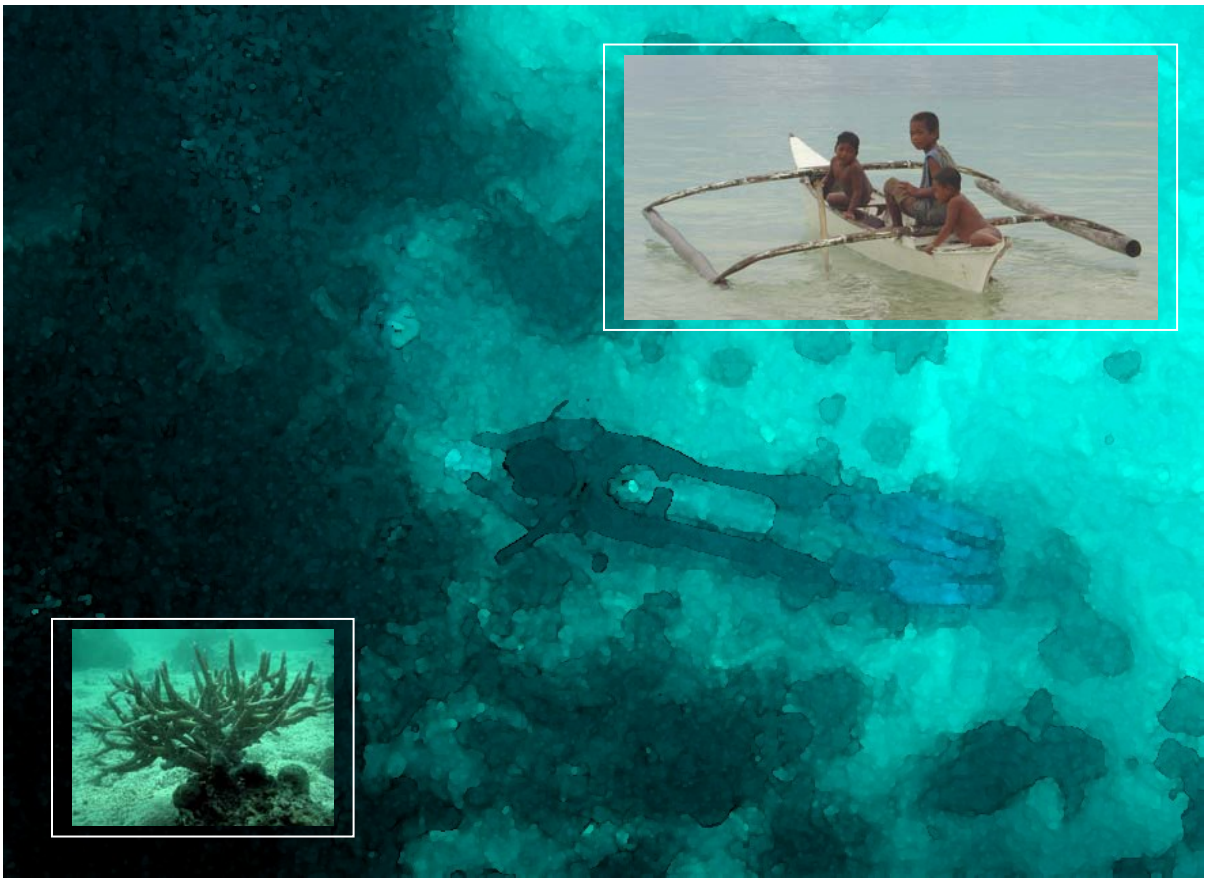
Report of the April 2008 Reef Surveys of Sta. Fe's Marine Protected Areas, Cebu, Philippines



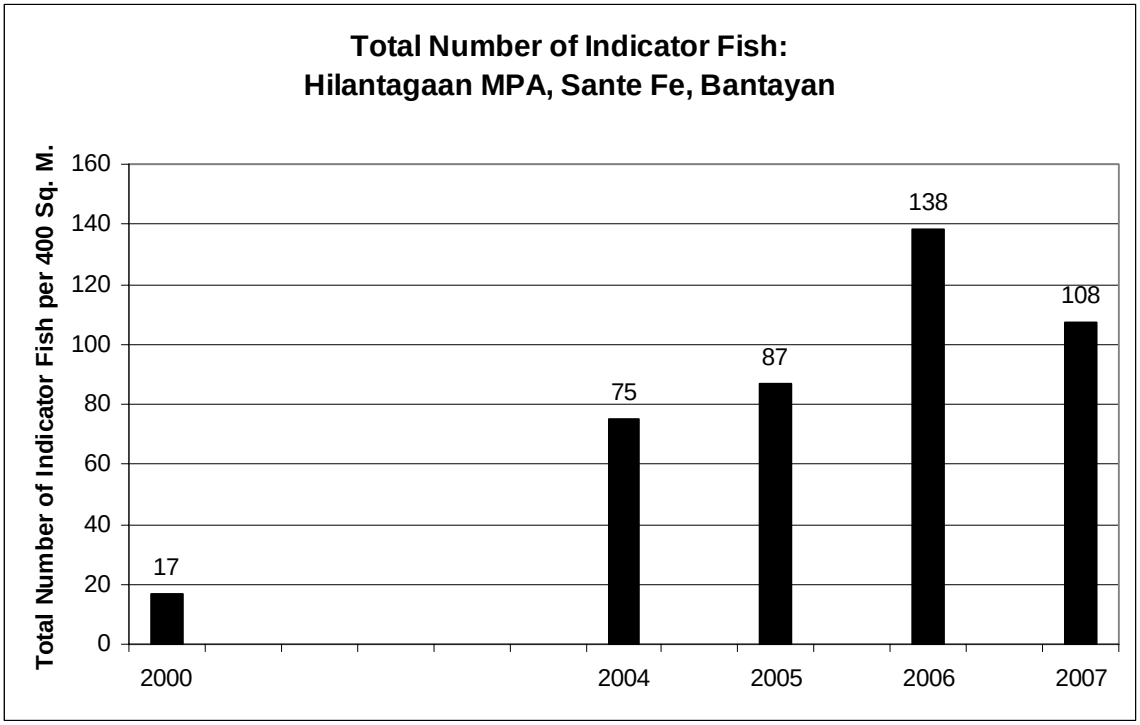
Municipal Government of Sta. Fe, Cebu, Philippines

Coastal Dynamics Foundation, Inc.

1.0 Introduction

The Philippines is recognized as being in the global "center of the center" of marine biodiversity as reflected in its potentially richly diverse and highly productive coral reefs and fisheries. But unfortunately, in so many areas of the Philippines, these coastal resources have been seriously damaged and abused for so many years. As a result, the productivity, potential livelihood and economic benefits and attraction of these coastal areas are greatly decreased.

In response, an increasing number of local government units (LGUs) and environmental groups have initiated efforts to improve their coastal resources management (CRM). One of the most popular and successful CRM measures involves establishing and enforcing marine protected areas (MPAs). An example of the possible MPA benefits is provided in the following figure of the increased abundance of indicator fish in the Hilantagaan MPA, the first MPA that established in the Municipality of Sta. Fe in 2000.



Sta. Fe is a fifth class municipality, located on Bantayan Island, in northern Cebu. The municipality has 10 barangays, all of which are located along the coast. In the past, Bantayan Island and the surrounding Visayan Sea were well-known as a rich fisheries ground, referred to as the "Alaska of the Philippines". Unfortunately, the area's fisheries resources has been largely depleted and damaged over the years. Sta. Fe is famous for its white sand beaches that are an important tourism attraction. However, Sta. Fe's coastal resources, particularly its' fringing coral reefs, have been seriously threatened from illegal fishing practices and human impacts.

To help address its' CRM problems, the Sta. Fe municipal government, through its' Municipal Agriculturalist Office (MAO), supported surveys during April 2008 to assess the status of their surrounding coral reefs, assisted by the Visayan Sea Squadron (VSS) and Coastal Dynamics Foundation (CDF). This report provides a summary of the survey methods, results and recommendations.

These reef assessment surveys ("Reef Check") were focused on coastal areas proposed or designated as MPAs within 7 of the 10 barangays in the municipality. Complimenting these Reef Check surveys, socio-economic assessment and monitoring surveys ("SocMon") of community members were also conducted or initiated in each of these barangays. A summary of the April 2008 survey sites is provided in **Table 1** and a general location map is provided in **Figure 1**.

