

Implementing ‘Reef Check’ monitoring programme in the country of St. Vincent and the Grenadines for long-term sustainability

Kimberly Baldwin
CERMES, University of the West Indies
Cave Hill Campus, Barbados, WI.

Prepared for the St. Vincent Fisheries Division and The Sustainable Grenadines Project (information to be used for a paper to be submitted at the 2005 GCFI Conference)

Introduction

The main goal of a government coral reef monitoring program is to acquire the data which is needed for management decisions. Management initiatives in turn require community education and support in order for successful implementation and enforcement. Therefore by involving local communities in monitoring programs such as Reef Check, governments help build a sense of stewardship for marine resources as well as increasing public education and support for management plans. Additionally, by utilising community volunteers; a cost-effective source of standardised scientific information can be collected for comparison on a local and global scale. Ideally, it has been shown that the success of establishing a long-term sustainable community-based monitoring programs such as Reef Check is increased if there is collaboration between local government, NGO's, and the private sector. From January – April 2005, The Amadis Project trained and assisted the country of St. Vincent and the Grenadines in implementing Reef Check, the country's first standardised community-based marine monitoring program.

What is Reef Check?

Reef Check was developed in 1996 as a volunteer, community-based monitoring protocol designed to measure the health of coral reefs on a global scale in areas with limited economic resources. Now in its eighth year of operation, Reef Check is active in over 82 countries and territories throughout the tropical world. During this time, Reef Check has evolved into the largest international marine monitoring environmental organization with the following goals:

- To educate the public about the coral reef crisis;
- To create a global network of volunteer teams which regularly monitor and report on reef health;
- To scientifically investigate coral reef processes;
- To facilitate collaboration among academia, NGOs, governments and the private sector;
- To stimulate local community action to protect remaining pristine reefs and rehabilitate damaged reefs worldwide using ecologically sound and economically sustainable solutions.

Reef Check scientists train teams of volunteers about the value of coral reefs, their ecology and how to scientifically monitor them. Reef Check survey methodology is relatively simple and easy to learn and most volunteers can be trained in approximately 2–3 hours. During surveys, the work is supervised and checked by a scientist. Teams are composed of a diverse range of volunteers ranging from scientists, government agencies, local NGO's, recreational divers to village fishermen, school children and tourists. Through this process, Reef Check is a relatively low cost monitoring survey as well as a public awareness tool regarding the global coral reef crisis and potential solutions. Around the tropical world Reef Check volunteer teams have collected a wealth of standardised data about the health of reefs for comparison by Reef Check and other global databases such as GCRMN (Global Coral Reef Monitoring Network) and Reef Base.

Reef Check teams collect four types of data:

1. A description of each reef site based on over 30 measures of environmental conditions and expert rating of human impacts in area
2. Fish counts along an 800 m² section of shallow reef
3. Invertebrate counts over the same area
4. A measure of the percentage of the seabed covered by different substrate types including live and dead coral as well as coral bleaching and diseases

Sixteen global and eight regional indicator organisms and substrates are selected by Reef Check and GCRMN to serve as specific measures of human impacts on coral reefs (Appendix 1). These were chosen based on their global economic and ecological value as well as their sensitivity to human impacts. Furthermore, Reef Check survey methodology can be easily adapted for site-specific use by implementing additional indicator organisms to surveys for use in local management decisions or to examine the effectiveness of marine protected areas. For example in the Eastern Caribbean, the spiny lobster, queen conch, sea-turtles, West Indian sea egg, groupers and snappers are threatened throughout the region by over-fishing. Therefore in areas where these 'indicator organisms' are targeted; their populations are expected to decrease. The Reef Check monitoring program uses specific 'indicator organisms' in order to get a 'snapshot' of the local marine environment. Reef Check is a relatively fast method of examining the general health of coral reefs, fish and invertebrates at up to two sites a day. As the number of Reef Check sites increases in a particular area the resolution of this 'snapshot' is increased. By utilising Reef Check volunteer teams many more sites are able to be examined in an area than is possible with more intensive scientific methods which are more costly in time, trained professional staff and funding (Hodgeson 1998).

Ideally the benefits of an individualised government long-term monitoring program can be fully utilised by implementing Reef Check monitoring programme as part of a two level 'design framework'. This cost-effective framework consists of at least two levels of monitoring: a community-based relatively broad-bush program such as Reef Check conducted at many sites, as well as a high-resolution program carried out by more scientific teams at fewer sites. This combination of monitoring provides governments with an early-warning indicator system for major anthropogenic changes in the marine environment such as coral bleaching, diseases, over-fishing, eutrophication and

sedimentation. Additionally, implementing Reef Check facilitates collaboration between governments, local NGO's and the private sector by building community support for coral reef monitoring and management in an area. By participating in Reef Check training and surveys the community in turn learns more about the marine environment and see the resulting anthropogenic impacts thus gaining a sense of stewardship and spread their experience throughout society therefore increasing public education and support for coral reef research and management decisions.

