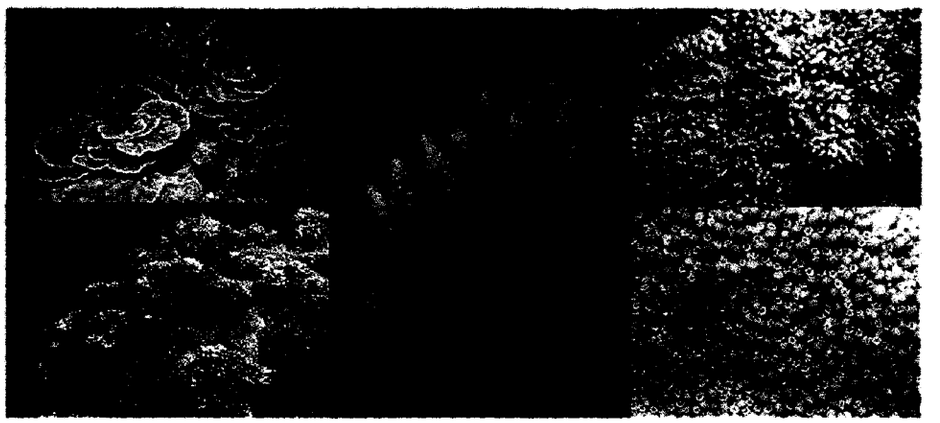
# Vanuatu Coral Reef Monitoring Network (VCRMN) Project Progress Report, July 2002.



## Resource Assessment and Computer Information System (RACIS).

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## 1. Introduction.

Coral reef is a rich but fragile ecosystem. It is very important to the marine biodiversity as well as to the global economy. Coral reefs rival that of the great communities such as the tropical rain forest in terms of richness, beauty, complexity and diversity. It provides habitats, feeding and breeding grounds of many marine lives including some important commercial species. Coral reefs contribute to the rural and national economy, nutrition, shoreline protection and more importantly the self- reliance of the people, particularly the coastal communities. Coral reefs are some of the main tourist attractions and contribute a lot to the tourism industry. They also contribute to scientific research studies particularly in the medical field for the search of new drugs for fatal diseases.

The coral reefs of Vanuatu exhibits the range of characteristics expected of an archipelago including outer reefs, sheltered flats and lagoons, partially sheltered embayments and sheltered embayments. There are relatively few shallow water reefs and are limited to narrow fringing reefs and platforms surrounding the islands and few lagoons and barrier reefs. The combine reef area is approximately 408 $km^2$. Other reef associated habitats, which includes mangroves and estuarines amounts to a total area of 25 $km^2$ (Done & Navin, 1988).

Expose coral reef slopes and reef crest were dominated by coralline algae and robust plating and branching corals (*Acropora* and *Pocillopopridae*), in the reef flat areas a dominance of mixer of massive and branching corals. Various *Acropora* and *Montipora* species dominate the sheltered parts of the outer reefs. Massive *Porites* were common in open embayments while the sheltered embayments were characterized by soft corals. It has been said that Vanuatu's coral reefs are similar to that of the Great Barrier Reef in Australia. (Done & Navin, 1988).

Because of the richness, beauty, complexity and diversity, coral reefs should be respected and protected from any form of destruction. However for millions of years coral reefs have been heat hard with environmental changes. Although they have been resilient for millions of years surviving major environmental events such as ice age, changes in solar activities, sea level changes and tectonic activities, the recovery has been very successful in other parts of the world. Over the past decades coral reefs have been faced yet with another major threat, that from human related activities which has seen over 35 million acres of coral reefs being destroyed by these human related activities. This has raise-increasing concern over the threats of existence to coral reefs in some parts of their range. This report aims at looking at the condition of the reefs at the two monitoring sites being setup, namely Malapoa Point Reef and Hat Island Reef.

