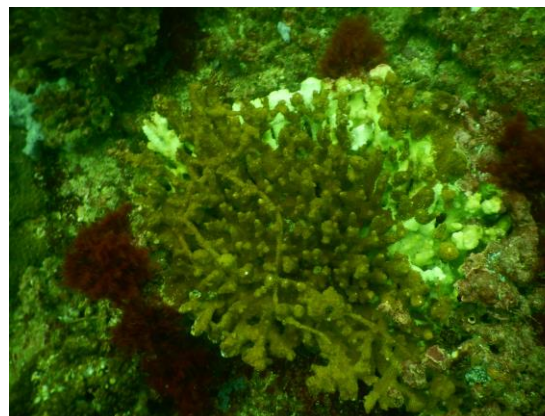


Image 2.4B Fishing Line



Image 2.4C Hard coral

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



2.5 INNER GNEERINGS, THE CAVES; SITE 2

Inner Gneerings, Site 2, was surveyed for the first time in 2013. It is situated on the reef flat at eight metres on an exposed rocky outcrop. The topography of the reef in this area is slightly varied with low walls and occasional large rocks. This subtropical reef is frequented by divers and fishers.

Rock made up 56% of the substrate (including rock with turf algae and rock with coralline algae). Hard coral made up 36% of the total substrate, with soft coral at 1% (Figure 2.5.1). Sponge and other made up 2.5% each, with sand at 1.2% and Bleached coral at <1% making up the balance of the substrate composition. Turf algae and *Asparagopsis* were once again the dominant algae.

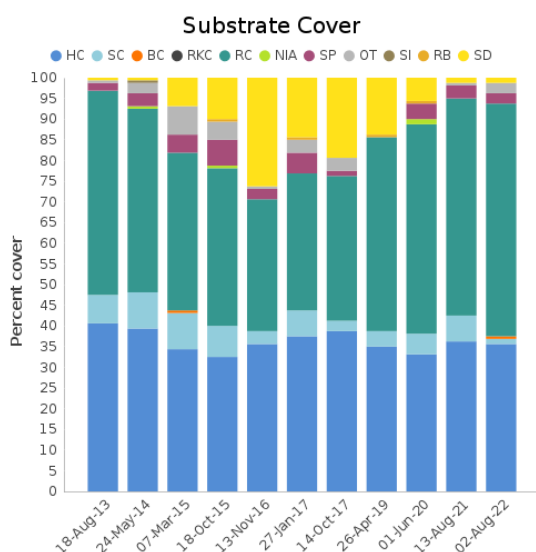


Figure 2.5.1 Benthic type and percentage cover, Inner Gneerings: The Caves, Site 2, 2013-2022.

Bleaching affected less than 1% of the total coral population with an average of 28% of any individual colony being bleached. Coral disease was observed on one coral colony, whilst two *Drupella* scars and nine unknown scars were recorded, along with 4 incidents of unknown damage on the impact survey. Marine debris was limited to one item of fishing line.

Seven *Drupella* snails were observed on the invertebrate survey.

A targeted fish survey was conducted, and five butterfly fish, one moray eel and one sweetlip were recorded.



Image 2.5A Site photo



Image 2.5B Unknown scar



Image 2.5C Hard coral and sponge

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



2.6 KINGS BEACH

Kings Beach Reef is located approximately 100m offshore, close to a boat ramp and regular boat traffic, and near to Caloundra's popular beach front area. Due to the impacts flooding has on this site, continued monitoring is required to document changes in the future. Water conditions proved challenging this year with poor visibility, strong winds and large surf hampering efforts to get to site. However, once we did we were pleasantly surprised by the diversity observed on the substrate.

Nutrient indicator algae (*Lobophora* spp.) (37%) was the dominant substrate followed by rock with turf algae (34%). Other (ascidians and halimeda) made up 17% of the benthos (Figure 2.6.1). Several hard and soft corals were seen during the survey, however they attributed just 2% and 1% of the total substrate respectively. Sand made up 9% and sponge <1%.

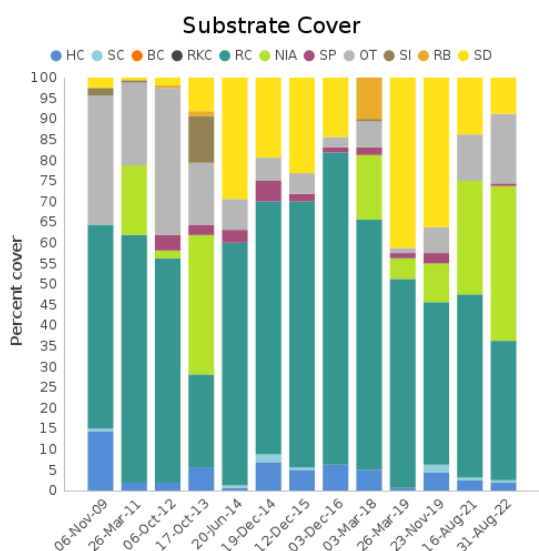


Figure 2.6.1 Benthic type and percentage cover, Kings Beach, 2009-2022

Coral bleaching was not observed, nor were other impacts to the corals. Four items of fishing line were the only debris recorded on transect.

Fifty one *Drupella* snails, one small trochus shell, two collector and seven long-spined urchins and one juvenile lobster were recorded during the invertebrate survey.

A fish survey was conducted and one moray eel was recorded, although other non-target fish were also observed.



Image 2.6A Coral and dominant algae



Image 2.6B Collector urchin

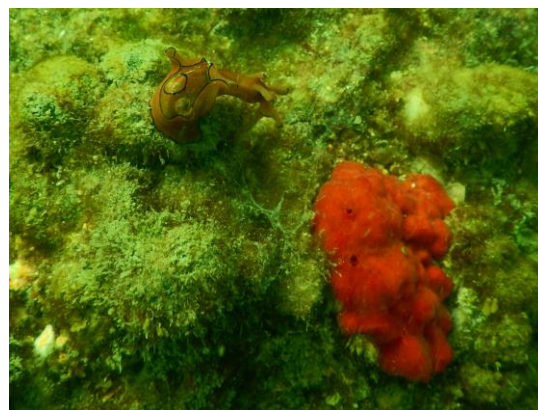


Image 2.6C Sea hare and ascidian

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



2.7 MOOLOOLABA RIVER, LA Balsa NORTH

The Mooloolah River, La Balsa north, Site 1 was set up in 2018 due to growing interest in the area. The site runs parallel to the shore, at a depth of 5m. It has become a popular diving location for locals and visitors alike due to its easy access and protection from the wind. It is dominated by rock and sand, but levels of hard and soft corals have noticeably decreased with none recorded on transect this survey.

Levels of silt decreased to 2% as this site was surveyed prior to the summer floods. Rock at 56% and sand at 29% made up the major substrate groups with nutrient indicator algae recorded at just under 6%, "Other" at 3% and rubble at 4% (Figure 2.7.1). Several encrusting hard corals were seen on the transect, however were not captured within the substrate survey. Sponges and soft corals were not recorded during this survey but was observed off transect. Macroalgae was not recorded on the transect.

