DOMINICA CORAL REEF STATUS 2001:
Assessment of the Sea Urchin *Diadema antillarum*, Reef Fishes, Algae and Sponges.

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Introduction

Formed 26 million years ago, the island of Dominica has a unique terrestrial and marine landscape unlike other islands in the Caribbean. Located midway along the Lesser Antilles (61° W 15° N) and as part of the windward islands, Dominica's weather and climate are highly influenced by the Atlantic Ocean. This influence, combined with the island's steep terrestrial and marine landscape, impact the settlement and success of reef corals and the organisms that inhabit them. The following studies look at the current status of these organisms and their adaptations, and roles in this ecosystem.

Study I (3-9), S M Williams assessed the abundance and size distribution of *Diadema antillarum*, an important invertebrate grazer. Study II (10-18), E. Mohan determined the abundance and size distribution of selected herbivorous fishes. Fish biodiversity list was also compiled. Both studies above compliment D A S Willette's study III (19-25) survey of benthic algal cover. Study IV, N Lestrade surveyed the sponge composition and cover of the benthos.

The purpose of these studies was to bring together four elements of coral reef assemblages in Dominica. It was the goal of these studies to evaluate and compare the occurrence and relationship between the four elements and to provide an initial database for future environmental monitoring.

These studies were carried out at 4 locations along the west coast of Dominica.

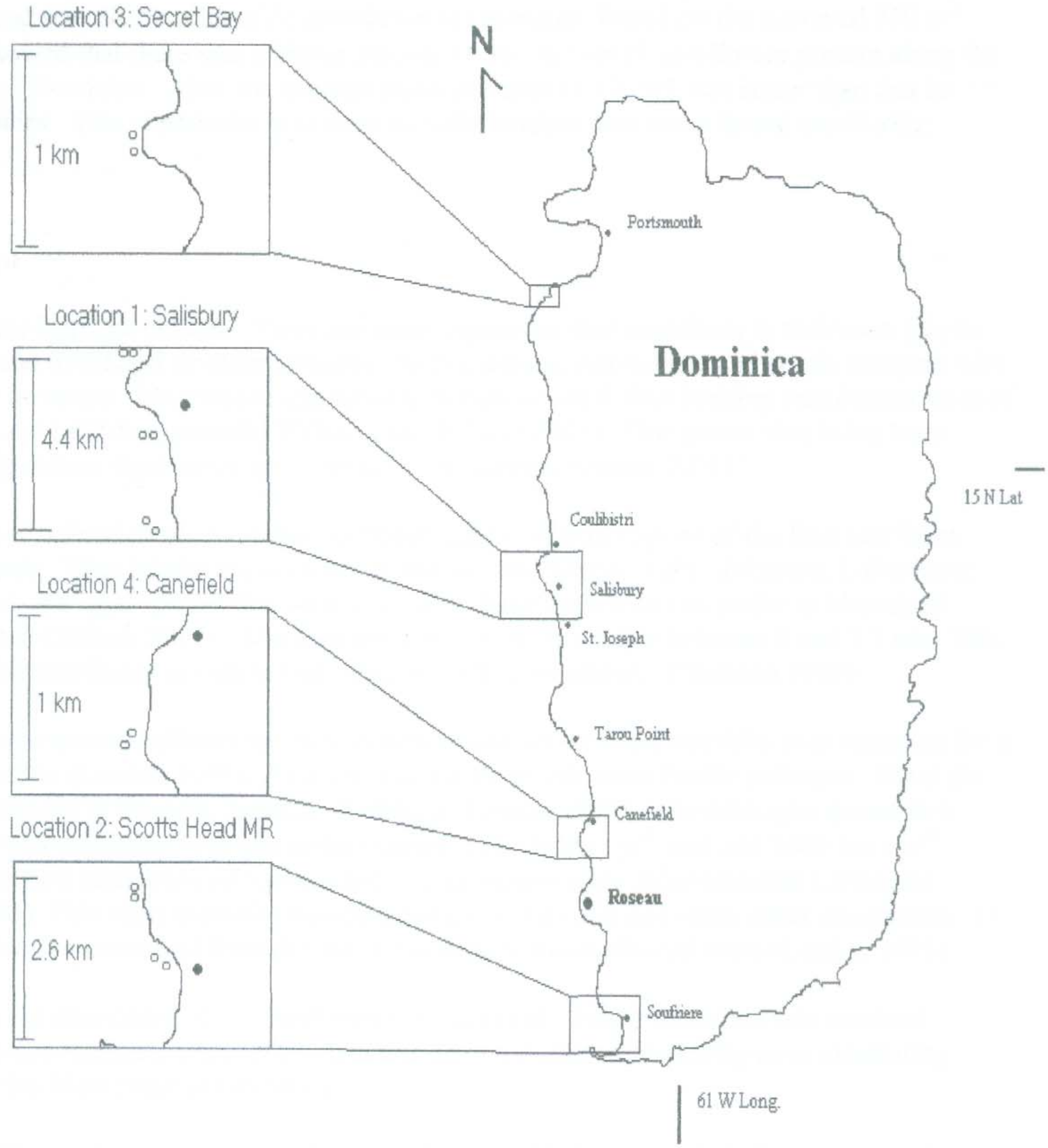
Location 1: Salisbury – Located between the villages of St. Joseph and Coulibistri. Benthic substrate at this location was composed of large rock slates, frequently bordered by sand flats. These rock slates were often fragmented into smaller sections. The total area surveyed extended 4.4 km north to south. Six sites were surveyed within the location.

Location 2: Scott's Head/Soufriere Marine Reserve (MR) – The only protected area surveyed in this study. This site was located at the southwest tip of Dominica. The reserve extends 2.6 km, north to south, and contains the most structurally diverse reefs surveyed in this study. Four sites were surveyed within this location.

Location 3: Secret Bay – 3.2 km south of Portsmouth, this location was the shallowest and northern most location in this study. A mosaic assemblage of boulders bordered by sand flats, composed the substrate at this most rugose location. A river emptied into the ocean 30 m north of this location. Two sites were surveyed at this location.

Location 4: Canefield – Located between the cities of Roseau and Canefield, it is speculated that this location was most impacted from human activities. Benthic substrate was composed of large boulder slates averaging 30 m in length. Two rivers drained into the surrounding area of this location. Two sites were surveyed.

Surveyed Locations Along the West Coast of Dominica. o = site



26, November 2001 Stacey Williams, Eva Mohan, Demian Willette, Nedd Lestrade

Study I: Abundance and Size Distribution of *Diadema antillarum* Along the West Coast of Dominica, West Indies.

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Abstract. Since the mass mortality in 1983, there has been a low abundance of *Diadema antillarum* in many Caribbean islands. The main objective in this study was to assess the abundance and size distribution of *D. antillarum* in Dominica. Based on the surveyed 560 m^2, this study showed that there was a higher amount ($1.35 \cdot m^{-2}$) of *D. antillarum* present along the West coast of Dominica. Also, the average mean diameter (6.13 cm) was larger than that in reported studies. This experiment was done to build baseline data and a future monitoring program.

Introduction

Coral reefs are intricate entities. There are many organisms that contribute in their own way to the success and livelihood of these biotopes. In this setting, macroalgae and corals compete with one another for space. Macroalgae can directly overgrow coral, thus limiting recruitment rates of coral larvae and inhibiting growth (Williams and Polunin 2001). One grazer that is has been found to help reduce algal cover on a reef is *D. antillarum* (Szmant 2001).

This species is sighted throughout the Caribbean and in tropical regions of the East and West Atlantic oceans. They inhabit crevices during the day and feed at night. *Dictyota*, *Lobophora*, and *Halimeda* are algal species that these organisms have been found to prefer in laboratory feeding assays (Szmant 2001). The average test size for an adult is between 5 and 7.5 cm. This species can be distributed at depths that range from 0 to 39 meters. (Humann 1993)

In 1983-84 this species suffered the most extensive and severe mass mortality ever recorded for a marine organism (Lessios 1995). This was caused by an unknown Pacific pathogen. Mass die-offs were recorded in Panama, Jamaica, Barbados (Lessios 1995). The pathogen spread in a pattern that was consistent with the surface currents ($2000 \text{ km} \cdot \text{yr}^{-1}$ east and $3000 \text{ km} \cdot \text{yr}^{-1}$ west). 3.5 million kilometers of benthos and coastal waters were affected in the Caribbean (Lessios 1988). This mass mortality was damaging to coral reefs and many other ecosystems. *D. antillarum* has not recovered from this mass mortality in these affected areas (Lessios 1995)

In this study the abundance of *D. antillarum* was surveyed. Size distribution was assessed through test-size measurements. Both data sets are a foundation for a long-term monitoring program on the West coast of Dominica.

This *D. antillarum* data was compared with Willette's (2001) survey of algal coverage and Mohan's (2001) survey of fish species. If a positive correlation between abundance of *D. antillarum* and macroalgae cover existed, one can conclude that this organism plays an important role with respect to algal abundance and coral growth. Relationship between *D. antillarum* and predator presence were evaluated based on Mohan's (2001) survey of reef fish.