Methods for Implementing Reef Check in St. Vincent & the Grenadines

Amadis Project Overview:

In order to implement a Reef Check monitoring programme for long-term sustainability in St. Vincent and the Grenadines formal proposals were drawn up outlining responsibilities for each of the various stakeholders (government, local NGO's and local community volunteers).

Initially the St. Vincent Fisheries Division was consulted in order to design the implementation of the Reef Check monitoring program in the country as well as attain permission to conduct research in the waters of St. Vincent and the Grenadines. Consultations with the Chief Fisheries Officer were conducted over a two week period in which the role of the Fisheries Division's involvement in the monitoring programme was reviewed. Additionally hands-on training of a staff member as the 'Reef Check Country Coordinator' responsible for training new survey teams, initiating annual surveys throughout the country, data handling and management as well as the application of Reef Check data for local management use was conducted during this period. A formal proposal of the requirements for implementing Reef Check in St. Vincent and the Grenadines was agreed upon and approved by the Minister of Agriculture in January 2005 (Appendix 2). All parties participating in the St. Vincent and the Grenadines Reef Check programme were given a copy of this implementation proposal.

Collaboration with the NGO 'The Sustainable Grenadines Project' proved invaluable in many ways throughout this project in the implementation of Reef Check. By partnering with a trusted local community non-governmental organisation the Amadis Project was able to quickly locate the appropriate contacts in each island and more importantly quickly gain the trust and acceptance of each island community during the project. From January – March 2005, 'The Amadis Project' team of 5 volunteers and 38' sailing yacht *Amadis* acted as a roving 'Reef Check' research training coordinator in the islands of St. Vincent, Bequia, Mustique and the Tobago Cays (a joint effort between Mayreau & Union Islands). With the assistance of the local NGO, The Sustainable Grenadines Project, a variety of stakeholders including government agencies (including the Tobago Cays Marine Park rangers), several smaller local NGO's, schools and members of the private sector were solicited in each island in order to gain support and volunteers for the Reef Check monitoring programme. Additionally, The Sustainable Grenadines Project implemented 'Reef Check Monitoring' to its annual work plan and agreed to act as the 'NGO Reef Check Coordinator' for St. Vincent and the Grenadines responsible for spearheading annual surveys from a NGO perspective as well as being a liaison with the Fisheries Division. Furthermore, a member of The Sustainable Grenadines Project was

trained to use the locally collected data for its own purposes as well as be a 'Reef Check Team Trainer' in order to train new teams and gain additional support throughout the country in subsequent years.

The members of 'The Amadis Project' supported by Reef Check, the St. Vincent Fisheries Division and local NGO's (principally the Sustainable Grenadines Project) set sail to encourage local communities (including dive shops operators, marine park rangers, fishers, community groups, schools, tourists and hoteliers) to get involved in the new Reef Check monitoring programme. In each island visited, informational meetings were held to inform the community of the project and solicit interest from community members to volunteer and form new Reef Check survey teams who will participate in annual Reef Check surveys. Local communities also assisted scientists in locating appropriate survey sites and provided boats, gas, tank air-fills, SCUBA gear and divers needed to perform surveys. Thanks to a PADI Project AWARE grant, the Amadis Project provided free training and all survey equipment needed (including training videos, identification slide shows, underwater species identification cards, transect tapes, clipboards, underwater papers, plumb lines, PVP pipes, pencils and Excel spreadsheets) for each new 'Reef Check' team set up in St. Vincent and the Grenadines during the project.

Additionally in each of the Grenadine islands of Bequia, Mustique and the Tobago Cays (Union Island) a local 'Reef Check Island Coordinators' was appointed for overseeing Reef Check teams and act as a liaison to the Fisheries Division assisting with spearheading subsequent annual surveys in their respective islands as well as reviewing and entering local data collected during surveys before sending it to the Fisheries Division.

Reef Check Training:

A total of 5 new teams were trained in Reef Check methodology with a total of 7 sites set up and surveyed from January to March 2005. Each of the registered Reef Check teams and member information including local Reef Check Island Coordinators are listed in Appendix 3.

Each Reef Check training session was specifically tailored around the capacity and specific interests of the volunteers in each island. Professional dive operators tended to be the busiest yet easiest groups to train and as a result of their dive experience they tended to know the various indicator fish, inverts and substrates. Therefore these types of training sessions were informal and training consisted of reviewing indicator organisms and the focus was primarily on survey techniques and data entry and analysis. Others teams such as the marine park rangers, school groups and environmental clubs were trained in a more formal fashion over a week period. A series of lectures were conducted in classrooms sessions introducing Reef Check, the importance of reef monitoring, slideshow and field identification of fish, inverts and substrates, practice snorkelling surveys and a separate data entry/analysis session. Teams usually consisted of a minimum of 6 members; 2 people assigned to survey each of the three variables examined.

