



# 2008 Site Report Great Barrier Reef Project

*By Jessica Stella, Steve Prutzman, Tara Swansborough and Jos Hill*



[support@reefcheckaustralia.org](mailto:support@reefcheckaustralia.org)  
[www.reefcheckaustralia.org](http://www.reefcheckaustralia.org)



## ACKNOWLEDGEMENTS

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**Australian Government**  
**Great Barrier Reef**  
**Marine Park Authority**



**CALYPSO**



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## REEF CHECK SITES - GREAT BARRIER REEF PROJECT

The Reef Check Australia Great Barrier Reef Project is supported by the Australian Marine Park Tourism Operators and other members of Queensland's Dive Industry who recognise the importance of coral reef health and sustainable management. These operators provide a range of in-kind support from training facilities, equipment and berth space so that our teams can monitor their dive sites.



## REEF CHECK METHODS

Reef Check's methods were designed to be simple and easy to use by anybody in the community after a little training. These scientific methods have been peer reviewed by international scientists. The goal of Reef Check monitoring is to determine how our reefs are changing through time. Where changes do occur, Reef Check acts as an 'early warning system' for coral reef managers.

### *What do we measure?*

A set of biological indicators was chosen for Reef Check, to serve individually as indicators of specific types of human impacts, and collectively as a proxy for ecosystem health. These indicators fall into the following categories:

- Anecdotal site description (conducted in the 'site survey');
- Coral Communities (conducted in the 'substrate survey' and 'video transect');
- Macro-invertebrates (conducted in the 'invertebrate and impact survey');
- Fish (conducted in the 'fish survey');
- Impacts (conducted in the 'invertebrate and impact survey').

## THE TRANSECT LINE

Reef Check surveys are conducted along a transect line marked by a graduated tape measure and laid at a constant depth. The transect length that is surveyed is 80 m. This 80 m length is divided into four 20 m sections or transect replicates (figure 1). These sections can either be surveyed along a 100 m of continuous line (an easy option where there is continuous coral reef at a constant depth) or in 20 m sections that must each be separated by 5 m or more (where the reef is not continuous, e.g. spur and groove formations or separate bommies. In these circumstances Reef Check transects can be a bit more tricky and time-consuming to set up). *This means that Reef Check surveys can only be conducted where there is a minimum of 80 m of coral reef at a constant depth.*

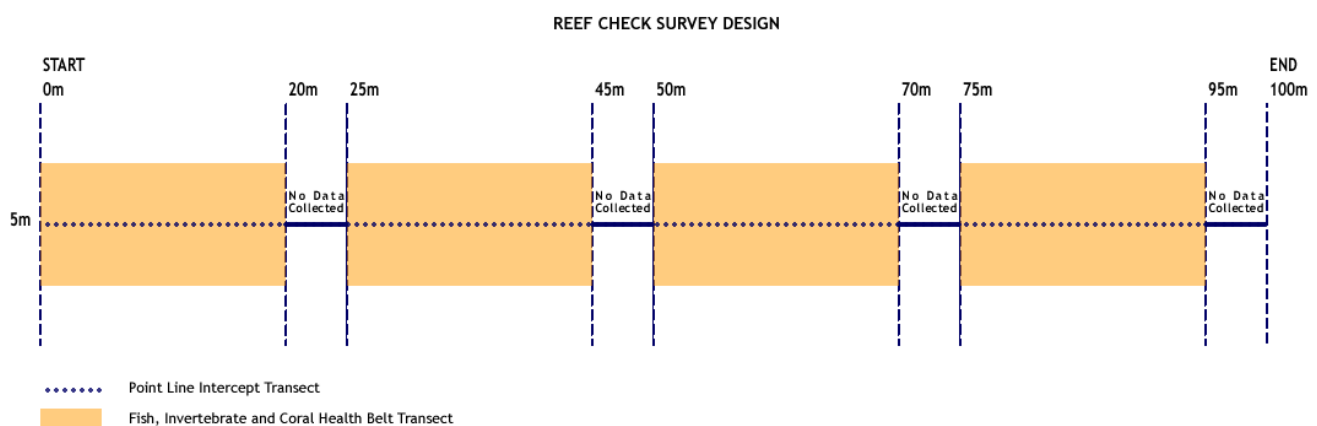


Figure 1: The Reef Check transect.

We currently complete 1 standard Reef Check survey at most of our survey dive sites. However, In order to improve the precision of our data, we aim to do up to 3 Reef Check transects at some sites e.g. those that are most accessible and have sufficient coral reef (figure 2).

1 x Reef Check transect site (single depth) can be surveyed in a single dive by our Reef Check team.

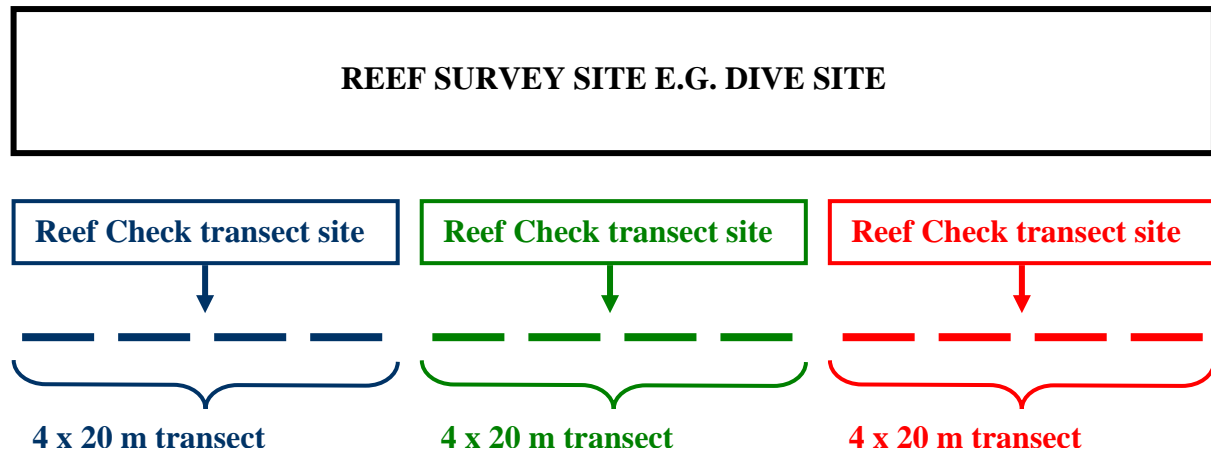


Figure 2: Illustration of how multiple Reef Check sites are set up in one survey location.



## SUBSTRATE SURVEY

The substrate survey collects information about the percentage cover of bottom-dwelling (benthic) organisms and substrate on the reef. Each of these indicators of coral reef health has a function on the coral reef. Tables 1 and 2 provide the key of codes used for the different types of substrate.

These codes are used by Reef Check volunteer researchers to quickly record the substrate categories they see underwater. They are also used on the graphs we produce of our survey results.



A “point sampling” method is used for this survey. The team records the substrate type that is directly below the tape measure every 0.5 m along each of the four 20 m sections interval. To determine which part of the reef is directly below the line at each 0.5 m interval, a weighted line (called a plumb line) is dropped at each interval and the substrate the weight lands on is recorded. This removes bias, which ensures the data represent the real abundance of each substrate category on the reef.

### *Why is the substrate survey important?*

The substrate survey is important because it provides the percentage cover of hard coral. Hard corals are the reef-builders. Without hard corals, coral reefs and all their associated organisms would not exist. Percentage cover of hard coral is the most commonly used proxy for coral reef health by coral reef managers around the world.

*When hard coral cover declines and doesn't recover well over the following 5-10 years, this may indicate a decline in coral reef health.*

Hard coral cover may decline for a variety of reasons. Predation by crown-of-thorns starfish or *Drupella* sp. snails, decline in water quality by fertiliser pollution and sedimentation, and bleaching due to raised sea surface temperatures, have caused some hard coral death on the Great Barrier Reef in recent years. We are starting to understand that if we can reduce the impacts caused by water quality pollution or overfishing, the coral reef will likely be more resilient to the predicted increase in coral bleaching caused by Climate Change. See [www.gbrmpa.gov.au](http://www.gbrmpa.gov.au), [www.reef.crc.org.au](http://www.reef.crc.org.au) and <http://www.nova.edu/ncri/11icrs/outcomes.html> for more information. Around the world, these and additional impacts, such as sewage pollution, over-fishing, destructive fishing practices and disease are significant causes of hard coral decline.

Coral reefs are naturally subject to acute (sudden and short-lived) environmental disturbances such as cyclones. Reefs that are damaged by these physical disturbances will recover over a 10-20 year period. As the rubble consolidates, new corals settle and grow. This in turn attracts other organisms.



This cycle of physical disturbance-decline-recovery is natural for coral reefs. These natural disturbances play an important role in shaping the ecosystem structure that we see.

*It is important that we understand how reefs change naturally so that we can determine how human impacts may affect them.*

A healthy coral reef will naturally decline and recover in cycles through time. The health of a coral reef can be explained in terms of its *resilience* to impacts, such as its ability to recover after disturbance. We can measure this health by monitoring how coral reefs change over time. A single survey will not tell us if a reef is healthy or not, because we would not know at what stage of decline or recovery the reef is at in terms of its dynamic balance (figure 3).

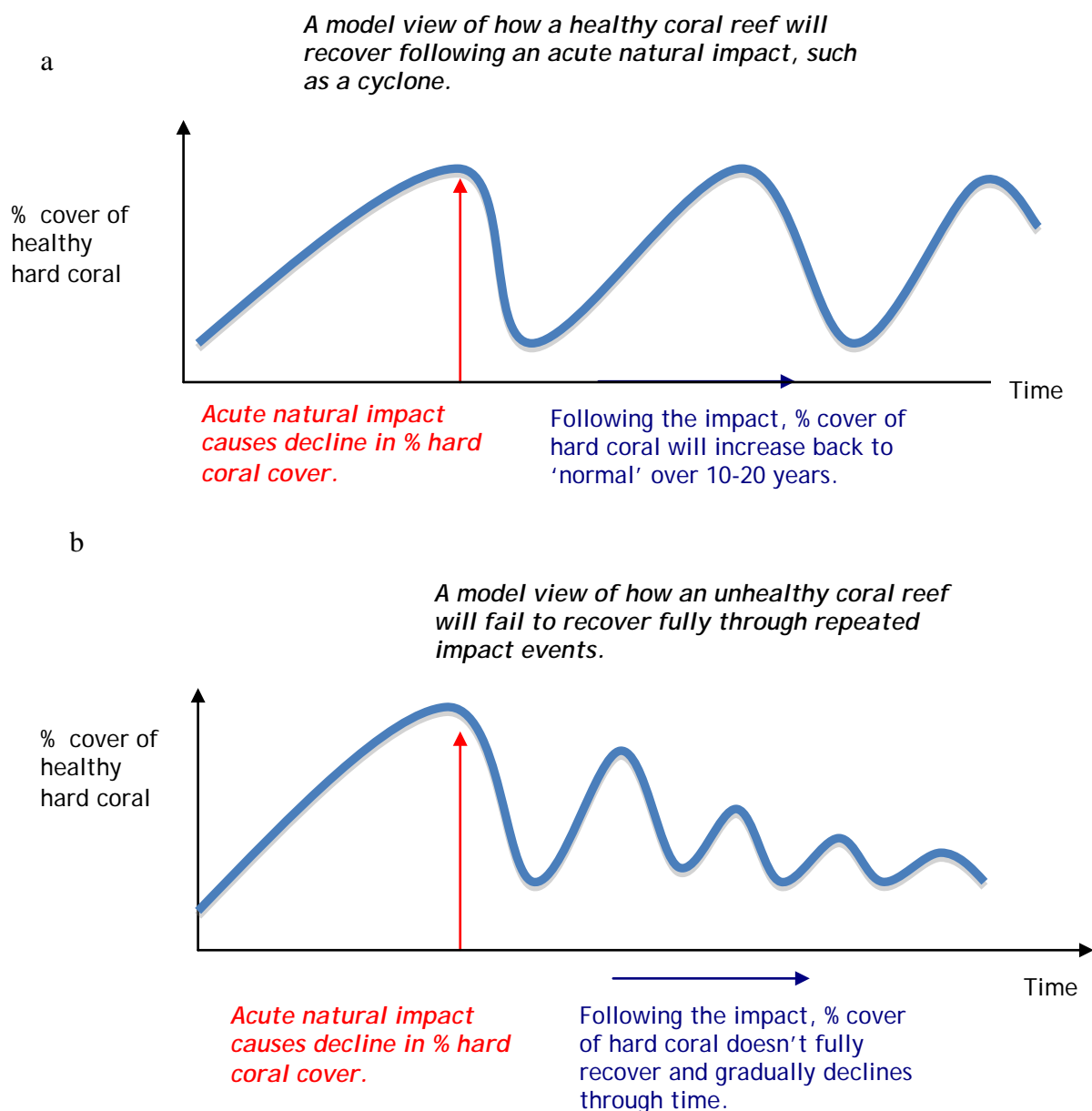


Figure 3a: dynamic balance of a healthy (resilient) coral reef; b: gradual decline of an unhealthy (non-resilient) coral reef.

As the disturbance-recovery regime of a coral reef is complex, the longer the time-period for which we have monitoring data, the more disturbance-recovery patterns we can see. This will lead to a better understanding of how coral reefs can change over time.

Monitoring is, therefore, important to help managers to understand which management practices (e.g. levels of fishing pressure or fertiliser run-off that are allowed) are sustainable (i.e. no damage to resources is caused) and which ones are unsustainable and cause a decline in coral reef health. Monitoring is an essential component to coral reef management.

*By monitoring our reefs each year, we'll be helping scientists understand how human activities affect reefs into the future.*

**Table 1: Coral and Substrate Indicators and Codes**

Reef Check Substrate Codes	Reason
HC - hard coral	The major building component of the reef.
SC - soft coral	Non-reef builder.
SP - Sponge	Indicator of sewage pollution if abundant.
OT - other	
NIA - nutrient indicator algae	Nutrient pollution.
RC - rock	Bare surface on which young coral can settle.
RKC - recently killed coral	Indicator of recent disturbance.
SI - silt	Indication of sedimentation.
SD - sand	
RB - rubble	Indication of dynamite damage or storm damage.

Table 2: Coral and Substrate Growth Form Codes

<b>HARD CORALS Growth Forms</b>	HCBR: Branching Hard Coral HCF: Foliose Hard Coral HCM: Massive Hard Coral HCE: Encrusting Hard Coral HCP: Plate Hard Coral HC: gathers other growth forms (digitate, columnar, etc.)  HCB: Bleached Hard Coral
<b>SOFT CORALS</b>	SCL: Leathery Soft Coral SCZ: Zoanthids SC: Other Soft Coral (tree or flower shaped)  SCB: Bleached Soft Coral
<b>RECENTLY KILLED CORAL</b>	RKCTA: Recently killed coral covered with Turf Algae RKCNA: Recently Killed Coral covered with Nutrient Indicator Algae RKC: Recently killed coral (non covered with algae)
<b>ROCK</b>	RCTA: Rock covered with Turf Algae RCCA: Rock covered with Coralline Algae RC: Rock (non covered with algae)
<b>SPONGES</b>	SPE: Encrusting sponge SP: All other sponges

## FISH, INVERTEBRATE AND IMPACT SURVEYS

These surveys are conducted using the same transect as the substrate survey, however, this time the transect is 5 m wide. This is called a belt transect.

### *Invertebrate and fish survey:*



These indicators represent economically or ecologically important invertebrates and fishes. See table 3 for a list of these indicators and why they have been selected. Economically important species are important for fisheries. Ecological indicators are important for the health of the coral reef system. Examples of ecological indicators are *Diadema* sp. urchins, which are important algae grazers. The absence of algae grazers can cause prolific algae growth and a change in the state of the coral reef from a *coral-dominated state* to an *algae-dominated state*. Crown-of-thorns starfish are also ecological indicators and are coral-eating predators. Their

presence in large numbers can reduce hard coral cover, providing more space for growth of algae and other invertebrates.

