REEF CHECK AUSTRALIA
2009 survey season report

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A. Summary results

The Reef Check Australia (RCA) community volunteers led by our full-time and part-time (unsalaried) project officers, Nick Greenwood and Joel Stibbard, have surveyed 50 dive sites (Figure 1) on 19 reefs, including 15 reefs of the Great Barrier Reef (Figure 2) and 4 reefs of Magnetic Island. The coral cover on most the reefs surveyed by RCA during more than 1 year (using the point intercept method) has been either consistently increasing (33%) or fluctuating (46%) since the first RCA surveys were carried out. The coral cover of only few reefs have been consistently decreasing (6%) or stable (15%) (Table 1). When the 2009 coral cover was compared to the last survey (of any previous year), at a particular site, 61 % of sites showed an increase in coral cover while 27% decreased and 12% showed a stable situation (Table 2a). When coral cover in 2009 was compared the coral cover in 2008, 65% of the sites showed an increase in coral cover, 23 % showed a decrease and 12% remained stable (Table 2b). In summary, coral cover on the dive sites surveyed by RCA has predominantly increased or fluctuated rather than stayed stable or decreased.

Figure 1: List of surveyed dive sites with a map showing the location on the Australian coast (from RCA database)

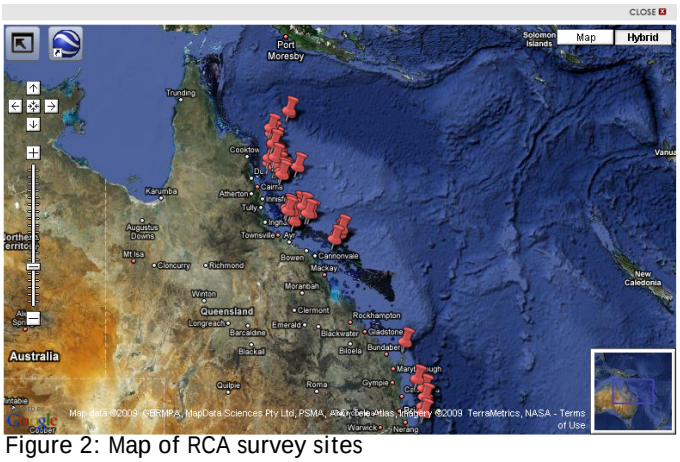


Figure 2: Map of RCA survey sites

Table 1: Coral cover through all survey years at sites surveyed more than once

Coral cover through time:	% surveys
Increased	33
Fluctuated	46
Remained stable	15
Decreased	6

Table 2: Comparison of coral cover between a) any previous surveys b) only the sites surveyed in 2008

Coral cover	a) % last survey-2009	b) % 2008-2009
Increased	61	65
Remained stable	12	12
Decreased	27	23

Impacts recorded in 2009 in the belt survey (2.5 either side of the transect line) included Crown-of-thorns starfish (COTS), disease, bleaching and Drupella snails (Table 3).

Table 3: Percentage of sites where impacts were recorded in 2009

Impacts 2009	% of dive sites
COTS	4
Disease	54
Bleaching (line transect)	78
Drupella snails	48

B. Dive sites where coral cover increased

Agincourt 3D Reef (pontoon), site 2

Coral cover steadily increased from 2004 to 2009, with a considerable decrease in nutrient indicator algae over this period (Figure 3a). Hard corals were predominantly branching, and soft corals were leathery. The dominant algae type was turf algae but considerable amount of bare rock was also recorded (Figure 3a). Nutrient indicator algae decreased consistently from 2004 to 2009. All sponges recorded were of the encrusting type. Giant clams were common, the majority of them being between 10-20 cm. No COTS were observed in 2009 but the incidence of unidentified coral damage increased substantially from previous years (Figure 3b). The most common fishes present were butterflyfishes and parrotfishes. Some coral trouts were also recorded.

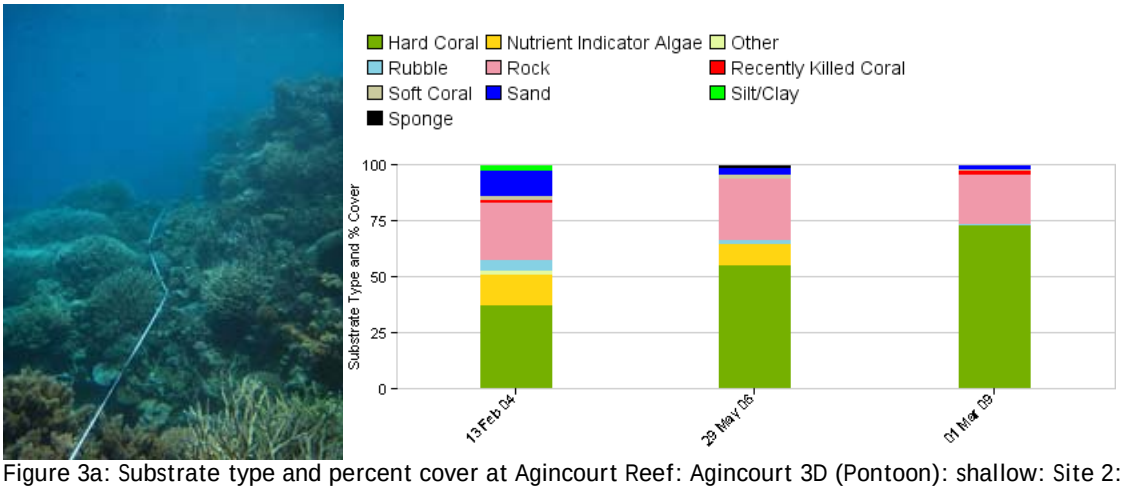


Figure 3a: Substrate type and percent cover at Agincourt Reef: Agincourt 3D (Pontoon): shallow: Site 2: Back reef slope

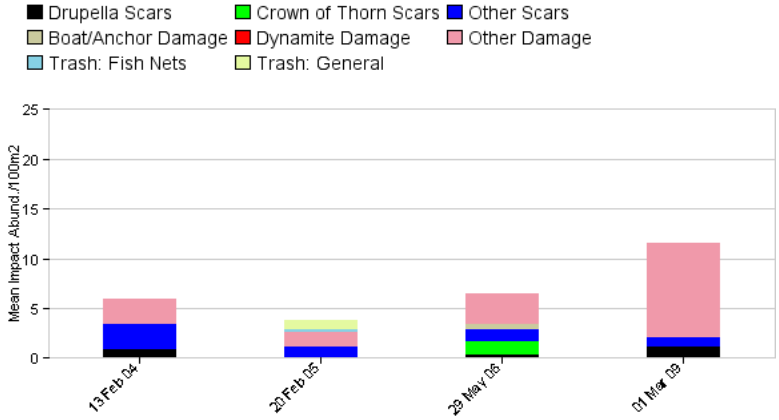


Figure 3b: Mean abundance of impacts at Agincourt Reef: Agincourt 3D (Pontoon): shallow: Site 2: Back reef slope

Agincourt Reef, Harry's Bommie

Hard coral cover increased substantially between 2003 and 2009, with a noticeable decrease in nutrient indicator algae over this period (Figure 4). All life forms of hard corals were present with a dominance of the massive coral morphology, and no soft coral recorded along the transect. 13 clam <50cm were recorded, but no Drupella snail or COTS were sighted along the transect. Impacts seen included scarring, with many small scars present on branching corals, some bleaching and unknown coral damage. The back reef slope was rated by surveyors as "nice and healthy-looking".

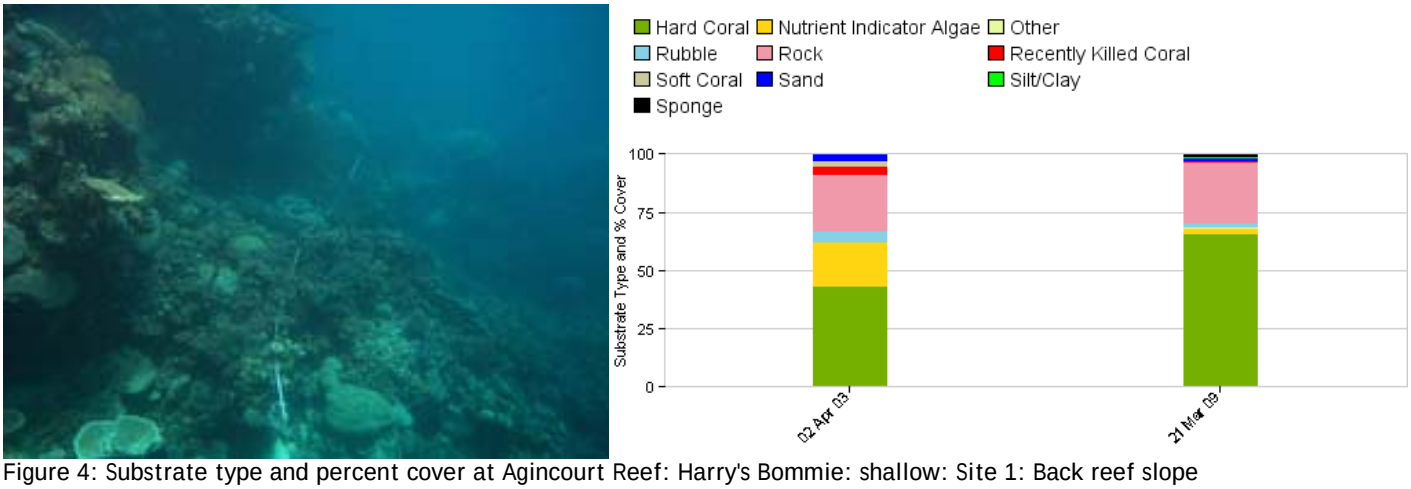


Figure 4: Substrate type and percent cover at Agincourt Reef: Harry's Bommie: shallow: Site 1: Back reef slope

Agincourt Reef, Phil's

Coral cover increased from 2003 to 2009, with nutrient indicator algae remaining steady in the past 2 years after a significant decrease between 2003 and 2008 (Figure 5). Predominant hard corals were branching, and soft corals were leathery. Turf algae were present on most rock surfaces. Very few of the key invertebrates (listed on the survey protocol) were seen, with 1 giant clam being the only representative. Some bleaching, scarring and general damage were seen but coral health was otherwise good. The surveyors described this site as "rolling fields of bushy and branching Acropora with occasional massive Porites bommies".

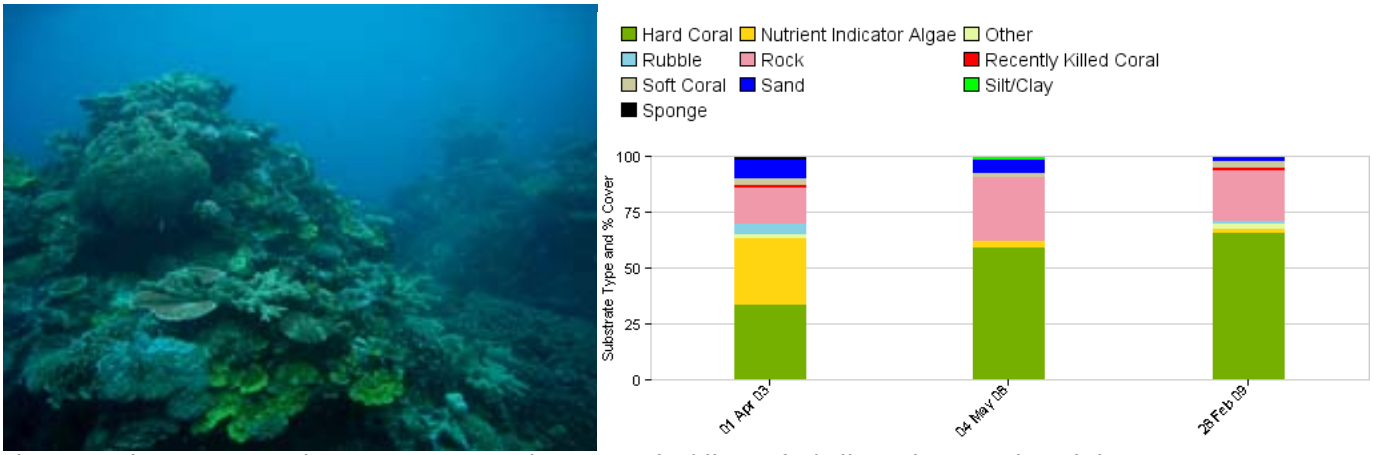


Figure 5: Substrate type and percent cover at Agincourt Reef: Phil's Reef: shallow: Site 1: Back reef slope

Flynns Reef, Yellow Mooring (also known as Fish bowl)

Hard coral cover increased over the past 2 years, with an associated decrease in the amount of rock which was predominantly covered with turf algae (Figure 6). In 2009, the majority of hard corals were branching. Soft corals were of the leathery kind. Three clams (<40cm) were recorded, and were the only key invertebrates sighted. Some damage at the site included scarring and damage, yet coral health was described as good by surveyors, with a considerable amount of young corals at this site, and high fish abundance. The surveyors rated the coral as "very healthy looking, with very few signs of damage and lots of young corals". They rated the fish abundance as "high with lots of parrotfish and groupers". A turtle was sighted (Figure 6).

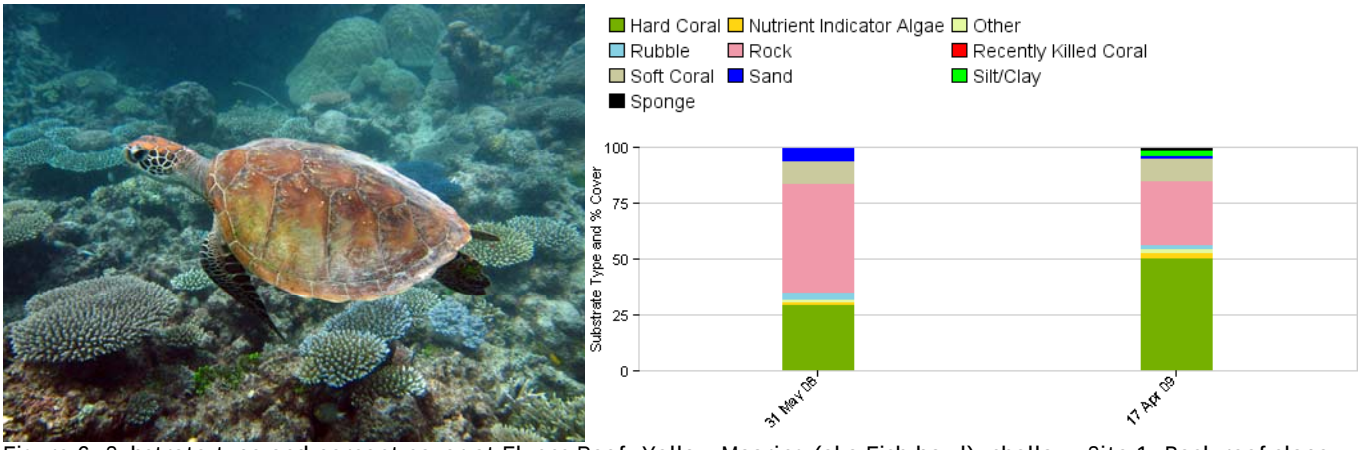


Figure 6: Substrate type and percent cover at Flynns Reef: Yellow Mooring (aka Fish bowl): shallow: Site 1: Back reef slope

Hastings Reef, North Hastings A

Hard coral cover in the lagoon increased between our 2005 and 2009 surveys, and a decrease in soft coral cover and nutrient indicator algae was also observed (Figure 7). The predominant hard coral type was branching and most soft corals were leathery. Turf algae predominantly covered any bare rock, with unidentified coral damage and bleaching being the observed impacts on coral. However, site was evaluated as being in very good condition by the coral reef surveyors, with very high fish abundance recorded, especially snappers (>5/100m^2).

