

# **Report on Reef Check Monitoring Programme in Saint Lucia (1999-2004)**

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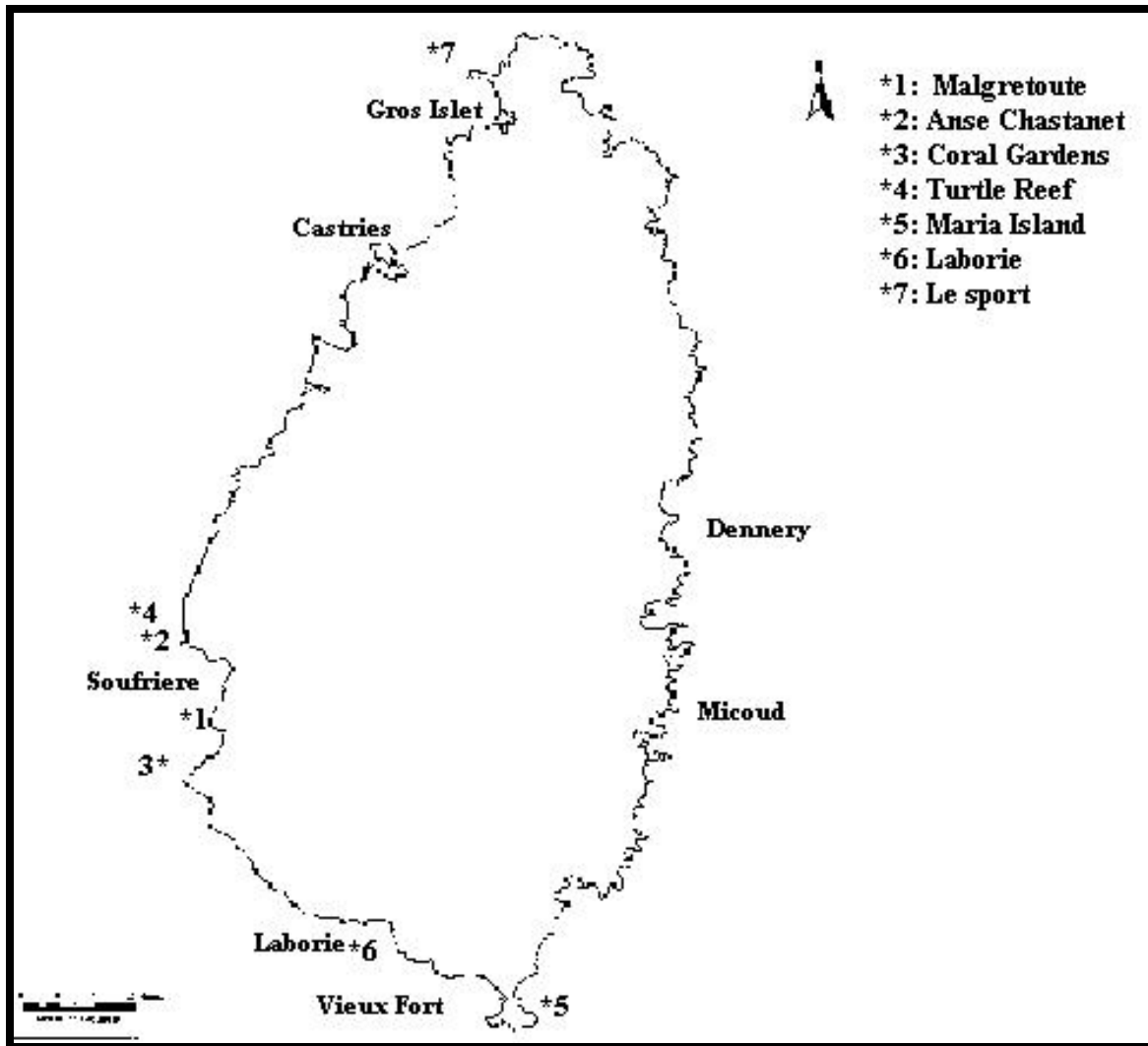
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## **Introduction**

Reef Check is the largest international coral reef monitoring program. It started in 1997, and at the same time was conducted by 100 volunteer scientists and over 750 volunteer sports divers. At that time more than 300 reefs were surveyed in 50 countries. To date, 160 scientists are leading over 1500 trained divers in surveys of 250 reefs in 50 countries.

The methods used by this reef monitoring programme are simplistic so as to allow for them to be used by non-scientists. Methods entail setting up permanent transect lines to record benthic species and substrates at set points along the line, and the species and number of fish and selected invertebrates present within a belt area (5m wide) along the line.

In 1999, St Lucia became a participant in the Reef Check Programme with five sites (all of which are marine reserves) being established in the Soufriere Marine Management Area (SMMA), which is located on the west coast. In 2002, in an effort to expand monitoring activities islandwide, a site was established in the south south east of the island at Maria Island and another on the south west coast off the village of Laborie. In 2003, yet another site was established, but this time in the north of the island adjacent to the Le Sport Hotel. Note that none of the sites outside of the SMMA are marine reserves. See map below for location of all monitoring sites. This report summarizes the data collected under this programme to date.



## Data Summary

### *Malgretoute*

In 1999, a transect line and belt was established in 3m depth at this site. In 2001, a second transect line and belt was established, but this time at a depth of 10m. This reef starts at the northern-most flanks of Petit Piton. The name Malgretoute means “Despite Everything.” In the shallow areas, the reef mainly comprises large boulders with coral veneer and some small patches of reef. However, in deeper areas the reef fringes the coastal slopes of Petit Piton.

In the shallow areas the main species are encrusting fire coral, sponges and small heads of brain and star coral. However, the deeper parts of the reef are dominated by larger coral heads and sponges.

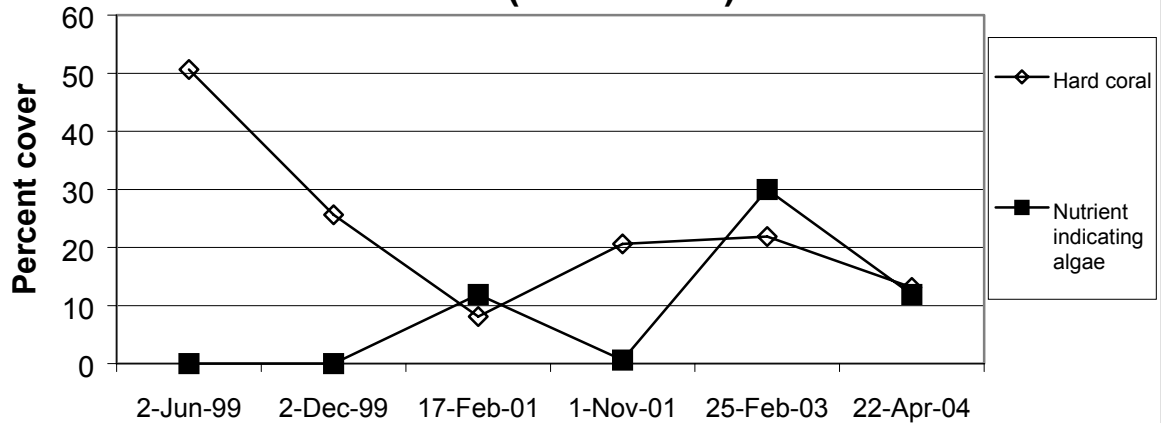
### Results

During the first monitoring activities on this reef in mid 1999, hard coral cover was recorded as 50.63% on the shallow reef area and 35.00% on the deeper reef area. However, later that year, in December, hard coral cover had dropped to 25.62% and 16.88%, respectively. This decrease in hard coral cover in both shallow and deeper reef areas was likely due to the passing of Hurricane Lenny in mid November. The heavy wave action associated with this storm took a toll on coastal resources, causing reef damage in several areas. Notably, between June 1999 to December, 1999, coral cover decreased by 49.38% in the shallow area and 51.79% in the deeper area. Data collected after November, 2001 showed some signs of recovery, that is, an increase in hard coral cover. However, recovery was minimal and, to date, hard coral cover remains well below that recorded as the baseline (June, 1999).