The presence or absence of these indicators does not *necessarily* mean there is a problem on a reef-by-reef scale. However, providing scientists with an overview of where they occur can help them to understand changes to coral reefs over time and analyse the potential cause of threats to coral reef health.

Table 3: Invertebrate and fish Indicators

Indicators	Overfishing	Dynamite Fishing	Cyanide Fishing	Curio Collection	Aquarium Fish Collecting	Pollution e.g. fertilizer or sewage	Coral damage
<b>Invertebrates</b>							
Banded coral shrimp ( <i>Stenopus hispidus</i> )					X		
Crown-of-thorns starfish ( <i>Acanthaster planci</i> )						X?*	X
Spiny lobster ( <i>Panulirus</i> spp.)	X						
Long-spined black sea urchins ( <i>Diadema</i> spp.)							
Giant clams ( <i>Tridacna</i> spp.)	X			X			
Pencil urchin ( <i>Heterocentrotus mammilatus</i> )				X			
Sea cucumbers ( <i>Thelenota ananas</i> , <i>Stichopus</i> <i>Chloronotus</i> , <i>Holothoria edulis</i> )	X						
Triton ( <i>Charonia</i> spp.)	X			X			
<i>Drupella</i> spp. snails							X
<i>Tripneustes</i> spp. urchins	X					X	
Trochus ( <i>Trochus niloticus</i> )	X			X			
Anemone					X		
<b>Fish</b>							
Butterfly fish (Chaetodontidae)	X		X		X		
**Grouper (>30 cm) (Serranidae)	X	X	X				
Barramundi cod ( <i>Cromileptes altivelis</i> )	X	X	X		X		
Snapper (Lutjanidae)	X	X					
**Humphead wrasse ( <i>Cheilinus undulates</i> )	X	X	X		X		
Parrotfish (>20cm) (Scaridae)	X	X	X		X		
Bumphead parrot ( <i>Bolbometopon muricatum</i> )	X	X	X		X		
Sweetlips (Haemulidae)	X	X	X		X		
Moray eel (Muraenidae)	X				X		

\*Scientists think there may be a link between crown-of-thorns starfish outbreaks and nutrient pollution (Brodie et al, 2005).

\*\*Note that all grouper > 30 cm and sized to the nearest 10 cm are counted. Maori wrasse and bumphead parrotfish that are off the transect area recorded because the transect length is insufficient to capture true populations of these large fish which have a large range.

### ***Impact survey:***

Any visible impact on the reef is recorded during this survey. See table 4.

**Table 4: Impact Indicators**

Impact
Coral damage: boat/anchor
Coral damage: dynamite
Coral damage: other
Trash: fish nets
Trash: general
Bleaching (% of coral population)
Bleaching (% of colony)
Disease (% presence of disease of coral population)
<i>Drupella</i> sp. scars
Crown-of-thorns starfish
Other scars

## **PHOTO SURVEY**

Our volunteers take photos of any of the impacts they see, such as coral bleaching or disease so that we can ensure our data are accurate and can be checked by a scientist at a later date. Photos are also taken of the dominant algae types found on the survey in order that scientists can review which species are involved with any outbreaks recorded.

## **VIDEO SURVEY**

This survey provides a permanent record of the coral and substrate on the transect. This information may be important for future, more detailed (species identification) analyses of the data at sites where interesting changes have been recorded by our volunteer researchers.



## RESULTS OVERVIEW

Reef Check Volunteers conducted surveys of a total of 26 dive sites during the 2008 survey season. Table 1 illustrates a summary of the percent cover of key indicators in each of 4 survey regions.

Only 1 crown-of-thorns starfish was recorded in the whole survey season at Briggs Reef in the Cairns Region. A number of *Drupella* spp. snails were, however, recorded at many sites.

Table 1: Regional Results Summary

Region	Hard Coral % Cover	Nutrient Indicator Algae % Cover	Soft Coral % Cover
Ribbon Reefs	59.58	5.83	3.75
Port Douglas Reefs	42.03	3.82	5.92
Cairns Reefs	32.87	3.8	12.08
Townsville Reefs	60.63	11.25	1.25
Airlie Beach Reefs	48.83	0.83	12.34

The following pages detail the substrate (benthic) surveys conducted and reports on key invertebrate species or coral impacts recorded for each site surveyed.

## SITE BY SITE RESULTS

### OSPREY REEF: CORAL SEA

Located in the Coral Sea more than 250 km from the shore, Osprey Reef is a deep-sea mount with steep drop-offs, which fall below 1000 m. It is considered pristine and is a popular dive site with a growing live-aboard dive industry. Osprey Reef is not currently under a management regime.

Since Osprey reef is 250 km from shore, the site experiences little anthropogenic impact. Tourism and the occasional recreational fishing are considered the main anthropogenic pressures at this site.

#### SITE NAME: ADMIRALTY ANCHOR

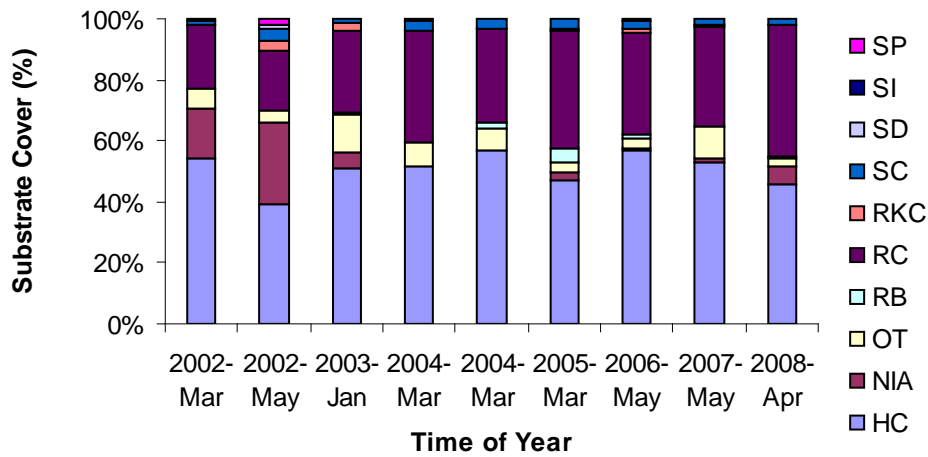
Admiralty Anchor is located on the Northwest side of Osprey Reef (13°53.244 S, 146°33.435 E). It is a sheltered site comprised of bommie fields with canyons and steep walls on the West side. Surveys have been conducted at this site since 2002 when a permanent transect was marked out. Subsequent surveys are conducted along this transect.



#### Substrate Survey

Hard coral cover was approximately 40% at this site in 2008, exhibiting a slight decrease from the previous 3 years (~10%). Nutrient indicator algae was slightly higher in 2008 from previous years, around 5%. The dip in hard coral cover in 2002 was due to coral bleaching event where the coral was recorded as bleached. The coral cover appeared to recover the next year indicating no major loss from the bleaching event. Algae cover was highest during this bleaching event but has since dropped off and remained low (Graph 1).

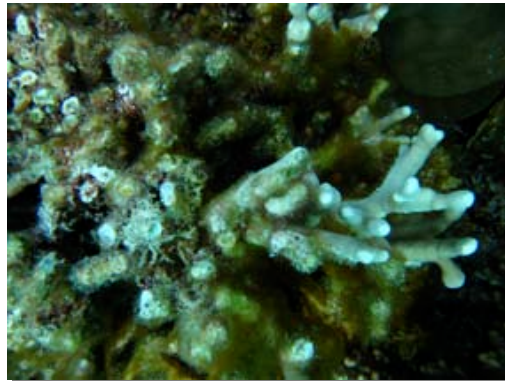




Graph 1. Substrate type and percent cover at Admiralty Anchor.

### Dominant Algae: 2008

The two dominant algae found at Admiralty Anchor were *Halimeda* sp. and nutrient indicator algae.



### Invertebrates and Impacts: 2008

There were neither any sightings of crown-of-thorns starfish (COTS) nor any COTS scars to coral colonies. Although a total of 9 *Drupella* spp. snails were observed, no feeding scars were observed on any coral colonies. In fact, no coral scars were recorded. Coral disease and coral bleaching were also not observed at this site.

## OSPREY REEF: CORAL SEA

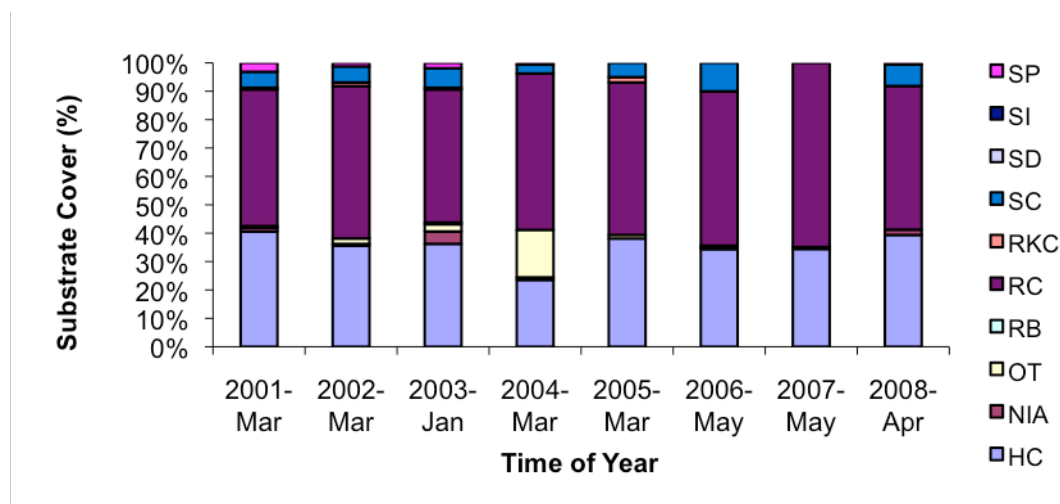
SITE NAME: NORTH HORN

North Horn is located at the north tip of Osprey Reef in the Coral Sea (13°48.073 S, 146°33.422 E). It is a very popular dive site and is home to a large reef shark population.



### Substrate Survey

Hard coral cover has hovered around 40% in the last 7 years. Nutrient indicator algae has never exceeded 5%, with only approximately 2% being recorded in 2008 (Graph 2).



Graph 2. Substrate type and percent cover at North Horn.

### Dominant Algae: 2008

The two dominant algae recorded at this site were *Halimeda* sp. and turf algae.



### Invertebrates and Impacts: 2008

A belt transect did not detect the presence of either crown-of-thorns starfish or *Drupella* spp., nor any scars to coral colonies from these animals. However, 9 other scars to coral were recorded. No coral bleaching or coral disease was recorded.

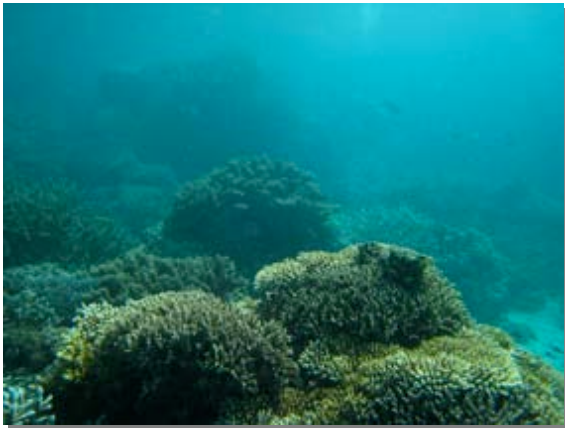
## GREAT BARRIER REEF PORT DOUGLAS

### RIBBON REEFS

REEF NAME: RIBBON REEF # 10

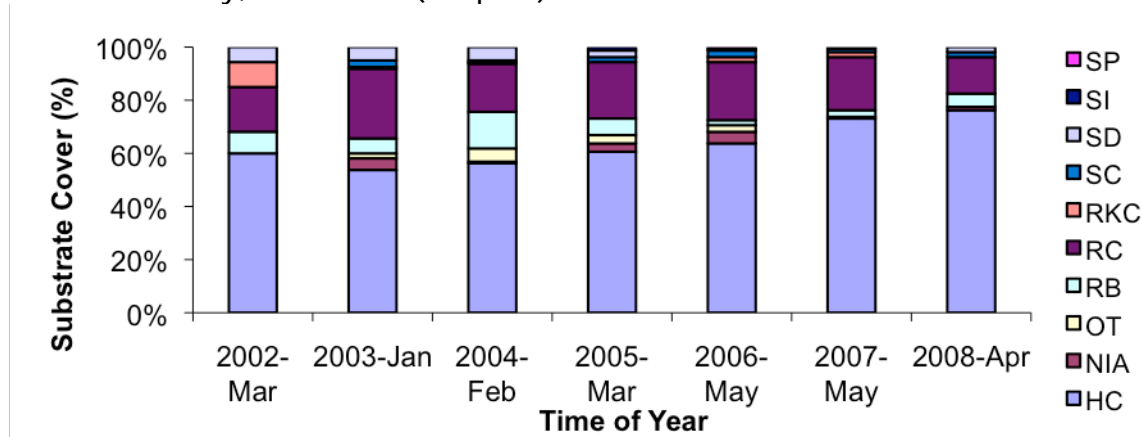
SITE NAME: CHALLENGER BAY

Challenger Bay is located at the southern tip of Ribbon Reef #10 (14°55.02 S, 145°41.38 E). The site is protected from fishing and is in a Marine Park Green Zone. The site is composed of a back reef slope with an amazing diversity of corals and a sandy slope with patches of corals, which drops to approximately 35m. The site has been surveyed since 2002.



#### Substrate Survey

Hard coral cover has been slowly increasing over the past 7 years and was found to be approximately 70% in 2008 (up from 60% in 2002). Nutrient indicator algae in 2008 was found to occur minimally, around 2% (Graph 3).



Graph 3. Substrate type and percent cover at Challenger Bay.

### Dominant Algae: 2008

The two most dominant algae, both occurring in low abundance, were a brown filamentous nutrient indicator algae and turtle weed.



### Invertebrates and Impacts: 2008

Crown-of-thorns starfish (COTS) were not observed on the transect nor any evidence of feeding scars. Although 8 *Drupella* spp. snails were observed, there were no observed feeding scars from these snails. Although no coral bleaching was detected at this site, a small amount of coral disease was observed (0.5% of the coral population) but not recorded on camera.



## GREAT BARRIER REEF PORT DOUGLAS

### RIBBON REEFS

REEF NAME: RIBBON REEF # 10

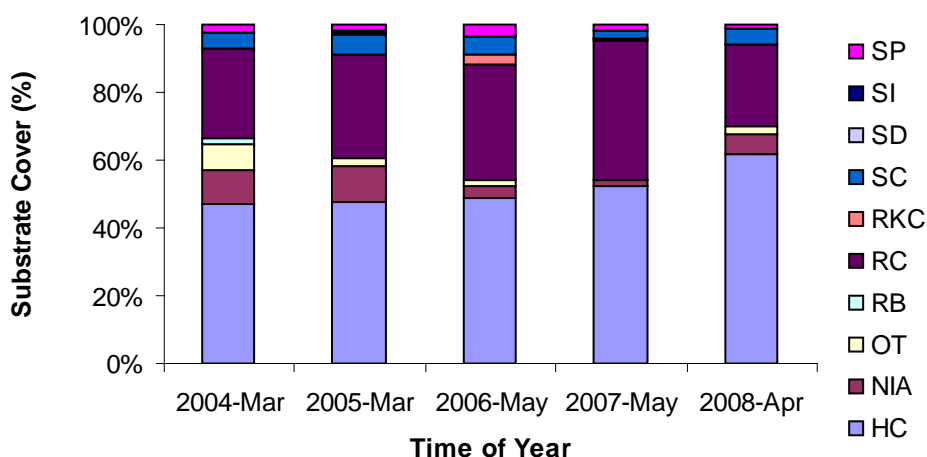
SITE NAME: *PIXIE GARDENS*

Pixie Gardens is located at the south end of Ribbon Reef #10 (14°55.812 S, 145°40.523 E). It is a sheltered site affected mainly by storms, fishing and the tourist industry. Pixie Gardens is in a Green Marine Park zone. Pixie Gardens is characterised by large sandy areas and patches of corals. A steep wall is observed throughout the site as the transition to the reef flat. Reef Check surveys are not normally done on walls but an exception was made in order to continue the long term monitoring of this site.