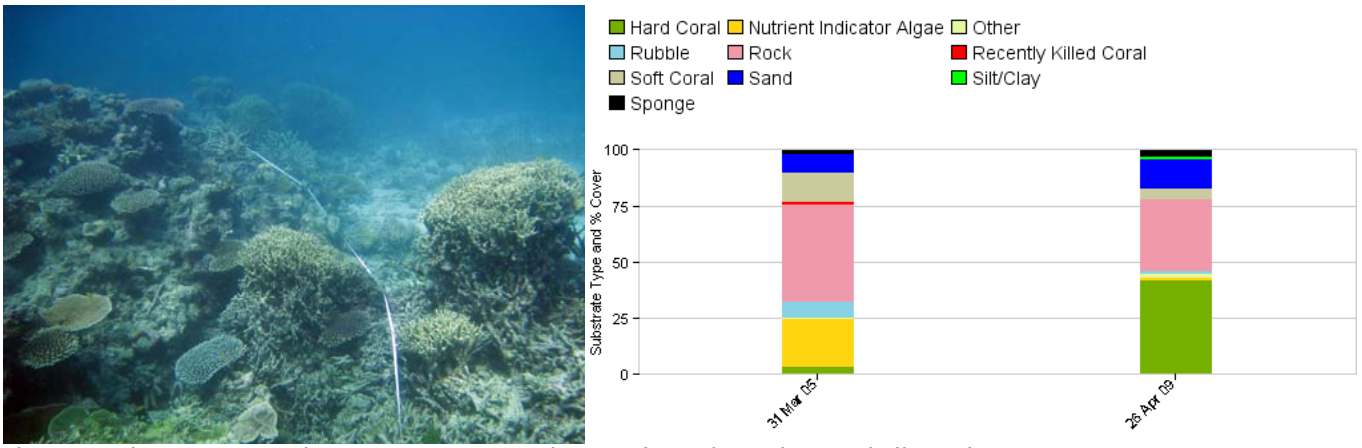


Figure 7: Substrate type and percent cover at Hastings Reef: North Hastings A: shallow: Site 1: Lagoon

Hastings Reef, North Hastings B

Hard coral cover observed to have increased from the previous survey in 2008, with a decrease in soft coral cover being the only notable change between surveys (Figure 8). Hard coral were predominantly encrusting. Bare rock was frequently covered with turf algae, which was the dominant algae type observed. Most soft coral colonies were of the leathery kind. Several giant clams were seen at the site, some of which were very large (>50cm long). Coral health varied along the site, with some areas noted as being in good condition and others showing signs of bleaching and physical damage.

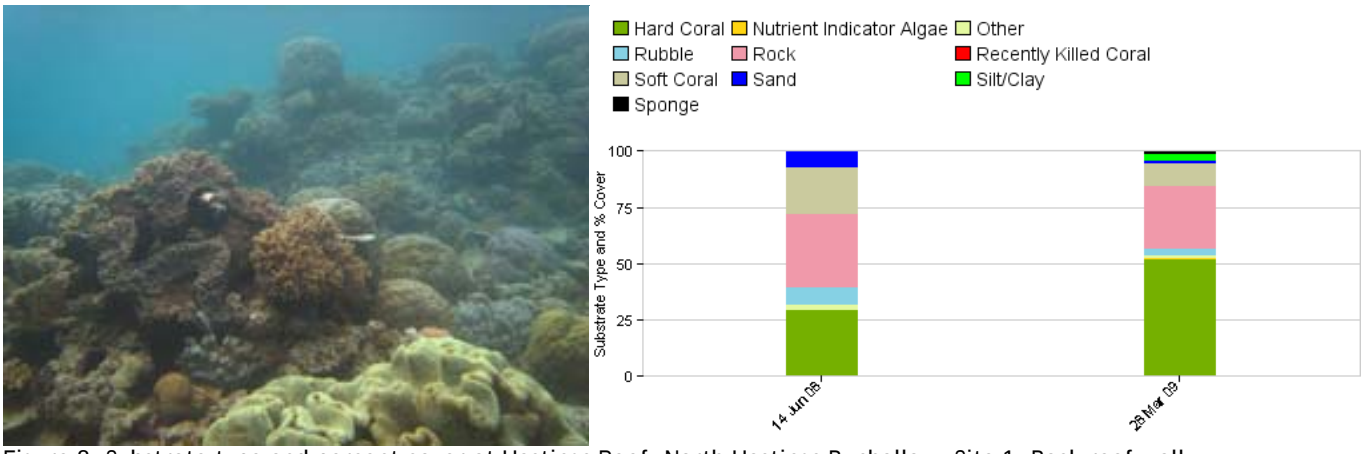


Figure 8: Substrate type and percent cover at Hastings Reef: North Hastings B: shallow: Site 1: Back reef wall

Knuckle Reef (North Bommie)

Hard coral cover increased slightly between 2006 and 2009. Soft coral cover was also seen to increase between surveys with an associated decrease in bare rock cover (Figure 9). The site was described by coral reef surveyors as being patchy in its coral cover with many small, young colonies seen. Hard coral forms were predominantly massive (boulder corals), yet also significant amounts of branching and sub-massive forms were seen. The majority of soft corals were leathery, and any bare rock substrate surveyed was covered in turf algae. Over 20 clams were spotted along transect, the majority of which were <30cm. Many juvenile parrotfish, wrasse and rabbitfish were seen but the site was heavy in suspended sediment, limiting visibility (Figure 9). The surveyors' impression of the site was "the fish abundance was average with mainly butterflyfish and damselfish, but also many juvenile wrasse, parrotfish and rabbitfish. The coral cover was slightly patchy with many small colonies and soft coral. The visibility was low with lots of suspended sediment."

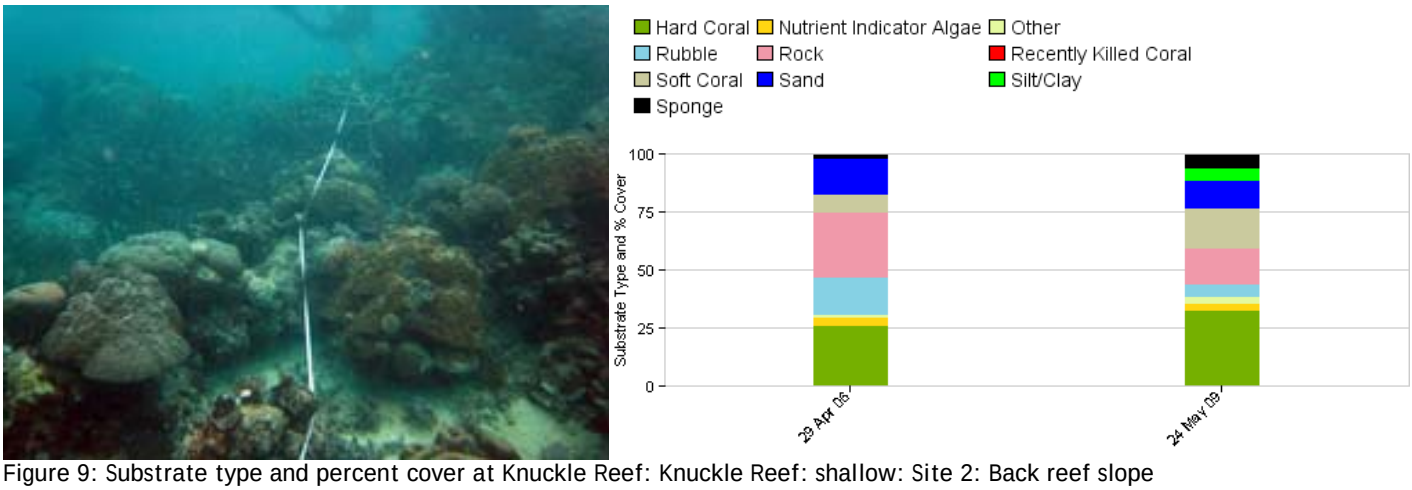


Figure 9: Substrate type and percent cover at Knuckle Reef: Knuckle Reef: shallow: Site 2: Back reef slope

Milln Reef, swimming pool

2009 saw an increase in both hard and soft coral cover from the previous survey in 2006, with a marked decrease in sand cover (Figure 10). Predominant hard coral types included branching and massive forms, with soft corals predominantly non-leathery. The majority of rocky substrate was colonised by turf algae. Bleaching was more prevalent at this site than others, and consistent amounts of scarring and damage were observed and recorded along the transect. The difference in sand cover between the 2 completed surveys may indicate that survey locations were independent; therefore interpretation of results must be made with caution. The surveyor thought that the reef was in "fair condition, good coral cover, but consistent small scale scarring and damage."

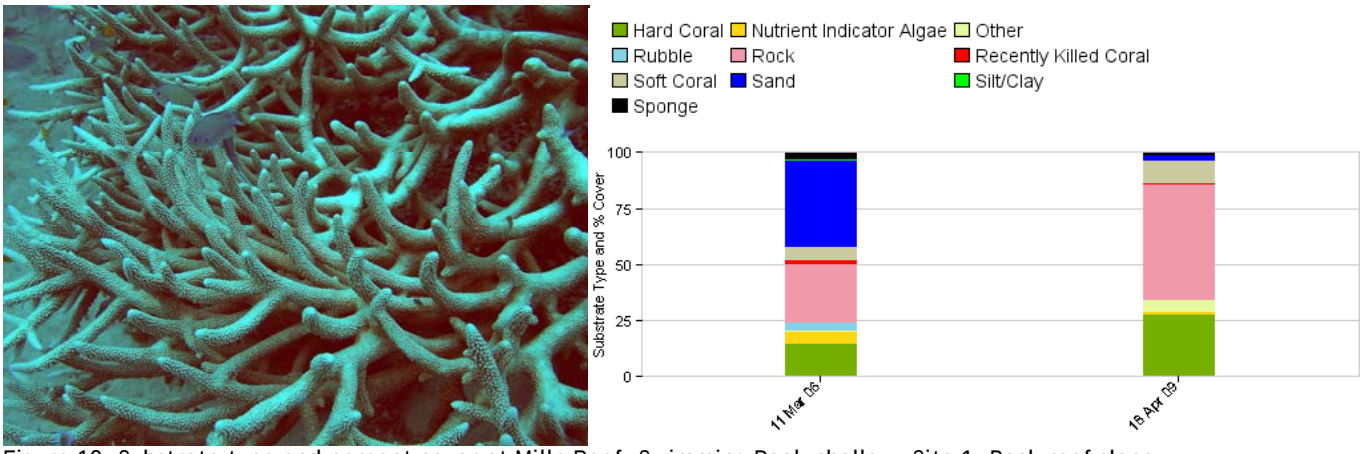


Figure 10: Substrate type and percent cover at Milln Reef: Swimming Pool: shallow: Site 1: Back reef slope

Opal Reef, Cathedrals

Coral cover was dominated by massive and encrusting form in both years (2006 and 2009). Most of the rock was covered with turf algae. The incidence of leathery soft coral decreased in 2009 and other soft corals increased. Impacts on the reef were attributable to scars and other unidentified coral reef damage but the surveyors thought that this site "looked very healthy".

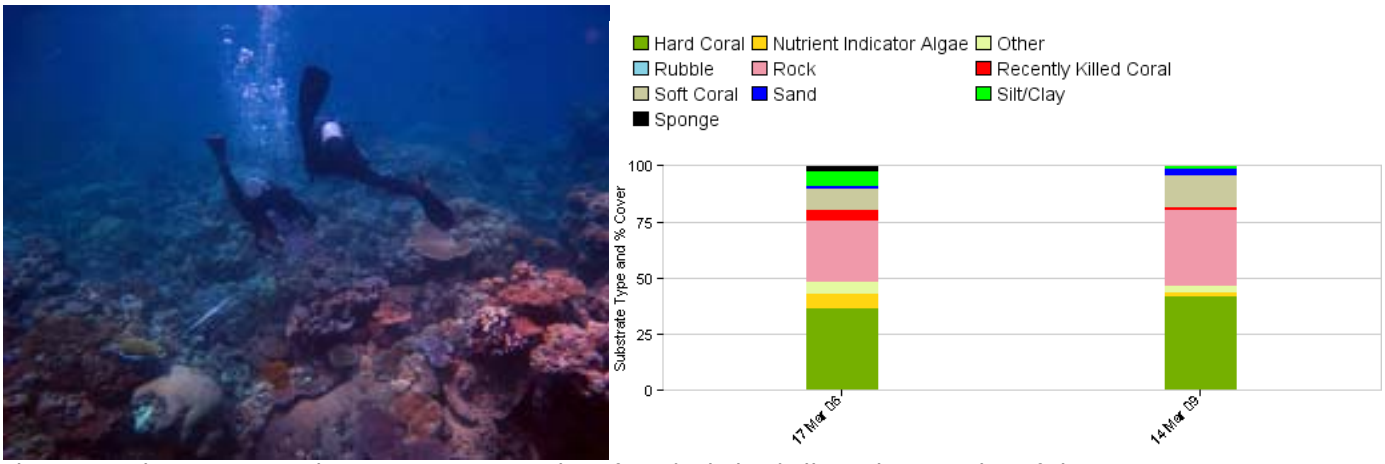


Figure 11: Substrate type and percent cover at Opal Reef: Cathedrals: shallow: Site 1: Back reef slope

Saxon Reef

Coral cover increased steadily since 2002 at this site and nutrient indicator algae decreased (Figure 12a). The main growth forms of hard corals were branching and massive while leathery soft corals dominated. The impacts were unidentified scars and other coral damage (Figure 12b). Butterfly fish were dominant and parrotfish & snappers were also recorded in 2009. The surveyors' assessment of the site was "Coral: In overall better condition than site 1 at Cathedrals as there was much less sign of damage. There was high fish abundance, including several of the larger fish such as Napolean wrasse, Bumphead parrotfish and large sweetlips."

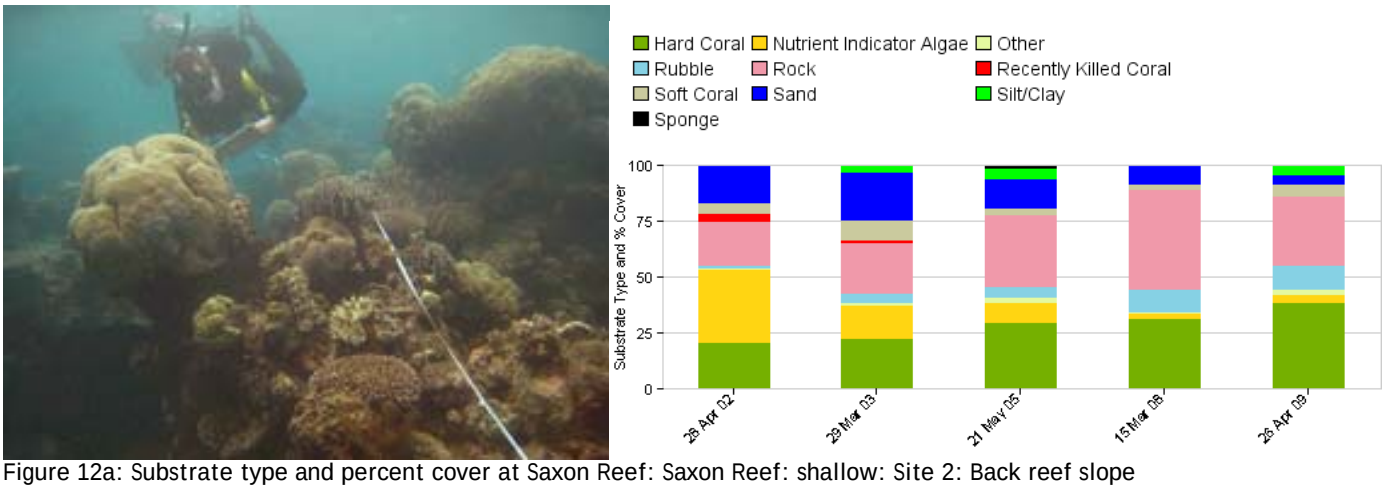


Figure 12a: Substrate type and percent cover at Saxon Reef: Saxon Reef: shallow: Site 2: Back reef slope

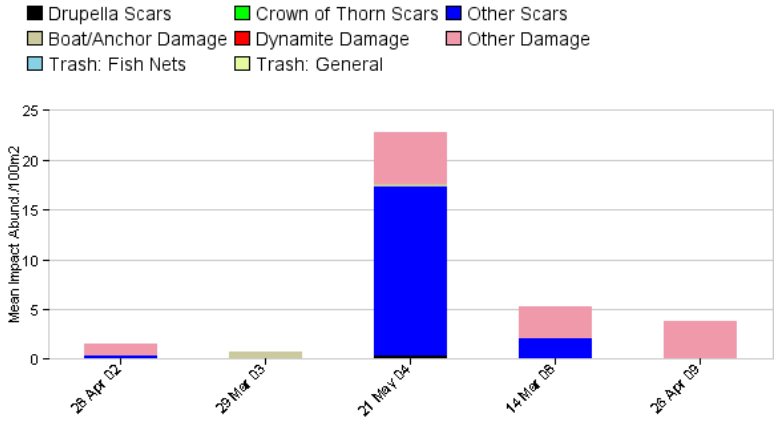


Figure 12b: Mean abundance of impacts at Saxon Reef: Saxon Reef: shallow: Site 2: Back reef slope

Magnetic Island, Alma Bay, site 1

Hard coral cover increased of almost 2-fold from 2004 to 2009 at this site while nutrient indicator algae increased as well (Figure 13a). The main type of coral was foliose followed by encrusting coral. In 2004 most of the rocks were covered by coralline algae and few were covered by turf algae. In the opposite turf algae was the dominant rock cover with only coralline algae in 2009. All the sponges recorded in both years were encrusting sponges. Drupella snail was the only invertebrate recorded in 2004 but its abundance decreased in 2009 and lobster was dominant (Figure 13b). Impacts observed were unidentified damage and scars and slightly increased in 2009 (Figure 13c).

