

# Reef Check Australia

## Ningaloo Coast Project:

Implementing a volunteer reef health monitoring program on the  
Ningaloo Coast, Exmouth, Western Australia



REEF CHECK



AUSTRALIA

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

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*All photographs in this document are from Ningaloo Coast, Western Australia June 2013.  
Black & White line drawings are by Sarah Lowe.*



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Photo credit: Alek Nowak

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# Reef Check Australia

## Heads West

Reef Check Australia is an innovative environmental charity dedicated to protecting Australia's reefs and oceans by engaging the community in hands-on research and education. Since 2001 our trained volunteers have been surveying Queensland reefs using a globally standardised reef health monitoring program shared by more than 90 Reef Check projects around the World.

In 2011, we were awarded an Australian Government Caring for Our Country grant to develop a framework for Reef Check on the Ningaloo Coast with the aim to support World Heritage values and effective management. This grant allowed our organisation the opportunity to investigate how our successful Queensland program could adapt to the unique social, economic and environmental context of the Ningaloo Coast. This report has been created to share project outcomes and promote discussion about how Reef Check Australia can continue to work with the Ningaloo Coast community.

The area's remote and extensive reef systems mean that monitoring and protecting this ecosystem is a huge undertaking. Reef Check data can supplement government and academic efforts to understand and manage this huge area, by engaging local communities in hands-on reef monitoring and education.









# Why the Ningaloo Coast is unique

Ningaloo Reef is Australia's largest fringing coral reef. Tropical and temperate waters meet here to create an amazing diversity of marine species nestled against an arid and rugged coastline. Thousands of marine species call these reefs home. Even whalesharks can't resist visiting these remarkable reef systems, travelling here every year to feed on plankton aggregations from coral spawning.

In 1987, the Ningaloo Marine Park and Muiron Islands Marine Management Areas were established to form a framework for a multi-use park that provides a wide range of activities. The Marine Park stretches 260km, encompassing 5,000 square kilometres of oceans. Sanctuary zones form 34% of the Marine Park. All of the new Reef Check monitoring locations are within sanctuary zones, where no harvesting is permitted.

In 2011, The Ningaloo Coast World Heritage Area was declared to recognise the outstanding natural beauty and biological diversity of both the marine and terrestrial systems in the region. Ningaloo Reef is home to 300 documented coral species, more than 700 reef fish species, approximately 650 mollusc species and more than 1,000 species of marine algae.

The reefs fringing the Ningaloo Coast provide food and shelter to many marine animals. Reefs are also important to the economy, recreation, environmental processes, medicine and culture. Corals and the reef habitats they create are very sensitive to changes in their environment, which makes them an excellent indicator for the health of our oceans. Long-term reef monitoring is critical to understand how both natural and human activities are impacting these iconic coral communities.



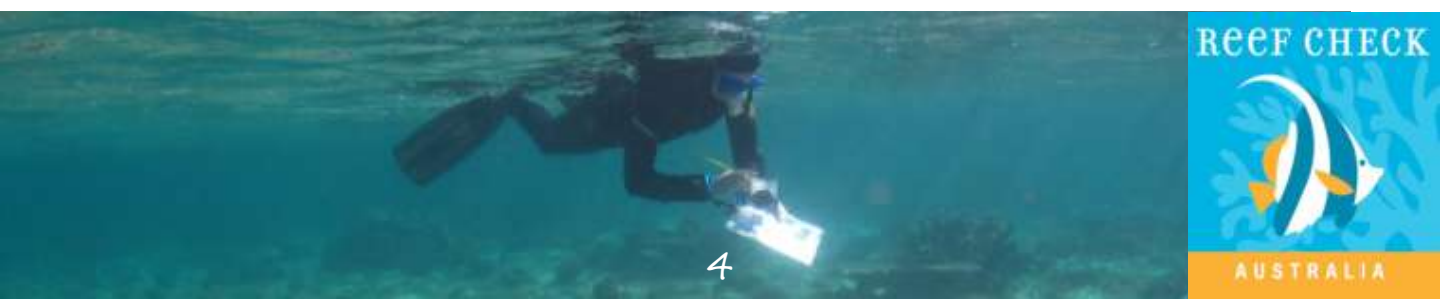
# Reef Research on the Ningaloo Coast

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.

The Western Australian Department of Parks and Wildlife has been studying coral since 1987 as part of a long-term monitoring program, which includes 23 locations from Gnarloo to the Muiron Islands. The Australian Institute of Marine Science (AIMS), Commonwealth Scientific and Industrial Research Organisation (CSIRO) and numerous other organisations also have ongoing research in the region. Citizen scientists can play an important role in reef monitoring and protection by filling knowledge gaps, investigating exciting new science questions and taking an active role in reef conservation activities.

To ensure the data collected by our volunteers is meaningful and applicable, we have developed a strong working relationship with the Western Australian Department of Parks and Wildlife. Monitoring sites were selected based on their feedback and site advice and information collected will be made available for management applications.