#### Substrate Survey

Hard coral cover was found to be highest in 2008 (~62%) than in any of the previous four years. Nutrient indicator algae was found to have a low occurrence, only accounting for approximately 4% of the substrate cover ( Graph 4).



Graph 4. Substrate type and percent cover at Pixie Gardens.

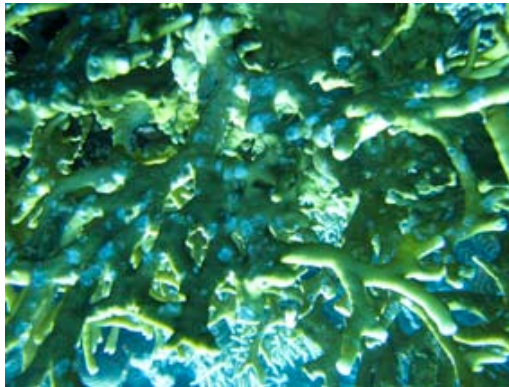
### Dominant Algae: 2008

The two dominant algae found at this site were turtle weed and red filamentous algae.



### Invertebrate and Impacts: 2008

There were no crown-of-thorns starfish (COTS) or associated feedings scars at this site. *Drupella* spp. were found in a small number (3) with 2 feeding scars. Five other scars and damage to coral colonies were recorded (bottom left photo) but their cause was unknown. No coral bleaching was recorded however a very small amount of coral disease was found at the site (affecting less than 1% of the coral population).





## GREAT BARRIER REEF PORT DOUGLAS

### RIBBON REEFS

REEF NAME: RIBBON REEF # 3

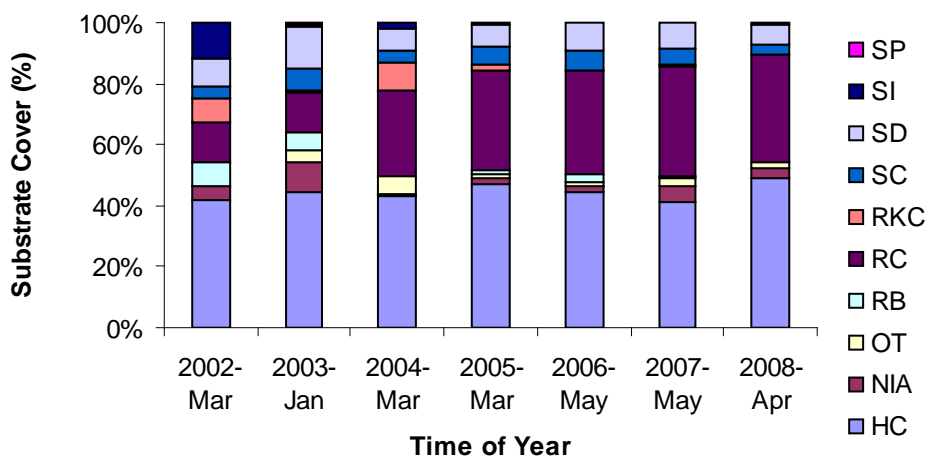
SITE NAME: *CLAM BEDS*

Clam Beds is located south of Ribbon Reef # 3 (15°23.808S, 145°45.794E). The site faces northwards, sometimes exposing it to swells that move towards the South. There is only one Reef Check transect site at Clam Beds and it is oriented West to East. Clam Beds experiences low overall anthropogenic impact. It is regularly visited by divers. Clam Beds is protected from fishing activities and is in a Marine Park Green Zone. Clam Beds is popular due to the large number of large giant clams found at this site. The site has been surveyed since 2002.



### Substrate Survey

Hard coral cover has fluctuated little in the past 7 years, consistently hovering around 40%. Nutrinet indicator algae has never been higher than 10% but is generally around 4% (Graph 5).



Graph 5. Substrate type and percent cover at Clam Beds.

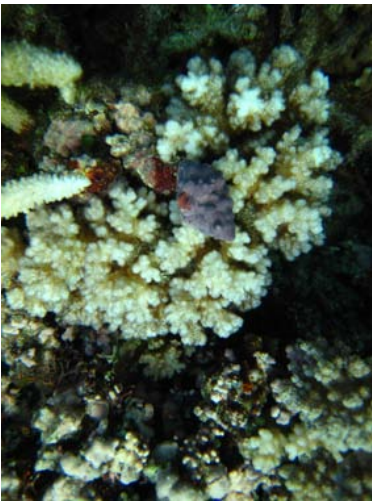
### Dominant Algae: 2008

The two most dominant algae found at this site were a species of *Halimeda* and a turf algae.



### Invertebrates and Impacts

Crown-of-thorns starfish (COTS) and feeding scars were absent at this site. A small number of *Drupella* spp. were recorded (7) with 2 recorded feeding scars. A total of 6 other scars were recorded, their cause unknown. There were no observed incidences of coral bleaching or disease at this site.



GREAT BARRIER REEF  
PORT DOUGLAS

RIBBON REEFS

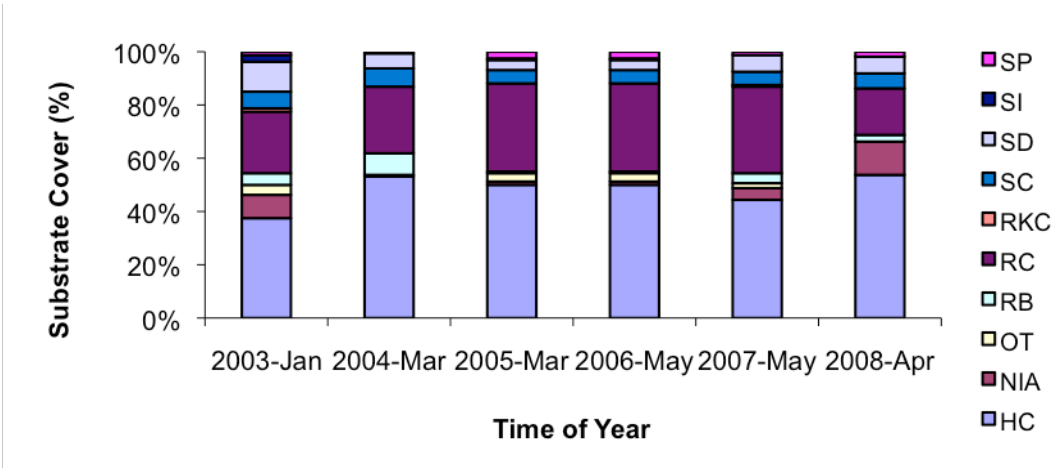
REEF NAME: RIBBON REEF # 3  
SITE NAME: *TRACEY'S WONDERLAND*

Tracy's Wonderland is located south of Ribbon Reef # 3 (15°30.769S, 145°46.645E). It is a sheltered site and is in a Marine Park Green Zone.



Substrate Survey

Hard coral cover has increased by approximately 10% in the past 6 years, found to be 50% in 2008. Nutrient indicator algae was also higher in 2008 than past years at approximately 10% of the substrate (Graph 6).

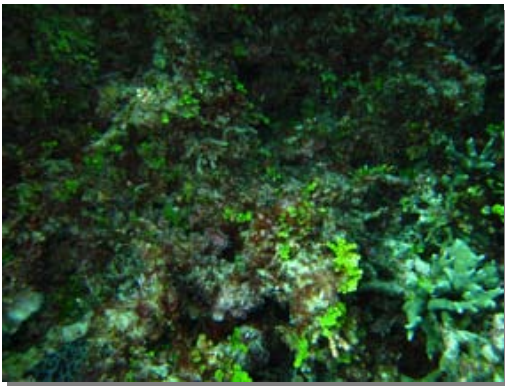


Graph 6. Substrate type and percent cover at Tracey's Wonderland.



### Dominant Algae: 2008

The two most dominant algae found at Tracey's Wonderland were a species of *Halimeda* sp. and red filamentous algae.



### Invertebrates and Impacts: 2008

Neither crown-of-thorns starfish (COTS) nor their feeding scars, were observed at this site. There were a total of 5 *Drupella* spp. observed but no feeding scars. Six unknown coral scars were recorded. There was no recorded coral bleaching at this site, but a small amount of what may be coral disease was found to affect 1.25% of the coral population (see photos below).



## GREAT BARRIER REEF PORT DOUGLAS

REEF NAME: AGINCOURT REEF

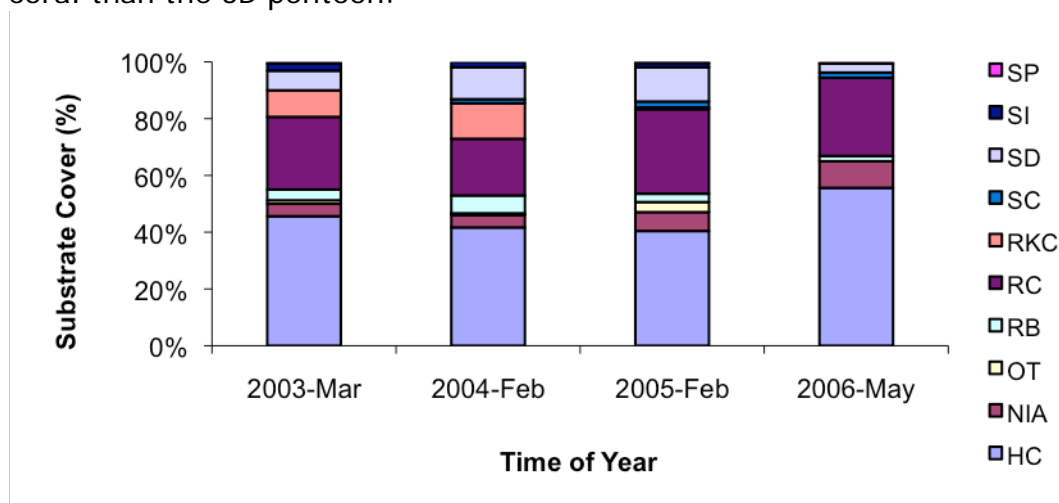
SITE NAME: *AGINCOURT PONTOON 3D & 2D*

Agincourt Reef is located in Port Douglas (15°58.978S, 145°49.343E). The site is off Quicksilver Connection's Pontoon and is visited by some 200-400 people per day. The pontoon is situated at Agincourt Reef number 3 and is 20NM from Cape Tribulation. It lies on a back reef that comprises of a shallow reef flat, coral bommies and sandy patches. The maximum depth of the site is 12m. The survey site is within a Marine Park Green Zone.

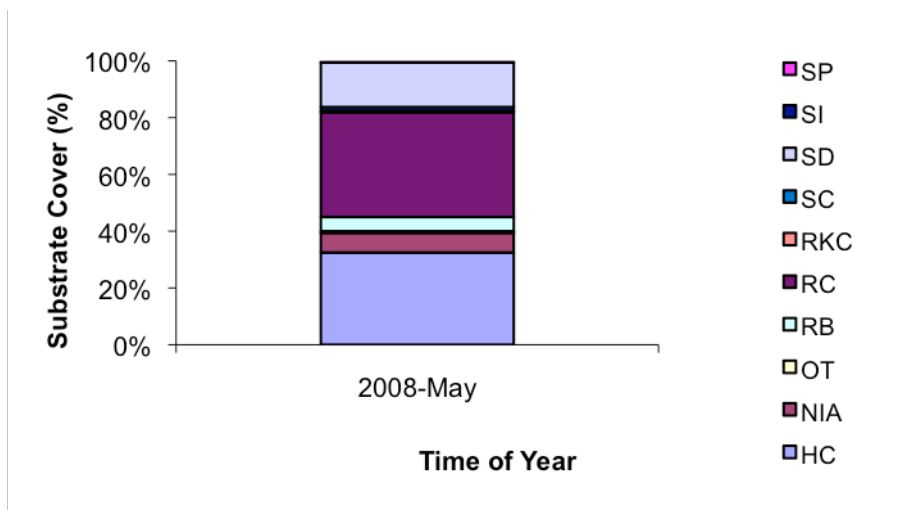


### Substrate Survey

Three sites have been surveyed at the pontoon site. The graph below is a combination of these sites. Hard coral cover at Agincourt 3D pontoon had shown a slight increase between 2003-6 (Graph 7). One site was surveyed at Agincourt 2D pontoon in 2008. This site has slightly less hard coral than the 3D pontoon.



Graph 7a. Substrate type and percent cover at Agincourt Pontoon.



Graph 7b. Substrate type and percent cover at Agincourt Pontoon 2D.

#### Dominant Algae: 2D Pontoon 2008

The two most dominant algae present were both nutrient indicator algae, one a filamentous red the other a green.



#### Invertebrates and Impacts: 2008

This site was free of crown-of-thorns starfish (COTS) and *Drupella* spp. and their associated feeding scars. There were a total of 13 scars found to coral colonies of unknown origin (see photo below documenting a coral scar).



## GREAT BARRIER REEF PORT DOUGLAS

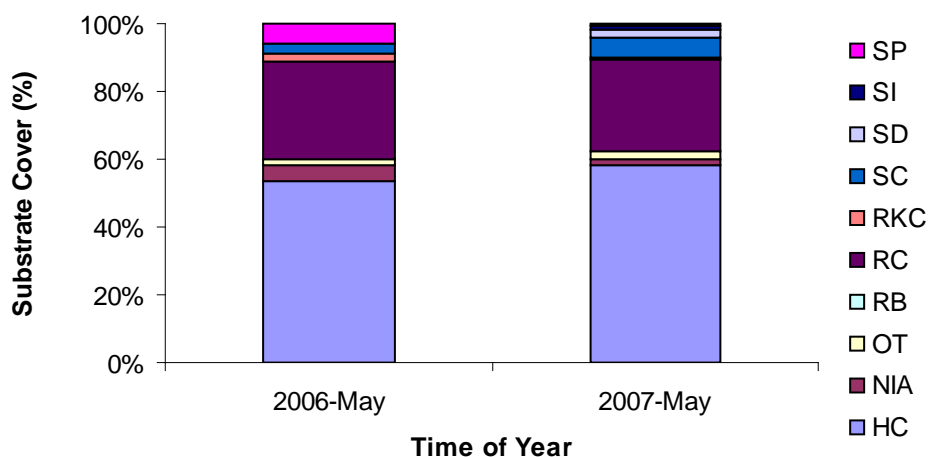
REEF NAME: AGINCOURT REEF  
SITE NAME: PLAYGROUND

Playground is also located at Agincourt Reef (16°04.58S, 145°45.25E). This sheltered site is not subject to high anthropogenic impacts other than diving and snorkelling. It is a Marine Park Green Zone. This site was not surveyed in the 2008 survey year due to adverse weather conditions on the planned sampling day.



### Substrate Cover

In the two years in which surveys were conducted, hard coral cover and nutrient indicator algae remained at similar levels (Graph 8).



Graph 8. Substrate type and percent cover at Playground.