## 2. Status of coral reefs.

There has been no systematic monitoring of Vanuatu's coral reefs over the past decades since the last intensive survey by AIMS in 1988. Therefore, the recent status of coral reefs is unknown and information on the status of reefs in Vanuatu is based solely on this survey (Naviti & Aston, 2000). The AIMS survey reported that coral reefs in Vanuatu is least well developed and have been very little studied. The survey showed that coral reefs in Vanuatu have been developing under intensive disturbances such as tectonic activities, cyclones, coral bleaching and crown –of-thorns Starfish attack. In fact these events have been part of the reef formation in Vanuatu. Out of the 16 islands surveyed, 50% of the sites have been reported with severe cyclone damage and coral mortality is widespread (Done and Navin, 1988), 20% of the sites were reported with active crown-of-thorns starfish attack and another 20% of the sites surveyed showed major coral mortality (Zann et al, 1988). Although population pressure is low, reefs were generally considered to be in a poor condition. Anthropogenic disturbances remain primary threats to reefs in urban areas. Sedimentation is a threat to coral reefs in localized areas where logging and agricultural activities occur.

### 2.1.Status of reef fish.

The AIMS survey on reef fish (<30m) reported that there are about 469 species of fish in Vanuatu. Most of the species surveyed represent 6 major groups. These includes, snapper (*Lutjanidae*), parrotfish (*Scaridae*), sweetlips (*Haemulidae*), butterfly fish (*Cheatodontidae*), grouper (*Serranidae*) and wrasse (*Labridae*) (Done & Navin,1988 and Ayling *et al*, 1988). Most of the species surveyed were very patchy in their distribution. Out of the 6 major groupings, it was reported that some parrotfish species (*Scaridae*) and some butterfly species (*chaetodintidae*) are found to be abundant with high density (Ayling *et al*,1988)

Vanuatu's largest fishery is the subsistence and artisinal fishery where bulk of the catch is sold and consumed locally. Catch method employed range from hand collection to gillnetting and spear guns. In the most remote areas most method employed were traditional, for example bows and arrows, traps and poisoning using leaves. The employment of these methods were generally limited to shallow coastal waters (Bell & Amos,1993).

## 3. Coral bleaching impact.

Coral bleaching event has increase in frequency and intensity over the last 20 years and has been the major cause of mass coral destruction. The last mass bleaching occurred in 1997/98 which caused loss of large areas of coral reefs throughout the Pacific region. In March this year 2002, warning was given out by the Regional Node for Coral Reef Monitoring Network (RNCRMN) for countries to look out for bleaching occurrences. This follows weather anomalies in the Pacific Ocean that might indicate another possible El Nino event (www. NOAA 2/07/02). In Vanuatu, bleaching was reported in March on the islands of Efate and other offshore islands, the shepherds group, Malekula and

offshore islands and Santo and some offshore islands. Large areas of beautiful coral reefs were reported to have been wiped out by this event (Fred, pers. Com.). It is believed the bleaching event was widespread throughout the country. There were also reports of mass bleaching occurrences in New Caledonia taking place at the same time.

**4. Vanuatu Coral reef Monitoring Network Project.**

There is no systematic monitoring programmes for coral reef in Vanuatu. The work of the Fisheries Department is mainly focusing on the rural fisheries development, stock assessment of the inshore fisheries resources such as trochus, green snail, berche-de-mer, giant clams and other inshore fisheries related resources and offshore tuna fishing activities. After a workshop of coral monitoring which was conducted in 1998, a team comprising of the Fisheries Department, Environment Unit and other tour operators was set up to carryout a task of Coral Reef Monitoring. However, the group fail to carryout the task of monitoring due to lack of financial support. In 2002, following financial support from the Canadian government, another training workshop was conducted after which a team comprising of the Fisheries Department and environment Unit staff excluding the others was form. This group was assigned with a task of setting up and collecting data from the first two monitoring sites on Efate island (Figure 1) and later organizing workshops to initiate the involvement of other stakeholders including the tour and dive operators, rural communities and other interested individuals or organizations. This in the long- run will help diversify the collection of data throughout the country, which will help in preparing reports on the status of coral reefs in the country. The Vanuatu Coral Reef Monitoring Network (VCRMN) is aimed at monitoring the status of the coral reef in response to both natural and anthropogenic disturbances and it is part of the Regional Node of Coral Reef Monitoring Network (RNCRMN) and the Global Coral Reef Monitoring Network (GCRMN). The coral reef stresses that include both natural and human induced are presented in the AIMS report on *Status of the Worlds Coral Reefs* and can be access through their website (www.aims.gov.au)

