Reef Check Australia

Ningaloo Coast
2016 Survey Report

Prepared for: Cape Conservation Group

empowering people to save our reefs and oceans

CAPE CONSERVATION GROUP

REEF CHECK AUSTRALIA

This project is supported by
Reef Check Australia and Cape Conservation Group,
through funding from the BP Pyrenees Operations Team.

Project activities were conducted in the traditional country of the
Yinikurtira, Baiyungu and Thalanyji People.

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All images in this document are from Ningaloo Coast, Western Australia February 2016..
Black & White line drawings are by Sarah Lowe.

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Thank you to our team of dedicated project volunteers:

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Ningaloo Project launch with Cape Conservation Group

Reef Check Australia (RCA) believes in protecting reefs and oceans by empowering people. Trained surveyors are part of a worldwide network that regularly monitor and report on reef health in more than 90 countries using the standardised Reef Check scientific survey method. Reef Check data supports government and academic efforts to understand and manage Australian marine habitats, by engaging local communities in hands-on reef monitoring.

In 2013, RCA piloted a project with support from the Australian Government Caring for Our Country to investigate how the program could be implemented to suit the unique ecological, cultural, economic and social context of the Ningaloo region. Reef Check Australia (RCA) is committed to support a sustainable volunteer reef health monitoring program for the Ningaloo Coast.

Cape Conservation Group (CCG) was heavily involved in the pilot project and expressed interested in leading Exmouth-based Reef Check Australia monitoring activities to create a sustainable local program. Volunteers from CCG have been trained to survey reef health using the globally-standardised protocols and will gather information on reef composition, abundance of indicator organisms and reef health impacts.

The 2016 project is the first time RCA has helped to set up a framework support a local partner to independently lead reef monitoring activities.

REEF CHECK AUSTRALIA

Reef Research on the Ningaloo Coast

Ningaloo Reef is an incredibly diverse natural environment and therefore the best approach to understanding this system is coordinated research and monitoring activities from numerous organisations. The combined efforts of researchers, managers and citizen scientists have and will continue to play vital roles in understanding and protecting Ningaloo Reef. Citizen science can also make an important contribution to reef health monitoring, management and education.

CSIRO Shallow Reefs

To increase the ecological understanding of the Ningaloo Coast World Heritage Area's deep and shallow reefs and the reef's shark and turtle populations, BHP Billiton Petroleum and CSIRO have formed a strategic marine research partnership, Ningaloo Outlook. One of the objectives of Ningaloo Outlook is the shallow reef research theme. This theme will provide the data to support the management of coral and fish ecological values. The research will also gather new knowledge to better understand the ecological processes that are important in the structuring of reef flat and reef slope communities, and how this varies within the different management zones of the Ningaloo Marine Park. With the assistance of local community groups (e.g. Cape Conservation Group) the team are using a combination of diver based surveys and modelling techniques to assess the relative abundance and diversity of fishes, sharks and corals.

Department of Parks and Wildlife

The Department of Parks and Wildlife are constantly monitoring the marine park to measure their condition relative to pressures and manage the marine park accordingly. Monitoring also aids developing scientific advice for marine reserve planning, environmental assessment and licencing. Monitoring can provide important information to the response and recovery of the natural environment after natural weather events such as cyclones and floods.

Reef Research on the Ningaloo Coast

Australian Institute of Marine Science

The Australian Institute of Marine Science continue their close involvement with Ningaloo through a number of science projects. In collaboration with the Department of Parks and Wildlife (DPaW) and the Australian National University, annual surveys of newly recruited fishes continue along the length of Ningaloo. The program is now in its 8th year and aims to identify long-term trends in fish recruitment to assist management of fish stocks within the Ningaloo Marine Park.

The data set is also being used to answer more specific questions such as which habitats act as important fish nursery grounds and what factors are important in maintaining fish diversity and abundance in seasonal algal meadows (Wilson et al. 2014).

AIMS, in collaboration with the DPaW, have also recently completed extensive baseline surveys of fish and benthos in the Ningaloo Marine Park on behalf of Woodside Energy Limited which covered over 300km of reef habitat from the Muirons to Red Bluff. AIMS also continue their whale shark research through satellite tagging and photo-identification techniques at Ningaloo. These techniques allow us to document the movements and seasonal reoccurrence of individual whale sharks to Ningaloo.

Summaries of these research projects are available through the Ningaloo Atlas http://ningaloo-atlas.org.au/ alongside automated weather station data for Ningaloo at http://weather.aims.gov.au/#/station/8.

REEF CHECK AUSTRALIA

Setting the scene

Reef Check Australia came and set up six monitoring sites in 2013. Since this time the area has seen some severe weather events.

In April 2014 severe flooding occurred in the area. More than 250mm, almost the average annual rainfall for the region, fell over a weekend and caused severed flooding and washed away roads and scoured the riverbeds.

In March 2015 a category 3 cyclone, Olwyn, struck to the south of the region. Less than 6 weeks later Tropical Cyclone Quang came ashore close to the region.

These events whilst natural will have an impact on the reef, especially the inshore lagoon reef. The monitoring that Reef Check Australia does is important to monitor the changes that have occurred since 2013 and if this change can be attributed to the weather events of 2014 or 2015.