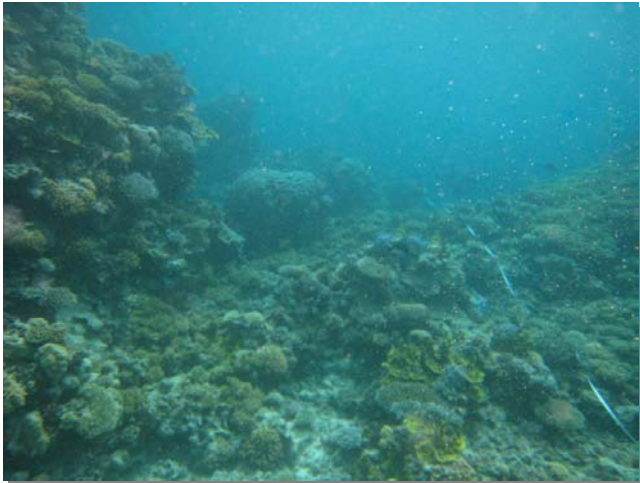


## GREAT BARRIER REEF PORT DOUGLAS

REEF NAME: AGINCOURT REEF

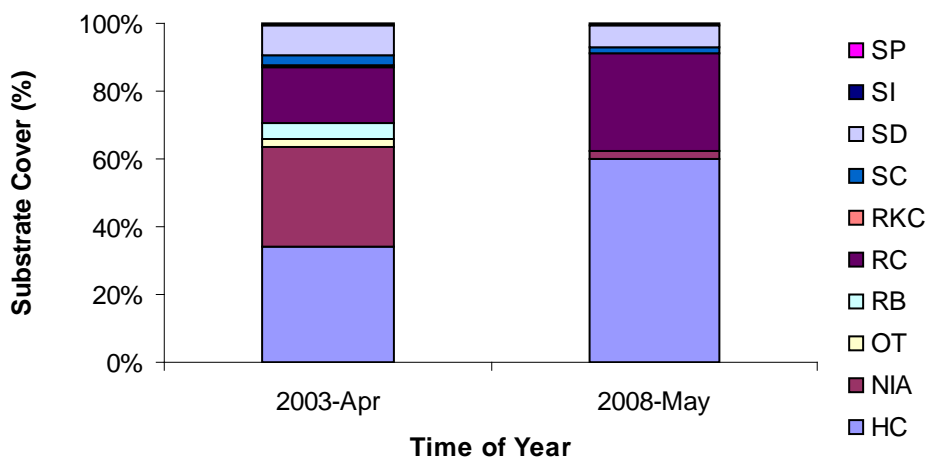
SITE NAME: *PHIL'S REEF*

Also located within Agincourt Reef off the coast of Port Douglas, Phil's Reef (16°00.992S, 145°48.431E). It is a Marine Park Green Zone and a popular dive and snorkelling destination



### Substrate Survey

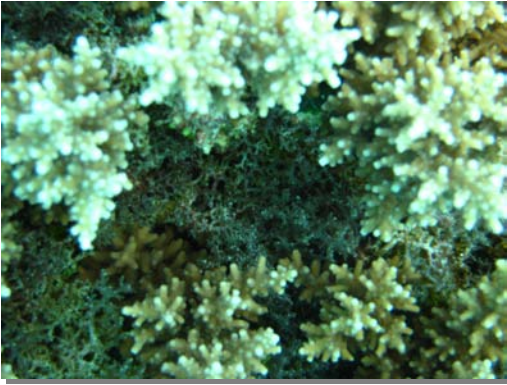
Hard coral cover has exhibited a marked increase from the survey conducted in 2003 to the 2008 survey, with almost 20% more cover. In 2003, nutrient indicator algae comprised approximately 20% of the substrate cover when there was a bloom of "Golden Noodle" algae (*Chrysocystis fragilis*) at several reefs in the Cairns area. In 2008 NIA was only approximately 2% (Graph 9).



Graph 9. Substrate type and percent cover at Phil's Reef.

### Dominant Algae: 2008

The most dominant algae present at Phil's Reef were mat-like algae: *Dictyota* sp.



### Invertebrates and Impacts: 2008

This site was found to be free of crown-of-thorns starfish and their associated feeding scars. *Drupella* spp. were observed in low numbers (a total of 3) but feeding scars to coral colonies were not present. Bleaching was not found to occur at this site.

## GREAT BARRIER REEF PORT DOUGLAS

REEF NAME: AGINCOURT REEF

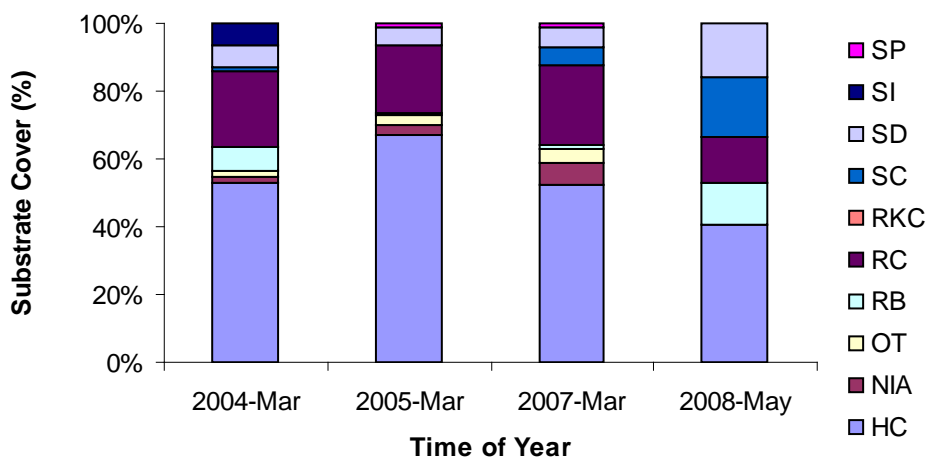
SITE NAME: *THE POINT*

The Point is located on Agincourt Reef approximately 39.6 kilometres off shore from Port Douglas (15°58.054E, 145°49.157S). It is situated in a Marine Park Green Zone.=



### Substrate Survey

Hard coral cover appears to have declined slightly since 2005. In 2005, hard coral cover comprised close to 65% of the total substrate, however in 2008 it only accounted for approximately 40%. In 2008, nutrient indicator algae did not account for even 1% of the substrate (Graph 10).



Graph 10. Substrate type and percent cover at The Point.

### Dominant Algae: 2008

The two most dominant algae found at The Point were turtle weed and a brown filamentous algae.



### Invertebrates and Impacts: 2008

No COTS were found at this site. Only 2 *Drupella* spp. were observed and no scars of any kind were found on any coral colonies.

## GREAT BARRIER REEF PORT DOUGLAS

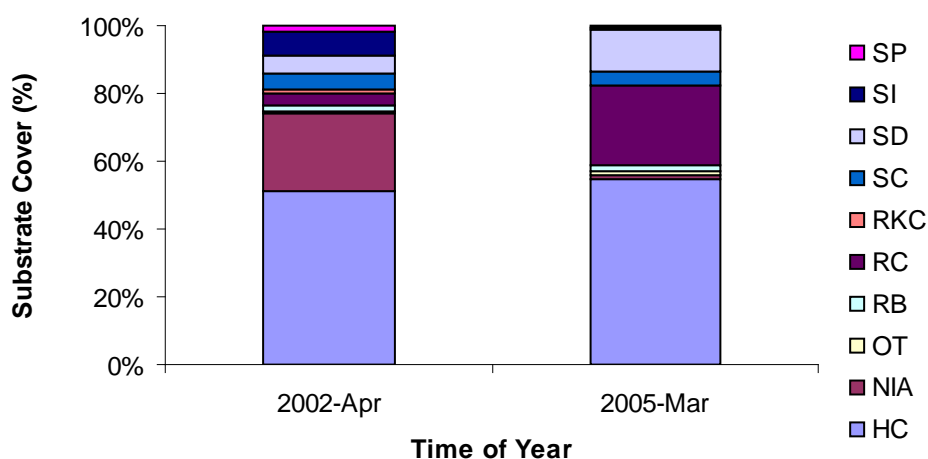
REEF NAME: AGINCOURT REEF  
SITE NAME: *END OF THE WORLD*

End of the World Reef is located on the Northwest corner of Agincourt reef, (15°15.531S, 145°49.464E) about 22 nm from the shoreline off of Port Douglas. It is a sheltered site, heavily used for recreational diving and snorkelling. A Marine Park General Use Zone, it is only subject to low levels of fishing and other anthropogenic impacts. This site was not surveyed in 2008.



### Substrate Survey

Hard cover has approximated 50% in both the 2002 and 2005 survey years. Nutrient indicator algae was high in 2002 (~20%) when there was a bloom of "Golden Noodle" algae (*Chrysocystis fragilis*) at several reefs in the Cairns area. The algae then decreased to 2% in 2005 (Graph 11).



Graph 11. Substrate type and percent cover at End of the World Reef.

## GREAT BARRIER REEF CAIRNS / PORT DOUGLAS

REEF NAME: ST CRISPIN REEF

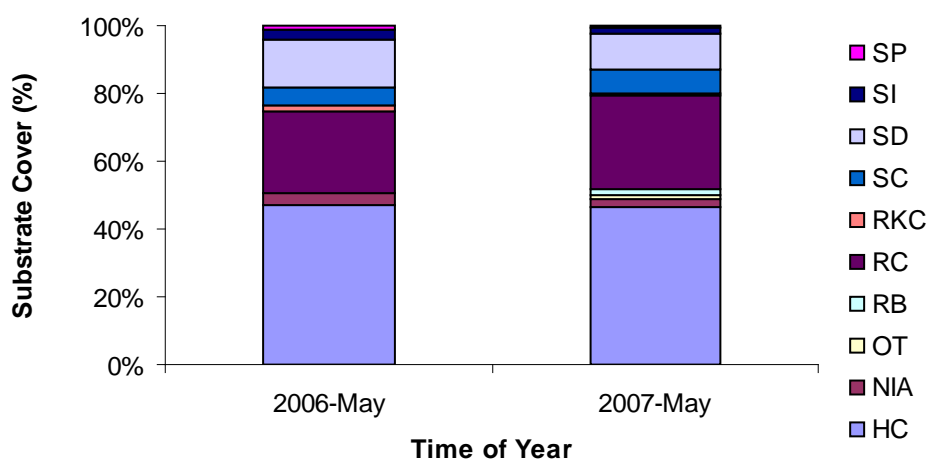
SITE NAME: *NORTH POINT*

North Point is located approximately 46 km off the coast of Port Douglas (16°04.35S, 145°50.59E). The overall anthropogenic impact is medium, based on high levels of diving and snorkelling and low levels of aquarium fishing. It is a Marine Park General Use Zone. This site was not surveyed in 2008.



### Substrate Survey

Hard coral cover has remained somewhat constant in recent years, approximating 43%. Nutrient indicator algae has also remained a somewhat constant 3% in recent years (Graph 12).



Graph 12. Substrate type and percent cover at North Point.

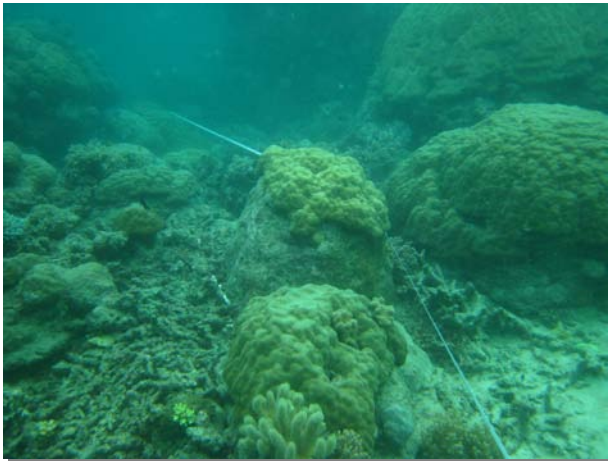


## GREAT BARRIER REEF PORT DOUGLAS

REEF NAME: OPAL REEF

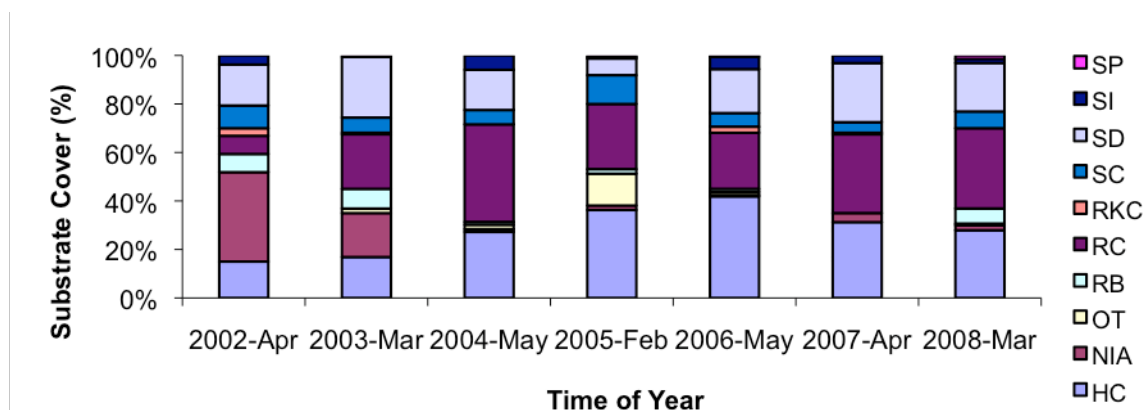
SITE NAME: *BASHFUL BOMMIE*

Bashful Bommie is located in Opal Reef, 41.4 Km from Port-Douglas (16°.14.499S, 145°.51.837E). The Reef Check survey site is always sheltered and is situated in a Marine Park Green Zone where dive tourism is the main anthropogenic impact. The site is a back reef bommie field and the area is visited by 2-3 dive boats a day.



### Substrate Survey

Since surveys have been conducted at this site, hard coral cover has fluctuated from below 20% in 2002 to over 40% in 2005. In 2008 hard coral cover was found to account for almost 30% of the substrate. Nutrient indicator algae has been found in much lower abundance in recent years, only accounting for approximately 3 % of the substrate in 2008 down from almost 40% in 2002 when there was a bloom of "Golden Noodle" algae (*Chrysocystis fragilis*) at several reefs in the Cairns area (Graph 13).



Graph 13. Substrate type and percent cover at Bashful Bommie.



### Dominant Algae: 2008

The two most dominant algae present at Bashful Bommie were turtle weed and red filamentous algae.



### Invertebrates and Impacts: 2008

This site was free from both crown-of-thorns starfish and *Drupella* spp. and their associated feeding scars. Only one scar was found on one coral colony, its origin unknown.

## GREAT BARRIER REEF PORT DOUGLAS

REEF NAME: OPAL REEF

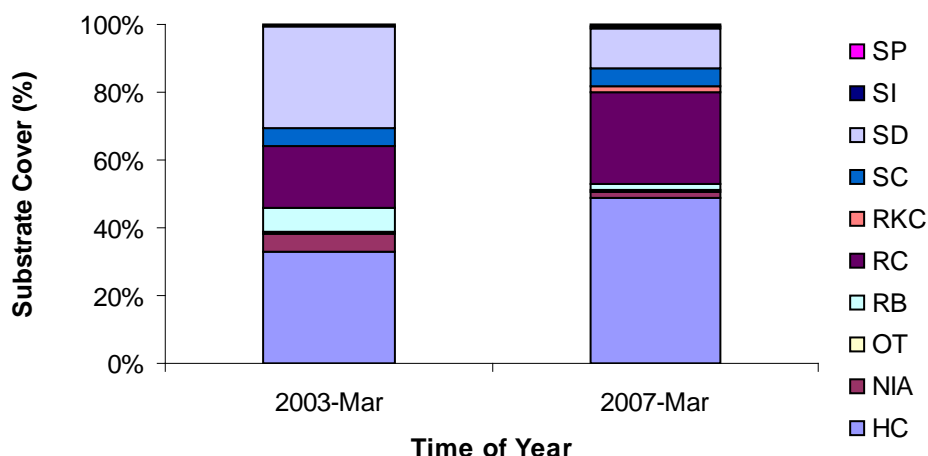
SITE NAME: *BARRACUDA BOMMIE*

Barracuda Bommie is located near Cairns, about 30 miles offshore in South Opal Reef (16°00.36S, 145°50.92E). This somewhat sheltered bommie is a popular tourist spot for diving and snorkelling and is protected as a Marine Park Yellow Zone. This site was not surveyed in 2008.



### Substrate Survey

Hard coral cover exhibited a marked increase between 2003 and 2007, from approximately 30% to 45% cover. Nutrient indicator algae decreased slightly between the two survey years, from approximately 5% to 2% (Graph 14).