Methods

The survey was carried out along the West coast of the Commonwealth of Dominica during the months of October and November 2001. Dominica is the youngest island in the Caribbean (Honychurch 1995). This volcanic island has a steep and deep shelf. Four locations were surveyed: Salisbury, Scott's Head-Soufriere Marine Reserve, Secret Bay, and Canefield. See the introduction of Student Research Papers of the ITME Fall Semester 2001 for further description and positions of these locations. These five locations were chosen to represent different reefal habitats along the West coast. Table 1 lists the different depths and the method of data collection for each site.

Surveying Methodology

At each site a 40 m^2 belt transect was surveyed. Sand patches were avoided, when selecting placement for these transects. *D. antillarum* were counted in 10 m^2 increments. Each survey consisted of two counts. The strict count consisted of any *D. antillarum* that were positioned horizontal or vertical on the hard substrate. The total count included *D. antillarum* that were on the undersides of rocks. If the test of the sea urchin did not lie within the belt transect, it was not counted.

Test Measurements

One Hundred *D. antillarum* were measured at Salisbury (sites 1,2), Scott's Head-Soufriere (sites 7,8), Secret Bay, and Canefield. *D. antillarum* were collected from large aggregations. Only a couple in each aggregation were randomly retrieved. This was done to avoid as much disturbance as possible to the environment. *D. antillarum* were chosen away from transect sites (>20 m radius) in order to not interrupt data for future surveys. Test diameters were measured with a caliper. After measurements, the *D. antillarum* were returned into the ocean.

Results

Seven hundred and fifty-five *D. antillarum* were counted within the surveyed 560 m^2. The mean abundance of *D. antillarum* was $1.35 \cdot m^{-2}$. Canefield (site 14) had 99 *D. antillarum*. This was the highest amount recorded (Table 1). There were 47 that were counted within the second 10 m^2. Soufriere (site 7) had 15 *D. antillarum* (Table 1). This had the lowest amount recorded. Abundance at this site was $0.38 \cdot m^{-2}$ (Table 1) and the most dispersed (Fig. 2).

The mean test size was 6.13 cm and ranged between 5.71 (sites 9,10) and 6.78 cm (sites 1,2) (Table 1). The two largest test size diameters were both at Salisbury, 9.08 and 8.87 cm. The two smallest test size diameters were both at Scott's Head-Soufriere, 2.36 and 2.80 cm. Salisbury had larger amounts of bigger (7.1-9.0 cm) *D. antillarum*. Scott's Head-Soufriere had larger amounts of smaller (<5.1 cm) *D. antillarum*. At Canefield the size classes were more evenly distributed (Fig. 2). Although none of the size classes were equally distributed at each surveyed location (Fig. 2).

Table 1: Results for *D. antillarum* Abundance, per m^{-2}, and Average Test Diameter.

Locations	Sites	Surveying Methods	Depth	Abundance of D. antillarum	Abundance per m^-2	Average test size
Salisbury						6.78 cm
	1	Snorkel	2-4 m	42	1.05	
	2	Snorkel	2-4 m	24	0.6	
	3	SCUBA	5-6 m	17	0.43	
	4	SCUBA	5-6 m	43	1.08	
	5	SCUBA	9-10 m	80	2	
	6	SCUBA	10-12 m	64	1.6	
Scott's Head-Soufriere						5.71 cm
	7	SCUBA	12-15 m	15	0.38	
	8	SCUBA	5-7 m	24	1.75	
	9	Snorkel	2-4 m	42	1.05	
	10	Snorkel	2-4 m	44	1.1	
Secret Bay						6.01 cm
	11	Snorkel	2-4 m	85	2.13	
	12	Snorkel	2-4 m	75	1.88	
Canefield						5.93 cm
	13	Snorkel	1-4 m	55	1.38	
	14	Snorkel	1-4 m	99	2.48	

Figure 1: Size Distribution at Each Location

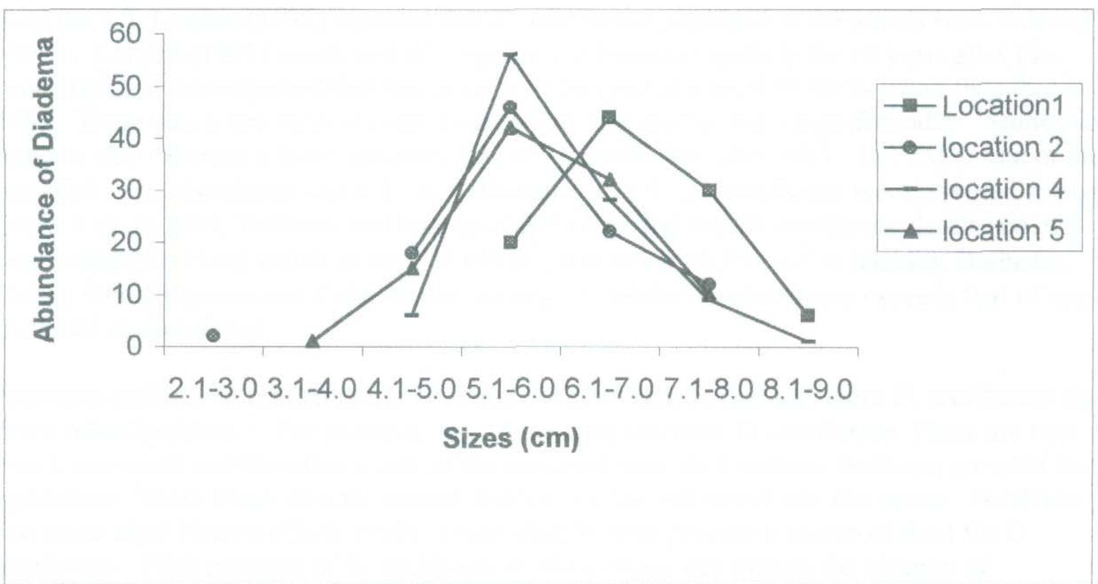
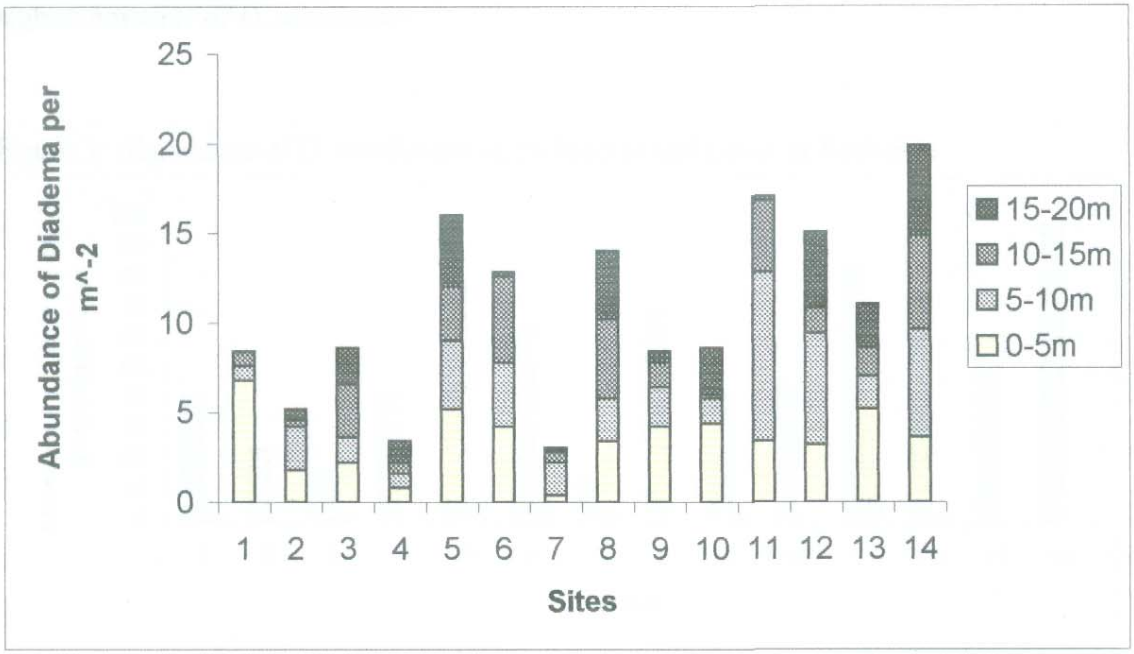