Reef Check Surveys:

All surveys were conducted parallel to shore, at one depth contour (due to the deep nature of reefs in St. Vincent and the Grenadines) in relatively shallow reef areas (2-13 m).

Along one depth contour, four 20 meter transects each separated by a 5 meter space were deployed at each site was surveyed for fish, invertebrates and benthic substrates and a site description was completed by the members of the survey team. In each island, sites were chosen based on recommendations from Fisheries Division and community members initially focusing on surveying their “best” reefs in terms of areas that are the least likely to be affected by human impacts, fishing, pollution as well as areas that possessed high amounts of living coral cover and living fish and invertebrate populations. In many cases, sites chosen for surveys were areas located in marine protected or conservation areas or popular dive sites. If multiple sites were surveyed in an area, additional sites were representative of moderate to heavy human impacts. A list of the various sites surveyed and their GPS locations are listed in Table 1.

Island	Site Name	Depth	GPS Coordinates	Site Description
St. Vincent	Young Island Cut	7	13.07.09 N, 61.12.21 W	Conservation Area
	The Gardens	13	13.09.79 N, 61.14.88 W	Popular Dive Site
Bequia	Moonhole	12	12.59 35 N, 61.16.32 W	Popular Dive Site
Mustique	Plaintain	9	12.86.99 N, 61.19.46 W	Conservation Area
	Horseshoe Reef	2	12.38.09 N, 61.21.01 W	Marine Protected Area
Tobago Cays	Petite Tabac	3	12.37.28 N, 61.21.02 W	Marine Protected Area
	Petite Bateau	2	12.37.59 N, 61.21.33 W	Marine Protected Area

Table 1. Reef Check survey sites by depth (m), GPS coordinates (degree-minutes-seconds) and rationale for site selection set up during the Amadis Project from January to April 2005.

Additionally local ‘indicator species’ and ‘site description’ questions of particular interest by the Fisheries Division and/or local communities were also added to Reef Check surveys. Eastern Caribbean ‘Indicator species’ added to the Reef Check surveys are sea turtles, queen conch, bristle worms, the West Indian sea egg as well as additional questions regarding boat traffic (including motor boats), storm drains, turtle nesting beaches, turtle and whale harvesting, as well as water pollution regulations in the area.

Immediately after completing each Reef Check survey, the team leader gathered the slates and reviewed data collected for quality assurance with team members. Later that day, team leaders as well as interested team members registered the team online and entered the data collected with a scientist into automated Excel spreadsheets. All data was reviewed a second time before being sent to the St. Vincent Fisheries Division’s Reef Check Country Coordinator for review and data management for governmental use before sending data to Reef Check headquarters. Results in this report are calculated using the Reef Check automated spreadsheets which were taught and distributed to all teams and coordinators throughout this project allowing for individual teams to easily produce localised reports in a similar style as the following.

Results

Seven Reef Check sites were surveyed in four islands within the country of St. Vincent and the Grenadines from January to April 2005. These preliminary surveys will comprise the baseline information needed for future statistical comparisons with subsequent annual Reef Check marine monitoring surveys.

Analysis of substrate data indicate mean hard coral abundances ranged from 2.5 % at the Gardens site in St. Vincent to a high of 17.25 % hard coral cover at Plantain, Mustique (Table 2). Recently killed corals were only found at the Moonhole and Plantain sites and in negligible amounts (less than 1%). Generally, marine protected and conservation area survey sites seem to comprise of the lowest hard coral abundances as compared to sites which were chosen because of popular dive sites.

Nutrient indicator algae (NIA) was present at all sites although it was found in generally low abundances; the Horseshoe Back Reef site had the lowest percent cover of NIA at 2.25% and Petite Bateau was the site with the highest percent cover of NIA at 16.25%. The Gardens site had by far the highest mean sponge abundance (13 %) whereas Plantain and Petite Tabac sites had none. Other substrate categories of rubble, silt/clay and other all consisted of less than 5% mean cover of each per transect (Figure 1).

The highest overall densities of indicator fish species were seen at Petite Bateau, 65 individuals and Young Island Cut sites, 58 individuals per 100 m² (Table 3). On average, the indicator fish families (grunts and butterflyfishes respectively) were the most abundant families found across all sites whereas larger high-value fish were found in lower abundances. Fish data confirm that mature groupers (greater than 30 cm in length) are a scarce resource at reef sites in St. Vincent and the Grenadines only being seen at 2 sites, Young Island Cut with a mean of 1 fish and Plantain with a mean of 4.5 individuals per 100 m². Snappers were not seen at the Young Island Cut, the Gardens or the Horseshoe Back Reef sites and highest densities were found at Plantain at 8.25 fish per 100 m². Mature parrotfish (greater than 20 cm in length) were also seen in low abundances at all sites averaging about 2 individuals per 100 m² transect. Overall fish diversity was highest at the Plantain site in Mustique whereas the lowest fish diversity was seen at the Horseshoe Back Reef site in the Tobago Cays Marine Park.