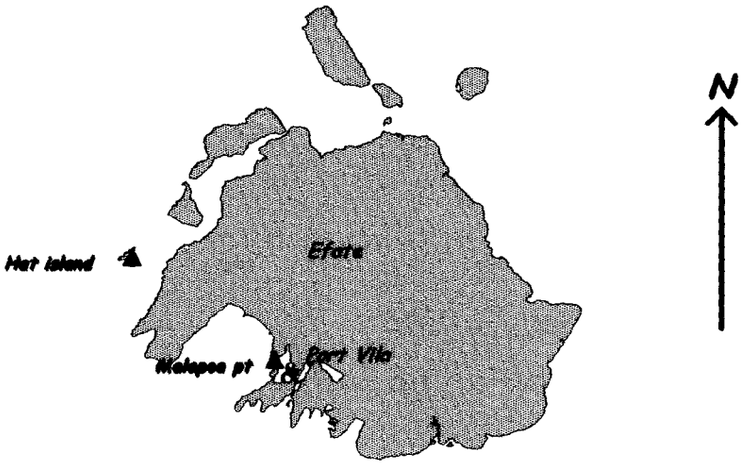



*Figure 1: Map showing the monitoring sites at Malapoa point and Hat island.*

### 4.1 Site 1: Malapoa point.

Malapoa point is a potentially impacted site. It was chosen as an experimental site due to its easy access from the general public in Port Vila and the nearby settlements. Although both natural and anthropogenic disturbances will be monitored, more emphasis will be to monitor the impact of anthropogenic disturbances. This site often experiences flood waters and sediments discharge from the black sands river during torrential rain. The site is located at the entrance of the Port Vila harbor, one of the main and busiest commercial ports in Vanuatu where trading vessels come in and out every week. In this site, two 100 m transect were set- up. One in the 2 m zone and the other in the 2- 6 m deep zone. Work done on this site commenced on the 22$^{nd}$ of March 2002. During the period of monitoring, the team observed a wide area of bleaching in the area. Bleaching was observed from the yacht club and extending as far as Malapoa estate. The bleaching was very intense that it can be observed from passing boats and canoes.

### 4.2. Hat Island.

Hat Island is chosen as a control site since access by family and landowners to the Island is limited (Fig.1). It is far from any rivers and free from any form of pollution such as eutrophication. Although there is a little tourism activity on the island, the impact is insignificant. On this site two 100 meter transect were set up. One at the 2-meter zone

and the other at the 6- 12-meter zone. Work on setting up the site was conducted on the 11 of June 2002. The site has some beautiful corals but the impact of the bleaching event earlier in the beginning of the year was still obvious. A lot of corals including soft corals were destroyed due to the bleached event.

## 5. Aim.

The aim of the coral reef monitoring program is to assess the status of coral reefs in Vanuatu in response to natural and anthropogenic disturbances and to provide information necessary for the interest of the country.

### 5.1. Objectives.

The objectives of the monitoring program are:

- Establish a long-term coral monitoring programme in Vanuatu.
- Collect data, analyze and communicate results acceptable to GCRMN database.
- To collect and record environmental data relevant to the interest of Vanuatu.
- To provide adequate training for relevant nationals in coral reef monitoring team.
- To raise awareness and education to communities in an attempt to initiate community participation in coral reef conservation.

### 5.2. Equipments.

- At least two divers
- Boat
- SCUBA or snorkel gears
- Blank slates and pencils
- Fish, seabed and Invertebrate identification sheets
- Tape measure (50 m)
- Marker buoys or cable ties
- Thermometer.

### 5.3. Method of survey.

The monitoring methods comprises of several scientific methods used for assessing different ecological features but are in accordance with the standard GCRMN guidelines for recording ecological features and overall assessment of coral reefs. In this monitoring the *Reef Check Monitoring Techniques* is used. The technique used was developed by Helen Sykes resrtsupport@is.com.fj.

### 5.3.1. Belt Transect.

This is to assess the abundance, density and size distribution of invertebrates including corals. Categories of the invertebrates recorded includes, giant clams, triton's trumpet, black spiny sea urchin, pencil sea urchin, crown of thorns, lobster, banded coral shrimp and sand fish sea cucumber.

Figure 2. Illustration of the lay out of the transect line. An imaginary 5M "corridor" lying over the transect line is surveyed. At least two divers are needed, one on each side of the transect line. Each diver takes one side of the transect line and counts half of the "corridor".