Figure 2: Spatial Distribution at Each Site



Discussion

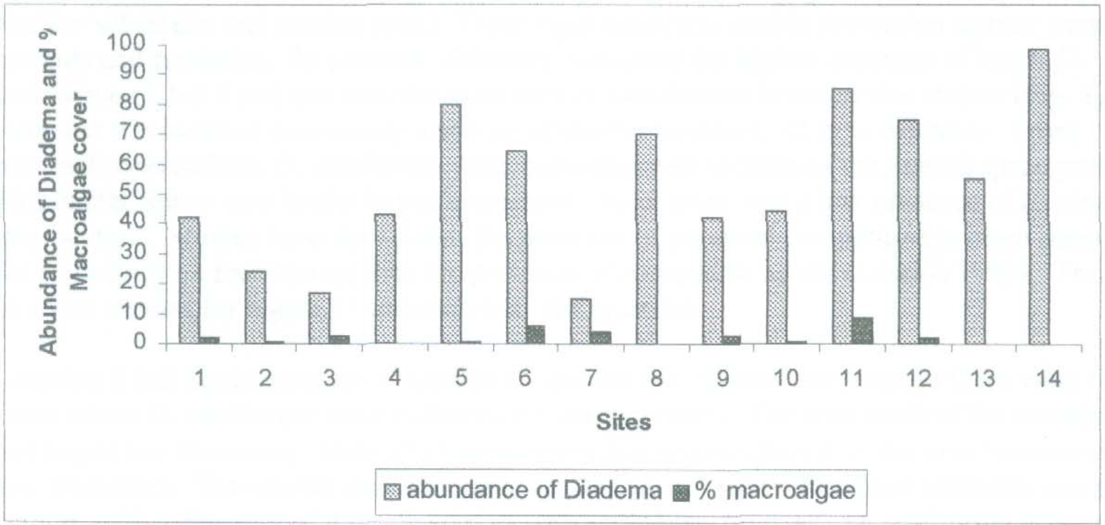
Abundance and Density

In Dominica, *D. antillarum* abundance exceeds that of many other Caribbean islands. After the mass die-off, Lessios (1995) reported that *D. antillarum* populations in Panama were reduced by >93 %. Lessios (1995) monitored this organism in Panama regularly for 10 years after this catastrophe. It was reported that this organism remained at a level 99.96 % lower than that in 1983. There was a low recovery rate even though this species has a high fecundity. Studies in Jamaica also reported a lower recovery rate of *D. antillarum* after 1983. In 1993 at one of their recorded sites, abundance was $0.1 \cdot m^{-2}$ (Woodley 1999). *D. antillarum* were reported scarce below 8 m. In 2001, Williams and Polunin (2001) reported that *D. antillarum* density on mid-depth reefs (12-15 m) within an area of 199 m^2, was never $>0.01 \cdot m^{-2}$ in Jamaica, Barbados, Belize, Grand Cayman and Cuba. In this survey, *D. antillarum* abundance exceeds that of any of the listed studies above.

Nutrients and lack of predation can be reasons why Dominica contains more *D. antillarum* then many other locations. For example, site 14 contains the most *D. antillarum*. There are two rivers, one north and the other south of the surveyed sites. In Dominica fertilizers are used for agriculture. These rivers directly deposit fertilizers from soil runoff into the ocean. Fertilizers can cause algal blooms (Clark 1992). These algal blooms provide a source of food for *D. antillarum*. High amounts of D. antillarum in this location can explain the absence of macroalgae (Willette 2001). An inverse correlation between the presence of *D. antillarum* and macroalgal cover supports this concept (Fig. 3).

Also another possible reason for the high abundance at some sites was the lack of predation. Triggerfish are known predator of sea urchins (Russ and Alcala 1999). Mohan's (2001) reef fish survey reported a minimal presence of triggerfish at site 5, 11 and 14. These sites contained the highest amounts of *D. antillarum*.

Figure 3: Abundance of *D. antillarum* vs. % Macroalgal Cover at Each Site.



The lowest abundance of *D. antillarum* recorded in a shallow site was at site 2 (Table 1). The benthic substrate was the least rugose site examined. This limits the amount of space for the *D. antillarum* to inhabit. Without crevices to hide in they become more prone to predators. Also, the benthic substrate is isolated from any nearby hard substrates by sand flats. Sea urchins become susceptible to predators when traveling on sand flats. Thereby, the topography can limit the immigration and emigration of this species. This can account for the low amounts of this organism but does not account for larval immigration.

In this survey, depth did not play a factor in the abundance of *D. antillarum*. Eighty *D. antillarum* were counted at site 5 (9-10 m). The average abundance of *D. antillarum* at this site was $2 \cdot m^{-2.}$ Also site 6 (10-12 m) had large amounts (64). The average abundance of *D. antillarum* at this site was $1.6 \cdot m^{-2}$. Although, the lowest abundance recorded was at site 7 (14-15 m). Low rugosity in this location played a major role in the presence of *D. antillarum*. The survey site was limited in amount of crevices for protection. Even though this site had the lowest average abundance, it still surpassed that recorded in Jamaica, Barbados, Belize, Grand Cayman, and Cuba (Williams and Polunin 2001).

Size Distribution

Another major contrast between Dominica and other Caribbean islands is the average test size. Lessios (1995) reported that the average mean diameter of this sea urchin's test was 4.2 cm before the mass mortality. After the mass mortality the average test size fluctuated between 1.73 and 3.52 cm. Thus, the mass mortality affected not only the abundance, but also the test size distribution. The mean test size in this study was 6.13 cm. The mass die-off may not have affected Dominica. Alternatively, Dominica may have had a higher recovery rate.

A couple factors that affect the size distributions of *D. antillarum* in many of these locations were rugosity and presence of *Echinometra viridis*. For example, Canefield's test size measurements were more evenly distributed (Fig. 1). There were greater amounts of large boulder substrates and smaller rocks. These rigid substrates enable protection against strong currents and predation. In contrast, Salisbury contained the highest amounts of larger *D. antillarum* (7.1-9.0 cm) but also the most uneven distribution between size classes (Fig. 1). The terrain at this location was mainly made up of smaller boulders, <2 m in diameter. From personal observations, *D. antillarum* were more clumped because of the limited space provided. This limited space may hinder larvae settlement. Also, there was a low presence of *E. viridis* at this location. Studies have shown that the presence of potential competitors is more beneficial for *D. antillarum* recruitment than the presence of conspecific adults (Lessios 1995). These can be some reasons for bigger *D. antillarum* at this location.

Location 2 had larger amounts of smaller *D. antillarum*. Within this location there were two areas where *D. antillarum* were collected for measurements. The area north of the transect sites had larger test diameters. Only 39 *D. antillarum* that were collected in this area because of the low abundance. The second area was south of the transect sites. This hard substrate was a large boulder with a diameter of 4 m. Sand flats surrounded this boulder. *D. antillarum* averaged lower in test size on this boulder, thus lowering the overall average for this location. From personal observation there was an abundance of *Echinometra viridis* present at the second site. Lessios (1995) stated that the presence of *E. viridis* facilitates *D. antillarum* larvae settlement. This may be a reason for smaller *D. antillarum* at this site.

Overall the count and test size of *D. antillarum* surpass those reported for Panama, Jamaica, Barbados, Belize, Grand Cayman and Cuba. Earlier reports state that *D. antillarum* were abundant along the Caribbean coast of Dominica (Kier 1966). Just recently (2000) *D. antillarum* have been surveyed along the West coast of Dominica (Steiner in review). Therefore, one cannot know if the pathogen affected Dominica in any way.

In conclusion, *D. antillarum* are very important grazers on reefs. They benefit to low algae coverage (Fig. 3) and therefore, to coral growth. The rugose benthic substrates that are along the West coast make great habitats for these organisms. In Dominica these creatures are not artisinally fished and are more abundant than in other Caribbean islands. The current data serves as a reference for future monitoring.

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Study II: Fish Species Composition and Size Class Distribution of Dominica, West Indies.

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Abstract. Very little research has been done about the coral reef community of Dominica. Species diversity was evaluated at four sites on the West coast of Dominica (the protected area of Scott's Head/Soufriere Marine Reserve (MR) and the unprotected areas of Canefield, Salisbury and Secret Bay), by following AGRRA 1999 censuses. Ten transects were surveyed at each site within a location. Each transect included an area of $60m^2$. It was found that the marine reserve had the highest species diversity, and the highest percentage of Scaridae. Snappers were prevalent in deeper waters (8-15 m) and grunts in shallower waters (1-5 m). Scaridae and Acanthuridae were more dominant in shallow areas. This study will provide a basis for further research that is carried out on monitoring the abundance and diversity of fishes within Dominica, which can be indicators of coral reef health.

Introduction

Coral reefs and reef fish are co-dependent upon each other. Reef fish can be carnivores, herbivores or detritivores. Coral reefs provide food and shelter for fish as fish aid in controlling algal growth. Fish provide an important source of nutrients to an oligotrophic environment through their waste products. Thus, fish are an important aspect of the ecology of coral reefs, and any disturbances of the balance of reef fish assemblages can increase algal cover and decrease live coral cover (Roberts 1995, McClanahan 1996).

The main interference of fish population growth is human activity, which includes various combinations of commercial, subsistence and recreational fishing. This affects the biodiversity of fish. Biodiversity was assessed as a reference point for more detailed surveys of selected families (Acanthuridae, Balisitidae, Chaetodontidae, Serranidae, Haemulidae, Lutjanidae, Pomacanthidae and Scaridae). These family assessments provided an inventory on selected herbivores and carnivores, as well as the size class distribution of each herbivorous species. Size classes of the herbivorous fish provide a reference point of grazing pressure on reef fish. The other fishes can be indicators of the effects of fishing pressure within the system.

"Dominica's demersal reef fish are overexploited" (personal comment by A. Philbert – Chief Fisheries Officer). There is no baseline data for Dominica, to evaluate the 'health' of the marine ecosystem. The survey of grazers can provide a numerical foundation needed to estimate the severity of over fishing and its correlation of algal cover. The data can also be used to monitor fish populations.