TABLE 1: Summary of April 2008 Survey Sites

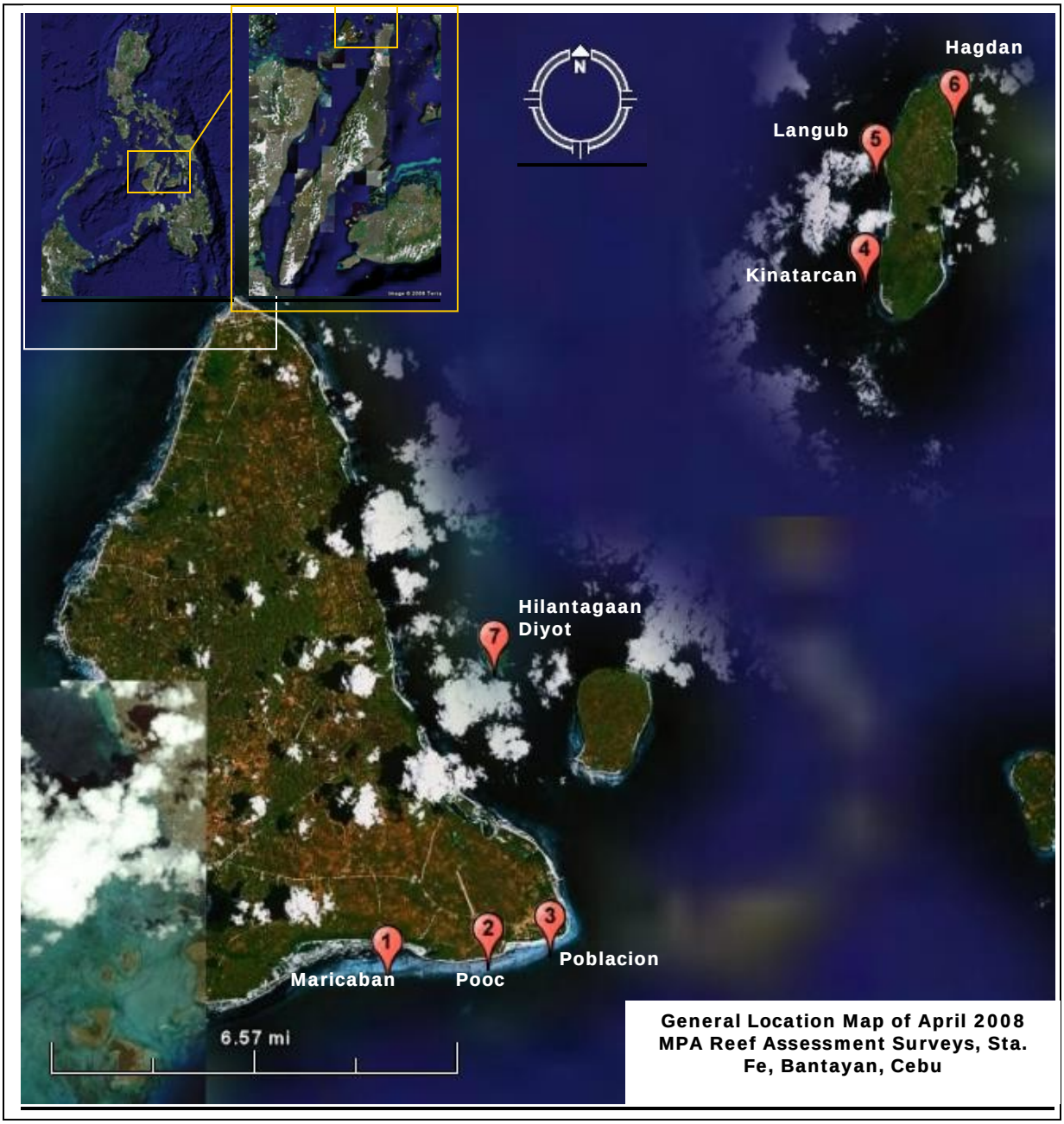
	Barangay	MPA Area (ha)	MPA Enforcement Agency
1	Hilantagaan (Bgry)	15	Barangay - LGU
2	Ocoy	15	Law of Nature Foundation (LNF)
3	Hilantagaan (Diyot)	15	Barangay - LGU
4	Kinatarcan	30	Barangay - LGU
5	Langub	15	Barangay - LGU
6	Hagdan	6	Barangay - LGU
7	Maricaban	15	Barangay - LGU
8	Poblacion	23	Barangay - LGU
9	Pooc	15	Barangay - LGU

2.0 Reef Check

Reef Check (www.reefcheck.org) was developed in 1996 as a volunteer based reef monitoring program used to check the health of reefs on a global scale. Reef Check is the official community-based method of the Global Coral Reef Monitoring Network (GCRMN).

Seven of the coastal barangays in Sta. Fe were assessed namely: Kinatarcan, Langub, Hagdan, Hilantagaan Diyot, Poblacion, Pooc and Maricaban. Data from these survey sites is compared with the Hilantagaan MPA as the "control" site since it has been established as an MPA since 2000.

FIGURE 1: General Location Map of Survey Sites



2.1 Reef Check Methodology

1. *Site Selection* – An appropriate site is selected either with regards to previous year's information using a GPS reading or according to local site factors. At each site 2 surveys are carried out one shallow, at 2-6m and one deep, at >6-12m.

2. *Site Description* – a description of each reef site is carried out based on over 30 measures of environmental conditions and human impacts.

3. *Transect Laying* - A 100m long transect line is placed at each depth to delimit the survey area. Each line is marked with 0.5m intervals, every 20m there is a 5m space separating the transect into 4 sections to make data recoding and assessment more coherent.

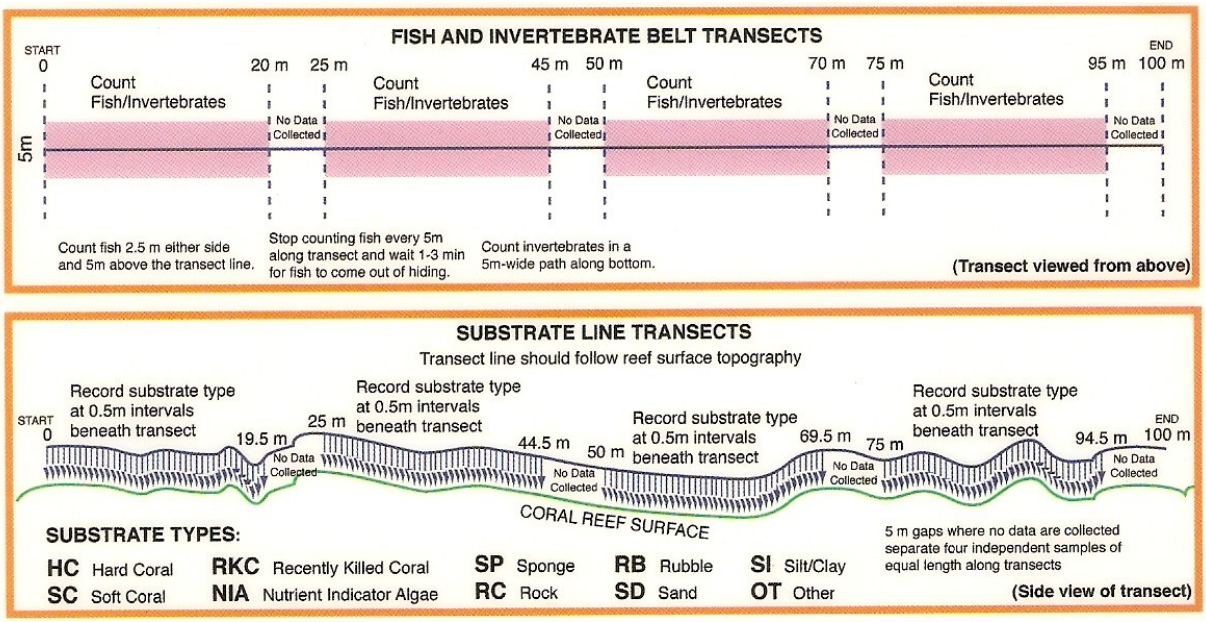


FIGURE 2. Illustrates transect line orientation emphasizing the 5m gaps.

4. *Fish Belt Transect* – A fish survey is carried out at both depths by 2 team members covering a 400m² area.

   In the Indo-Pacific, 9 indicator fish have been chosen by Reef Check for assessing reef health. These 9 indicator fish (*and their Cebuano names*) are:

   - Butterflyfish (*Alibangbang*);
   - Sweetlips (*Lipti*);
   - Groupers over 30cm (*Lapu-Lapu / Pugapo*);
   - Barramundi cod (*Panter*);
   - Parrotfish over 20cm (*Molmol*);
   - Moray eel (*Ubod / Indong*);
   - Snapper (*Maya-maya*);
   - Humphead wrasse (*Mameng*);
   - Bumphead Parrotfish (*Taongan*).