Gorgonian densities ranged from a low of 4.5 individuals per 100 m² at Young Island Cut and in densities as high as 46.25 at Petite Tabac and 43.25 individuals per 100 m² at Plantain sites (Table 3). Diadema densities varied widely with the highest mean densities found at sites in St. Vincent with a high of 60 individuals per 100 m² found at Young Island Cut and a mean of 26.25 at the Gardens site. Diadema densities were less than 1 (0.5 individuals per 100 m²) at the Moonhole site. This may account for the exceptionally low abundance of NIA (2.75 %) at the Young Island Cut site versus the (10.50 %) NIA found at the Moonhole site thus reinforcing the role of diadema on controlling the amount

of fleshy macroalgae cover on a reef. Petite Bateau also had low densities of diadema (3 individuals per 100 m²) and the highest measure of NIA percent cover at a site averaging 16.25% per transect.

All other invertebrate species (flamingo tongue, pencil urchin, West Indian sea egg, bristle worms, spiny lobster, queen conch, banded coral shrimp and triton) were seen at zero or minimal densities across all sites indicating that the invertebrate resource in St. Vincent and the Grenadines is severely over-harvested (Table 3).

Coral bleaching was considered to be low at all sites except for Petite Bateau where several colonies showed up to 40 % coral bleaching (Table 4). Diseases found on reefs during the surveys include white plague, black band and aspergilliosis. Coral damages from human impacts ranged from high with trash and heavy anchor damage at the Young Island Cut site to medium with snorkelling damage at the Petite Bateau site and low with fish nets found at the Moonhole site.

Conclusion and Recommendations

A healthy marine environment is essential for the sustainable livelihoods of local communities as well as the long-term success of tourism in St. Vincent and the Grenadines. Results from these initial Reef Check surveys reflect the effects that human impacts are having on the marine environment; such as coastal development, pollution (marine and land based) and over-fishing. Implementing the Reef Check program is the first step in monitoring the marine environment thereby aiding in management decisions and conservation in St. Vincent and the Grenadines.

The Amadis Project assisted in organising and training 5 new volunteer Reef Check survey teams and set up 7 sites for annual marine monitoring from January – April 2005. After the 2006 surveys, statistical comparisons may be made for monitoring purposes. This project has provided the baseline data for the St. Vincent and the Grenadines Reef Check marine monitoring programme. Further collaboration between the St. Vincent Fisheries Division, the Sustainable Grenadines Project and local island Reef Check teams is essential for the sustainable implementation of this long-term monitoring programme. Reef Check Coordinators (both governmental and NGO) need to work together to be responsible for organising subsequent annual surveys, training new teams, implementing additional sites for monitoring and managing data in order to produce useful information for management.

It is recommended that the St. Vincent Fisheries Division implement this Reef Check programme as part of a two level 'design framework'; consisting of at least two levels of monitoring: a community-based relatively broad-bush program such as Reef Check conducted by volunteers at many sites, as well as a high-resolution program carried out by more scientific teams at fewer sites. This combination of monitoring provides governments with a cost-efficient early-warning indicator system for major anthropogenic changes in the marine environment such as coral bleaching, diseases, over-fishing, eutrophication and sedimentation as well as facilitating community support for marine management in an area.

Acknowledgements

Many thanks to the various local communities, schools and private sector organisations in St. Vincent and the Grenadines who were involved in the implementation of this project. It would not have been possible to set up the Reef Check monitoring programme in this country without your donations of time, local information and resources; especially the many dive shops and divers who volunteered in the Reef Check training sessions and conducted the marine surveys. Thanks to the St. Vincent Fisheries Division for allowing the Amadis Project to conduct marine research and for supporting the Amadis Project by providing staff, boats and gas to perform surveys in the islands of St. Vincent and the Tobago Cays. Special thanks to Casper Smith and Robin Mahon of the Sustainable Grenadines Project; without your support and facilitation with locating relevant contacts within the St. Vincent government and various communities of the Grenadines we would have not been as successful or readily welcomed and trusted by the local communities as we were. We honestly could not have done this project without your collaboration. This project was funded by a PADI Project AWARE grant as well as generous donations from Rite in the Rain paper products. Last but definitely not least, the crew of *Amadis* for volunteering four months of their lives to this Project; it wouldn't have happened without you all. Thank you!