Methods

The belt transect, roving diver census and stationary fish census follow the methodology of the Atlantic and Gulf Rapid Reef Assessment (AGRRA), 1999. A few modifications were made, (1) Doctor and Ocean Surgeonfish were identified as one to reduce the error in species identification, (2) Gobiidae, Blennidae, and Aulostomidae were identified to the family level, and (3) eels and rays were not recorded. AGRRA 1999 set out the necessary surveyable fish species. The herbivorous species from this list were selected for size class measurements. The size classes were: Small (≤10 cm), Medium A (11-20 cm), Medium B (21-30 cm) and Large (≥31 cm). Reef fishes less than 5 cm were not included. The roving diver census was completed to assess the fish species composition and abundance.

Snorkeling censuses were at shallow depths of 1-5 m, and SCUBA surveys were also conducted between 8-15 m. The four locations had five areas where snorkel transects were completed, and two areas on SCUBA. A minimum of ten transects were done at each location, covering most of the area. Each transect took about 10 minutes.

Results

There were 21 families of fishes found in Dominica (Table 1).

Table 1: Fish Species and Abundance Along the West Cost of Dominica

Abundance was estimated to the following scale (Lucas 2001): Very Abundant = present in large schools (>100), Abundant = present in large numbers (dozens), Common = not present in large numbers but seen on almost every dive, Rare = one to few sightings

Family Name	Common Name	Scientific Name	Abundance
Acanthuridae	Blue Tang	Acanthurus coeruleus	Abundant
	Ocean Surgeonfish	A. bahianus	Abundant
	Doctorfish	A. chirurgus	Abundant
Aulostomidae			Abundant
Balisitdae	Queen triggerfish	Balistes vetula	Rare
	Ocean triggerfish	Canthidermis sufflamen	Rare
	Black Durgon	Melichthys niger	Rare
	Orangespotted filefish	Cantherhines pullus	Common
	Whitespotted filefish	C. macrocerus	Common
Blenniidae			Abundant
Bothidae	Peacock flounder	Bothus lunatus	Common
Carangidae	Bar Jack	Caranx ruber	Common
Chaetodontidae	Banded Butterflyfish	Chaetodon striatus	Common
	Foureye Butterflyfish	C. capistratus	Rare
	Longsnout Butterflyfish	C. aculeatus	Common
Gobiidae			Very Abundant

Haemulidae	French grunt	Haemulon flavolineatum	Abundant
	Striped grunt	H. striatum	Abundant
	Smallmouth grunt	H. chrysargyreum	Abundant
	Caesar grunt	H. carbonarium	Rare
Holocentridae	Squirrelfish	Holocentrus adscensionis	Rare
	Blackbar soldierfish	Myripristis jacobus	Abundant
Labridae	Hogfish	Lachnolaimus maxmius	Rare
	Spanish hogfish	Bodianus rufus	Common
	Creole wrasse	Clepticus parrae	Abundant
	Puddingwife	Halichoeres radiatus	Common
	Yellowhead wrasse	H. garnoti	Abundant
	Bluehead wrasse	Thhalassoma bifasciatum	Very Abundant
Lutjanidae	Mahogany snapper	Lutjanus mahogoni	Abundant
	Yellowtail snapper	Ocyurus chrysurus	Common
Mullidae	Spotted goatfish	Pseudupenesus maculatus	Abundant
	Yellow goatfish	Mulloidichthys martinicus	Abundant
Ostraciidae	Smooth trunkfish	Lactophrys triqueter	Common
Pomacanthidae	French Angelfish	Pomacanthus paru	Common
	Rock Beauty	Holacanthus tricolor	Common
Pomacentridae	Dusky damselfish	Stegastes fucus	Common
	Threespot damselfish	S. planifrins	Common
	Bicolor damselfish	S. partitus	Very Abundant
	Yellowtail damselfish	Micropathodon chrysurus	Abundant
	Sergeant Major	Abudefduf saxatilis	Very Abundant
	Blue Chromis	Chromis cyanea	Very Abundant
	Brown Chromis	Chromis multilineata	Very Abundant
Scaridae	Queen parrotfish	Scarus vetula	Common
	Stoplight parrotfish	S. viride	Common
	Princess parrotfish	S. taeniopterus	Rare
	Striped parrotfish	S. croicensis	Common
	Redband parrotfish	S. aurofrenatum	Common
	Yellowtail parrotfish	S. rubripinne	Common
Sciaenidae	Spotted drum	Equetus punctatus	Common
Scorpaenidae	Spotted Scorpionfish	Scorpaena plumieri	Rare
Serranidae	Barred hamlet	Hypoplectrus puella	Rare
	Yellowtail hamlet	H. chlorurus	Rare

	Black hamlet	H. nigricans	Rare
	Rock Hind	Epinephelus adscensionis	Rare
	Coney	E. fulvus	Common
	Harlequinn bass	Serranus tigrinus	Common
	Tobaccofish	S. tabacarius	Common
Sphyraenidae	Great Barracuda	Sphyraena barracuda	Rare
Tetraodontidae	Sharpnose puffer	Canthigaster rostrata	Common
	Balloonfish	Diodon holocanthus	Common

The distributions of fish throughout the four locations reveal the following:

1. The MR had the highest species diversity (27) followed by Salisbury (24). Twelve transects were done in the Marine Reserve and 30 in Salisbury (Figure 1-4).

Figure 1. Abundance of Surveyed Species at Salisbury Location (see Table 2 for legend)

Figure 2. Abundance of Surveyed Species at Secret Bay Location (see Table 2 for legend)

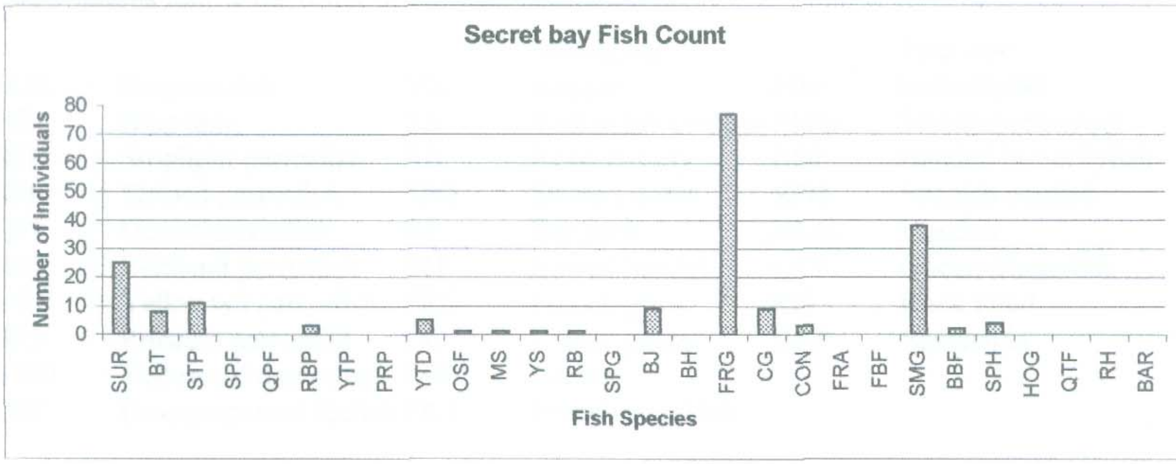

Figure 3. Abundance of Surveyed Species at Canefield Location (see Table 2 for legend)

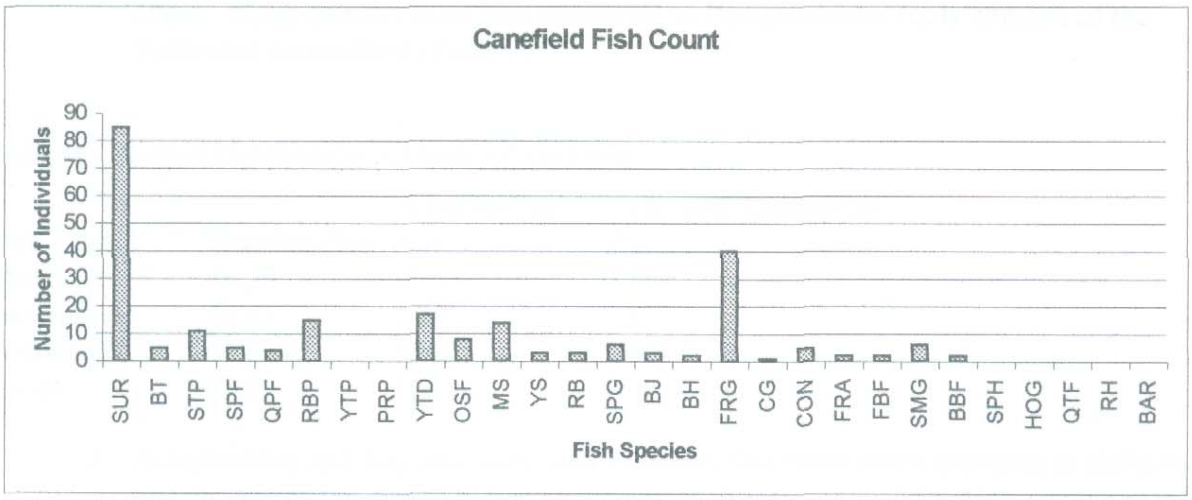

Figure 4 Abundance of Surveyed Species at the Marine Reserve Location (see Table 2 for legend)