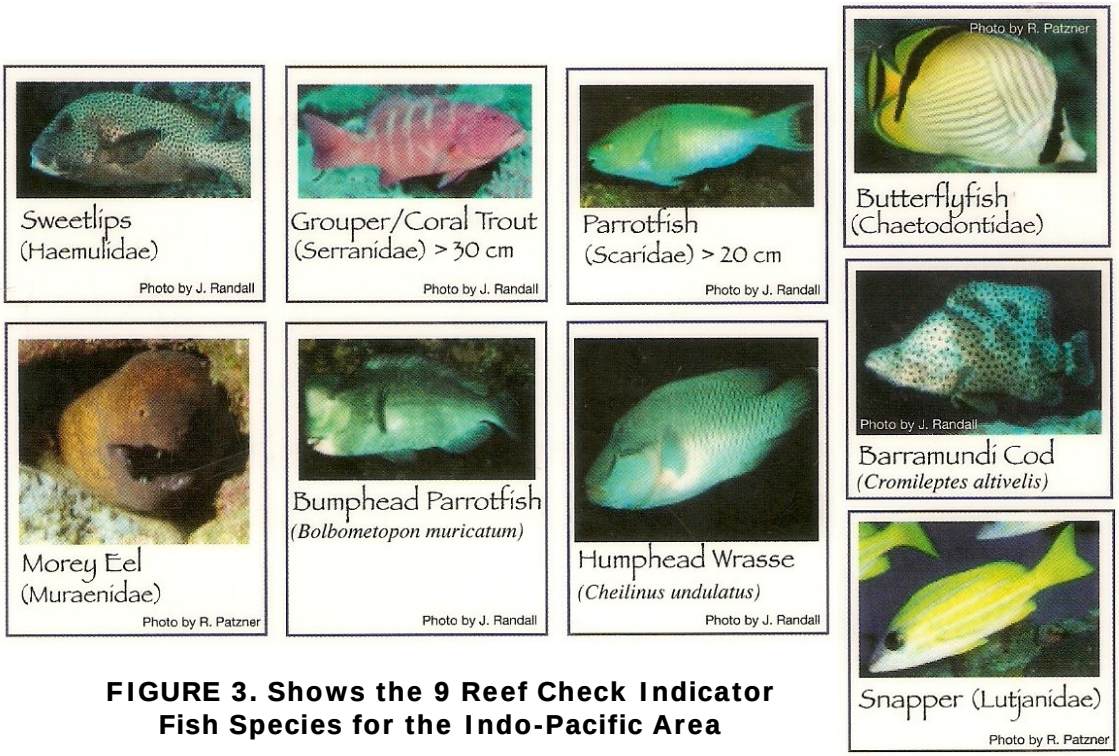


FIGURE 3. Shows the 9 Reef Check Indicator Fish Species for the Indo-Pacific Area

5. *Invertebrate Belt Transect* – An invertebrate count is then undertaken over the same area again using 9 indicator species: Banded coral shrimp (*Pasayan paakpaak*); Sea/Diadema urchins (*Tuyom*); Collector urchins (*Swaki*); Pencil Urchins (*Tudlo-dato*); Edible sea cucumbers (*Bat*); Crown-of-thorns starfish (*Sanay/Dap-ag*); Giant Clams (*Takubo/Hagdanan)*); Triton shell (*Trumpit*) and lobster (*Banagan*).

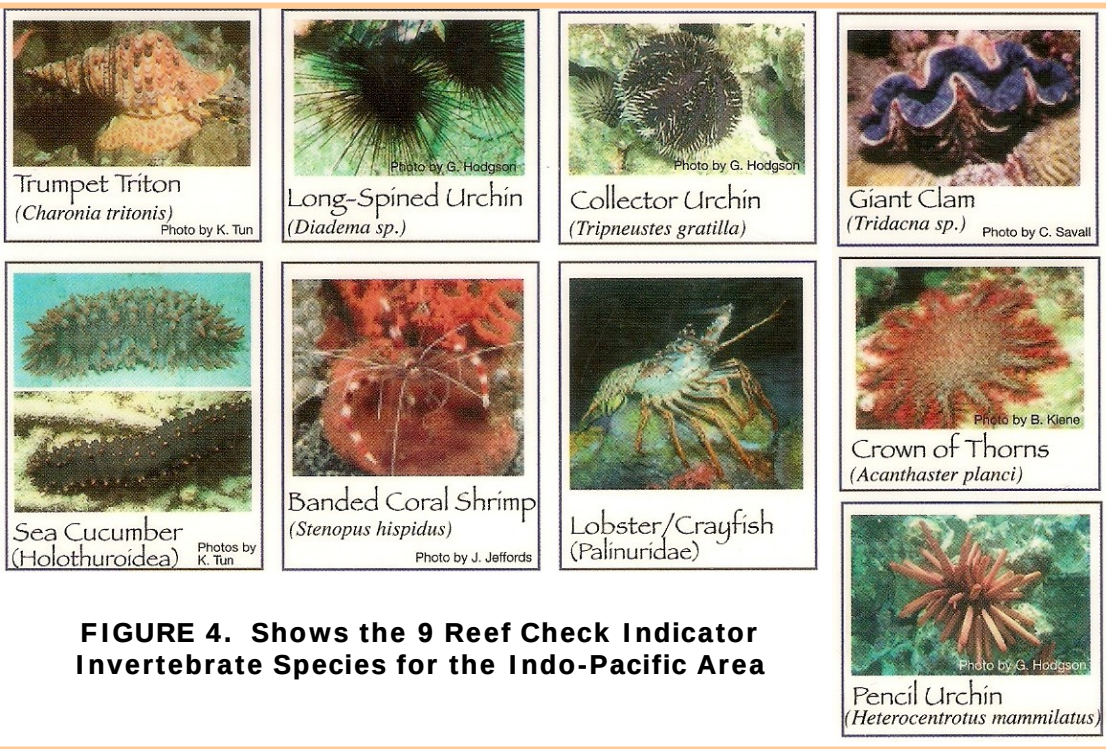


FIGURE 4. Shows the 9 Reef Check Indicator Invertebrate Species for the Indo-Pacific Area

6. *Substrate transect* – This is used to assess the percentage of the seabed covered by different substrate types including live and dead coral. A recording is taken every 0.5m along the same transect over the 4 segments. Substrates include: Hard Coral (*Gahi nga buhi nga gasang*); Soft Coral (*Humok nga gasang*); Recently killed coral (*Bago ra namatay nga gasang*); Nutrient Indicator Algae (*Lumot*); Sponge (*Spongha*); Rock (*Bato*); Rubble (*Dugmok nga gasang ug bato*); Sand (*Balas*); Silt (*Lapok*).

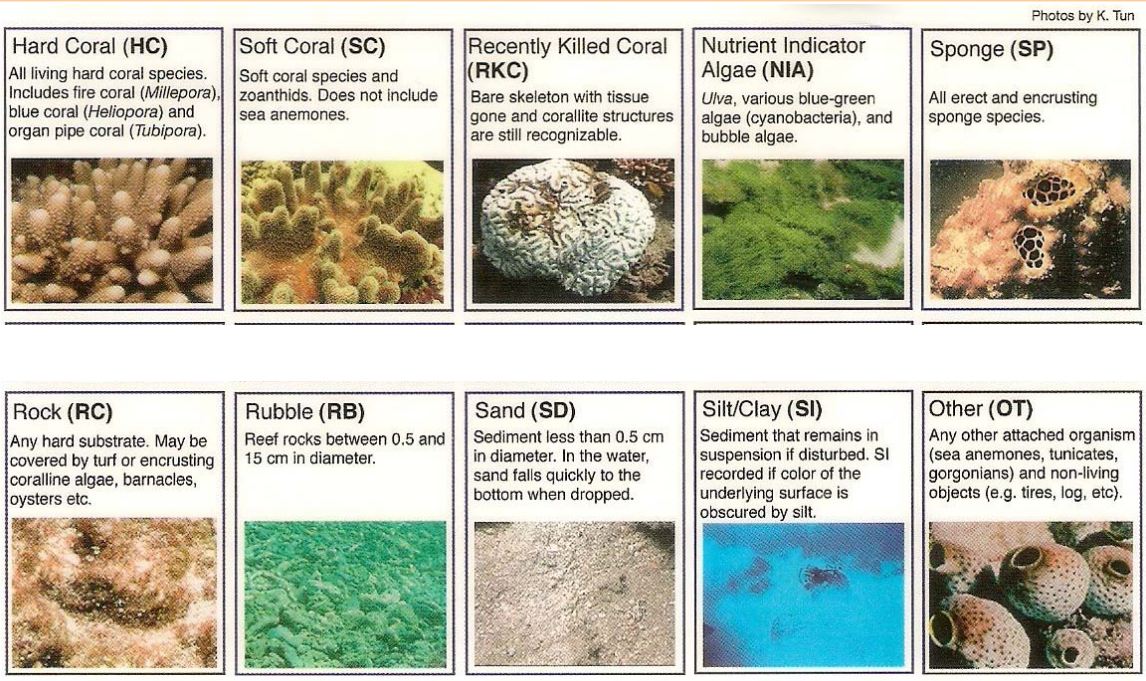


FIGURE 5. Shows the different Reef Check Indo-Pacific Substrate Categories

3.0 Reef Assessment Survey Results

3.1 Fish

Out of the nine (9) Reef Check indicator fish species (which are commonly collected for food or the aquarium trade), only three were recorded during the reef surveys, namely butterflyfish (*alibangbang*), parrotfishes (*molmol*; over 20cm in length) and snappers (*Maya-maya;* only recorded in Poblacion survey site).

Figure 6 shows the limited number of butterflyfish recorded at all surveyed reef sites in comparison to the Hilantagaan MPA control site. As shown in **Figure 7**, Parrotfish were observed as more abundant in Pooc and Kinatarcan reef sites, with a total of 16 individuals recorded per 400m^2 survey area.