Island	Site	Depth (m)	Hard Coral	Recently Killed Coral	Nutrient Indicator Algae	Sponge	Soft Coral	Rubble	Rock	Silt/Clay	Other
St. Vincent	Young Island Cut	7	4.75 (2.6)	0	2.75 (1.5)	3.00 (0.8)	0	4.25 (2.5)	6.25 (2.5)	0	4.75 (1.0)
	The Gardens	13	2.50 (3.7)	0	10.00 (3.2)	13.00 (2.2)	0	3.50 (1.7)	4.25 (2.8)	0	0.25 (0.5)
Bequia	Moonhole	12	15.75 (0.5)	0.75 (1.0)	10.50 (3.9)	2.50 (2.4)	2.00 (0.8)	1.00 (0.8)	4.75 (2.8)	0	0.25 (0.5)
Mustique	Plaintain	9	17.25 (5.3)	0.25 (0.5)	6.75 (4.27)	0	5.25 (2.5)	0	4.25 (1.3)	0	0.75 (0.5)
Tobago Cays	Horseshoe Back Reef	2	9.75 (3.1)	0	2.25 (1.0)	0.75 (1.0)	0.5 (1.0)	2.50 (2.9)	15.75 (2.6)	0	0
	Petite Tabac	3	4.00 (1.6)	0	8.25 (1.9)	0	0.75 (0.5)	0	23.25 (3.9)	1.00 (1.4)	0.50 (1.0)
	Petite Bateau	2	5.50 (5.0)	0	16.25 (6.8)	0.50 (0.6)	0	1.25 (2.5)	9.75 (3.9)	0	0

Table 2. Mean benthic substrate abundance (% cover) per 20m² transect surveyed at Reef Check sites in St. Vincent and the Grenadines during the Amadis Project from January - April 2005.

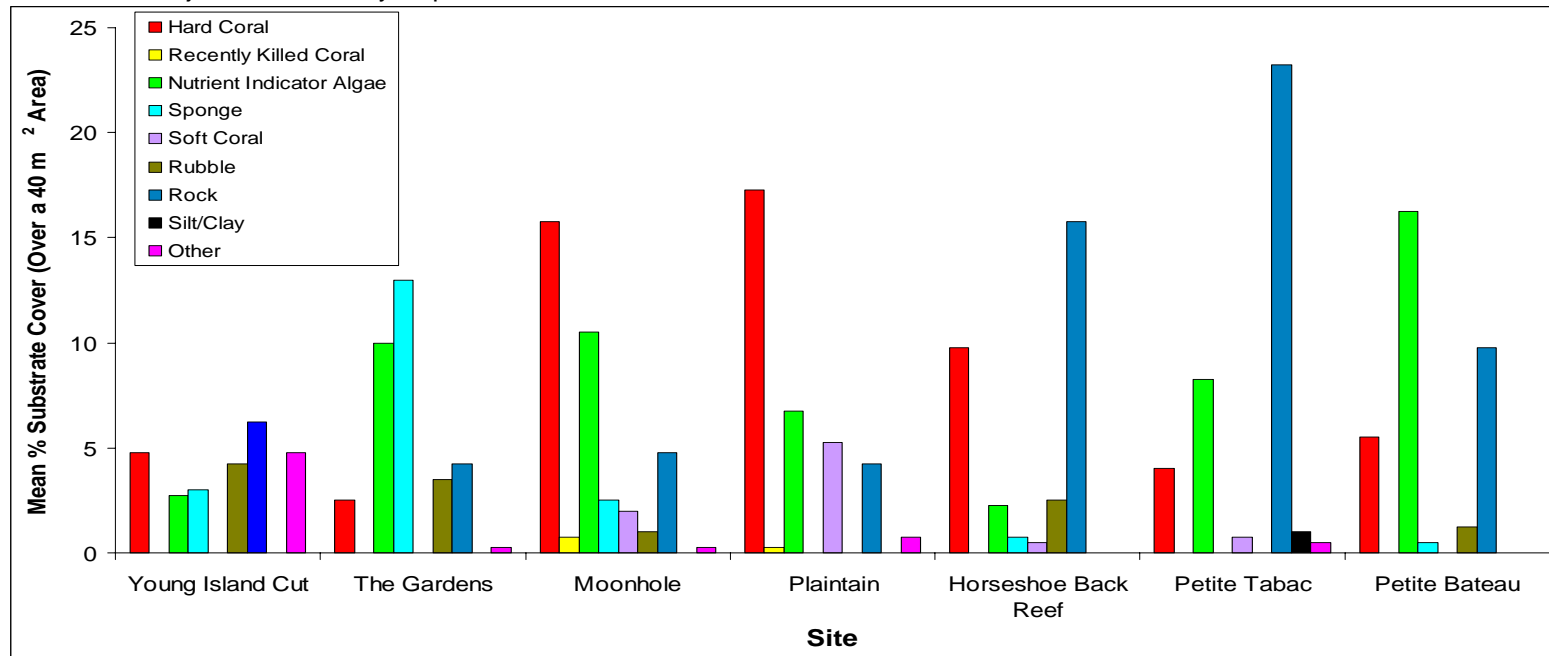


Figure 1. Mean benthic substrate abundances (% cover) at Reef Check sites in St. Vincent and the Grenadines surveyed from January - April 2005.

