FINAL REPORT

REEF CHECK- EASTERN CARIBBEAN PROJECT

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1.0 PROGRESS REPORT (OCT 2004)

As part of the Regional Coordinating Unit of the Caribbean Environment Programme of the United Nations Environment Programme (UNEP-CAR/RCU's) sub-programme "Conservation and Sustainable Use of Major Ecosystems in the Wider Caribbean", the **Reef Check Eastern Caribbean Project** (RC-ECP) was officially launched in March 2004. The Coastal Zone Management Unit in Barbados, the regulatory governmental agency that officially launched Reef Check in Barbados, and Mr. Andre Miller the Barbados Reef Check Coordinator jointly supported this project.

The RC-ECP's primary goal was to establish and monitor two offshore sites in six islands of the Eastern Caribbean while utilising the Reef Check methodology. The islands selected were St Vincent, Grenada, Dominica, Antigua, St Kitts and Tobago. As stipulated in the UNEP-CEP/RCU's Memorandum of Understanding, a Governmental and a Non-governmental Organisation was identified in each country to continue the second round of monitoring.

1.1 Status of Coral Reefs

About one half of the worlds coastlines are in the tropics and about one third of the tropical coastlines are made up of coral reef (Birkeland, 1997). Corals are sensitive organisms and in order for a larva to settle out of the planktonic drift, attach to the substrate, survive and develop into young corals, they require: the perfect substrate, adequate water movement, an average salinity of 32-36 ppt, adequate sunlight, limited sedimentation and sometimes specific algal species or biological films (Richmond, 1997).

In recent decades the negative impacts on coral reefs have increased in scale and frequency. These stressors have negatively affected corals throughout the tropics (Bryant, 1998), including the Caribbean. In the Caribbean many, if not most of the reefs, have never been assessed, therefore the scale of the damage is presently unknown because of a lack in baseline data. This is especially true for Caribbean countries with low population densities and GDPs. In an effort to address this deficiency the Reef Check Eastern Caribbean Project was conceptualized in 2004. Since Reef

Check utilises a standardised monitoring protocol direct comparisons will be easily made between islands and sites, for the first time.

Figure 1: Map of the Eastern Caribbean

2.0 ISLANDS SURVEYED

2.1 St Vincent and the Grenadines (Mar 25-28th)

St Vincent and the Grenadines is made up of over twenty islands and islets, and has a population of 110,000. At this early stage of this Reef Check project all sites monitored were restricted to the mainland. The Fisheries Division (CFO Justin Rene), biologists Sophia Pinnet, Simone Cordice and the Caribbean Regional Fisheries Mechanism Secretariat (Biologist Sherry Constantine) represented the Government of St Vincent. Dive St Vincent (Bill Tweets and Calvert Richards) served as the non governmental counterpart. It should be noted that three sites were monitored in St Vincent due to high volunteer turn out from the dive operation and the government regulatory agencies.

Training of Participants

Prior to arriving in St Vincent various training materials such as the RC Five Year Reports, the RC training manual and vhs tapes were couriered to St Vincent. Therefore once EC Coordinator André Miller arrived all volunteers were already knowledgeable of Reef Checks' methodology. Various fish and coral identification books (Humann, 1993) were also used to familiarise volunteers with both fish and invertebrates. Several "dry runs" were conducted in the parking lot of the dive shop until all six participants were familiar with the methodology.

It should be noted that a similar Reef Check training protocol was established in the other five islands visited. However, for clarity the above information will not be repeated throughout this report.

Study sites and preliminary data

Three (3) permanent sites were identified, stored in a GPS and monitored in St Vincent. The sites were selected jointly by the St Vincent participants (both Government officers and non governmental personnel), and in such a way that protected sites and stressed sites would both be assessed.

Orca 2 is located on the west coast of St Vincent approximately 4 miles north of the capital Kingstown. Orca 2 was the first site assessed, and was selected as it was a heavily visited snorkel and dive site which receives some informal protection through the vigilance of the local dive operators. For example, permanent moorings have been installed and environmental spiels are given on many tours. This site had the highest abundance of hard and soft corals of the three islands (St Vincent, Grenada and Dominica) assessed during the first half of this project, as hard coral coverage averaged at 61.3% and nutrient indicator algae averaged at 4.4%.

There were approximately 8 adult parrot fish observed during each 20m belt transect, and the presence of these grazers may have accounted for the relatively low abundance of nutrient indicator algae observed on the line transect. There were also high number of schooling grunts and snappers at Orca Two (80 and 67 respectively), and this site is probably indicative of one of the St. Vincent's productive fringing reefs.