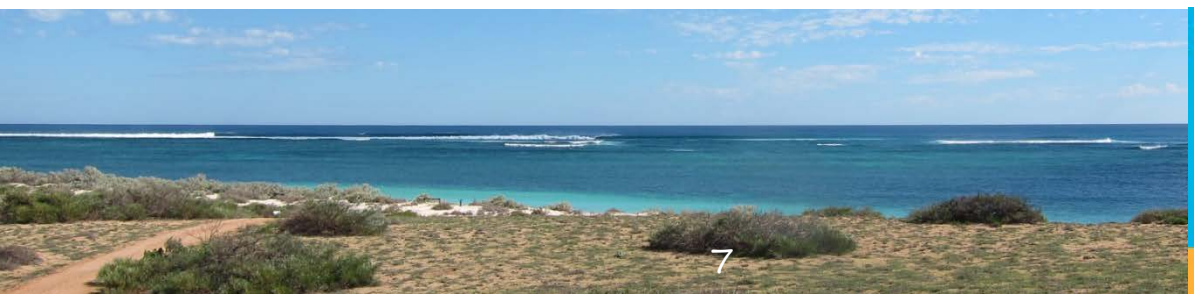
Key findings from 2016

- Hard Coral Cover had decreased at all sites previously surveyed sites (4-9%).
- The average hard coral cover across all sites in 2016 was 14%.
- The site with the highest hard coral cover in 2016 was Oyster Stacks South Site 1 (19%).
- Average percent cover of rubble across all sites increased from 3% in 2013 to 8% in 2016.
- Fewer invertebrates were found in 2016 at existing sites.
- Fewer *Drupella* were counted in 2016 (average 7/100m2 across all sites, 2/100m² on sites surveyed in 2013) compared to 2013 (20/100m²).
- Oyster Stacks South 2 had the highest count of *Drupella* out of sites surveyed in 2016 (19/100m²).
- Oyster Stacks Central had the highest count of Giant Clams in 2016 (2/100m²).
- Fishing Line and trash have never been counted on a survey at any site.
- Oyster Stacks North Site 2 had the highest count of coral disease in 2016 (11/100m²).
- The highest relative hard coral bleaching abundance in 2016 was found at site Oyster Stacks North Site 1 (45%), but note that the site only has 8% hard coral cover.
- Data collected by volunteer survey teams is available to the public and project stakeholders through our online Reef Health Database.

Summary of findings

		Depth (m)	Change in Hard Coral	Hard Coral %	Soft Coral %	NIA %	Rubble %	Unknown Scar	Other Coral Damage	Fishing Line/net abundance	General Trash abundance	Bleaching Population %
Oyster Stacks	North Site 1	1	↓	8	0	3	15	20	9	0	0	2
	North Site 2	1	_	9	0	2	17	7	5	0	0	11
	Central Site 1	1	↓	8	0	0	3	1	12	0	0	45
	Central Site 2	1	_	12	0	1	18	8	6	0	0	6
	South Site 1	1	_	19	1	1	2	14	7	0	0	3
	South Site 2	1	_	10	1	2	3	7	6	0	0	13
South Mandu	Site 1	1	↓	15	0	3	8	0	1	0	0	1
	Site 3	1	--	8	0	1	1	10	2	0	0	9

Table 1. The table displays summary results for a selection of key Reef Check indicators, listed by site. Indicators include: percent cover of 3 key benthic habitat categories (hard coral cover, soft coral cover & recently killed coral); macroalgae abundance (total counts); invertebrate abundance (anemones, *Drupella* snails, giant clams, long-spine urchins, target sea cucumbers, Trochus); and reef impact levels (abundance of coral damage, coral scars, *Drupella* snail predation scars and the percent of coral bleaching at the coral population and coral colony level).

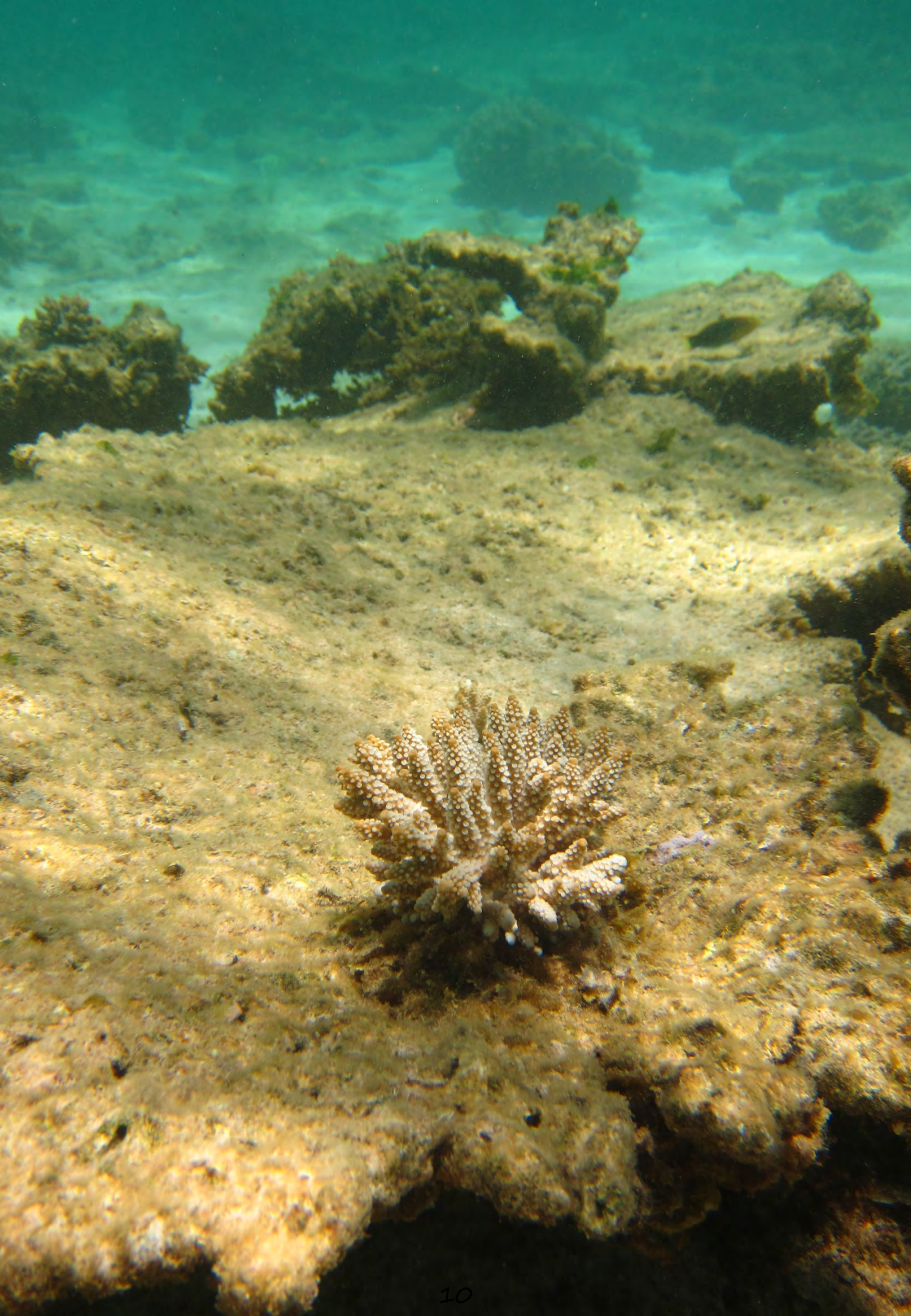


REEF CHECK AUSTRALIA

Monitoring Site Locations

Figure 1. Six RCA monitoring sites have been established at Oyster Stacks, with 2 replicates at the northern, central and southern end of this reef area. The central area is most heavily utilised from a tourism perspective.