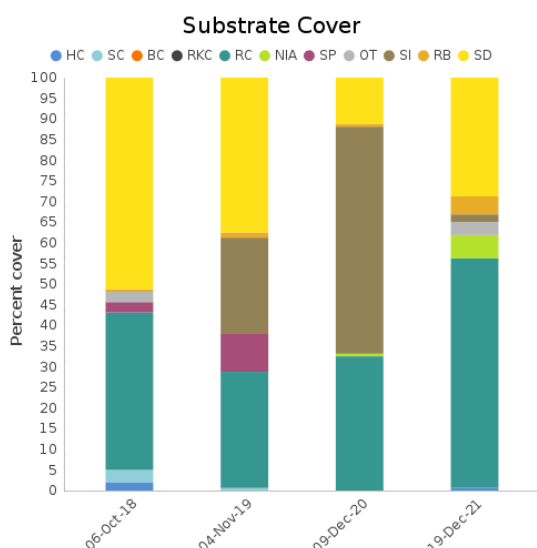


Figure 2.7.1 Benthic type and percentage cover, Mooloolah River, La Balsa North, 2018-2021.

Impacts to coral were not recorded due to the absence of coral. However, 66 pieces of fishing line debris and eight pieces of general trash were recorded.

One juvenile lobster and three collector urchins were recorded during the invertebrate survey. A fish survey was conducted, and 23 butterfly fish, to moray eels, one sweetlip and one snapper were recorded. Numerous Bream and one stick pipefish were observed during the survey.



Image 2.7A Substrate and butterflyfish



Image 2.7B Nudibranch and dominant algae



Image 2.7C Small hard coral

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



2.8 MUDJIMBA ISLAND, NORTHWEST

Mudjimba Island is located just off the mainland, close to both the Maroochy and Mooloolah River Mouths on the Sunshine Coast. Mudjimba Island is a popular location for in-water activities including fishing, diving and surfing. The Northwest Reef site was established in 2013 to gather more information about this highly utilised area. Site 1 faces the Northwest side of the island and is situated at a depth of 8m. The site is a relatively flat terrain dominated by hard corals.

Rock was the dominant substrate (50%), followed by hard coral (31%) (Figure 2.8.1). Soft coral attributed 11% to the substrate, with sand (4%), rubble (2%), other (1%) and bleached coral (1%) making up the rest. Turf algae was the dominant algae.

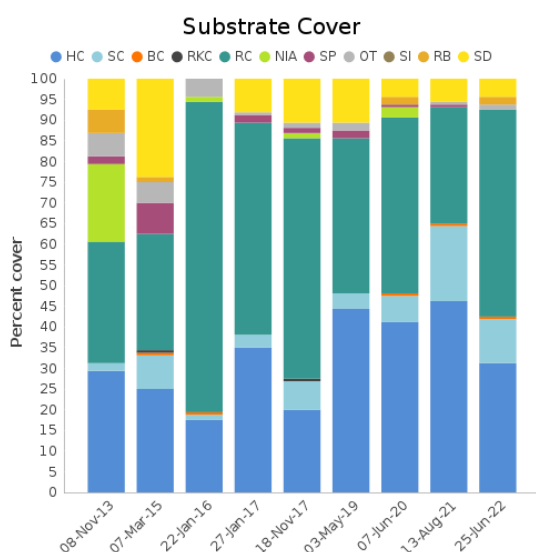


Figure 2.8.1 Benthic type and percentage cover, Mudjimba Island, Northwest Reef, Site 1, 2013-2022.

Unknown coral damage was higher than last season with 28 incidences recorded. Unknown scars were also higher at 26, with 27 *Drupella* scars and 26 incidences of coral disease recorded. Marine debris was not observed. Coral bleaching was estimated to affect less than 1% of the total coral population, with an average of 83% per individual colony.

Thirty seven *Drupella* snails were recorded during the invertebrate survey. One giant clam was observed off-transect.

A fish survey was conducted and four butterfly fish were recorded, along with one octopus.

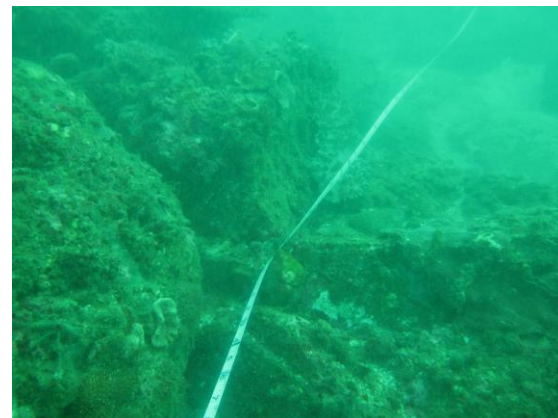


Image 2.8A Site photo



Image 2.8B Giant clam



Image 2.8C Ascidians

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



2.9 MUDJIMBA ISLAND, THE LEDGE; S1

Mudjimba Island, The Ledge Site 1 was established in 2007 and is the shallowest site, located on the top of the reef flat. The other sites run parallel to this site on the southern side of Mudjimba Island. It is characterised by rock, and a variety of encrusting corals, soft corals and zoanthids. The location is a frequently used dive and snorkel site due to the availability of shallow reef and diversity of corals and fish.

Hard coral (41%) was the dominant substrate; followed by rock (29%) and soft coral (21%) - this is an increase on soft coral cover from previous years. Other (Calcareous algae and ascidians) (4%), bleached coral (2%), sponge (3%) and recently killed coral (1%) made up the balance of the substrate (Figure 2.9.1).

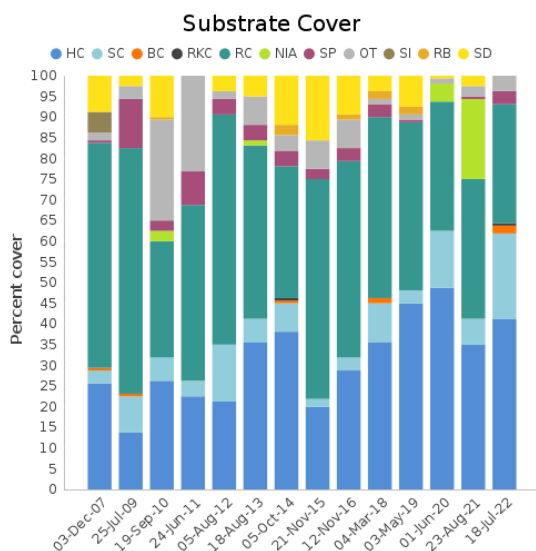


Figure 2.9.1. Benthic type and percent cover: Mudjimba Island, The Ledge, Site 1, 2007- 2022.

Coral bleaching affected less than 1% of the total coral population, with an average of 73% of each colony showing surface bleaching.

Two incidences of damage of unknown origin, six of disease, eight incidences of scars of unknown origin and eight *Drupella* scars were recorded, along with three observations of fishing line and two of fishing net.

Anemones without fish was high at 12 with only two anemones with fish recorded on the invertebrate survey. *Drupella* snails were high with 60 recorded, predominantly on the fourth transect. A fish survey was conducted and one moray eel was recorded. Several turtles and wobbegong sharks were also observed.



Image 2.9A Site photo



Image 2.9B Bleached coral



Image 2.9C Fishing line

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



2.10 MUDJIMBA ISLAND, THE LEDGE; S2

Mudjimba Island, The Ledge Site 2 was established in 2013 and is on the deepest section of the steep reef slope. This site sits parallel to Site 1 on the southern side of Mudjimba Island. This deeper location represents a different habitat type to the long-established research Site 1, and Site 3. It is characterised by rock, and a variety of encrusting corals and corallimorphs. The location is well known as a site inhabited by a variety of nudibranch species and turtles.