Despite this high fish abundance, or perhaps because of it, two spear fishers traversed the reef during the survey. Their catch indicated that predators and herbivorous reef fish were targeted.

Gardens was the second site monitored, and was approximately 1 mile south of Orca 2. Though also visited by divers/snorkellers to a lesser degree, there were signs of land-based sedimentation, and the shoreline showed signs of recent erosion. The relatively high abundance of nutrient indicator algae (average 20.6%), and low hard coral abundance (average 9.4%) may also be indicative of eutrophic waters.

Although there was a relatively high coverage of macro algae and sand, numerous (23) grazing parrot fish, and 58 *Diadema* urchins were observed. This may indicate that the grazing pressure though high, can not keep up with the proliferation of algae.

Young Island, the third site assessed was selected as it was in very close proximity to Dive St Vincent, and the shallow depth and calm waters provide a good location to conduct Reef Check training dives. This site had the highest abundance of *Diadema* urchins, with a total of 126 urchins being observed over the four 20m transect lines. Perhaps due to the separation from the mainland, and the busy waterway, spear fishing and pot fishing pressure at this site was reported to be less intense than at either of the other sites.

Plate 1: Soft coral dominated section of the Gardens, note transect line

2.2 Grenada (May 20-22nd)

The archipelago (the Grenadines) that runs from the north coast of Grenada (population 97,000) to the south coast of St Vincent has made the boundary between the two territories somewhat obscure. Fishers and sailors from both islands routinely enter each others territorial waters unhindered, and geographically there is little variation between the territories.

Unfortunately it appeared that the ability to holistically manage the offshore resources of Grenada was waning, and Government personnel lacked the equipment to consistently conduct marine monitoring. Furthermore, unforeseen circumstances on the part of the Fisheries staff prevented their participation in the training exercise at the last moment. Their space was however quickly filled by several divers from at least three dive operations who took part in the exercise. Eco Dive and Trek on Grand Anse Beach acting as the Reef Check coordinating office and meeting point.

The Grenadian situation has no doubt become more critical after the passage of category 4 Hurricane Ivan in September 2004, as priorities will obviously be focused on maintaining public health and providing adequate housing to 70% of the population. The extent of the physical damage inflicted on the Reef Check sites, or any other reefs, the dive boats or the Fisheries infrastructure by Hurricane Ivan is presently unknown.

Training of Participants

As earlier explained all training materials were delivered to the Fisheries Division prior to the arrival of the RC Eastern Caribbean Coordinator in Grenada. The final round of training was conducted in front of the Eco Dive and Trek operation, and allowed students to independently conduct a virtual Reef Check dive (Figure 1). Local recreational divers, who work outside of the dive and fishing industry are not very common in Grenada, therefore most volunteers were either native divemasters or instructors. A PADI Course Director Mr. Russel Hough, who lives on island, also took part in the training exercise. It should be noted that the manager (Marvin) of Ecodive

and Trek facilitated and invited the participation of divers from other hotels/dive operations, and appeared poised to oversee Reef Check in Grenada.

Study sites and preliminary data

The first monitoring site established off Grenada was Northern Exposure, which is located in close proximity to Grande Anse. The second site, Boss Reef/Quarter wreck though an appreciable distance away from Northern Exposure was also located off Grande Anse. Grand Anse is the largest tourism hub in Grenada. Both reefs were selected because they are highly utilised and their health critical to the local economy, with varying degrees of stress and most importantly there is a void of any standardised benthic data in this ecologically sensitive and highly utilised area.

The Northern Exposure and Boss Reef monitoring sites had a similar topography; a low relief barrier reef separated from the mainland by extensive sand reserves. Both reefs had a relatively high abundance of hard corals and on average both reefs had in excess of 20 hard coral points per transect. It should be noted that Boss Reef had the second highest percentile coverage (58%) of hard corals in the 2004 monitoring program, and was the only site where absolutely no nutrient indicator algae (NIA) was detected. It was however reported by some volunteers that NIA coverage was seasonal and later in the summer months it would reappear. There were approximately the same numbers of sessile *Diadema* urchins as they were mobile parrot fish, on the day Boss Reef was surveyed.

Northern Exposure had a total of 188 healthy soft corals across the entire transect, whereas Boss Reef had 122 soft coral colonies. This high abundance of soft corals, mainly *Pseudopterogorgia* sp., made the fish counts more difficult, while increasing the habitat for the smaller schooling species that were not listed as an indicator species by Reef Check.