Figure 2. South Mandu monitoring sites. NEED TRACKS TO FURTHER EVALUATE. DOES SIET @ needs to be 3?



Oyster Stacks Substrate Results

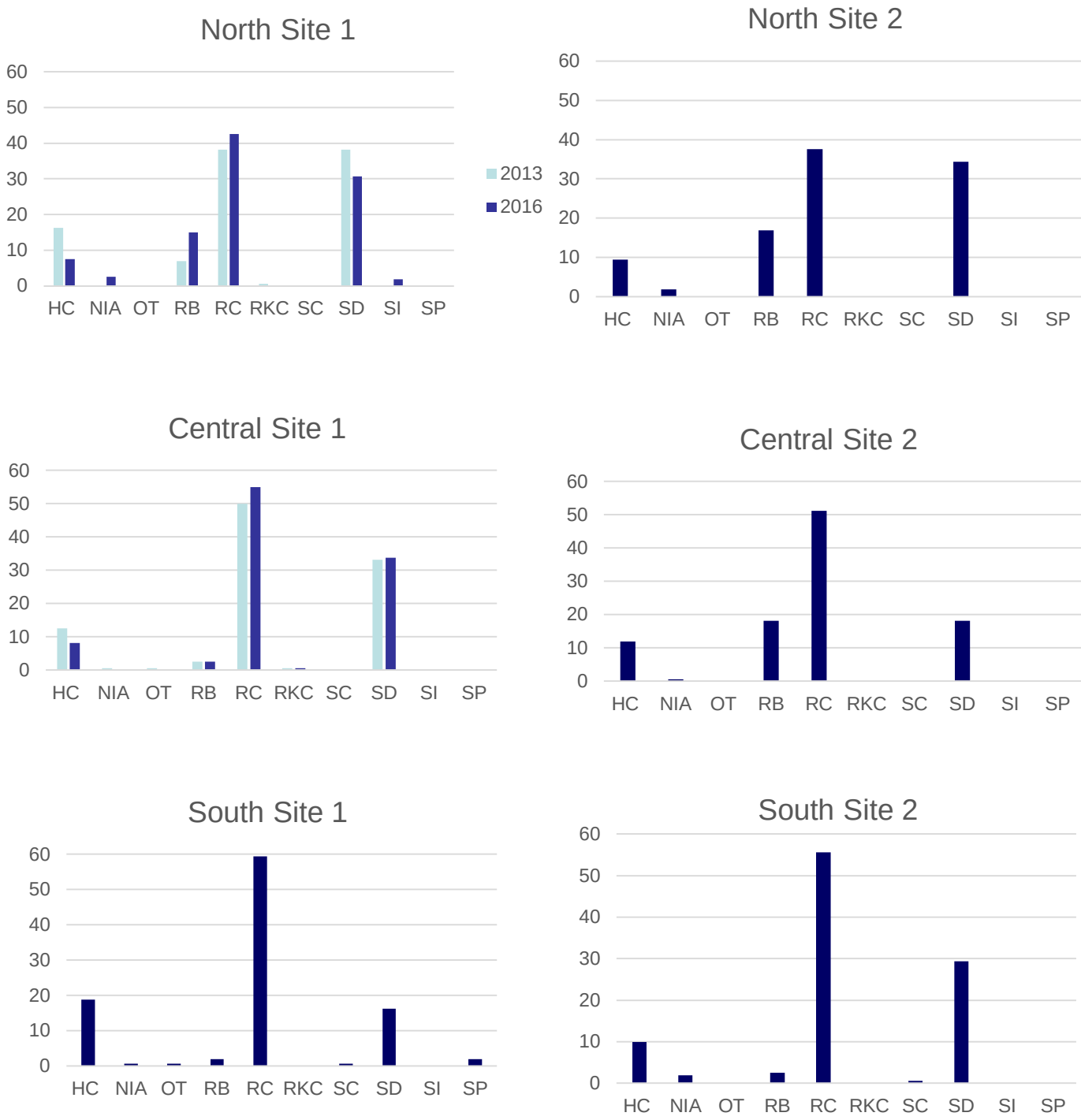


Figure 3. Graphs of substrate percent cover for each site at Oyster Stacks in 2016, with substrate percent cover from 2013 for sites that were surveyed previously.