We support our volunteers through high-quality training and resources that offer opportunities to collect globally standardised reef health information that contributes to reef datasets with local, national and international applications. Data collected by our volunteer survey teams is available to the public and project stakeholders through our online [Reef Health Database](#).













# Reef health trends on the Ningaloo Coast

A recent study examining 25 years of data from multiple studies found that coral cover in the Ningaloo Coast region has remained relatively stable (averaging 28% cover), even though specific localized areas have experienced declines from specific events such as cyclones and temperature stress (Speed et al 2013).

Coral cover is often used as an indicator of reef health, providing insights about available habitat for marine life and environmental conditions. Additional measures are useful to understand how the composition and abundance of reef communities may change and help better inform effective management and conservation of the reef.

Algae also plays a key role in reef ecosystems, providing shelter and food resources for many other reef organisms. However, algae can compete with coral for space, particularly if human activities change the ecosystem balance through overfishing or increased nutrients. Ningaloo is unique in that these factors are not currently considered major threats, but it is important to track trends to allow us to understand any changes and help protect the reef.

A recent study identified that major seasonal trends in macroalgae growth on Ningaloo Reef are largely driven by time of year, location and water temperature (Fulton et al 2014). High abundances of *Sargassum* occurred over summer, while the macroalgae *Dicyopteris* and *Lobophora* dominated during the winter. How changes in marine climate affect these important seaweed cycles will be important to monitor into the future.

Fulton, C.J., Depczynski, M., Holmes, T.H., Noble, M.M., Radford, B., Wernberg, T., Wilson, S.K. (2014) Sea temperature shapes seasonal fluctuations in seaweed biomass within the Ningaloo coral reef ecosystem. *Limnology & Oceanography* volume 59(1): 1-11.

Speed CW, Babcock RC, Bancroft KP, Beckley LE, Bellchambers LM, et al. (2013) Dynamic Stability of Coral Reefs on the West Australian Coast. *PLoS ONE* 8(7): e69863. doi:10.1371/journal.pone.0069863



# Reef Check Australia on the Ningaloo Coast

Our formula bring together volunteers, industry, natural resource managers, scientists and community groups to work collaboratively on reef monitoring, education and conservation.

From 2012-2013, we undertook discussions with relevant research and management authorities to tailor the Reef Check program to the unique Ningaloo Coast region. We examined how the program can complement ongoing reef monitoring and research projects already underway in the region. Discussions were held with organisations already operational in the area, including the Australian Institute of Marine Science, Western Australian Department of Parks and Wildlife and experts from the University of Western Australia, University of Queensland and the Australian National University.

From 6-17 June 2013, our Queensland-based team visited Exmouth. We trained 9 volunteers in Reef Check Australia snorkel protocols and established 5 long-term reef monitoring locations. Our new volunteers brought years of local and international experience and the process of exploring new sites, assessing future areas of expansion and reviewing new potential indicators was ongoing throughout the visit. Our first-hand experience in Exmouth allowed us the opportunity to consider similarities and differences from our Queensland program and will help to build a more solid and informed foundation for the new program.

To ensure the data collected by volunteers is meaningful and applicable, we have developed a strong working relationship with the Western Australian Department of Parks and Wildlife. Monitoring sites were selected based on their feedback and site advice and information collected will be made available for management applications.

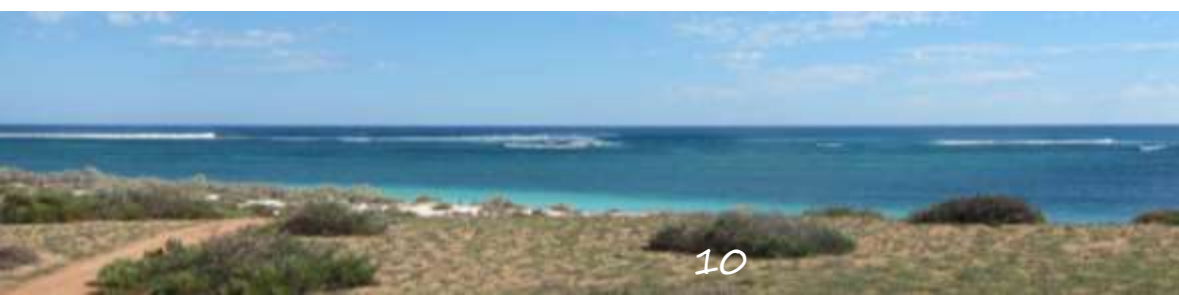






# Key findings from 2013 Reef Check surveys

- Coral cover across sites ranged from 12% to 39%, with the highest recorded cover at Tantabiddi Sanctuary Zone.
- Reef Check target sea cucumbers were found only at Oyster Stacks.
- Giant clams were found at all sites, but the highest abundance was found at Oyster Stacks.
- *Drupella* snails were found at all sites. The highest abundance was at Oyster Stacks (more than double other sites).
- Oyster Stacks had the highest recorded level of coral damage.
- All sites had low levels of coral bleaching recorded (impacting 5% or less of the population).
- Coral scars (both unknown scars and *Drupella* predation scars) were recorded on all sites, but Oyster Stacks had the highest abundance of both scar types.
- All anemones recorded on the invertebrate surveys hosted anemone fish.
- Anecdotally, average sizes of recorded *Drupella* snails was larger than those commonly seen by Reef Check teams in Queensland.