FIGURE 6

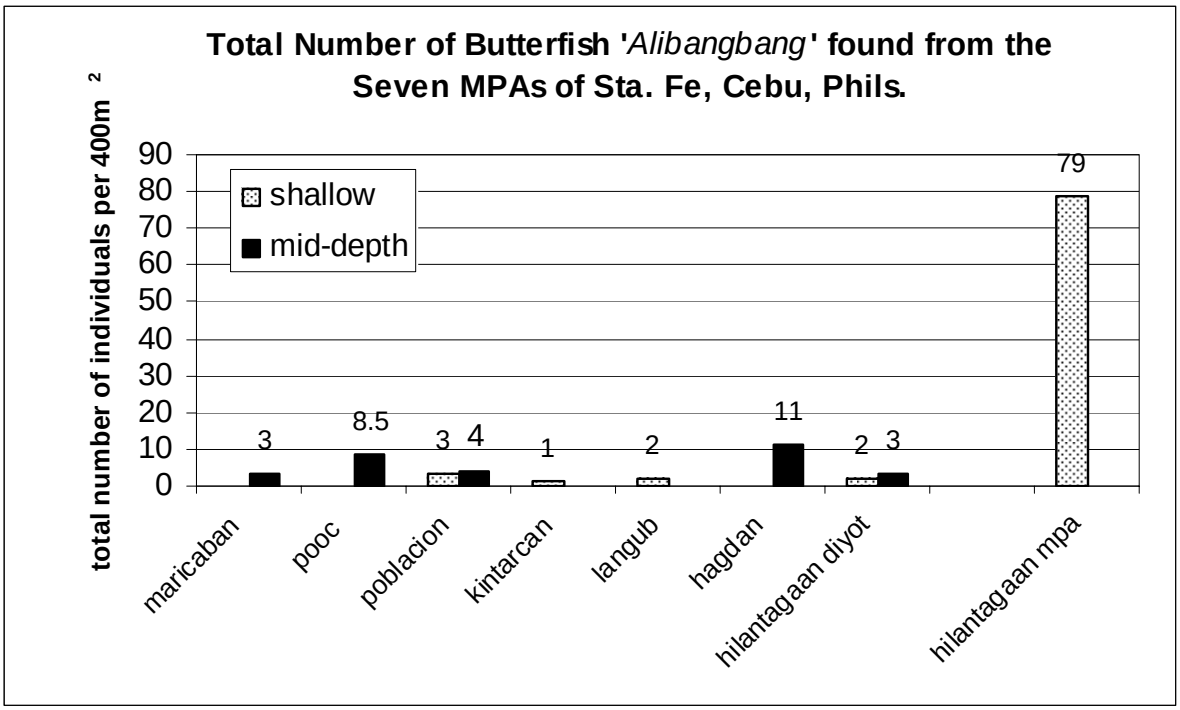
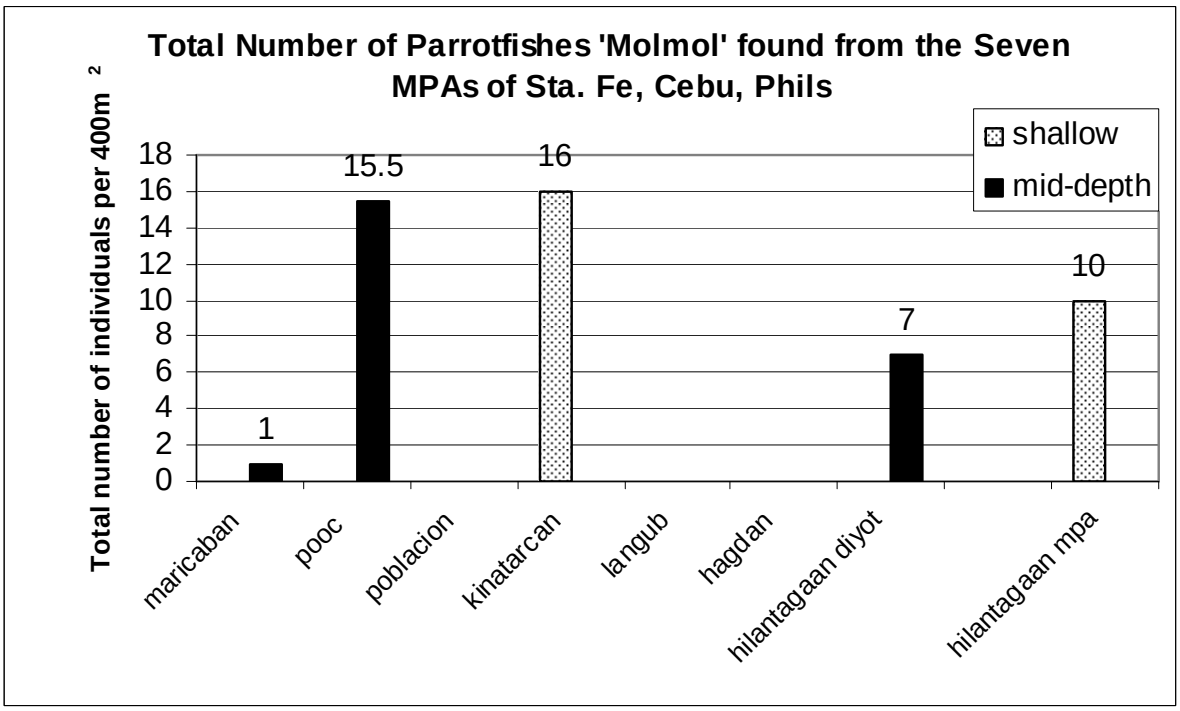


FIGURE 7

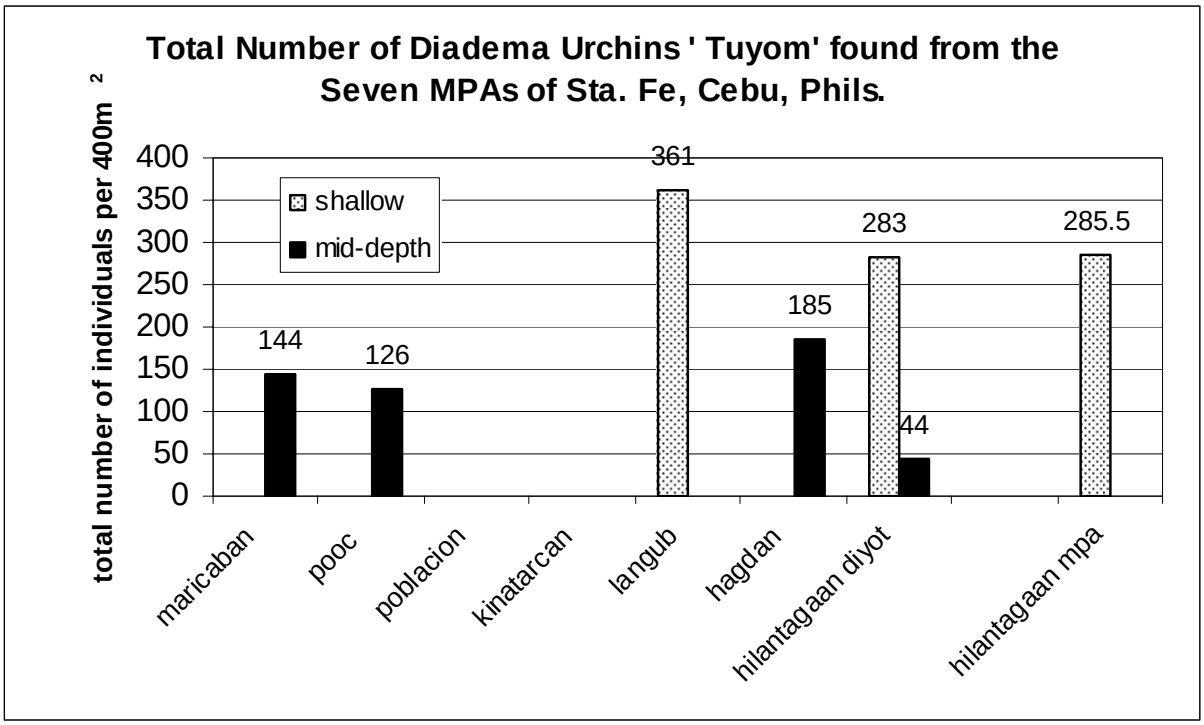


3.2 Invertebrates

Invertebrates such as diadema urchins (long-spined urchin; *tuyum*), crown-of-thorns starfish and giant clams were the only three invertebrates observed out of the 9 Reef Check indicator species in the surveyed reef sites as shown in **Figures 8**, **9** and **10**.

The shallow part of Langub reef site was recorded as being more densely populated with diadema urchins (361 individuals per 400m^2) followed by Hilantagaan Diyot (283 individuals per 400m^2) which is very similar to the Hilantagaan MPA control site (286 individuals per 400m^2).

FIGURE 8



The presence of crown-of-thorns starfish in each surveyed reef site is a concern, specially in Langub and Hagdan reef sites which had 6 and 12 individuals per 400m^2 respectively (**Figure 9**).