Three lobsters were counted at Boss Reef within the transect, and several others were observed beyond the scope of the belt transect and closer to the steeper parts of the

reef. The presence of such a readily assessable delicacy in such a popular site attests to Grenada's success in regulating this fishery, or the respect had by fishers and divers for the sustainable use of the resource.

Plate 2: Refining the Reef Check methodolgy to belt transect divers

2.3 Dominica (May 20-22nd)

Reef Check recommends that a relativity low relief reef with minimal reef rugosity is selected when monitoring. Dive sites with such a topography is very difficult to find off Dominica, and due to the extremely steep "walls" cohesive coral reefs are generally restricted to fringing and patch reefs very close to shore. The Dominica transects though run continuously using a 100 metre pvc measuring tape, could not be deployed in a straight line, as it was deployed along the semicircular and shallow reef crest.

Training of Participants

Traditionally Dominica "the Nature Isle" with its 74,000 has led the way with terrestrial conservation within the Caribbean. Apparently, this nurturing also extended to the marine environment as there were more local participation and involvement in Dominica than at any other country. The twelve volunteers who took part in the training were very passionate about protecting and learning more about their marine environment. Some volunteers who could not dive offered support by preparing slates, snorkeling above the divers and doing other types of benthic monitoring for the MPA.

Both dives were conducted in the Scotts Head Marine Park, and organized by Fisheries Officer Arun Madisisetti, an officer who is highly recognised in the Scotts Head and Soufriere area. Nature Island Divers facilitated all divers, and provided a boat and equipment. Based on their location in the centre of the MPA these operators were very aware of the successes and difficulties within the park, and worked very closely with the Fisheries Division. Training was conducted on land and several practice dry runs were made to ensure that all volunteers mastered the Reef Check methodolgy.

Study sites and preliminary data

Champagne Outer and La Bym were the two sites monitored and both were within the Scotts Head MPA. At the all other sites assessed to date (i.e. St Vincent and Grenada) coral diseases were occasionally observed while establishing the transect lines. However

there were no diseases observed at either monitoring site, or by extension at any point during the training/monitoring dives in Dominica.

Nutrient indicator algae abundance was also relatively low at both sites as La Bym's NIA averaged at 2.5% and Champagne Outers NIA coverage averaged at 7.5%. Hard coral abundance was twice as high at Champagne Outer (38%) as it was at La Bym (20%), two sites with very similar water quality, climatic conditions and stressors. The high occurrence (31.3%) of barren carbonate substrate at La Bym, which had not been colonised by opportunistic algae or corals, may be directly related to the 334 Diadema urchins counted at that site. In addition to being prolific grazers, excessively high urchin densities may also reduce coral recruitment and growth by physically damaging the sensitive colonies (Carpenter, 1984).

When compared to other sites assessed in the Caribbean, the two Dominica sites (8 belt transects) had relatively high reef fish abundance; several butterflyfish, grunts and parrot fish were counted at all but one transect. At La Bym one moray eel on average was found at each transect, and these top predators were all mature specimens. There were several mature yellow tail snappers in loose schools hunting just beyond the reef crest, which were outside of the scope of the monitoring.

Plate 3: Dry run and introduction at Nature Isle Divers

Plate 4: Trial run at Outer Champagne

Plate 5: In the middle of Scotts Head Marine Protected Area

3.0 Terminal Report (additional islands surveyed)

Six Eastern Caribbean countries were visited in 2004 as part the Reef Check Eastern Caribbean Project. On average two monitoring sites were selected, demarcated and assessed, and the relevant NGO/GO selected the sites in each country based on local knowledge and challenges. This segment of the report spans the latter half of the project (October to December 2004).

3.1 Antigua (Oct 11-13th)

Antigua and her sister island Barbuda (population 74 300) are surrounded with numerous islets and extensive low relief patch and barrier coral reefs. Antidotal evidence suggests that Antigua may even have one of the most extensive elevated reef frameworks in the Caribbean, and several times during the surveys look-outs had to be placed on the bow of the boat to assist in navigating through very shallow water. Quite often these vast reefs, which are 1-2 metres below the surface, were located several miles offshore. This natural phenomenon has protected Antigua's coastline from several storms and hurricanes in the last decade alone, and hundreds of the high profiled corals Elkhorn coral (*A palamata*) were observed broken and dislodged along the bottom. Natural recovery was occurring on several reefs, as many of the severed corals were undergoing fragmentation and small projections were growing up from the dislodged colonies.