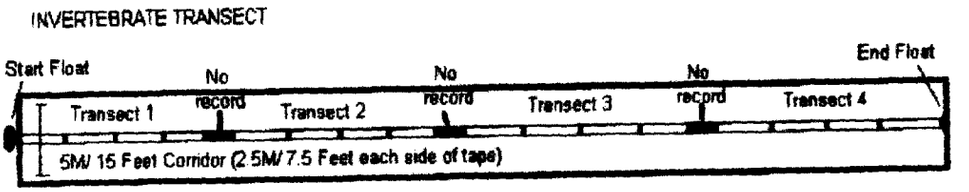
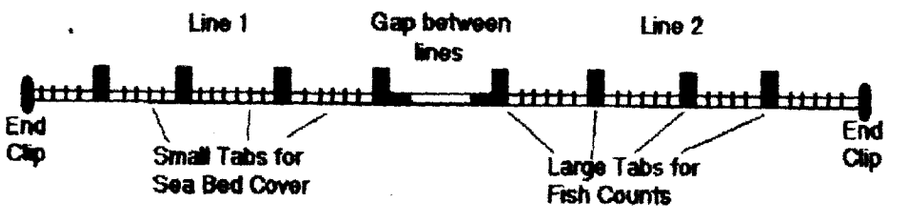


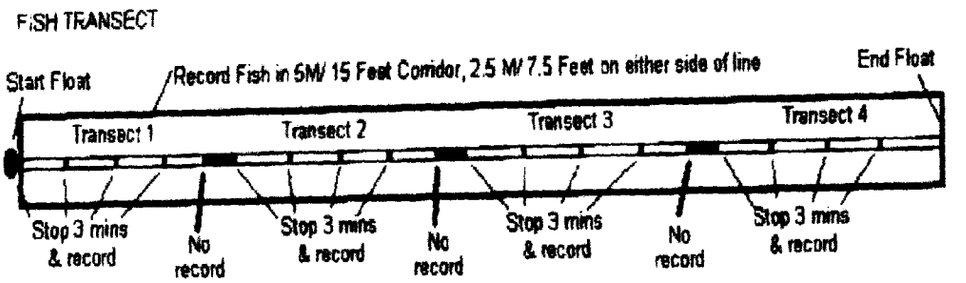

Figure 3. Layout of the bed cover transect line. The surveyor swims along the line and stops every half a meter (50 cm) to record what is ***directly*** under the line. **The 5 meter "corridor" does not apply on this survey.**




### 5.3.2. Spot on visual census.

To assess temporal changes in the abundance and density of fish communities. Fish species targeted are indicator species, which includes grouper, snapper, sweetlips, parrotfish, butterfly fish, humphead wrasse, bumphead parrotfish and moray eel.

Figure 4. Layout of the fish survey transect line. An imaginary 5 m "corridor" overlying the transect line. Two surveyors swim along each side of the transect line and count the fish in the half (2.5 m) of the "corridor".



## 5.4. Data analysis.

Data gathered from the monitoring sites are analyzed at the Fisheries Department using different method of analysis but are in accordance with the GCRMN. For example, data from LIT and Manta Tow will be analyze using the AMDES program. For the purpose of this report, all data are analyze using Microsoft Excel program as shown below:

***Percentage (%) cover or (%)Abundance = $N/N_T$ x 100***

***Where N= occurrence of a particular species or category***
***$N_T$ = Total number of occurrences of all the species or categories along the 100m transect line.***

## 5.5. Results

**Table 1.**

| Abbreviation | Common names of ecological features of coral cover |
|---|---|
| HC | Hard coral (live) |
| RKC | Recently killed corals |
| SC | Soft corals |
| FS | Fleshy seaweed |
| SP | Sponges |
| RC | Rock over 15cm (or coral dead for over a year) |
| RB | Rubble 0.5 to 15 cm |
| SD | Sand less than 0.5 cm |
| SI | Silt (fine sediment) |
| OT | Others (sea anemones, gorgonians, tunicates, other non- living substrata) |

**Table 2.**

| Abbreviation | Common names of target fish species |
|---|---|
| GRP | Grouper |
| SNP | Snapper |
| SWL | Sweetlips |
| PF | Parrotfish |
| BFF | Butterfly fish |
| HHW | Humphead wrasse |
| BHP | Bumphead parrot |
| ME | Moray eel |