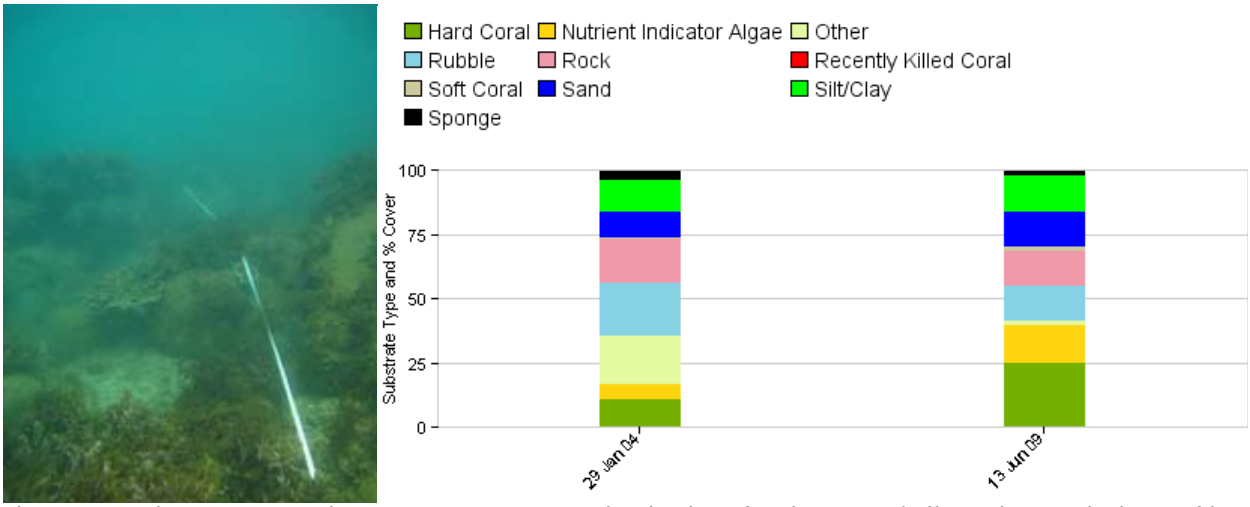


Figure 13a: Substrate type and percent cover at Magnetic Island Reefs: Alma Bay: shallow: Site 1: Fringing reef leeward

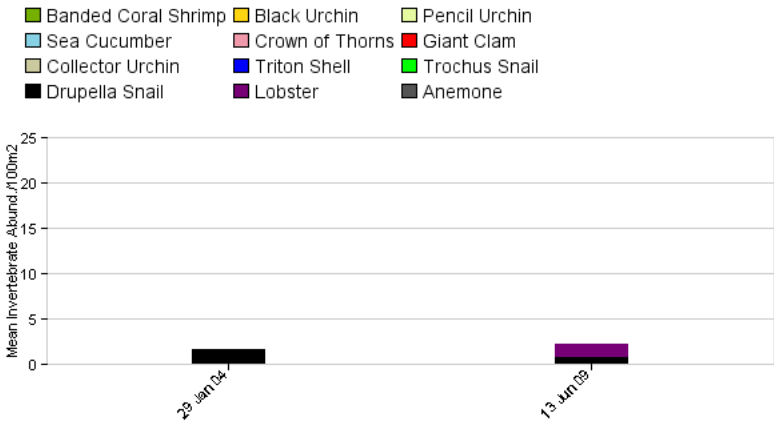


Figure 13b: Mean abundance of invertebrates at Magnetic Island Reefs: Alma Bay: shallow: Site 1: Fringing reef leeward

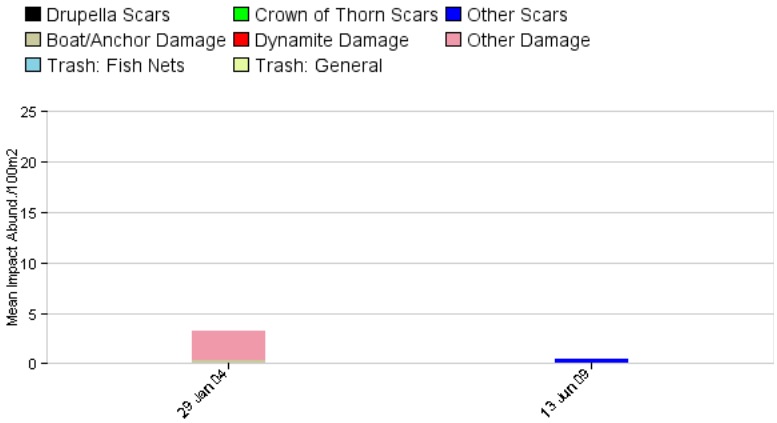


Figure 13c: Mean abundance of impacts at Magnetic Island Reefs: Alma Bay: shallow: Site 1: Fringing reef leeward

C. Dive sites where coral cover decreased

Opal Reef, Split Bommie

The coral cover at this site decreased each year since 2004 while the amount of rock tended to increase (Figure 14). In 2008 rock and rubble made the bulk of the substrate cover at this site. Although the site was not surveyed in 2009 the surveyors said they saw “sections of broken coral between vertical sections of the wall.”

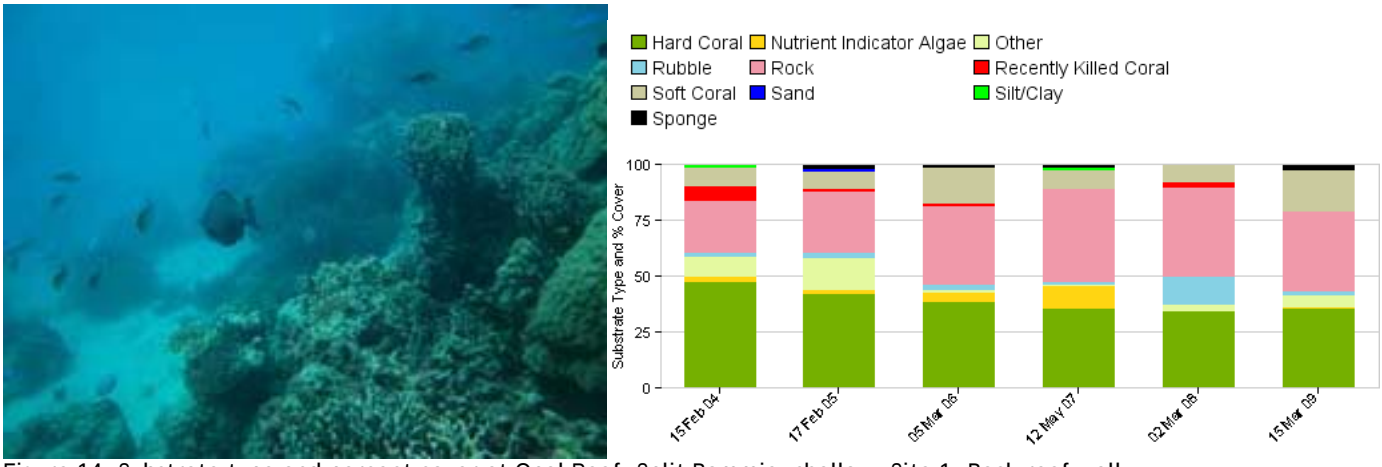


Figure 14: Substrate type and percent cover at Opal Reef: Split Bommie: shallow: Site 1: Back reef wall

Magnetic Island, Middle Reef, site 1

Coral cover decreased over 50% in 2005 to less than 20 % in 2009 (Figure 15a). Foliose coral was largely dominant from 2005 to 2007 and to a lesser extent in 2009. Silt or clay cover appeared to have increased over the past 4 years and was rated as high in 2006 and 2007 and as medium in 2009. Most of the rocks were covered by turf algae. Drupella snail was the key invertebrate recorded between 2005 and 2007 while only black urchins were observed in 2009 (Figure 15b). Mean impacts was around 7 incidents per 100 m^2 in 2005 most of them being unidentified impacts followed by scars, including Crown of Thorns, Drupella and unidentified scars (Figure 15c). However the occurrence of impacts decreased during the following years to a very low level.

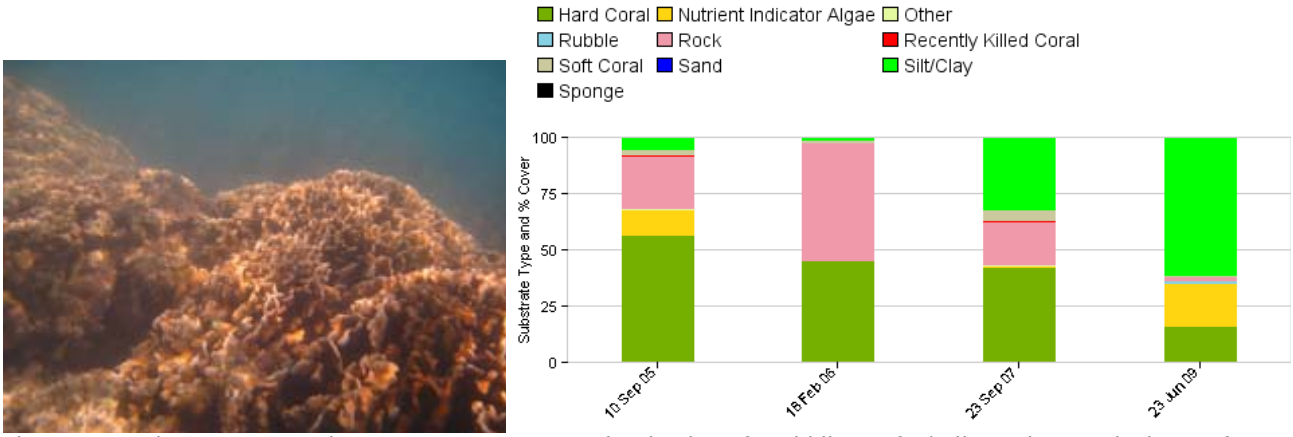


Figure 15a: Substrate type and percent cover at Magnetic Island Reefs: Middle Reef: shallow: Site 1: Fringing reef seaward

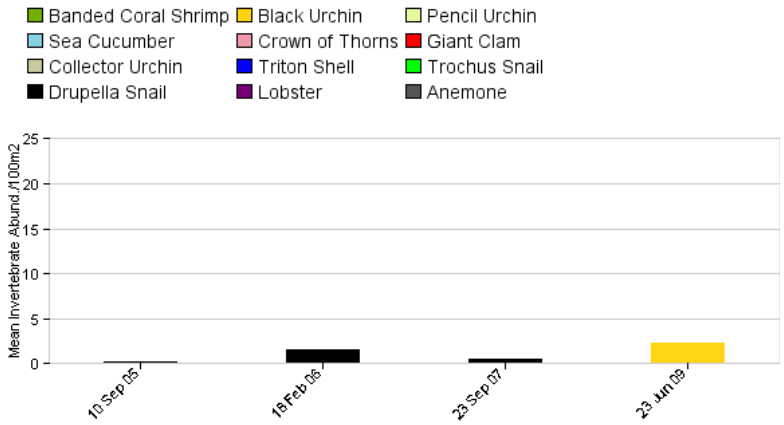


Figure 15b: Mean abundance of invertebrates at Magnetic Island Reefs: Middle Reef: shallow: Site 1: Fringing reef seaward

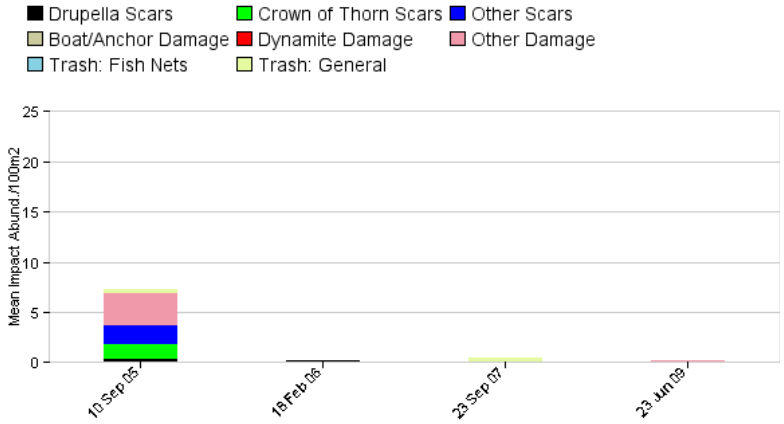


Figure 15c: Mean abundance of impacts at Magnetic Island Reefs: Middle Reef: shallow: Site 1: Fringing reef seaward

D. Dive sites where coral cover fluctuated

Opal Reef: The Wedge

Coral cover fluctuated between 20% and 40% at this site over the last 5 years while nutrient indicator algae decreased since 2005 (Figure 16a). The coral was mainly branching and massive for all years except 2008 where all the hard coral recorded was massive. Rock was covered with turf algae and crustose coralline algae. Since 2006 the incident of encrusting sponges has increased from amounting to 30 % of all sponges recorded to 100 % in 2009. While the overall cover of soft coral remained rather stable (Figure 16a) more than 90 % of soft corals recorded in 2009 were leathery in nature in contrast to 20 % in 2005. Black spine urchins were recorded in 2005 and 2009 while Drupella snails were recorded each year except 2006 and 2008. In 2009, 5 other scars per 100 m^2 were recorded, which was the highest since the site was first surveyed in 2004 (Figure 16b). The surveyors thought the coral had "a fair amount of bleaching at this site relative to other sites at this time of year. There were suggestions of disease in some plate corals."

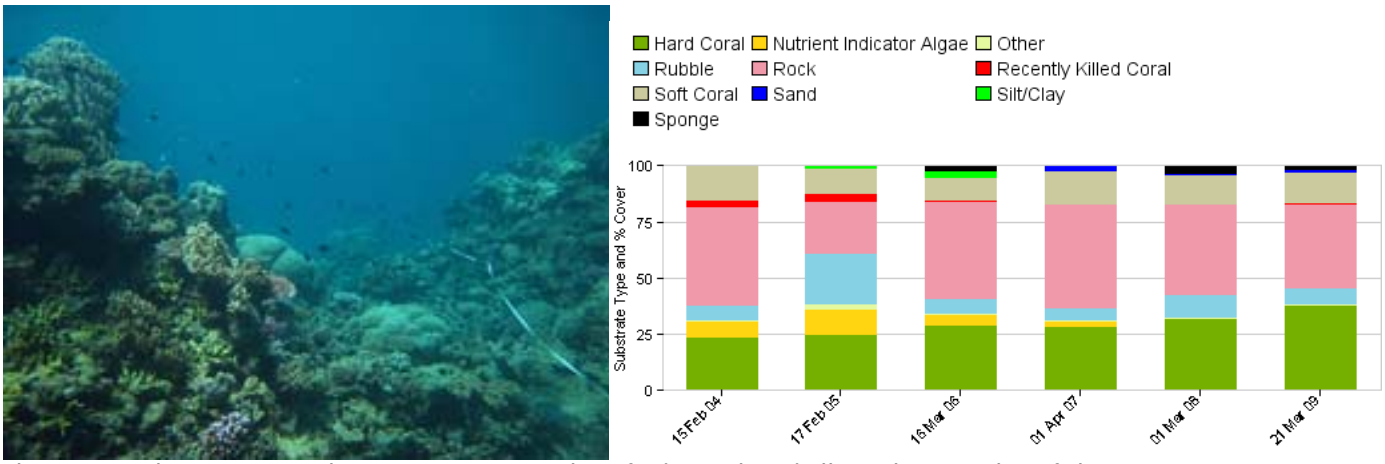


Figure 16a: Substrate type and percent cover at Opal Reef: The Wedge: shallow: Site 1: Back reef slope

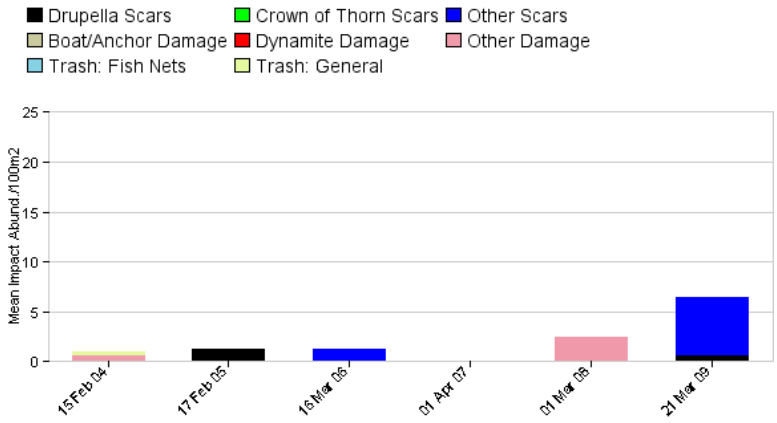


Figure 16b: Mean abundance of impacts at Opal Reef: The Wedge: shallow: Site 1: Back reef slope

Agincourt Reef: Agincourt 3D (Pontoon), site 1

Coral cover fluctuated since 2003 but increased from 2005 to 2009. Nutrient indicator algae much reduced from 2009 compared to 2005 (Figure 17). The coral was predominantly branching, rock was mostly covered with turf algae, soft coral were predominantly leathery, 5 Drupella snails were observed, clams were < 20 cm, impacts were unidentified scars and coral damage.