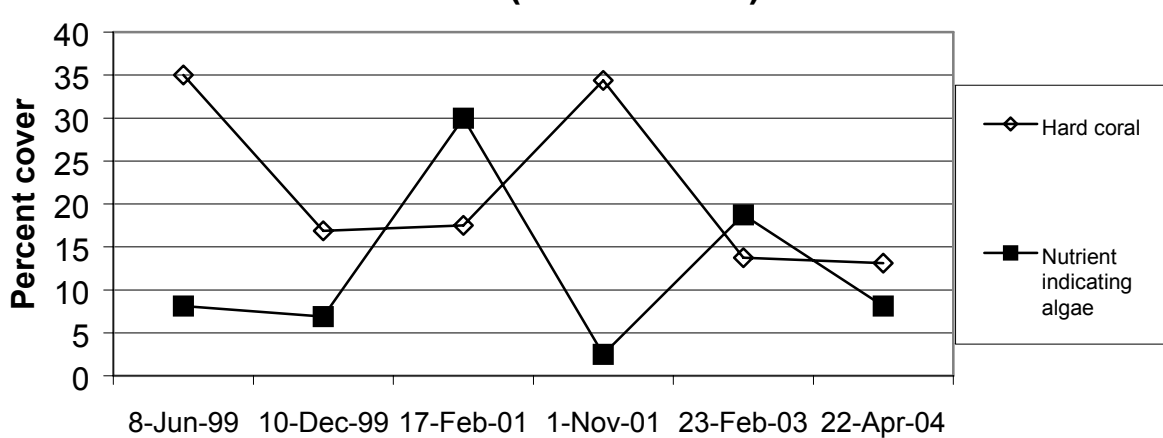
After the passage of Hurricane Lenny, nutrient-indicating algal cover also showed an increase in shallow and deeper areas of the reef. To date, algal cover in the shallow area still remains higher than that of the baseline, but interestingly, algal cover in the deeper reef area has reverted back to baseline figures.

See Figures 1 and 2.

**Figure 1. Malgretoute: Changes in percent hard coral and algal cover on shallow reef area (1999-2004)**



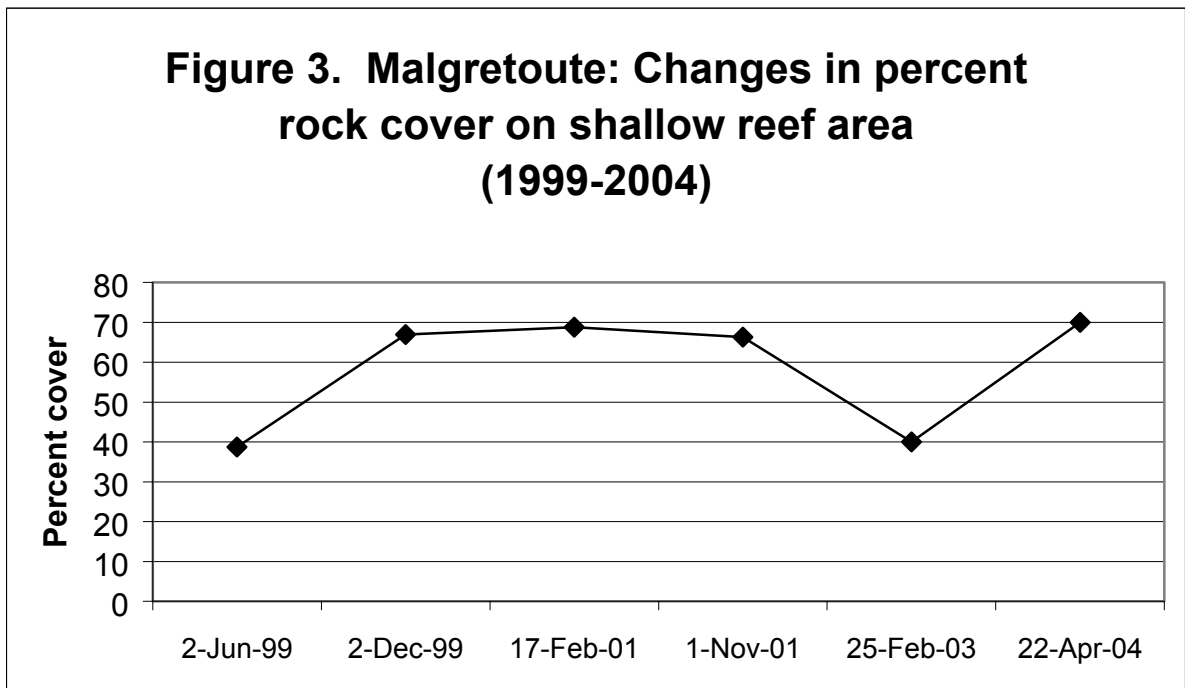
**Figure 2. Malgretoute: Changes in percent hard coral and algal cover on deep (10m) reef area (1999 - 2004)**



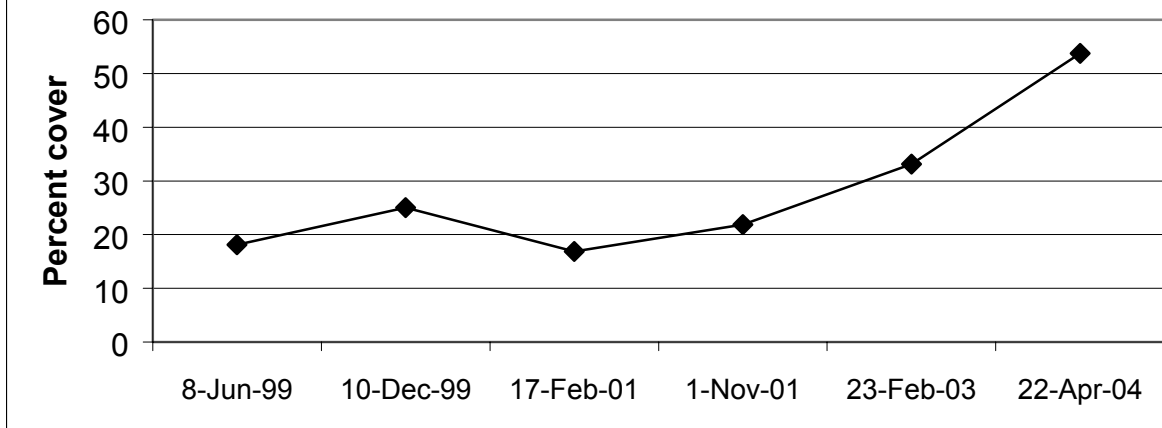
Over the period under review (1999-2004), rock cover has increased in both the shallow and deeper areas. When comparing baseline figures to present (2004), rock cover has increased by 80.65% in the shallow area and 196.55% on reef in the deeper area. This observation is likely due to the decline in hard coral cover, noting that dead coral, once

not recently killed, is recorded as rock. In support of this observation correlation tests performed show that there was a significant negative correlation between rock and hard coral in both shallow (Spearman's  $\rho$ : -0.771;  $\alpha$ : 0.05) and the deeper reef (Spearman's  $\rho$ : -0.829;  $\alpha$ : 0.05) areas.

See Figure 3 and 4.



**Figure 4. Malgretoute: Changes in percent rock cover on deep (10m) reef area (1999-2004)**



#### ***Anse Chastanet***

In 2000, a transect line was established at this site at a depth of 10m. This is a fringing reef, which is located at the mid to southern extent of the Anse Chastanet Bay and starts a few short steps off the beach. There is a plateau area with a very sandy bottom, just before the start of the reef, with depths of 2-8m. The reef generally falls quickly away from 8 to over 50 metres in a solid wall of mixed corals and sponges.

The most common coral species on this reef are *Montastraea annularis* (small star boulder coral), *Porites porites* (finger coral), *Madracis mirabilis* (yellow pencil coral) and a variety of brain corals. Some coral bleaching has been observed on this reef, but this was limited to small sections of the reef.