Rock (39%) was the dominant substrate; lower than from the previous survey followed by hard coral (29%) and soft coral (14%) (Figure 2.10.1). Other attributed 4%, sponge 3%, bleached coral 4% and recently killed coral 1%. Macroalgae was not recorded on the transect.

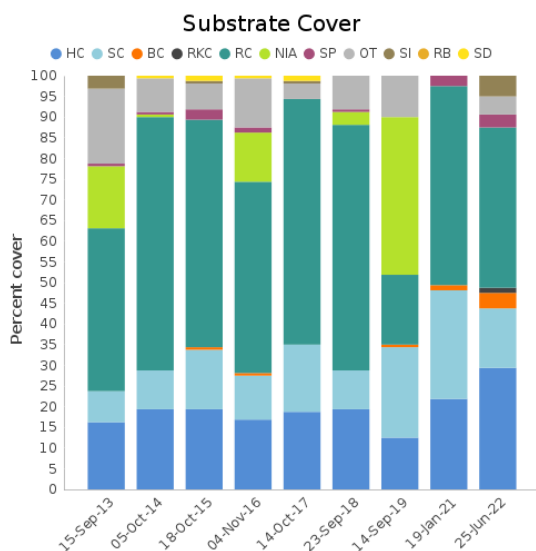


Figure 2.10.1 Benthic type and percentage cover, Mudjimba Island, The Ledge, Site 2, 2013-2022.

Coral bleaching affected 1% of the total coral population, with an average of 30% of each colony showing surface bleaching, a decrease from the last survey.

Only one incidence of damage of unknown origin, and one item of fishing line were recorded.

No target invertebrates were not recorded on the invertebrate survey.

A fish survey was conducted and two butterfly fish were recorded. A turtle was also observed.

The invertebrate and fish results may also be limited by the poor visibility on the day of the survey.



Image 2.10A Juvenile lobster (off transect)



Image 2.10B Bleached coral



Image 2.10C Zooanthid

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



2.11 MUDJIMBA ISLAND, THE LEDGE; S3

The Ledge Site 3 was established in 2013, to gather more information about this highly utilised area. Site 3 is situated on the reef slope and sits in between the shallower Site 1 and the deeper Site 2 on the southern side of the island. This additional location represents a different habitat type to Sites 1 and 2, despite their proximity to each other.

Hard corals accounted for 27% of the benthos, with rock making up 49%. Nutrient indicator algae was not recorded, a decrease from last season. The remaining benthic cover constituents recorded were soft coral (14%), other (7%), and sponge, bleached coral and recently killed coral each making up <1%. Turf algae was the dominant algae recorded.

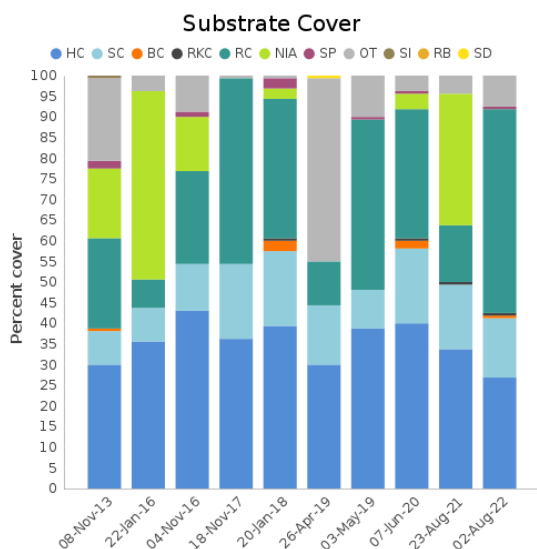


Figure 2.11.1 Benthic type and percentage cover, Mudjimba Island, The Ledge, Site 3, 2013-2022.

Coral bleaching affected <1% of the total coral population, with an average of 16% of the colony with surface bleaching.

Four incidences of boat anchor damage, nine of unknown damage, six unknown scars, 15 *Drupella* scars and four items of fishing line were recorded on the impacts survey.

On the invertebrate survey, no anemones were observed, however 182 *Drupella* snails were recorded, a significant increase on previous seasons. No target fish were recorded. However turtles were present.



Image 2.11A Site photo



Image 2.11B Turtle



Image 2.11C Surveyor in action

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



3.0 INSHORE MORETON BAY SITE REPORTS:

3.1 AMITY POINT, SITE 2

This relatively sheltered site is located on the south-west end of North Stradbroke Island and is frequented by vast numbers of fishers, boaters and divers all year round. The relatively shallow site runs along the rock wall, commencing near the public boat ramp. The site is subject to strong tidal currents and the amount of growth on the rocks varies throughout the site.

Rock (64%) and silt (29%) were the dominant substrate followed by recently killed coral (1%). The balance of the substrate was made up from soft coral (1%) (Figure 3.1.1).

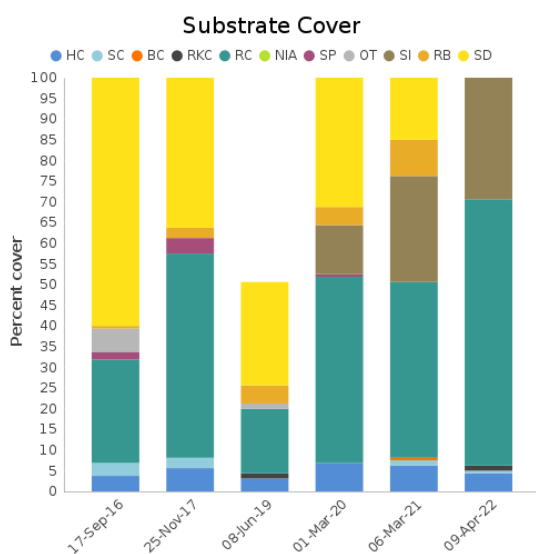


Figure 3.1.1. Benthic type and percent cover: Amity Point, Site 2, 2016- 2022.

Bleached coral was not observed. One hundred and nine urchins were recorded on the invertebrate survey, an increase from the last survey. The majority of urchins were recorded close to the boat ramp; within the first 20m of the transect. This area appears to provide the preferred habitat for this species at this location.

Three *Drupella* scars, 25 items of fishing line and six items of general trash were recorded. It is

to be noted that although the count of fishing line appears low, each item was a conglomerate of numerous pieces of line.

During the fish survey, three snapper, one parrotfish, one sweetlip, 11 butterfly fish and six moray eels were recorded, with wobbegong sharks also observed.



Image 3.1A Hard and soft corals



Image 3.1B Zoanthids and nudibranch



Image 3.1C Fishing debris

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



3.2 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 3.2.1). The level of silt was consistent with those observed in 2019.

