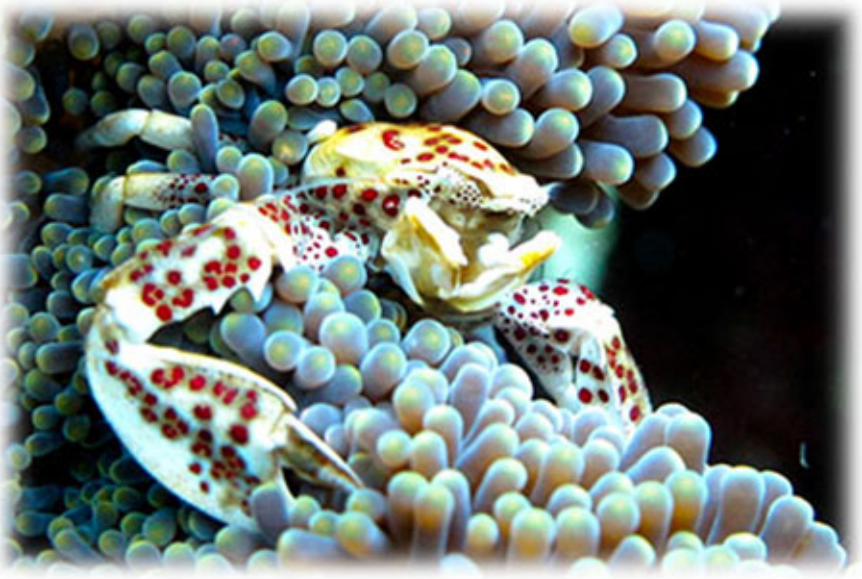
Summary Field Report
Saving Philippine Reefs

Coral Reef Monitoring Expedition to Camiguin Island, Philippines April 12-20, 2015



A Project of:

The Coastal Conservation and Education Foundation, Inc.

With the participation and support of the Expedition Volunteer Researchers

unico conservation foundation

CCEF

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Coral Reef Monitoring Expedition to Camiguin Island, Philippines April 12-20, 2015

Produced by the Coastal Conservation and Education Foundation, Inc. (CCEF)
Cebu City, Philippines

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CCEF is a nonprofit organization concerned with coral reef conservation and fisheries management through marine protected areas.

Cover photo: Spotted Porcelain Crab (*Neopetrolisthes maculatus*)
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EXECUTIVE SUMMARY

Due to its volcanic history, Camiguin Island is one of the most fertile and lush islands in the Philippines that also boasts a treasury of marine resources. With 31 locally declared marine protected areas (MPAs), and more in the process of being planned, Camiguin Province has shown good leadership and initiative over the past five years in its marine conservation efforts. Already it is becoming a prime tourist destination for foreigners and local tourists alike, with its main attractions ranging from its coral reefs to historical points of interest.

This summary field report analyzes the condition of benthic and fish fauna at ten MPAs in Camiguin Island. Overall, results in benthic cover varied among sites with the highest percentage live hard coral (LHC) recorded at Balite Marine Sanctuary, Sagay (60.6%) in the shallow reef and 72.3% for the deep coral reef. Much of the damage in some of the sites can be attributed to Typhoon Pablo (or Typhoon Bopha) that swept through the region in 2012.

Fish biomass was low in all the areas, ranging from Very Poor to Poor based on standard measures established for the Philippines. The highest fish biomass recorded was in Mantigue Island, Mahinog at 3.1 kg/500m^2. This was also true for fish densities and fish species richness in the study sites of this expedition where numbers rated Very Poor to Poor. The area with highest target fish density was South Poblacion with 208.7 fish/500m^2 and it also had the highest all reef fish density with 1,378.7 fish/500m^2. The area with highest target fish species richness was Mantigue Island with 17 species/500m^2 and it also had the highest all reef fish species richness with 40 species/500m^2. A major factor that contributes to the low biomass, low fish densities and low fish species richness is likely to be the lack of enforcement of rules and regulations in some of the MPAs so that fishing is still to be occurring. Another contributing factor is the relatively small size of most of the MPAs. No large marine life was observed in the area except for a few sea turtles in some of the sites. The number of butterflyfish species observed overall totaled 30.

It is recommended by the research team that some of the sites consider increasing their MPA area size to cover more marine habitats (Balite, Cabuan, and Mantigue Island core zone). Further, some sites need marker buoys to delineate MPA boundaries, a feature that is important for visitors and fishers alike (Alangilan and Kabiling-Tupsan). Many sites also needed mooring buoys so that visiting boats can moor and avoid dropping anchors and damaging the coral substrate (Alangilan, Lawigan, and Kabiling-Tupsan). Although some sites are well managed, others still need more visible patrolling and law enforcement to lessen illegal fishing and other violations. In White Island, there is a need to reconsider where to place the core zone of the MPA where the coral habitat is richer and in consideration of the downstream sink for fish and other larvae.

Overall, it is important for current management groups to maintain and improve current management efforts in Camiguin MPAs where they are already feeling the pressure of tourism and overfishing.

ACKNOWLEDGEMENTS

This coral reef monitoring expedition and its outcome are credited to the 11 international volunteers from Australia, England, the United States, and the Philippines who dedicated their time and funding to the research work. Equally important are the Coastal Conservation and Education Foundation staff, partners and volunteers that prepared for the trip and have all done their part in the overall successful completion of the Expedition. They include: Jonathaniel Apurado, (Co-Principal Investigator) Research Monitoring Team Leader and Divemaster; Sheryll Tesch, Data and Logistics Coordinator; Agnes Sabonsolin, Logistics Assistant; Dalton Dacal, Fish Counter and GIS Coordinator; Al Jiereil Lozada, Database Specialist; Jane Trangia, CCEF Chief Accountant; Pablita Toyong-Huerbana, CCEF Administrative and Accounting Assistant; Marilyn Alilay, CCEF Administrative Assistant; and Vangie White, Project Manager for the trip.

Special mention and appreciation goes to Mrs. Evelyn Deguit for her invaluable support and time in assisting the team in coordinating the trip with partners and communities on Camiguin Island. Many thanks also to Julius Guirjen for assisting the staff in choosing the MPA survey sites. A big thank you to Moonyeen Alava (Executive Director of CCEF) for guiding the Saving Philippine Reefs team in overall project coordination and preparations.

The Bahay Bakasyunan sa Camiguin resort staff and management are thanked for hosting our group with traditional Filipino hospitality and excellent facilities in meeting the needs of the volunteers and staff.

The Matangale Dive Boat operations captain, crew and divemasters are thanked for providing a safe diving procedures and excellent survey assistance and boat throughout the trip. Many thanks to Captain Ruel 'Dodong' Uy) and Fraand Timothy Quimpo for giving their special attention to our team's needs.

Finally, thanks goes to the Camiguin Island Communities, Honorable Governor Jurdin Jesus M. Romualdo, the Honorable Mayors and Barangay Captains, and the local government officials that made this dive survey expedition possible. More specifically, Mayor Maria Luisa D. Romualdo (Mambajao), Mayor Joanne Marie C. Rubin (Guinsiliban), Mayor Alex R. Jajalla (Mahinog), Mayor Joseph G. Uayan (Sagay), Mayor Nestor Jacot (Catarman). A very special thanks to the invaluable assistance given to the SPR team in coordinating with the LGUs, MPA management groups and Bantay Dagat, especially by Mr. Felicisimo Gomez (PPDO), Ms. Fe Belara (CRM Officer - Mambajao), Mr. Jake Abuzo (CRM Officer - Mahinog), Dr. Willy Lobido (MBDO - Mahinog), Ms. Melchora Sibayan (CRM Officer - Guinsiliban), Ms. Elma Uayan (CRM Officer - Sagay), Mr. Edgardo Agbu (CRM Officer - Catarman), and Mr. Daniel Casino (Bantay Dagat). You all provided the team a warm welcomes to your MPAs and made logistical processes easier throughout the implementation of the research expedition. For those we have missed mentioning in this report, the SPR team is grateful for all your help and kindness in making us feel welcome on your beautiful island.

The final production of this report was done by Sheryll Tesch, Dalton Dacal, Agnes Sabonsolin, and Jonathaniel Apurado.

Alan T. White
Principal Investigator

LIST OF ACRONYMS OF ABBREVIATIONS

ANOVA	Analysis of Variance
CA	coralline algae
CB	branching coral
CCEF	Coastal Conservation and Education Foundation, Inc.
CCRMP	Camiguin Coastal Resources Management Project
CE	flat/encrusting coral
CF	foliose/cup coral
CM	massive coral
CRM	coastal resource management
DC	white dead standing coral
DCA	dead coral with algae
FVC	fish visual census
LGU	local government unit
LHC	live hard coral
M/V	marine vessel
MA	fleshy algae
MPA	marine protected area
MPA-MEAT	Marine Protected Area Management Effectiveness Assessment Tool
NL	non-living
NS	not significant
OT	other animals
R	coral rubble
RCK	rock and block
SC	soft coral
SD	standard deviation
SE	standard Error
SG	seagrass
SI	sand and silt
SP	sponge
SPP	species
SPR	Saving Philippine Reefs
TA	turf algae
UVC	underwater visual census

INTRODUCTION

The Saving Philippine Reefs (SPR) Expeditions were started in the 1980's by Dr. Alan White and colleagues. These research trips have been vital in collecting essential information on coral reef and fish health in marine protected areas around the Philippines. Provinces in the Philippines that have been covered by the SPR expeditions are Palawan, Batangas, Bohol, Cebu, Negros Oriental, and Cebu. The data that has been gathered over the years have been used to assist local managers of marine protected areas in making effective changes in management approaches. This data is also used to help them develop appropriate policies and strategies to protect the reef resources that they manage.

The Camiguin Coastal Resource Management Project is a project that was managed administratively by the Coastal Conservation and Education Foundation (CCEF) from 2012 through 2014. With the closing of the project, CCEF decided to do its 2015 expedition in Camiguin Island, a new site and province for the SPR Project. The Camiguin Coastal Resource Management Project has been implemented in Camiguin Island since 2008 and has focused on assisting the municipal and provincial government on the island in coastal and fisheries management. In 2012, CCEF was invited to administer the project and has seen the project through to its closing with 31 marine protected areas in different management stages under provincial and municipal supervision.

In the past, initial coral reef and fish surveys on the island, for the sites covered in this report, were done using different monitoring methods to collect similar data. Coral reef monitoring utilized the line intercept transect method (LIT) and fish visual census method. Further, each site used permanent transect stakes installed by previous monitoring teams.

Management History of Camiguin Island

Camiguin is a small island province with a land area of 29,187 hectares and 144,058 hectares of municipal waters. The island has seven volcanoes, one of which is active – Mount Hibok-hibok. Camiguin Island is comprised of five towns (municipalities): Catarman, Sagay, Guinsiliban, Mahinog, and its capital town, Mambajao. These towns, under the general guidance of the Camiguin provincial government, have implemented coastal resource management projects since 2008 with the assistance of the Camiguin Coastal Resource Management Project (or CCRMP).

Through the CCRMP, the local governments (municipal and provincial) have been able to institutionalize these conservation efforts and integrate conservation activities into their local programs. Much of these programs include MPA establishment and strengthening, alternative livelihood identification and implementation, tourism promotion, and other environmental management activities.

Currently Camiguin has 31 small MPAs declared by municipal ordinance. Several of these MPAs have established visitor user-fee systems to generate revenue for the local government units and their adjacent communities managing the MPAs.

THIS EXPEDITION – 2015

This Saving Philippine Reefs Expedition from April 12 to 21, 2015, was the first survey done by CCEF in Camiguin Island. It was implemented and participated in by seven CCEF staff members and 11 international volunteers from the United States, Australia, and England. Most of the volunteers were already seasoned SPR expedition researchers and divers, who return often (if not annually) to join the research team. They are exceptional individuals who never fail to inspire and motivate the SPR team to accomplish expedition objectives and contribute to the overall vision of involved communities and sustainable coasts of CCEF.

The SPR 2015 research team stayed at the Bahay Bakasyunan sa Camiguin resort during the expedition. Research diving was facilitated by the Mantangale dive boat from the Mantangale Alibuag Dive Resort based in Cagayan de Oro City. The dive plans were executed in a smooth, safe, and efficient manner, thanks to the able crew and captain of the boat.

The SPR research team completed the underwater surveys of ten sites within the municipal waters of Camiguin Island province. These ten sites were all established MPAs under municipal ordinance. They all contained core 'no-take' zones of five hectares or more protected from any form of extraction and fishing by law. Each day of the research trip consisted of two scuba dives to collect underwater data and also a snorkel survey between dives. At the end of each day, researchers encoded their data into a central locally shared database. Evenings consisted of presentations from staff members and some volunteers about recent research and CCEF work that contributes to marine conservation.

Overall, the team collected information at the ten sites on coral reef biota and substrate conditions, fish diversity, fish abundance, fish biomass, indicator species, and human activities that directly affect the health of the reefs. This report documents the conditions in reef fish abundance and coral health in 2015. Further, this report aims to report possible factors that contribute to changes in reef and fish conditions. The authors also provide recommendations for the improvement in the management of each of the marine protected areas.

Study site

Two MPAs per municipality were selected to best represent each town in their efforts in marine conservation and MPA management. MPAs were selected based on the general condition of the coral reef and the strength of management being practiced in the area. The sites recommended and surveyed were the following:

- White Island Marine Sanctuary (Municipality of Mambajao)
- Kabiling-Tupsan Marine Sanctuary (Municipality of Mambajao)
- Lawigan Marine Sanctuary (Municipality of Catarman)
- Pasil Sunken Cemetery Marine Sanctuary (Municipality of Catarman)
- Alangilan Marine Sanctuary (Municipality of Sagay)
- Balite Marine Sanctuary (Municipality of Sagay)
- Cabuan Marine Sanctuary (Municipality of Guinsiliban)
- South Poblacion Marine Sanctuary (Municipality of Guinsiliban)
- San Roque Marine Sanctuary (Municipality of Mahinog)
- Mantigue Island Marine Sanctuary (Municipality of Mahinog)

Data collection

Substrate cover. Systematic snorkeling surveys were carried out in the shallow reef flat at 2-3 m depth covering a distance of 0.5 – 1 km parallel to the reef crest. The distance covered for sampling is limited by the reef extent and may be less than 0.5 km in some sites. The substrate was evaluated within an estimated area of $1m^2$ quadrat at every 50-meter stop (or station). The following data was recorded:

1. Percent cover of living coral (hard and soft)
2. Percent cover of non-living substrate (e.g., rock, rubble, sand, dead coral)
3. Percent cover of living substrate (e.g., seagrass, algae, sponges)
4. Numbers of indicator species (e.g., butterflyfish, giant clams, lobsters, Triton shells, Crown of thorns sea-stars and other invertebrates)
5. Presence of large marine life (e.g., sharks, manta rays, Humphead wrasses, sea turtles, whales, dolphins and others)
6. Causes of reef damage

Distances between stations were estimated through kick cycles, wherein, volunteers calibrated their kicks along a transect tape prior to surveys. Each volunteer attempted to make at least 10 or more stations on one snorkel survey which was limited by the extent of the reef. Scuba surveys were carried out in the deep area (6-8 m) parallel to the reef crest using a systematic point-intercept method. Transects were laid on sections of a reef flat, reef crest, or slope. Substrate was evaluated at 25 cm intervals along a 50 m transect. Data gathered during scuba surveys were the same type as those collected during snorkel surveys. The distance between transects was approximately 5 m.

Fish counts. Fish abundance and diversity were estimated using a 50 x 10 m visual census (UVC; n = 4 - 10) technique done by four specialists (J Apurado, DP Dacal, AT White, and TJ Mueller). Specified substrate transects were utilized as guides for the UVC. The abundance of target species, indicator species and numerically dominant and visually obvious species were all counted. Length of fish was also estimated (Uychiaoco et al. 2011; English et al. 1997). Biomass of target species was computed using length-weight constants (www.fishbase.org).