#### **Results**

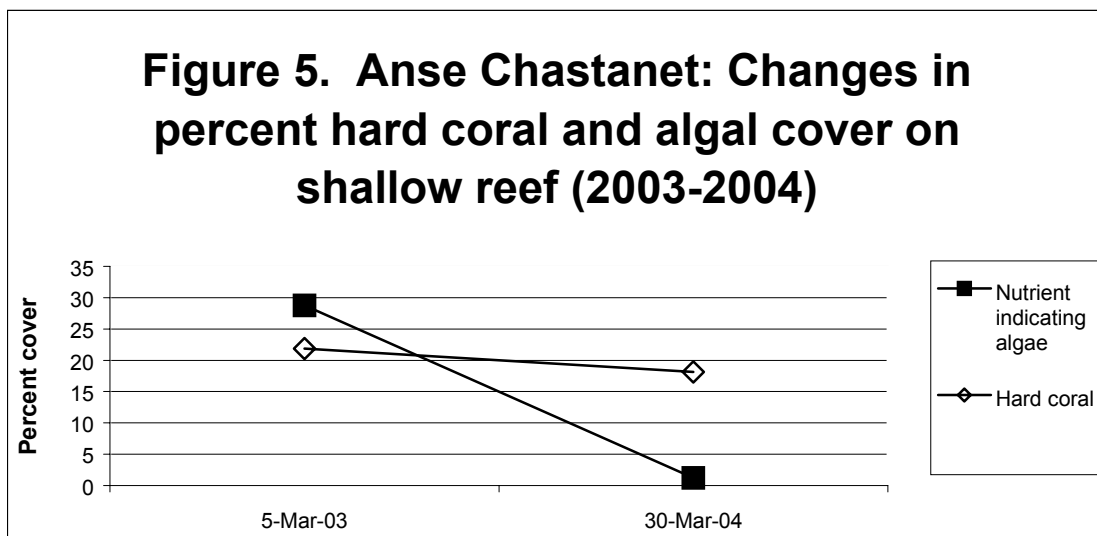
The dataset for the shallow area at this site only covered a two-year span, with one set of data from each year. As such, it was difficult to determine if any significant trends actually existed. However, it was noted that, on the shallow reef area, hard coral cover



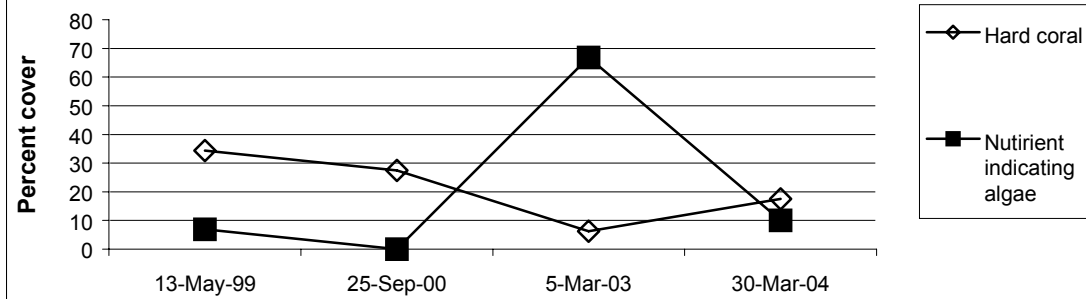
remained relatively similar over the two-year period, while nutrient-indicating algal cover appeared to have declined.

Conversely, the data collected on the deeper reef areas extended over a four-year period, and showed that when baseline (1999) figures were compared to present (2004), hard coral cover had decreased by 62.50% and algal cover had increased by 45.45%.

See Figure 5 and 6.



**Figure 6. Anse Chastanet: Changes in percent hard coral and algal cover on deep reef (1999-2004)**

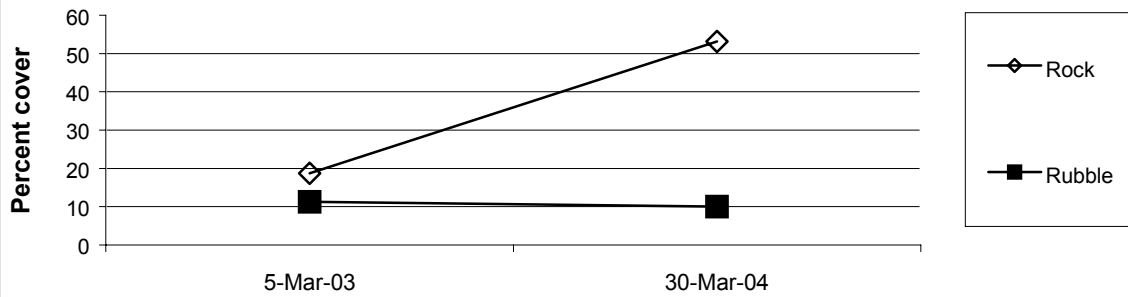


While the data set for the shallow area was limited, as stated earlier, it was noted that in the shallow area, rubble cover remained relatively constant between 2003-2004, but rock cover increased by 183.33%. This latter figure could not be accounted for by a loss in coral cover since during this period coral cover remained relatively the same.

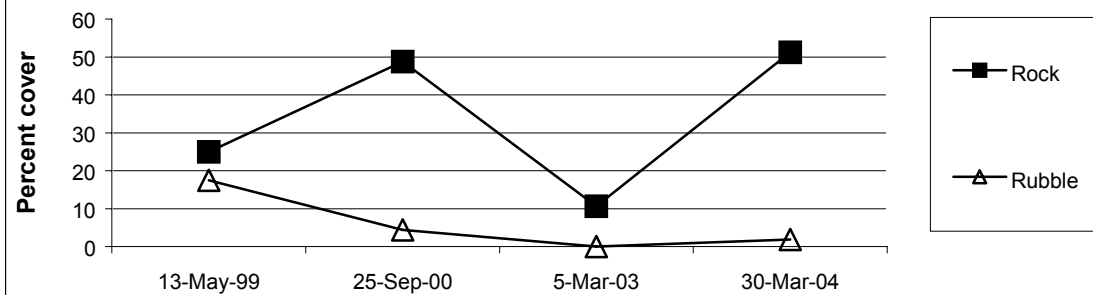
The data set for the deeper reef area showed that rubble decreased over the four-year period, but rock cover showed a general increase. In this case, the increase in rock cover could possibly be accounted for by the loss in hard coral cover, while the decrease in rubble may be accounted for by the increase in sand cover. See appendix for figures representing sand cover.

See Figure 7 and 8.

**Figure 7. Anse Chastanet: Changes in percent rock and rubble cover on shallow reef (2003-2004)**



**Figure 8. Anse Chastanet: Changes in percent rock and rubble cover on deep reef (1999-2004)**



### ***Coral Gardens***

In 2000, a transect line was established at this site in a depth of 10m. A second transect line was setup at a depth of 3m. In general, the reef is fringing with a slope of about 10 – 20 degrees. The reef is located at the base of the Gros Piton (on the northern flank).

The most common coral species found on this reef are *Porites Porites* (finger coral), *Millipora* species (fire coral), *Madracis mirabilis* (yellow pencil coral) and a variety of brain corals.

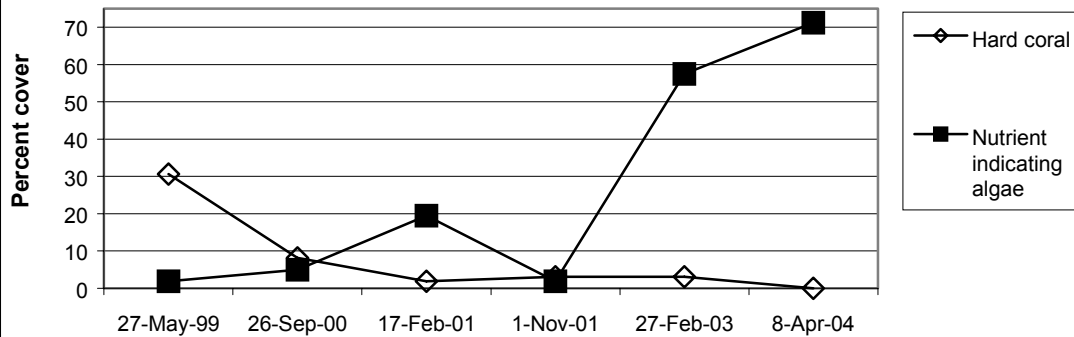
### Results

During the period 1999-2004, hard coral cover in the shallow reef area showed a general decline (from 30.63% in 1999 to 0.00% in 2004). Conversely, nutrient indicating algal cover showed a general increase (from 1.88% in 1999 to 71.23% in 2004). The initial decline noted in 2000, when coral cover decreased by 65.32%, was likely due to the impacts of Hurricane Lenny. Some signs of recovery were noted in 2001, but these appeared to have been short lived since coral cover has continued to decline in this area, while nutrient indicating algal cover has continued to increase.