Oyster Stacks Invertebrates

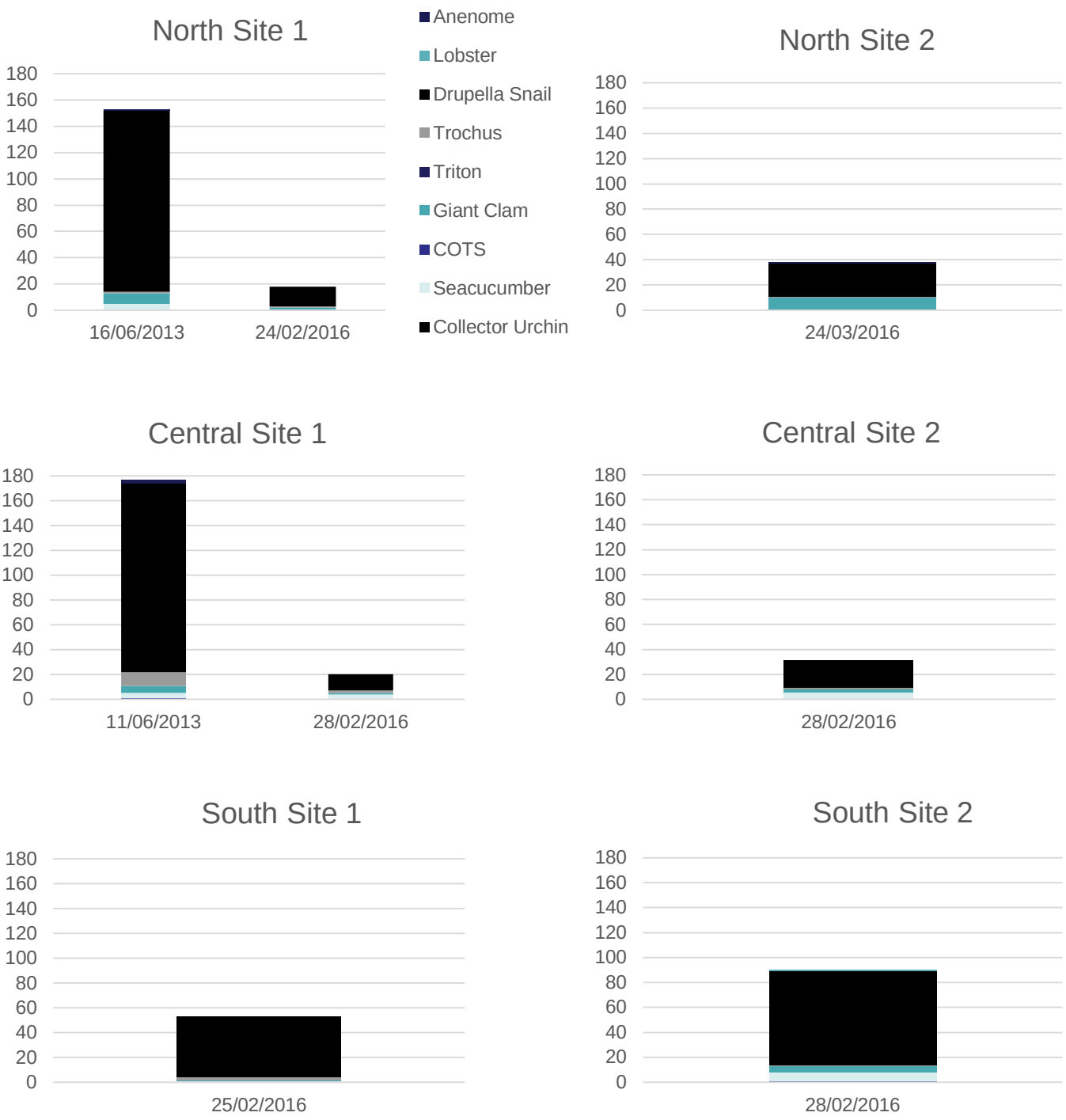
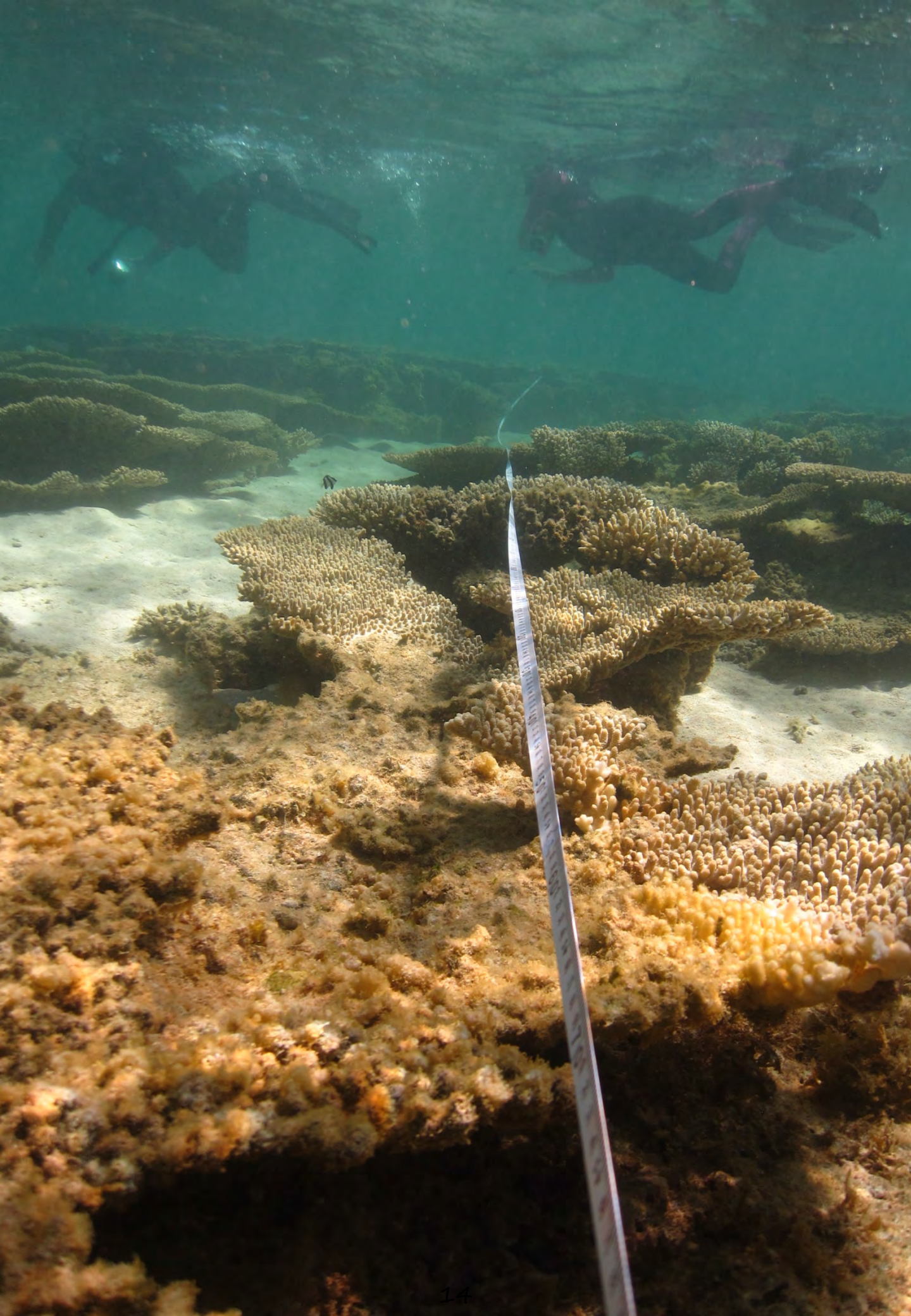


Figure 4. Graphs of numbers of invertebrates found at each site at Oyster Stacks in 2016, with invertebrate survey data from 2013 for sites that were surveyed previously.