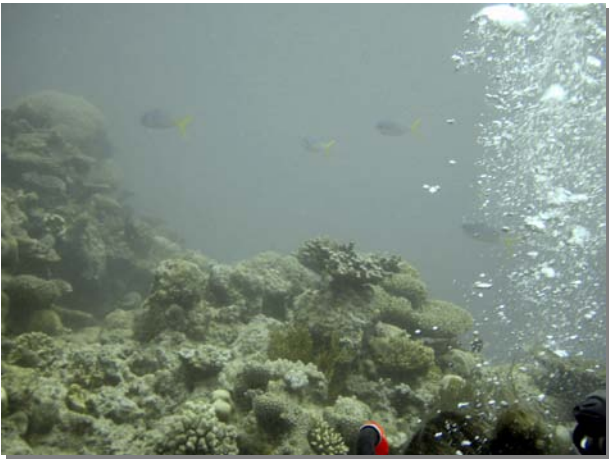


Graph 14. Substrate type and percent cover at Barracuda Bommie.

GREAT BARRIER REEF  
PORT DOUGLAS

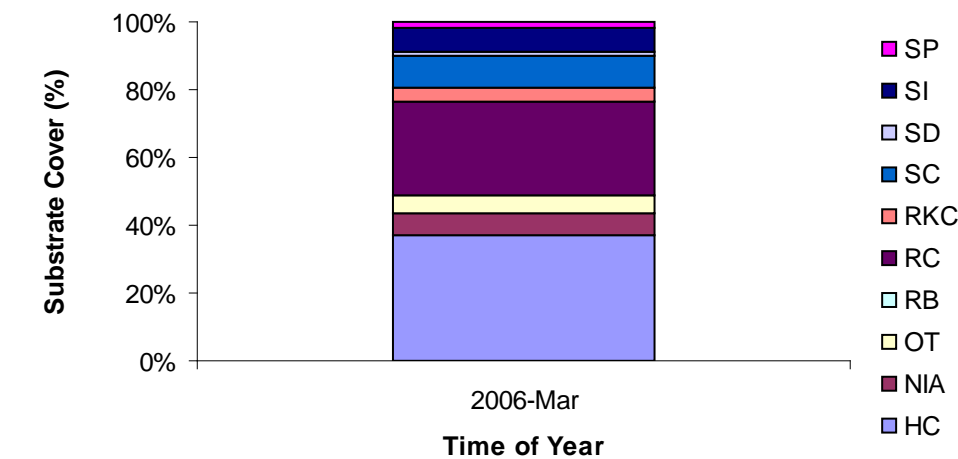
REEF NAME: OPAL REEF  
SITE NAME: CATHEDRALS

Cathedrals dive site is located approximately 50 km off the coast of Port Douglas (16°10.698S, 145°53.286E).



Substrate Survey

This site has only been surveyed once since becoming a Reef Check monitored site. Hard coral cover was found to account for nearly 40% of the transect and nutrient indicator algae for approximately 5% (Graph 15).



Graph 15. Substrate type and percent cover at Cathedrals.

## GREAT BARRIER REEF PORT DOUGLAS

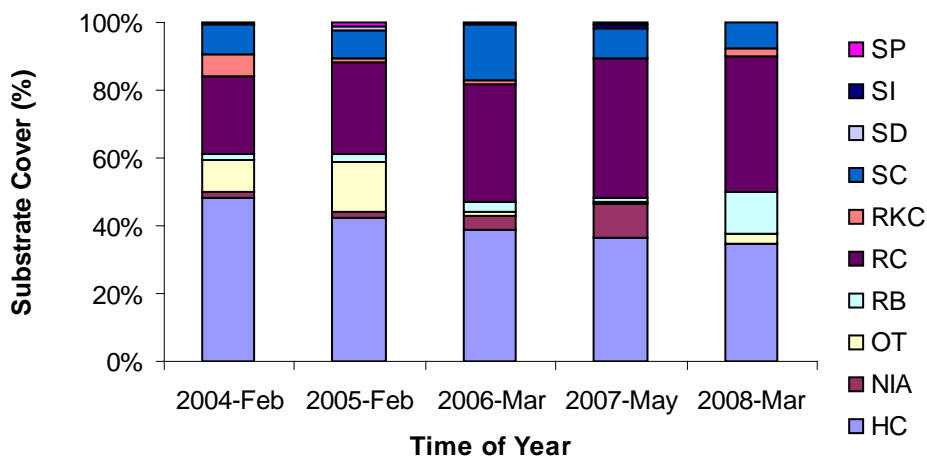
REEF NAME: OPAL REEF  
SITE NAME: *SPLIT BOMMIE*

Split Bommie (South Opal Reef, 16°13.851S, 145°52.054E) is in a Marine Park Green Zone about 29NM from Cape Tribulation. Split Bommie is an isolated bommie on the back reef and has a maximum depth of 25m.



### Substrate Survey

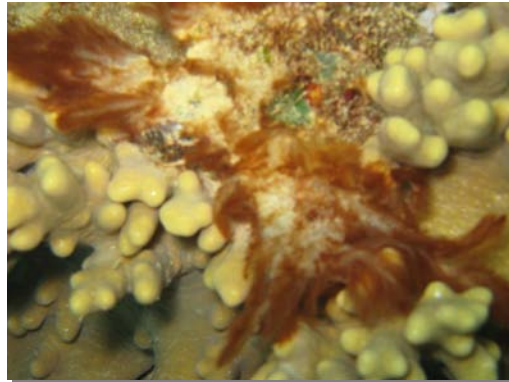
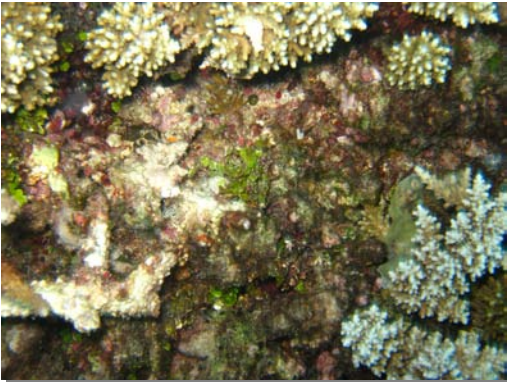
Hard coral cover has exhibited a steady decline over the past five years, accounting for approximately 50% of the transect in 2004 compared to only 35% in 2008. Nutrient indicator algae abundance has fluctuated over the five years, however in 2008 it was not observed on the transect (Graph 16).



Graph 16. Substrate type and percent cover at Split Bommie.

### Dominant Algae: 2008

The two most dominant algae were a species of *Halimeda* sp. and filamentous brown algae.



### Invertebrates and Impacts: 2008

Crown-of-thorns starfish were not observed at this site. Only 2 *Drupella* spp. snails were observed, yet no feedings scars to coral colonies were found. Although all colonies were disease free, approximately 2.25% of the coral population was observed as partially bleached (see photo below documenting coral bleaching).



## GREAT BARRIER REEF PORT DOUGLAS

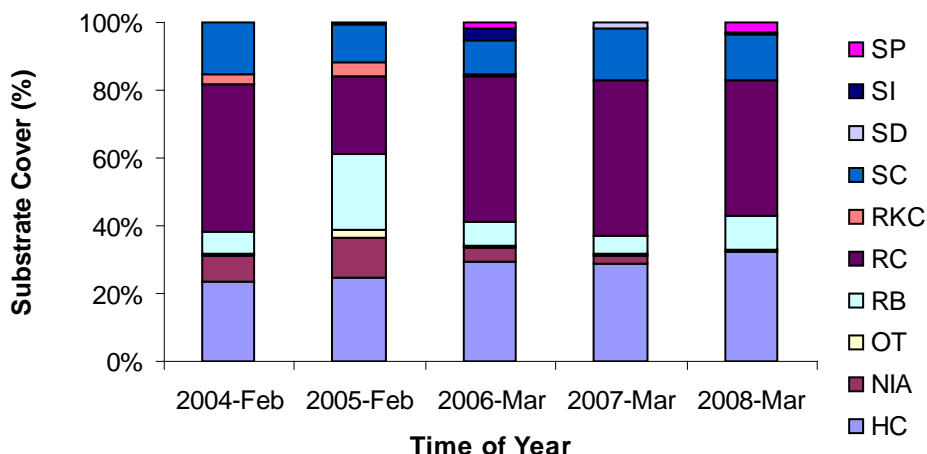
REEF NAME: OPAL REEF  
SITE NAME: *THE WEDGE*

The Wedge is within a protected Marine Park Green Zone, which is 20NM from Cape Tribulation (16°14.512S, 145°57.976E). There are 6 moorings within 500m of each other, which are visited by 3 boats 3 times a week. There is a channel where a strong current can be experienced. It is a fairly flat back reef that drops to a maximum depth of 15m. Due to its location on the edge of the channel that leads to the outer reef it appears different to the other sites in this area (Bashful Bommie, Two Tonne).



### Substrate Survey

Hard coral cover at The Wedge has shown a small, steady increase in the past five years of monitoring, increasing from approximately 22% in 2004 to 37% in 2008. Nutrient indicator algae exhibited a decline at this site, from approximately 10% to 1% in the five years (Graph 17).

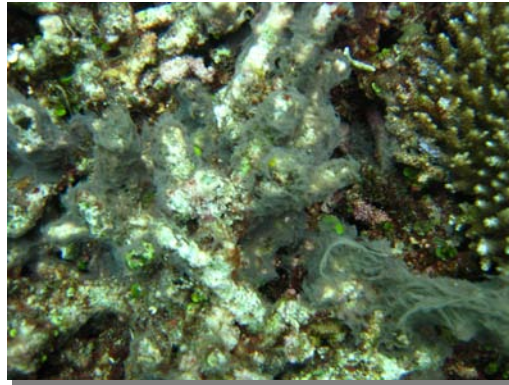
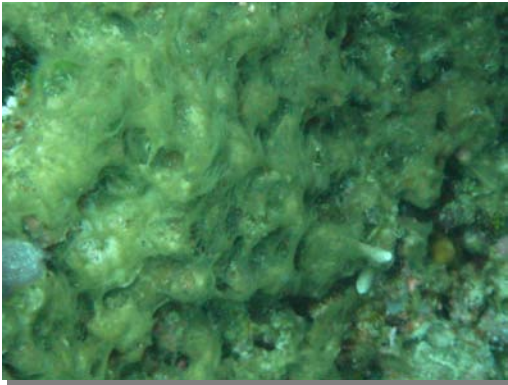


Graph 17. Substrate type and percent cover at The Wedge.



### Dominant Algae: 2008

The two most dominant algae at this site were both filamentous algae.



### Invertebrates and Impacts: 2008

At this site, crown-of-thorns starfish (COTS) and *Drupella* spp. were not observed. Only one scar to one coral colony was found, its origin unknown. There were no incidences of coral bleaching or disease found at this site.

## GREAT BARRIER REEF PORT DOUGLAS

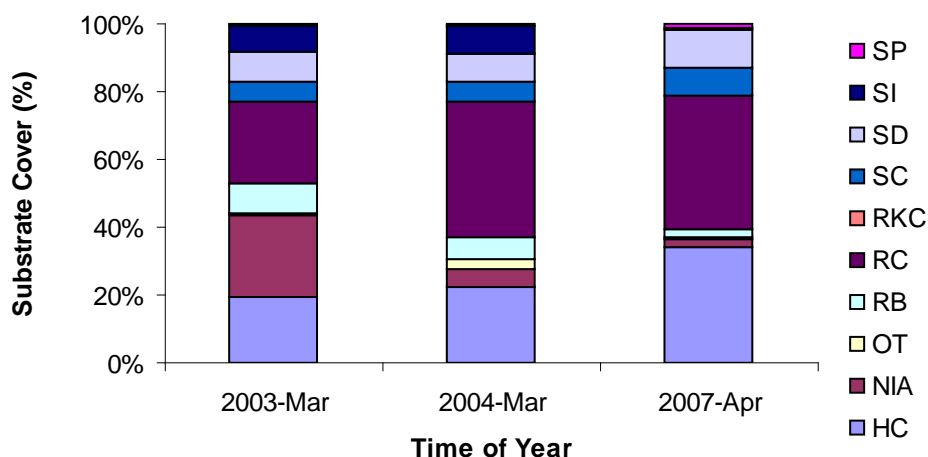
REEF NAME: OPAL REEF  
SITE NAME: TWO TONNE

Two Tonne Reef, in South Opal Reef, is located 41km offshore of Port Douglas (16°14.139S, 145°52.148E). It is a Marine Park Yellow Zone. This site was not surveyed in 2008.



### Substrate Survey

Hard coral cover has increased from approximately 20% in 2003 to 35% in 2007. With an increase in hard coral cover, nutrient indicator algae has declined from over 20% in 2003 to just 3% in 2007. The high NIA in 2003 may have been due to a bloom of "Golden Noodle" algae (*Chrysocystis fragilis*), which affected reefs in the Cairns area (Graph 18).



Graph 18. Substrate type and percent cover at Two Tonne.

## GREAT BARRIER REEF PORT DOUGLAS

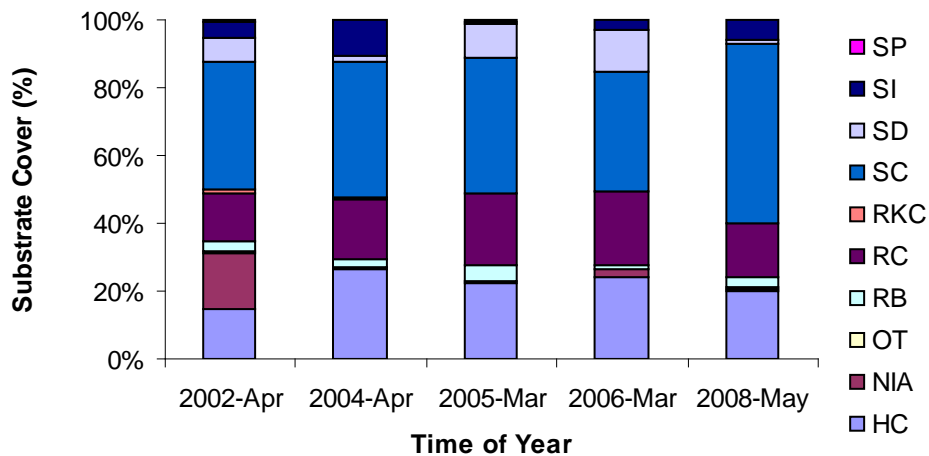
REEF NAME: LOW ISLES FRINGING REEF  
SITE NAME: *LOW ISLES*

Low Isles is a mostly sheltered coral cay situated 15 km Northeast of Port Douglas (14°53.76 E, 16°22.99 S). The mangrove island nearby provides a buffer from storms, and it is within a Marine Park Green zone. Low Isles' reef flat is dominated by 15 species of soft corals. The visibility at Low Isles is greatly determined by the weather and the water is often turbid. High sedimentation may have been caused by land-based run off as agriculture has increased over the years.



### Substrate Cover

Hard coral cover has been shown to fluctuate over the past five survey years, from less than 20% in 2002, to 30% in 2004 and back to ~20% in 2008. It is possible that the change in hard coral recorded was due to transect redeployment as there is no clear reef edge to follow to ensure the transect goes in the exact same place each year. Soft coral has remained relatively steady but with a slight increase in 2008. Nutrient indicator algae was found to be lowest in 2008, less than 1% cover. The data indicates a higher amount in 2002 which may be due to the bloom of "Golden Noodle" algae (*Chrysocystis fragilis*) (Graph 19).



Graph 19. Substrate type and percent cover at Low Isles.

### Dominant Algae: 2008

Only filamentous algae was observed as dominant at this site.



### Invertebrates and Impacts: 2008

The transect was found to be free of crown-of-thorns starfish, *Drupella* spp., any coral scars, coral bleaching and coral disease.