**Table 3.**

| Abbreviation | Common names of invertebrate species |
|---|---|
| GC | Giant clam |
| TT | Triton's trumpet |
| BSSU | Black spiny sea urchin |
| PSU | Pencil sea urchin |
| COT | Crown- of- thorns |
| LOB | Lobster |
| BCS | Banded coral shrimp |
| SFSC | Sandfish sea cucumber |

### 5.5.1. Malapoa Point Reef.

Although there was a good cover of hard coral or live coral (Figure 5) in this site, it was clear that the reef has been under considerable pressure. Bleaching was intense and was widely observed in the area. Coral damaged was visible. Fishing pressure was practically intense as targeted fish species; giant clams, lobsters and edible sea cucumber were absent or occur in very low numbers (figure 6&7). Despite a relatively high percentage of butterfly fish, they were of very small sizes. Stressed indicators species such as black spiny sea urchin and crown of thorns starfish were recorded in relatively high number which indicate signs of pollution and stress on the reef.

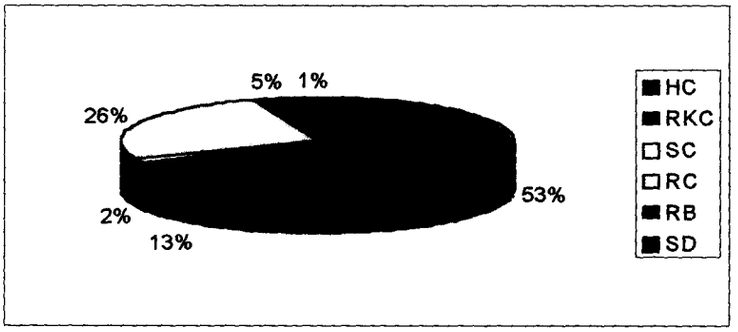



**Figure 5**: Percentage cover of Malapoa point. It shows that Hard coral (HC) dominates the percentage cover, however stressed was visible. Wide area of coral bleaching was observed, coral damage was visible. Recently Killed Coral (RKC) and Coral dead (RC) together accounts to a total of 39% at the time of the survey.

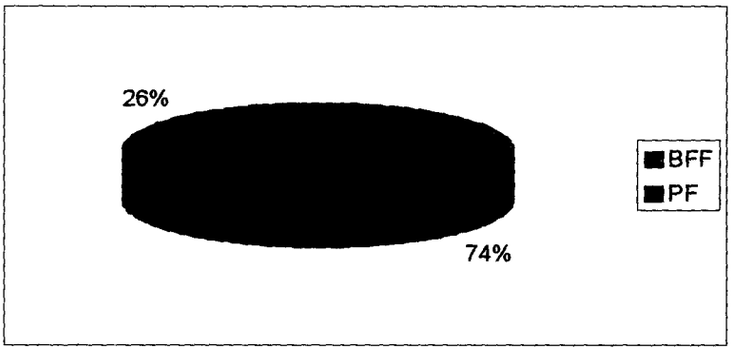



**Figure 6:** Pie chart showing the percentage abundance of target fish specie. It showed a relatively under pressure reef as most of the target fish species are totally absent. Butterfly fish (BFF) showed a relatively high percentage of 74%, but are mostly juveniles.

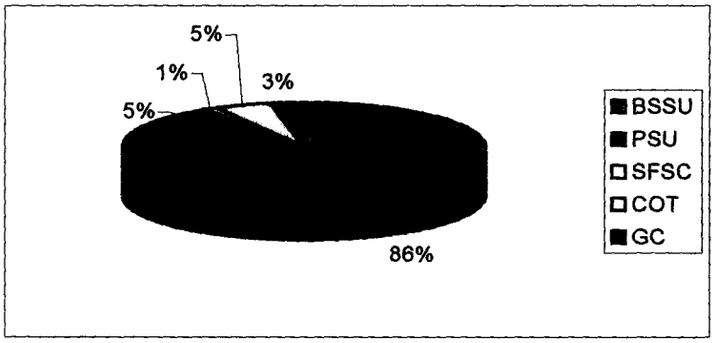



**Figure 7:** Pie chart showing the percentage abundance of invertebrates or reef stress indicators at Malapoa Point Reef. The high percentage of BSSU and COT is an indicator that the reef is relatively polluted. While the low percentage of invertebrates such as GC, and the absence of LOB means the reef is under intense fishing pressure.