Data Analyses

Coral and fish density, species abundance and biomass. Substrate was categorized into total live hard coral (branching, massive, encrusting and foliose), soft coral, rubble, non-living substrate (white dead standing coral, dead coral, rock and block, sand and silt) and others (sponges, algae, and seagrass) for comparison and presented graphically. Sites with surveys that have low replication (n<2) were excluded from statistical analyses. In describing coral condition, the following terms may have the corresponding values:

Gomez et al. (1994) categories:

Live Coral Cover (%mean ±SE)			
Poor	Fair	Good	Excellent
0% – 24.9%	25% – 49.9%	50% - 74.5%	75% - 100%

Density and species abundance of fishes was presented and classified according to the 19 coral reef fish families/subfamily which include target fish families (Serranidae: Epinephelinae and Anthiinae, Lutjanidae Haemulidae, Lethrinidae, Carangidae, Caesionidae, Nemipteridae, Mullidae, Balistidae, Chaetodontidae, Pomacanthidae, Labridae, Scaridae, Acanthuridae, Siganidae, Kyphosidae, Pomacentridae and Zanclidae), used as indicators in Coral Reef Monitoring for Management (Uychiaoco et al. 2011).

When applicable, species richness was expressed as mean number of species per 500 m^2. In order to classify the year 2015 all reef fish densities to "high, moderate, or low" using the category of Hilomen et al. (2000), we extrapolated the 500m^2 fish densities area to 1000 m^2. However, what is reflected in this report are the 500m^2 values to be consistent with standard CCEF data.

Hilomen et al. (2000) categories:

Fish Species Diversity (no. of species/1000 m^2):				
Very Poor	Poor	Moderate	High	Very High
0 – 26	27 – 47	48 – 74	75 - 100	>100
Fish Density (no. of fish/1000 m^2):				
Very Poor	Poor	Moderate	High	Very High
0 – 201	202 – 676	677 – 2,267	2,268 – 7,592	>7,592
Biomass (MT/km^2)				
Very Poor	Poor	Moderate	High	Very High
<5	5.1 – 20	20.1 – 35	35.1 – 75	>75

Fish biomass. Fish biomass was computed using the formula: a* Lb (Fishbase 2004), using the length-weight constants in FishBase (www.fishbase.org). Biomass of target fish species were computed on the species level and summed per site, based on selected target fish/commercially important food fish: Epinephilinae (Serranidae), Lethrinidae, Lutjanudae, Acanthuridae, Caesionidae, Carangidae, Haemulidae, Nemipteridae, Mullidae, Scaridae, Siganidae, Labridae (larger species, i.e., Cheorodon spp., Cheilinus spp.), including non-reef families, Scombridae and Sphyraenidae. For this report, biomass computations were based on consensus with species-specific lengths (n = 3-10).

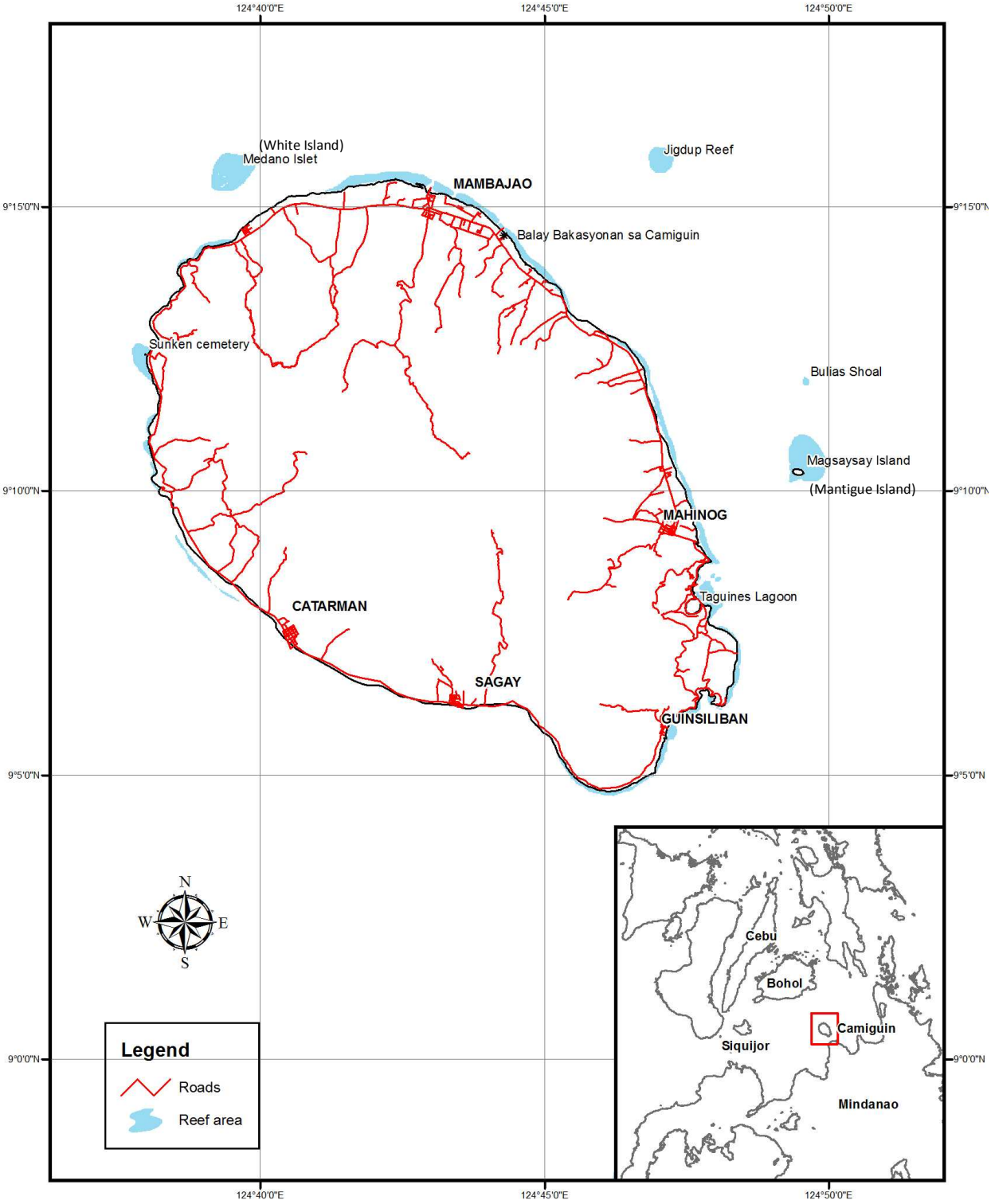

Figure 1. Camiguin Island, Philippines with primary towns.

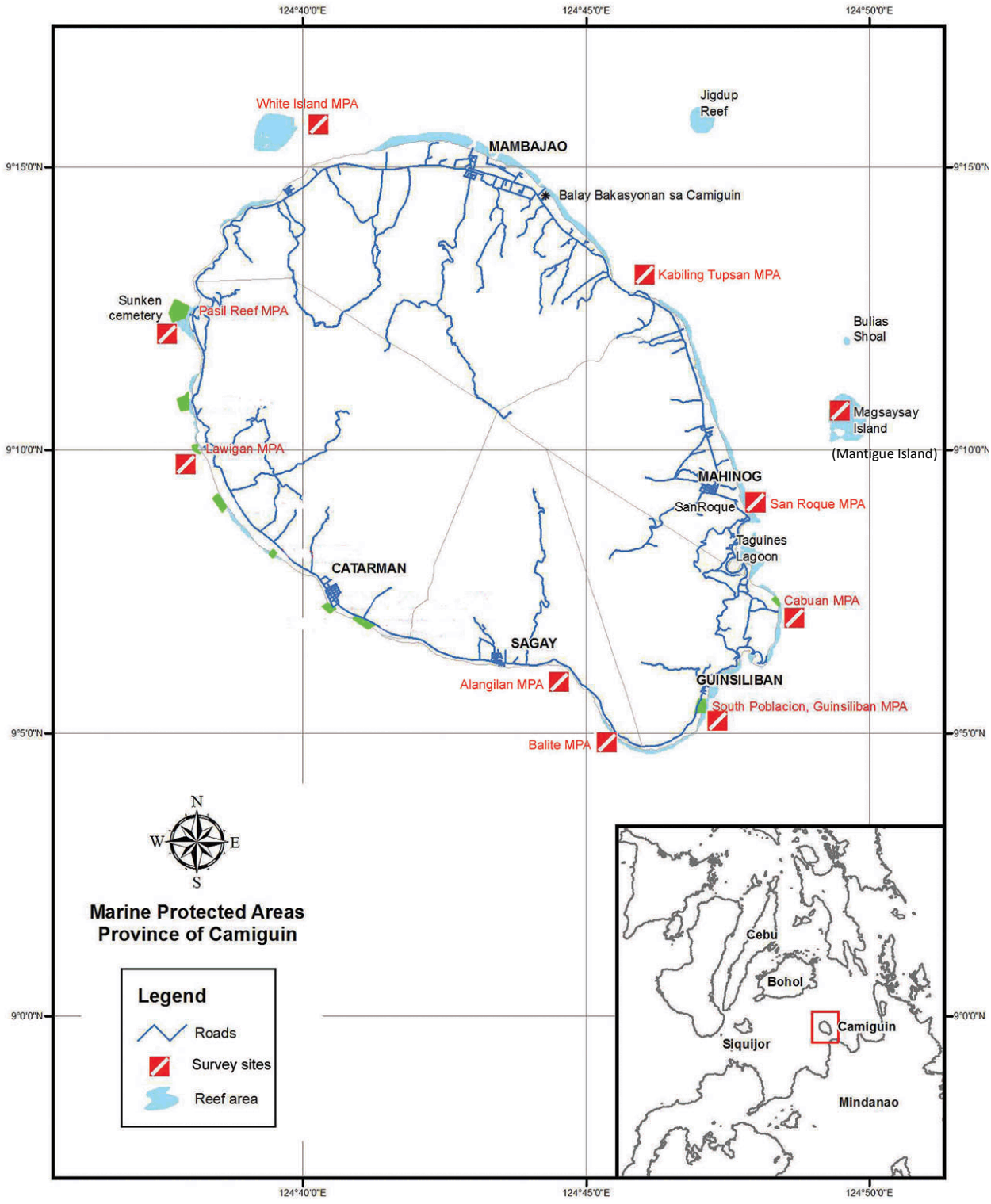

Figure 2. Survey sites in Camiguin Island, Philippines.

OVERVIEWS OF SITE SURVEYS

White Island Marine Sanctuary, Mambajao

Site Overview. The area surveyed was outside White Island MPA on the south side. The White Island Marine Park is approximately 19.7 hectares and was declared a protected area in 2000 by municipal ordinance. White Island is basically a sand bar and is a 5 to 10 minute boat ride from the adjacent main island. The first survey dive was on the south side of White Island (sand bar) with a wide 300 to 500 meter reef flat ending in a gradual slope to deeper waters. Only dives outside of the sanctuary were done for this particular site, mainly due to the very strong currents on the inside of the core zone during the survey. This marine protected area has a user fee as well as an environmental fee if boats dock on the sand bar and use the area for picnicking. Upon visiting the area it was observed that the marine sanctuary core zone was clearly demarcated by buoys and anchor buoys were available for boat mooring.

The southern part of the reef crest was at approximately 5 to 8 meters and drops off after that with a mostly live hard coral habitat. Fish are few and small with almost no observable target fish in the area. The herbivorous fish are also missing in the general area, which explains why algae growth is common on the reef.

The expedition team did a quick snorkel inside the sanctuary in the afternoon to determine the general topography of the inside reef. It was found that the reef inside the sanctuary is predominantly sandy with a patchy coral reef, unlike the site where the survey was done in the morning where the reef was more extensive and continuous. The north reef sanctuary is mostly flat with sand and some corals of up to about 20% live coral cover. There is more branching coral on the north side with more massive forms on the south.

On initial observation, the marine sanctuary may be located on the wrong side of the island because the currents are moving predominately to the south. Larvae and small fish move with the current and will tend to aggregate on the southern side of the island. Therefore recruitment would be higher on the southern side and thus a more appropriate location for the no-take zone

During the dive surveys there were fishers observed operating in the island reef, the southern side of the island, but not inside the sanctuary. Signs to announce a MPA and its rules and regulations were absent and the boatmen on the dive boats were unclear about the location of the sanctuary and its actual core zone. Based on the *Report on the Status of Coral Reefs, Coral Reef Fishes and Management Effectiveness of the Marine Protected Areas of the Province of Camiguin. July, 2014*, (or *2014 Status of Camiguin Coral Reefs Report*) White Island Marine Sanctuary rates at Level 4 on the MPA-MEAT (Marine Protected Area Management Effectiveness Assessment Tool), which describes MPA management to be *Effectively Institutionalized* for at least seven years. The Level 4 rating is not corroborated by observations of this survey given that the core area location and design is not appropriate and that signs are not present to indicate the management rules of the municipal ordinance.

Substrate. At a 7 to 8 meter depth live hard coral, outside of the designated marine sanctuary, is good based on Gomez, et. al. at 57.8% (Table 2). The shallower reef had poor coral cover and 70.9% of substrate cover in the shallow was made up mainly of coralline algae (Figure 3). Due to strong currents, only a quick ocular assessment of the reef inside the marine sanctuary located on the northern side of

the island was made. The rapid ocular assessment determined that the inside reef was patchy and not as diverse as the reef on the southern side of the island.

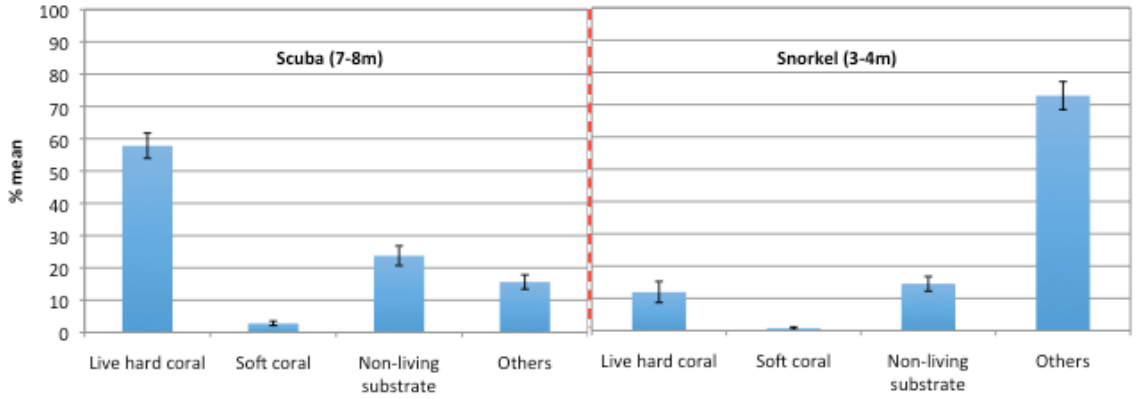

Figure 3. Substrate composition (%mean ±SE) outside White Island Marine Sanctuary, Mambajao in 2015.

Fish Diversity, Abundance, and Biomass. For target reef fish density, White Island rated at Very Poor with 120.8 fish/500m^2 (Table 3). Target fish were mainly made up of fusiliers and snappers, with a few parrotfish and surgeonfish. For all reef fish densities, the most dominant fish in White Island were the damselfishes. All reef fish density was recorded at 800 fish/500m^2, which is Moderate. Fish species richness was Very Poor for target fish at 4.3 species/500m^2 and Poor for all reef fish at 28.5 species/500m^2 (Figures 4 & 5).