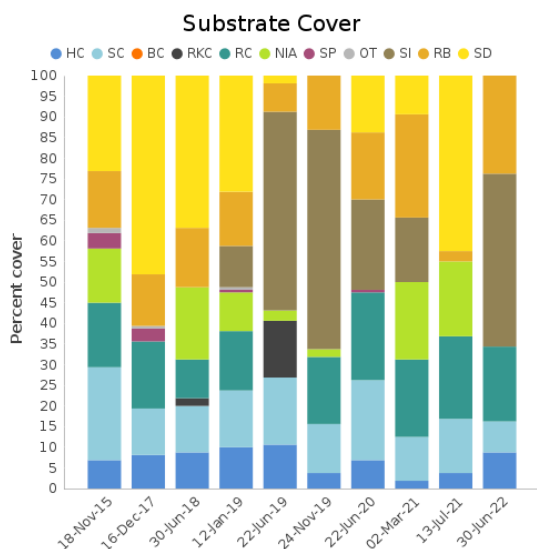


Figure 3.2.1. Benthic type and percent cover: Green Island North, Site 1, 2015 - 2022

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* spp. and *Padina* spp. 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 3.2A Hard coral



Image 3.2B Sponge and Massive hard coral



Image 3.2C Puffer fish and soft corals

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



3.3 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 3.3.1).

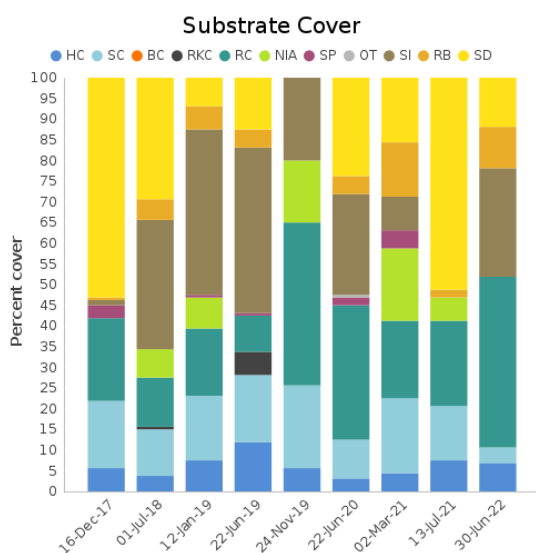


Figure 3.3.1. Benthic type and percent cover: Green Island West, Site 1, 2017 - 2022

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 3.3A *Asparagopsis* algae



Image 3.3B Bleached coral



Image 3.3C Nudibranch – *Hypselodoris obscura*

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



3.4 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 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 3.4.1).

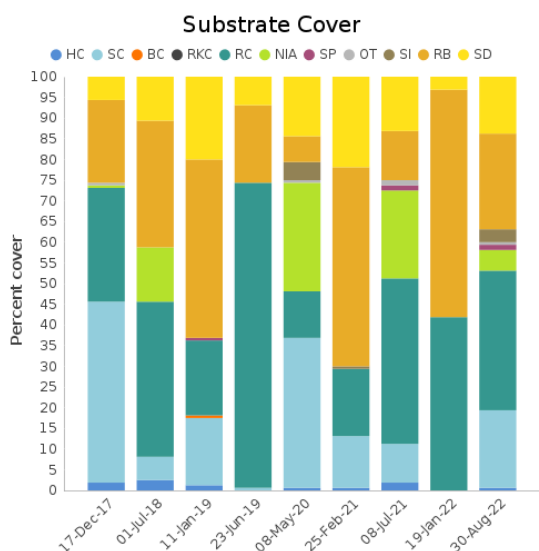


Figure 3.4.1. Benthic type and percent cover: Mud Island, Coral Galore, 2017 - 2022

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.

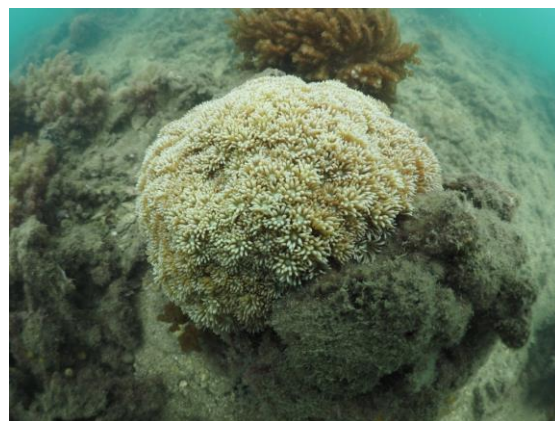


Image 3.4A Hard coral



Image 3.4B Site photo



Image 3.4C Summertime dominant algae - *Sargassum*

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



3.5 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 after it was identified by Roelfsema et al (2017) as an area of interest.

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 3.5.1).

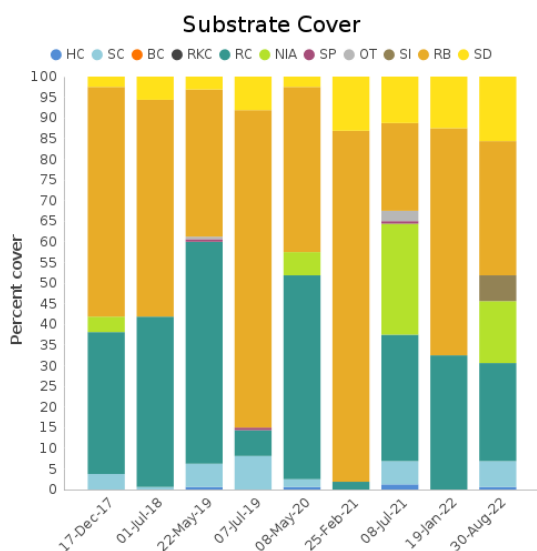


Figure 3.5.1. Benthic type and percent cover: Mud Island, Rubble Patch, 2017 - 2022

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 3.5A Site photo



Image 3.5B Soft coral



Image 3.5C *Drupella* snail

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



3.6 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 3.6.1).

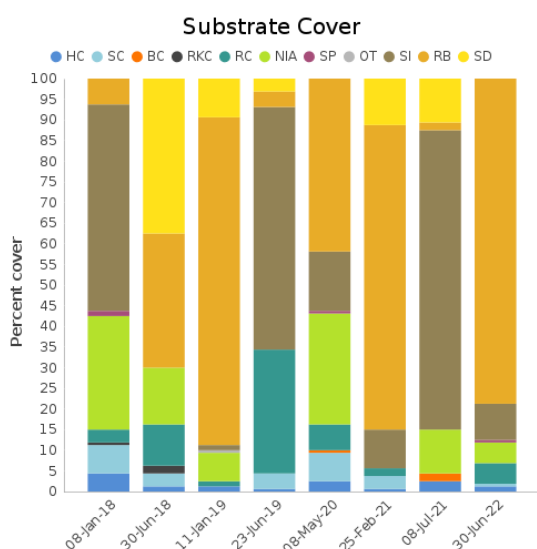


Figure 3.6.1. Benthic type and percent cover: St Helena Island, Palindrome, 2018 – 2022.

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 3.6A Hard coral



Image 3.6B Unknown scar

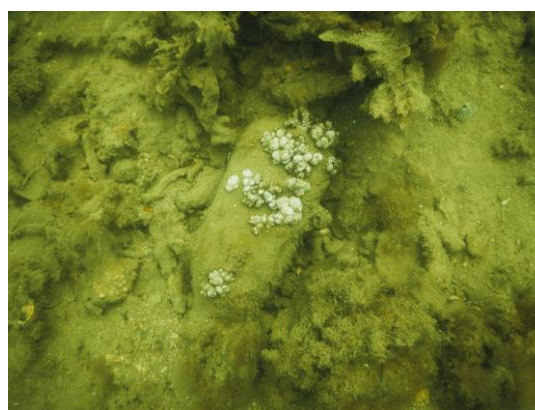


Image 3.6C Bottle with ascidians

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



3.7 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 3.7.1).