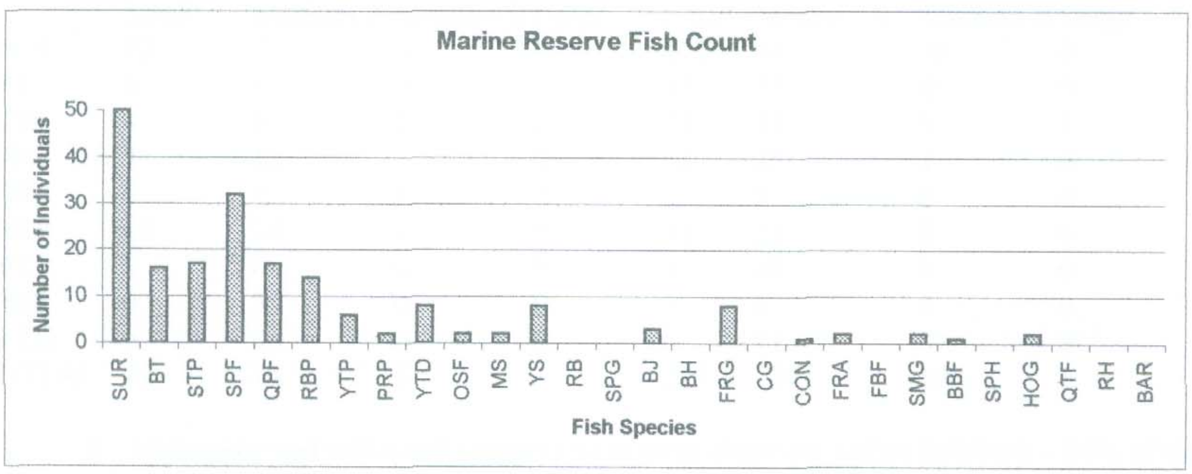

Table 2: List of Fish Species Abbreviation to Common Names. The following species and abbreviations follow the order of the figures.

SUR	Surgeon fish	MS	Mahogany snapper	FBF	Four-eye butterflyfish
BT	Blue tang	YS	Yellowtail snapper	SMG	Smallmouth grunt
STP	Stoplight parrotfish	RB	Rock Beauty	BBF	Banded butterflyfish
SPF	Striped parrotfish	SPG	Striped grunt	SPH	Spanish hogfish
QPF	Queen parrotfish	BJ	Bar Jack	HOG	Hogfish
RBP	Redband parrotfish	BH	Barred hamlet	QTF	Queen triggerfish
YTP	Yellowtail parrotfish	FRG	French grunt	RH	Rock Hind
PRP	Princess parrotfish	CG	Caesar grunt	BAR	Barracuda
YTD	Yellowtail damselfish	CON	Coney		
OSF	Orangespotted filefish	FRA	French angelfish		

2. Scaridae consisted of more than 50% of the fishes surveyed that were greater than 11cm. Acanthuridae consisted of more than 60% of the fishes that were less than 10cm. These families were also compared to Pomacentridae (only consists of the Yellowtail damselfish) (Table 3).

Table 3: Percent Distribution of Herbivorous Fishes

Size Class	Scaridae (%)	Acanthuridae (%)	Yellowtail Damselfish (%)
Small	36.25	60.31	1.56
Medium A	49.63	6.67	13.70
Medium B	60.78	39.22	0.00
Large	0.00	100	0.00

3. Acanthuridae and Scaridae were approximately five times more abundant in shallow waters; Yellowtail damselfish were not within the transects of the deep-water surveys (Table 4).

Table 4: Comparison of Herbivores in Deep and Shallow Waters

	DEEP				SHALLOW			
	Small	Medium A	Medium B	Large	Small	Medium A	Medium B	Large
SUR	12	7	0	0	172	64	10	0
BT	0	1	0	1	12	27	0	0
STP	4	6	2	0	24	34	0	1
SPF	7	12	1	0	12	26	1	0
QPF	0	1	1	0	3	9	0	0
RBP	19	14	1	0	42	21	8	0
YTP	0	0	0	0	3	10	0	0
PRP	0	3	0	0	1	1	0	0
YTD	0	0	0	0	6	37	0	0
TOTAL	42	44	5	1	275	229	19	1

4. Mahogany and yellowtail snappers were most abundant within Salisbury – 80% of the yellowtail snappers were recorded at deeper depths (Table 5).

Table 5: Comparison of Snappers in Deep and Shallow Locations

	DEEP			
	Small	Medium A	Medium B	Large
MS-Salisbury	0	6	3	0
Marine Reserve	0	0	0	1
Secret Bay	0	0	0	0
Canefield	0	0	0	0
TOTAL	0	6	3	1
YS-Salisbury	4	1	4	0
Marine Reserve	0	4	0	3
Secret Bay	1	0	0	0
Canefield	0	0	0	0
TOTAL	5	5	4	3

	SHALLOW			
	Small	Medium A	Medium B	Large
MS-Salisbury	7	6	2	0
Marine Reserve	1	0	4	0
Secret Bay	1	0	0	0
Canefield	5	9	0	0
TOTAL	14	15	6	0
YS-Salisbury	0	0	0	0
Marine Reserve	0	0	1	0
Secret Bay	0	0	0	0
Canefield	1	2	0	0
TOTAL	1	2	1	0

5. Grunts made up about 30% of all fish surveyed – they accounted for more than 60% of all fishes surveyed at Secret Bay (Fig. 2).
6. Salisbury had the highest number of parrotfish, but the MR had the highest percentage (Table 6).

Table 6: Herbivorous Abundance by Location

	Salisbury	Marine Reserve	Secret Bay	Canefield
Herbivorous species	8	14	5	6
Species Diversity	24	27	16	21
Acanthuridae individuals	106	66	33	90
Scaridae individuals	141	88	14	40
% Herbivorous Individuals	47.88%	83.94%	27.27%	59.9%
Total Herbivorous individuals	260	162	52	153
Total Fish Individuals	543	193	198	239

7. Queen parrotfish were only present within Canefield and MR, but larger (Medium B and Large size class) and more abundant within the MR (Fig. 3,4).

Discussion

The study of reef fish composition of Dominica has not yet been completed (Lucas 2001, Aris 1993, Mohan 2001). Surveys were restricted to the west coast of Dominica. This study did not include night surveys.

Roberts (1995) and McClanahan (1996) state that any disturbances of the balance of reef fish assemblages can increase algal cover and decrease live coral cover. However, coral cover is unlikely to limit fish recruitment (Doherty et al. 1997). Recruitment rates of fishes may reflect their larval supply (Doherty et al. 1997). The event of spawning alters the fish populations. Spawning and recruitment are higher during warmer periods (Zapata 1997). In Dominica, the warmest periods are between July and September; surveys began in the latter half of October (average temperature of 29.5°C). This could explain the majority of Acanthuridae being in the small size classes.

Depth is an important community-structuring factor for reef fishes (Bouchon-Navaro et al. 1997). Acanthuridae and Scaridae were found to be more abundant at shallower depths. Both families are grazers of fast growing turf algae (Williams and Polunin 2001). Willette (2001) found that turf algae were more abundant in shallow areas of 2-6 m, than deeper areas of 7-15 m, thus potentially sustaining larger numbers of Acanthuridae and Scaridae.

Snappers were most abundant in Salisbury. Over 65% of the snappers surveyed ranged from 11 cm to 45 cm. However, 80% of all snappers counted were found within the depth ranges of 8-15 m. At Salisbury 30 transects were surveyed and 1800 m^2 were assessed. Surveys at all other locations never exceeded an area of 660 m^2. The difference in abundance of snappers may be due to the differences in areas surveyed.

The Haemulidae family dominated the fish population in Secret Bay (Fig. 2). The area surveyed was shallow. Lucas (2001) states that haemulids show clear depth structuring. This study also confirms Bouchon-Navaro (1997) and Lucas (2001) that there is vertical zonation of fish community structure. Grunts in particular prefer shallower waters and snappers prefer deeper areas.

The MR extends from Scott's Head to Champagne. It has four separate areas, (1) SCUBA diving (2) recreational (3) fishing priority and (4) nursery area where no fishing is allowed. There are two fishing villages with in the reserve, the villages of Soufriere and Scott's Head (ITME Research Papers 9:1-2). The fishermen from these villages are the only ones allowed into the fishing priority area for artisanal fishing. The amount of fish caught and size classes are regulated. The MR had the highest species diversity and the most individuals of yellowtail damselfish as well as most individuals within the Scaridae and Acanthuridae. This location has a near shore drop off. Deeper portions of this location may be under reduced fishing pressure. The high rugosity (ledges and overhangs) provides more habitat for the fish to hide. These factors may account for the higher diversity and abundance of fishes in the MR.

When the species diversity list of this study was compared to Lucas (2001), 79% of the species were the same. Of the remaining 21%, 87% were rare and not observed in this study. Also, Lucas' (2001) study included nocturnal surveys, which were not done in this study. Lucas (2001) surveyed the Tarou Point area, and this can now be considered as another surveyed location.

In conclusion, fish diversity, abundance and size class data of this study and that of Lucas (2001), provide a more accurate description of Dominica's reef fish community.

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Study III: Algal Cover versus Grazing Fish Abundance of Shallow and Mid-Depth Coral Reefs of Dominica, West Indies.