### 5.5.2. Hat Island.

The site has some very beautiful corals, however coral dead due to the bleaching event that occurred early in the year was still visible. COT recorded a relatively high percentage in this site and this may be a contributing factor to coral mortality that occurred in the area (fig.10). These have resulted in a relatively high percentage of dead corals (RC) for the area (fig.8). There was abundance of fish species and compare to the experimental site, some of the target fish species were recorded (Fig.12) with sizes ranging from 15- 30cm. Invertebrate stress indicators have not been recorded which means that the area is free from eutrophication and impact of fishing activity is moderate. However, contrary to what is expected of a less impacted reef, invertebrate species such as giant clams and sea cucumber were recorded in very low numbers. This may be attributed to commercial fishing of sea cucumber and harvest of giant clam for the aquarium trade.

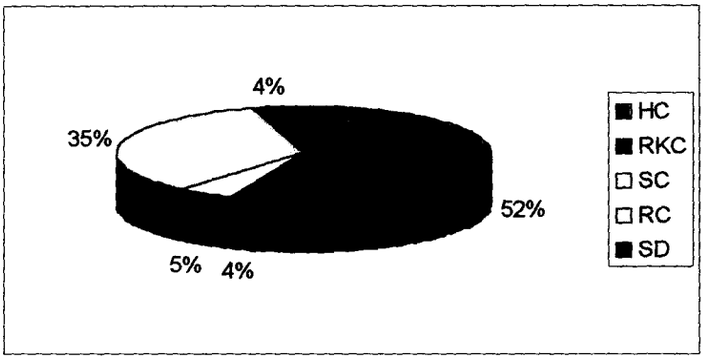



**Figure 8:** Pie chart showing the percentage cover of Hat Island. It shows that Hard coral or live coral (HC) is a dominant category, however dead coral (RC) and Recently Killed Corals (RKC) together also shows a relatively high percentage. This may be attributed to the bleaching event early in the year.

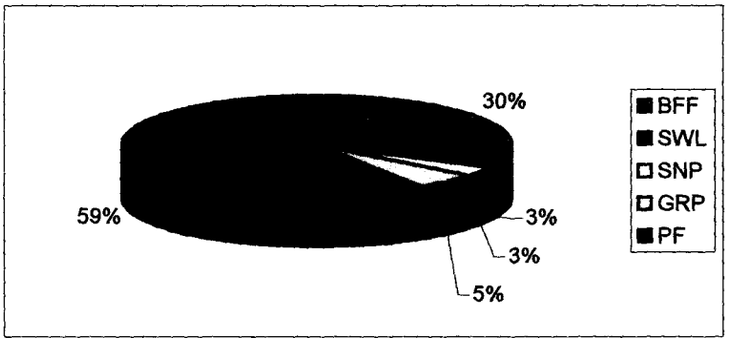



**Figure 9**: Pie chart illustrating the percentage abundance of target fish species on Hat Island Reef. It shows that most of the target fish species are recorded but in relatively low percentage except for PF. This might be an indication that fishing activities in the area is at a moderate level.

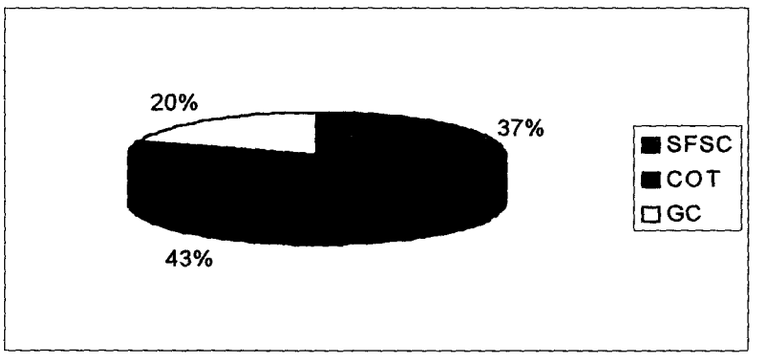



**Figure 10**: Pie chart showing the percentage abundance of invertebrates. It shows a relatively high percentage of COT and they may be one of the contributing factors to the coral dead in the area.