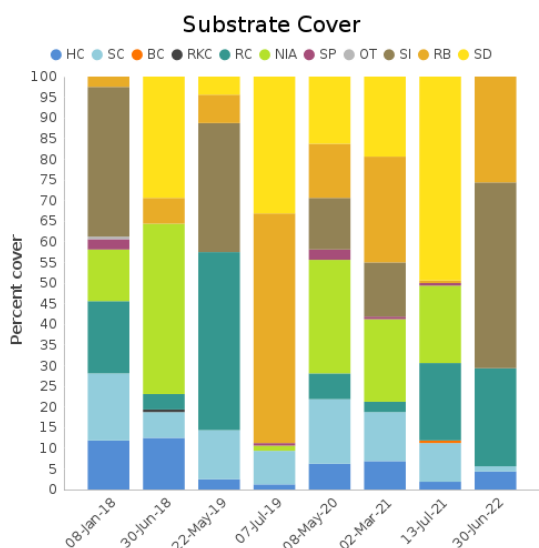


Figure 3.7.1. Benthic type and percent cover: St Helena Island, Ray of Sunshine, 2018 - 2022

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 3.7A Foliose coral



Image 3.7B Cage with rope

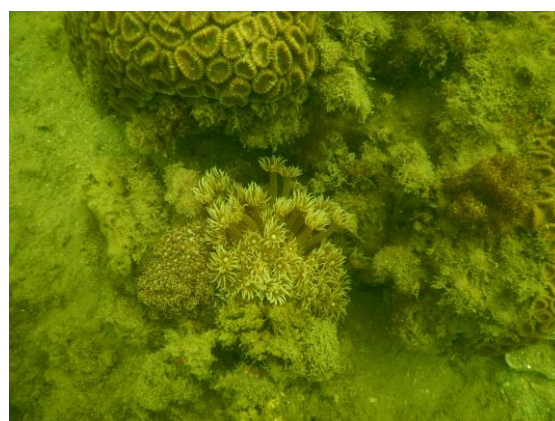


Image 3.7C Corals

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



3.8 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 3.8.1).

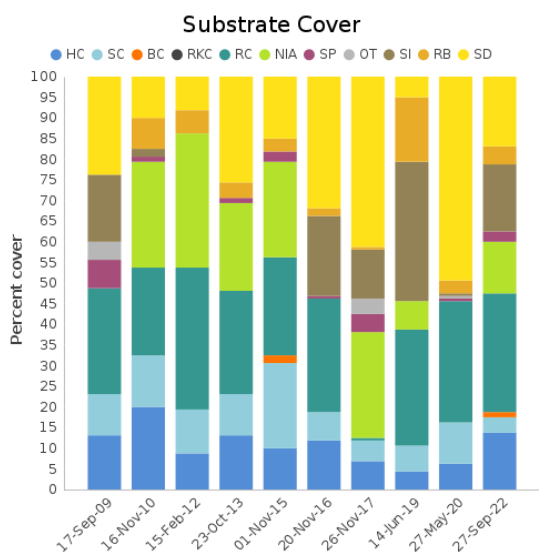


Figure 3.8.1. Benthic type and percent cover: Peel Island, East, 2009 - 2022

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 3.8A Site photo



Image 3.8B Bleached soft coral



Image 3.8C Shovel nose ray

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



3.9 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 3.9.1).

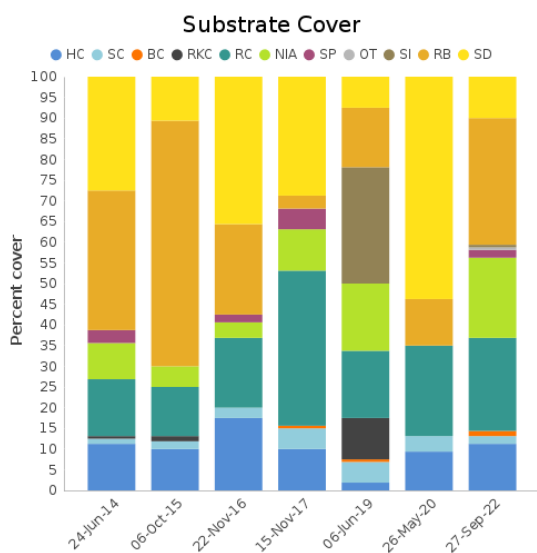


Figure 3.9.1. Benthic type and percent cover: Peel Island, North-east, 2014 - 2022

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 3.9A Site photo



Image 3.9B Bleached hard coral



Image 3.9C Butterflyfish

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



3.10 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 3.10.1).

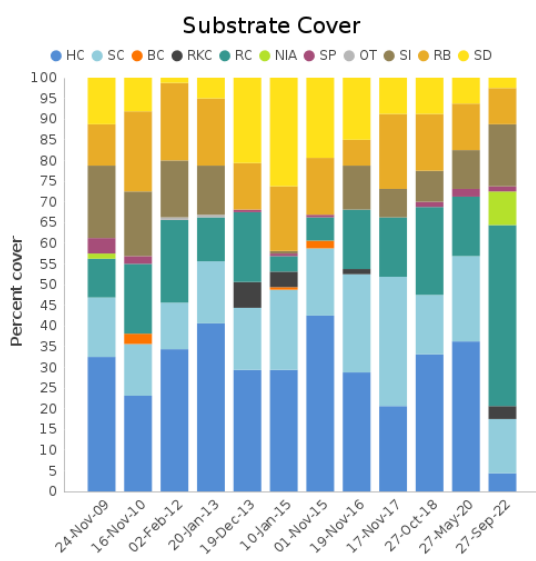


Figure 3.10.1. Benthic type and percent cover: Goat Island, East, 2009 - 2022

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 3.10A Dead branching coral with turf algae



Image 3.10B Site photo



Image 3.10C Dominant algae

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



3.11 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 3.11.1).

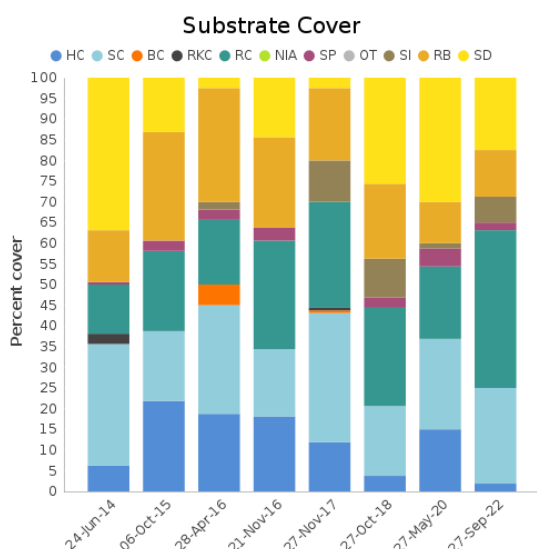


Figure 3.11.1. Benthic type and percent cover: Goat Island, West, 2014 - 2022

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 invertebrates survey.

A fish survey was conducted but no target fish were recorded.