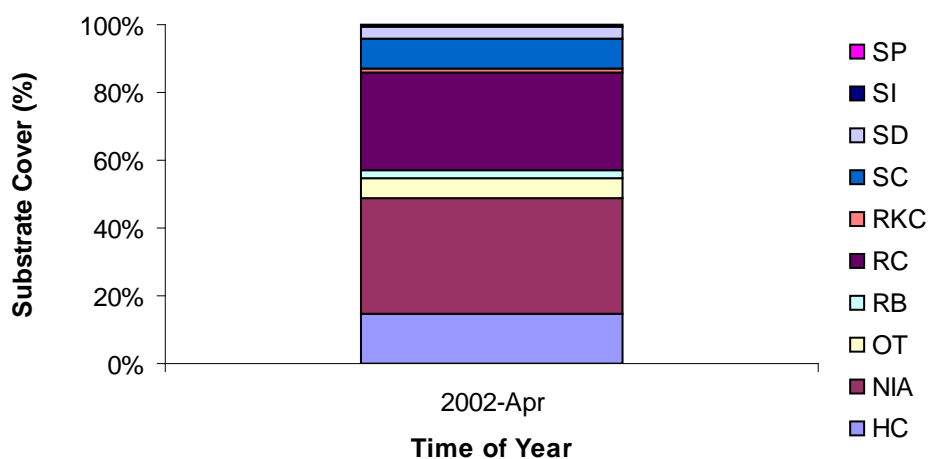
## GREAT BARRIER REEF CAIRNS

REEF NAME: NORMAN REEF  
SITE NAME: *NORMAN REEF NORTH*

Norman Reef North is located approximately 47 km off of Cairns (16°25.274 S, 145°59.716E). It is a regular dive site, somewhat sheltered. This site was surveyed only once, in 2002.

### Substrate Survey

In the one survey yet conducted, hard coral cover was found to be just less than 20%. Nutrient indicator algae was the dominant substrate cover, at almost 40% of the transect. The survey was conducted when there was a bloom of "Golden Noodle" algae (*Chrysocystis fragilis*) at several reefs in the Cairns area (Graph 20).



Graph 20. Substrate type and percent cover at Norman Reef.

## GREAT BARRIER REEF CAIRNS

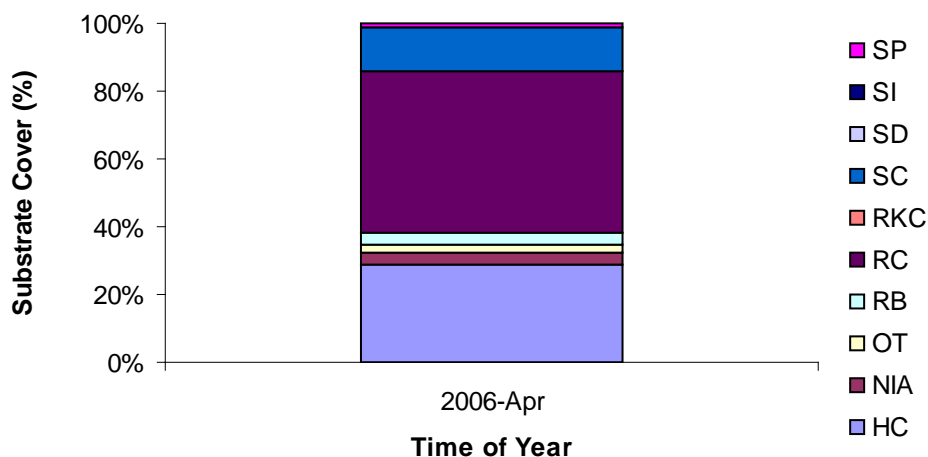
REEF NAME: NORMAN REEF  
SITE NAME: *NORMAN REEF SOUTH*

Norman Reef South is located about 48 km off of Cairns (16°26.25.S, 145°59.53E). It was surveyed in 2006. It is a Marine Park Green Zone with a low overall anthropogenic impact. This site was not surveyed in 2008.



### Substrate Survey

In 2006, hard coral cover was found to be close to 30% of the transect line and nutrient indicator algae only 4% (Graph 21).



Graph 21. Substrate type and percent cover at Norman Reef South.



## GREAT BARRIER REEF CAIRNS

REEF NAME: SAXON REEF

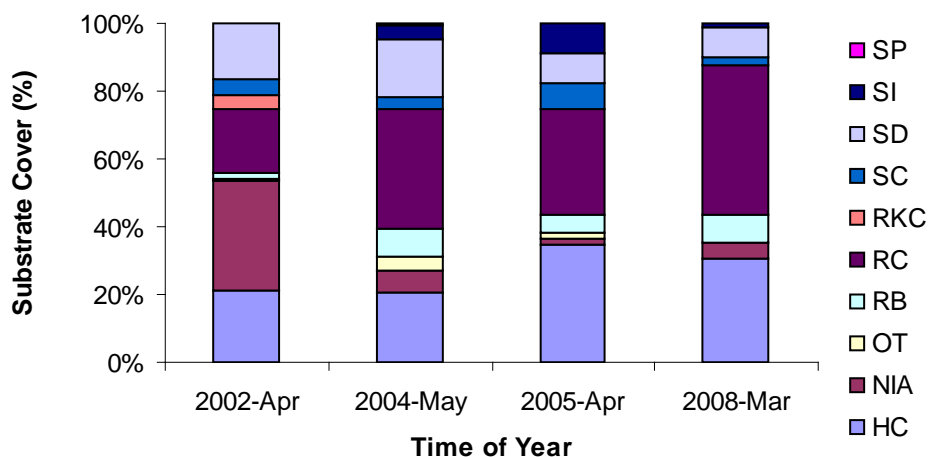
SITE NAME: SAXON REEF

Saxon Reef (16°27.50S, 145°58.958E) is visited by a number of tourist dive operators. It is a back reef bommie field with sandy patches. Saxon reef is a Marine Park Green Zone.



### Substrate Survey

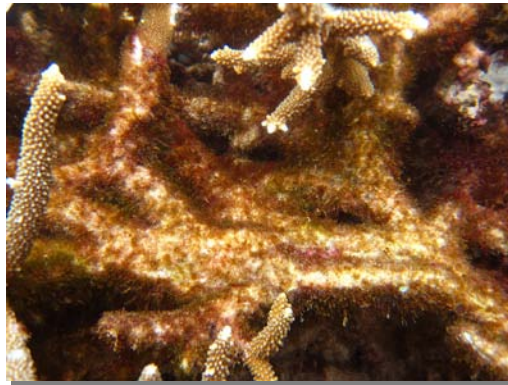
Hard coral cover accounted for only approximately 20% of the transect in 2002 and 2004, increasing to nearly 30% by 2008. Nutrient indicator algae exhibited a marked decrease, accounting for nearly 40% of the transect in 2002 when there was a bloom of “Golden Noodle” algae (*Chrysocystis fragilis*) at several reefs in the Cairns area. Nutrient indicator algae was down to 5% in 2008 (Graph 22).



Graph 22. Substrate type and percent cover at Saxon Reef.

### Dominant Algae: 2008

The two most dominant algae at Saxon Reef were red filamentous algae and a turf algae.



### Invertebrates and Impacts: 2008

Crown-of-thorns starfish were not observed at Saxon Reef. A total of 4 *Drupella* spp. and 2 feeding scars were observed along with 16 other coral scars from unknown causes. A single incidence of partial bleaching was observed.

## GREAT BARRIER REEF CAIRNS

REEF NAME: HASTINGS REEF

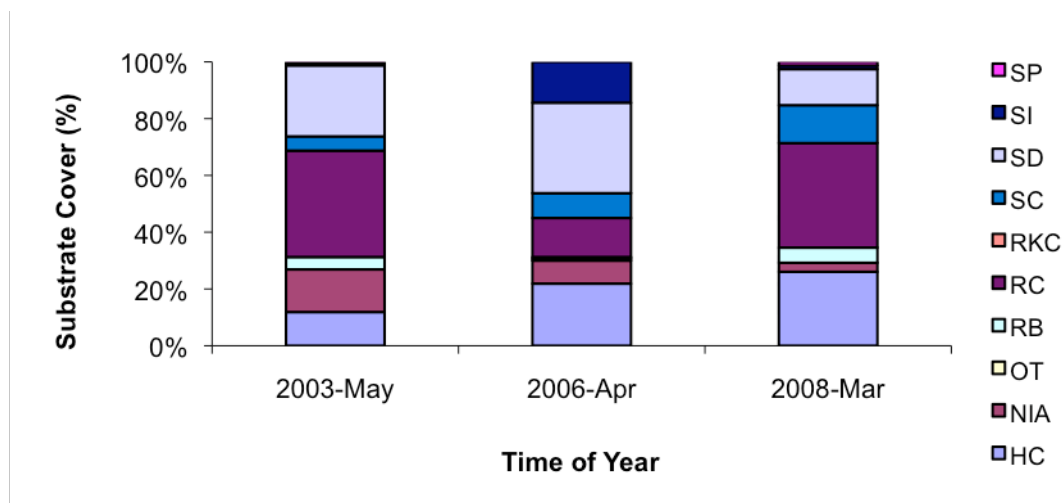
SITE NAME: *HASTINGS REEF NORTH*

Hastings Reef North is located approximately 42 km from Cairns (16°13.31 S, 146°00.70 E). Considered to be subject to low overall anthropogenic impact, this site is most popular as a diving and snorkelling destination. Reef Check has mapped out 4 potential survey sites but to date has only surveyed 2 of these sites. Site 1 and site 3.



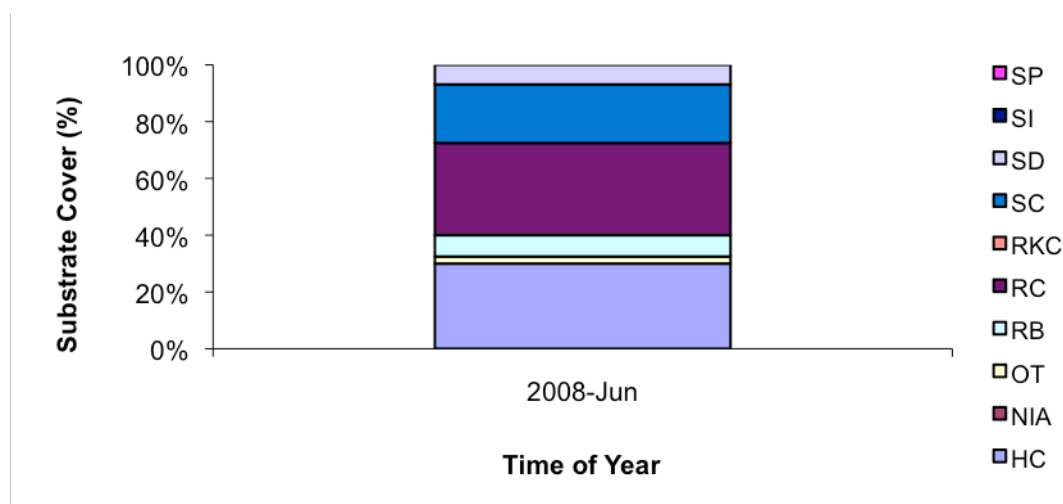
### Substrate Survey Site

At Site 1 Hard coral cover has increased over the past 6 survey years, from approximately 18% in 2003 to 30% in 2008. In 2003, hard coral cover decreased to less than 10% and nutrient indicator algae was slightly higher. However, in 2008 nutrient indicator algae decreased to about 4% as hard coral cover increased (Graph 23a).



Graph 23a. Substrate type and percent cover at Hasting Reef North Site 1.

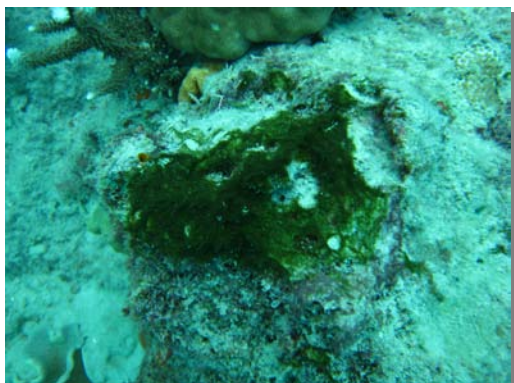
At site 3 the hard coral cover in 2008 was 30%. There was no nutrient indicator algae recorded. The majority of the rock recorded was covered in turf algae.



Graph 23b. Substrate type and percent cover at Hasting Reef North Site 3.

#### Dominant Algae: 2008

Only filamentous algae was recorded as dominant at site 1. At site 3 turf algae was dominant.



#### Invertebrates and Impacts: 2008

These sites were found to be free from crown-of-thorns starfish and *Drupella* spp. as well as their associated feeding scars. No coral bleaching or disease was observed at these sites.

GREAT BARRIER REEF  
CAIRNS

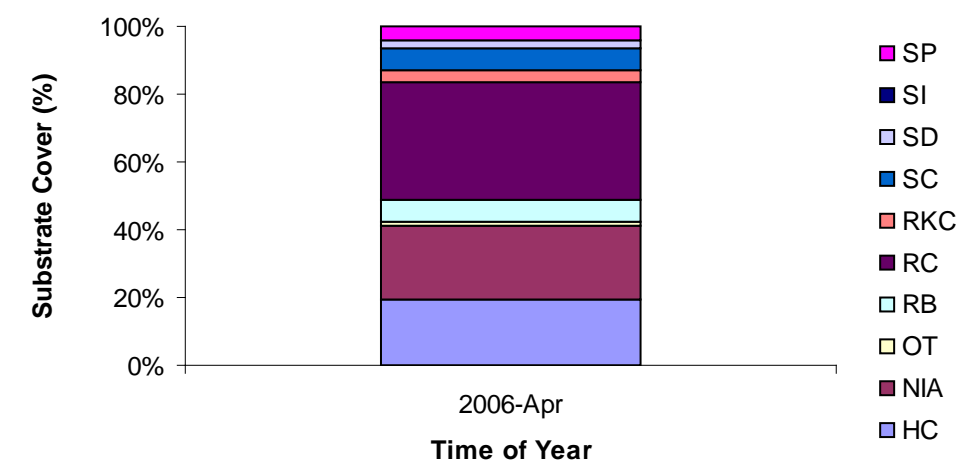
REEF NAME: HASTINGS REEF  
SITE NAME: *HASTINGS REEF SOUTH*

Hastings Reef South is also located about 42 km off the coast of Cairns (16°31.892S, 145°59.672 E). It is an exposed site occasionally subject to high siltation and is in a Marine Park Green Zone. This site was not surveyed in 2008.



Substrate Survey

When this site was surveyed in 2006, hard coral cover was found to account for nearly 20% of the transect. Nutrient indicator algae also accounted for nearly 20% (Graph 24).



Graph 24. Substrate type and percent cover at Hastings Reef South.



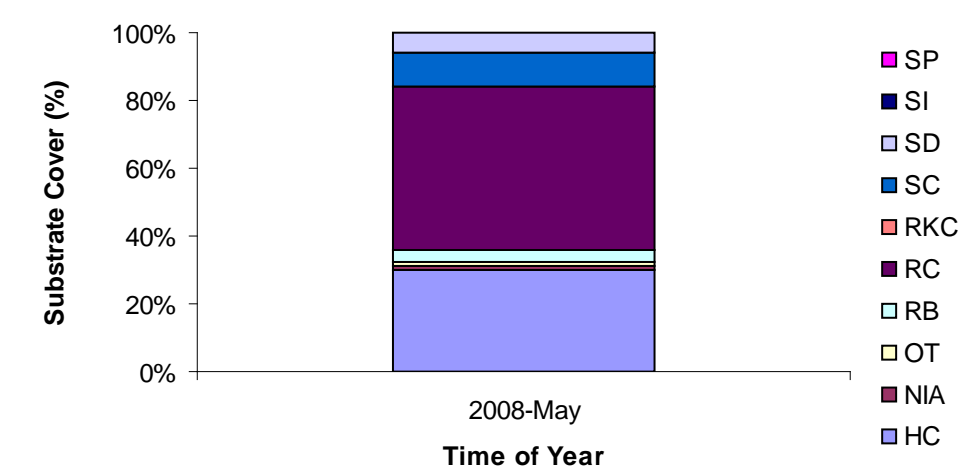
GREAT BARRIER REEF  
CAIRNS

REEF NAME: FLYNN REEF  
SITE NAME: *FISHBOWL*

Flynn Reef is located approximately 56 km from Cairns (16°43.91 S, 146°15.98 E). It is a back reef slope, which is always sheltered and considered the best reef in the area. It is in a Marine Park Yellow Zone. Only substrate data was recorded for this first year of monitoring this site.