It is encouraging that giant clams are recorded in Pooc, Poblacion, Bitoon and Hilantagaan Diyot survey sites (**Figure 10**).

FIGURE 9

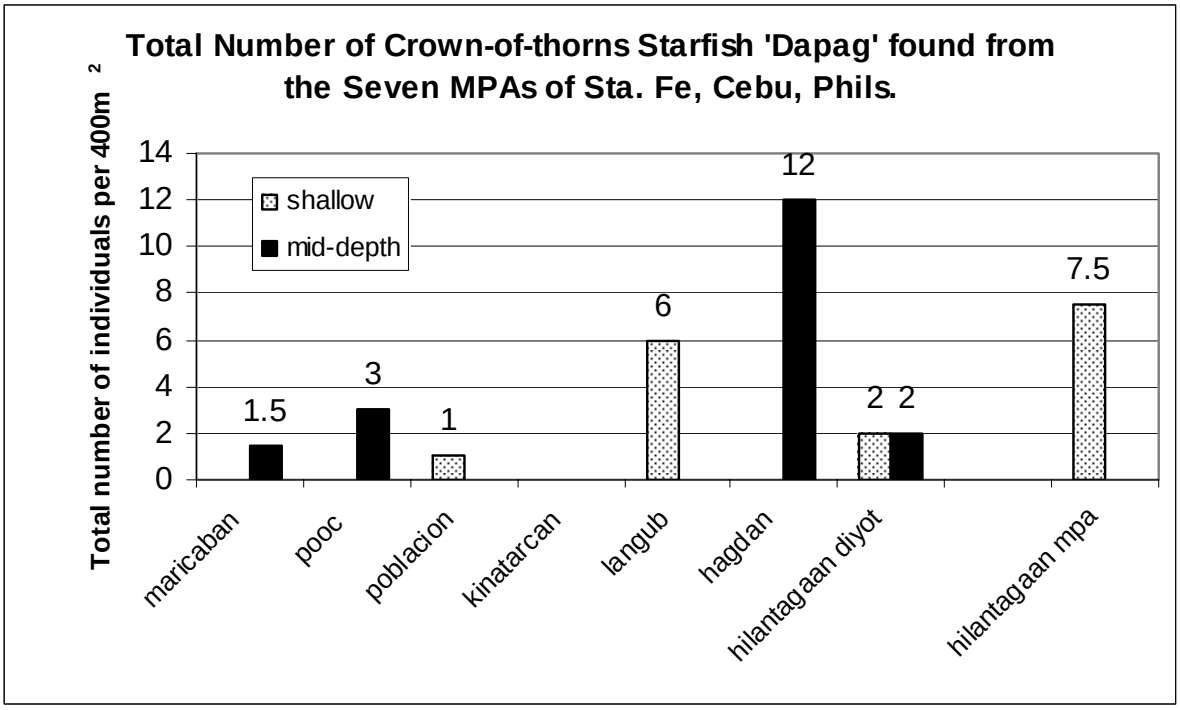
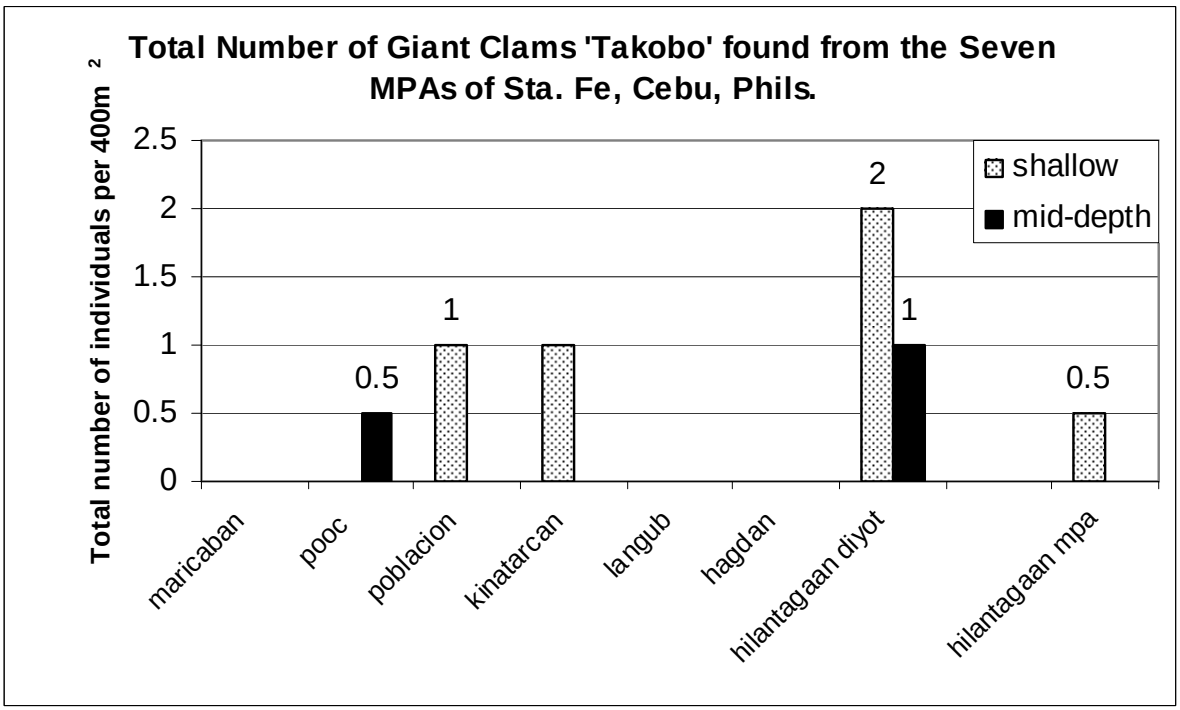


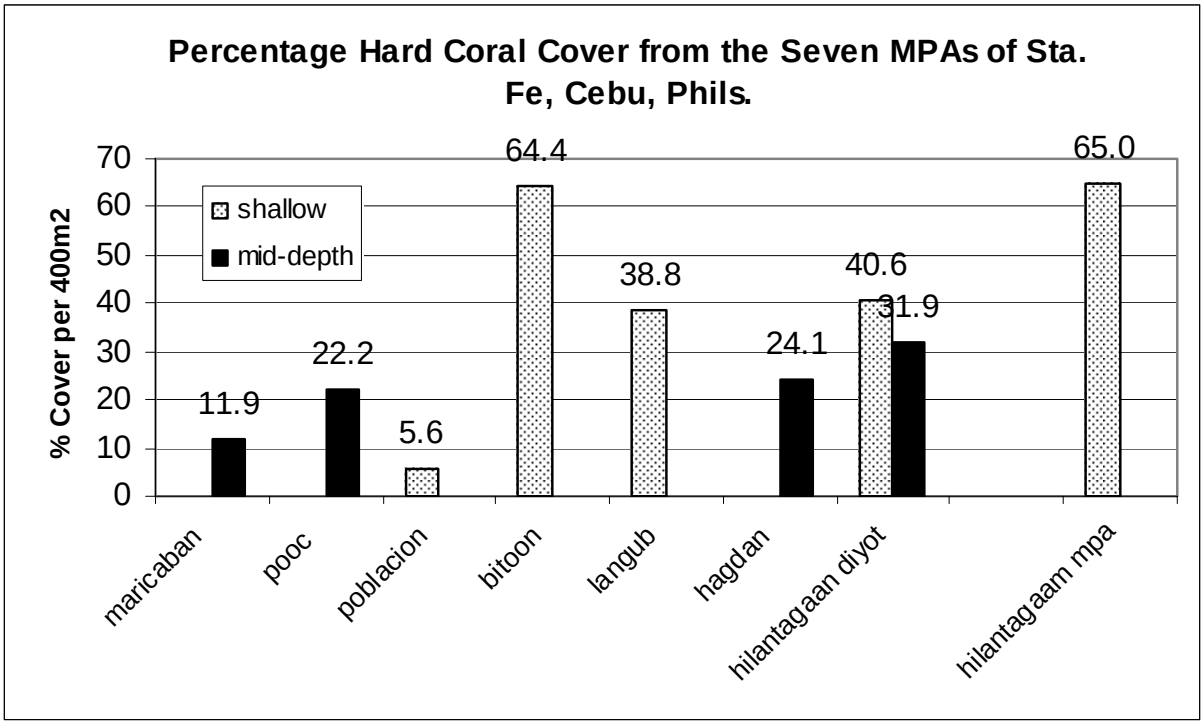
FIGURE 10

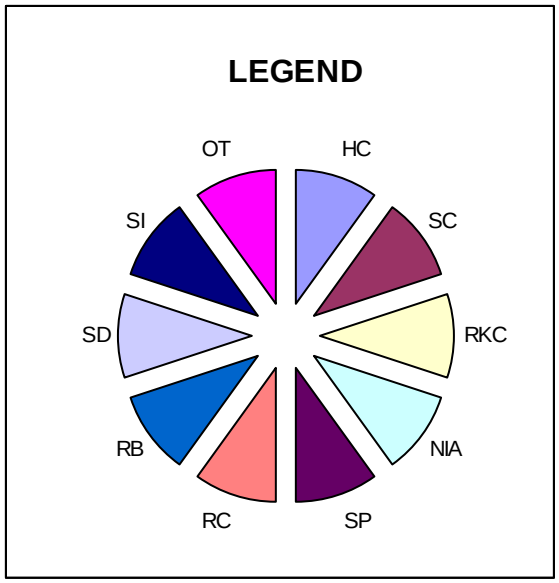


3.3 Substrate

Major substrate composition of the surveyed Sta. Fe reef sites is comprised mostly of sand which ranges from 26% to 76% per 400m^2 as illustrated in **Figures 11a - 11g**. **Figures 11d** and **11e** show that Bitoon and Langub survey sites have healthier coral cover with 65% and 39% respectively. **Figure 12** shows the average percentage substrate cover of the 7 sites assessed. Hard coral cover only constitutes 29% against the sand which covers over 43%. Other types of substrate recorded include rubble and rock, which comprises 4.6 % and 14.7% respectively.