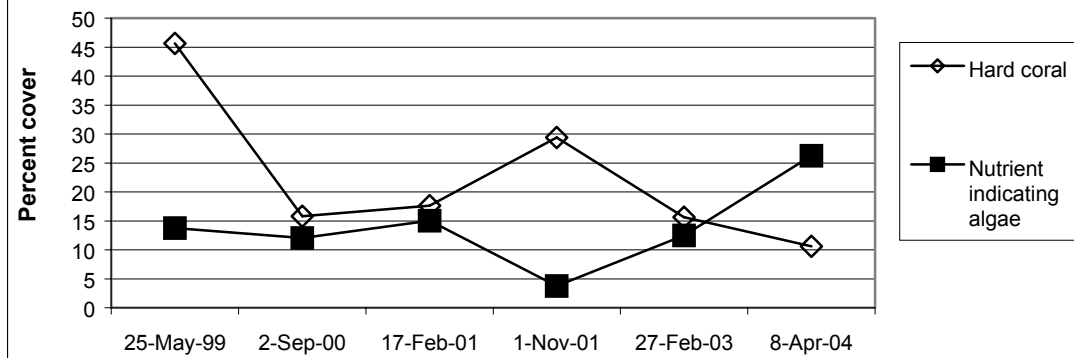
In general, reef in the deeper area showed a similar trend, with hard coral cover decreasing by 76.71% during 1999-2004 and nutrient indicating algal cover increasing by 90.91% during the same period.

See Figures 9 and 10.

**Figure 9. Coral Gardens: Changes in percent hard coral and algal cover on shallow reef (1999-2004)**



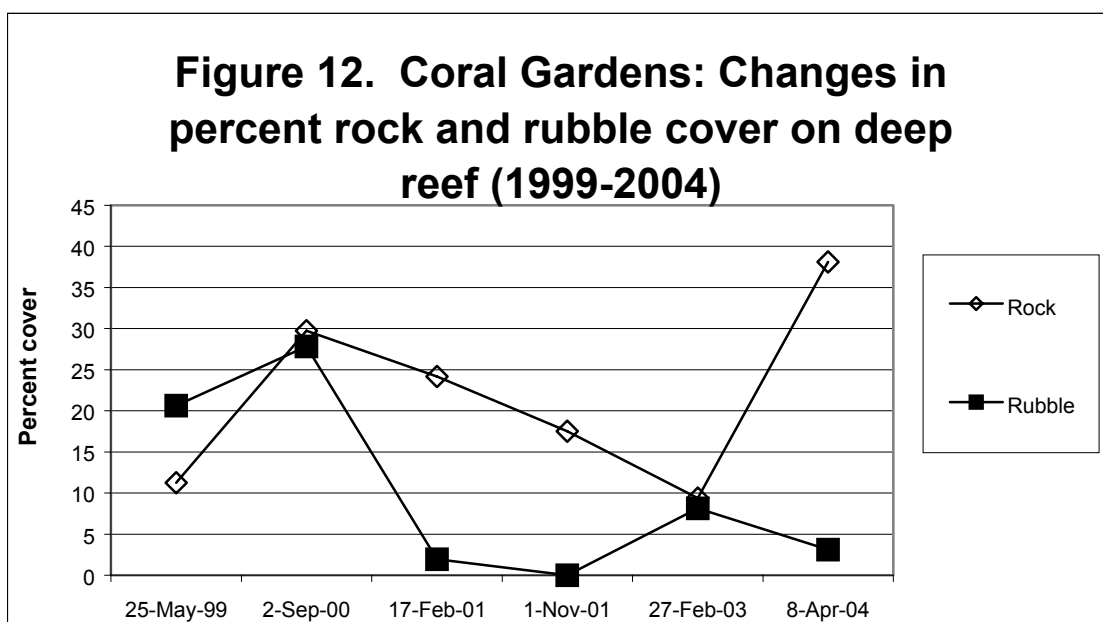
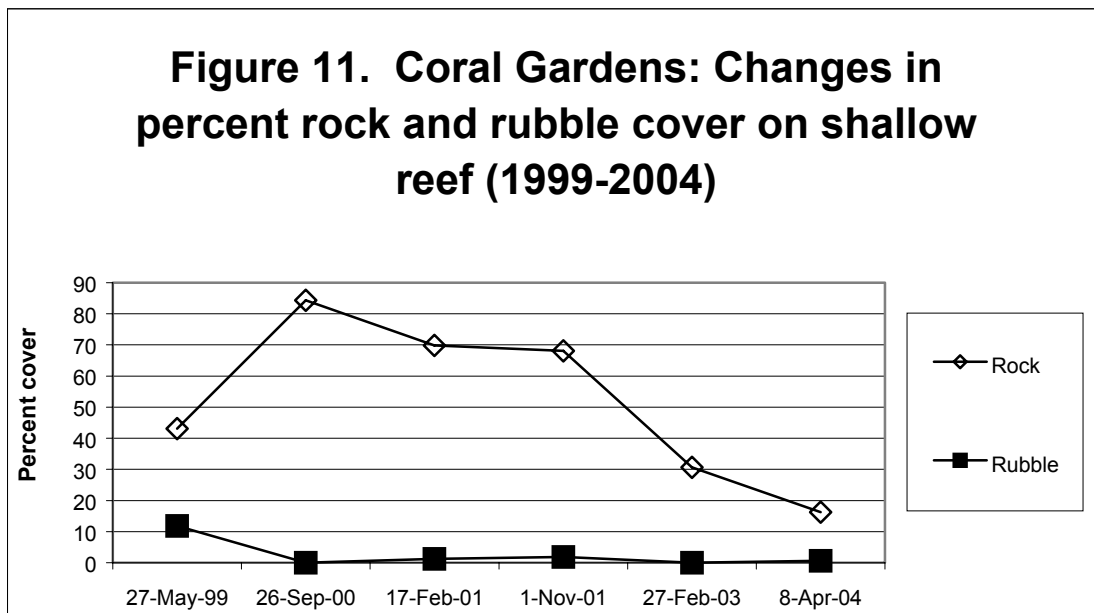
**Figure 10. Coral Gardens: Changes in percent hard coral and algal cover on deep reef (1999-2004)**



On the shallow reef area, rock cover showed an initial increase in 2000, but a general decline after this period. Rubble also showed a general decline over 1999-2004. These general declines could not be accounted for by loss in hard coral cover over this period. However, the declines in rock and rubble cover could be as a result of these substrates being over grown with nutrient indicating algae.

On the deeper reef area, rock cover increased after the passing of Hurricane Lenny in late 1999, but followed a decreasing trend after this period until 2003. Rubble cover showed a general decreasing trend from 1999-2004.

See Figures 11 and 12.



### ***Turtle Reef***

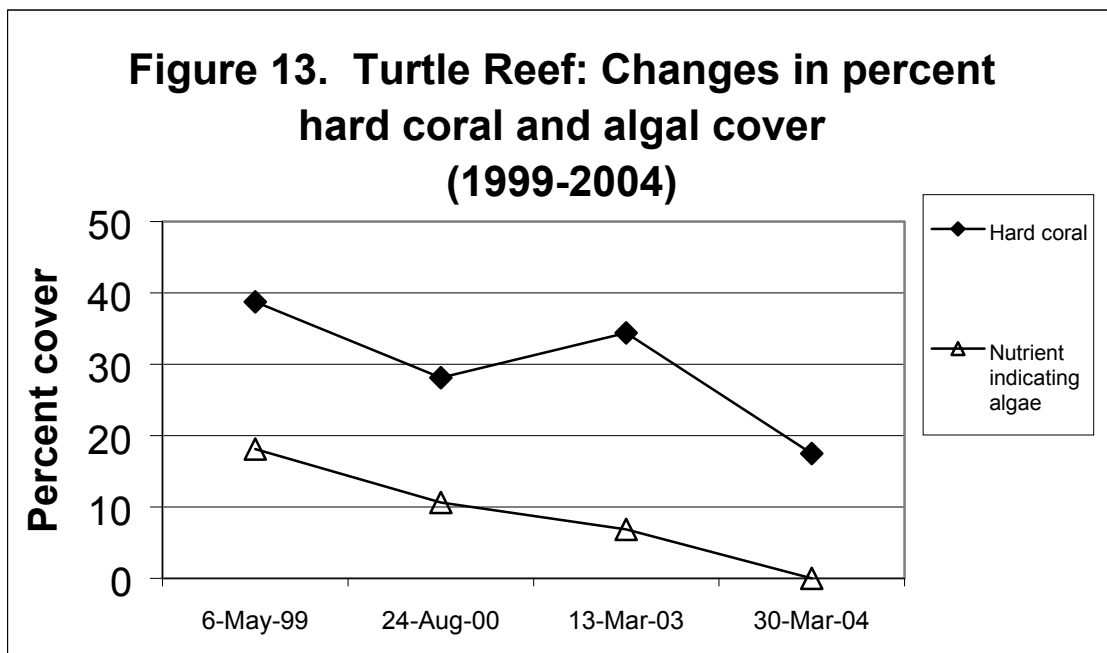
In 2000, a transect line was established at this site at a depth of 10m. This is a relatively large crescent-shaped patch reef to the north of the Anse Chastanet Reef. Depths on this reef range from 12-30m.