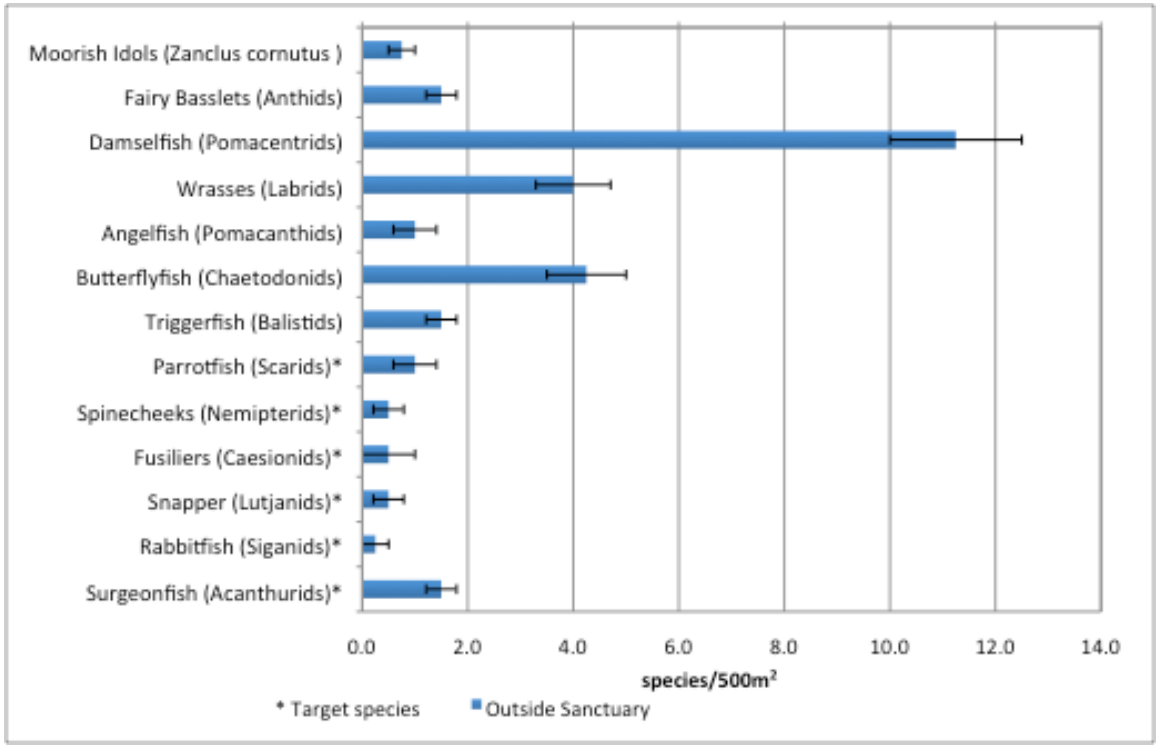

Figure 4. Fish species richness (species/500m^2) at White Island Marine Sanctuary, Mambajao in 2015.

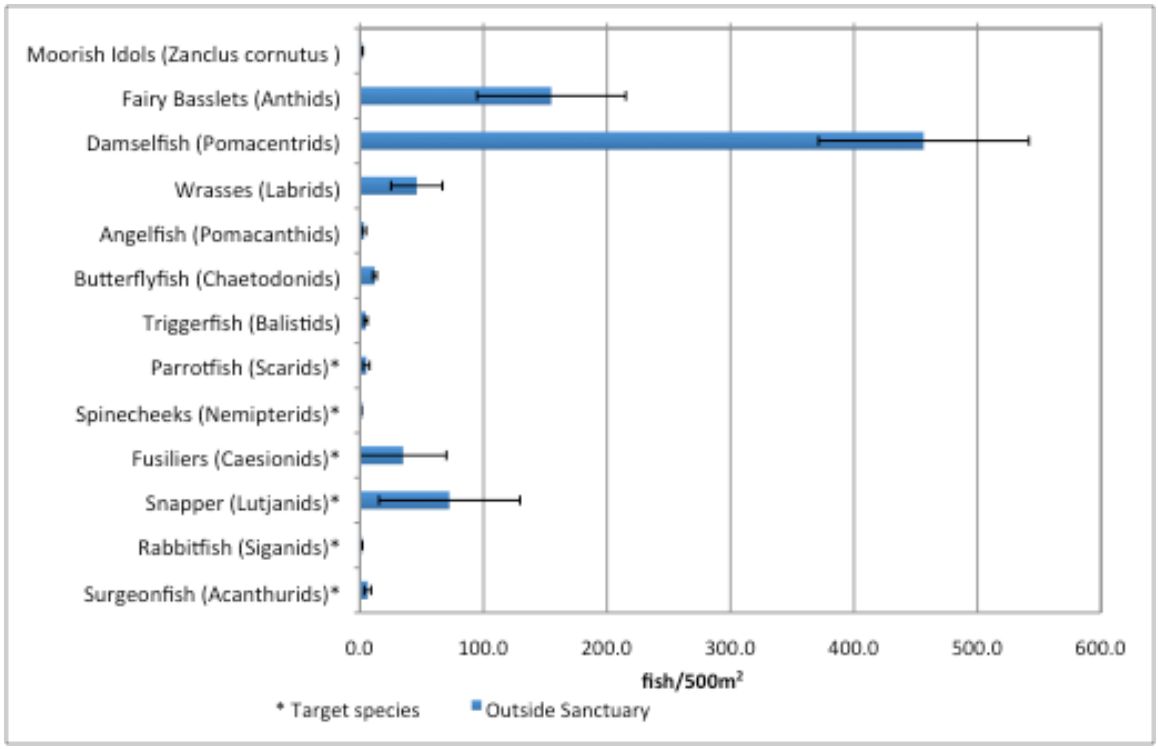

Figure 5. Fish density (fish/500m^2) at White Island Marine Sanctuary, Mambajao in 2015.

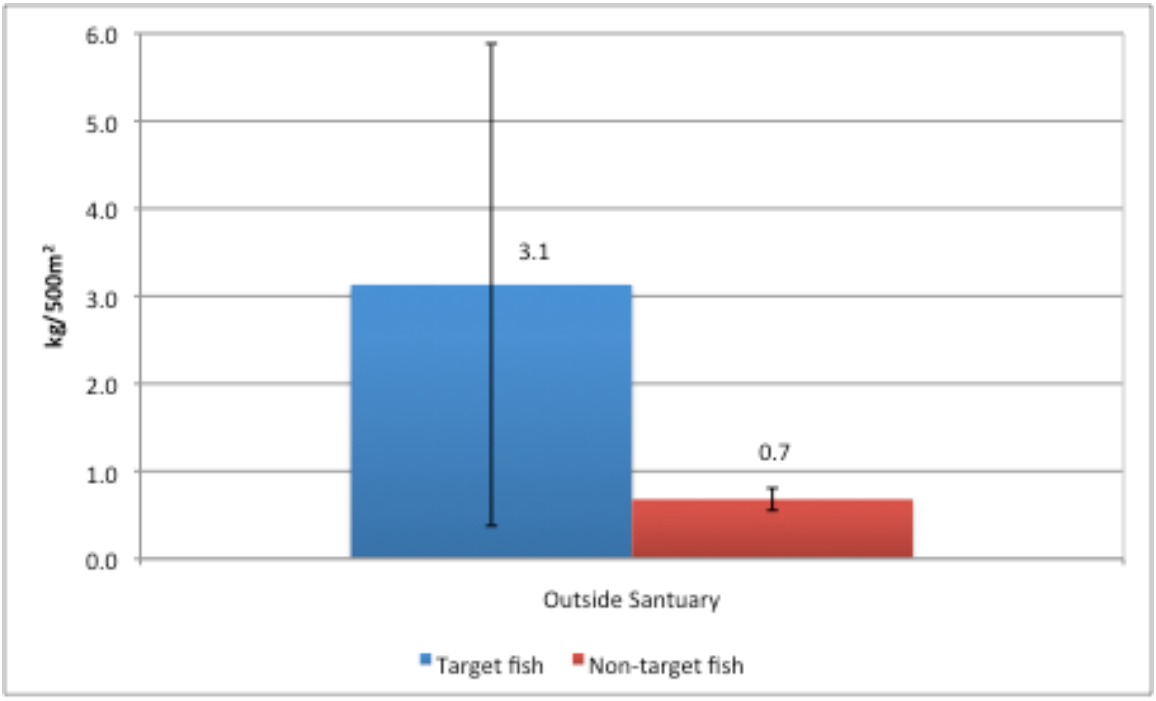

Figure 6. Total target and non-target fish biomass (kg/500m^2) at White Island Marine Sanctuary, Mambajao in 2015.

Target fish biomass was measured at 3.1 kg/500m^2 (Figure 6) outside of the sanctuary, which is rated at Very Poor based on the Hilomen categories (Hilomen, et. al., 2000). Biomass of non-target species was determined at 0.7 kg/500m^2, which is Very Poor. This is not surprising considering that the area is not the core zone and is outside the sanctuary.

Kabiling-Tupsan Marine Sanctuary, Mambajao

Site Overview. Kabiling-Tupsan Marine Sanctuary was established in 2005. It has a core zone of approximately 11 hectares. The general reef area is similar to others with a gradual slope with sand and coral heads. Fish were scarce at six meters depth but seemed more abundant at 13 meters and below, as noted by divers who swam deeper after the survey was completed.

Kabiling-Tupsan Sanctuary was not demarcated by visible marker buoys to show the MPA core zone. Further, the barangay officials were not vigilant. During our visit, neither *Bantay Dagat* nor community members approached the boat to determine why we were diving there. During the survey visit it was unclear if the area was really enforced or not. Based on the *2014 Status of Camiguin Coral Reefs Report*, Kabiling Tupsan Marine Sanctuary rates at Level 2 on the MPA-MEAT, which describes MPA management to be effectively strengthened.

Substrate. Live hard coral at Kabiling-Tupsan Marine Sanctuary, at 7-8 meters depth, was 51.1% (Figure 7), which is Good based on the Gomez rating table. Outside the sanctuary, live hard coral was Poor at 10.6% (Table 4). Both the inside and outside of the reef had a fair share of non-living substrate

consisting mainly of sand and rubble. The site has potential to improve in coral cover if the area can be better protected through marker buoys and regular patrolling.

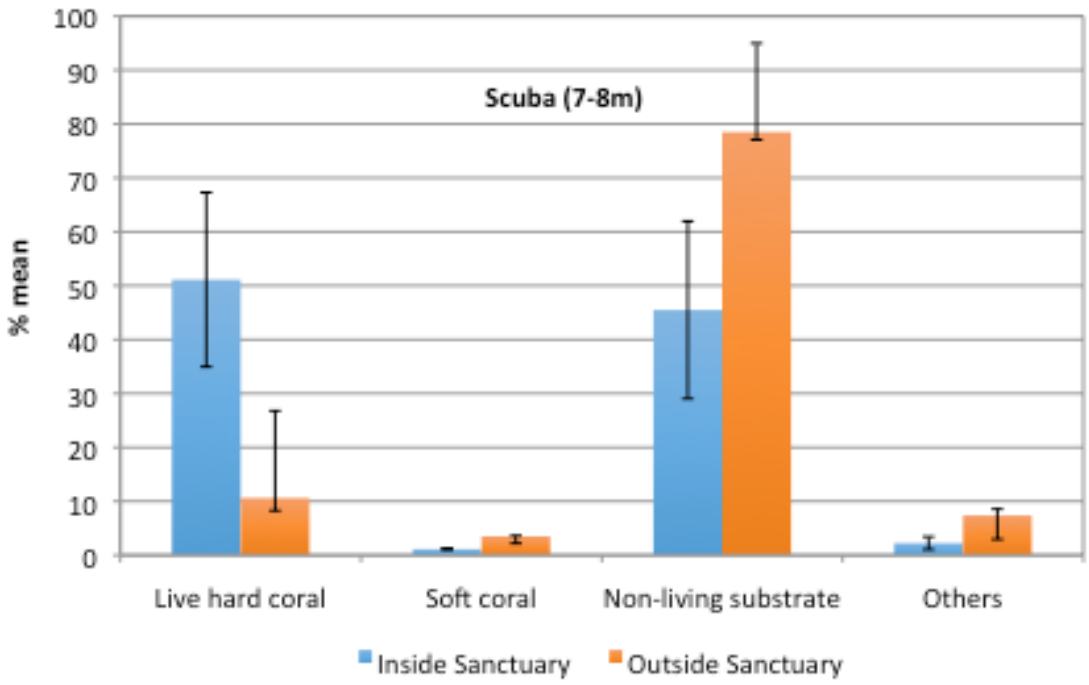

Figure 7. Substrate composition (%mean ±SE) at Kabiling-Tupsan Marine Sanctuary, Mambajao in 2015.

Fish Diversity, Abundance, and Biomass. Kabiling-Tupsan showed a Moderate rating in all reef fish density with 1,146.3 fish/500m^2 (Table 5), but it must be noted that this is composed mainly of damselfishes. As for target fish density, it was Poor at 34.3 fish/500m^2. Main target fish in the area were parrotfish, surgeonfish, and goatfish. Species richness was Very Poor at 10.3 target species/500m^2 and 35 species/500m^2 (Figures 8 & 9).

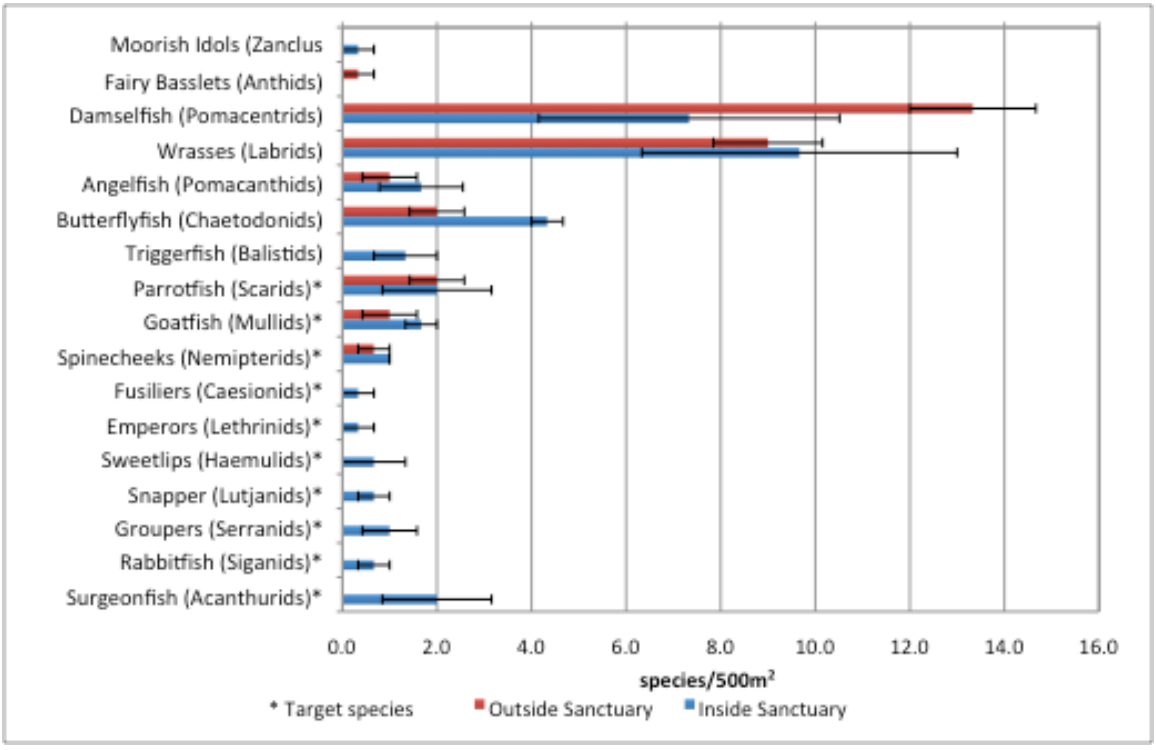

Figure 8. Fish species richness (species/500m^2) at Kabiling-Tupsan Marine Sanctuary, Mambajao in 2015.