FIGURE 11




LEGEND
OT
HC
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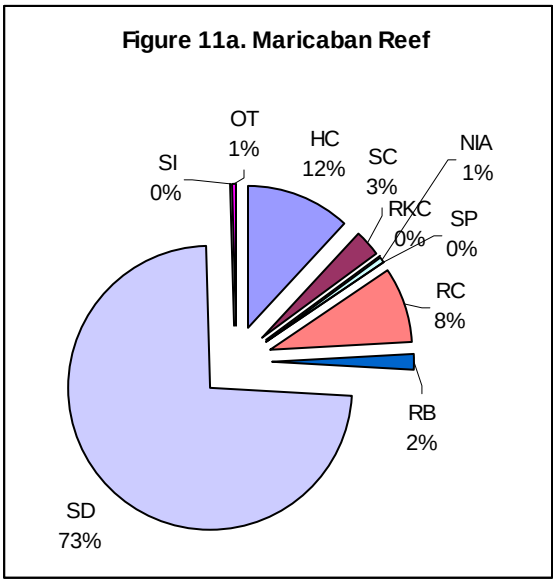


Figure 11a. Maricaban Reef
OT 1%
HC 12%
SC 3%
NIA 1%
RKC 0%
SP 0%
RC 8%
RB 2%
SD 73%
SI 0%

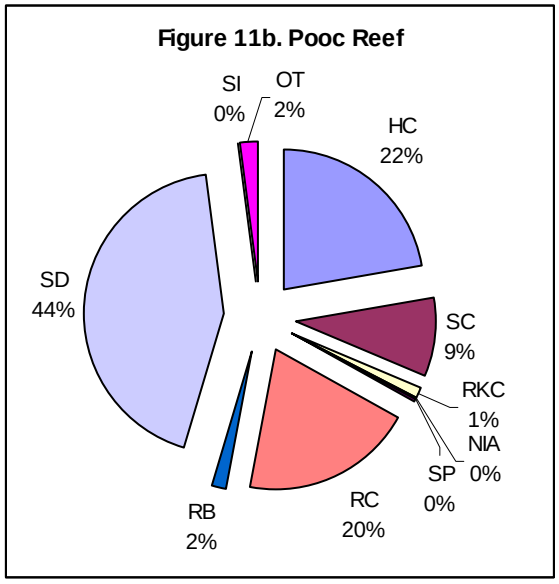


Figure 11b. Pooc Reef
SI 0%
OT 2%
HC 22%
SC 9%
RKC 1%
NIA 0%
SP 0%
RC 20%
RB 2%
SD 44%

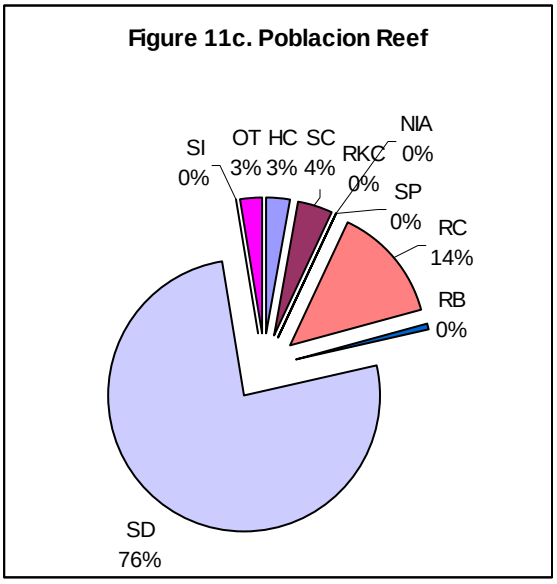


Figure 11c. Poblacion Reef
SI 0%
OT 3%
HC 3%
SC 4%
RKC 0%
NIA 0%
SP 0%
RC 14%
RB 0%
SD 76%

Figure 11d. Bitoon Reef

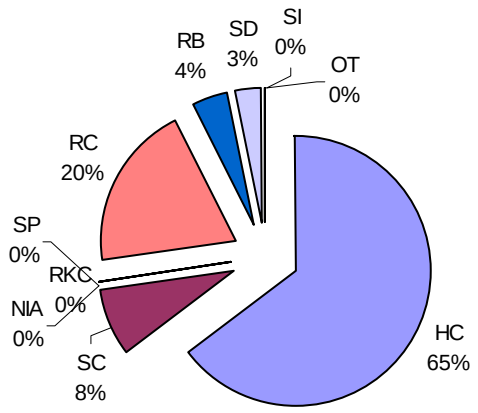


Figure 11e. Langub Reef

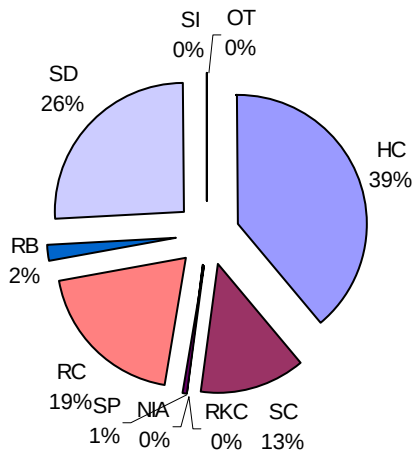


Figure 11f. Hagdan Reef

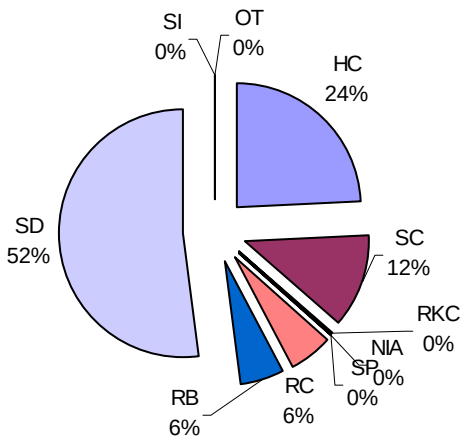


Figure 11g. Hilantagaan Diyot Reef

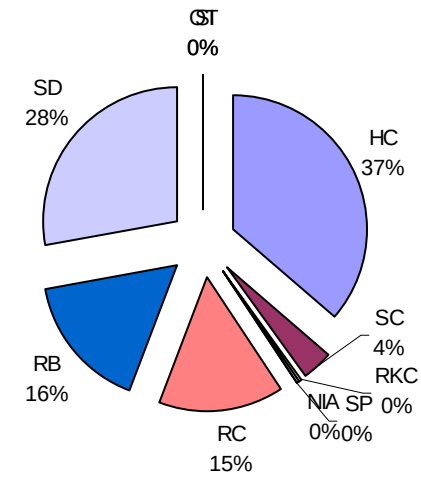


FIGURE 12.

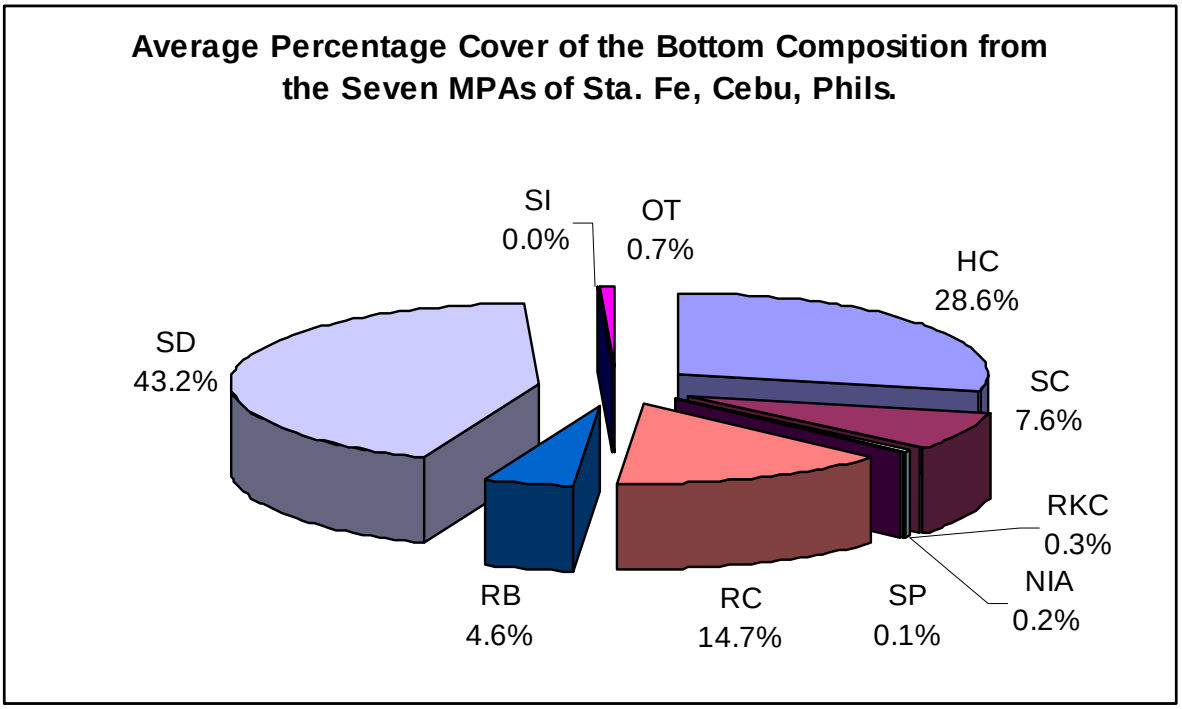


TABLE 2. Indicates the extent of coral damaging phenomenon and diseases.