The Antigua Fisheries Division is very active in developing novel fishing techniques, and new ways to conserve the benthic resources. However, like many other islands in the Eastern Caribbean there is very little monitoring of the coral reefs and reef fish data is often derived from the amount of fish landed. The Fisheries Division also maintains very close ties to dive operators and the local diving committee, most notably Dive Antigua, which jointly became the Reef Check coordination arm in Antigua. This long standing affiliation allows the government regulatory agency to be proactive when dealing with user conflicts or breaches in laws or informal agreements. For example, the first site assessed, Boons Reef, like all other reefs in Antigua are not protected by local legislation

however there is an understanding that the area is a no take, and no go area. Spear fishing is not allowed in Antigua.

Training of participants

The participants were all local volunteers from the dive community or from environmental conservation industry (Ingrid Slyvester), and many had taken part in different monitoring exercises. Training was conducted over a two day period which began with dry runs on the beach, and as was done in all other location slates, manuals, video tapes/DVDs were used for the training exercise. The Fisheries Division representatives were quite knowledgeable regarding fish and substrate identification, and they required only minimal supervision. Fisheries Officer Steve Archibald and dive instructor Ashton Williams of Dive Antigua essentially forms the core of all offshore monitoring and marine conservation projects. Both individuals also took part in the Reef Check training exercise in St Lucia in 2001.

Study sites and preliminary data

Boons Reef and Little Bird Island, which are located on the west and northeast coast respectively, were the two sites monitored in Antigua. Boons Reef is in close proximity to one of the busiest dive and snorkel sites on island, however the specific area chosen has be declared “off limits” by the Antigua Fisheries Division/Dive Antigua. Despite the large expanse of reefs, hard coral abundance was moderate especially at Boons Reefs where hard corals made up approximately 12% of entire 100 metre long transect. Conversely, nutrient indicator algae coverage was over 42%, which was the highest algal coverage across the six islands surveyed. Boons reef also had a very high soft coral coverage of 21% when the line transect was run, and a total of 334 soft corals when data from the 400 m^2 belt transect was compiled

Not unlike many of the Caribbean countries there was a lack of both mobile (parrot fish) and sessile (*Diadema* urchin) algal grazers off Antigua, which may account for the elevated macroalgae. Large mature mahogany tail snappers were however observed in

the deeper sections of the site, and though not counted, their presence was documented. (Boons Reef data independently submitted from Fisheries Division).

Plate 6: First dry run on Dive Antigua's beach

Plate 7: Moribund colonies of elkhorn coral (*Acropora palmata)*

3.2 St Kitts (October 14-15th)

The island of St. Kitts was the smallest and least populated (35,000) island monitored during the Reef Check Eastern Caribbean Project. To date very little has been published about the benthic marine communities around the island, and what is know is a result of St Kitts' small recreational dive industry. Diving also seems to be limited to visitors and expatriates, and this made the recruiting of local volunteers very difficult although formal links had been made weeks earlier. It was however a good indication that the Chief Fisheries Officer (CFO) of St Kitts is a Padi Divemaster with a genuine interest in preserving the marine environment.

Resources and personnel are the main limitation facing St Kitts. However the high level of awareness by the CFO, as well as the most popular dive operation on island (Kenneth's Dive Centre) shows that eventually a permanent local-team can be established. Until funding or more local personnel is trained to dive and monitor reefs, it is unlikely that St Kitts will be able to independently monitor their reefs.

Training of participants

The NGO point agency in St Kitts was Kenneth from Kenneth's Dive Centre, and CFO Joseph Simmonds would act as team leader time permitting and help upload data to Reef Check's UCLA database. Although several visitors inevitably became involved with the training exercise and learnt to identify the selected fish habitat type, they could not be considered to be part of the permanent St Kitts Reef Check team. Kenneth was therefore the only local participant; and he also mastered and taught the methodolgy quickly.

Study sites and preliminary data

Ponds Bar was selected as the only site to be assessed. This site was recommended by both the Fisheries Division and Kenneth's Dive Centre, based on its proximity to the

small capital of Basseterre. Furthermore Kenneth reported that they have been diving this reef for decades as has slowly watched fish numbers undergo a significant decline. Both individuals further advised that the most pristine reefs were found off Brimstone Hill on the west coast, and that they should be monitored to give an indication of St Kitts' most productive reefs. This site may therefore be monitored during the subsequent Reef Check monitoring in St. Kitts, as personnel constraints did not allow Kenneth to make the relatively long trip to the site.

Despite this reported decline in fish abundance and diversity, abundance levels of the selected indicator species were on par with, and above often exceed the assessments made at other reefs. This may suggest that many neophyte divers or recent additions to the regulatory agencies may be affected by the "shifting baseline syndrome", whereby community changes over time by not be easily detected.