# Key findings

	Hard Coral Cover	Soft Coral Cover	Recently Killed Coral	Macroalgae	Anemone	<i>Drupella</i>	Giant Clam	Long Spine Urchin	Sea Cucumber	Trochus	Coral Damage	Coral Scars	<i>Drupella</i> Scars	Coral Bleaching Population	Coral Bleaching Colony
Oyster Stacks North	16%		1%	21	1	138	8		5	1	22	31	32	1%	12%
Oyster Stacks South	12%		1%	7	3	152	6	1	4	11	31	44	27	0.5%	7%
South Mandu 1	21%			5	2	21	1				5	5	10	5%	20%
South Mandu 2	32%		1%	19		15	2			1		19	4	1%	18%
Tantabiddi Sanctuary Zone	39%		3%	13		76	2				9	11	16	2%	29%

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).

*A note about algae.* Algae is an important component of reefs habitats. Reef Check divides algae into 2 main categories: macroalgae and nutrient indicator algae. Macroalgae are selected in each region to highlight algae types with very noticeable seasonal trends. Currently in Ningaloo, this includes: *Dictyota* & *Dictyopteris*, *Lobophora* and *Sargassum*. These categories are still under discussion. All other types of algae fall in the Reef Check global category of nutrient indicator algae. Despite the name, keep in mind, that algae aren't "bad"... but you can have too much of a good thing! Rapid changes from coral to algae dominated habitats due to changes in ecological factors, like water quality or herbivores to maintain algae levels, can have serious impacts on reef residents.

For more information about Reef Check categories and protocols see the Reef Check Australia Methods Manual.

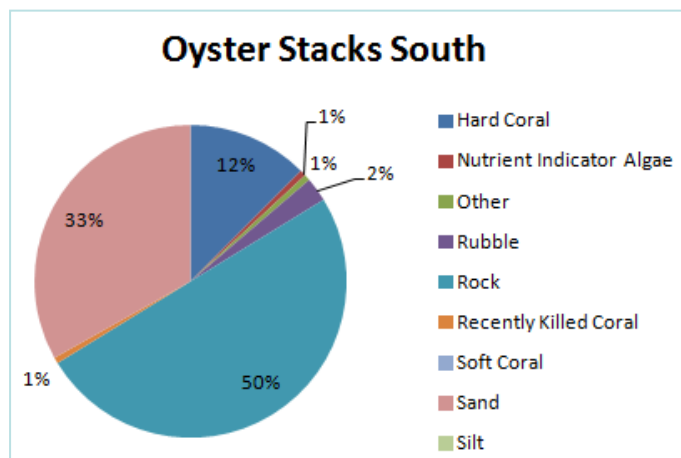




# Oyster Stacks (Site 1: South)

Oyster Stacks is a sandy fringing reef area within Mandu Sanctuary Zone, where no harvesting is permitted. It is an accessible and popular snorkelling location, with relatively high tourism levels.

Two monitoring locations were established on this reef area. Oyster Stacks South was selected as a heavy use tourism area. The location adjacent to the oyster stack structures is easily accessible from the parking lot entry track.



Hard coral represented 12% of the reef structure at this site. 25% of the hard coral was plate growth forms, with most other coral colonies in the general hard coral category (including digitate forms etc). Other substantial reef components included rock (50%) and sand (33%). Turf algae, *Dictyota* and *Lobophora* were dominant algae types on the site.

This site had the highest overall invertebrate counts, including 6 of the 14 Reef Check target categories. This included 3 anemones, 1 long-spine black urchin, 6 giant clams, 4 sea cucumbers (all Prickly Greenfish, *Stichopus chloronotus*), 11 trochus and 152 *Drupella* snails. This was the highest abundance of *Drupella* snails over all 5 sites.

*Drupella* scars were also recorded (27). The site also had the highest counts of coral damage (31) and coral scars from unknown causes (44). Coral bleaching was estimated to impact less than 1% of the population, affecting only 7% of the colony on average.