Oyster Stacks Impacts

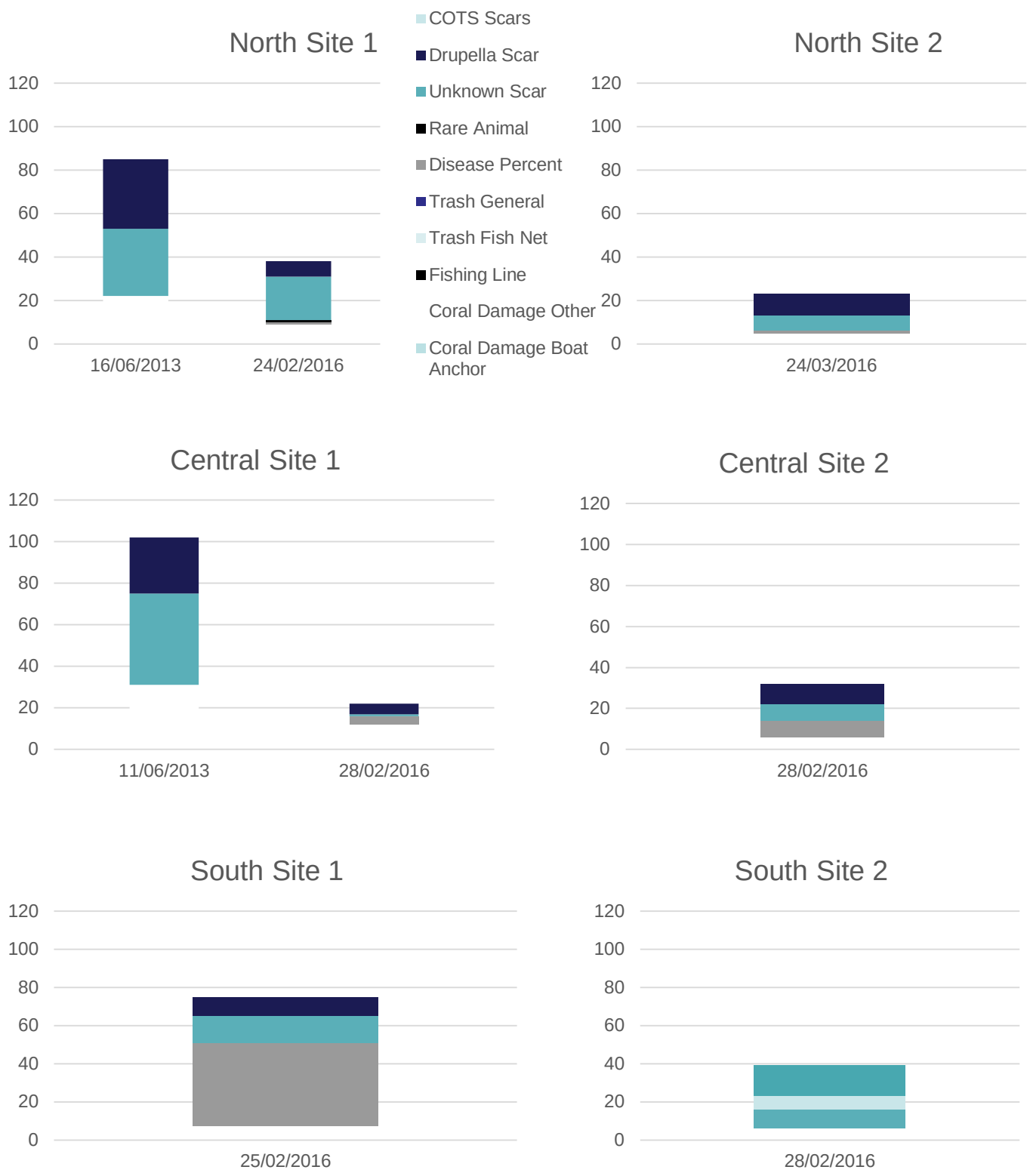


Figure 5. Graphs of the number of impacts counted at each site at Oyster Stacks in 2016, with data from 2013 for sites that were surveyed previously.

Oyster Stacks North

Site 1

Oyster Stacks is a sandy fringing reef area within the Mandu Sanctuary Zone. The area is very popular with snorkelers. The northern sites are less frequently visited than the central sites but is still accessible via a track from the car park. Site one is located approximately 30m from shore.

In 2016 hard coral cover had decreased from 16% to 8%, one of the lowest hard coral cover percentages of the sites surveyed. Percent cover of rubble increased from 7% to 15% and rock had increased from 38% to 42%. There was evidence of structural damage (old mortality such as plate formations and rubble), which can likely be attributed to the two cyclones that moved through the area in 2015.

Over the invertebrate survey 15 *Drupella*, one trochus and two giant clams. In 2013, 138 *Drupella* were counted at this site.

This site had nine counts of coral damage in 2016 compared to 22 in 2013, one count of disease, 20 counts of unknown scars and 7 *Drupella* Scars.

Site 2

North of the Oyster Stacks was established as a new site in 2016. It is positioned **m further out from shore than Site 1 and runs parallel.

Hard coral cover at Site 2 was 9%, similar to the hard coral cover at Site 1. Rock had the highest percent cover with 37%, closely followed by Sand (34%).

One sea cucumber, a prickly greenfish, was counted at this site. Nine giant clams, one trochus, 29 *Drupella* snails and one anemone were also counted.

Five counts of coral damage, one count of disease, 7 unknown scars and 10 *Drupella* scars were counted. This is less damage and scars than was counted at Site 1 closer to shore.

Bleaching at this site affected 11% of the population and on average 72% of the colony which is the highest impact of bleaching recorded in the 2016 surveys.

Figure 6: Prickly greenfish seen on invertebrate survey

Figure 7: Site photo at North Site 2

Oyster Stacks Central

Site 1

Oyster Stacks Central Site 1 lies parallel to shore on the seaward side of Oyster Stacks. This site has high levels of visitation and is more likely to demonstrate potential human use impacts.