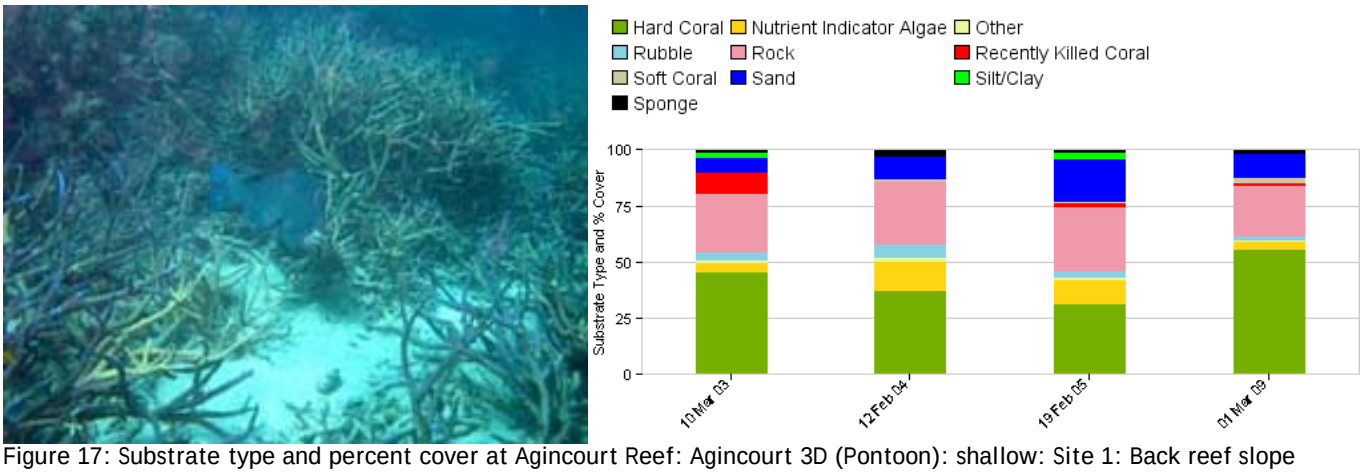


Figure 17: Substrate type and percent cover at Agincourt Reef: Agincourt 3D (Pontoon): shallow: Site 1: Back reef slope

Hayman Island Reef, Blue Pearl Bay

The coral cover at Blue pearl bay fluctuated around the 50 % mark in the last 8 years (Figure 18a). Since 2005 branching coral is the dominant coral growth form. The incidence of macro-algae in 2008 was medium whereas it was low in 2009. Rock was mostly covered with turf algae but nutrient indicator algae were largely absent. Soft corals were both of the leathery type and other types in all years except in 2007 where all soft corals recorded were leathery. The overall number of impact recorded has increased between 2005 and 2007 but not in 2009 (Figure 18b). Snappers have increased since 2006 (Figure 18c).

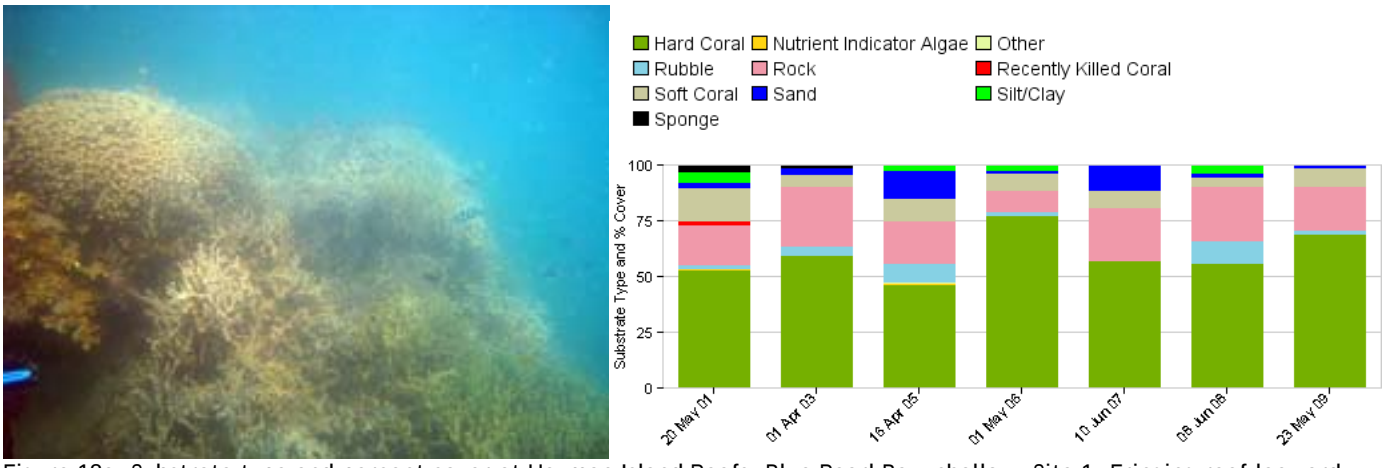


Figure 18a: Substrate type and percent cover at Hayman Island Reefs: Blue Pearl Bay: shallow: Site 1: Fringing reef leeward

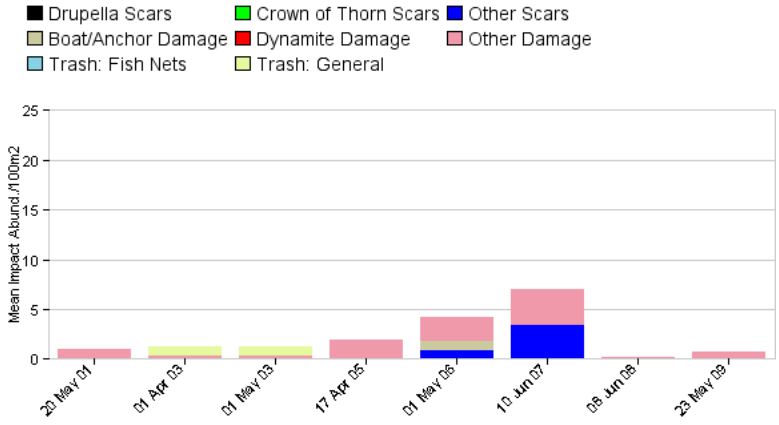


Figure 18b: Mean abundance of impacts at Hayman Island Reefs: Blue Pearl Bay: shallow: Site 1: Fringing reef leeward

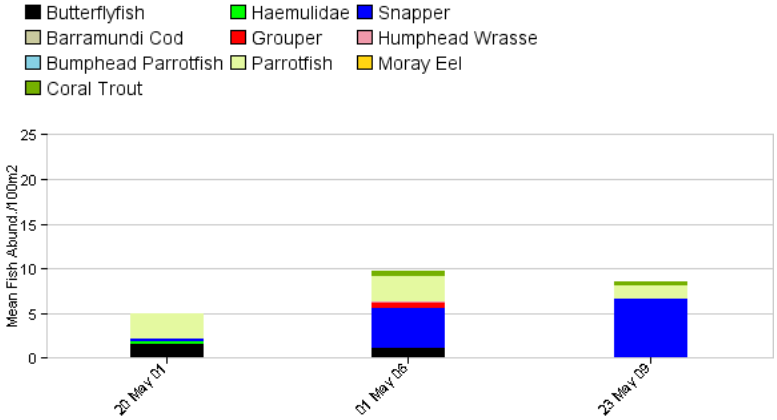


Figure 18c: Mean abundance of fish at Hayman Island Reefs: Blue Pearl Bay: shallow: Site 1: Fringing reef leeward

Hardy Reef, site 1, back reef wall

The coral cover has been fluctuating around 40% over the last 7 years (Figure 19a). The most common coral growth type was branching coral while soft coral were predominantly leathery in 2006 and 2009. The Drupella snails observed in the 2005 and 2006 survey season were not observed in the last 3 years. The prevalence of unknown scars increased this year compared to previous years (Figure 19b). The number of butterflyfishes decreased since 2006 (Figure 19c). The surveyors thought that the site had "lots of fish diversity and abundance, including lots of large and medium sized sweetlips and snapper species, lots of butterflyfish and a wobbegong shark. Some large (2m+) Queensland groupers were around the pontoon. As for corals, there was noticeable damage to the fragile plates, possibly due to diver damage as site is protected from storm damage, and damage levels decreased with distance from the pontoon. Large COTS-like scars were frequently found on the Acropora, but no specimens were discovered. There was lots of suspended sediment in the water."

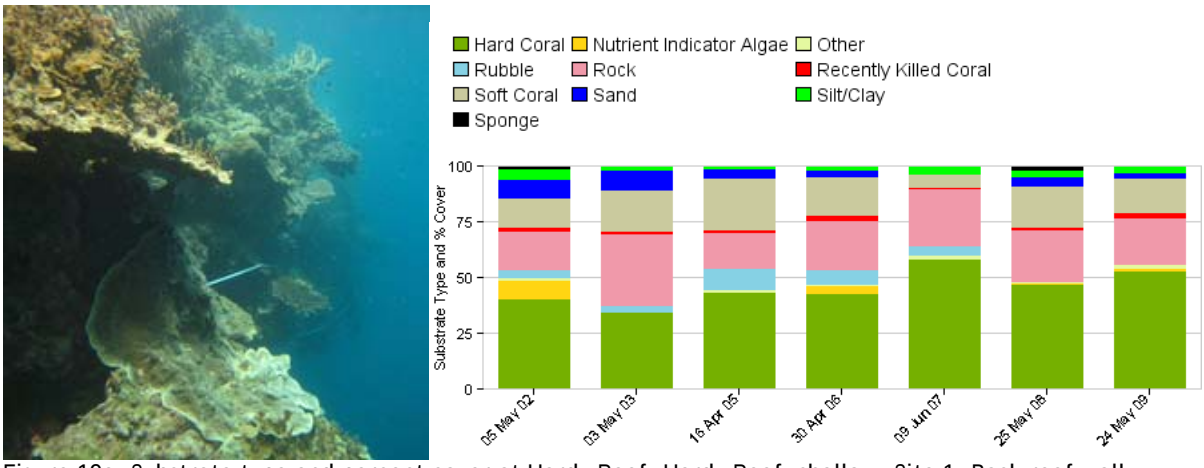


Figure 19a: Substrate type and percent cover at Hardy Reef: Hardy Reef: shallow: Site 1: Back reef wall

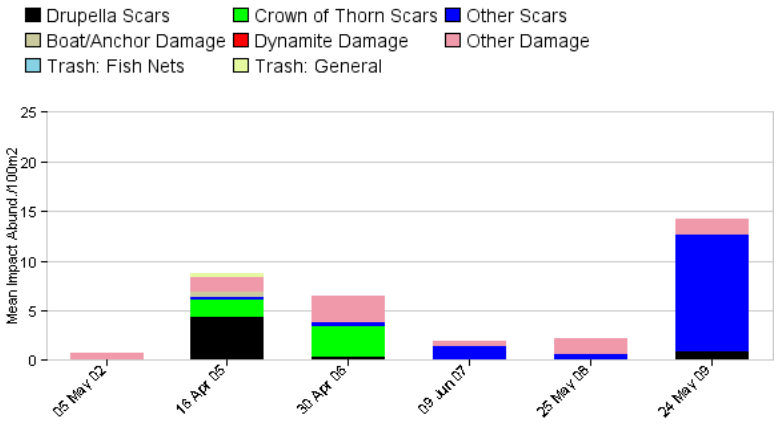


Figure 19b: Mean abundance of impacts at Hardy Reef: Hardy Reef: shallow: Site 1: Back reef wall

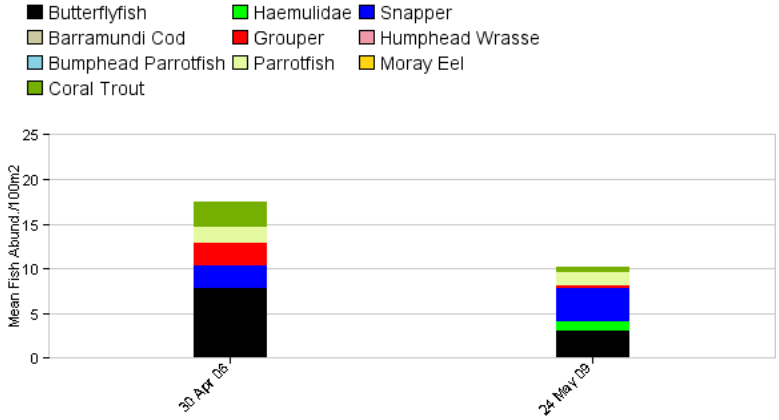


Figure 19c: Mean abundance of fish at Hardy Reef: Hardy Reef: shallow: Site 1: Back reef wall

Low isles Reef, site 1

Coral cover fluctuated over the last 7 years around the 12 % mark while the proportion of soft coral is higher since 2006 (Figure 20). Hard coral was mostly branching and the soft coral predominantly leathery. Turf algae were the dominant algae covering rock. Recorded invertebrates over the whole survey period included sea cucumber, collector urchin and giant clams. Impacts noted included unidentified scars and coral damage. The surveyors thought that "the coral cover was virtually entirely made of soft coral which appeared pale. The fish was in very high abundance, especially juveniles. The water was rather turbid. A black-tip reef shark was sighted."

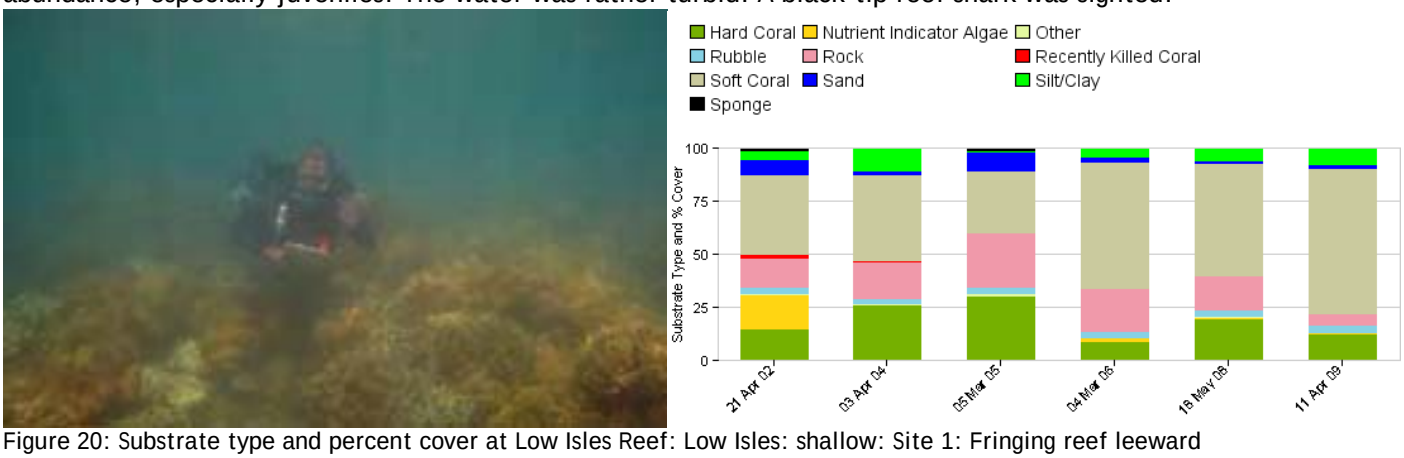


Figure 20: Substrate type and percent cover at Low Isles Reef: Low Isles: shallow: Site 1: Fringing reef leeward

Low isles Reef, site 2

The coral cover fluctuated between 15 and 40 % at this site. The low coral cover in 2005 and 2009 was matched by increased levels of soft corals (Figure 21a). The hard coral growth forms were very homogenous across groups and all the following growth forms were represented: branching, foliose, massive, encrusting, plate and other (HC) (Figure 21b). The rock was predominantly covered with turf algae and very low levels of nutrient indicator algae were noted. Damage to the reef was unidentified coral damage but was only observed in 2006 at low levels. The surveyors noted that both hard and soft coral were present, but there was lots of bare substrate too. A large green turtle was sighted."