# Oyster Stacks South Photos



Image 1. Site photo



Image 2. Octopus



Image 3. *Drupella* snails  
& feeding scars



Image 4. Butterflyfish



Image 5. Bleached  
encrusting coral

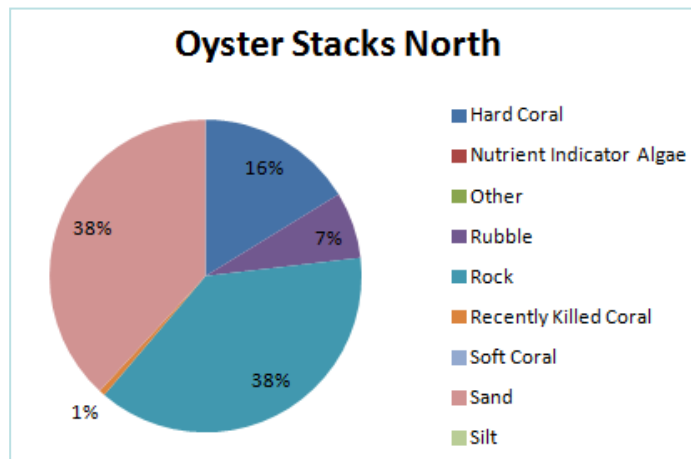


Image 6. Coral damage

# Oyster Stacks (Site 2: North)

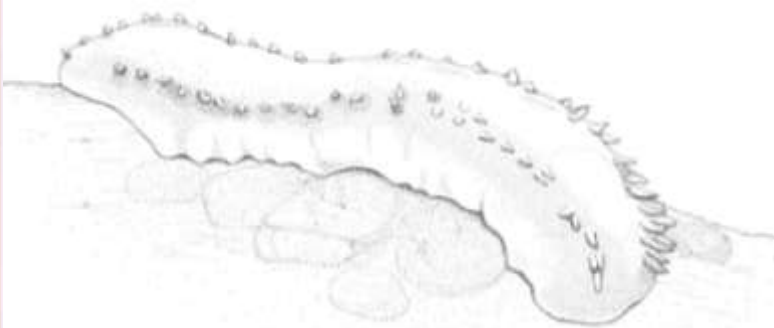
Oyster Stacks North is located 150m north of Site 1. This site is less frequently visited, but is still easily accessible from shore via a rocky ramp.

Hard coral represented 16% of the benthos at this site. Plate, foliose and branching coral made up half of the hard coral, with other coral colonies in the general hard coral category (including digitate forms etc). This site had higher levels of sand (38%) and rubble (7%) than the southern site. This site had the highest macroalgae count of all 5 monitoring locations (21), made up of *Sargassum* and *Dictyota*.



On this site, 5 of the 14 Reef Check indicator invertebrates were recorded, including 1 anemone, 8 giant clams, 1 trochus and 5 sea cucumbers (*Stichopus chloronautus*). *Drupella* snails were found in the second highest abundance on all the sites (138 snails).

Slightly higher numbers of *Drupella* scars were recorded (32), along with 31 coral scars from unknown causes. Coral damage was recorded at this site (22), although it was lower than at Oyster Stacks South. Low levels of coral bleaching were recorded, impacting approximately 1% of the population and 12% of each affected colony.





# Oyster Stacks North Photos



Image 1. Site photo



Image 2. Giant Clam



Image 3. Branching coral with RCA nutrient indicator algae (NIA)



Image 4. Drupella snail with feeding scar



Image 5. Sea cucumber: Prickly Greenfish).



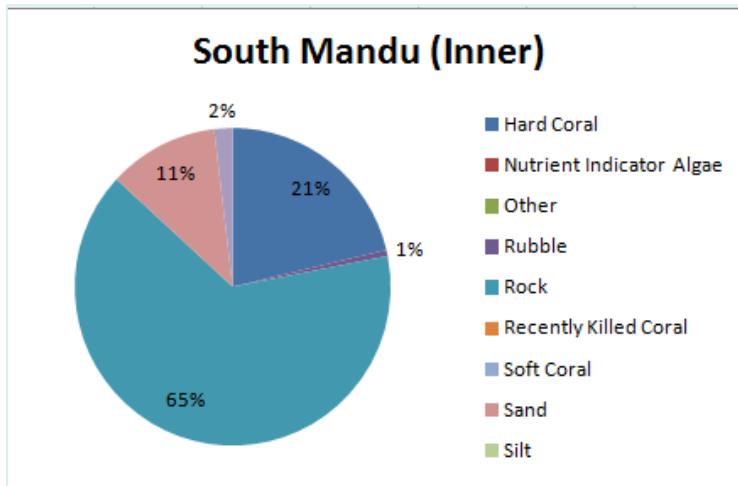
Image 6. Trochus

# South Mandu (Site 1)

South Mandu is a fringing reef area with rocky reef structure. It is within Mandu Sanctuary Zone, where no harvesting is permitted. Sal Salis Resort is located nearby, but the reef area receives relatively low levels of snorkelling tourism compared to other areas in the park.



Two monitoring locations were established on this reef area. South Mandu Site 1 was selected very near to shore (15m from reef start).



Hard coral represented 21% of the benthos at this site. Plate, encrusting and branching coral made up approximately 40% of the hard coral, with the majority of other coral colonies in the general hard coral category (including digitate and solitary mushroom coral forms etc).

Three out of the 14 Reef Check invertebrate categories were recorded on this site, including: 2 anemones, 21 *Drupella* snails and 1 giant clam.

Coral damage (5) and coral scars (5) were recorded at the lowest levels on this site compared to other locations. Ten *Drupella* feeding scars were recorded. Coral bleaching was found at the highest level on this site, impacting approximately 5% of the population and 20% of each impacted colony on average.