The dominant coral species on this reef are *Montastraea annularis* (boulder star corals), *Madracis mirabilis* (yellow pencil coral), *Porites porites* (finger coral) and a variety of brain corals.

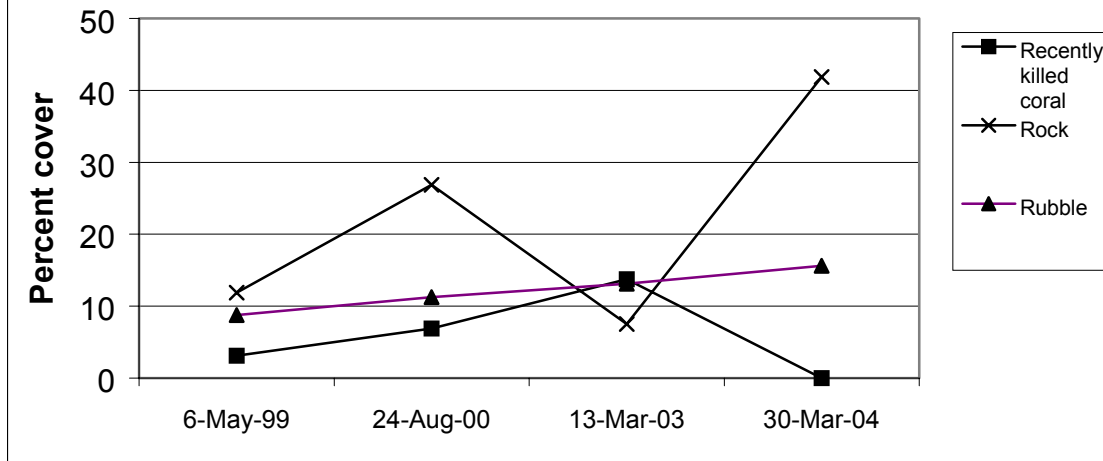
### Results

During the period 1999-2004, both hard coral and nutrient indicating algal cover decreased. However, both rock and rubble cover showed a general increase over this period. Interestingly, recently killed coral cover showed an increase from 1999-2003, but declined in 2004.

See Figures 13 and 14.



**Figure 14. Turtle Reef: Changes in percent cover of various substrates (1999-2004)**



### ***Maria Island***

A transect line was established at this site in 2002, at a depth of 3m. This reef is very shallow and fringing. It is located in the south of the island and west of Maria Islet Major. Depths range from about 5-7m, while some of the coral colonies rise to within 1-2m of the water's surface.

The reef is dominated by coral species such as *Gorgonia ventalina* (common sea fan), *Acropora palmata* (elkhorn coral), *Acropora prolifera* (staghorn coral), and *Millepora complanata* (blade fire corals). A variety of brain corals and sponges are also present on this reef.

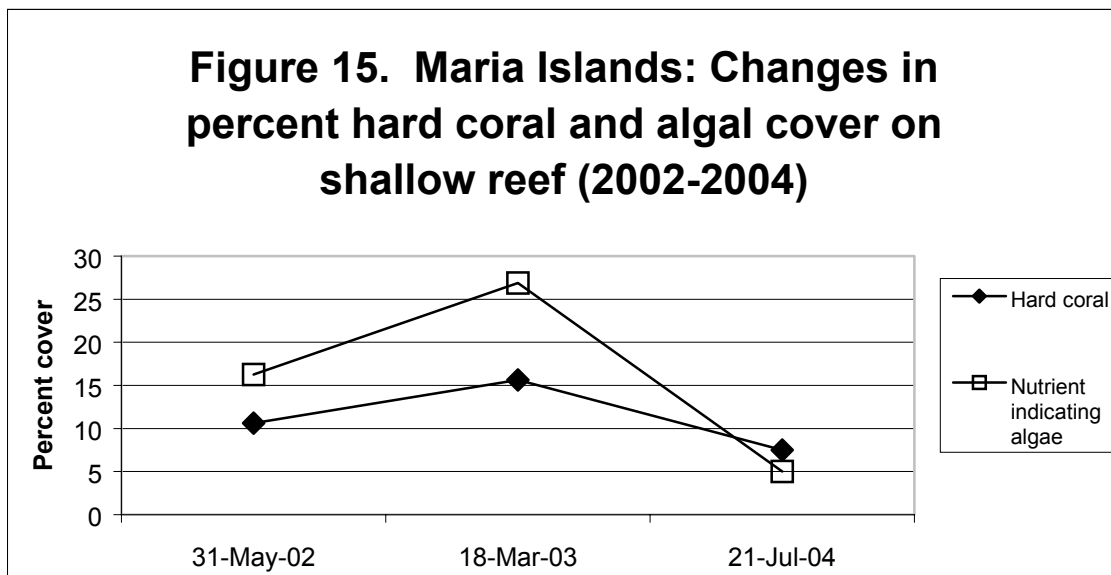
Physical damage is clearly evident and most likely due to the strong surges and currents that are often found in this region. The damage includes detached sea fans, and broken branches of *Acropora prolifera* (staghorn) and *Acropora palmata* (elkhorn), all of which form a latticework of crevices.

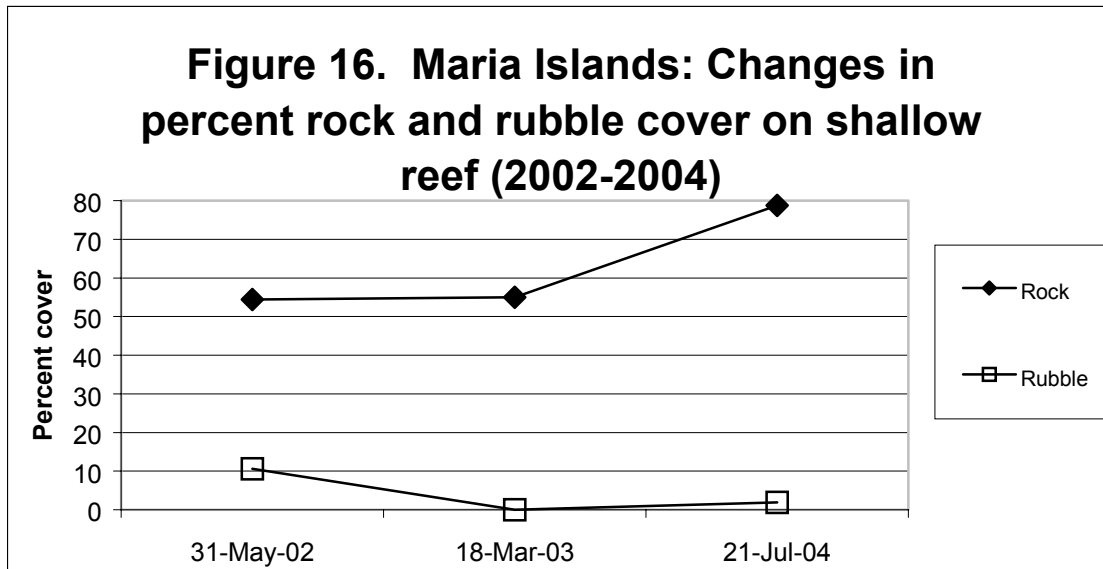


## Results

The data for this reef area spanned a three-year period, with one set of data being collected for each year. As such, there was insufficient data to determine significant trends. However, generally, hard coral and nutrient indicating algal cover followed a similar trend, increasing from 2002-2003 and then declining in 2004. Over the three-year period there was also a general increase in rock cover, but a decline in rubble cover.

See Figure 15 and 16.





### ***Laborie***

In 2001, a transect line was established on the outer section of the Kay Ken reef in Laborie and another was established on Flat Land, which is located a little further offshore. The bay of Laborie comprises several large patch reef areas, but only the two latter mentioned reef areas are monitored on a regular basis. In general, these sites range in depth of 2-5m.