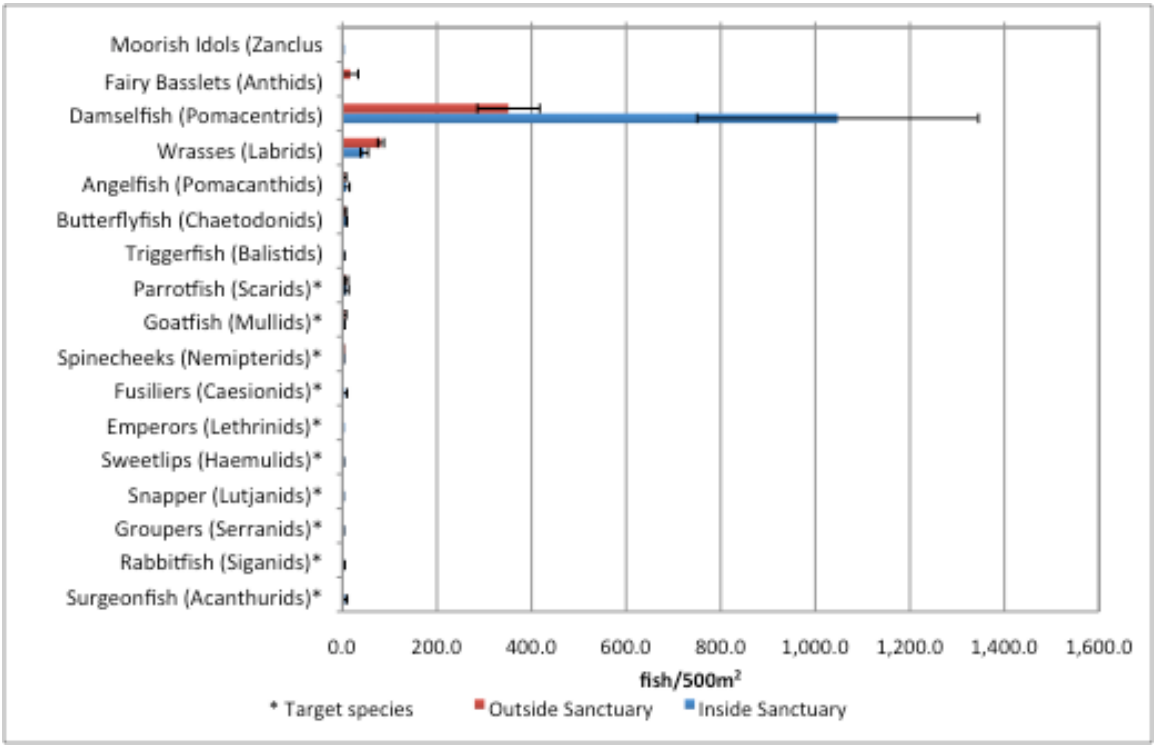

Figure 9. Fish density (fish/500m^2) at Kabiling-Tupsan Marine Sanctuary, Mambajao in 2015.

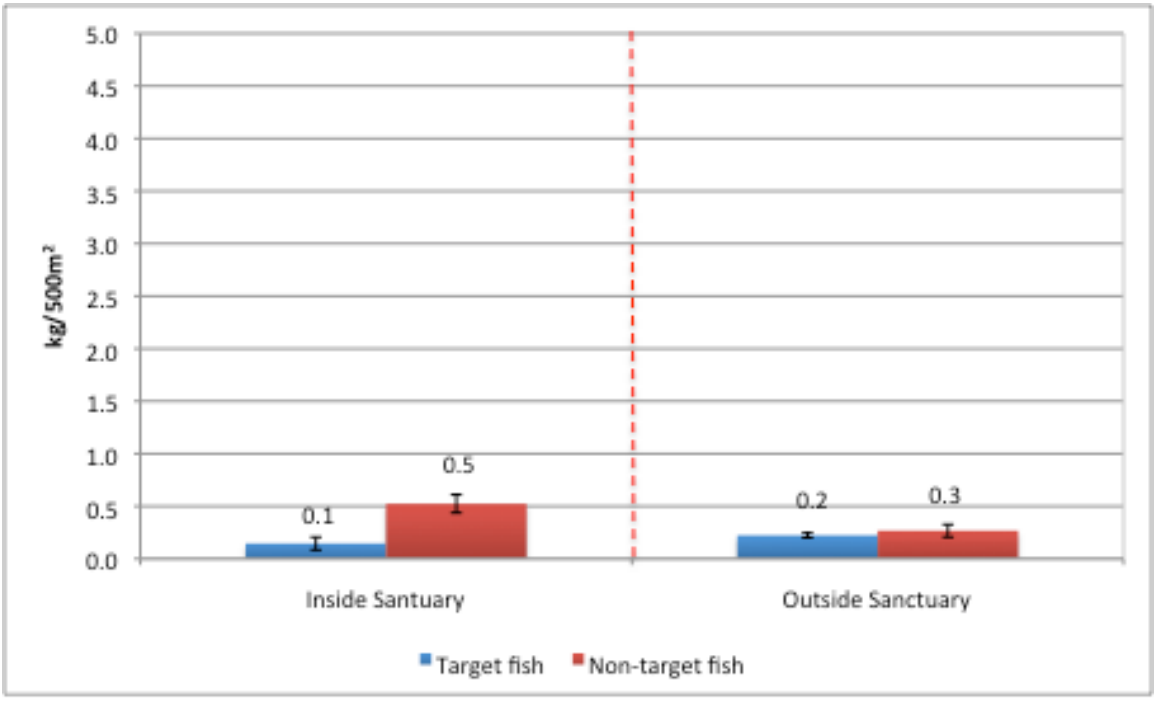

Figure 10. Total target and non-target fish biomass (kg/500m^2) at Kabiling-Tupsan Marine Sanctuary, Mambajao in 2015.

Target fish biomass 0.1 kg/500m^2 (Figure 10) and non-target fish biomass 0.5 kg/500m^2 inside the Kabiling-Tupsan Marine Sanctuary is Very Poor based on the Hilomen categories for biomass rating (Hilomen, et.al. 2000). This may be due to the lack of enforcement of the MPA.

Lawigan Marine Sanctuary, Catarman

Site Overview. Lawigan Marine Sanctuary was established in 2011 and is approximately 4.9 hectares in size. It has a very narrow coral reef community growing on lava rock/boulders close to shore with a drop-off that goes down to 18 meters. It is populated with a variety of soft and hard corals and is surrounded by many species of small fish. Visibility was about 9 meters given that there are underwater cold springs in the area and some land based nutrient/sediment input.

The area has markers and is protected and patrolled by the privately owned resort located directly in front of the MPA. The facilities in the resort area include a small forest on a rocky shoreline. The resort owners are active in providing patrolling operations at the Lawigan Marine Sanctuary with paid guards and through supporting local community activities that involve marine conservation. Based on the *2014 Status of Camiguin Coral Reefs Report*, Lawigan Marine Sanctuary rates at Level 1 on the MPA-MEAT, which describes the MPA as established.

Substrate. Hard coral cover was Fair at Lawigan Marine Sanctuary 43% (Table 6) inside the sanctuary (7-8 m depth) and 31.5% outside the sanctuary. There was also a lot of soft coral inside and outside the marine sanctuary at 32.8% and 14.4%, respectively (Figure 11).

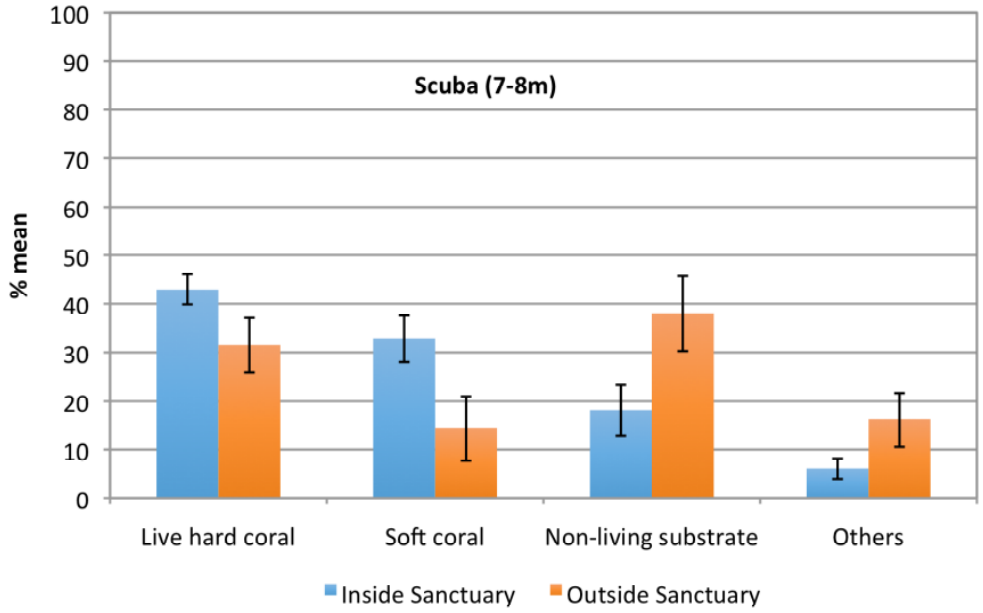

Figure 11. Substrate composition (%mean ±SE) at Lawigan Marine Sanctuary, Catarman in 2015.

Fish Diversity, Abundance, and Biomass. Between the inside and the outside of the Lawigan Marine Sanctuary, there were notably more fish inside than outside. Fish density inside the sanctuary rated at Moderate with 1,186 fish/500m^2 (Table 7) for all reef species, although these were mainly made up of damselfish and wrasses. Target fish density was Very Poor at 65 fish/500m^2 and was made up mainly of parrotfish and surgeonfish. Species richness inside the sanctuary was Very Poor for target fish species at 8 species/500m^2 and Very Poor for all reef species at 39 species/500m^2 (Figures 12 & 13).

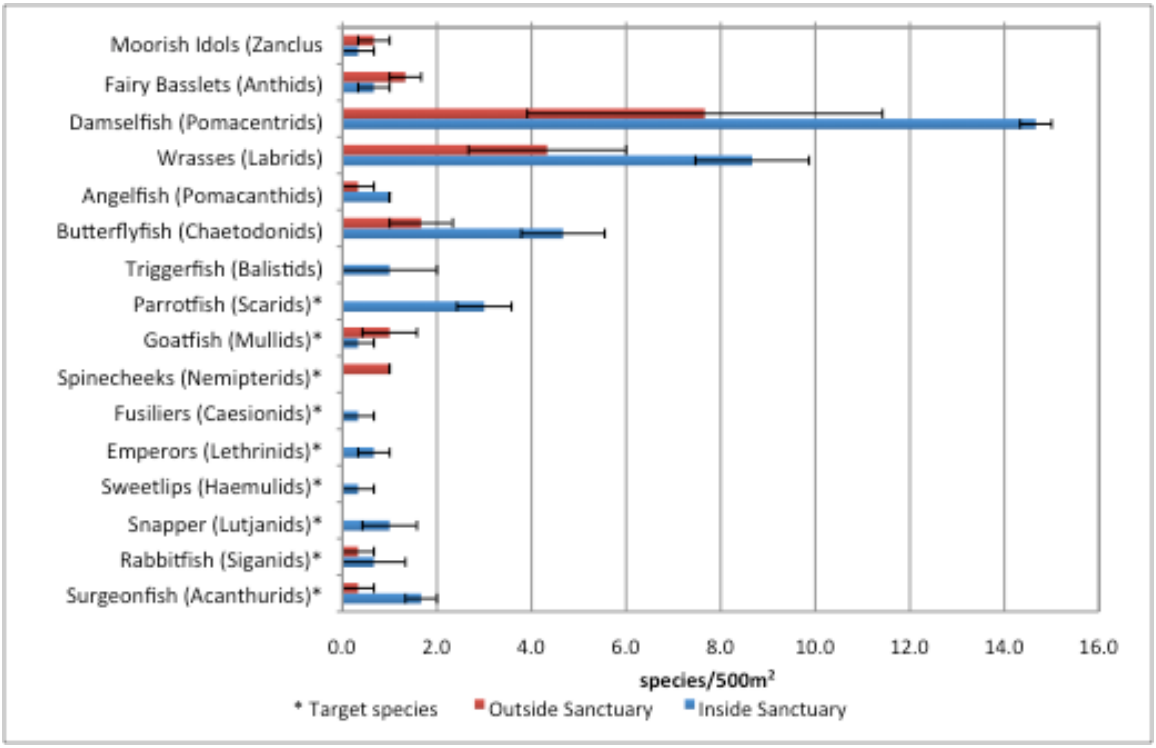

Figure 12. Fish species richness (species/500m^2) at Lawigan Marine Sanctuary, Catarman in 2015.

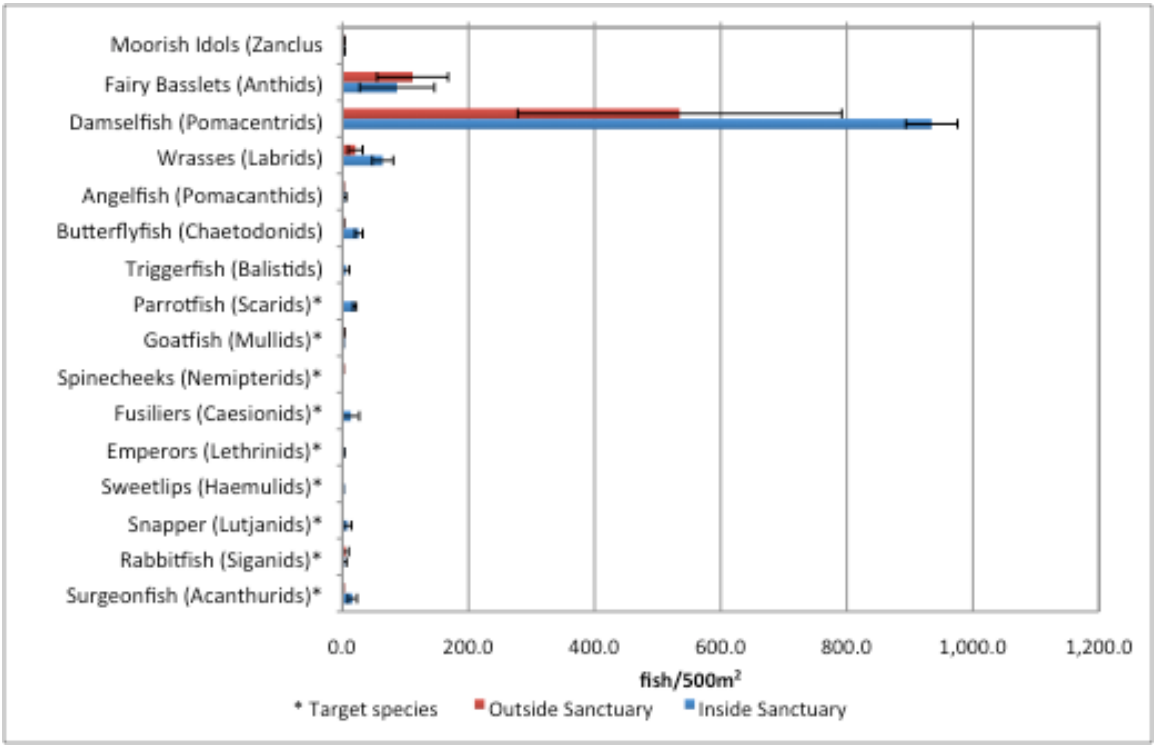

Figure 13. Fish density (fish/500m^2) at Lawigan Marine Sanctuary, Catarman in 2015.