# South Mandu Site 1 Photos



Image 1. Site photo



Image 2. *Drupella* with feeding scars

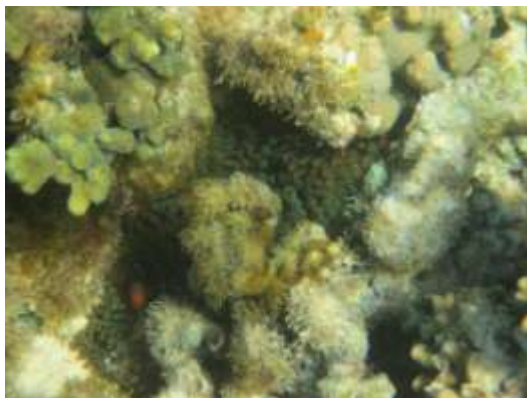


Image 3. Anemone with fish

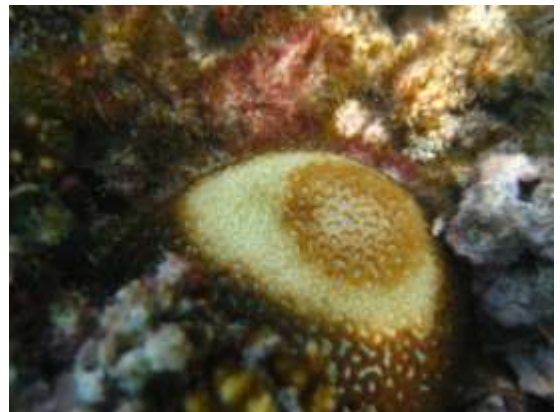


Image 4. Coral bleaching



Image 5. Sponge



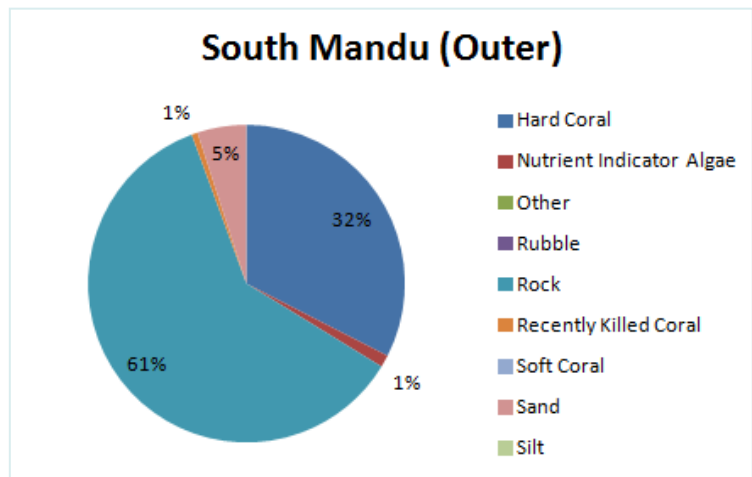
Image 6. Mushroom corals



# South Mandu (Site 2)

South Mandu Site 2 is located parallel and slightly offshore (50m) from South Mandu Site 1. Despite the close proximity, these two reef areas did appear to have different compositions and together helped create a more comprehensive picture of the area overall.

Hard coral represented 32% of the benthos at this site. Branching and encrusting coral made up more than 50% of the hard coral growth types. This site had more rock and less sand than the nearshore South Mandu location. Both sites featured turf algae, *Sargassum* and *Turbinaria* as the most dominate algae on site. The reef was most rocky substrate (more than 60% cover).



On this site, 3 out of 14 Reef Check indicator invertebrates were recorded, including 2 giant clams, 15 *Drupella* snails and 1 trochus.

There were 19 coral scars recorded from unknown causes and 4 *Drupella* snail feeding scars. Coral bleaching was recorded at lower levels than on the nearshore site, impacting approximately 1% of the population and 18% of each affected colony.