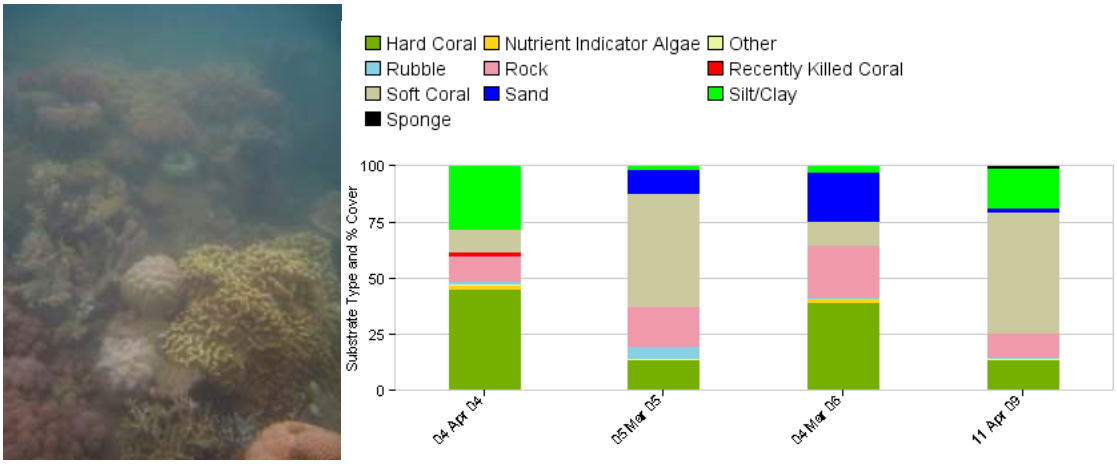


Figure 21a: Substrate type and percent cover at Low Isles Reef: Low Isles: shallow: Site 2: Fringing reef leeward

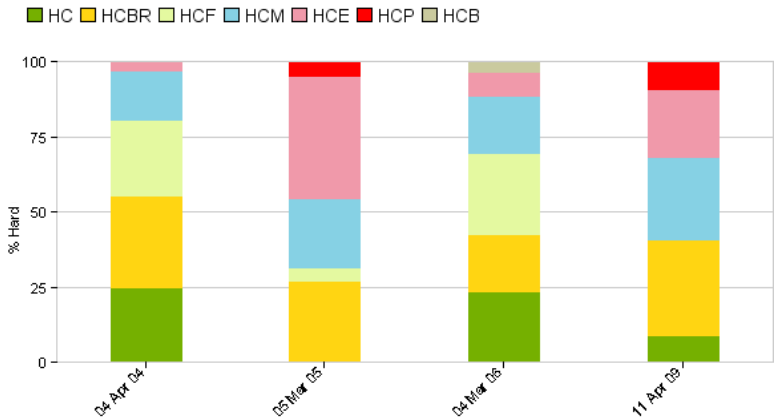


Figure 21b: Hard coral lifeforms and percent cover at Low Isles Reef: Low Isles: shallow: Site 2: Fringing reef leeward

Moore Reef

Coral cover has fluctuated minimally around 40 % in the last 4 years and the nutrient indicator algae decreased in the 2008 to 2009 period (Figure 22). Hard coral was mostly branching and plate-like. Rock was covered with both turf algae and crustose coralline algae. The incidence of leathery soft coral had been declining from 2005-2008 but increased in 2009 to make leathery soft corals the dominant form of soft coral on the reef. Impact to this reef included unidentified scars and coral damage. Parrotfishes were the dominant fish at this site in 2009. The surveyors assessment of the site was that fields of branching Acropora were seen East of the pontoon, with occasional massive Porites bommie. There were lots of small white spots, presumed to be scars, over most Acropora branches, although very few Drupella were seen. Site said to be improving over recent years with an increase in coral growth, particularly the fast-growing Acropora. Fish: Several small fishes, several humphead wrasse and one bumphead parrotfish. Some small adult COTS seen hiding in crevices in then rock underlying the Acropora."

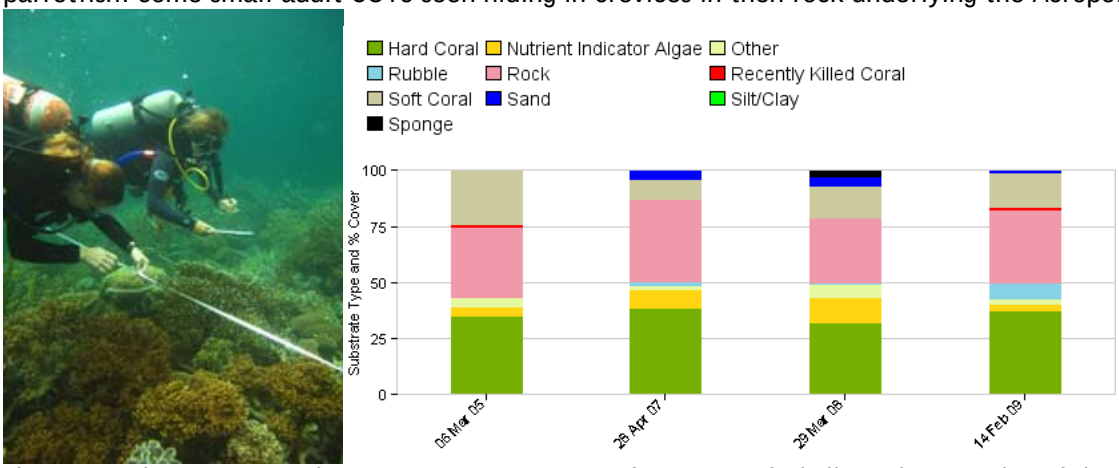


Figure 22: Substrate type and percent cover at Moore Reef: Moore Reef: shallow: Site 1: Back reef slope

Opal Reef, Bashful Bommie, shallow

The percentage coral cover fluctuated between 12-40% and was highest in 2006 (Figure 23). The hard coral was predominantly massive and soft corals predominantly leathery. Rock was typically covered with turf algae and nutrient indicator algae were low except in 2002. In the period of 2004-2007 black urchins were observed while they were absent from the 2002, 2008-2009 surveys. Sighted giant clams were very small (<10 cm) throughout the 2004-2009 period. Impacts were unidentified scars and coral damage. Parrot fish and butterflyfish were the two dominant fish types. The surveyors thought there was "lots of dead and broken coral."

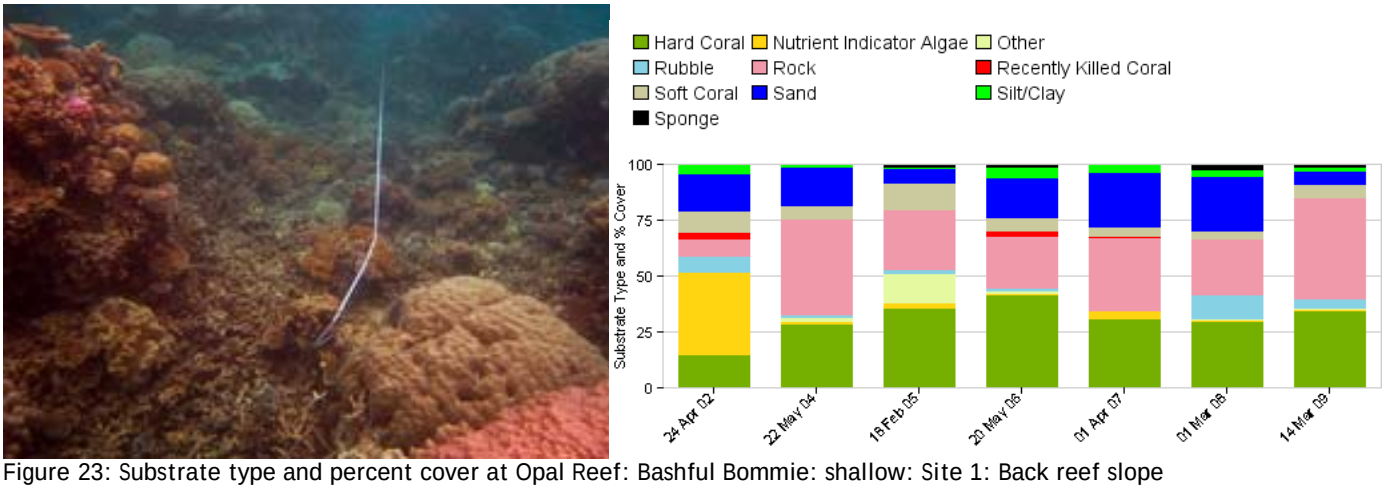


Figure 23: Substrate type and percent cover at Opal Reef: Bashful Bommie: shallow: Site 1: Back reef slope

Opal Reef, Bashful Bommie, medium

Hard coral cover fluctuated about the 25 % mark (Figure 24a) and was mostly of the massive type. There was a mixture of bare, turf algae-covered and crustose algae-covered rock at this site. Sponges were solely encrusting in 2006 and 2009. In past years, soft coral had been a mixture of leathery and other soft corals but the 2009 surveys showed a dominance of leathery soft corals at this site. Black urchins have been decreasing since 2005 (Figure 24b) and the sea cucumbers and Drupella snails detected in 2005 and 2006, respectively, were absent in 2009 even though a large amount of unidentified scars were found at this site (Figure 24c). Butterflyfish were the dominant fish at this site in 2009. The surveyor thought that the branching coral had any scars visible and that there was a moderate degree of siltation in turf algae."

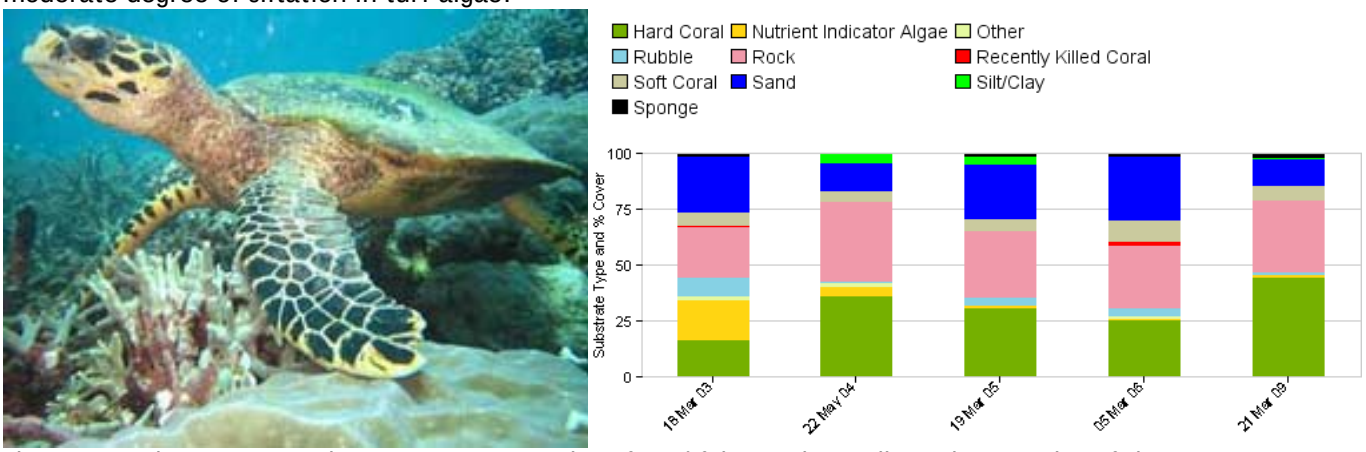


Figure 24a: Substrate type and percent cover at Opal Reef: Bashful Bommie: medium: Site 1: Back reef slope

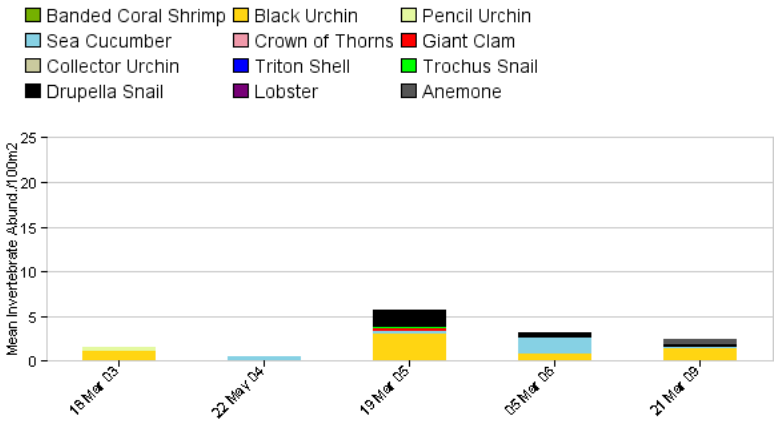


Figure 24b: Mean abundance of invertebrates at Opal Reef: Bashful Bommie: medium: Site 1: Back reef slope

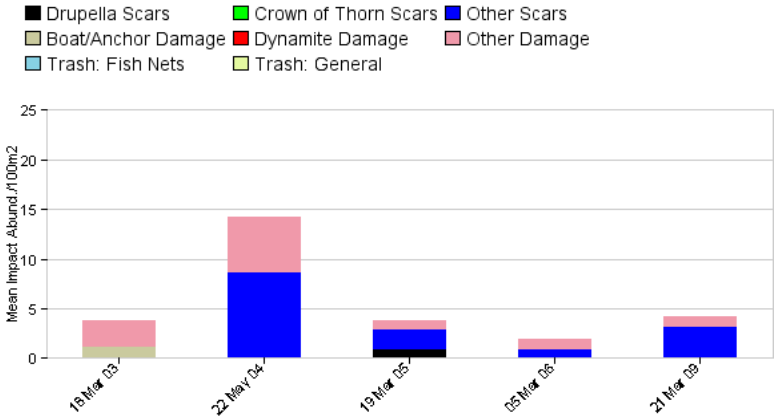


Figure 24c: Mean abundance of impacts at Opal Reef: Bashful Bommie: medium: Site 1: Back reef slope

Saxon Reef

Coral cover has been fluctuating around the 25 % mark for the last 4 years (Figure 25a). Branching corals are the most dominant coral growth form and soft coral of the leathery type. Rock was mostly covered with turf algae. Black urchins and Drupella snails were the key invertebrates recorded the most often. The impacts (unidentififed coral damage and scars) have decreased dramatically since 2004 (Figure 25b). Cods, snappers and parrotfishes were the most dominant fishes in 2009. The surveyors' assessment was that coral was of mixed morphologies. There were lots of rubble and signs of damage, but further away from mooring coral was in much better condition. The fish were in very high abundance."