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Abstract. Percent cover of turf and macroalgae, as well as abundance of the herbivorous Acanthuridae and Scaridae, were determined at 14 sites along the West coast of Dominica. Sites were categorized into two depth ranges, shallow (2-6m) and mid-depth (7-15m), and into two management classifications, protected and non-protected, for comparison of algae and herbivorous fish relationships. It was found that turf algae composed >40% of the overall substrate at all sites, whereas macroalgae composed <2% of the substrate. Turf algae were twice as high at shallow sites than at mid-depth sites, while macroalgae abundance was similar at all sites. No significant difference of turf or macroalgae existed between protected and non-protected sites. Herbivorous fish at protected sites were twice as abundant than at non-protected. At mid-depth sites, herbivorous fish were twice as abundant than at shallow sites. An experimental algal biomass/growth determination method was carried out in this study as well. Results from this method proved successful in providing viable measurement data.

Introduction

A multitude of elements make up the complex and diverse reef systems of the Caribbean. When one of these elements (e.g. corals) is reduced or removed from the system, other elements (e.g. macroalgae) move in to assume the replacing role. This phenomenon is known as a phase shift (Done 1992). A phase shift from coral to algae may be due to one or more disturbances, such as disease (Antonius 1973), sedimentation (Rogers 1990), overfishing (McClanahan 1999), hurricanes, and structural damage from tourism (Epstein *et al.* 1999). Despite its source, a phase shift alters the parameters of a system and allows for the re-shuffling of organisms' roles in that system. In the Caribbean, the mass die off of *Diadema antillarum*, an important algal grazer (Lessios 1995), and the increasing fishing pressure on herbivorous fishes, has contributed to an increase in macroalgae abundance (Connell 1997, Steneck 1994, Lirman 2001). Observations of the above stated occurrences have been extensively documented in many regions of the Caribbean (e.g. Panama, Belize, Cuba, Jamaica, Grand Cayman, Barbados) (Lessios 1988, 1995, Williams & Polumin 2001, Connell 1997, Woodley 1999), however these observations are absent in other regions, such as Dominica.

Geologically, fringing reefs have never formed in Dominica due to a narrow shelf (Honychurch 1995, Steiner & Borger 2000) and constant heavy sediment run-off from the island's steep terrain (Hodge 1954). The sparse reef structures that do exist are mainly isolated to large boulders and rock slates that have broken off from the terrestrial landscape. Corals (Steiner and Borger 2000) and reef fish populations are most dense at shallow near-shore and several mid-depth off shore assemblages.

In this study the percent cover and biomass of turf and macro-algae, as well as the abundance of two families of herbivorous fish, Acanthuridae and Scaridae were determined at 14 sites on the West coast of Dominica. The goals of this study were to (1) compare percent cover of two algal types verse abundance of herbivorous fish in (a) protected and non-protected areas and (b) shallow and mid-depth reefs; (2) estimate small scale biomass of algae using an experimental growth rate/biomass determination method; and (3) to provide baseline data for future monitoring of Dominican reefs.

Methods

Site Information

Four locations on the West coast of Dominica were selected (ITME Research Reports 9:1-2) based on availability of accessible reef structures at depths of 2-6m (shallow depth) and 7-15m (mid-depth). Two to six sites were selected within each location.

It is important to note that many of the "reefs" that macroalgae and grazing fish inhabit are isolated to rock/boulder substrate areas. The sites chosen at each location were selected to represent the overall inhabitable marine-scape for the targeted organisms. Efforts were made to limit the inclusion of extensive sand patches within the surveyed sites since the targeted organisms rarely inhabit these areas.

Algal Percent Cover

A 20 m transect line placed parallel to the shore was used in measuring algal percent cover. Algal percent cover was measured within twenty 1 m^2 quadrants placed on alternating sides for each meter of the transect. Algal cover was divided into two categories; turf algae – less than 1 cm in height, and macroalgae – equal or greater than 1 cm in height.

Fish Survey

The Bohnsack & Bannorot (1986) cylinder method was used to survey the targeted fishes. Positioned at the 10 m mark along the transect, the number of acanthurids and scarids were censused within a 5 m radius, imaginary cylinder. Slowly turning in a full circle, a count of all Acanthuridae fish was made. The total number was recorded and the survey was repeated for Scaridae fish. Individuals less than 12 cm in total length were excluded from the count, due to their limited impact on algal cover (Bruggeman et al. 1994). Accuracy of length was assured by the use of a 12 cm marking on the side of the dive slate as a reference.

Algal Biomass/Growth

A transparent 4 m^2 plastic tarp (~0.25mm thick) was placed on the sea floor at depths between 4 and 6 meters to measure algal biomass/growth. For weight, a re-bar was tied with string to each end of the plastic. The tarp was also secured with rocks along all sides. After one week the plastic tarp was carefully rolled up and removed from the water. Algal growth was scraped from the tarp and placed on a pre-weighed piece of aluminum foil. The combined weight of the algae and foil was measured to the nearest hundredth and recorded (wet weight). The algae and foil was allowed to air dry for 4 days. The combined weight was again measured after the 4-day drying period (dry weight).

Results

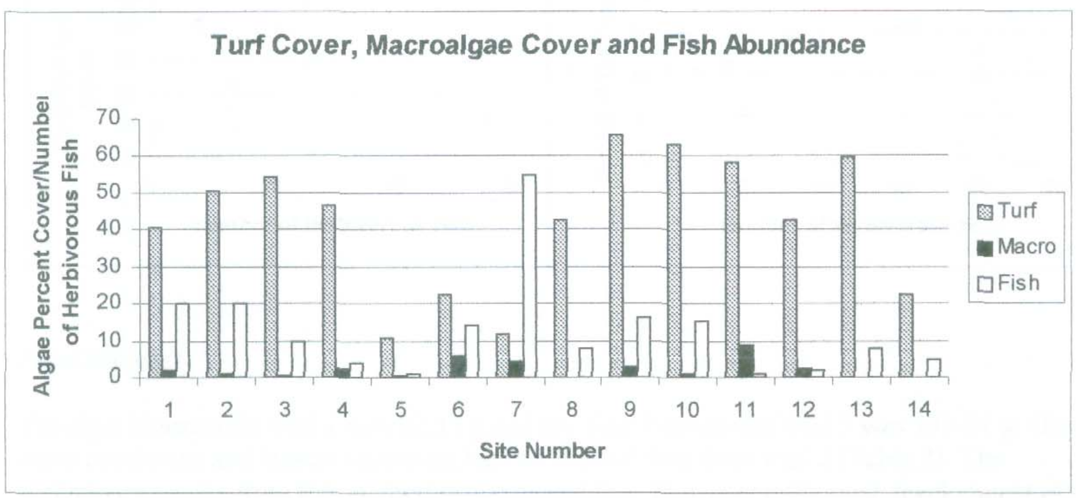
Turf Algal Cover and Macroalgal Cover

Algae covered a total of 44.35% of the 280 m^2 surveyed substrate (Table 1). Turf algal cover (42.17%) was 19 times higher than macroalgal cover (2.18%). Turf cover was twice as high in shallow reefs (50.29%) than in mid-depth reefs (21.86%), however, macroalgae were nearly equal in abundance at both depths (shallow-1.98%, mid-2.66%). Percent cover of both turf and macroalgae were almost indistinguishable when comparing protected and non-protected areas (turf – 45.66% and 40.77% respectively; macro- 1.98% and 2.25% respectively). Turf algal cover was highest at site 9 (65.75%) and lowest at site 5 (10.85%), both of which were within the protected location. Macroalgae cover was highest at site 11 (8.80%) and lowest at sites 13 and 14 (0.0%), both of which are non-protected sites. *Dictyota* and *Galaxaura* were the dominant macroalgae species at all sites. *Dictyota* was most dominant at mid-depth reefs, whereas *Galaxaura* was the dominant species at shallow depth reefs.

Table 1 – Summary of Dominica - Locations, Sites, Depths, Turf Algae Percent Cover, Macroalgae Percent Cover, Total Algae Percent Cover, Individual and Total Herbivorous Counts, and Site Status

Location	Site	Depth (m)	Turf % Cover	Macro % Cover	Total % Cover	# of Acanthurids	# of Scarids	Total Fish	Status
1) Salisbury	1	2-4m	40.7	1.75	42.45	18	2	20	non-protected
	2	2-4m	50.35	0.8	51.15	20	0	20	non-protected
	3	5-6m	54.3	0.25	54.55	2	8	10	non-protected
	4	5-6m	46.45	2.35	48.8	1	3	4	non-protected
	5	9-10m	10.85	0.4	11.25	0	1	1	non-protected
	6	10-12m	22.65	5.95	28.6	0	14	14	non-protected
2) Scott's Head	7	14-15m	11.8	4.2	16	47	8	55	protected
Marine Reserve	8	7-8m	42.15	0.1	42.25	4	4	8	protected
	9	3-5m	65.75	2.75	68.5	12	4	16	protected
	10	3-5m	62.95	0.85	63.8	10	5	15	protected
3) Secret Bay	11	2-4m	58.2	8.8	67	0	1	1	non-protected
	12	2-4m	42.35	2.25	44.6	2	0	2	non-protected
4)Canefield	13	2-4m	59.5	0	59.5	8	0	8	non-protected
	14	2-4m	22.35	0	22.35	2	3	5	non-protected