# South Mandu Site 2 Photos



Image 1. Site photo



Image 2. Giant clam



Image 3. Branching hard coral with unknown scars



Image 4. Coral bleaching



Image 5. Lizard fish



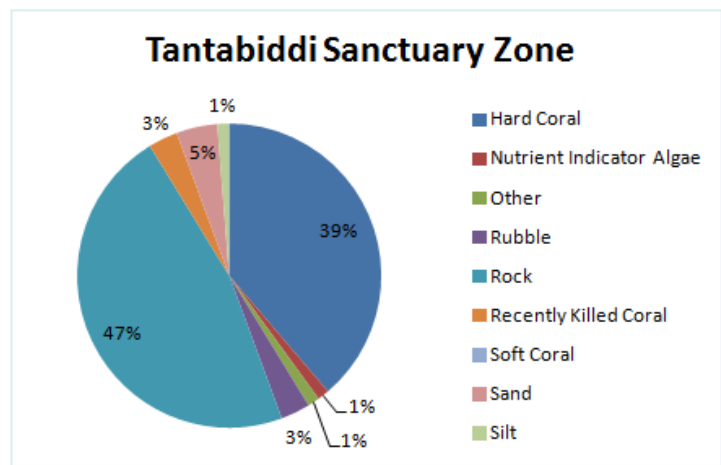
Image 6. Turbinaria



# Tantabiddi Sanctuary Zone

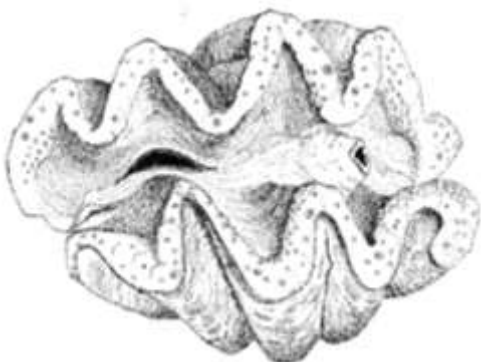
Tantabiddi Sanctuary Zone is within a protected management area, therefore no harvesting is allowed. The 4km reef area is located close to a busy boat ramp area, but also features several moorings.

This site had the highest coral cover of all monitoring locations (39%). Most hard coral at this site was foliose growth forms (50%) due to one large area of the transect being exclusively foliose colonies. The other transect areas were largely made of branching hard coral (25%) but all other growth forms were represented as well. This was the only site where siltation was recorded (1%). Recently killed coral made up 3% of recorded substrate.



On this site, 2 out of 14 Reef Check indicator invertebrates were recorded, including 2 giant clams and 76 *Drupella* snails.

There were 9 counts of unknown coral damage, 11 coral scars of unknown causes and 16 counts of *Drupella* snail feedings scars. Coral bleaching was estimated to impact 2% of the coral population, affecting approximately 29% of each affected colony.