Image 3.11A Surveyor in action



Image 3.11B Soft corals



Image 3.11C Trash

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



4.0 GOLD COAST SITE REPORTS:

4.1 PALM BEACH REEF, SITE 1

Palm Beach Reef is an extensive rocky reef made up of numerous ridges and gullies, located 800-1000 m offshore. The reef has patchy hard coral cover and hosts a high number of benthic invertebrates such as sponges, ascidians and a high abundance of anemones. It also has a notably high abundance of sea urchins.

Site 1 was established in 2007 to gain a better understanding of the subtropical reefs in the Gold Coast sub-region. The site is situated on the reef flat.

Hard coral accounted for 12% of the benthos, and soft corals 9%, both an increase from last season (Figure 4.1.1). Rock made up the majority of the substrate at 62%. Sponge (15%), sand (1%) and nutrient indicator algae (<1%), made up the balance.

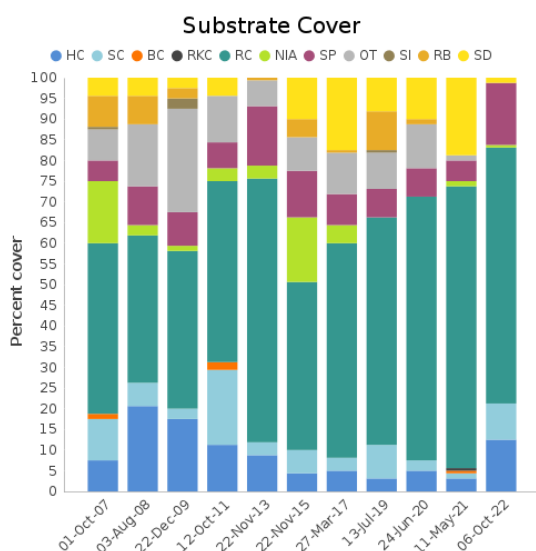


Figure 4.1.1. Benthic type and percent cover: Palm Beach Reef, Site 1, 2007 - 2022

Coral bleaching was not observed. Two unknown scars and one item of marine debris were recorded.

Three hundred and fifteen anemones (all without fish), 21 *Diadema* urchins and five pencil urchins were recorded on the invertebrate survey, which is a reduction in urchins from last season. Six butterflyfish, one sweetlip and one moray eel were recorded on the fish survey, along with several wobbegong sharks.



Image 4.1A Anemones

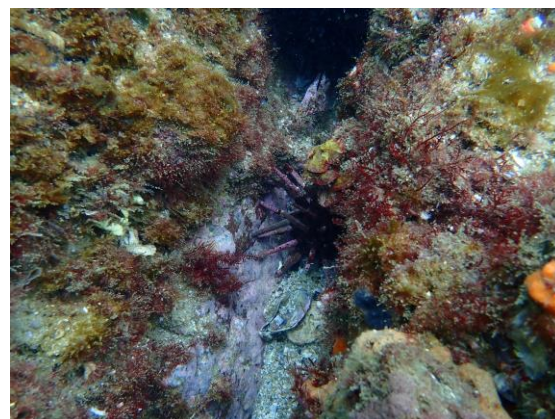


Image 4.1B Pencil urchin

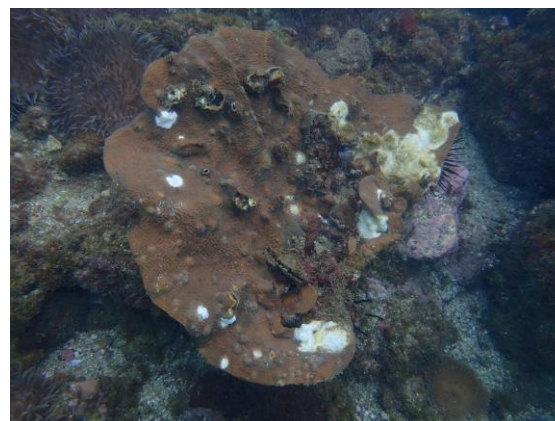


Image 4.1C Unknown scars

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



4.2 PALM BEACH REEF, SITE 2

Palm Beach Reef, Site 2 is located in close proximity to the long-established Palm Beach Reef, Site 1 and was established in 2009. This site is located on the reef flat.

Rock remained the dominant substrate at 60%. Hard coral accounted for 14% and soft coral 2%, both an increase from last season (Figure 4.2.1). Sponge made up 23% (also an increase), with recently killed coral at <1% making up the balance of the substrate.

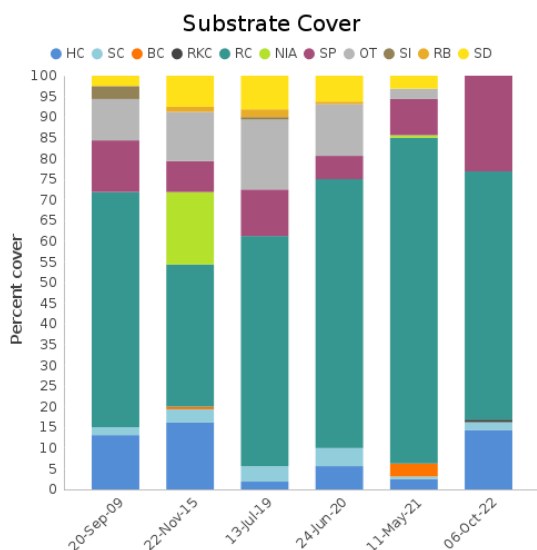


Figure 4.2.1. Benthic type and percent cover: Palm Beach Reef, Site 2, 2009 - 2022

Coral bleaching was not recorded, nor were any other impacts to coral observed. Two items of fishing line were recorded on the impacts survey.

One hundred and ninety-three anemones were recorded on the invertebrate survey. One lobster, 23 *Diadema* urchins and 21 pencil urchins were also recorded.

Two butterflyfish and two sweetlips were the only target fish observed during the fish survey.



Image 4.2A Turtle



Image 4.2B Pencil urchin



Image 4.2C Transect photo

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



4.3 GOLD COAST SEAWAY, SOUTHWEST WALL; SITE 1

The Gold Coast Seaway South-West Wall site was established in 2007 and was established to record the impacts upon this heavily utilised site. It is located on the sandy slope parallel to the rock wall. It is characterised by rocks and sand, with a variety of hydroids and algae. The location is frequently used by divers and snorkelers due to the availability of shallow habitat and diversity of fish.

The flooding heavily impacted the seaway sites and sand (84%) was the dominant substrate; followed by rock (16%). Macroalgae was not recorded on the transect, with turf algae dominating (Figure 4.3.1).

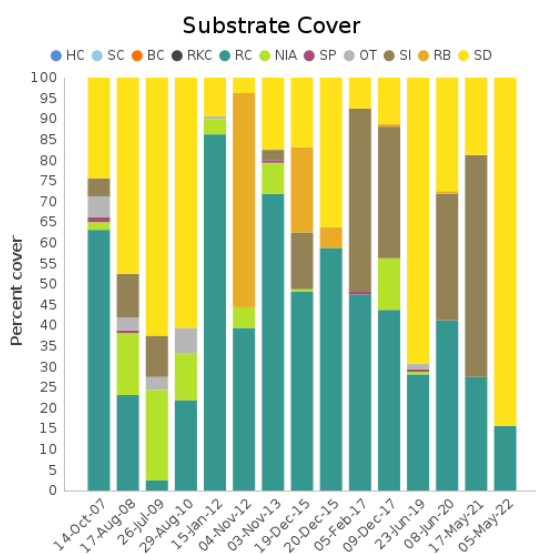


Figure 4.3.1. Benthic type and percent cover: Gold Coast Seaway, South-West Wall, 2007 - 2022

Coral was not recorded during the survey and hence coral bleaching was not recorded.