(0 = *none*, ≤1 = *low*, ≤2 = *medium*, ≤3 = *high*)

Impacts	maricaban	pooc	poblacion	kinatarcan	langub	hagdan	hilantagaan diyot
Coral damage: Boat/Anchor	0	0	0	1	1	0	0.5
Coral damage: Dynamite	0.5	0	0	3	2	1.25	0.5
Coral damage: Other	0.75	1	1	3	1	1	1.5
Trash: Fish nets	0.125	0	0	1	0	0	0
Trash: General	0	1	0	1	1	1	0.5
Bleaching (% of coral population)	5.25	10	0	20	10	15	15.625
Bleaching (% of colony)	5.125	10	0	20	10	15	20.625
Coral Disease	0	10	0	0	0	0	0

Coral damage attributed to dynamite fishing and other factors is most evident in Kinatarcan Island, where the Bitoon and Langub survey sites are located (**Table 2**). Kinatarcan reef displays a grade of 3 which is equivalent to higher impact. During the less than one hour underwater survey, the team heard 6 - 8 dynamite blasts. Bleaching phenomenon (when corals turn white and generally die) was most commonly recorded at the Kinatarcan reef survey site.

4.0 Analysis of Reef Assessment Survey Results

The Philippines is recognized for its potentially highly diverse and highly productive coral reefs. But if reef degradation and illegal fishing activities continue, this potential is greatly decreased or lost entirely. In addition to reduced or lost biodiversity and fish production, this loss can also be measured in terms of lost livelihoods, tourism attraction, recreation, coastal protection from storms and sand generation for beaches.

In the surveyed Sta. Fe reef sites where MPAs are proposed or have been recently established, only 3 of the 9 Reef Check indicator fish species (butterflyfish, parrotfish and snappers) were recorded. The apparent absence of other indicator species (sweetlips, groupers, moray eels, humphead wrasse, bumphead parrotfishes and barramundi cods) can be attributed to over-fishing and reflect poor reef conditions.

For invertebrates, the Reef Check survey methods includes indicator species that are highly valued as a source of food and for the aquarium trade. Sad to say that most of the indicator species are absent during the surveys, including the triton (*tambuli*), one of the major predators of crown-of-thorns starfish; banded coral shrimps, which are collected for aquarium trade; pencil urchins, which are collected for curio sale and lobsters, a high priced sea food.

The indicator invertebrates that recorded were limited to Diadema urchins (which are responsible in the balance of algae in the reef community); a few giant clams and sea cucumbers, and crown-of-thorns starfish (one of the major predators of corals). Crown-of-thorns starfish were observed to be numerous in Hagdan reef site having 12 individuals per 400m^2. Traces of bleached coral perhaps due to predation by crown-of-thorns starfish were also present in this area.

The Sta. Fe reef survey sites on the main island of Bantayan have long, nearly level foreshore (sublittoral) reef flats which lead to gently sloping reef shelf. Hard corals are found in patches of exposed rocky substrate while sand substrate (where hard corals can generally not grow) is common as reflected in the data of Maricaban, Pooc and Poblacion.

In Kinatarkan Island, the Kinatarcan, Langub and Hagdan survey sites are characterized as having have shorter foreshore (sublittoral) reef flats and stunning drop-offs. These surveys sites are located over 1 hour away by pumpboat from the Bantayan mainland.

The Kinatarcan and Langub reefs have excellent cover of living hard corals perhaps due to better substrate and water quality conditions and less human pressures in these more remote waters. However, the remote area is prone to rampant dynamite fishing which may seriously threaten these remaining reefs in the near future.

5.0 Socio-Economic Monitoring

Establishing an MPA is seldom an easy task as it directly involves the local community and fisherfolks to enable it to be successful and sustainable. By conducting socio-economic surveys, we can help determine whether the community understands the need to conserve and rehabilitate a certain part of their coastal waters. Socio-economic assessment and monitoring surveys (SocMon) summarize sampled community members perceptions and recommendations which can contribute to planning and managing the coastal resources and designated MPAS in their areas.

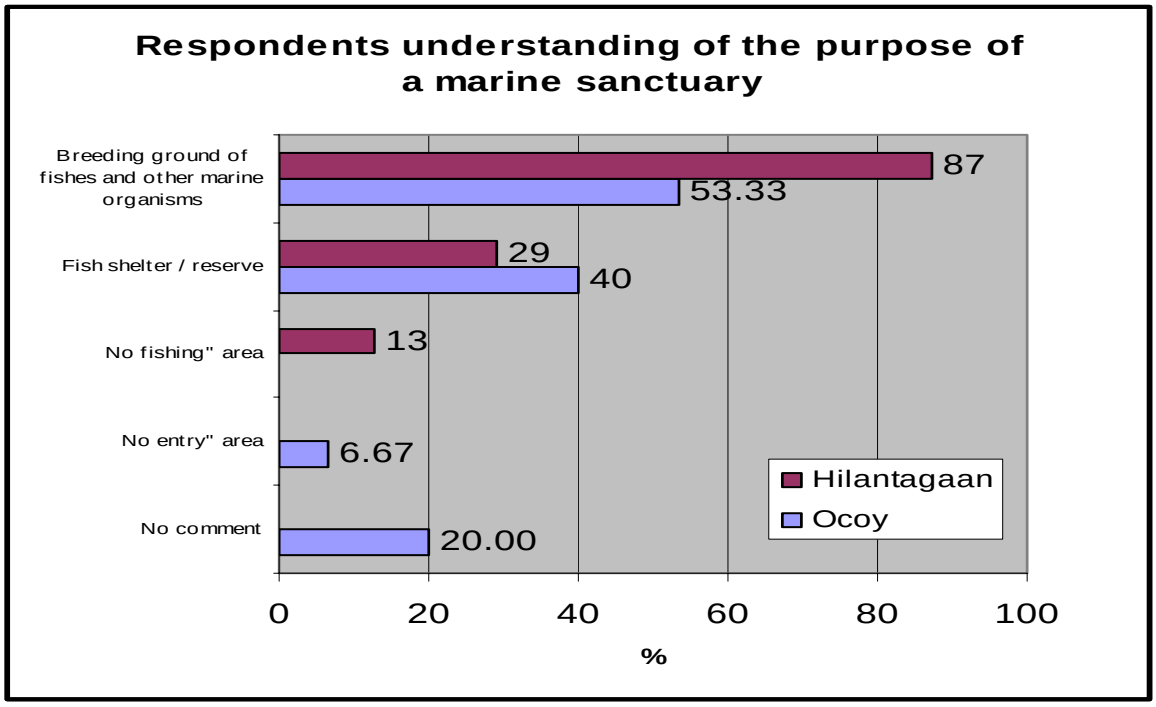
Two of the 10 sampled coastal barangays of Sta. Fe have responded to the SocMon survey to date and both of these two barangays already have existing MPAs that are believed to be successful over the years. These two barangays that have responded to date are Ocoy and Hilantagaan (Sitio Dakongbabay), summary results are attached.

5.1 SocMon Results

The conducted SocMon surveys involved a total of 15 and 31 respondents of Barangay Ocoy and Hilantagaan, which represents 2 – 5% of the total households respectively of each barangay. The majority of the respondents were fishermen, especially in Hilantagaan, over 20 years old. Because they are more frequently in the water, they admitted that the condition of their coral reefs has changed dramatically over time – over 50 % responded that their reefs were now damaged /destroyed compared to before. They believed that damages were caused by illegal fishing activities, such as dynamite and cyanide. They also complained about commercial fishing vessels that fished within the municipal waters of Sta. Fe.