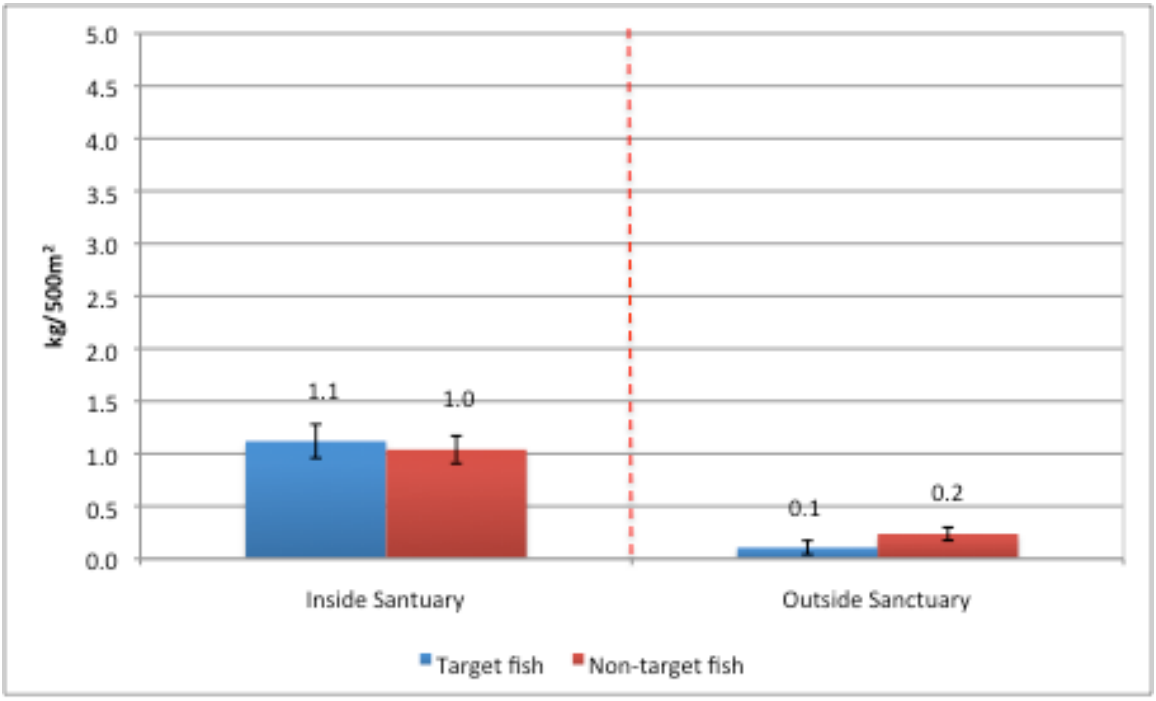

Figure 14. Total target and non-target fish biomass (kg/500m^2) at Lawigan Marine Sanctuary, Catarman in 2015.

Lawigan Marine Sanctuary contained a fish biomass of 1.1 kg/500m^2 (Figure 14) for target fish and 1 kg/500m^2 for non-target fish inside the core zone. Although these figures indicate a Very Poor biomass based on the Hilomen categories, one can see the big difference between the inside and the outside of the sanctuary where target fish biomass is 0.1 kg/500m^2 and non-target fish biomass was only 0.2 kg/500m^2. This shows that there is enforcement ongoing and that due to the size and age of the sanctuary, figures may be low. However, with continued strict enforcement possible improvements can be anticipated.

Pasil Sunken Cemetery Marine Sanctuary, Catarman

Site Overview. The Pasil Sunken Cemetery Marine Sanctuary is a tourist spot that commemorates the 1871 eruption of Mount Vulcan Daan, which is now an inactive volcano. During the eruption the cemetery was submerged and is now a popular tourist destination. The local government has increased popularity of the spot by installing a large cross in the water that marks the location of the old cemetery.

Declared a marine sanctuary in 2004, the protected core zone reaches 27.2 hectares. The area boasts an active *Bantay Dagat* group that diligently monitors and controls tourist and diver activities at the site. Pasil Sanctuary or the Sunken Cemetery is a large wide reef flat about 500m out to deeper water with a consistent cover of hard coral across the reef flat. There was new growth of branching Acropora and foliose corals observed.

The marker buoys were two parallel strings to the offshore to mark the boundaries. During the survey day the *Bantay Dagat* was present to show the researchers the site for the survey. Initial observation was that coral cover was high and fish were abundant in numbers, especially of small fish with a few groupers, snappers, and goatfishes. There are also some fresh underwater springs within the sanctuary area. Based on the *2014 Status of Camiguin Coral Reefs Report*, Pasil Sunken Cemetery Marine Sanctuary rates at Level 3 on the MPA-MEAT, which describes MPA management to be effectively sustained for at least five years. The 2015 survey observations corroborate this level of protection.

Substrate. Live hard coral inside and outside the Pasil Sunken Cemetery Marine Sanctuary was Good at 68.9% cover (inside) and 70.3% (outside), at 7-8 meters depth, which shows that there is enforcement effectively being done in the area (Table 8). The core zone is well delineated and the *Bantay Dagat* is very active as well, especially since it is a busy tourist spot. In the shallow reef the live hard coral is Fair at 45.5% together with a dominance of rock and block at 40.7% (Figure 15).

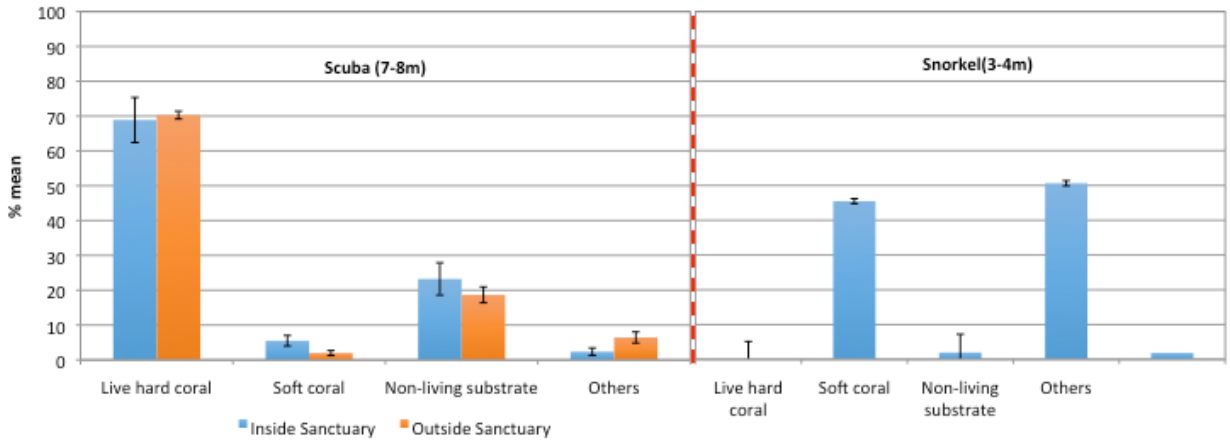

Figure 15. Substrate composition (%mean ±SE) at Pasil Sunken Cemetery Marine Sanctuary, Catarman in 2015.

Fish Diversity, Abundance, and Biomass. Fish density at Pasil Marine Sanctuary was notably higher inside the sanctuary than outside of the sanctuary. Fish density of target fish species inside the marine sanctuary was 64.3 fish/500m^2 and for all reef fish at 870.7 fish/500m^2 (Table 9). Fish species richness, inside the sanctuary, for target fish, was Very Poor at 7.7 species/500m^2 and Poor for all reef fish species at 32.7 species/500m^2. For all reef fishes, the predominant fish were damselfish, wrasses, and butterflyfish. For target fish there were parrotfish and surgeonfish (Figures 16 & 17).

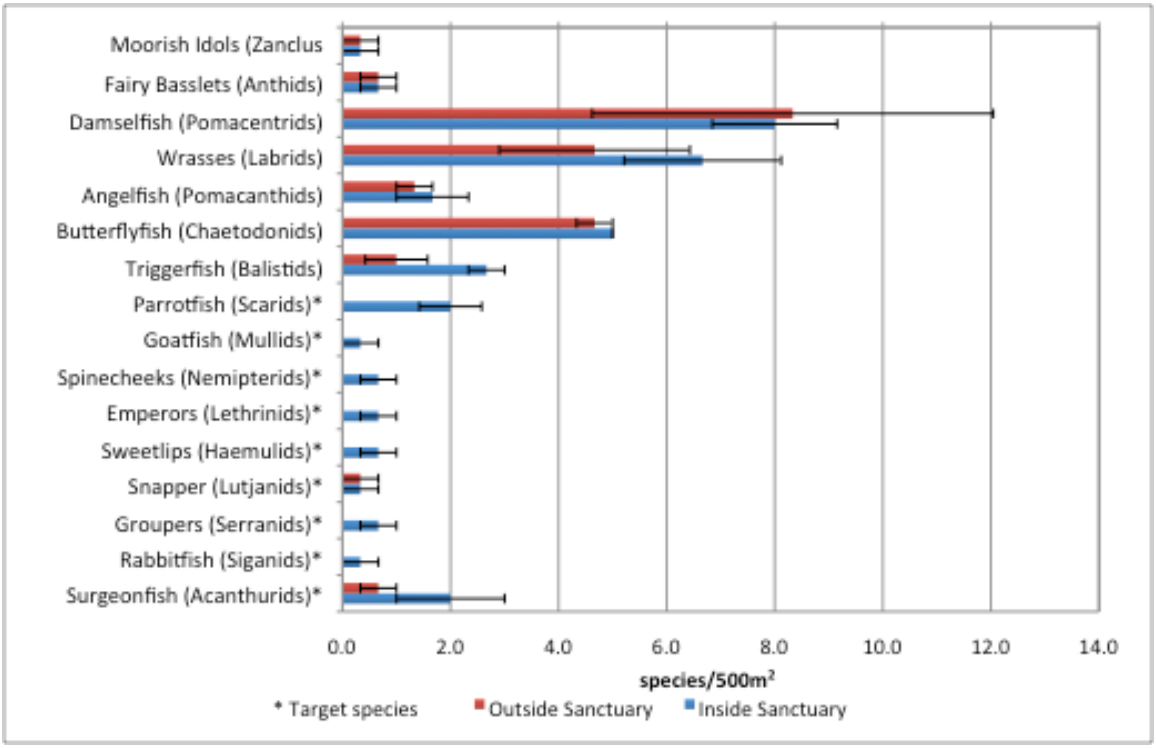

Figure 16. Fish species richness (species/500m^2) at Pasil Marine Sanctuary, Catarman in 2015.

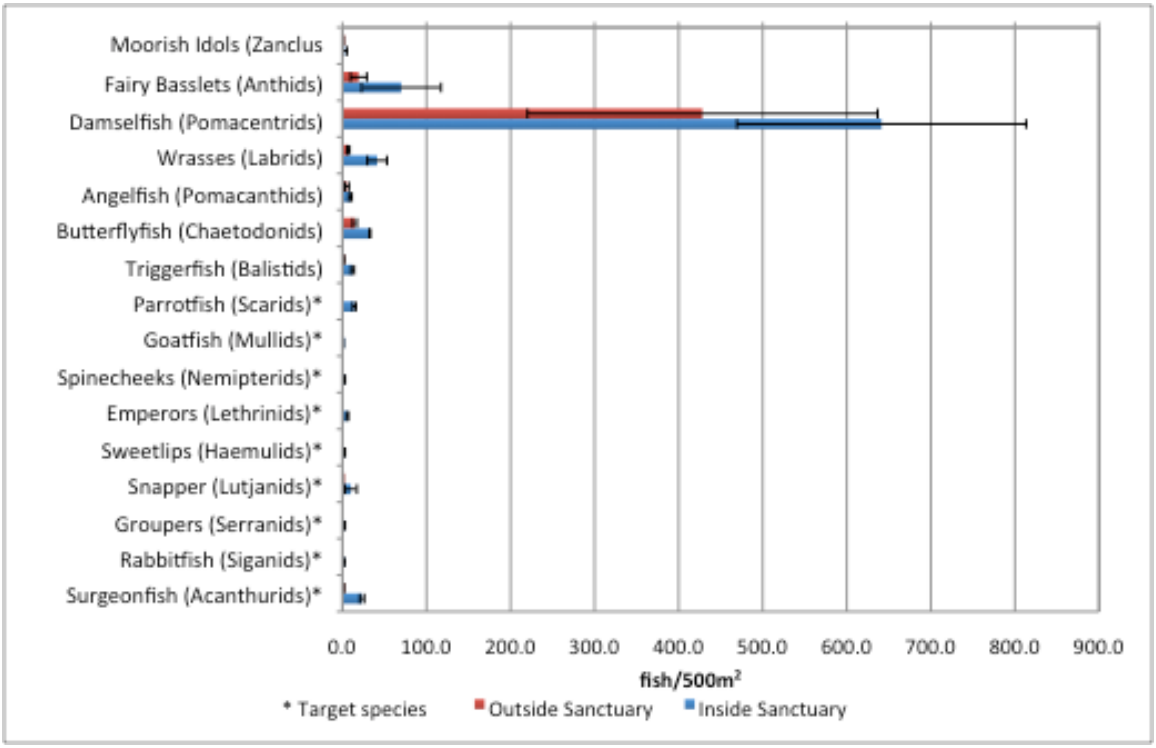

Figure 17. Fish density (fish/500m^2) at Pasil Marine Sanctuary, Catarman in 2015.

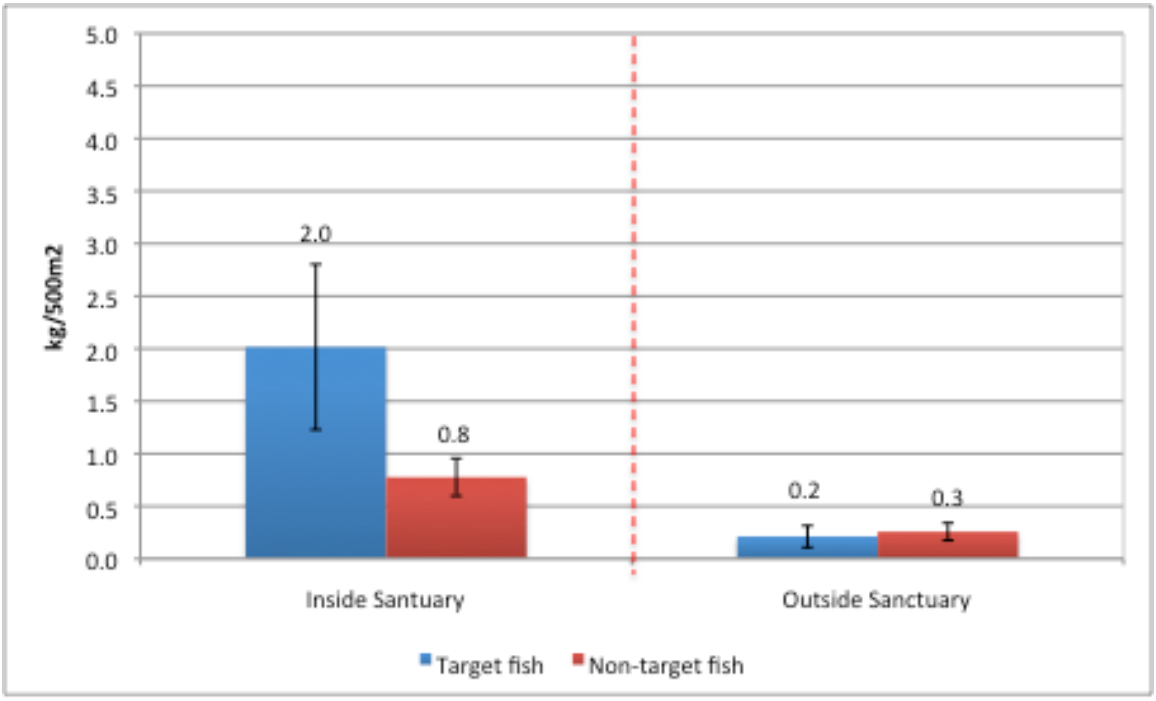

Figure 18. Total target and non-target fish biomass (kg/500m^2) at Pasil Sunken Cemetery Marine Sanctuary, Catarman in 2015.