Fishing line again represented the largest impact, with 115 incidences recorded and nine observations of general trash. During the invertebrate survey, one juvenile lobster was recorded.

A fish survey was conducted and three snapper and four sweetlip were recorded. Large schools of tarwhine and luderick were also observed.



Image 4.3A Site photo



Image 4.3B Fishing line



Image 4.3C Flatworm and organic matter

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



4.4 GOLD COAST SEAWAY, THE PIPE; SITE 1

The Gold Coast Seaway - The Pipe site was established in 2015 to record the impacts upon this heavily utilised site. It is located on the sandy slope parallel to the rock wall. It is characterised by large rocks and sand, with scattered sponges and algae. The location is a frequently used dive and snorkel site due to the availability of shallow habitat and diversity of fish.

Rock (68%) was the dominant substrate; followed by sand (32%) (Figure 4.4.1).

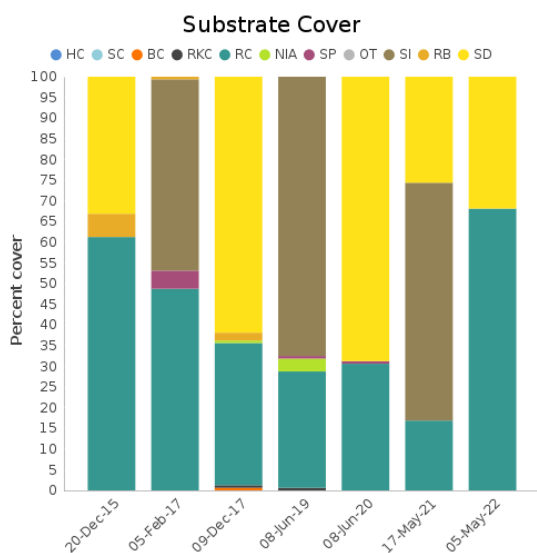


Figure 4.4.1. Benthic type and percent cover: Gold Coast Seaway, The Pipe, 2015 - 2022

Coral bleaching was not recorded and coral was not recorded during the survey.

Fishing line represented the largest impact, with 73 incidences recorded. General trash was limited to one item.

During the invertebrate survey, three juvenile lobsters were recorded.

A fish survey was conducted and eight butterflyfish, six moray eels, one parrotfish and three sweetlips were recorded.

Schools of small fish were observed amongst the rocks in this area.



Image 4.4A Schooling catfish



Image 4.4B Moray eel



Image 4.4C Non target sea cucumber

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



4.5 NARROWNECK REEF; SITE 1

This artificial reef is characterised by high cover of macro algae over the geotextile bags. It has lots of fish life and lots of black crinoids. The site is sensitive to wave action due to its proximity to the shore and surf zone. As a result of continual bad weather an attempt was made to survey this site in October 2022. However, the survey was abandoned at the end of transect 2 due to low visibility and strong surge. The substrate data shown below is an extrapolation of the data recorded in the first 2 transects.

Nutrient indicator algae (53%) was the dominant substrate; followed by sand (44%) and sponge (3%) (Figure 4.5.1).

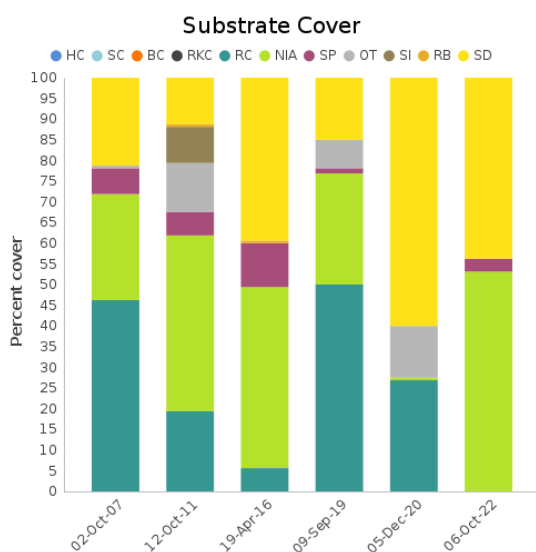


Figure 4.5.1. Benthic type and percent cover: Narrowneck Reef, 2007 - 2020

Coral bleaching was not recorded, and coral was not recorded during the survey. The site is dominated by macro algae.

Impacts were not observed but during the invertebrate survey, one lobster was recorded.

A fish survey was conducted but no target fish were observed, however this may be the result of poor visibility.

Challenging conditions also made photography difficult.



Image 4.5A Site photo



Image 4.5B Ascidians and sponges



Image 4.5C Dominant algae

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



4.6 WAVEBREAK ISLAND; SITE 1

Wavebreak Island is located within the seaway. The site is a rocky scree starting at 5m, to a depth of around 12m. The site wraps around the end of the rock groin and is characterised by sponges, small corals and a variety of fish.

Rock (61%) was the dominant substrate; followed by sand (31%) and sponge (7%). Silt contributed just over 1% (Figure 4.6.1).

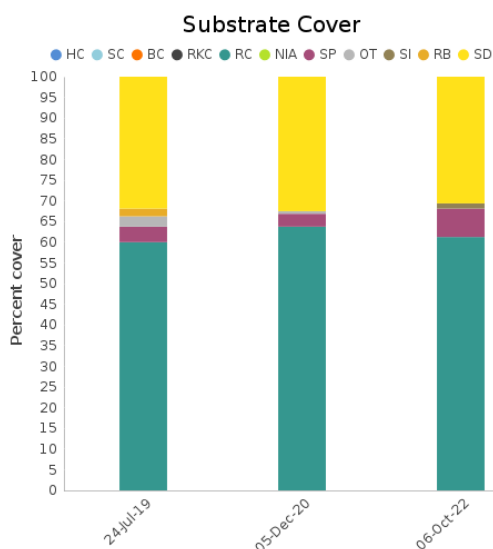


Figure 4.6.1. Benthic type and percent cover: Wavebreak Island, 2019 - 2022

Coral was not recorded and therefore no coral bleaching was recorded during the survey.

Two items of fishing line and two of general trash were the only impacts recorded.

Target invertebrates were not observed during the invertebrate survey

A fish survey was conducted and three sweetlips and one moray eel were recorded.

Schools of bream and a few flathead were observed amongst the rocks in this area, particularly on the southern side of the rock wall.



Image 4.6A Site photo



Image 4.6B Surveyors in action



Image 4.6C School of bream near start of transect

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



4.7 KIRRA REEF; SITE 1

Kirra reef is a collection of nearshore rocky outcrops located a few hundred metres offshore from Kirra Beach. The site was included in our program in 2015 to monitor the condition of the reef due to exposure to increased sand levels from the Tweed River Entrance Sand Bypassing project since 1995.

Rock (45%) was the dominant substrate; followed by sponge (34%). Soft coral (10%), sand (9%) and nutrient indicator algae (1%) made up the balance of the substrate (Figure 4.7.1).