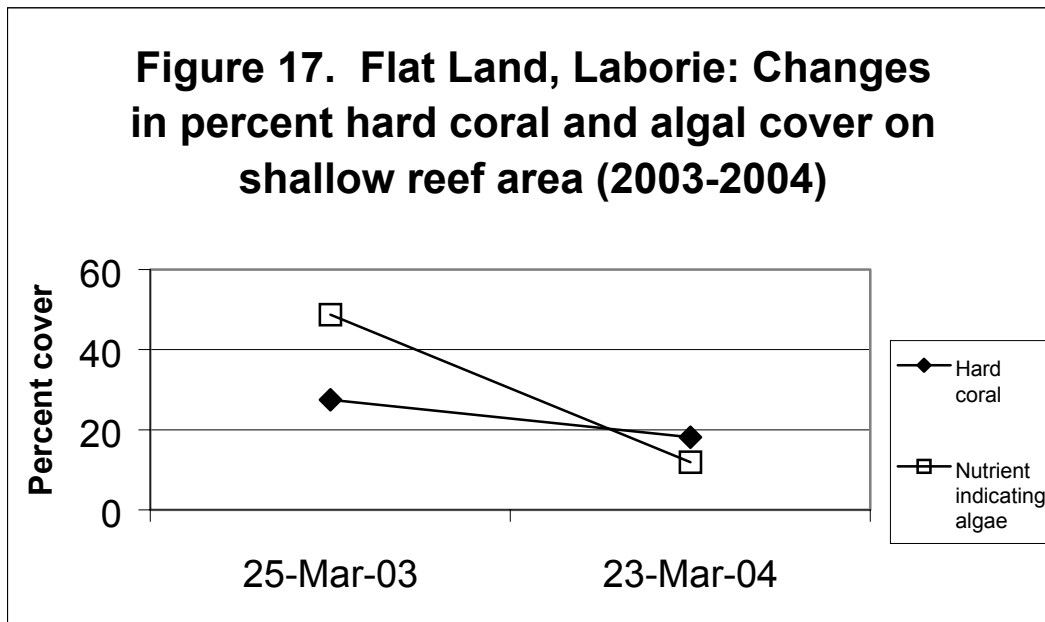
The most dominant coral species present on these reefs are *Porites astreoides* (mustard hill, *Porites porites* (finger coral), the common sea fan, and *Montastraea annularis* (small star boulder coral).

### **Results**

#### **Flat Land Reef**

Data for this section of the reef only comprised two sets of data, one collected in 2003 and the other in 2004. As such, analysis of the data was limited. However, it could be noted that hard coral cover decreased by 34.09% during the period under review, and algal cover decreased by 75.64%.

See Figure 17.

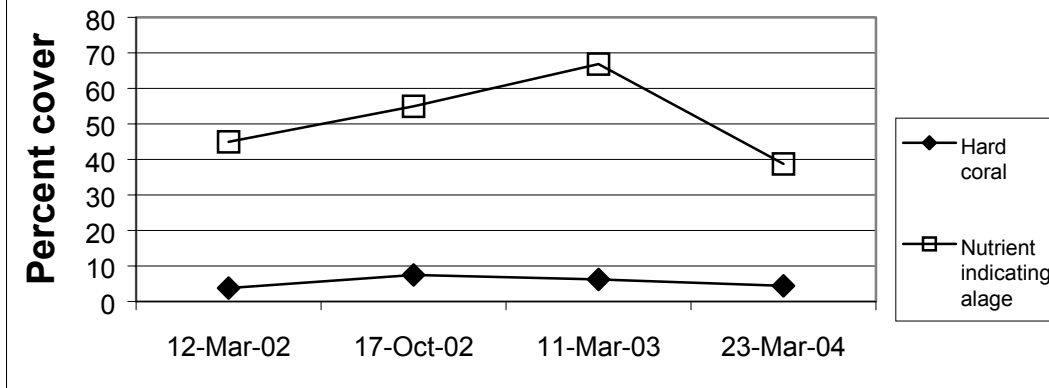


#### Kay Ken Reef

Hard coral cover on this reef area remained relatively the same over 2002-4. Nutrient indicating algal cover increased over the period 2002-3, but declined in 2004.

See Figure 18.

**Figure 18. Kay Ken, Laborie: Changes in percent hard coral and algal cover on shallow reef area (2002-2004)**



In general, when comparing the two reef areas, there were higher numbers of *Diadema* (long spine black sea urchin) on Flat Land than on Kay Ken; but higher numbers of *Tripneutes* (white sea urchin) on Kay Ken than on Flat Land.

### ***Le Sport***

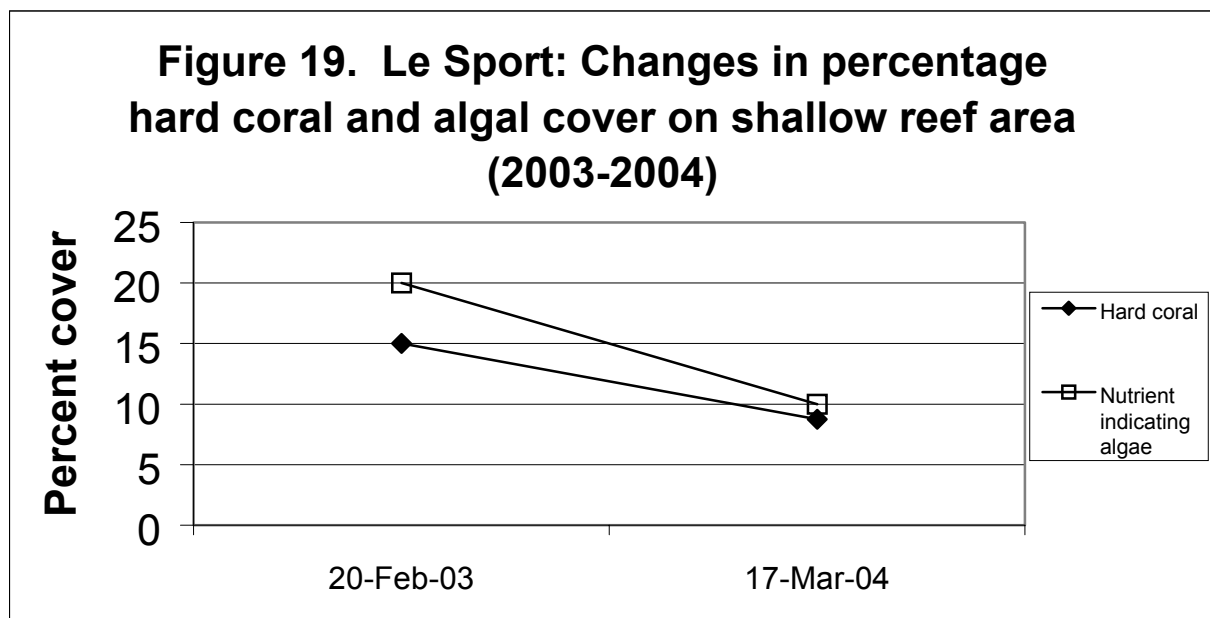
Due to the small and shallow nature of this reef, in 2003, a single transect line was established in 3m depth at this site. This is a fringing patch reef, which is located in the north of the island within the bay just south of Saline Point. This reef starts at the northern end of the Le Sport Beach, a few short steps into the water. The reef fringes the coastline within depths of 2-12m in some areas, but also comprises large boulders bordering the fringe.

Common coral species are *Millepora* species (box and encrusted fire corals), *Siderastrea radians* (lesser starlet coral) and *Porites porites* (finger coral) and a variety of brain corals including, *Diplora strigosa* (symmetrical brain coral) and *Colpophyllia natans* (boulder brain coral).

## Results

The data set for this reef was limited, comprising of only two sets of data. However, it was noted that both hard coral and nutrient indicating algal cover decreased over 2003-2004. The decrease in hard coral cover could be due to negative impacts from construction work that was being conducted adjacent to the area during the mid-latter part of 2003. However, this loss of coral cover did not appear to impact on rock, rubble or recently killed coral cover, as these showed very little change during this period. On the other hand, sand cover increased by 56.25%, which could possibly have resulted from the introduction of sediment into the nearshore from the aforementioned construction works.

See Figure 19.



In 2004, *Diadema* numbers were higher than in 2003 and algal cover was correspondingly lower in 2004 when compared with 2003. However, the data set was too short to determine if these parameters were significantly negatively correlated.