Substrate Survey

When this site was surveyed in 2008, hard coral cover was found to comprise 30% of the substrate and nutrient indicator algae only about 2% (Graph 25).



Graph 25. Substrate type and percent cover at Flynn Reef.

## GREAT BARRIER REEF CAIRNS

REEF NAME: FLYNN REEF

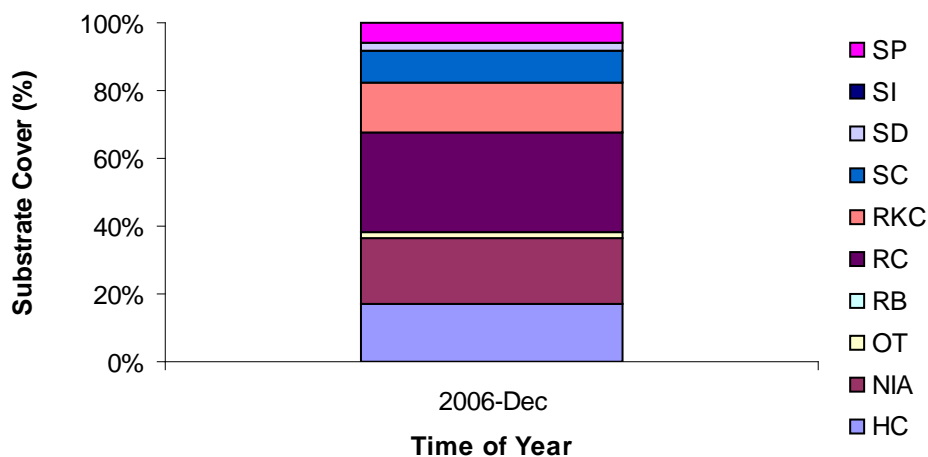
SITE NAME: *GORDON'S MOORING*

Gordon's Mooring is also located within Flynn Reef (16°43.922 S, 146°16.023 E) approximately 50 km East of Cairns. Gordon's Mooring is comprised of a variety of small bommies, swim-throughs and overhangs. This site is a Marine Park Yellow Zone. This site was not surveyed in 2008.



### Substrate Survey

When this site was surveyed in 2006, hard coral cover was an estimated 17% of the substrate whilst nutrient indicator algae accounted for 20% (Graph 26).



Graph 26. Substrate type and percent cover at Gordon's Mooring.

## GREAT BARRIER REEF CAIRNS / PORT DOUGLAS

REEF NAME: MILN REEF

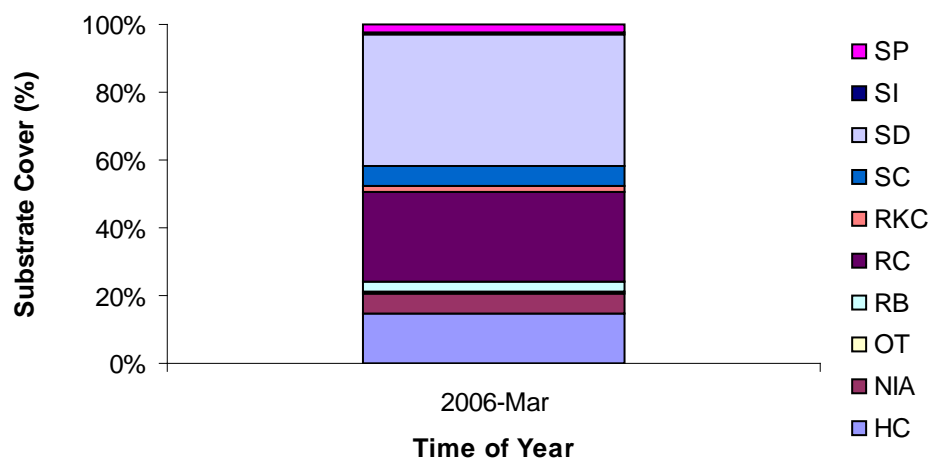
SITE NAME: *SWIMMING POOL*

Swimming Pool is located approximately 55 km off of the coast of Cairns (16°47.515S, 146°15.859 E). It is a new Reef Check survey site as of 2006. It is sometimes a sheltered site. This site was not surveyed in 2008.



### Substrate Survey

In 2006, hard coral cover accounted for approximately 15% of the substrate and nutrient indicator algae an estimated 5% (Graph 27).



Graph 27. Substrate type and percent cover at Swimming Pool, Miln Reef.

GREAT BARRIER REEF  
CAIRNS

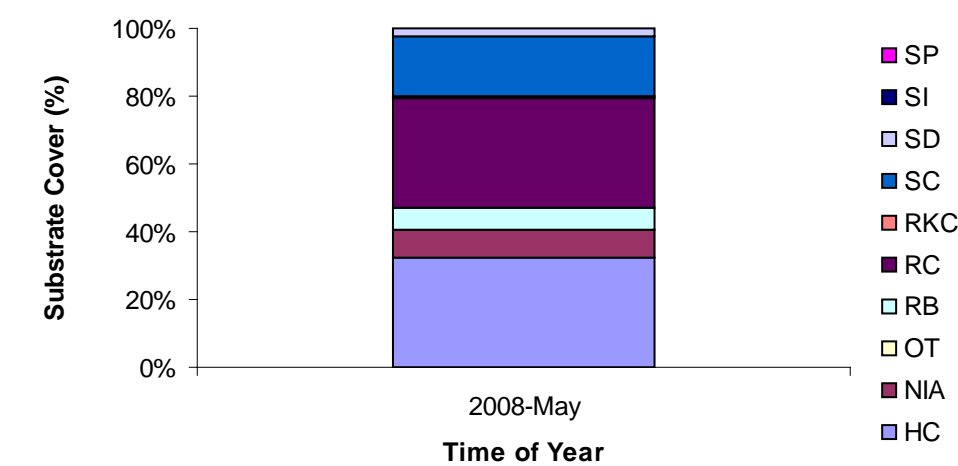
REEF NAME: THETFORD REEF  
SITE NAME: *THETFORD REEF*

Thetford Reef is located approximately 45 km East of Cairns (16°47.76S, 146°10.78E). It is an exposed back reef wall site considered to be the best reef in the area. Only substrate data was recorded for the 2008 survey year.



Substrate Survey

When this site was surveyed in 2008, hard coral cover was found to be 30% of the substrate and nutrient indicator algae approximately 10% (Graph 28).



Graph 28. Substrate type and percent cover at Thetford Reef.

## GREAT BARRIER REEF CAIRNS

REEF NAME: MOORE REEF

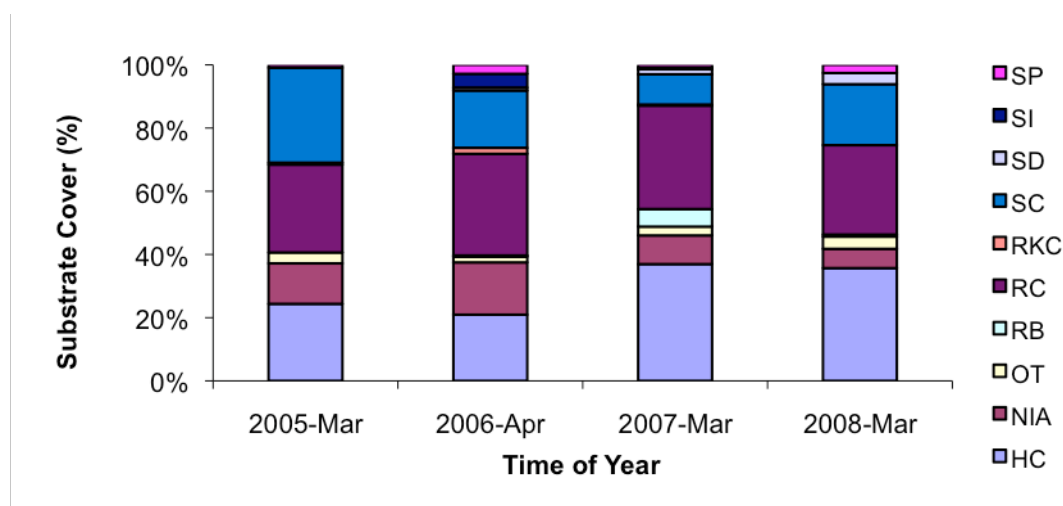
SITE NAME: *MOORE REEF*

Located approximately 47 km off of the coast of Cairns (16°52.35S, 146°12.28E), Moore Reef is in a Marine Park Green Zone.



### Substrate Survey

Hard coral cover has increased from approximately 20% in 2005 to 35% in 2008. The site is recovering from a crown-of-thorns outbreak that affected the reef prior to 2005. As the hard coral has recovered, nutrient indicator algae has decreased from approximately 15% in 2005 to 7% in 2008 (Graph 29).



Graph 29. Substrate type and percent cover at Moore Reef.



### Dominant Algae: 2008

The two most dominant algae found at this site were a species of *Halimeda* and filamentous algae.



### Invertebrates and Impacts

This site was free from crown-of-thorns starfish and *Drupella* spp. as well as their associated feedings scars. Two coral scars were observed but their origin unknown. No coral bleaching or coral disease was observed at this site.

GREAT BARRIER REEF  
CAIRNS

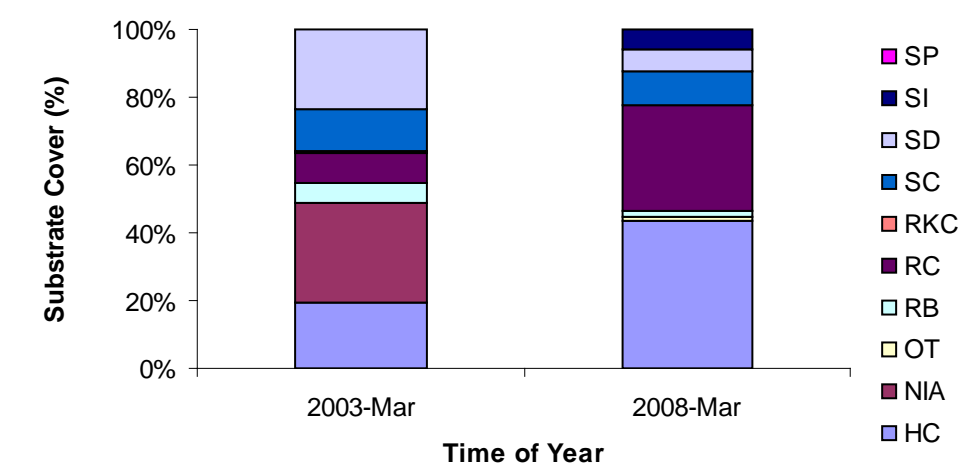
REEF NAME: BRIGGS REEF  
SITE NAME: *BRIGGS REEF*

An exposed reef located 47 km from Cairns, Briggs Reef (16°56.108 S, 146°12.191 E) is in a Marine Park Green Zone.



Substrate Survey

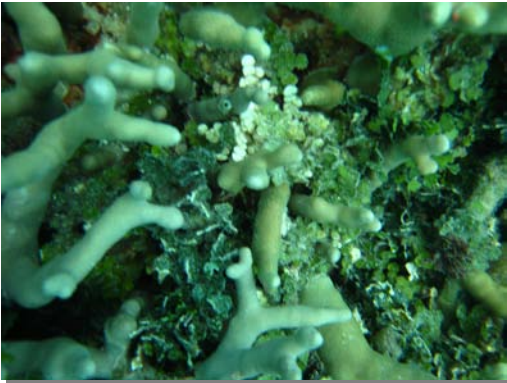
This reef has been surveyed twice, however at both times this was in a different place therefore comparisons between the years should be treated with care. From the data presented here it appears that nutrient indicator algae was more prominent in the 2003 survey than in 2008 (Graph 30).



Graph 30. Substrate type and percent cover at Briggs Reef.

### Dominant Algae: 2008

The two most dominant algae found at this site were a species of *Halimeda* and filamentous algae.



### Invertebrates and Impacts

Although one crown-of-thorns starfish feeding scar was observed, the animals themselves were not observed on the transect. This site was also free from *Drupella* spp., coral bleaching as well as any coral disease.

## GREAT BARRIER REEF TOWNSVILLE

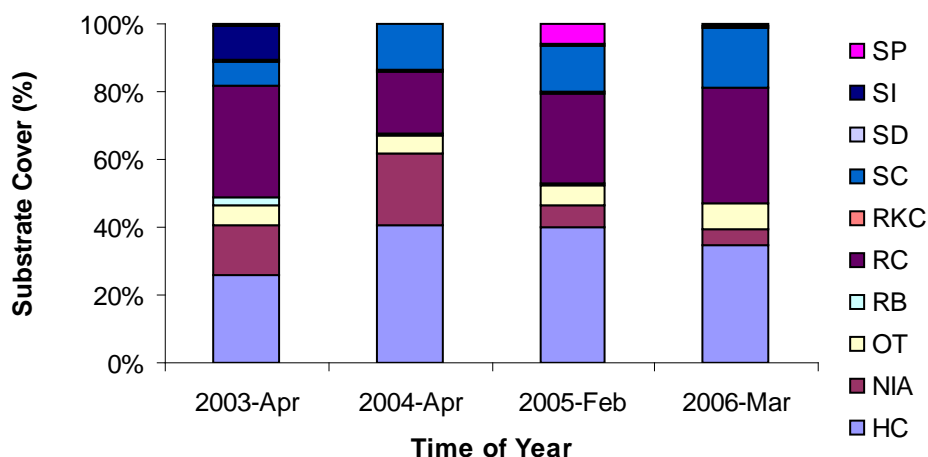
REEF NAME: DAVIES REEF  
SITE NAME: *THE LOST WORLD*

Davies Reef is located Southeast of Townsville (18°349.578S, 147°37.636E). The Reef Check survey site is located on the leeward side of the reef and as such is protected from the prevailing wind. This survey site was predominantly located on a wall. Davies Reef is located within a Marine Park Yellow Zone.



### Substrate Survey

Hard coral cover was approximately 35% of the substrate type in 2006, up from nearly 24% in 2003. Nutrient indicator algae decreased from nearly 15% in 2003 to only 5% in 2006 (Graph 31).



Graph 31. Substrate type and percent cover at Davies Reef.

### Dominant Algae: 2008

The two most dominant algae observed were a species of *Halimeda* sp. and filamentous algae.



### Invertebrates and Impacts: 2008

Only coral bleaching and coral disease were observed at this site, both at very minimal levels. A small amount of coral bleaching was observed and found to affect only 0.03% of the coral population. A couple of incidences of what may be coral disease were also observed (see photo).