Target fish biomass inside the sanctuary was recorded at 2.0 kg/500m^2 (Figure 18), which is Very Poor according to the Hilomen categories. Non-target fish biomass (0.8 kg/500m^2) was Very Poor. However, due to strict enforcement of the area, there is a clear difference between the inside sanctuary fish biomass and outside sanctuary biomass, which record very low at 0.2 kg/500m^2 (target fish) and 0.3 kg/500m^2 (non-target fish). Given time and continued strict enforcement, improvements in biomass can be expected in the following years.

Alangilan Marine Sanctuary, Sagay

Site Overview. The Alangilan Marine Sanctuary was established in 2010 by municipal ordinance. It is a small 5-hectare marine protected area. It was observed that there are no marker buoys demarcating the boundaries of the sanctuary core zone. Upon arriving at the site it was discovered that the adjacent community was not informed by their municipal agricultural officer about the survey. However, upon the arrival of the researchers in the dive boat, the local police came to the scene, by land, to find out what the research activity inside the sanctuary was and we had permission to enter. This shows that there is knowledge by the residents that the sanctuary is there, but the MPA is not properly enforced yet by the *Bantay Dagat*, nor does it have the proper infrastructure to support enforcement activities (e.g. marker buoys, guardhouse, anchor buoys, etc.).

Adjacent to a rocky shoreline, Alangilan Marine Sanctuary had poor visibility (especially at 5 to 8 meters depth) because it is a relatively silty area. The sandy bottom was covered with silt that easily gets stirred up. The coral colonies are about 100 meters offshore starting at about 6 meters depth on a relative flat

reef flat that slopes very gradually outwards. The site was dominated with soft corals, a few hard corals, and many small fish of damsel and wrasse fish families. Historically, this area experiences very rough sea conditions during the *Habagat* season, therefore ideal months to dive and snorkel here are during the summer months of March to June. Based on the *2014 Status of Camiguin Coral Reefs Report*, Alangilan Marine Sanctuary rates at Level 2 on the MPA-MEAT, which describes MPA management to be effectively strengthened. The MPA-MEAT level 2 is only barely being achieved based on the observations during the 2015 survey.

Substrate. At 7 to 8 meters depth, the Alangilan Marine Sanctuary has a hard coral cover of 32% (Fair) inside the sanctuary and Poor live hard coral cover outside the sanctuary at 1.3% (Figure 19). In the shallows, at 3 to 4 meters, the reef is mostly made up of rock and block and sand, with live hard coral cover of 2.3% (Table 10). This area is not well protected. There are no marker buoys delineating the core zone, neither are there anchor buoys for boats to moor to when they visit the area. Further, the waters during the survey were quite silty giving bad visibility to the divers.

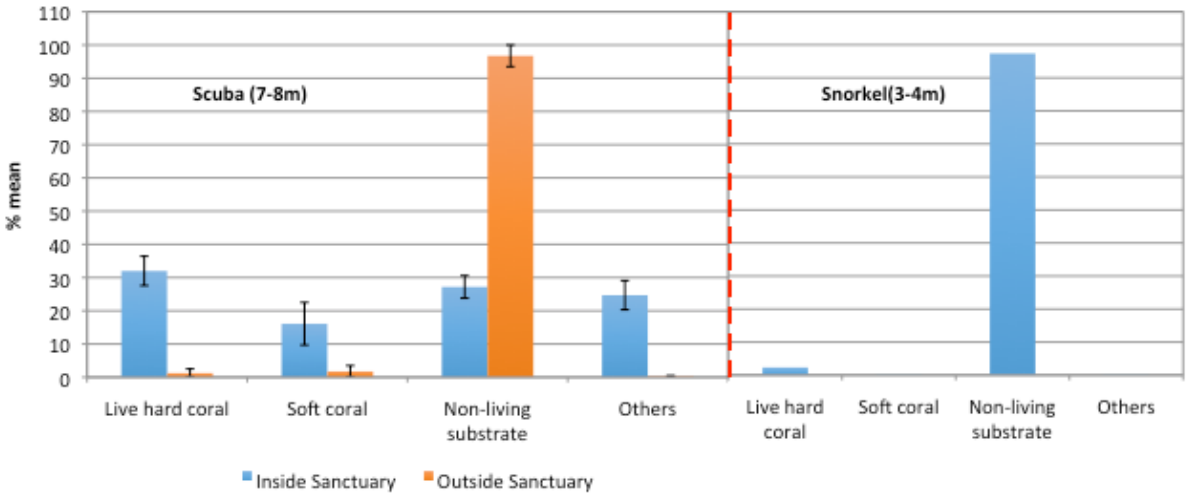

Figure 19. Substrate composition (%mean ±SE) at Alangilan Marine Sanctuary, Sagay in 2015.

Fish Diversity, Abundance, and Biomass. At Alangilan Marine Sanctuary, fish density and species diversity were very low for both inside and outside the sanctuary. Target fish density was Very Poor at 25.3 fish/500m^2 and Poor for all reef fish density at 486.7 fish/500m^2 (Table 11). Species richness was also Very Poor for target fish at 4.7 species/500m^2 and Poor for all reef fish at 27 species/500m^2 (Figure 20 & 21). Fishes inside the sanctuary were predominantly damselfish and wrasses. Target fish present were mainly parrotfish and goatfish.

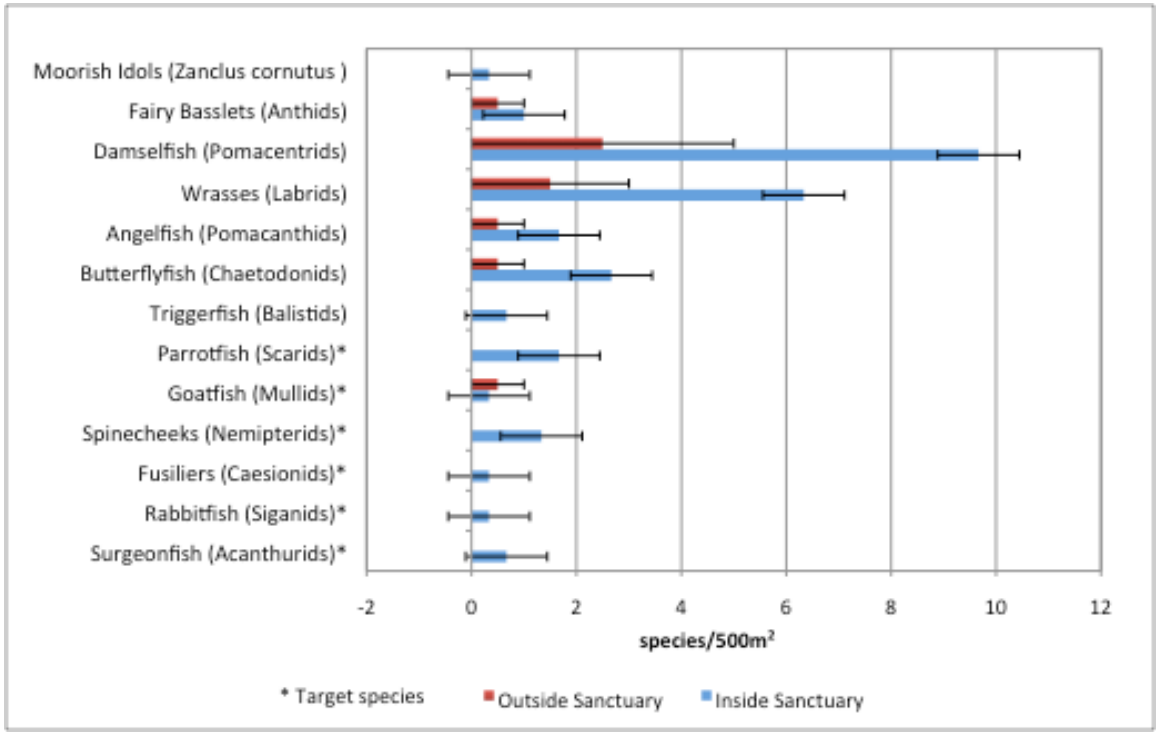

Figure 20. Fish species richness (species/500m^2) at Alangilan Marine Sanctuary, Sagay in 2015.

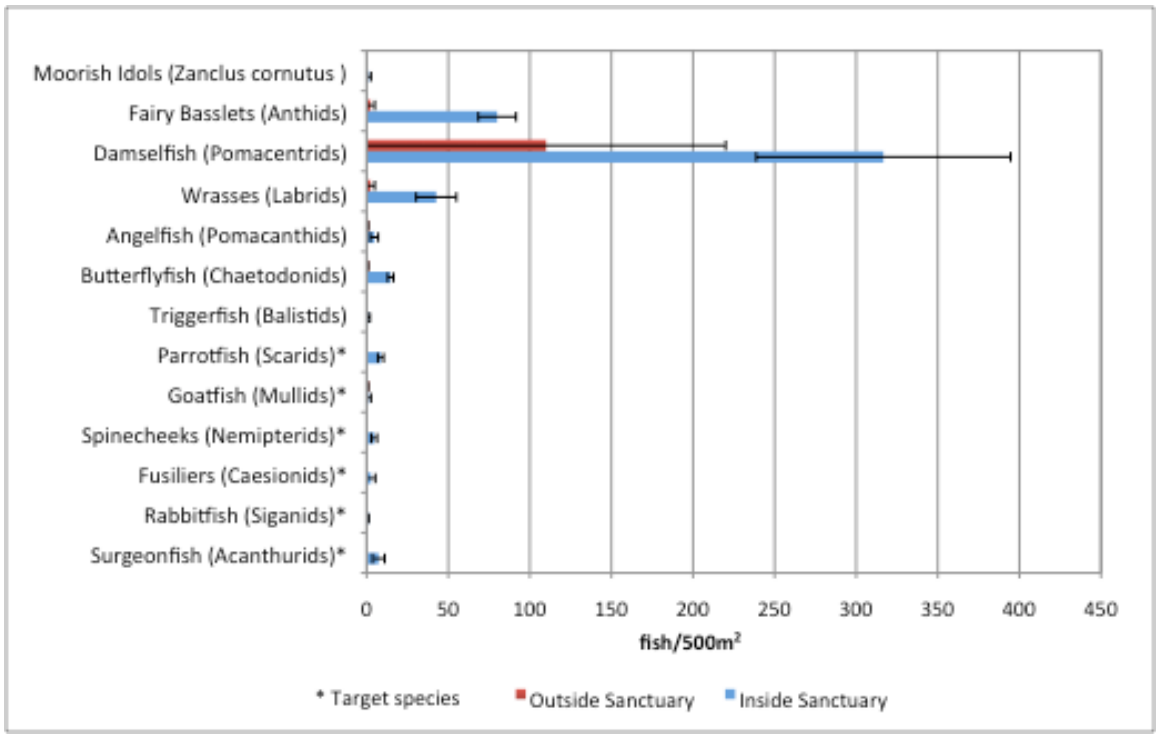

Figure 21. Fish density (density/500m^2) at Alangilan Marine Sanctuary, Sagay in 2015.

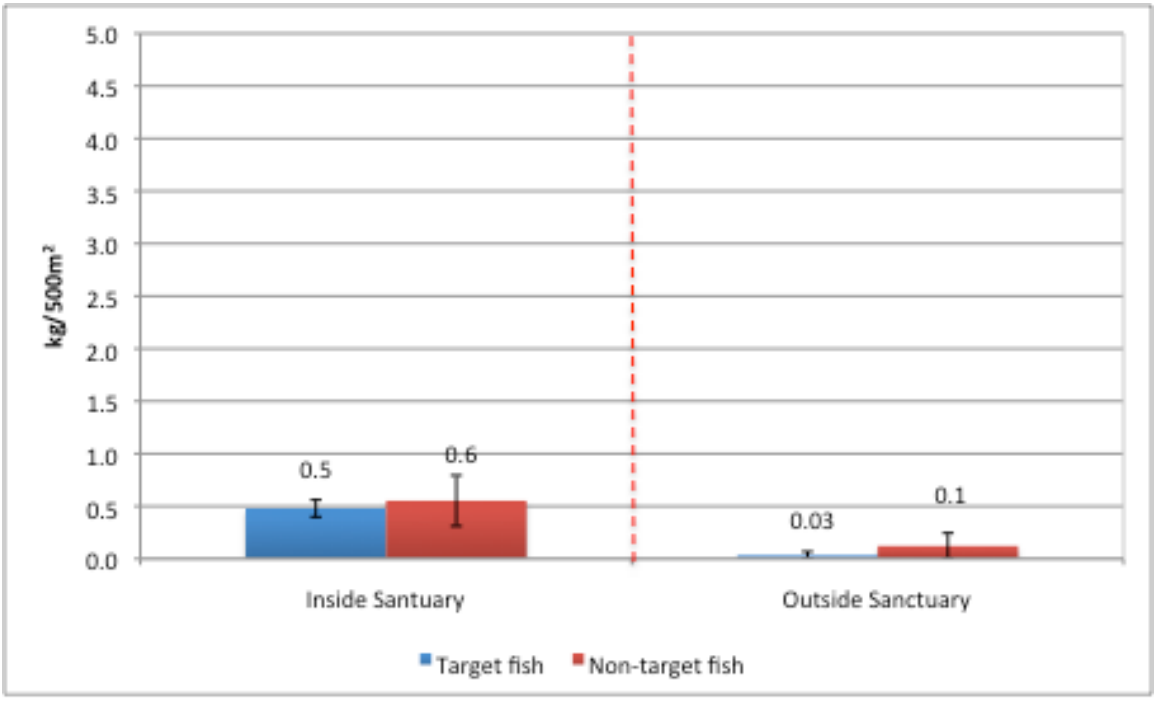

Figure 22. Total target and non-target fish biomass (kg/500m^2) at Alangilan Marine Sanctuary, Sagay in 2015.

Biomass was recorded at 0.5 kg/500m^2 (Figure 22) for target fish species and 0.6 kg/500m^2 for non-target fish species inside the marine sanctuary, which are both Very Poor based on the Hilomen categories. This may be due to the lack of enforcement of the marine protected area in terms of patrolling and no visibility of MPA boundaries via installed marker buoys.

Balite Marine Sanctuary, Sagay

Site Overview. Balite Marine Sanctuary is a 5-hectare marine protected area that was established through municipal ordinance in 2008. Located directly in front of a fishing village, this area is well protected. Marker buoys demarcate the boundaries of the MPA core zone and there are anchor buoys installed for visiting dive boats and tourist boats to moor to.

Balite reef is an impressive area with good hard coral cover, at first impression, in both the shallow and deep reefs. Common fish in the site are damsel and wrasse species with a few butterfly fish. Water visibility was approximately 15 meters and it appeared that the reef area was periodically flushed by currents, mainly because not much silt/sediment was present. Initial observations garnered that the shallow reef had an impressive coral cover composed mainly of massive and branching coral species. According to community members, large marine life, such as whale sharks and devil rays, cross the Bohol Sea to the area during summer where they are spotted by residents. Based on the *2014 Status of Camiguin Coral Reefs Report*, Balite Marine Sanctuary rates at Level 2 on the MPA-MEAT, which describes MPA management to be effectively strengthened and is corroborated by observations from the 2015 survey team.

Substrate. At both inside and outside the Balite Marine Sanctuary, at 7 to 8 meters depth, live hard coral cover was Good at 72.3% (Figure 23) inside the sanctuary and 68.1 outside the sanctuary. The area is well protected with patrolling and clearly marked core zone. There are also anchor buoys installed for guests that visit the area. In the shallow reef, live hard coral cover was also Good at 60.6% (Table 12).