## **Discussion/conclusion**

### Substrates

With the exception of Kay Ken, Laborie, which remained relatively the same, hard coral cover has decreased at all other sites. In addition, only 4 of the 11 transects being monitored showed a general increase in the nutrient indicating algal cover. All other transect sites, despite an occasional peak observed during the period under review, showed a general decline in the nutrient indicating algal cover.

Reefs being monitored within the SMMA showed a general decline in sponge cover. These reefs also showed a general increase in rock cover, with the exception of the shallow area of Coral Gardens. However, interestingly, this latter mentioned site had an increase in the nutrient indicating algal cover (from 1.86% in 1999 to 71.25% in 2004) and this increased algal cover likely blanketed much of the exposed rock in the area, masking the general increase in rock cover.

In general, silt remained low (mostly 0%), with an occasional increase in 2003 or 2004 on 3 reef areas.

### Rare species

While the Nassau grouper has been observed on reefs in Saint Lucia in recent times, the occurrence is rare, accounting for the lack of observation of this species during Reef Check activities. Other species that were rarely recorded included the pencil urchin and lobsters. Tritons (conch-like shell fish) have never been recorded during Reef Check activities; however, shells of this species have occasionally been observed in Saint Lucia waters. The nocturnal nature of lobsters and tritons could possibly contribute to these rare sightings.

### Groupers and parrotfish

It is worth noting that groupers greater than 30cm have only been recorded on marine reserves within the SMMA. In addition, data regarding parrotfish greater than 20cm for

the period 2003-4 were examined. This revealed that, in general, deeper reefs had a higher mean number of these fish than shallower reefs areas, and that marine reserves within the SMMA had higher mean numbers than reefs in other parts of the island. See Table 1 for mean averages of parrotfish for the various reefs.

The low average recorded for the Malgretoute (SMMA) could possibly be due to some conflicting perspectives regarding the precise marine reserve northern boundary, which at times has led to fishing in the area.

**Table 1.** Mean number of parrotfish >20cm for the period 2003-4.

Reef Area	Mean number of parrotfish >20cm (2003-4)	
	Shallow reef (approx. 3m)	Deeper reef (approx. 10m)
Malgretoute (SMMA)	5.5	3.3
Anse Chastanet (SMMA)	12.5	14
Coral Gardens (SMMA)	10.5	20.5
Turtle Reef (SMMA)	--	41.5
Maria Island	1	--
Laborie – Flat Land	10.5	--
Laborie –Kay Ken	0.5	--
Le Sport	3	--

#### *Tripneustes ventricosus* (white sea urchin)

Although the data for *Tripneustes* was limited since data collection for this species had only commenced in 2003, it was noted that the numbers were much higher on reefs located on the south and south east coast (Maria Island and Laborie) than on other reef areas. This observation is consistent with earlier studies conducted during the 1980s by the Department of Fisheries and other interested partners, which investigated populations of these sea urchins around the island.

### *Diadema antillarum* (long spine black sea urchin)

To determine whether *Diadema* was generally chiefly responsible for grazing on reefs in Saint Lucia, datasets from all areas were combined and correlation tests performed. However, tests showed that there was no significant relationship between the number of *Diadema* present on reef areas and nutrient indicating algal cover. Notably, this observation is likely obscured by the numerous other grazers present on the reef such as *Tripneustes*, and a host of juvenile and adult grazing fish.

### Coral and nutrient indicating algal cover

The combined data set showed that there was a negative correlation between hard coral cover and nutrient indicating algae (Spearman's rho: -0.479; significance: 0.01). This observation could possibly imply that nutrient indicating algae is negatively impacting on hard coral cover. Interestingly, the data also showed a significant negative correlation between hard coral and rock cover (Spearman's rho: -0.332; significance: 0.01). This latter observation could probably be explained by the fact that dead coral, once not recently killed, is recorded as rock.

Data collected from individual monitoring sites that comprised both a shallow and a deeper reef transect were examined to determine if there was a significant difference in nutrient indicating algal cover on shallow parts of the reef compared with deeper parts. However, *t tests* performed did not reveal any significant differences on any of these reefs. But interestingly, when the combined data set for nutrient indicating algae from 1999 – 2004 for all sites was used and a *t test* was performed to determine whether the nutrient indicating algal cover was significantly higher on shallow reefs than on deeper reefs, results showed that the overall mean nutrient indicating algal cover on shallow reefs was significantly higher than that found on deeper reefs (*t test* (P) value: 0.047;  $\alpha$ : 0.05).



# **APPENDIX**

## TRANSECT LINES

**Note:** these figures represent the percentage cover of the various substrate types located along the transect lines.

### MALGRETOUTE

#### Shallow Reef (3m)

Date	Hard Coral	Soft Coral	Recently Killed Coral	Nutrient Indicating Algae	Sponge	Rock	Rubble	Sand	Silt	Other
2-Jun-99	50.625	0	0.625	0	2.5	38.75	0	6.25	0	1.25
2-Dec-99	25.625	0	1.25	0	3.125	66.875	0	0	0	3.125
17-Feb-01	8.125	0	0	11.875	1.875	68.75	4.375	5	0	0
1-Nov-01	20.625	0.625	0	0.625	2.5	66.25	6.875	2.5	0	0
25-Feb-03	21.875	0	0	30	1.875	40	0	2.5	3.125	0.625
22-Apr-04	13.125	0	0	11.875	1.25	70	0	1.875	0	1.875

#### Deep Reef (10)

8-Jun-99	35	0	5.625	8.125	15.625	18.125	5	12.5	0	0
10-Dec-99	16.875	0	3.75	6.875	19.375	25	20.625	6.25	0	1.25
17-Feb-01	17.5	0.625	0	30	8.125	16.875	8.125	8.125	0	1.25
1-Nov-01	34.375	6.875	7.5	2.5	5.625	21.875	9.375	8.125	0	3.75
23-Feb-03	13.75	0	0.625	18.75	3.75	33.125	0.625	15	13.125	1.25
22-Apr-04	13.125	0	0.625	8.125	7.5	53.75	0.625	14.375	0	1.875

## ANSE CHASTANET

### Shallow Reef (3m)

Date	Hard Coral	Soft Coral	Recently Killed Coral	Nutrient Indicating Algae	Sponge	Rock	Rubble	Sand	Silt	Other
5-Mar-03	21.875	1.25	1.875	28.75	0	18.75	11.25	16.25	0	0
30-Mar-04	18.125	0	0	1.25	1.875	53.125	10	15.625	0	0

### Deep Reef (10)

13-May-99	34.375	0	1.25	6.875	5.625	25	17.5	9.375	0	0
25-Sep-00	27.5	0.625	3.75	0	5	48.75	4.375	10	0	0
5-Mar-03	6.25	0	0	66.875	0	10.625	0	16.25	0	0
30-Mar-04	17.5	0	0	10	0.625	51.25	1.875	18.75	0	0

## CORAL GARDENS

### Shallow reef (3m)

Date	Hard Coral	Soft Coral	Recently Killed Coral	Nutrient Indicating Algae	Sponge	Rock	Rubble	Sand	Silt	Other
27-May-99	30.625	0.625	0	1.875	1.875	43.125	11.875	8.125	0	1.875
26-Sep-00	8.125	0	0	5	1.875	84.375	0	0.625	0	0
17-Feb-01	1.886792	0	0	19.49686	1.257862	69.81132	1.257862	4.402516	0	1.886792
1-Nov-01	3.125	3.125	2.5	1.875	1.25	68.125	1.875	17.5	0	0.625
27-Feb-03	3.125	4.375	0	57.5	0	30.625	0	3.75	0	0.625
8-Apr-04	0	1.25	0	71.25	0.625	16.25	0.625	3.75	0	0

### Deep reef (10m)

25-May-99	45.625	0	1.875	13.75	6.25	11.25	20.625	0.625	0	0
2-Sep-00	15.82278	0	8.227848	12.02532	1.265823	29.74684	27.8481	3.164557	0	1.898734
17-Feb-01	17.64706	1.30719	0	15.03268	0	24.18301	1.960784	39.86928	0	0
1-Nov-01	29.375	7.5	18.125	3.75	5	17.5	0	16.25	0	2.5

27-Feb-03	15.625	8.125	23.125	12.5	10.625	9.375	8.125	11.25	0	1.25
8-Apr-04	10.625	0	0	26.25	3.125	38.125	3.125	18.75	0	0