Almost all of the respondents understood that an MPA is a breeding ground of fishes and other marine organisms as well as a fish shelter (**Figure 13**) with the advantage of having a marine sanctuary being the possibility to increase fish population and thus increase future fish catch. Most respondents support establishing MPAs in their areas, including 87 % of the respondents from Hilantagaan and 67 % of the Ocoy respondents. For them, the best way to prevent destruction to the reef is by conducting information education campaigns. Fifty-one percent (51%) of Hilantagaan respondents are actively involved in coastal management while in Ocoy are less active.

FIGURE 13.



6.0 Recommendations

Based on these reef assessment results, it appears that overall the surveyed Sta. Fe reefs are in good condition and boasts the greatest diversity of fish in the Bantayan area. It is a good example for the other municipalities to follow. However, there is still a long way to go before Sta. Fe reefs and MPAs can rival the stunning beauty, attraction / tourism potential and vast number of fish and abundant corals at sites such as Gilutongan MPA near Mactan, Balicasag MPA in Bohol or Masaplod MPA in Negros Oriental. This view is also reflected in preliminary SocMon survey results.

To better protect and improve the management of these valuable coastal resources, the following recommendations are provided to the municipality of Sta. Fe:

- Make sure 24 hour observation of the designated MPA areas is carried out to prevent illegal fishing practices, such as cyanide fishing, dynamite fishing and invertebrate collection. This can be done from the shore or preferably using a patrol boat.

- It is important that the wardens/staff-in-charge are monitored to ensure they are carrying out their duties properly and not using the sanctuary for their own use.

- Consider carrying out underwater clean up dives on a regular basis in cooperation with local resorts and diveshops to keep the MPA areas clean and pristine.

- Encourage dive guides and tourists to pick up any rubbish they see when diving and provide facilities for them to dispose of trash properly.

- Implement environmentally friendly systems for waste and sewage disposal to prevent nutrient leakage and pollution of the reef.

- Install mooring buoys to prevent anchor damage to the reef at dive sites. Also install MPA marker / boundary buoys and signage so that fishermen are made aware of the designated MPA status of these areas.

- In the future, look to extend the boundaries of the MPAs and their buffer zones and the possibility of adding underwater diving “attractions” such as sunken ships, which also serve to enhance fish habitat in barren reef areas.

- If demand for recreational diving increases, consider the implementation of a MPA user’s fee to generate income which can be put back into the improvement of the area and to provide additional economic benefits to the local community and LGU. Good examples and models for such user fee systems are provided by the Gilutongan and Talima MPAs near Mactan Island.

- The proposed site of the Maricaban MPA was observed as being in poor condition with a substrate consisting mostly of sand plus the existence of numerous fish traps which occupying the western part of the barangay coast. We recommend that the MPA site should be relocated to the boundary between Maricaban and Pooc.

- Regular (annual) Reef Check monitoring surveys should be conducted for the same survey sites to check if MPA management and enforcement measures are proving effective and to provide valuable feedback to the LGU and barangay stakeholders.

- Regular (annual) SocMon monitoring surveys should also conducted to assess the community MPA benefits, such as increased fish catch in areas adjacent to the MPA and to identify possible improvements to MPA design and management measures.

ACKNOWLEDGEMENTS

The success of our survey would not have be possible without the help and support of the following:

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1. Sta. Fe Mayor - Hon. Jennifer Ilustrisimo
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3. Barangay Captain of Maricaban - Candelaria Baterzal
4. Barangay Captain of Pooc - Jose Espinosa Jr.
5. Barangay Captain of Poblacion - Dolores Gigante
6. Barangay Captain of Hilantagaan- Pableo Illut
7. Barangay Captain of Hagdan - Ginda O. Isabel
8. Barangay Captain of Langub - Rolando Villacarlos
9. Barangay Captain of Kinatarcan - Marcos Gilbuena

Visayan Sea Squadron & the Law of Nature Foundation

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2. Bonar Laureto - Assistant
3. Caesar Morandarte - Bantayan Agriculturist
4. Antonio Marabe - Sta. Fe Fish Warden
5. Editha Marabe - School of the Seas (SOS)
5. Timoteo 'Tuti' Menguito - Visayan Sea Squadron (VSS) Coordinator
6. All VSS & SOS Volunteer staff

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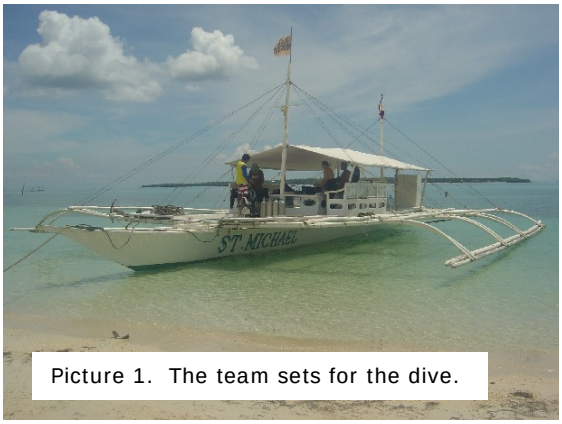
2. Myrtle Arias – Paquibot - Science Staff
3. Russ Pascual - CDF Volunteer / JCI- Cebu

Tropical Island Adventures Boat Crew:

1. Mario Ochea - St. Michael Boat Captain
2. Junrey Ochea - St. Michael Boat crew
3 Oliver Ochea - St. Michael Boat crew



Picture 1. The team sets for the dive.

Picture 2. Kinatarcan reef.

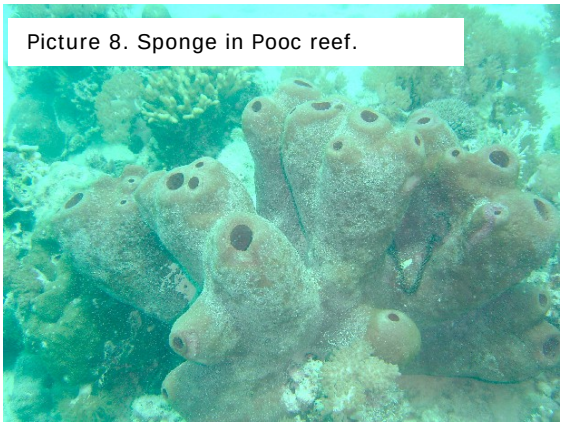
Picture 3. Yellow feather star found in Hilantagaan Diyot

Picture 4. Transfer of data from the slates.

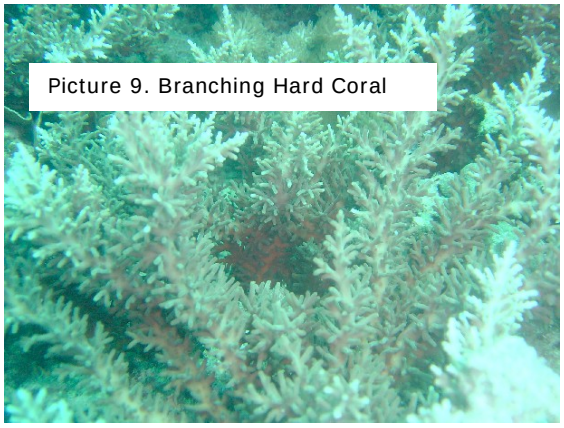
Picture 5. Massive hard coral

Picture 6. Giant clam found in Pooc reef.

Picture 7. Fish trap found inside Pooc sanctuary.



Picture 8. Sponge in Pooc reef.



Picture 9. Branching Hard Coral

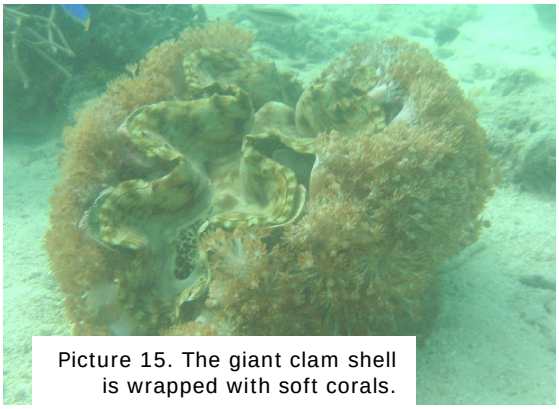
Picture 10. A newly grown giant clam.

Picture 11. The coral eater starfish: Crown-of-thorns starfish

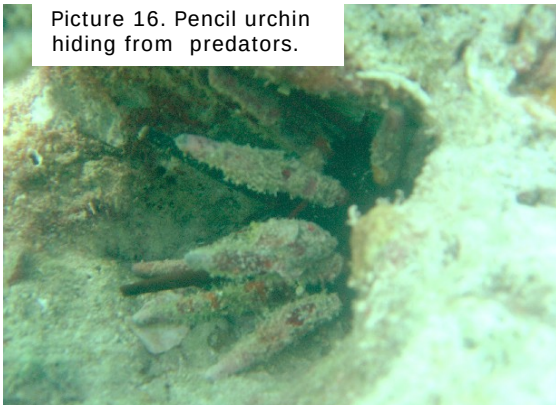
Picture 12. Blue Coral

Picture 13. Edible sea cucumber.

Picture 14. Ready to defend cuttlefish.



Picture 15. The giant clam shell is wrapped with soft corals.



Picture 16. Pencil urchin hiding from predators.