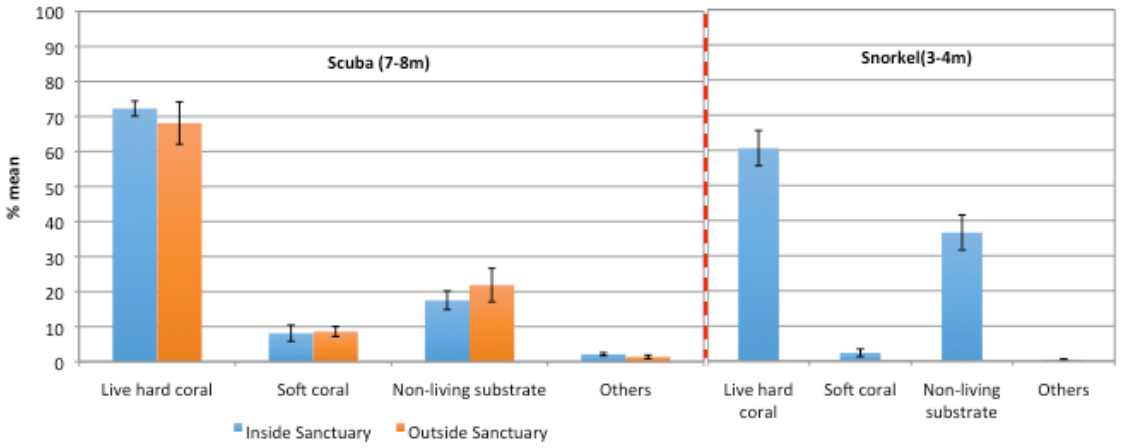

Figure 23. Substrate composition (%mean ±SE) at Balite Marine Sanctuary, Sagay in 2015.

Fish Diversity, Abundance, and Biomass. Balite Marine Sanctuary had low fish density and species diversity inside and outside of the protected area. The fish observed in the area were mainly damselfish, wrasses, and butterflyfish. Target species present were snappers and surgeonfish. Inside the sanctuary, target fish density was Very Poor at 30.3 fish/500m^2 and Moderate for all reef fish density at 878.7 fish/500m^2 (Table 13). Fish species richness in the area was generally low wherein, inside the sanctuary, it was 4.7 species/500m^2 for target fish and 21 species/500m^2 for all reef fish (Figure 24 & 25).

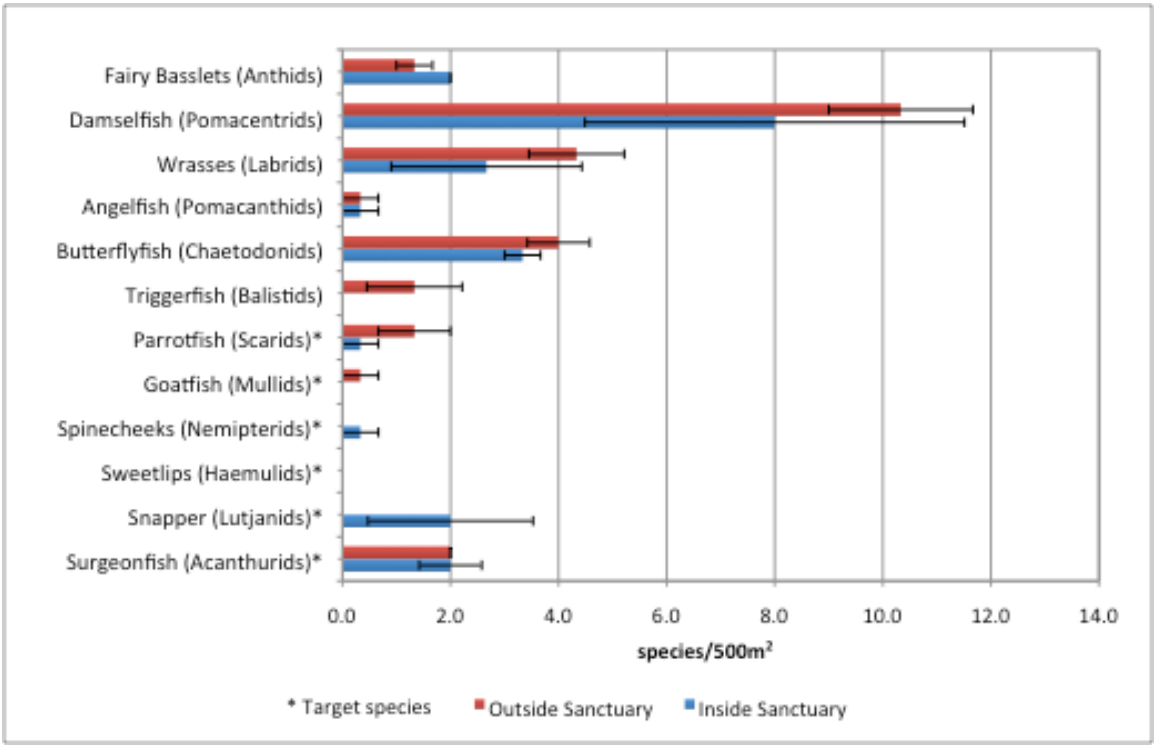

Figure 24. Fish species richness (species/500m^2) at Balite Marine Sanctuary, Sagay in 2015.

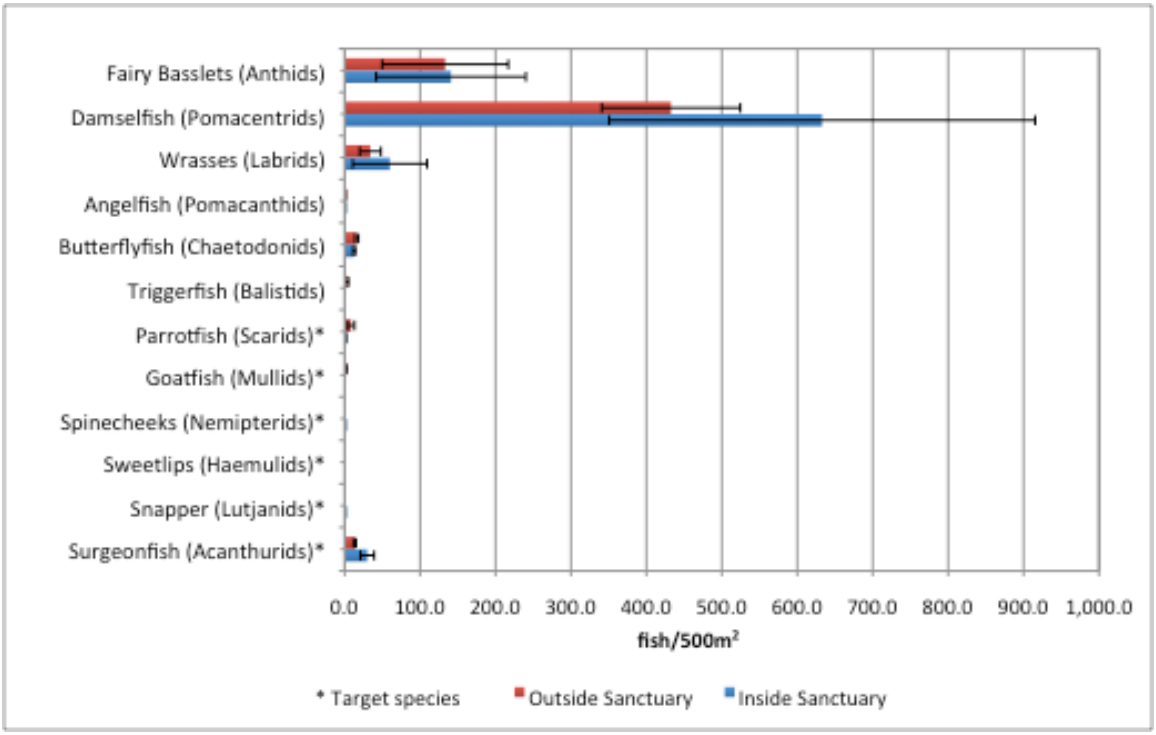

Figure 25. Fish density (fish/500m^2) at Balite Marine Sanctuary, Sagay in 2015.

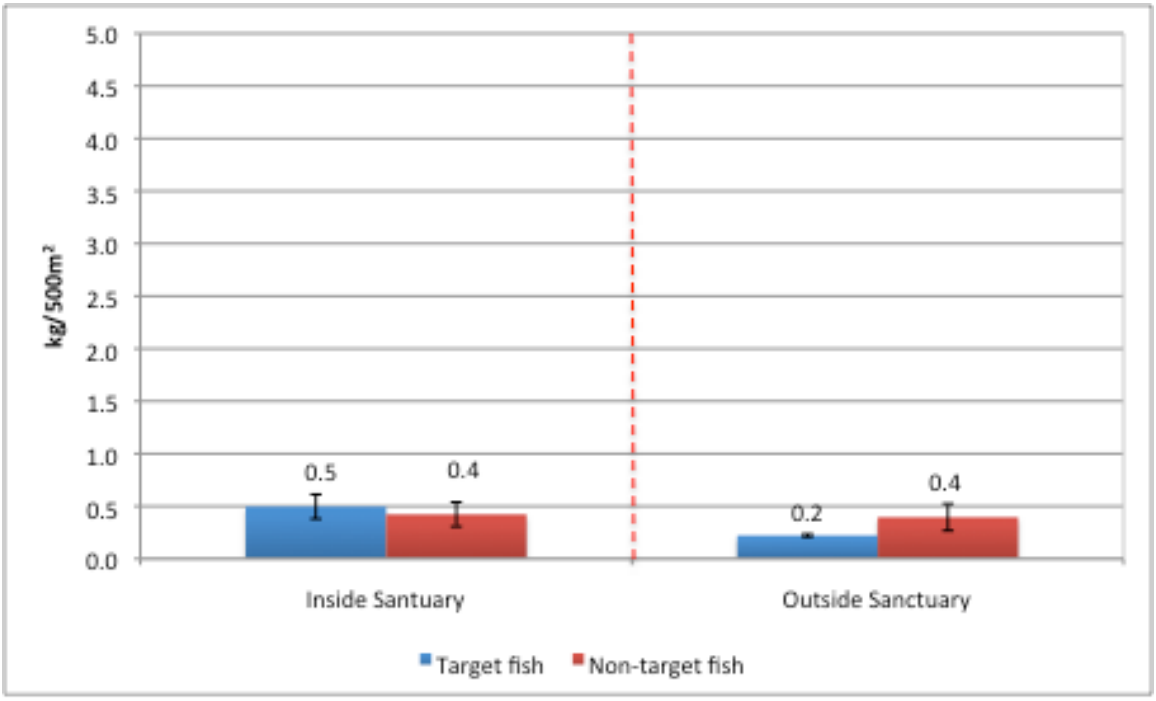

Figure 26. Total target and non-target fish biomass (kg/500m^2) at Balite Marine Sanctuary, Sagay in 2015.

Despite the visible boundaries marked by marker buoys in the marine protected area and its high live hard coral cover, target fish biomass (0.5 kg/500m^2) and non-target fish biomass (0.4 kg/500m^2) were still Very Poor in Balite Marine Sanctuary (Figure 26). It may be possible that there is fishing occurring inside the sanctuary.

Cabuan Marine Sanctuary, Guinsiliban

Site Overview. Established by municipal ordinance in 2006, the Cabuan Marine Sanctuary is only 5 hectares in size. This MPA is one of the first marine sanctuaries on the island. However, only one corner marker buoy marks the edge of the marine protected area and there are no anchor buoys in place. Based on interactions with the community they say that they regularly install marker buoys, but being at a tip of the island, the strong currents often sweep the buoys away.

Fronting a small community dive operation supported by a local NGO, Sang Kalikasan, the Cabuan Marine Sanctuary is a potential dive and snorkel tourist site in Guinsiliban. The community-owned dive shop rents out snorkel and dive gear to visitors and provides guides for their marine sanctuary. The people in the adjacent community are friendly and keenly aware of the need to protect their reef area to support their tourism activities. Further, the community also has a growing coco sugar manufacturing livelihood project that helps support local income.

The coral reef is a gradual slope with sand and coral heads with good visibility down to 20 meters. During the survey the divers experienced a slight current. The reef is about 100 meters wide before

descending to about 20 meters. The survey site was a pleasant place to visit with friendly hosts and a moderately nice reef area to dive in. Based on the *2014 Status of Camiguin Coral Reefs Report*, Cabuan Marine Sanctuary rates at Level 2 on the MPA-MEAT which describes MPA management to be effectively strengthened and is corroborated by the 2015 survey team.

Substrate. The Cabuan Marine Sanctuary had Poor live hard coral inside and outside of the sanctuary at 18.3% and 10.1%, respectively, at 7 to 8 meters depth (Table 14). The deeper reef was made up mainly of sand and rubble. Located at an island tip, this area tends to experience currents that converge to destroy some substrate. There is also soft coral in the deeper reef inside the sanctuary (15.%) and outside the sanctuary (9.6%). In the shallow reef, live hard coral is 23.7%, which is also Poor inside the sanctuary. But there was also some soft coral in the shallows at 19.7% (Figure 27).

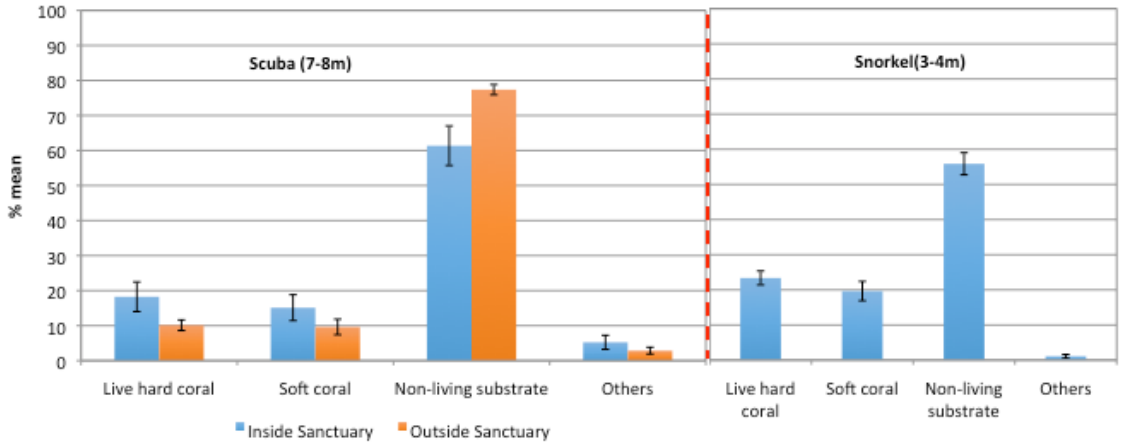

Figure 27. Substrate composition (%mean ±SE) at Cabuan Marine Sanctuary, Guinsiliban in 2015.

Fish Diversity, Abundance, and Biomass. There were more fish observed inside the sanctuary than outside the sanctuary at Cabuan Marine Sanctuary. Target fish density inside the sanctuary was Very Poor at 66.7 fish/500m^2 and Poor 563.3 fish/500m^2 for all reef fish density (Table 15). Fish species richness was Very Poor at 11.3 species/500m^2 inside the sanctuary for target fish, as was all reef fish species richness figure at 29.7 species/500m^2. Fish inside the sanctuary were mainly made up of damselfish, wrasses, and butterflyfish. Target fish present in the area were mainly parrotfish, goatfish, and surgeonfish (Figure 28 & 29).