## GREAT BARRIER REEF TOWNSVILLE

REEF NAME: WHEELER REEF

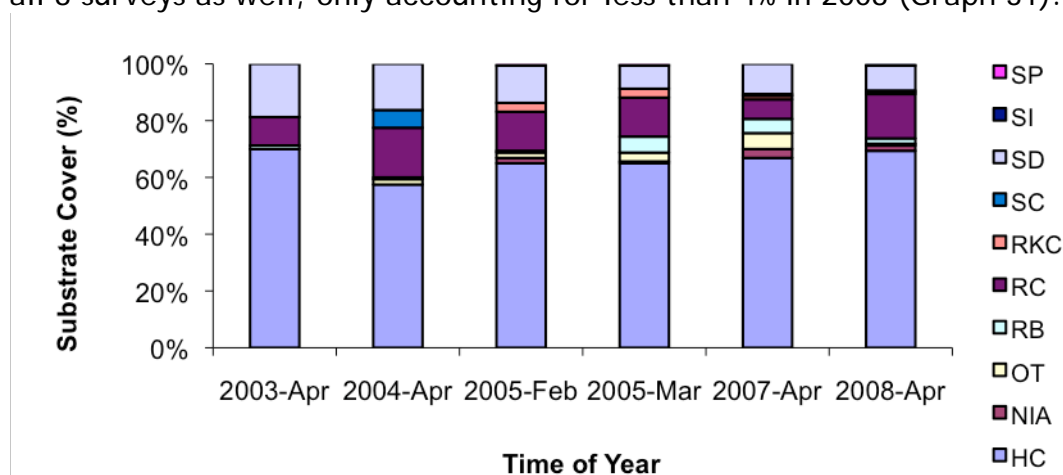
SITE NAME: *WHEELER REEF*

Wheeler Reef is an outer reef located east of Townsville (18°47.695S, 147°31.270E) and is sheltered on one side. It is a Marine Park Green Zone and would be considered one of the most pristine sites in the area due to its high percentage of live coral cover. The reef flat leads to a wall and a number of bommies, canyons and patches of reef surrounded by sand, reaching depths of 40m and above.



### Substrate Survey

Hard coral cover was found to be the most dominant substrate type in all 6 surveys, accounting for approximately 70% of the substrate in 2008. Nutrient indicator algae were relatively low for all 8 surveys as well, only accounting for less than 4% in 2008 (Graph 31).



Graph 31. Substrate type and percent cover at Wheeler Reef.



### Dominant Algae: 2008

Relatively free of nutrient indicator algae, the two most dominant algae found at this site were turtle weed and a species of *Halimeda* sp.



### Invertebrates and Impacts: 2008

Wheeler reef was free of any crown-of-thorns starfish, their feeding scars, coral bleaching and coral disease. Only a single *Drupella* sp. snail was observed. No coral scars of any kind were observed at this site.

## GREAT BARRIER REEF TOWNSVILLE

REEF NAME: JOHN BREWER REEF

SITE NAME: *JOHN BREWER REEF*

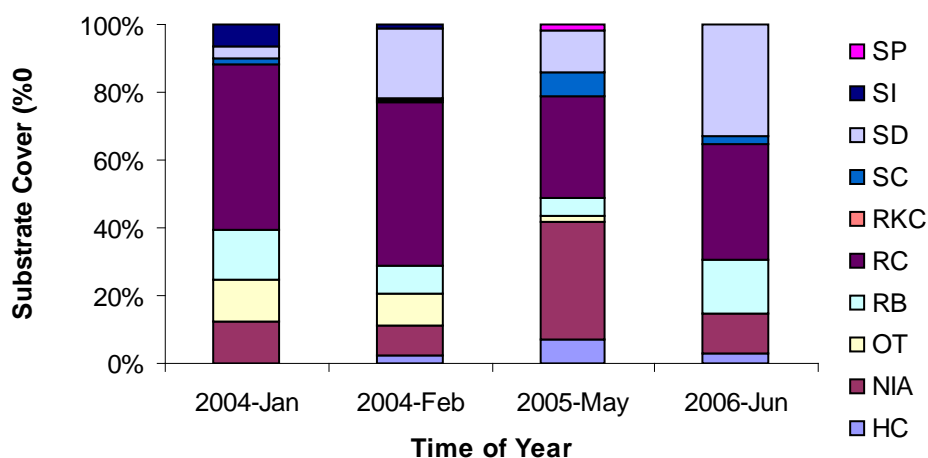
John Brewer Reef is a mid shelf reef situated approximately 72km from Townsville (18°57.364S, 146°57.375E). It is a lagoonal back reef habitat comprising a number of shallow bommies surrounded by sand. It is a yellow zone in the Great Barrier Reef Marine Park.

About 100 snorkellers and a handful of divers visited the site 4 times a week between 2003 and 2007. The site is frequented by commercial line fishing operations. A crown-of-thorns outbreak occurred in the 1980s and again during early 2000s. The outbreak appeared to have subsided during the latter part of 2004 and crown-of-thorns starfish numbers diminished.



### Substrate Survey

Hard coral cover has shown a mild recovery from the crown-of-thorns starfish outbreak. Accounting for less than 1% of the substrate in 2004, hard coral cover was an estimated 5% in 2006. Nutrient indicator algae peaked in 2005, at almost 40% but was found to have declined down to 10% in 2006 (Graph 32).



Graph 32. Substrate type and percent cover at John Brewer Reef.

## GREAT BARRIER REEF TOWNSVILLE

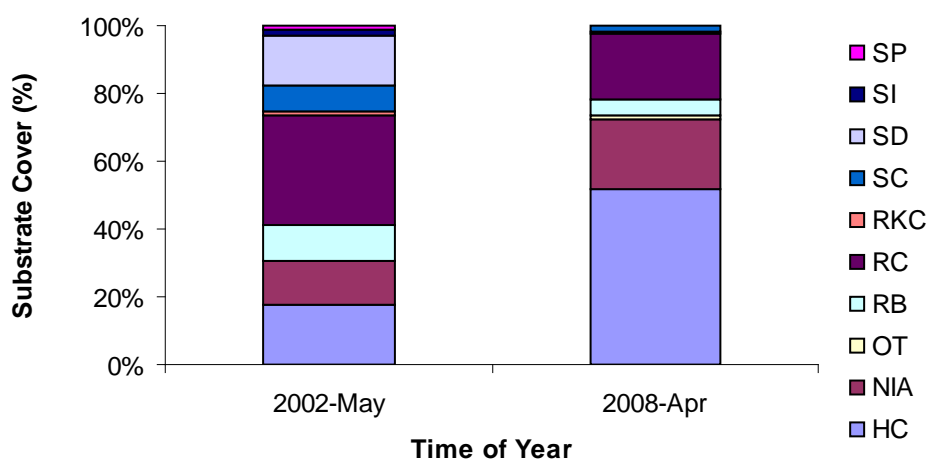
REEF NAME: KELSO REEF  
SITE NAME: *KELSO REEF*

Kelso Reef is located about 89km from Townsville (18°25.9S, 146°59.2 E). It is an exposed back reef slope considered the best reef in the area. It is a Marine Park Green Zone. Kelso Reef was also hit by the last crown-of-thorns starfish outbreak (2002-4) however parts of the reef were in good condition at the time of this survey.



### Substrate Survey

The site surveyed in 2002 is different to that surveyed in 2008. Differences in hard coral cover between survey years may be attributed to either recovery or differences between the outbreak damage across the reef (Graph 33).



Graph 33. Substrate type and percent cover at Kelso Reef.

### Dominant Algae: 2008

The two most dominant algae found were turtle weed and filamentous algae.



### Invertebrates and Impacts: 2008

This site was free of crown-of-thorns starfish and their associated feeding scars. Although no *Drupella* spp. were observed, one feeding scar was found on a single coral colony. Although this site was free from coral disease, a couple of incidence of possible coral bleaching were observed.

## GREAT BARRIER REEF

### AIRLIE BEACH: WHITSUNDAY AREA

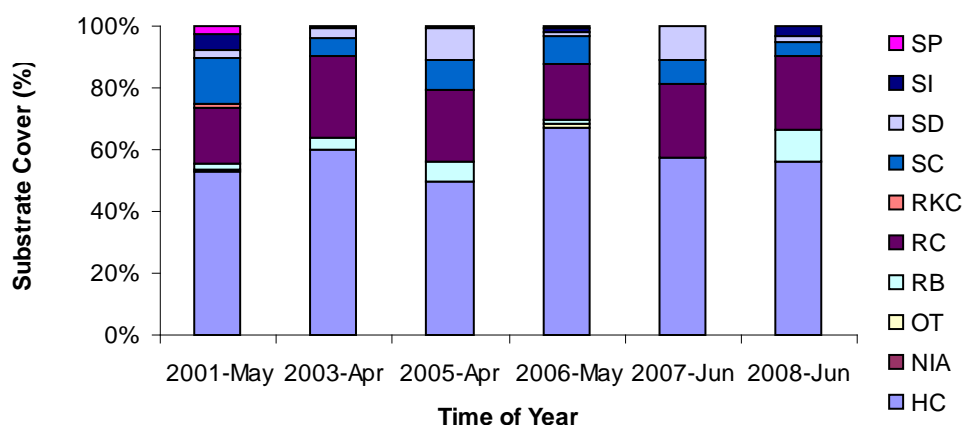
REEF NAME: HAYMAN ISLAND  
SITE NAME: *BLUE PEARL BAY*

Blue Pearl Bay, located just 27km off the coast of Hayman Island (20°02.34S, 148°52.55E), is a sheltered, fringing reef considered the best in its area. Siltation is often a problem at this site. On a typical day, it is visited by more than 5 yachts.



#### Substrate Survey

Hard coral cover has fluctuated over the past 8 years, from 55% in 2001 to 65% in 2006 back to 55% in 2008. Nutrient indicator algae has never appeared in high abundance at this site, accounting for 0% in 2008 (Graph 34).



Graph 34. Substrate type and percent cover at Blue Pearl Bay.

### Dominant Algae: 2008

Turf algae were the only dominant algae found at this site.



### Invertebrates and Impacts: 2008

The only impacts recorded at this site were a single partially bleached coral.



## GREAT BARRIER REEF

### AIRLIE BEACH: WHITSUNDAY AREA

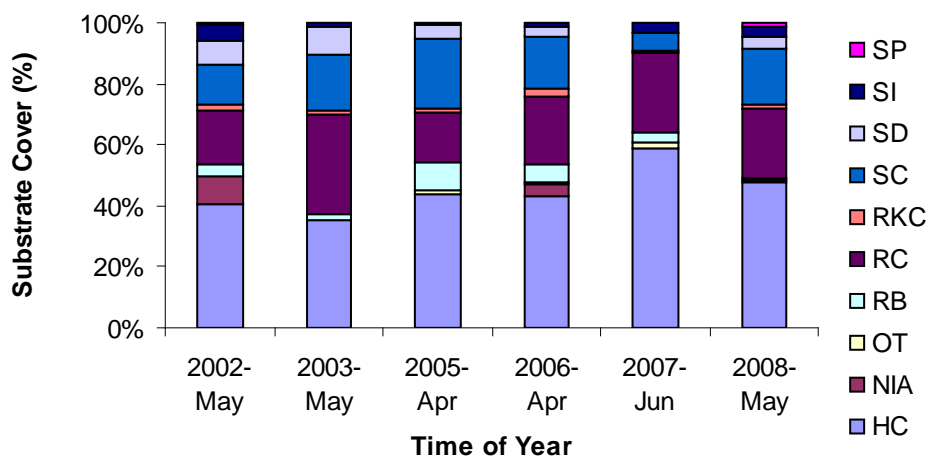
REEF NAME: HARDY REEF  
 SITE NAME: REEF WORLD PONTOON

Hardy Reef is also located in Airlie Beach (19°44.746S, 149°09.957E) off the Reef World Pontoon. It is a back reef wall subject to minimal anthropogenic impacts. It is a Marine Park Green Zone.



#### Substrate Survey

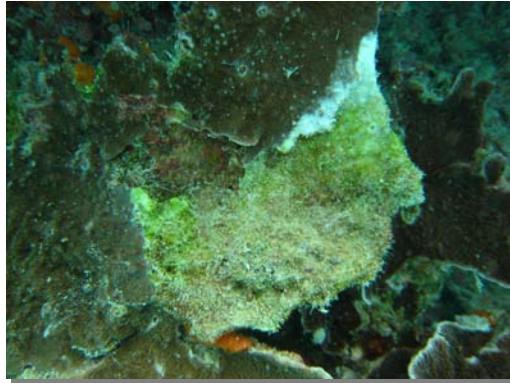
Hard coral cover fluctuated over the survey years, however was found to comprise approximately 42% of the substrate in 2008. Nutrient indicator algae was found to account for less than 1% of the substrate in 2008 (Graph 35).



Graph 35. Substrate type and percent cover at Hardy Reef.

### Dominant Algae: 2008

The dominant algae at this site was turf algae.



### Invertebrates and Impacts: 2008

This site was found to be free from crown-of-thorns starfish, *Drupella* spp. and their associated feeding scars. Only 3 coral scars were observed, their origin unknown. There was no observed coral bleaching or coral disease at this site although coral disease has been observed in the area in other years.

## GREAT BARRIER REEF

### AIRLIE BEACH: WHITSUNDAY AREA

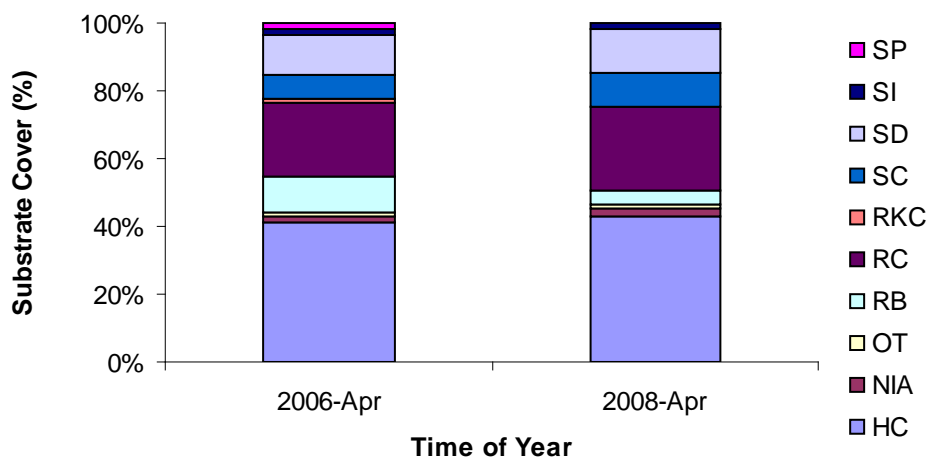
**REEF NAME:** Knuckle Reef  
*SITE NAME: Knuckle Reef*

Knuckle Reef (19°34.3S, 149°16.1 E) is located 91 km off the coast of Airline Beach, in the Whitsundays. It is a Marine Park Dark Blue Zone and anchoring is prohibited.



#### Substrate Survey

Hard coral cover was found to remain at approximately 40% over the two survey years and nutrient indicator algae at approximately 3% for both years (Graph 36).



Graph 36. Substrate type and percent cover at Knuckle Reef.

### Dominant Algae: 2008

The two most dominant algae found were a species of *Halimeda* sp. and turtle weed.



### Invertebrates and Impacts: 2008

Only one coral scar was observed at this site, due to the feeding habits of *Drupella* spp. However, no *Drupella* were observed. This site was found to be free from crown-of-thorns starfish, coral bleaching as well as coral disease.

## DISCUSSION

The long-term Reef Check monitoring data illustrates trends in the health and resilience of particular reefs. A number of general trends are described here.

The percent cover of hard coral at dive sites in the Northern region of the GBR is higher at reefs that are rated with low impact from run off i.e. the Ribbon Reefs and the Port Douglas Reefs (59.58 & 42.03% respectively). Average coral cover is lower in the Cairns region AT 32.97%, which is possibly due to higher water quality pollution levels due to the reefs' proximity to the Trinity river outlet and the cane-farming region. The Cairns and Port Douglas region saw an algae bloom of "Golden Noodle" algae (*Chrysocystis fragilis*) in 2002-3. This algae bloom died down the following year and has not since reoccurred.

Overall crown-of-thorns starfish do not pose a current threat to the Reef Check sites on the GBR. However, there are some sites (e.g. Kelso Reef and John Brewer Reef) that were adversely affected during the last outbreak. Only John Brewer was surveyed for a few years after the outbreak died down and recovery of hard coral monitored to date has been slow. A low number of *Drupella* spp. snails were found at most sites and many coral scars appeared to be snail feeding scars. Coral disease and coral bleaching were recorded in very low abundance at only a few sites.

*Reef Check would like to thank AMPTO and the numerous dive operators for their continued support of the Reef Check program on the Great Barrier Reef; all Reef Check volunteers who have donated their time and energy to collecting 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.*