	St. Vincent		Bequia	Mustique	Tobago Cays Marine Park		
	Young Island Cut	The Gardens	Moonhole	Plaintain	Horseshoe Back Reef	Petite Tabac	Petite Bateau
Indicator Fish Families							
Butterflyfish	4.75 (0.5)	1.25 (1.5)	6.25 (2.6)	5.25 (2.4)	8.25 (2.2)	0.25 (0.5)	2.50 (2.1)
Grunts	50.5 (67.6)	4.00 (2.9)	12.00 (6.2)	7.25 (2.4)	0.50 (0.6)	4.25 (2.2)	57.25 (97.9)
Parrotfish	1.50 (1.3)	5.25 (4.6)	0.75 (1.0)	5.25 (2.5)	2.00 (0.8)	3.00 (2.2)	2.25 (1.7)
Snappers	0	0	1.50 (1.9)	8.25 (6.4)	0	0.25 (0.5)	1.25 (1.5)
Nassau Groupers	0	0	0	0	0	0	0
Other Groupers	1 (0.8)	0.25 (0.5)	0	4.5 (1.3)	0	0	0
Moray Eels	0.50 (1.0)	1.25 (1.9)	0.25 (0.5)	0	0	0	0
Indicator Invertebrates							
Gorgonians	4.50 (3.1)	13.00 (5.0)	31.00 (5.6)	43.25 (18.3)	35.00 (10.9)	46.25 (16.8)	26.00 (20.6)
Flamingo Tongue	1.25 (1.5)	0.25 (0.5)	5.50 (4.8)	0.75 (1.0)	1.00 (2.0)	1.75 (2.4)	0.50 (1.0)
Diadema	60.00 (30.1)	26.25 (14.0)	0.50 (0.6)	16.75 (14.9)	9.75 (8.1)	15.25 (9.2)	3 (4.7)
Pencil Urchin	0	0	1.25 (1.0)	0.75 (1.0)	0.50 (1.0)	0	2 (4)
West Indian Sea Egg	0.50 (1.0)	0	0	0.25 (0.5)	0	0.50 (0.6)	0.75 (1.5)
Bristle Worm	0	1.50 (1.0)	0	0.5 (1.0)	0	0	0
Spiny Lobster	0	0	0	0	0.50 (1.0)	0.50 (1.0)	0
Queen Conch	0.25 (0.5)	0	0	0	0	0	0
Banded Coral Shrimp	0	0.25 (0.5)	0.75 (1.0)	0	0	0	0.50 (1.0)
Triton	0	0	0	0	0	0	0

Table 3. Mean density of Reef Check fish and invertebrate indicators per 100m² transect at sites surveyed in St. Vincent and the Grenadines during the Amadis Project from January - April 2005.

Island	Site	Coral Bleaching	Diseases	Coral Damage	Trash	Other Comments
St. Vincent	Young Island Cut	Low	White Plague	High (anchor damage)	High	A lot of macroalgae in area Popular shallow dive site near industrial area
	The Gardens	Low	Aspergiliosis	Low (anchor damage)	Low	
Bequia	Moonhole	Low	None	None	Low (fish nets)	High coral abundance & diversity at site
Mustique	Plantain	Low	Black Band & Aspergiliosis	Medium (anchor damage)	Low (fishing line)	Watersports and beach bar/restaurant in bay
Tobago Cays	Horseshoe Back Reef	Low	Black Band & Aspergiliosis	Medium (wave damage)	None	Generally healthy reef
	Petite Tabac	Low	White Plague	Medium (wave damage)	None	Fish bite marks seen in some hard corals
	Petite Bateau	Medium	Black Band	High (snorkeling damage)	Low	A lot of black band disease & coral rubble in area

Table 4. Coral diseases, bleaching, damage and trash found at Reef Check sites surveyed in St. Vincent and the Grenadines during the Amadis Project from January - April 2005.

Appendix 1. Atlantic indicator organisms and substrates chosen for survey by Reef Check.