Hard coral cover had decreased slightly from 12% in 2013 to 8% in 2016. The percent cover of Rubble remained constant at 2.5%, however the percent cover of rock increased slightly from 50% to 55%.

Four sea cucumbers were counted at this site, same as in 2013. In 2013 152 *Drupella* snails were counted at this site, in 2016 only 13 were counted at this site. Two trochus and one giant clam were also counted.

Fewer impacts were counted on Site 1 in 2016 compared to 2013, however the level of bleaching sighted was higher than in 2013. Twelve counts of coral damage were found in 2016 compared to 31 in 2013. Four counts of disease, one unknown scar and 5 *Drupella* scars were counted in 2016.

The percentage of bleaching of the whole coral population was an average of 45% in 2016, compared to less than 1% in 2013. The average bleaching to each colony was 31% compared to 25% in 2013. This was the highest level of bleaching at population level of all the sites surveyed in 2016

Site 2

Site 2 at the Central Oyster Stacks position was established as a new site in 2016. The site lies run parallel to site 1, 50m further offshore.

Hard coral cover at site 2 was 12%, higher than at Site 1. Rock covered 51% of the survey and rubble and sand both covered 18%. Turf algae was the dominant algae at this site, followed by Sargassum.

Two giant clams, one trochus and 22 *Drupella* snails were counted on this survey.

Impacts on this site included six counts of coral damage, eight counts of disease and eight unknown scars.

The average bleaching of the coral population at this site was 5.5% with an average of 48% of each colony bleached.

Figure 8: Site photo at Central Site 2

Oyster Stacks South

Site 1

This site was a new site established in 2016, it lies 250m further south along the beach from the central sites. This site is much less frequented by snorkelers as it is further away from the car park.

Hard coral cover at this site was 19%, this was the highest percent cover of hard coral found at all the Oyster Stacks sites in 2016. Rock made up 59% of the substrate survey, and sand 16%. There was small amounts of rubble, soft coral and sponge also found on the survey.

The invertebrate survey counted 49 *Drupella* snails, this highest number of *Drupella* seen on any survey in 2016. One prickly greenfish sea cucumber, one giant clam and two trochus were also counted.

This site had 44 counts of disease along the survey, this is the highest count of disease on a survey in 2016. 14 unknown scars, 10 *Drupella* scars and seven counts of coral damage were also found along the survey. Bleaching was found to impact 3% of the total coral population with an average impact of 50% found on colonies.

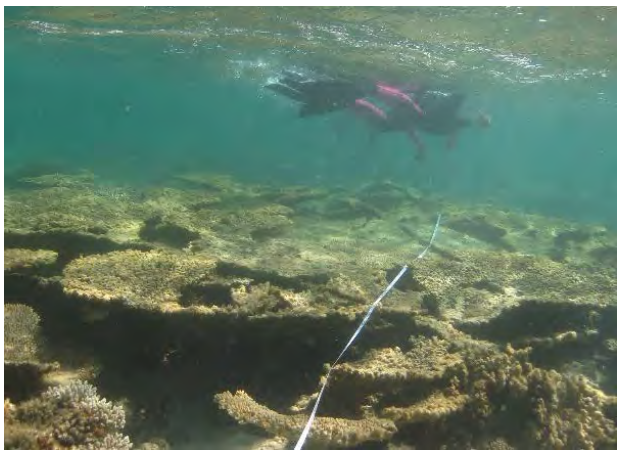


Figure 9: Site photo at South Site 1

Site 2

Site 2 at the southern end of Oyster stacks was a new established site in 2016. This site is further out from shore than site 1 and runs parallel to shore.

Site 2 had a hard coral cover of 10%, the hard coral growth forms seen were mostly general hard coral with some massive and plate growth forms. Rock made up 56% and sand made up 29% of the substrate cover.

Seven ‘prickly greenfish’ sea cucumbers were counted on the invertebrate survey, along with one long spined urchin, five giant clams, one trochus and one lobster. 75 *Drupella* snails were also counted along the transect.

Six counts of coral damage and seven unknown scars were counted on the impacts survey. Ten counts of disease and sixteen counts of *Drupella* scars were also counted.

Bleaching was found to affect an average of 12.5% of the coral population at this site and an average of 37% of each colony affected.

A fish survey was conducted at this site and counted two butterflyfish and three other parrotfish (greater than 20cm long).

Figure 10: *Drupella* at South Site 2

South Mandu

Site 1

South Mandu Site 1 is a fringing reef with a rocky structure. The sites are located close to Sal Salis Resort, although visitor numbers to this Reef are relatively low compared to Oyster Stacks.

Hard coral cover at Site 1 had decreased from 21% in 2013 to 15% in 2016. The percent cover of rubble increased from less than 1% in 2013 to more than 7% in 2016. This change in composition may be due to Cyclones Olwyn and Quang in March and April 2015.

Four of the indicator invertebrate categories were recorded at Site 1, including 8 *Drupella*, 4 anemones, 1 trochus and 1 Crown of Thorns seastar.

Only one incidence of coral damage was recorded, compared to 5 in 2013. Coral disease was recorded at this site (n=) which was not seen in 2013. Fewer *Drupella* scars were recorded (2 in 2016 and 10 in 2013) and no unknown scars were seen. Incidents of bleaching seen in 2016 had increased from 1% of the population to 2% with an average of 33% of the colony bleached.

Site 3

South Mandu Site 3 was established in 2016. The site is located close to site 2, but the patchy nature of this location suggests that the 2016 survey site was not comparable. While there were indications of damage from the 2015 cyclone and flood, however the change in sand ratios suggests that data was not comparable to Site 2 established in 2013. It is located further out from shore than Site 2 (10 m) and runs parallel.

Hard coral cover was 7%. The percent cover of rock made up 70% of the substrate and sand wa 20%.

Two *Drupella*, two giant clams were seen and one anemone ere recorded on the traanesct.