St. Kitts Reef Check team heading to Ponds Bar, note Basseterre in background.

3.3 Tobago (November 19-20th)

Tobago the smaller sister island to Trinidad is not legally considered to be part of the Eastern Caribbean, however geographically Tobago is very similar to the EC archipelago and is approximately only 75 miles from Grenada. Tobago Fisheries Division has the largest compliment of staff, most of which are dive instructors, divemasters and advanced divers. The fact that these divers/fisheries officers including the Chief Fisheries Officer- Mr. Errol Caesar are often offshore experimenting with fishing devices and conducting basic coral monitoring exercises meant that Tobago had the largest well trained dive team. Additionally one of the private (Ecodivers) dive operations in Grafton is headed by Andrew Lovell, an instructor who completed the Reef Check training in St Lucia in 2001, and has been affiliated with Fisheries for numerous years. Mr. Kirwin Sampson the Diving Superintendent of Tobago was also part of the training exercise.

Training of participants

A half day training seminar was held at the Fisheries Office, and was attended by seven Fisheries biologist and officers. This highly interactive session included conducting dry runs in the office, selecting monitoring sites one of which was in Bucco Reef MPA, and delegation of specific tasks to divers.

Unfortunately the night of the training session in Tobago, the island was affected by torrential rain, which persisted throughout the second day. This rain caused an influx of surface water into the ocean at several points along the coast and by mid day the entire Bucco area was filled with sediment laden water and all dives were cancelled at all dive shops as visibility was almost zero. It was since been reported that the rain persisted for another two days and caused severe flooding and land slides in the north of the island which destroyed several houses and roads.

Though disrupting the planned monitoring dives, this flooding clearly showed the impact that deforesting can have on a benthic ecosystem.

Study Sites

The two monitoring sites earmarked were Crown Point and the Bucco Reef MPA. Fisheries officer Keisha and Andrew Lovell (both of whom also took part in the 2001 St Lucia training exercise) indicated that the surveys will be completed at a later date when the UNEP grant was received, and the data forwarded to Reef Check.

4.0 Summary and Recommendations

Reef Check was the first standardised coral reef monitoring protocol to be implemented in the Eastern Caribbean. The data presented in this report represents the first round of such monitoring, and is viewed as a foundation to be built upon. In the short term, UNEP will fund the second round of monitoring as specified in the CZMU-UNEP Memorandum of Understanding, 2004.

All of the participants who took part in this pilot project are now equipped to continue Reef Check monitoring. Several of the trainees are well know in their respective countries and are viewed as local environmentalist and sometimes even heroes. These are the new Reef Check coordinators that, *once given the support*, will be able to promote coral and fish monitoring like only a local individual can.

In the medium term it is expected that additional monitoring sites will be established in the more pristine, and remote reefs on the Atlantic coasts. This would allow scientists and reef managers alike to gather "baseline" information on reefs that have not been overly stressed to date. In the case of Antigua, St. Kitts, St Vincent and Grenada it would also be optimum if Reef Check can also be introduced to the numerous islands that surround the mainland.

<u>Negative Impacts</u>

It became very clear that the stressors, both natural and anthropogenic were all quite similar across all sites monitored; however some islands are better equipped to address these problems. Based upon reports from Fisheries Divisions, the most common stressor appears to be over fishing of herbivorous fish, which has contributed to the proliferation of algae at many sites. However, many dive operators and local fisheries personnel are aware of this and were beginning to address these problems through new legislation and new fishing techniques.

It was also speculated (no water quality testing), that some of the algal overgrowth was aided by elevated nutrient levels (eutrophication). A comprehensive water quality

monitoring program that targets nitrates and phosphates should therefore also be included in future Reef Check monitoring to aid in identifying and quantifying these stressors. Simply put, a holistic approach is needed to address the general problem of overfishing and reef destruction.

Reef Check stands to play a vital role in the Caribbean, with minimal expenditure by the various governments, by establishing a cadre of volunteers from the recreational, fishing and scientific community who can compile extremely useful information. This information can be *directly* compared between islands (inter-governmental), and clearly show trends of recovery or depletion of resources. Knowing the true status of the benthic resources surrounding their islands is the only way that the respective stakeholders will make even stronger efforts to protect them.

At the completion of the first phase of the Reef Check Easter Caribbean Project, where individuals in six new territories were trained, and eleven new sites monitored and the data submitted, the number of countries that have utilised Reef Check globally has surpassed seventy.