# Tantabiddi Sanctuary Zone Photos



Image 1. Site photo



Image 2. Foliose coral

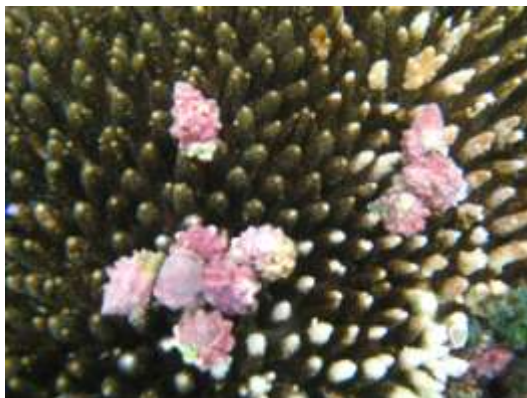


Image 3. *Drupella* snails  
& feeding scars



Image 4. Seastar

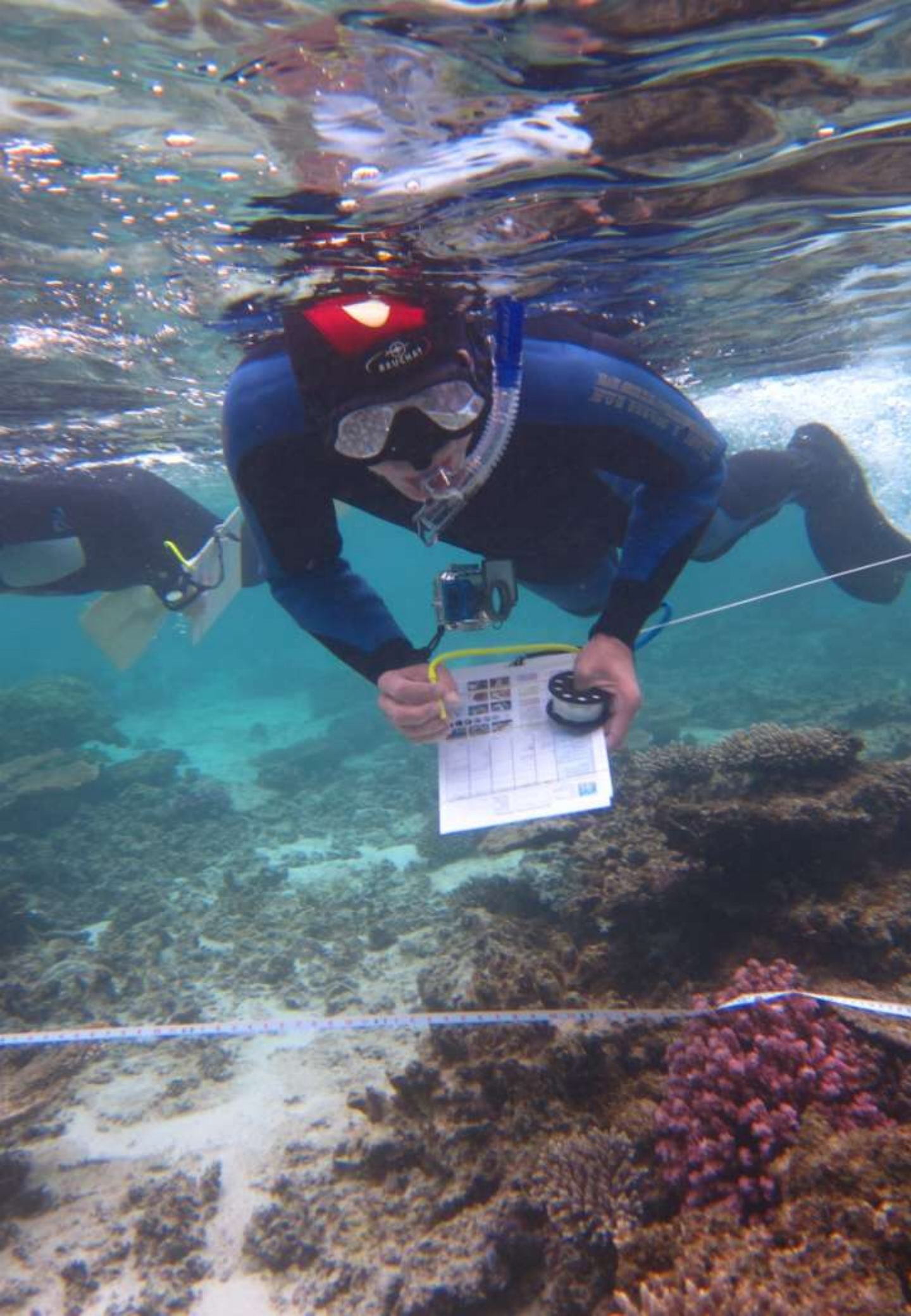


Image 5. Creeping  
*Dictyota* on hard coral



Image 6. Giant clam





# Testimonials

We are honoured that the initial Reef Check project has been well received by the Exmouth community. Please see a selection of comments from local authorities, volunteers, industry partners and community groups.



*"It was one of the best training events I have ever attended and you must be commended on the quality of materials in the course and the way in which it was delivered. I have no doubt there will be a high retention of volunteers in the region to undertake future monitoring at the sites we established."*  
--Nick Middleton, Ningaloo Atlas Editor



*"The opportunity for DPaW to support and work alongside Reef Check Australia will provide exciting opportunities for citizen science and community members to help better understand and conserve the precious marine life of Ningaloo Marine Park and the Ningaloo Coast World Heritage Area."*  
--Pete Barnes, Marine Parks Coordinator for Department of Parks & Wildlife



*"For sometime, [Cape Conservation Group] has attempted to engage in some sort of coral reef monitoring ... we are extremely enthusiastic about the idea of establishing Reef Check surveys along the Ningaloo Coast. The fact that there are clear methods to follow which are recognised and used globally, validates the data that will be gathered and which will contribute valuable information about local areas of the reef to the local management agency. About ½ of the recently trained Reef Check volunteers are current members of CCG. We are keen to take ownership of future Reef Check surveys along the Ningaloo Coast and build Reef Check capacity and education among the local community."*  
--Susie Bedford, President of Cape Conservation Group



*"Thanks again for coming to Exmouth Ningaloo to train us up for Reef Check; I learned so much and really look forward to go out there and try make a difference for a place I love so much."*  
--Röge Kempe, Executive Manager Community Engagement, Shire of Exmouth



*"The beauty of World Heritage Ningaloo Reef never ceases to amaze me. It stresses the responsibility bestowed upon us to pass it onto our children in its stunning beauty. We're proud to play a small part in supporting REEF Check Australia in their conservation efforts via systematic observation of changes on the reef. We believe such proactive approach greatly builds community spirit and stresses an awareness of present and future conservation efforts."*  
--Alek Nowak, Owner of Ningaloo Ecology Cruises and Industry Partner





# What happens next?

This is just the beginning. Our newly established local relationships, collaborative partnerships and a solid understanding of what we can offer the Ningaloo Coast through our programs, has motivated us to do more.

In the future we are looking to continue developing and expanding the program. We are seeking to:

- Train more volunteers as Reef Check Surveyors and Team Leaders to create a locally-based framework for field activities
- Expand our monitoring site locations with feedback from science, management, tourism and community partners
- Access monitoring sites annually or bi-annually for Reef Check surveys
- Work closely with stakeholders to build program sustainability
- Coordinate our activities to compliment other programs
- Find new ways to engage the community in better understanding and protecting reefs of the Ningaloo Coast.

While the Reef Check program finds its feet, our REEFSearch program is already available for public participation. REEFSearch is a casual reef identification and observation program based on a smaller subset of the indicators monitoring by trained volunteers. Any snorkeller, diver or reef walker can participate by grabbing an underwater REEFSearch slate and sharing findings and photos on our online REEFSearch Hub. No training required. Don't just look... search!

**Let us know how you would like to see the project develop.**  
**Drop us a line at [support@reefcheckaustralia.org](mailto:support@reefcheckaustralia.org).**





# Reef Check Australia

## Who are we?

**Reef Check Australia (RCA) believes in saving reefs and oceans by empowering people.** We are an innovative environmental charity dedicated to protecting Australia's reefs and oceans by engaging the community in hands-on research and education.