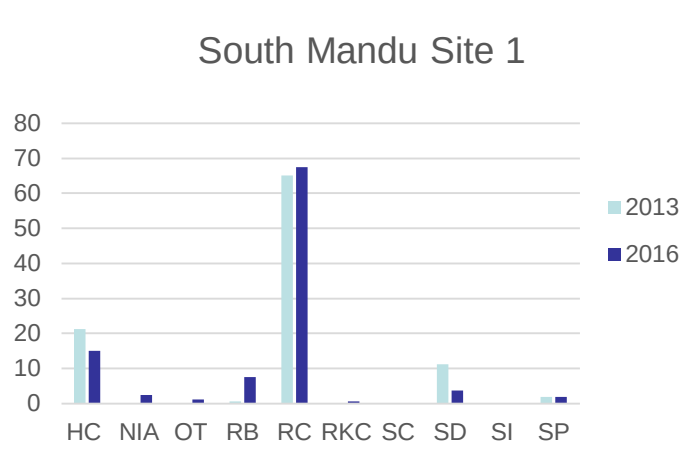
In 2016 two incidence of coral damage and 9 coral disease were found. There were 10 unknown scars found (compared to 19 in 2013) and 1 *Drupella* scar.

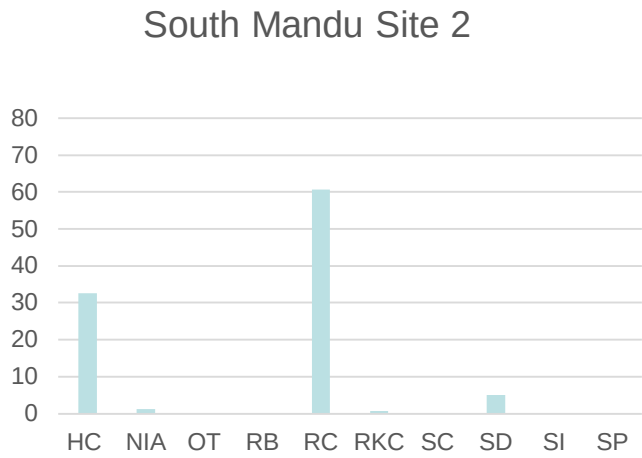
Coral bleaching of the total population had increased from 1% to 9%, with an average of 44% of each colony bleached.

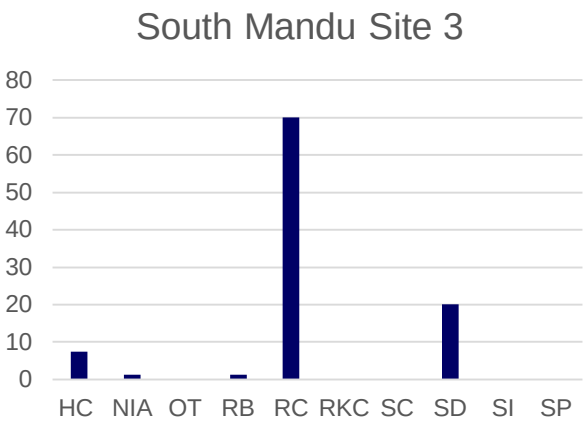
Figure 11: Site photo at South Mandu Site 1

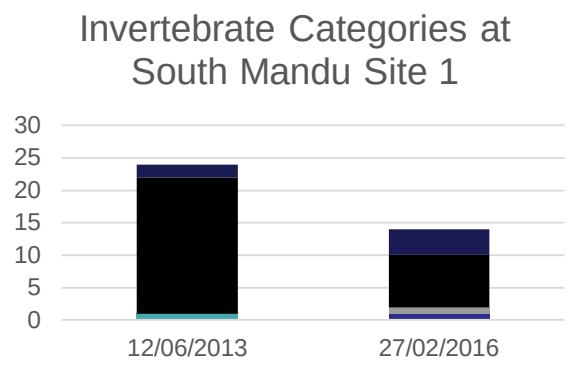
Figure 12: Sponge on South Mandu Site 2

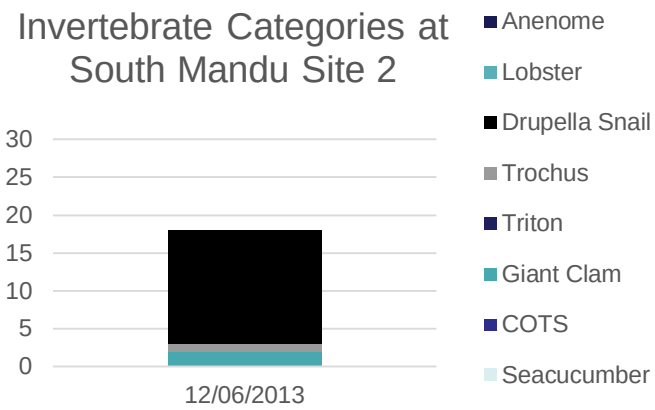
South Mandu Sites 1, 2 & 3











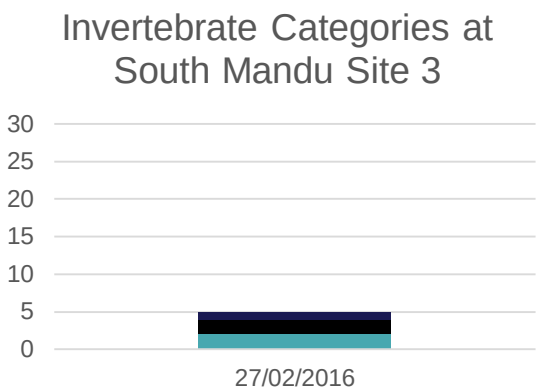
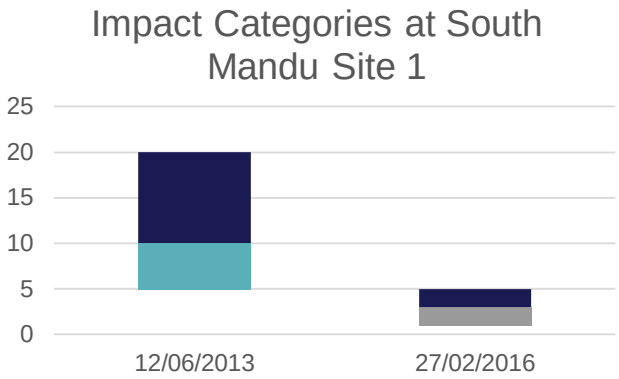
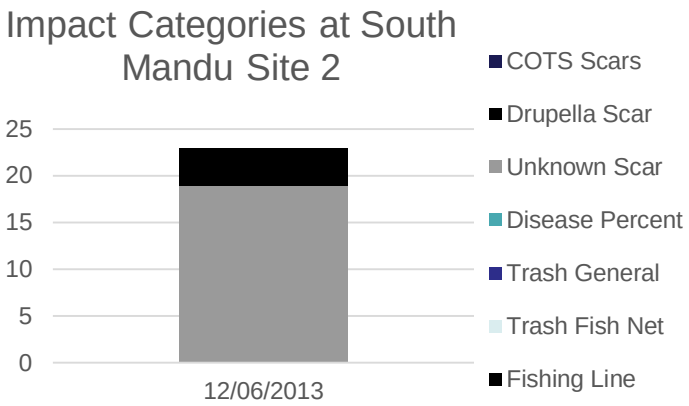
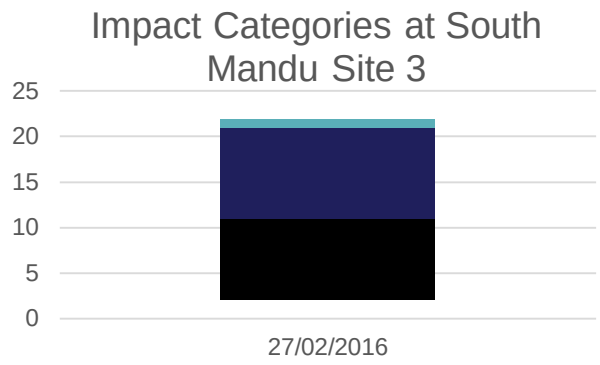