Fish
Butterflyfish
Grunts
Snapper
Nassau grouper*
Grouper*
Parrotfish
Moray eel
Invertebrates
Banded coral shrimp
Bristle Worms
Diadema
Pencil urchin
Triton
Flamingo tongue
Gorgonian
West Indian Urchin (Sea egg)
Queen Conch
Lobster
Coral Disease/ Bleaching//Trash/Other
Coral damage: Boat/Anchor
Coral damage: Dynamite
Coral damage: Other
Trash: Fish nets
Trash: General
Bleaching (% of coral population)
Bleaching (% of colony)
Grouper sizes (cm)
Coral Disease (Yes/No, Type & %)
Rare animals sighted (Type / #)

Appendix 1. Atlantic indicator organisms and substrates chosen for survey by Reef Check.

Substrates	
HC	hard coral
RKC	recently killed coral
SC	soft coral
NIA	nutrient indicator algae
SP	sponge
SD	sand
RC	rock
RB	rubble
SD	sand
SI	silt/clay
OT	other

Appendix 2. Proposal for the implementation of Reef Check monitoring programme in St.Vincent & the Grenadines distributed to all participants.

Proposal for the Implementation of Reef Check Coral Reef Monitoring Programme in St.Vincent & the Grenadines

What is Reef Check?

Reef Check was developed in 1996 as a volunteer, community-based monitoring protocol designed to measure the health of coral reefs on a global scale in areas with limited economic resources. Now in its seventh year of operation, Reef Check is active in over 87 countries and territories throughout the tropical world. During this time, Reef Check has evolved into the largest international marine monitoring environmental organization with the following goals:

- To educate the public about the coral reef crisis;
- To create a global network of volunteer teams which regularly monitor and report on reef health;
- To scientifically investigate coral reef processes;
- To facilitate collaboration among academia, NGOs, governments and the private sector;
- To stimulate local community action to protect remaining pristine reefs and rehabilitate damaged reefs worldwide using ecologically sound and economically sustainable solutions.

'Reef Check' scientists train teams of volunteers about the value of coral reefs, their ecology and how to scientifically monitor them. During surveys, the work is supervised and checked by a scientist. Teams are composed of a diverse range of volunteers ranging from scientists, government agencies, local NGO's, recreational divers to village fishermen and tourists. Through this process, 'Reef Check' is a relatively low cost monitoring survey as well as a public awareness tool regarding the global coral reef crisis and potential solutions. 'Reef Check' teams have collected a wealth of valuable data from reefs around the world. These have been analysed by 'Reef Check' and the results are presented in a five-year report (Appendix 1), providing a synoptic assessment of global coral reef health using a standard method.

Reef Check teams collect four types of data:

5. A description of each reef site based on over 30 measures of environmental conditions and expert rating of human impacts in area
6. Fish counts along an 800 m² section of shallow reef
7. Invertebrate counts over the same area
8. A measure of the percentage of the seabed covered by different substrate types including live and dead coral as well as coral bleaching and diseases

Sixteen global and eight regional indicator organisms were selected to serve as specific measures of human impacts on coral reefs (Appendix 2). They were chosen based on

their economic and ecological value as well as their sensitivity to human impacts. For example, the Caribbean spiny lobster, groupers and snappers are threatened in the region by overfishing and in areas where these organisms are targeted; their populations are expected to decrease. Furthermore, 'Reef Check' survey methodology can be easily adapted for site specific use by implementing additional indicator organisms to surveys for use in local management decisions or effectiveness of marine protected areas. 'Reef Check' survey methodology is relatively simple and easy to learn and volunteers can be trained in approximately 2–3 hours. Not included in this proposal but available in hard copy and digitally at the Fisheries Division is the 'Reef Check Instruction Manual' which contains the specific methodology for 'Reef Check' coral reef monitoring surveys to be conducted within the waters of St.Vincent and the Grenadines.

Project Overview:

From January – April 2005, 'The Amadis Project' team of 5 volunteers and sailing yacht *Amadis* will act as a roving 'Reef Check' research training coordinator in the waters of St.Vincent and the islands of Bequia, Mustique and the Tobago Cays (a joint effort between Myreau & Union Islands). We will work with a variety of stakeholders including government agencies, several local NGO's and the private sector in order to increase local education of the value of coral reefs and their preservation as well as train them how to scientifically monitor them in a standardised format for use locally by the St.Vincent Fisheries Division as well as in major global databases. Marine monitoring is essential for providing information on the status of local fisheries, aiding development and management decisions, tourism and coastal protection. One benefit of 'Reef Check' monitoring is that it involves a variety of stakeholders in the monitoring of marine resources in order to help facilitate local collaboration and support in management decisions. 'Reef Check' monitoring helps increase the understanding of the threats facing coral reefs in St.Vincent and the Grenadines and around the world and furthers public stewardship in the marine environment.