Reef Check Australia was founded by a passionate marine biologist, who believed that people power and collaboration was the way to achieve sustainable reefs. Since 2001, 200+ trained volunteers have surveyed 240,000 square kilometres of reef in Queensland (about the size of Victoria) and donated more than 50,000 volunteer hours. Their work helps to document globally, nationally and locally relevant health indicators, using the standardised Reef Check scientific survey method.

For more than a decade, our programs have offered cost-effective solutions that help to fill gaps in reef knowledge, empower communities to take an active role in understanding, managing and protecting their local reef resources.

## Our Vision

We envision a world with healthy and sustainable reefs supported by an engaged and informed public.

## Our mission

To promote healthy reefs through scientific research, community education and marine conservation.



# Our Principles

Reef Check Australia (RCA) is a citizen science organisation. Our primary purpose is to facilitate public participation in meaningful marine monitoring. We empower individuals and communities to support sustainable healthy reefs. Our work supports the principles listed below.

***We believe in volunteers.*** RCA is an inclusive, citizen science organisation. Our primary purpose is to engage volunteers in hands-on reef research, education and practical conservation. All community members are welcome to join in understanding and saving our reefs.

***Our data is for everyone.*** We are an environmental charity collecting scientific data appropriate for marine experts, reef managers and general public.

***In science we trust.*** We support and promote environmental initiatives with proven benefits for reef health, but we are not an advocacy group. We are not aligned with nor do we endorse any political party or position.

***We strive for excellence.*** We are an established not for profit organisation with a clear governance structure, a proven track record and large volunteer membership base.

***We are optimistic.*** Our approach focuses on what can be done rather than what cannot. Our messaging is positive and we aspire to inspire locally-based action driven by the vision of individuals and communities.

***We think collaboration multiplies results.*** We partner with other organisations on projects with practical on-ground marine outcomes. This does not mean that RCA endorses the media statements or policies of such organisations.





# What is a Reef Check survey all about?



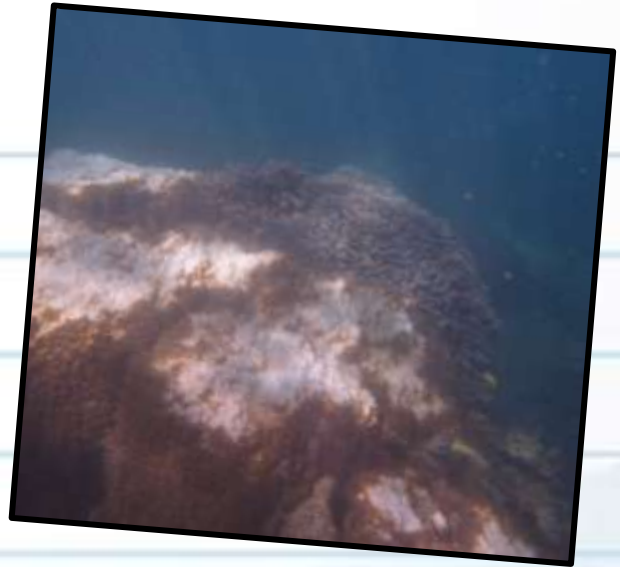
1. Volunteers lay out a 100m transect line along a constant reef habitat and depth. They collect data in 4  $5 \times 20\text{m}^2$  areas along the transect.

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 visual 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.

For more details, see the Reef Check Australia [Methods Manual](#).





# BE A REEFSEARCHER

Don't just look... Search!



Are you a snorkeller, reef-walker or SCUBA diver? Then YOU can be a REEFSearcher!

REEFSearch is a reef identification & observation program that allows YOU to take an active role in better understanding and protecting our reefs and oceans. Discover more and share your findings through the online REEFSearch Hub. Get involved and help us to better understand reefs across Australia.

1.



Check out your REEFSearch Guide kit and learn how to be a REEFSearcher.

2.



Hop in! Spend 10 minutes using your REEFSearch slate to explore the reef. Record what you find!

3.



Discover more. Identify important marine animals, detect reef threats and enhance your reef visit.

4.



Make your REEFSearch count. Share your information and photos in the online REEFSearch Hub.

5.



Keep it up! Be a regular REEFSearcher on a new reef or keep visiting your favourite spot. Back at home, take care of reefs by pledging to do one reef-friendly activity.



[www.reefsearchaustralia.org](http://www.reefsearchaustralia.org)







A diver wearing a blue mask and snorkel is underwater, holding a clipboard with a yellow highlighter and a measuring tape. The background shows a coral reef. The text is overlaid on the image.

# EMPOWERING PEOPLE TO SAVE OUR REEFS & OCEANS

*Reef Check Foundation Ltd (Reef Check Australia)*  
A registered Australia Company, ABN: 46108200933  
A registered Australian Charity with Tax Deductible Gift Recipient Status.

REEF CHECK



AUSTRALIA