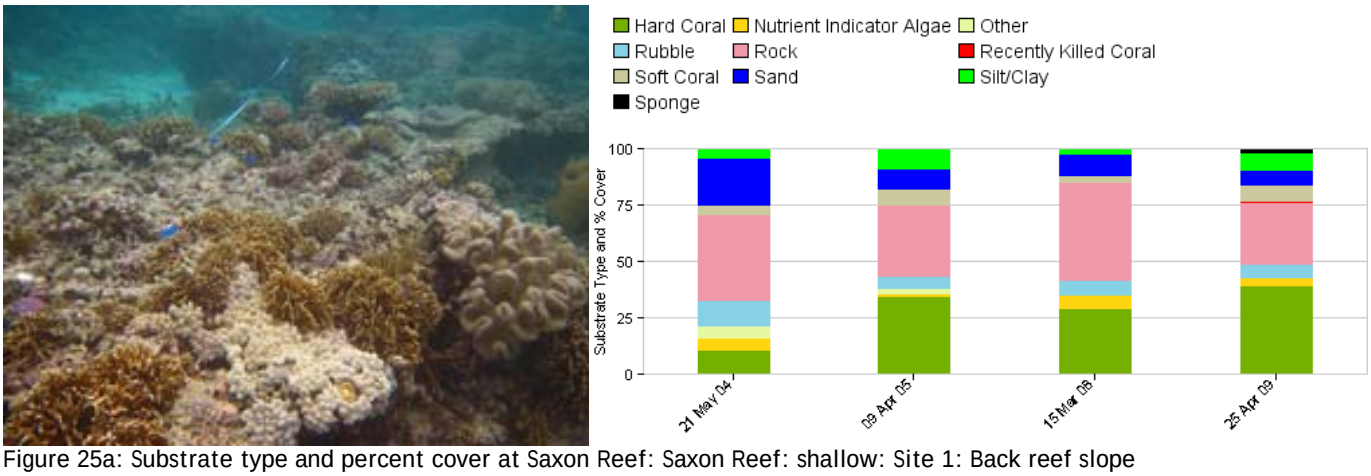


Figure 25a: Substrate type and percent cover at Saxon Reef: Saxon Reef: shallow: Site 1: Back reef slope

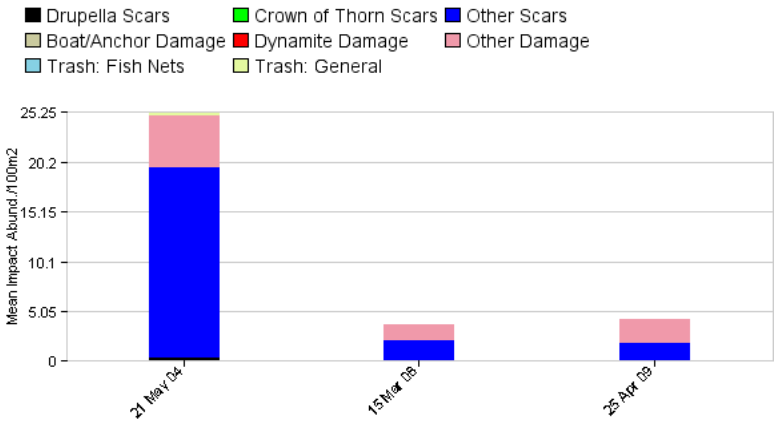


Figure 25b: Mean abundance of impacts at Saxon Reef: Saxon Reef: shallow: Site 1: Back reef slope

Magnetic Island, Alma Bay, site 2

Coral cover fluctuated between 20-60 % at shallow depth, the highest coral cover being in 2008 and the lowest in 2009 (Figure 26a). Foliose corals were consistently dominant over the 3 years, rocks were mostly covered by turf algae, and all the sponges recorded were encrusting sponge. Soft corals were solely leathery in 2005, however in 2009 only zoanthids were reported. No nutrient indicator algae were recorded until 2009. In the 2 years when the invertebrate count was conducted, Drupella snail was the only invertebrate recorded. Its abundance was slightly lower in 2009 than in 2005 (Figure 26b). In 2005 Drupella scars were recorded but none was observed in 2009. However unidentified scars were recorded in 2009 and unidentified damage were observed both years. Overall less damage were observed in 2009 than in 2005 (Figure 26c).

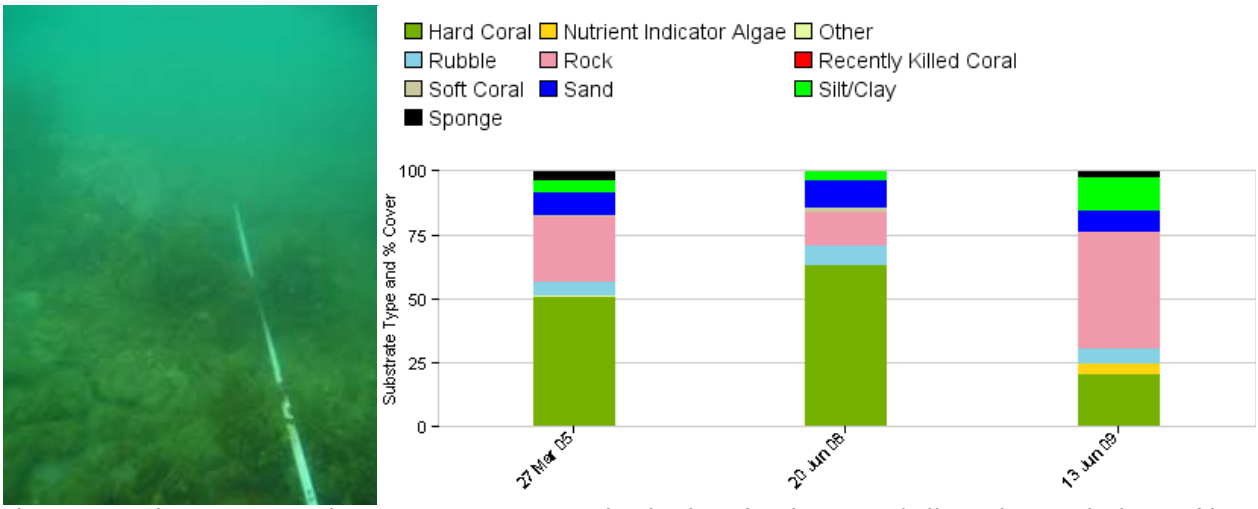


Figure 26a: Substrate type and percent cover at Magnetic Island Reefs: Alma Bay: shallow: Site 2: Fringing reef leeward

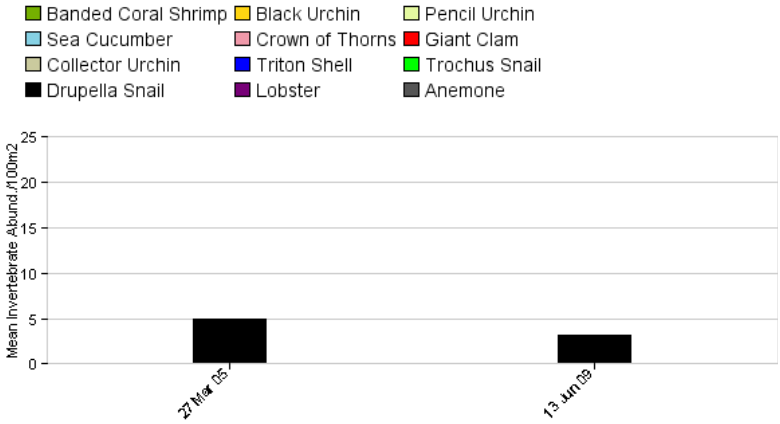


Figure 26b: Mean abundance of invertebrates at Magnetic Island Reefs: Alma Bay: shallow: Site 2: Fringing reef leeward

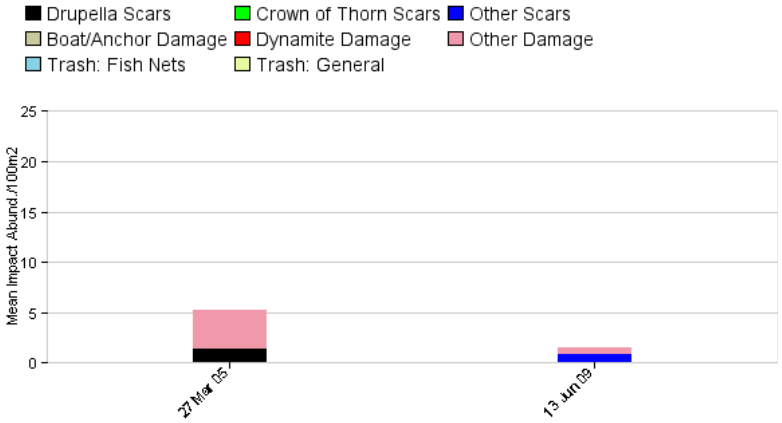


Figure 26c: Mean abundance of impacts at Magnetic Island Reefs: Alma Bay: shallow: Site 2: Fringing reef leeward

Magnetic Island, Geoffrey Bay, site 1

Hard coral cover increased around 15 % in 2003 to nearly 65 % in 2008 at this site but then dramatically decreased to reach its lowest level in 2009 (Figure 27a). Nutrient indicator algae fluctuated during the survey period but were overall lower during the years when hard coral cover was high (2005, 2007, and 2008) while they were more abundant when coral cover was low in 2003 and 2009. The main type of coral was encrusting and plate coral in 2005 while in the 3 following recorded years, foliose was largely dominant. Massive corals began to occur in a large proportion in 2009. Drupella snail was the main invertebrate observed in all years with few lobster sightings in 2007 (Figure 27b). Impacts abundance (unidentified damage and scars) remained stable over time with few trash damage observed in 2007 (Figure 27c).

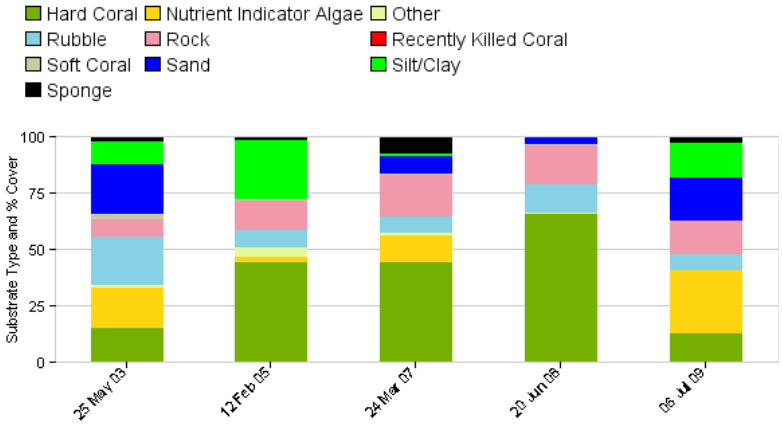


Figure 27a: Substrate type and percent cover at Magnetic Island Reefs: Geoffrey Bay: shallow: Site 1: Fringing reef leeward

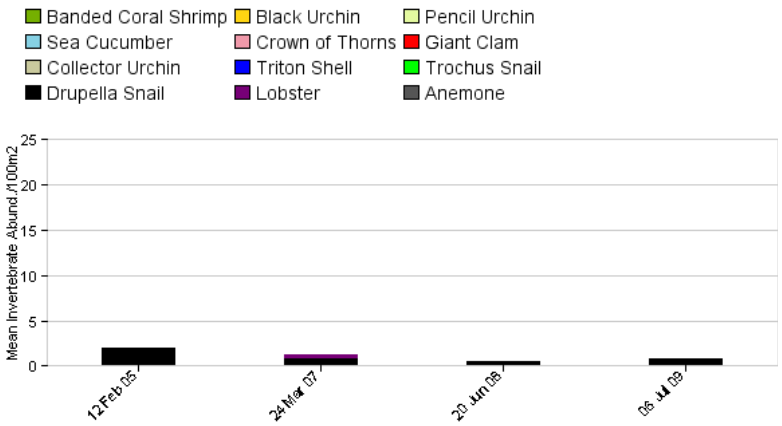


Figure 27b: Mean abundance of invertebrates at Magnetic Island Reefs: Geoffrey Bay: shallow: Site 1: Fringing reef leeward

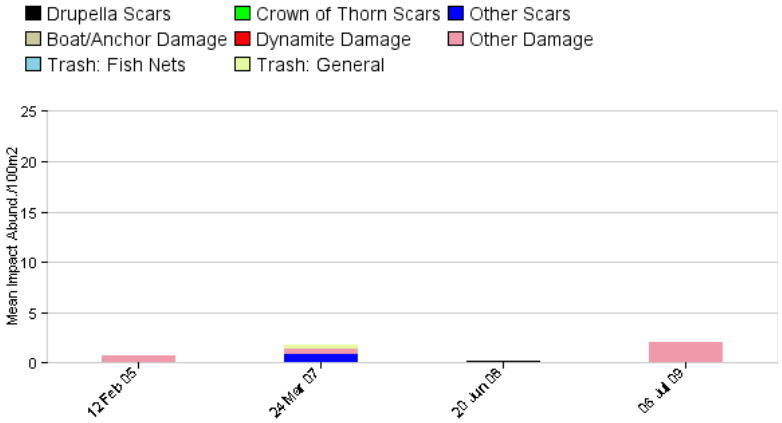


Figure 27c: Mean abundance of impacts at Magnetic Island Reefs: Geoffrey Bay: shallow: Site 1: Fringing reef leeward

Magnetic Island, Middle Reef, site 2

Hard coral fluctuated between 30-50% from 2005 with a majority of hard coral foliose followed by branching coral in 2005 and 2009 while other hard corals were dominant in 2007 (Figure 28a). The level of silt loading fluctuated between medium and high. Most of the rocks were covered by turf algae. Coral damages were observed in 2005 and 2007 but not in 2009 (Figure 28b). Unknown damage was the most frequently recorded with some unknown scars in 2005 and boat or anchor damage in 2007.

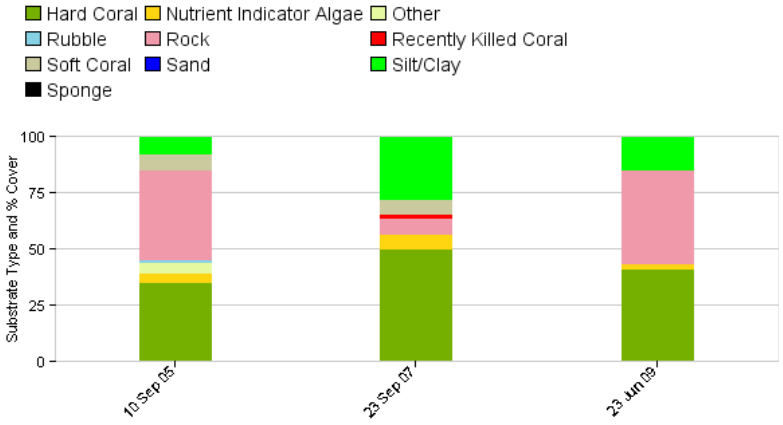


Figure 28a: Substrate type and percent cover at Magnetic Island Reefs: Middle Reef: shallow: Site 2: Fringing reef seaward

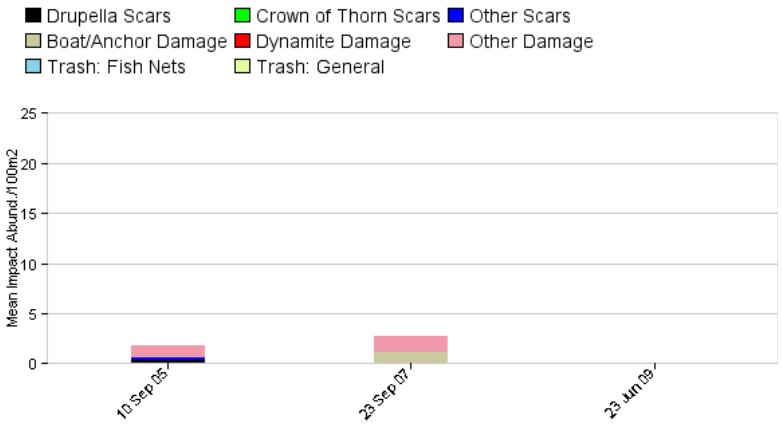


Figure 28b: Mean abundance of impacts at Magnetic Island Reefs: Middle Reef: shallow: Site 2: Fringing reef seaward

Magnetic Island, Nelly Bay, site 1

Hard coral cover steadily increased from 40% in 2003 to 72% in 2008 at this site but then decreased back to 40% in 2009 (Figure 29a). A storm was recorded in the area in January 2009 and might explain the sudden decline in hard coral cover in 2009. Interestingly nutrient indicator algae were abundant in 2003 (about 20%) but almost disappeared in the following years, and finally were abundant again in 2009. The dominant coral form was foliose followed by

branching coral in most years except in 2005 when it was followed by plate corals and in 2006 when branching corals were dominant followed by foliose. The majority of rocks were covered by turf algae in all years (100% in 2009) except in 2007. Silt loading was estimated as medium during the last 3 surveys. Some butterfly fishes and groupers were observed in 2008 and 2009 (Figure 29b).