'The Amadis Project' will facilitate collaborations between 'Reef Check', the St Vincent and the Grenadines Fisheries Division, local NGO's (principally the Sustainable Grenadines Project) and the private sector (including local dive shops, fishers, community groups, tourists and hoteliers in each of the islands) to:

- Conduct Reef Check marine monitoring surveys of coral reef health and human impact using SCUBA
- Train a member of the St.Vincent Fisheries Division (Sophia Punnett) to be the 'Reef Check' Country Coordinator as well as a certified 'Reef Check' trainer for subsequent interested parties / islands of St.Vincent and the Grenadines
- Train a member of the 'Sustainable St. Vincent and the Grenadines Project' (Casper Smith) to be the 'Reef Check' NGO Coordinator responsible for promoting marine resource and monitoring education by disseminating information to the public of St.Vincent and the Grenadines from a NGO perspective
- Assist the staff of the St.Vincent Fisheries Division in data management and interpretation of 'Reef Check' data into information for local management use

- Work with the Fisheries Division to locate appropriate survey sites and locate and train new 'Reef Check' teams on the islands of St.Vincent, Bequia, Mustique and the Tobago Cays
- Organise and train local 'Reef Check' Island Coordinators in each of the Grenadine islands of Bequia, Mustique and the Tobago Cays
- Provide all survey equipment needed (training videos and slide shows, underwater species identification cards, transect tapes, clipboards, underwater papers, plumb lines, PVP pipes, pencils and Excel spreadsheets) for the 5 new 'Reef Check' teams

All data collected will be managed and reviewed by the St.Vincent Fisheries Division before being sent to the global coral reef health database 'Reef Check' who will also supply raw data to global databases including Reef Base, Global Coral Reef Monitoring Network and the International Coral Reef Initiative. Data will also be used locally by the Fisheries Division to strengthen existing and proposed reef management projects and protected areas in St.Vincent and the Grenadines. The local NGO 'The Sustainable Grenadines Project' will assist 'The Amadis Project' in the coordination of local stakeholder volunteers from the private sector in each of the islands to be surveyed in the Grenadines. Additionally, as the NGO coordinator 'The Sustainable Grenadines Project' will add 'Reef Check' monitoring to their annual work plan and operate as a catalyst for annual participation in subsequent surveys and aid to the sustainability of the Reef Check monitoring project in St.Vincent and the Grenadines. All coordinators (NGO and island coordinators) will be approved by the Fisheries Division and must sign a memorandum of agreement for undertaking annual 'Reef Check' survey responsibilities as well as acknowledging the ownership of 'Reef Check' data by the Fisheries Division.

Requirements of St.Vincent Fisheries Division for Reef Check Implementation

'The Amadis Project' will facilitate the Fisheries Division in the initial coordinating and training of teams and survey sites as well as assistance in conducting all 2005 St. Vincent and the Grenadines 'Reef Check' surveys. The Fisheries Division will be required to oversee 'Reef Check' monitoring on an annual basis (or bi-annually if time permits or needed for local management purposes) as well as submit all data collected from St. Vincent and the Grenadines via email to 'Reef Check' headquarters within 10 days of conducting surveys. Additionally from February-March 2005 'The Amadis Project' requires the Fisheries Division to provide 'in-kind' donations consisting of:

- Use of Fisheries Division boat and dive staff for St.Vincent surveys at 3 sites
- Staff time required for training of interested divers of the Fisheries Division in 'Reef Check' survey protocol (2-3 hours) and methodology (Sophia Punnett)
- Staff time required for 'Reef Check' trainers course (Sophia Punnett) as well as data handling and management of 'Reef Check' data for local management use (1-2 days; depending on how much training is needed)
- Use of SCUBA dive tanks and tank air fills for the St.Vincent survey sessions
- Logistical help for soliciting local NGO, private sector and media involvement with annual 'Reef Check' surveys in St. Vincent and the Grenadines

Appendix 3. List of registered 2005 St. Vincent Reef Check coordinators and teams organised by the Amadis Project from January - April 2005.

Island	Organisation	Reef Check Island Coordinator	Team Members	Number	Email
St. Vincent	St. Vincent Fisheries Division	Sophia Punnett (RC Country Coordinator)		456-1178	sophiapunnett@yahoo.co.uk
	Indigo Divers		Kay Wilson	493-9494	info@indigodive.com
Bequia	Bequia Dive Adventures	Larry Stowe			adventures@caribsurf.com
	Bequia Community Highschool		Dave Stone Ron Williams Saskia Veerman Orlando	458-3514	humpback_1952@yahoo.com
Mustique	Mustique Watersports	Dianne Wilson		488-8511	dianne@vincysurf.com
			Raymond Dewer Kurt Beres Little		
Union Island	Sustainable Grenadines Project	Casper Smith (RC NGO Country Coordinator)		485-8779	susgrenpm@vincysurf.com
Tobago Cays Marine Park	Tobago Cays Marine Park	Albert Hanson		485-8191	meritha1@hotmail.com
			Jason Alexander Sammuel Debique Olando Harvey Hyron Joseph Meritha Small		