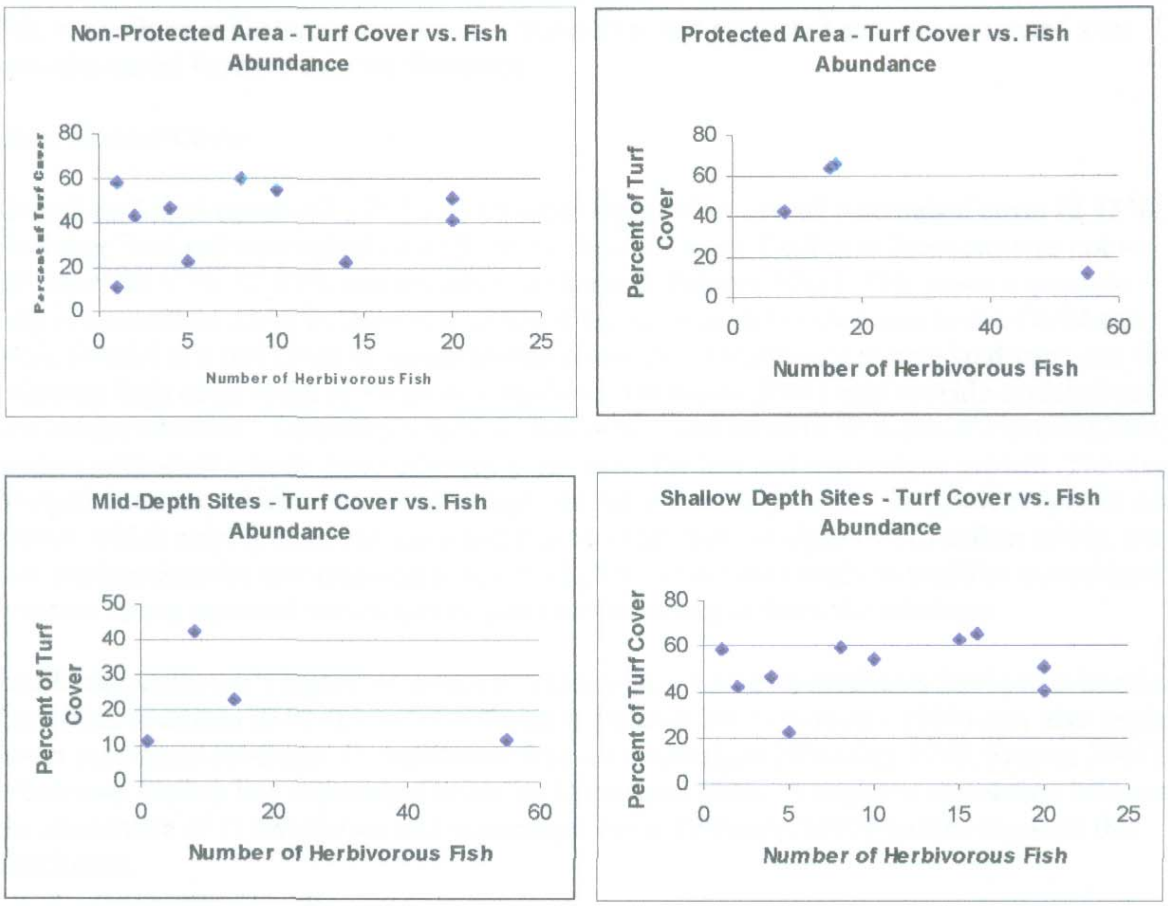
Figure 1 – Turf Percent Cover, Macroalgae Percent Cover and Fish Abundance side-by-side comparison of the 14 sites



Herbivorous Fish

Acanthuridae and Scaridae were absent within the cylinder at several sites (acanthurids – sites 5,6,11; scarids – sites 2,12,13) however, individuals of both families were observed at all locations by Mohan (2001). Overall, acanthurids averaged 9 individuals per site, whereas scarids averaged 4 individuals per site. In protected sites, acanthurids (5.25, 18.25 individuals) and scarids (3.20, 5.30 individuals) were at least twice as abundant than at non-protected sites. Similarly, at mid-depth sites, acanthurids (12.75, 7.50 individuals) and scarids (6.75, 2.60 individuals) were almost twice as abundant than at shallow depth sites.

Figures 2-5 – Turf Percent Cover vs. Herbivorous Fish Abundance – Non-Protected Area (2), Protected Area (3), Mid-Depth Sites (4), and Shallow Depth Sites (5).



Algal Biomass

The algal biomass for trial 1 was 32.37 g and the algal biomass for trial 3 was 133.81 g. Harsh wave conditions and human tampering lead to skewed data from trial 2 (Table 2). The preliminary results from this method prove its viability. However additional development of the method, as well as additional surveys are necessary further analysis of the algal biomass data.

Table 2 – Algae Biomass Data – Location, Trial Number, Algae Wet Wt., and Algae Dry Wt.

Location	Trial	Algae Wet Weight	Algae Dry Wet	Note:
Salisbury	1	97.96	61.56	
Champagne	2	0.58	N/A	Data loss
Canefield	3	136.25	133.81	

Discussion

Significant differences in the percent cover of algal types, as well as the number of herbivorous fish, were observed between shallow and mid-depth, and protected and non-protected sites. This provides useful baseline data for Dominica.

Algal Percent Cover

Overall turf algal cover (42.17%) was 19 times higher than overall macroalgal cover (2.18%). However, turf and macroalgal cover from 19 sites in 5 other Caribbean locations was not as different (29.51%, 37.63% respectively) (Williams & Polunin 2001). This poses a question – why is macroalgal cover in Dominica so low when compared to other sites in the Caribbean, while Dominica's turf cover is similar to that elsewhere? Dominica's marine landscape and the relatively high occurrence of *Diadema antillarum* (Williams 2001) may provide explanations for this unique situation. Dominica's narrow shelf, when compared to Williams & Polunin (2001) study's wide shelf islands, have different parameters for turf and macroalgae growth. The steep terrestrial terrain, which contributes to high sediment run-off (Hodge 1954), and reflective costal shores, which amplify seasonal wave and currents that remove algae (McClanahan 1999), are two explanations for low macroalgal cover. High sedimentation tends to smother macroalgae, whereas strong seasonal waves and currents tear macroalgae from the substrate.

Diadema antillarum's higher occurrence in Dominica (1.35 m^{-2}) (Williams 2001) than in other Caribbean locations (0.01-0.1 m^{-2}) (Williams & Polunin 2001, Woodley 1999) may also explain lower macralgae coverage. *D. antillarum* feed on macroalgae (Woodley 1999, Szmant 2001), which may explain low macroalgal cover on Dominican reefs. A negative correlation between the abundance of *D. antillarum* and macroalgal cover (Williams 2001) further supports this conclusion.

Non-Protected and Protected Areas

In this study 10 sites in 3 locations were classified as non-protected and 4 sites in 1 location were classified as protected (Table 1). Little difference was observed in turf and macroalgal cover when comparing protected and non-protected sites. It was expected that the protected area would have lower total algae cover when compared to non-protected areas since fishing pressure and other human impacts (pollution, coral breakage, etc.) would ideally be lighter. However, lower total algal cover was not observed.

Herbivorous fish abundance does differ between the protected and non-protected areas. Acanthurids (Doctorfish, Surgeonfish, Blue Tang) and scarids (Parrotfish) were more than twice as abundant in the protected than in non-protected (Table 1). Within both protected and non-protected areas acanthurids were 2-3 times as abundant as scarids. From this, conclusions can be drawn on the impact of the marine reserve on fish populations. The protected area shows higher fish abundance, which supports the concept of the reserve as a sanctuary. However, this data may be misleading in the sense that only 4 sites were surveyed in the protected whereas 10 were surveyed outside of the protected area. Interestingly, site 7, a protected site, has more than twice the number of acanthurids than any other site protected or not. This single data set may be an irregularity, that combined with the few protected site surveyed, raises the acanthurid's average abundance. When excluding site 7, the Acanthuridae abundance is significantly closer between protected (w/ site 7 - 18.25, w/o site 7 - 8.67) and non-protected (5.30) areas. The variance of fish populations between protected and non-protected sites without any observation of variance in the algal cover support speculations that additional factors influence this relationship (e.g. *D. antillarum*).

The size of the marine reserve may also influence these results. The estimated 1.6 km^2 reserve area surrounded by non-protected highly fished areas may not be large enough to release the populations for fishing pressure. Contrary to that, the topography of the reserve (narrowest shelf of the locations) may provide deep protected habitat from the surrounding fished areas for fish populations. Further studies are necessary for more in-depth conclusions.

Shallow and Mid-Depth Areas

Unlike protected and non-protected areas, significant differences did exist between shallow and mid-depth reefs. In this study 10 sites in the 4 locations were at shallow depths, whereas 4 sites in 2 locations were at mid-depth (Table 1). Turf algal cover was 2 times greater at shallow sites than mid-depth sites. This is thought to be due to higher fish abundances at mid-depth sites since herbivorous fish feed on turf algae (Williams & Polumin 2001). Macroalgal cover was approximately equal between shallow and mid-depth sites. The high occurrence of *D. antillarum* at both shallow (1.32 per m^{-2}) sites and mid-depth sites (1.43 per m^{-2}) (Williams 2001) may be the cause for low macroalgal cover. Also, due to mid-depth reefs located so close to the shore, it is possible that they are highly, if not equally, influenced by terrestrial impacts, thus explaining the similarity in algal abundance between the two depths.