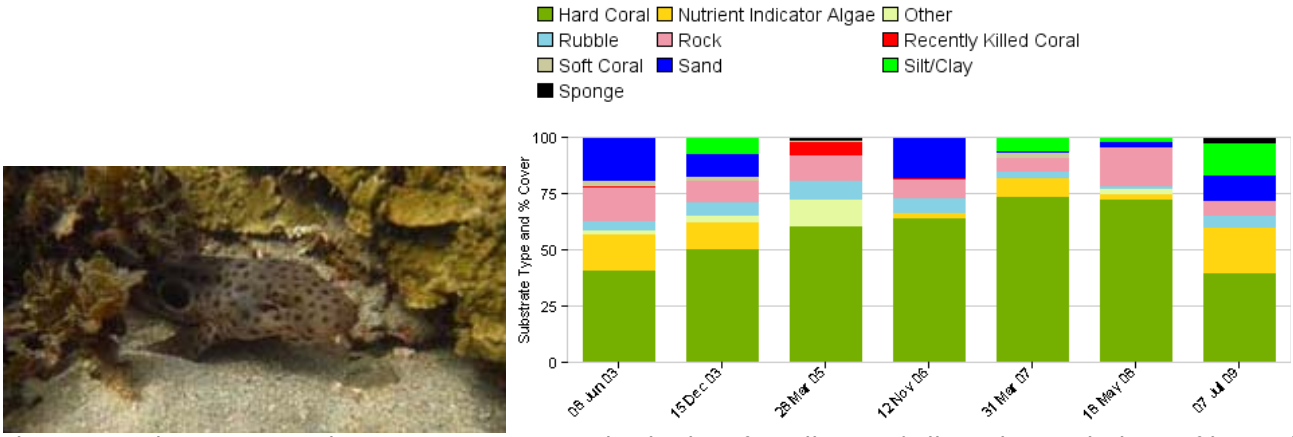


Figure 29a: Substrate type and percent cover at Magnetic Island Reefs: Nelly Bay: shallow: Site 1: Fringing reef leeward

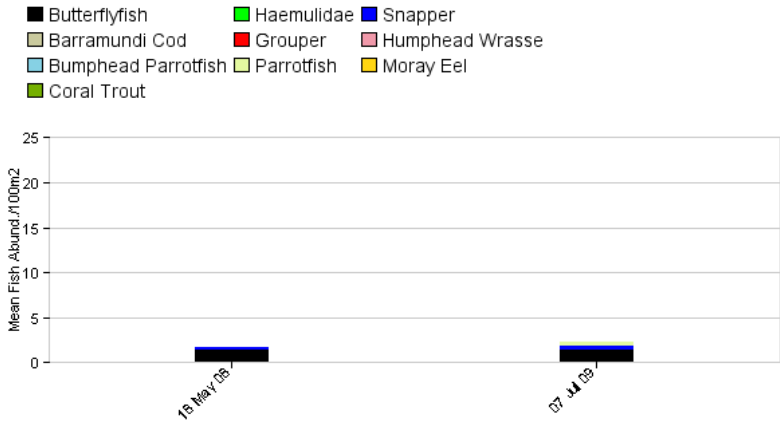


Figure 29b: Mean abundance of fish at Magnetic Island Reefs: Nelly Bay: shallow: Site 1: Fringing reef leeward

Magnetic Island, Nelly Bay, site 2

Similarly to site 1 in Nelly Bay, this site had an increasing coral cover from 30% in 2003 to almost 75% in 2006 but then coral cover decreased back to 30% in 2009 (Figure 30a). Once again the storm recorded in January 2009 might be responsible for this decline. Encrusting hard corals followed by plate corals were dominant in 2005 while foliose corals followed by branching corals were dominant in 2006 and 2009. Most of the rocks were covered by turf algae during the last 3 surveys. Drupella snails were observed during the last 3 surveys but were in lower number in 2009 than in the previous 2 years (Figure 30b). Consequently a lower number of scars were observed in 2009 (Figure 30c).

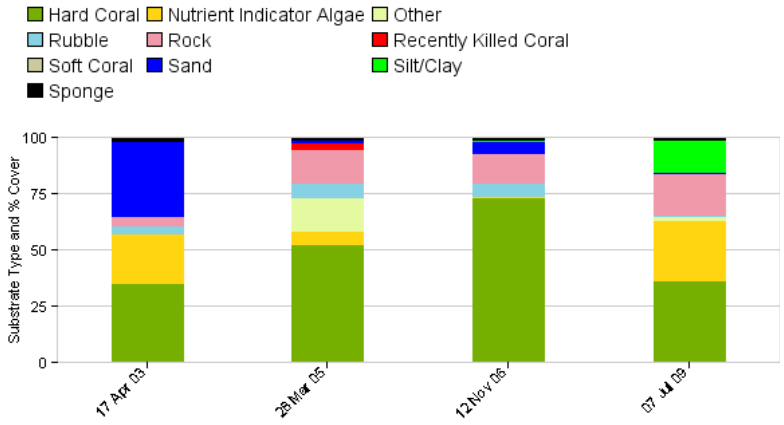


Figure 30a: Substrate type and percent cover at Magnetic Island Reefs: Nelly Bay: shallow: Site 2: Fringing reef leeward

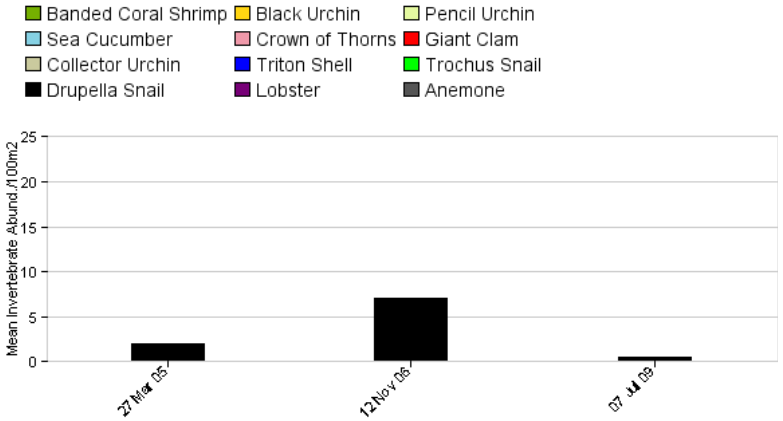


Figure 30b: Mean abundance of invertebrates at Magnetic Island Reefs: Nelly Bay: shallow: Site 2: Fringing reef leeward

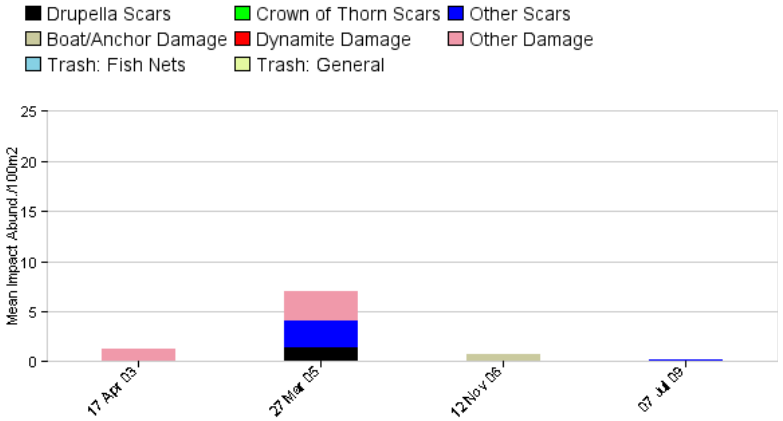


Figure 30c: Mean abundance of impacts at Magnetic Island Reefs: Nelly Bay: shallow: Site 2: Fringing reef leeward

E. Dive sites where coral cover remained largely stable

Hastings Reef, North Hastings A

Coral cover fluctuated little at this site and stayed rather stable between 12 and 22 % (Figure 31a). Hard coral was dominated by massive coral in 2006. In 2008 coral plates, and branching coral were also recorded and the massive corals were in lower numbers (Figure 31b). Rocky substrates were dominated by turf algae. Leathery soft corals increased from 20 % to 100 % of all soft corals between 2006 and 2009. Black urchins were the dominant invertebrate recorded in most years, although in variable numbers (Figure 31c). The only impacts recorded in all years were of low levels of coral damage and low bleaching in 2009. The surveyors thought that "the coral was sparsely distributed coral along shallow wall. Some large massive bommies and table corals were present on the leeward side of wall."

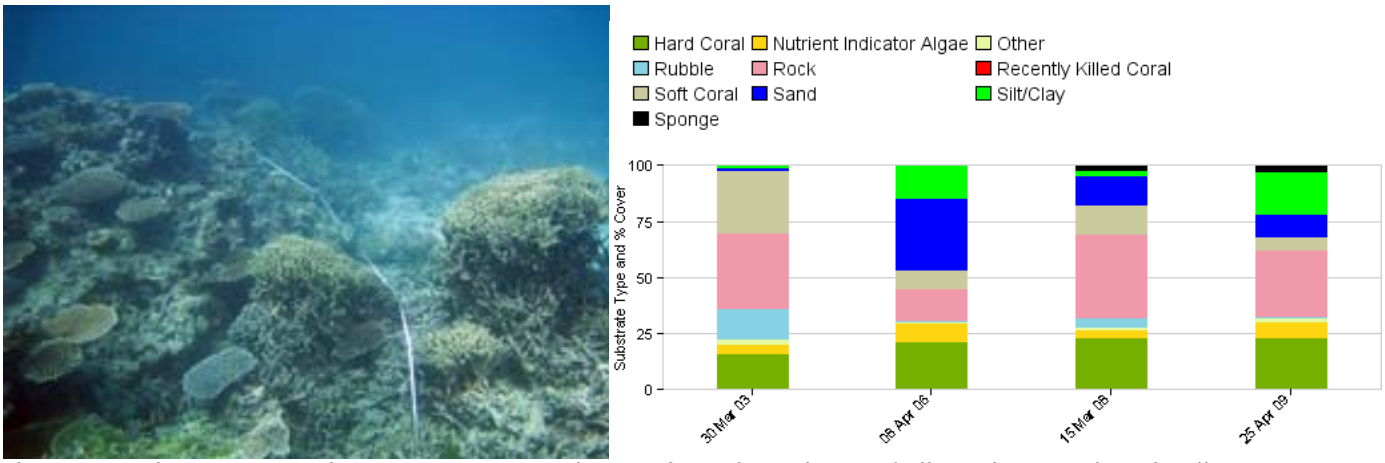


Figure 31a: Substrate type and percent cover at Hastings Reef: North Hastings A: shallow: Site 1: Back reef wall

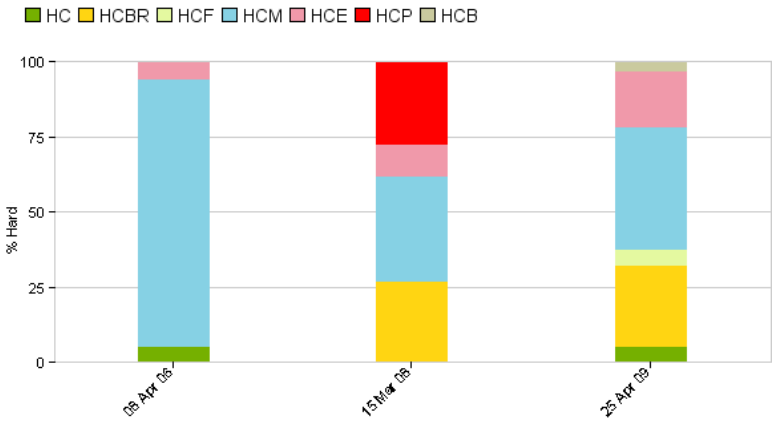


Figure 31b: Hard coral life form and percent cover at Hastings Reef: North Hastings A: shallow: Site 1: Back reef wall

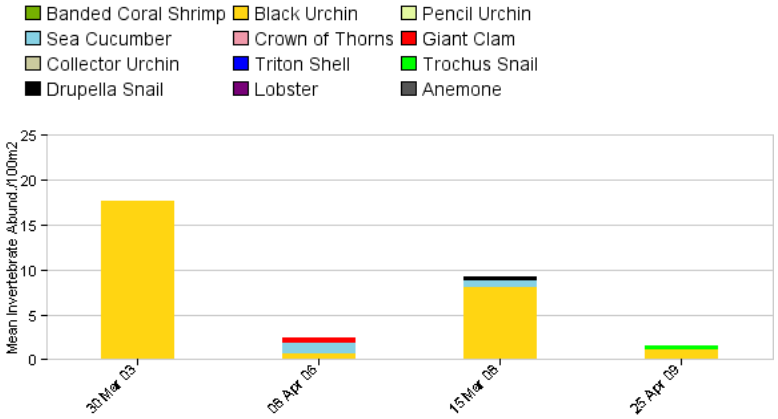


Figure 31c: Mean abundance of invertebrates at Hastings Reef: North Hastings A: shallow: Site 1: Back reef wall

Knuckle Reef

Overall coral cover changed little around the 50 % mark between 2006 and 2009 (Figure 32). Hard coral was predominantly branching except in 2008 where more massive forms were found on the transect. Rocky substrate was overall dominated by turf algae except in 2007 where coralline algae were typically covering rock. Zoanthids were recorded in 2006, but leathery soft corals increasingly dominated from 2007 to 2009. Impacts were dominated by coral damage, although scarring was recorded in 2006 and low levels of bleaching recorded in 2009. Butterflyfish dominated fish abundances, although some parrotfish were also recorded in 2006. The surveyors description of the site was "an average fish abundance, dominated by butterflyfish and damselfish. Good coral cover with mainly large branching, massive and plate coral colonies. Many large free standing and encrusting sponges. Strong currents were noted at certain locations."

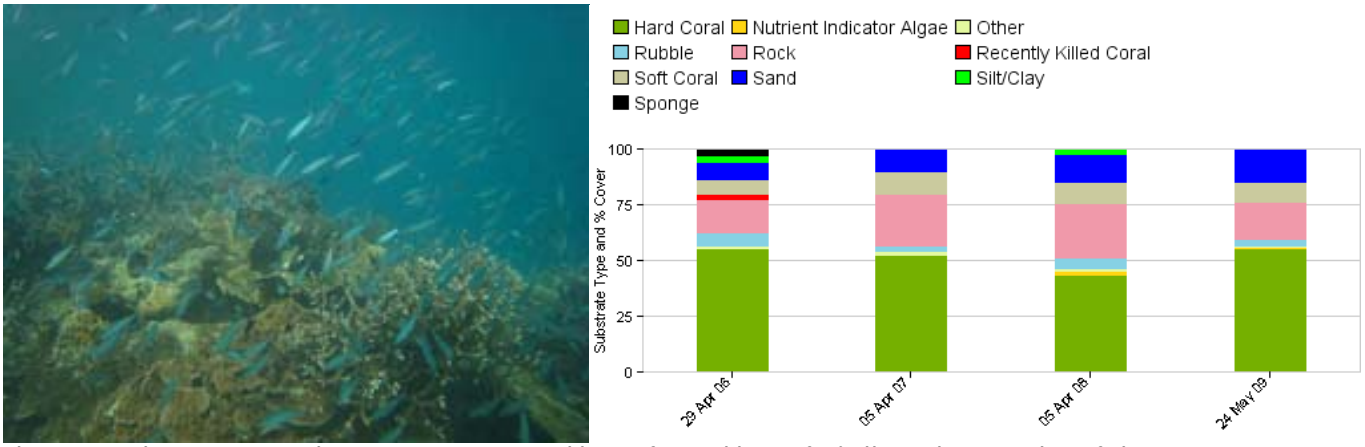


Figure 32: Substrate type and percent cover at Knuckle Reef: Knuckle Reef: shallow: Site 1: Back reef slope

Opal Reef, Two Tone

Hard coral cover increased from 16 % to 33 % between 2003 and 2007 but decreased back to 20 % in 2009 (Figure 33). Hard coral was dominated by branching and massive forms. From 2004 to 2009 turf algae increasingly dominated rocky surfaces over coralline algae and silt increase many fold compared to previous years. Soft corals were predominantly leathery, except in 2007, when non leathery types dominated. Sea cucumbers and black urchins were the key vertebrates recorded at this site. Clams were all under 20cm in size. The only impacts recorded were coral scarring, which was always below 5 incidents per 100m^2, and some bleaching in 2009. Fish were recorded in 2007 and were made up of parrotfish and butterflyfish in equal number. The surveyors reported several large patches of Acropora coral and high amount of sedimentation at the site. Also, COTS were sighted."