## TURTLE REEF

### Deep reef (10m)

Date	Hard Coral	Soft Coral	Recently Killed Coral	Nutrient Indicating Algae	Sponge	Rock	Rubble	Sand	Silt	Other
6-May-99	38.75	4.375	3.125	18.125	13.125	11.875	8.75	1.25	0	0.625
24-Aug-00	28.125	0.625	6.875	10.625	8.75	26.875	11.25	6.875	0	0
13-Mar-03	34.375	10.625	13.75	6.875	0	7.5	13.125	13.75	0	0
30-Mar-04	17.5	0	0	0	11.875	41.875	15.625	6.875	0	0

## MARIA ISLANDS

### Shallow reef (3m)

Date	Hard Coral	Soft Coral	Recently Killed Coral	Nutrient Indicating Algae	Sponge	Rock	Rubble	Sand	Silt	Other
31-May-02	10.625	0	0	16.25	0	54.375	10.625	8.125	0	0
18-Mar-03	15.625	2.5	0	26.875	0	55	0	0	0	0
21-Jul-04	7.5	0	0	5	0	78.75	1.875	3.125	3.125	1

## LABORIE

### Flat land: shallow reef (3m)

Date	Hard Coral	Soft Coral	Recently Killed Coral	Nutrient Indicating Algae	Sponge	Rock	Rubble	Sand	Silt	Other
25-Mar-03	27.5	0	0	48.75	0	18.125	0	3.125	0	0.625
23-Mar-04	18.125	11.875	0	11.875	1.25	45.625	0	11.25	0	0

### Kay Ken: shallow reef (3m)

Date	Hard Coral	Soft Coral	Recently Killed Coral	Nutrient Indicating Algae	Sponge	Rock	Rubble	Sand	Silt	Other
12-Mar-02	3.75	0.625	0	45	0	48.125	1.25	1.25	0	0
17-Oct-02	7.5	0	0	55	0	31.25	0	5	0	1.25
11-Mar-03	6.25	0	0	66.875	0	10.625	0	16.25	0	0
23-Mar-04	4.375	0	0	38.75	1.25	38.75	3.75	13.125	0	0

## LE SPORT

### Shallow Reef

Date	Hard Coral	Soft Coral	Recently Killed Coral	Nutrient Indicating Algae	Sponge	Rock	Rubble	Sand	Silt	Other
20-Feb-03	15	0.625	0.625	20	0.625	45.625	1.25	10	5	1.25
17-Mar-04	8.75	0	0	10	3.125	43.125	0	15.625	0.625	0

# TRANSECT BELTS

## MALGRETOUTE

### Shallow Reef

Date	Butterfly Fish	Grunts	Snapper	Nassau	Groupers >30	Parrot >20	Morray	Banded Coral shrimp	Diadema	Pencil urchin	Triton	Flamingo Tongue	Gorgonian	Tripneustes	Lobster
6-Jun-99	4	10	0	0	0	6		2	557	0	0	15	150		0
2-Dec-99	2	26	5	0	0	8		0	42	0	0	0	7		0
1-Nov-01	6	0	1	0	0	4	1	0	113	0	0	0	25		0
23-Feb-03	7	10	1	0	0	5	1	0	155	0	0	12	12	0	1
22-Apr-04	1	17	4	0	0	6	2	0	156	1	0	0	18	0	1

### Deep Reef

8-Jun-99	4	9	10	0	0	11		4	112	0	0	0	58		0
3-Dec-99	1	8	4	0	0	5		0	28	0	0	0	56		0
1-Nov-01	7	24	12	0	2	28	0	5	183	0	0	2	106		0
17-Feb-01	26	5	27	0	2	24	1	13	78	0	0	5	105		0
25-Feb-03	8	11	7	0	3	5	1	0	99	0	0	12	63	0	0
22-Apr-04	5	6	2	0	0	2	4	1	115	1	0	0	31	0	0

## ANSE CHASTANET

### Shallow Reef

Date	Butterfly Fish	Grunts	Snapper	Nassau	Groupers >30	Parrot >20	Morray	Banded Coral shrimp	Diadema	Pencil urchin	Triton	Flamingo Tongue	Gorgonian	Tripneustes	Lobster
5-Mar-03	16	4	1	0	1	9	1	0	732	0	0	10	23	0	0
30-Mar-04	3	23	0	0	0	16	0	0	372	0	0	0	7	0	0

### Deep Reef

13-May-99	13	6	18	0	1	13		2	56	0	0	0	74		0
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25-Sep-00	14	4	0	0	0	17		0	426	1	0	0	27		0
5-Mar-03	12	1	0	0	4	10	0	2	49	0	0	3	0	0	0
30-Mar-04	6	40	0	0	3	18	0	0	10	3	0	0	0	0	0

## CORAL GARDENS

### Shallow Reef

Date	Depth	Butterfly Fish	Grunts	Snapper	Nassau	Groupers >30	Parrot >20	Morray	Banded Coral shrimp	Diadema	Pencil urchin	Triton	Flamingo Tongue	Gorgonian	Tripneustes	Lobster
27-May-99	3m	12	5	0	0	0	1		1	145	0	0	5	263		0
26-Sep-00	3m	8	60	0	0	0	14		3	6	0	0	0	22		0
17-Feb-01	3m	8	10	17	0	2	36	0	0	14	0	0	0	12		0
1-Nov-01	3m	3	3	3	0	1	7	4	0	0	0	0	1	198		0
27-Feb-03	3m	5	1	0	0	0	5	0	0	5	0	0	0	558		0
8-Apr-04	3m	3	7	0	0	1	16	1	0	15	0	0	1	260	0	0

### Deep Reef

2-Sep-00	10m	5	1	0	0	0	17		2	41	0	0	0	34		0
17-Feb-01	10m	24	4	24	0	0	52	0	0	13	0	0	0	32		0
1-Nov-01	10m	23	15	43	0	6	12		0	15	0	0	0	25		0
27-Feb-03	10m	7	13	2	0	0	30	0	1	15	0	0	0	122	0	0
8-Apr-04	10m	2	2	4	0	1	11	0	0	27	0	0	0	164	0	0

## TURTLE REEF

### Deep Reef (10m)

Date	Butterfly Fish	Grunts	Snapper	Nassau	Groupers >30cm	Parrot >20cm	Morray	Banded Coral shrimp	Diadema	Pencil urchin	Triton	Flamingo	Gorgonian	Tripneustes	Lobster
6-May-99	20	91	2	0	4	39		2	0	0	0	0		1	0
24-Aug-00	18	39	32	0	0	59		1	0	4	0	0		0	1

13-Mar-03	15	62	7	0	3	49	1	0	4	0	0	0	4	0	0
30-Mar-04	14	1	1	0	1	34	0	0	1	0	0	0	4	0	0

## MARIA ISLANDS

### Shallow reef (3m)

Date	Butterfly Fish	Grunts	Snapper	Nassau	Groupers >30cm	Parrot >20cm	Morray	Banded Coral shrimp	Diadema	Pencil urchin	Triton	Flamingo	Gorgonian	Tripneustes	Lobster
31-May-02	0	49	0	0	0	20	0	0	3	0	0	40	86		0
18-Mar-03	4	100	0	0	0	2	0	0	5	0	0	44	382	388	0
21-Jul-04	0	1	0	0	0	0	0	0	6	0	0	16	164	634	0

## LABORIE

### Flat land: shallow reef (3m)

Date	Butterfly Fish	Grunts	Snapper	Nassau	Groupers >30cm	Parrot >20	Morray	Banded Coral shrimp	Diadema	Pencil urchin	Triton	Flamingo	Gorgonian	Tripneustes	Lobster
11-Mar-03	1	57	1	0	0	5	0	0	40	0	0	66	522	8	0
23-Mar-04	1	310	0	0	0	16	0	0	24	0	0	92	683	5	0

### Kay Ken: shallow reef (3m)

11-Mar-03	0	2	0	0	0	0	2	0	3	0	0	4	43	78	0
23-Mar-04	3	0	0	0	0	1	0	0	0	0	0	16	39	24	0



## LE SPORT

### Shallow Reef

Date	Butterfly Fish	Grunts	Snapper	Nassau	Groupers >30	Parrot fish >20	Morray	Banded Coral shrimp	Diadema	Pencil urchin	Triton	Flamingo	Gorgonian	Tripneustes	Lobster
20-Feb-03	8	20	0	0	0	0	1	2	780	5	0	0	2	3	0
17-Mar-04	6	71	19	0	0	6	2	0	1088	0	0	0	2	1	0