## 6. Conclusion.

Although there is a need for further study and a need for wide distribution of monitoring sites throughout the country that can provide a clear picture of the reef condition, this report provide some information on reefs that is potentially impacted and one that is less impacted. Coral reefs in urban centers are deteriorating in condition mainly due to human disturbances. Coral bleaching is widespread throughout the country and is one of the major causes that have a devastating effect on the coral reefs.

### 6.1. Recommendation.

For long- term assessment of the condition and status of the coral reefs in the country, initiative to involve the communities and other stakeholders in the rural areas is vital. Therefore it is important that the government through the Fisheries Department take initiative to support the project for the establishment of monitoring sites through out the country. This is to ensure that accurate reports on the condition and status of the coral reef is maintained, thus proper management regulations be formulated for the protection and conservation of our coral reefs.

Although this report present some data analysis, there should be a proper training on data analysis as specified in the project document so that data presented should be in accordance with both the RNCRMN and GCRMN data analysis guidelines and data base.

## 7. Tables and Figures.

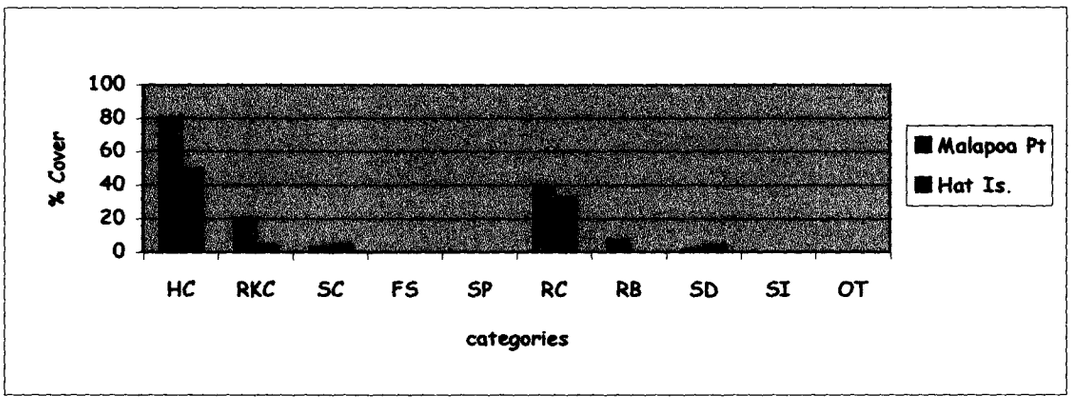



**Figure 11**: Bar chart showing the comparison of the percentage cover of Malapoa Point Reef and Hat Island reef.

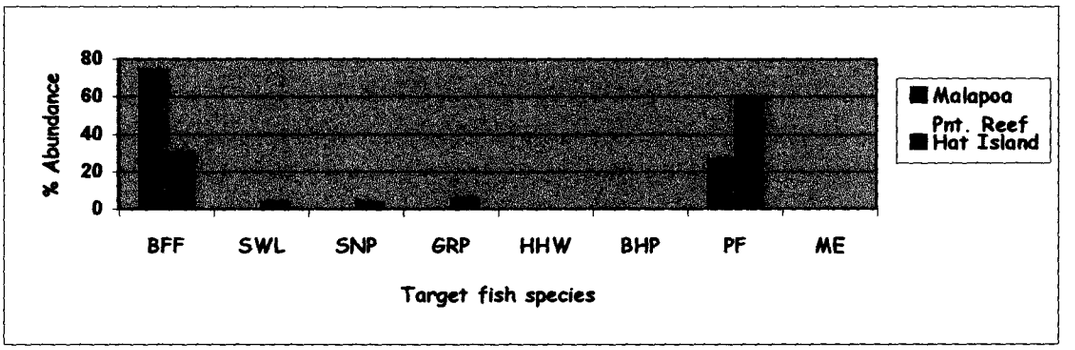



**Figure 12**: Bar chart showing the comparison of the abundance of target fish species at Malapoa Point Reef and Hat Island Reef.