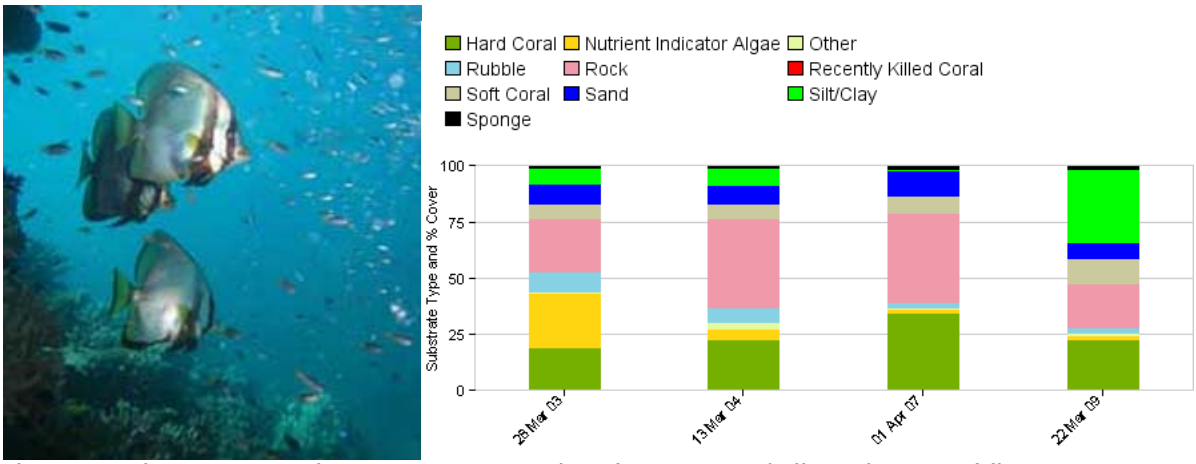


Figure 33: Substrate type and percent cover at Opal Reef: Two Tone: shallow: Site 1: Reef flat

Magnetic Island, Geoffrey Bay, site 2

Coral cover was approximately stable around 25 %, foliose corals being dominant over the 3 years surveyed (Figure 34a). A shift in rock cover from coralline algae to turf algae was observed. Few lobsters and Drupella snails were reported in 2009 at this site (Figure 34b). Impacts abundance reported over 2 years (2005 and 2009) was below 5 incidents per 100m^2 and was very low in 2009 (Figure 34c). Most impacts were unidentified damage but some trash damage and scars have been recorded in 2005. Butterflyfish was the only species recorded at this site in 2009 (Figure 34d).

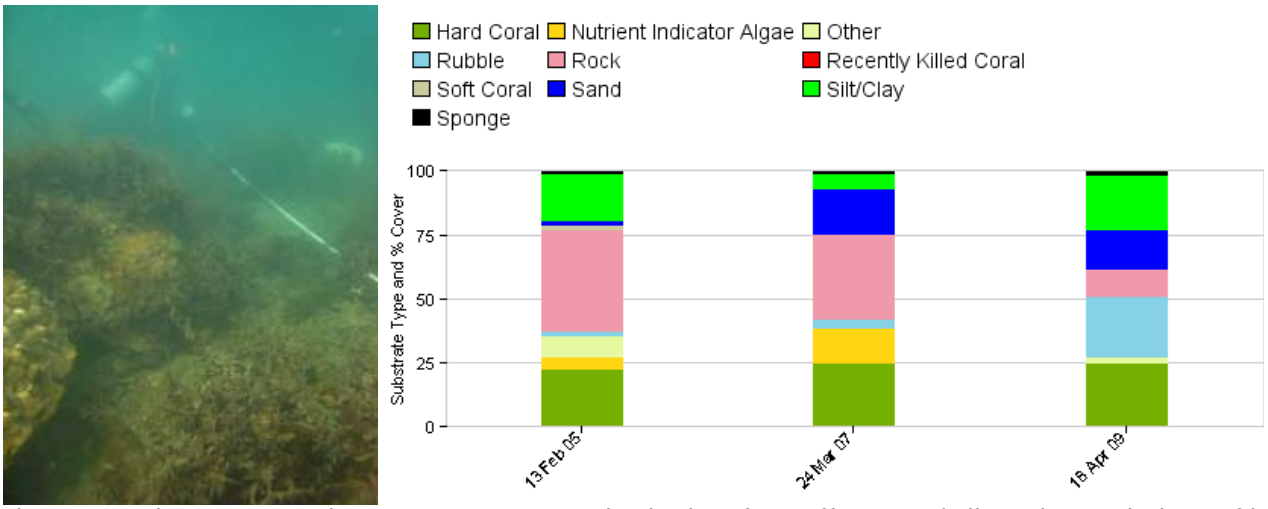


Figure 34a: Substrate type and percent cover at Magnetic Island Reefs: Geoffrey Bay: shallow: Site 2: Fringing reef leeward

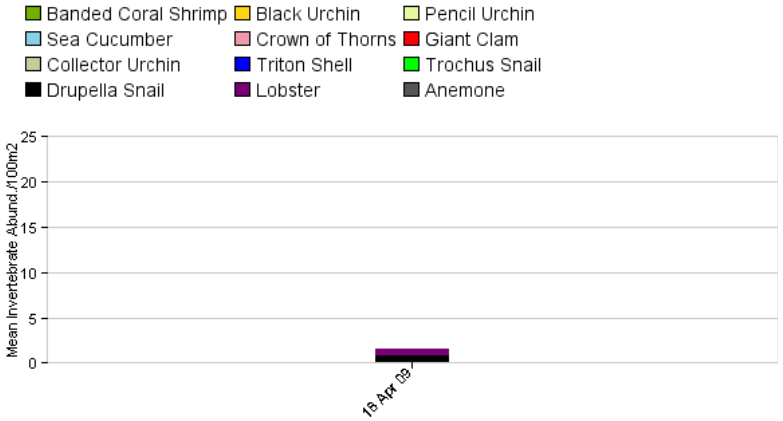


Figure 34b: Mean abundance of invertebrates at Magnetic Island Reefs: Geoffrey Bay: shallow: Site 2: Fringing reef leeward

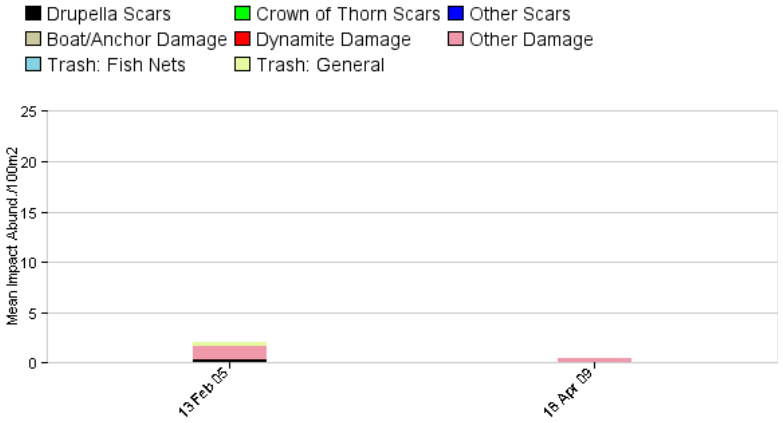


Figure 34c: Mean abundance of impacts at Magnetic Island Reefs: Geoffrey Bay: shallow: Site 2: Fringing reef leeward

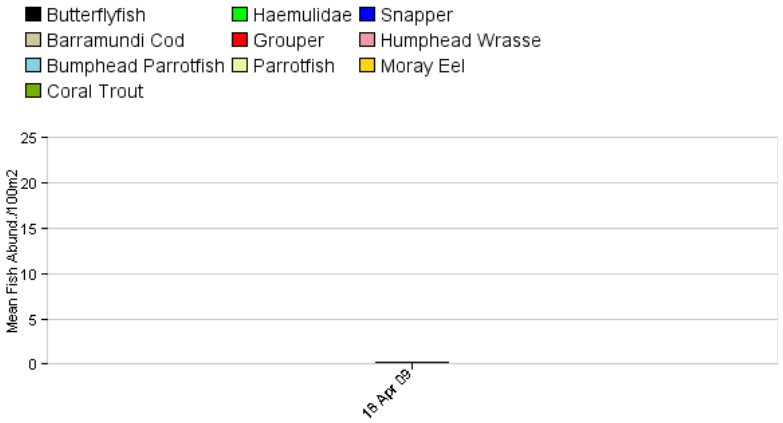


Figure 34d: Mean abundance of fish at Magnetic Island Reefs: Geoffrey Bay: shallow: Site 2: Fringing reef leeward

Magnetic Island, Geoffrey Bay, site 3

Coral cover was stable around 30% at this site (Figure 35a). Plate corals were dominant followed by massive corals in 2005 while in 2009 foliose and encrusting corals were dominant. The percentage of hard coral colonies estimated to be bleached was less than 10% in 2005 and below 5% in 2009. Rocks cover was important, most of them being covered by coralline algae in 2005 and by turf algae in 2009. Drupella snail was the key invertebrate recorded at this site but its abundance decreased in 2009 (Figure 35b). In the same way, impacts (unidentified and scar damage) decreased to a very low level in 2009 (Figure 35c).

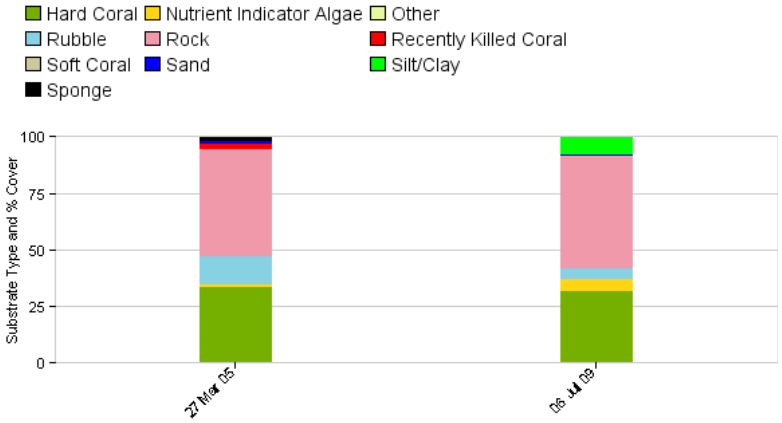


Figure 35a: Substrate type and percent cover at Magnetic Island Reefs: Geoffrey Bay: shallow: Site 3: Fringing reef leeward

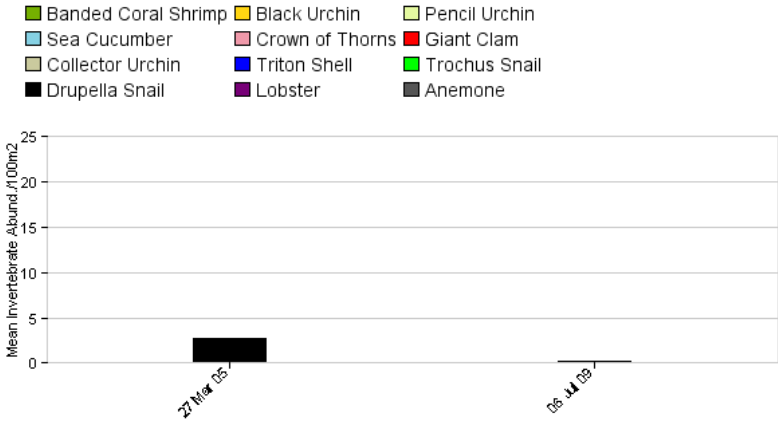


Figure 35b: Mean abundance of invertebrates at Magnetic Island Reefs: Geoffrey Bay: shallow: Site 3: Fringing reef leeward

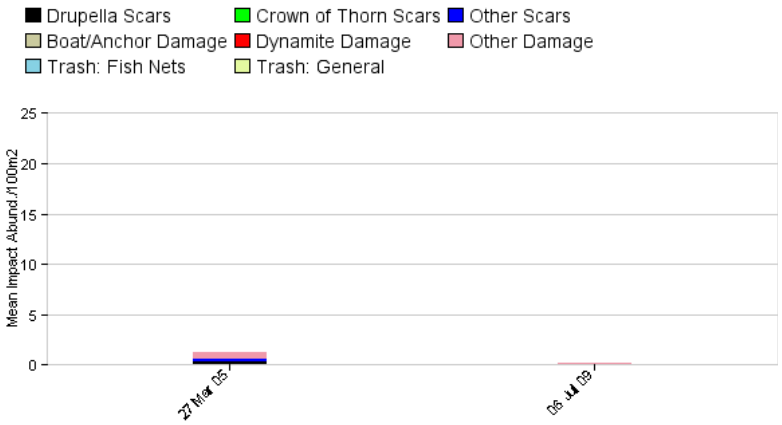


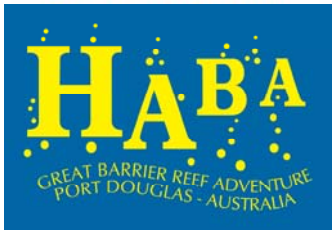
Figure 35c: Mean abundance of impacts at Magnetic Island Reefs: Geoffrey Bay: shallow: Site 3: Fringing reef leeward

F. New sites

Overall, 17 new sites were surveyed for which no previous data existed. These sites were mostly surveyed when the operator could not go to the previously surveyed reefs for weather and safety reasons. It is likely that the new reefs surveyed will be also used in the future when the conditions do not allow access to the intended dive site.

Reef name	Dive site name	Site	Coral cover	Site description by surveyors
Agincourt reef	Anybody's	1 (back reef slope)	30 %	Some tuna, but few reef fish
Agincourt reef	Phil's	2 (back reef slope)	80 %	x
Agincourt reef	Turtle bay	1 (back reef slope)	50 %	Tawny nurse shark and several reef sharks spotted
Hardy reef	Hardy reef	2 (back reef slope)	40 %	See in report for site 1
Hardy reef	Hardy reef	3 (back reef slope)	38 %	See in report for site 1
Hastings reef	North Hastings A	2 (back reef wall)	25 %	Coral: Very variable condition of coral, some areas excellent, some areas broken. Other: Several extremely large giant clams.
Hastings reef	North Hastings B	1 (lagoon)	40 %	x
Michaelmas reef	Breaking patches	1 (reef flat)	25 %	Coral: Coral flat with medium density of coral cover. Fish: White tip reef shark. Other: Site surveyed begins directly below mooring, with a lot of damaged coral seen as a result.
Michaelmas reef	Breaking patches	2 (reef flat)	20 %	Coral: Reef flat surrounded by deeper water with Porites bommies. Fair amount of coral cover on the reef flat, comprised mostly of branching corals. Other: Beautiful large anemone present. Few large swaths of nutrient-indicator algae.
Michaelmas reef	Breaking patches	1 (back reef wall)	16 %	Lots of sediment covering substrate. Fish: Lots of parrotfish
Moore reef	Moore reef	2 (back reef wall)	10 %	Coral: Very little hard coral, big patches of leathery soft coral with lots of bare substrate. Fish: Big shoal of bumphead parrotfish, roughly 16. Several other fishes including medium sized white tip reef shark Other: Turtle
Norman reef	Norman reef North	2 (back reef slope)	17 %	Coral: Patchy areas of coral on undulating slope/wall. Lots of turf algae with a considerable amount of silt.
Norman reef	Norman reef North	3 (back reef slope)	19 %	Coral: Similar to day before, patchy coral areas, lots of bare substrate laden with turf algae and silt.
Opal reef	South North Opal	1 (back reef slope)	58 %	x
Opal reef	Split Bommie	2 (back reef slope)	33 %	x
Thetford reef	Thetford reef	1 (back reef slope)	50 %	Coral: Healthy looking coral characterised by large massive bommies. Fish: Huge roving shoal of medium sized parrotfish
Thetford reef	Thetford reef	1 (reef flat)	9 %	Coral: Large areas of bare substrate and some very large soft coral. Very shallow site. Fish: Lots of parrotfish and wrasse. Other: Many large giant clams.

Reef Check would like to thank AMPTO and the numerous dive operators who have expressed continued support of the Reef Check program on the Great Barrier Reef; all Reef Check volunteers who have donated their time and energy to collect this valuable information and finally all the financial supporters of Reef Check Australia's Great Barrier Reef Project, in particular the Great Barrier Reef Marine Park Authority and the Reef and Rainforest Research Centre.



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