In conclusion, it was found that (1) total algal cover was near equal in protected and non-protected areas; (2) turf algal cover in non-protected areas was twice as high than in protected areas; (3) total algal cover and macroalgal cover was nearly equal in shallow and mid-depth sites; (4) turf algal cover at shallow sites was twice as high than at mid-depth sites; (5) both Acanthuridae and Scaridae were twice as abundant at mid-depth than at shallow, and protected than at non-protected sites; and (6) the data collected provides a valuable reference for further studies and for long-term monitoring of this marine resource. It is hoped that the information from this study will assisted in the assessment of coral reefs in Dominica and may provide reference for management of the marine reserve, as well as the marine environment as a whole. This study, along with future monitoring of algal cover, will potential help in the interpretation of the survivorship of corals and the reefs in Dominica, as well as assist in the monitoring of herbivorous reef fish.

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Study IV: Common Sponges and Percentage Cover at Four Locations on the West Coast of Dominica.

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Abstract. Dominica, a young volcanic island with a narrow shelf has relatively small areas suitable for many sessile organisms. At each of four locations along the West coast, 65 m^2 were surveyed and a total of 32 sponges were identified. Four additional sponges remain unidentified. Sponges identified covered 39.81% with an average cover 4.97% m^{-2} of substrates per site.

Introduction

Along the West coast of Dominica, coral reefs are one of the known recreational destinations for tourists such as snorkelers and SCUBA divers. Geologically, the island is relatively young (Honychurch, 1995) and a narrow shelf that extends to 3-5 miles. Not much research has been done on these reefs with the exception of studies on boring sponges, (Ruetzer, 1970), archiannelids (Kirsteuer, 1969), decapods (Raymond, 1970), echinoids (Porter, 1966), coral assemblages (Steiner 2001) and coral disease (Steiner and Borger, 2000).

Little is known about the current state of the reefs. Epibenthic organisms are under severe disturbance from traditional fishing techniques that include, beach sein net fishing and spearfishing (Honychurch, 1995) sediment run-off from road construction, gravel factories, and agro-chemicals from banana plantations. In this study the abundance and percentage cover of sponges at four locations along the west coast of Dominica were investigated. It is hoped that this paper will provide a baseline reference on sponges for monitoring and comparative studies on other benthic organisms such as corals, algae and grazers such as the sea urchin *Diadema antillarum* (Williams 2001).

Methods

The abundance and percentage cover of sponges was surveyed of (1) Lauro Club at Salisbury, (2) Sourfiere Scott's head Marine Reserve (S.S.M.R,) at Champagne. (3) Canefield, north of Fond-Cole (4) at Secret Bay in Portsmouth.

A total of 520 m^2 of substrate (metamorphosed volcanic bedrock that forms massive boulders, Donnelly, 1996) were surveyed using a 50 m^2 belt transect. The occurrence of sponges was surveyed within 50 m^2 at each of the 8 sites. Twenty-five quadrats (1 m^2) were placed along the transect and alternating sides every 1m to estimate percent cover. In addition, 15 quadrats were randomly placed following (Goldbery, 1973) to estimate percent cover outside the belt transects. Data was collected while snorkeling.

Results

Of the 29 sponge species identified. 3 remain unidentified (Appendix 1). Of these 32 species 9 were tube shaped, 3 barrel or vase, 10 encrusting, 2 balls, 3 calcareous and 5 rope shaped covering an average of 4.97% of benthos per site. At Lauro Club 19 common sponges were found, covering 16.58%, distributed into 322 colonies. The most abundant sponge was tube shaped (*Pseudoceratina craassa* with 59 colonies), and encrusting shaped. (*Halisarca sp* with 16 colonies).

In the S.S.M.R. 16 species were found, covering 9.48% (Table 1) of surveyed area. The most abundant sponge was ball shaped (*Ircinia stobilina* with 49 colonies) and tubes (*Oceanapia bartschi* with 47 colonies) .Two hundred and forty-eight colonies of sponges were found in surveyed area.

Secret Bay had a total of 196 sponge colonies covering 4.69% of the studied area. There were 18 sponge species. The most abundant sponges were the encrusting unidentified species, (Fig. 3b, Appendix 1) with 24 colonies and tube shaped (*Oceanapia bartschi* with 20 colonies).

At Canefield, 13 species were present. The sponges covered 9.06% with 286 colonies. The most dominant ones were tube shaped (*Oceanapia bartschi)* with 31 colonies and the encrusting unidentified species, (Fig 3c, Appendix 1.) with 20 colonies. The total numbers of sponge colonies found during the survey is 1053 (Table 2). Sponges cover 39.81%(see table 1) of substrate at an average depth between 4-6 meters.

Table 2 Percent Cover of Sponges

Table 7. Sponges identified *in situ*. Abundance: abundant: >100, common: >50, uncommon:>20, rare: <20 sponges

Common Name	Scientific Name	Lauro Club		SSMR		Secret Bay		Canefield		Abundance	Total
		site 1	site 2	site 1	site 2	site 1	site 2	site 1	site 2		
Variable Boring	*S. coralliphagun*	1	3	7	7	2				rare	20
Yellow Tube	*A. fistularis*	8		2	2					uncommon	12
Rough Tube	*O. bartschi*	23	40	23	47	20	8	31	28	abundant	220
Black Ball	*I. strobilina*	23	43	29	49	9	5	34	36	abunant	228
Red-Orange Encrusting	*D. megastellata*	2			2					uncommon	4
Red-Pink Encrusting	*S.coccinea*	2	5	1				2	1	uncommon	12
Orange Elephant Ear	*A. clathrodes*	3								uncommon	3
Green Finger	*I. birotulata*	2	30			4	2	49	6	common	93
Branching Tube	*P. crassa*	10	49	1	6	5	1	2		common	74
Red Boring	*C. delitrix*		4				11	2	4	rare	21
Scattered Pore Rope	*A. fulva*		3	3	1					uncommon	7
Row Pore Rope	*A. cauliformis*		5	6	3					uncommon	14
Branching Vase	*C. vaginalis*			2	6	3			1	uncommon	12
Giant Barrel	*X. muta*			1						uncommon	1
Brown Bowl	*C. vasculum*			7	2					uncommon	9
Convolated Barrel	*A. lacunosa*			3						uncommon	3
Brown Tube	*A. conifera*			2						uncommon	2
Red Sieve Encrusting	*P. amaranthus*		8			10	2	2	3	rare	25
Orange Ball	*Cinachyra sp.*		1	7			3			uncommon	11
Star Encrusting	*Haliarca sp.*	7	16	3	6	14	12	2		common	60
Spiny Ball	*L. barbata*				4					uncommon	4
White Cryptic	*L. aspera*				1					uncommon	1
Peach Encrusting	*Clathria sp.*					3	5			uncommon	8
Or Sieve Encrusting	*Diplastrella sp.*							6	4	uncommon	19
Or Veined Encrusting	*R. venosus*					1				uncommon	1
Touch-Me-Not	*N. nolitangere*						2			uncommon	1
Lumpy Overgrowing	*H. helwigi*					3				uncommon	3
White Calcareous	*X. calcareous*						2			uncommon	2
Unidentified sp 1.	See appendix 1		6	9	6	1	3	4	15	rare	44
Unidentified sp 2.	See appendix 1		16			26	13	8	17	common	80
Unidentified sp 3.	See appendix 1		3			24	3	9	20	common	59

Discussion

Sponges, together with certain algae, (Willette 2001) are among the most dominant sessile organisms that occupy the Dominican reefal communities. Many of these reef sponges are ramose and provide shelter or food. Vicente (1982) concluded that some sponges are frequently eaten by certain reef-fishes (e.g. Angel Fish) and the endangered Hawksbill Turtle (1 seen at Champagne and 1 at Canefield). During the survey a member of the Scaridea was observed biting a *Neofibularia nolitangere* sponge that appeared to be frequently grazed.

In this study, there was a marked difference in the frequency distribution of sponges at every site. There were high populations of encrusting sponges (194 colonies) occupying the fringes of ledges. This was particular evident at Secret Bay where encrusting sponges were abundant on the edges of hard substrates. Areas at least 5 m from fringing ledges were characterized by ball, barrel, vase, rope, and tube shaped sponges (856 colonies). It is possible that current, wave (Vacelet 1976) and substrate parameters are contributors to differentiated distribution patterns at the studied locations. Calcareous sponges (3 colonies) occupy the cryptic areas where light and wave action seem to be important factors in their population and distribution.

Within the average cover of cover 4.97% m^{-2} recoded here, only 2 primary framework constructors, (Lang J Hartman and Land L 1975) namely *Xestospongia muta* and *Neofibularia nolifangere* have been identified in Dominica. In relation to this, coral species that are framework builders constitute less than 3% of the average 15 % scleractinian cover reported for Dominica (Steiner, 2000) This may be the effect of the narrow shelf and its disturbance regime (hurricanes, sediment run off, etc). The sponge community of Dominica is still poorly investigated. This study serves as additional reference on benthic organisms and represents a further contribution to our understanding of sponges on the Dominican coral reefs.

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