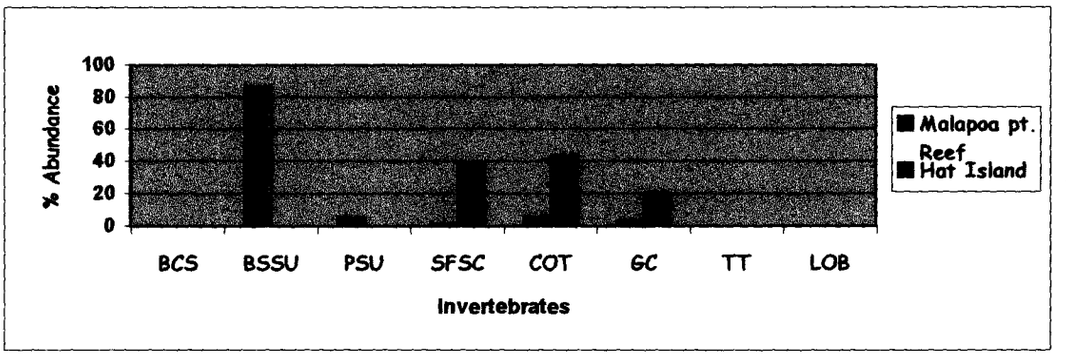



**Figure 13**: Bar chart showing the comparison of invertebrate's abundance of the two sites.

Table 4: Frequencies of categories of coral cover at Malapoa Point Reef.

| **Categories** | **Frequencies** |
|---|---|
| HC | 97 |
| RKC | 52 |
| SC | 6 |
| FS | 0 |
| SP | 0 |
| RC | 78 |
| RB | 19 |
| SD | 0 |
| SI | 0 |
| OT | 0 |

Table 5: Frequencies of target fish species at Malapoa Point Reef.

| **Target fish species** | **Frequencies** |
|---|---|
| BFF | 56 |
| SWL | 0 |
| SNP | 0 |
| PF | 4 |
| GRP | 0 |
| HHW | 0 |
| BHP | 0 |
| ME | 0 |

Table 6: Frequencies of invertebrates at Malapoa Point Reef.

| **Invertebrates** | **Frequencies** |
|---|---|
| BCS | 0 |
| BSSU | 119 |
| PSU | 6 |
| SFSC | 0 |
| COT | 3 |
| GC | 1 |
| TT | 0 |
| LOB | 0 |

Table 7: Frequencies of categories of coral cover at Hat Island Reef.

| **Categories** | **Frequencies** |
|---|---|
| HC | 147 |
| RKC | 12 |
| SC | 13 |
| FS | 0 |
| SP | 0 |
| RC | 97 |
| RB | 17 |
| SD | 12 |
| SI | 0 |
| OT | 0 |

Table 8: Frequencies of target fish species at Hat Island Reef.

| **Target fish species** | **Frequencies** |
|---|---|
| BFF | 52 |
| SWL | 3 |
| SNP | 2 |
| PF | 9 |
| GRP | 105 |
| HHW | 0 |
| BHP | 0 |
| ME | 0 |

Table 9: Frequencies of invertebrates at Hat Island Reef.

| **Invertebrates** | **Frequencies** |
|---|---|
| BCS | 0 |
| BSSU | 0 |
| PSU | 0 |
| SFSC | 3 |
| COT | 3 |
| GC | 2 |
| TT | 0 |
| LOB | 0 |

**8.0. References.**

Ayling, A.M, Andrew, G.J., Navin, K.F. and Benzie, J.A.H 1988. Quantitative survey of marine Resources of Malekula Island. Australian Institute of Marine Science, Townsville, Australia.

Bell L.A.J& Amos,M.J.1993. *Republic of Vanuatu fisheries resource profiles.* FFA Report 93/49. Forum Fisheries Agency, Honiara, Solomon Islands.

Castro, P. & Huber, M.E. (1997). Marine biology. 2nd ed. WCB, New York.

Done, T.J & Navin, K.F. (1988). Composition and condition of shallow water Benthic communities on coral reefs in Vanuatu. Australian Institute of Marine Science, Townsville, Australia.

Naviti, W. & Aston, J. (2000). Status of coral reefs and reef fish resources of Vanuatu, April 2000 for the Regional Symposium on Coral reefs in the Pacific: Status and Monitoring; Resource and Management, 22- 24 May 2000, Noumea, New Caledonia.

Zann, L.P., Done, T.J. & Ayling, A.M. (1988). The status of Crown of Thorns starfish *Acanthaster planci* in Vanuatu, March/April 1988)

www.aims.gov.au

www.coralreefalliance.org

www. NOAA (2nd of July 2002)