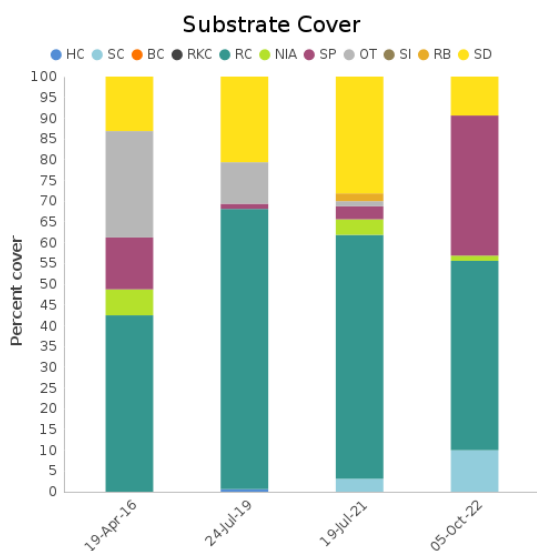


Figure 4.7.1. Benthic type and percent cover: Kirra Reef, 2016 - 2022

Coral bleaching was not recorded, with only soft coral recorded during the survey.

Four items of fishing line and two items of general marine debris were recorded.

During the invertebrate survey, sixty-nine anemones (six with fish) were recorded, a large increase since last season, along with one collector urchin, 12 long-spined urchins and two pencil urchins. This represents a reduction in urchins from last season.

A fish survey was conducted and three moray eels and two snapper were recorded.

The site hosted a large school of Yellowtail scad, a wobbegong and a turtle.



Image 4.7A Yellowtail scad

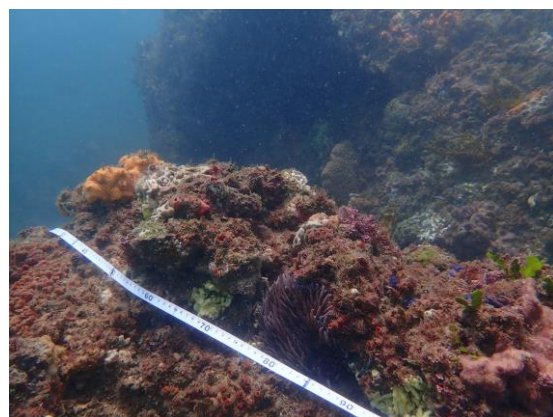


Image 4.7B Site photo



Image 4.7C Soft corals and anemones

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



4.8 COOK ISLAND; SITE 1

The monitoring site at Cook Island was set up in 2019 as it was considered a place of interest due to its proximity to Gold Coast Reefs and the potential for larval recruitment to occur from this location. The survey site sits at 7m on the northern side of the island, near the turtle sanctuary.

Rock, including rock covered with coralline algae and turf algae (45%) was the dominant substrate (a reduction from last season); followed by hard coral (29%) (an increase). Sponge (19%), soft coral (4%) and nutrient indicator algae made up the balance of the substrate (Figure 4.8.1).

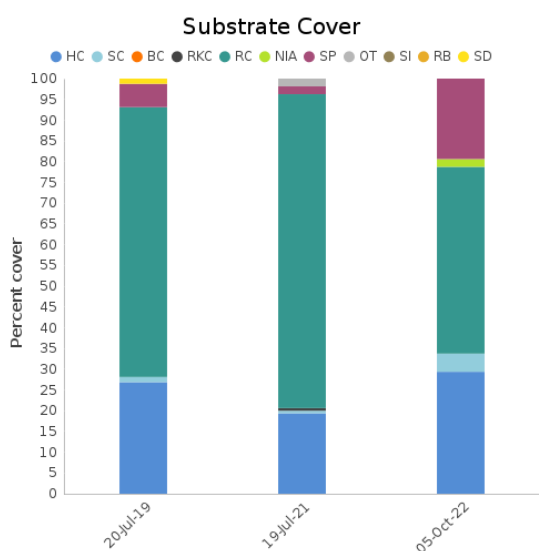


Figure 4.8.1. Benthic type and percent cover: Cook Island, 2019 - 2021

Coral bleaching was not recorded. One unknown scar was the only impact recorded on the impact survey. Marine debris was not recorded.

During the invertebrate survey, seven anemones with fish and 60 without fish were recorded along with five collector urchins and 52 long-spined urchins. This is an increase in anemones and a reduction in urchins from last season.

During the fish survey one sweetlip and two blue grouper were recorded, with numerous turtles also observed.



Image 4.8A Site photo



Image 4.8B Hard coral



Image 4.8C Blue grouper

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



5.0 DISCUSSION AND NOTES

As noted in the report above, this season proved difficult for a variety of reasons including ongoing weather issues resulting in devastating floods early in 2022, 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 30 reef health surveys throughout the year at key long term reef health monitoring sites within the Sunshine Coast, Moreton Bay, and the Gold Coast.

The floods from February 2022 saw thousands of tonnes of debris exit the Brisbane River, making its way north to the Fraser and Sunshine Coasts, south to the Gold Coast, and east throughout Moreton Bay. Coastal development and runoff lead to sedimentation, which directly impacts coral recruitment, growth, mortality, and the ecosystem services that coral reefs provide. Previous floods have had devastating effects on the ongoing health of southeast Queensland reef systems, so it was important for Reef Check Australia to take the opportunity to monitor and document changes in the health of reefs we could access in the pockets of decent weather prior to and shortly after this major disturbance. Stay tuned as we continue to monitor these sites and report on their health amongst the wet weather over the coming months.

From the surveys conducted during the 2021-2022 season prior to the flooding event, hard and soft coral populations continue to remain steady in number throughout the region. Many of the coral communities monitored 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.

Of particular note this season is the coral communities of Goat Island, Moreton Bay. 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. 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 5.1A-5.1C show images taken in June 2020, and Images 5.2A-5.2C are from the same site in September 2022.

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



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 5.1A Goat Island East June 2020



Image 5.1B Goat Island East June 2020



Image 5.1C Goat Island East June 2020



Image 5.2A Goat Island East Sept 2022



Image 5.2B Goat Island East Sept 2022



Image 5.2C Goat Island East Sept 2022

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



6.0 TEAM PHOTOS



REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



Our survey activities are made possible by our trained citizen scientists who donate their time, energy and skills! Thank you all!

REEF CHECK AUSTRALIA

SEQ Season Summary Report 2021-2022



7.0 FURTHER INFORMATION

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

7.1 REFERENCES

Beger, M., Sommer, B., Harrison, P.L., Smith, S.D.A. and Pandolfi, J.M. 2014. 'Conserving potential coral reef refuges at high latitudes', *Diversity Distrib.*, 20: 245-247. <https://doi.org/10.1111/ddi.12140>

Roelfsema, C.M., Bayraktarov, E., van den Berg, C., Breeze, S., Grol, M.G.G., Kenyon, T., de Kleermaeker, S., Loder, J., Mihaljević, M., Passenge, R.J., Rowland, P., Vercelloni, J. and Wingerd, J. (2017). Ecological Assessment of the Flora and Fauna of Flinders Reef, Moreton Bay Marine Park, Queensland. UniDive, The University of Queensland Underwater Club, Brisbane, Australia.

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