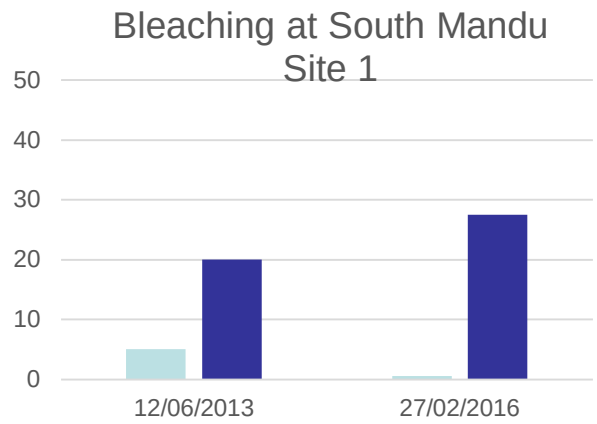
Figure 13. Graphs of Substrate percent cover and counts of invertebrates at South Mandu sites in 2013 and 2016.

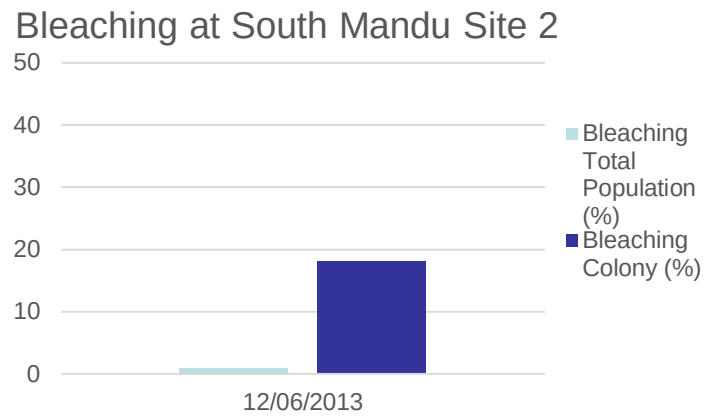
South Mandu Sites 1, 2 & 3











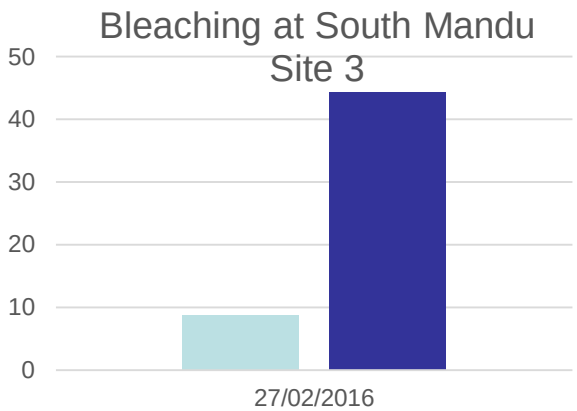


Figure 14. Graphs of counts of impacts and bleaching impact at South Mandu sites in 2013 and 2016.

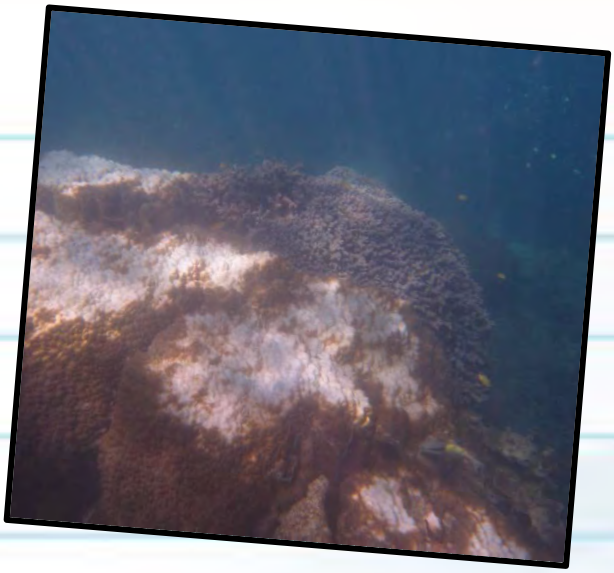
What is a Reef Check survey all about?

1. Volunteers lay out a 100m transect line along a constant reef habitat and depth. They collect data in 2 20m sections.

2. Volunteers record one of 25 Reef Check substrate categories at every 0.5m along the transect tape to calculate a percent cover of what is making up the reef.

3. Volunteers search for important invertebrates (such as anemones and urchins) using a 5m wide search pattern along the transect tape and record what they find.

4. Volunteers record reef impacts such as marine debris, coral bleaching and coral disease along a 5m area on either side of the Reef Check transect tape.



5. Reef Check volunteers document reef health indicators using underwater cameras.

6. Reef Check survey teams use GPS coordinates, maps and tide times to return to the same reef site every year to survey.

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