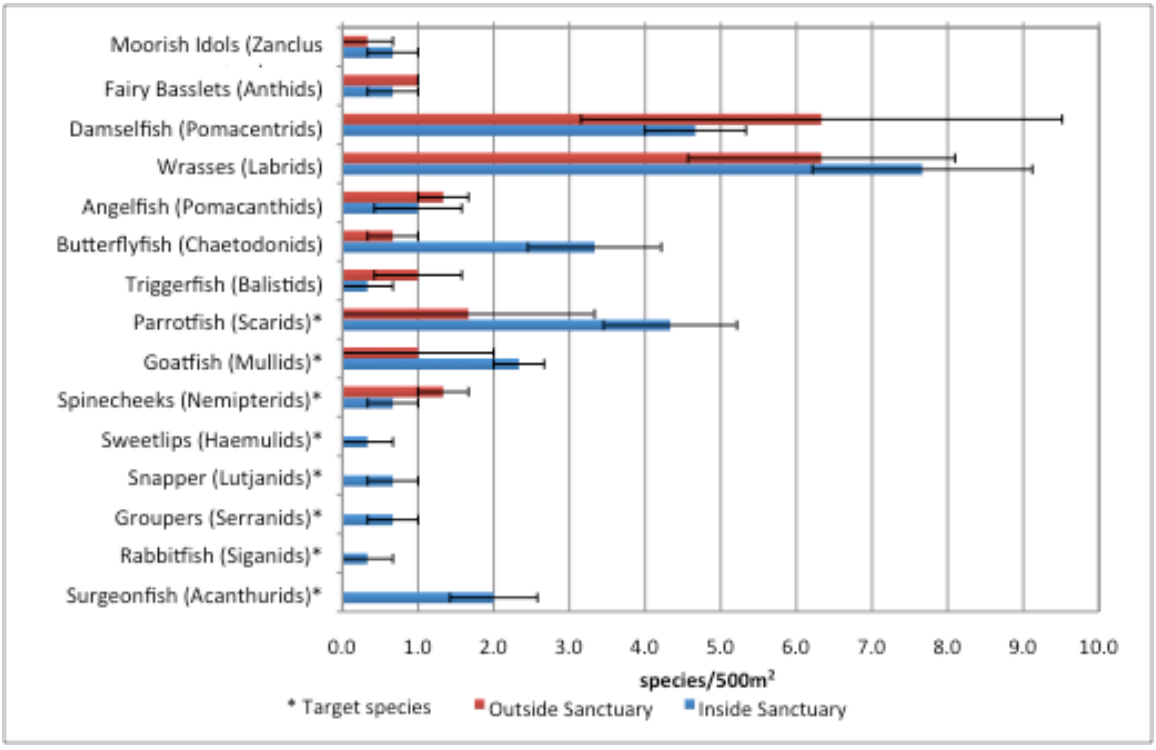

Figure 28. Fish species richness (species/500m^2) at Cabuan Marine Sanctuary, Guinsiliban in 2015.

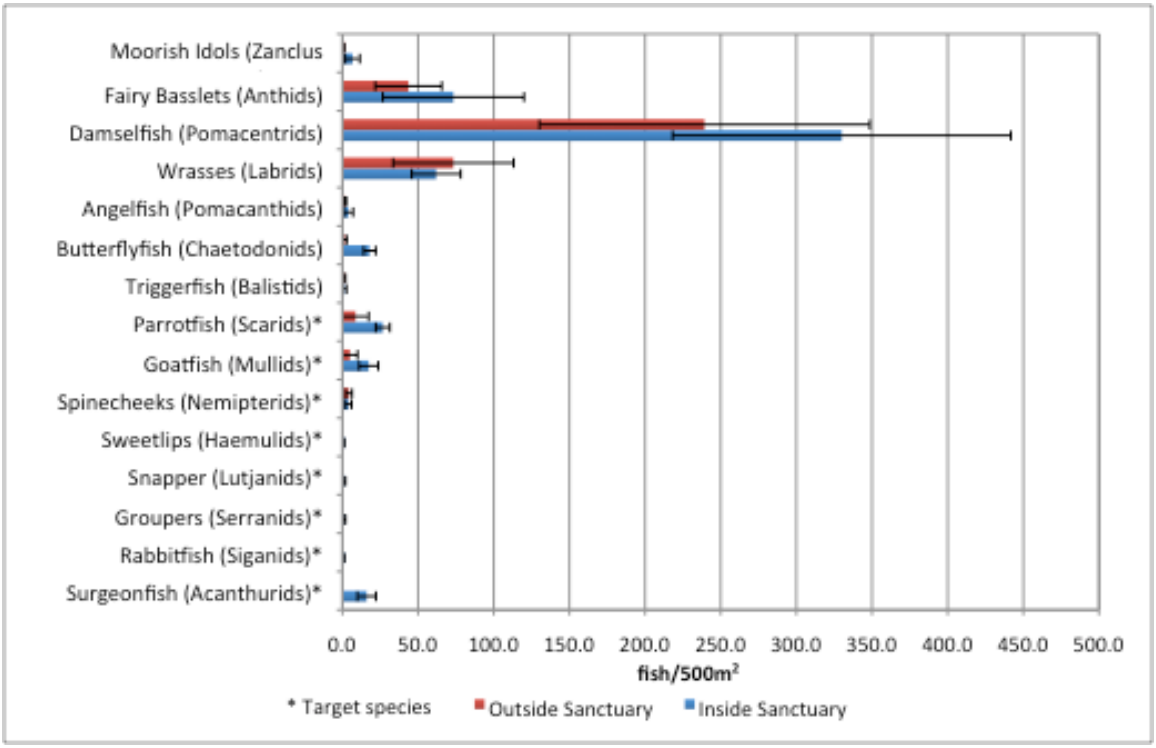

Figure 29. Fish density (fish/500m^2) at Cabuan Marine Sanctuary, Guinsiliban in 2015.

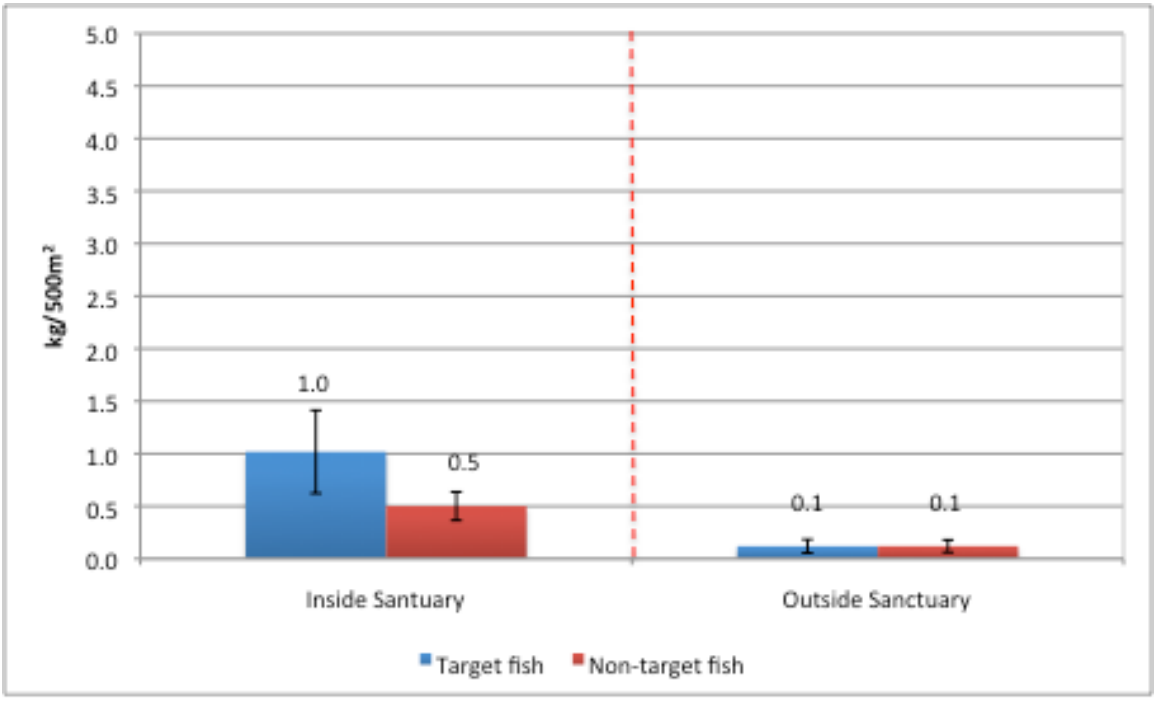

Figure 30. Total target and non-target fish biomass (kg/500m^2) at Cabuan Marine Sanctuary, Guinsiliban in 2015.

The biomass of target fish is at 1.0 kg/500m^2 and non-target fish is 0.5 kg/500m^2 (Figure 30) inside Cabuan Marine Sanctuary, which both rated at Very Poor based on the Hilomen categories. However, there is a significant difference between the fish biomass between the protected and the non-protected area. The non-protected area had a much lower fish biomass at 0.1 kg/500m^2 and 0.1 kg/500m^2 for target and non-target fish respectively. This shows there is enforcement in the core zone and with time, and continued strict enforcement, biomass can improve.

South Poblacion Marine Sanctuary, Guinsiliban

Site Overview. The South Poblacion Marine Sanctuary is a large 16-hectare MPA with good marker buoys on the north and south sides. Established in 2010, the MPA fronts an area where there is no visible coastal community. However, there is a very active *Bantay Dagat* present because when the researchers arrived at the site, a patrol boat came out to meet the dive boat to check on permits. This sanctuary is located close to a river mouth, which explains the slight siltiness of the water.

The reef has been damaged in the past, most probably from a strong storm (Typhoon Pablo) in 2012 that cut across Mindanao, hit Central Visayas reefs, and left behind destroyed reefs due to wave action. It was observed that the reef might, at one time, have had an impressive hard coral cover with lots of branching corals. Evidence of this is that there are now mostly rubble and dead standing coral covered by soft corals during the survey. Large target fish species were missing, as on most of the Camiguin reefs. This makes one speculate about fishing pressure inside and outside of the MPAs around the island. Based on the *2014 Status of Camiguin Coral Reefs Report*, South Poblacion Marine Sanctuary

rates at Level 2 on the MPA-MEAT, which describes MPA management to be effectively strengthened. The level 2 rating is corroborated by the 2015 survey team.

Substrate. South Poblacion Marine Sanctuary has Poor live coral cover, at 7 to 8 meters depth, at 12.3% inside the sanctuary and 8.1% outside the sanctuary (Figure 31). However, there was moderately high cover in terms of soft corals for the sanctuary at this same depth with 43.6% (inside) and 41.6% (outside). Other components consisted of rubble and dead coral with algae (Table 16). The rubble may be attributed to damage caused by past large storms, such at Typhoon Pablo in 2012.

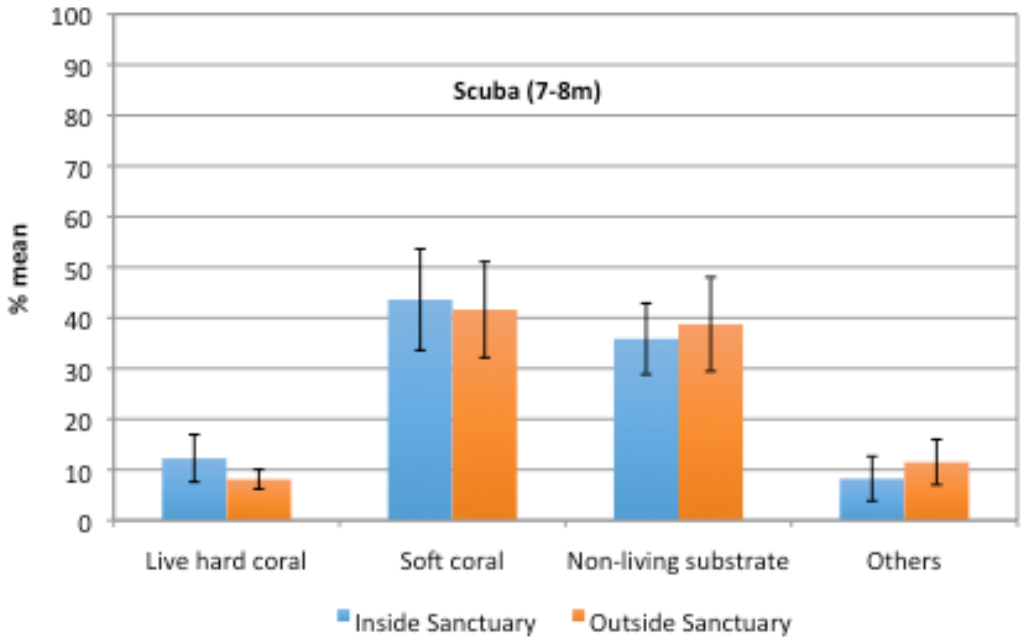

Figure 31. Substrate composition (%mean ±SE) at South Poblacion Marine Sanctuary, Guinsiliban in 2015.

Fish Diversity, Abundance, and Biomass. There were notably more fish inside the sanctuary than outside the sanctuary at the South Poblacion Marine Sanctuary. Target fish density inside the sanctuary was Poor at 208.7 fish/500m^2. All reef fish density inside the sanctuary was Moderate at 1,378.7 fish/500m^2 (Table 17). However, most of the fishes that made up the population were damselfishes and wrasses. For species richness, target fish inside the sanctuary was Very Poor at 9 species/500m^2, and for all reef fish was Poor at 35 species/500m^2. Target fish present at the site were mainly parrotfish and surgeonfish (Figure 32 & 33).

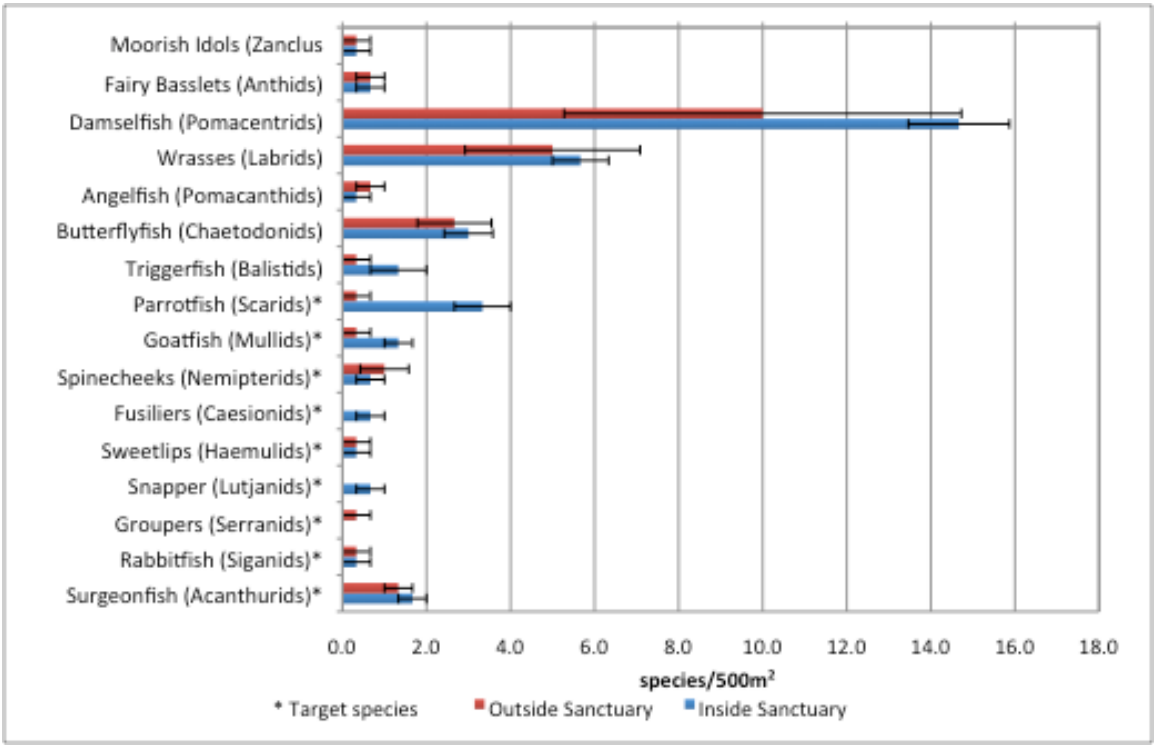

Figure 32. Fish species richness (species/500m^2) at South Poblacion Marine Sanctuary, Guinsiliban in 2015.

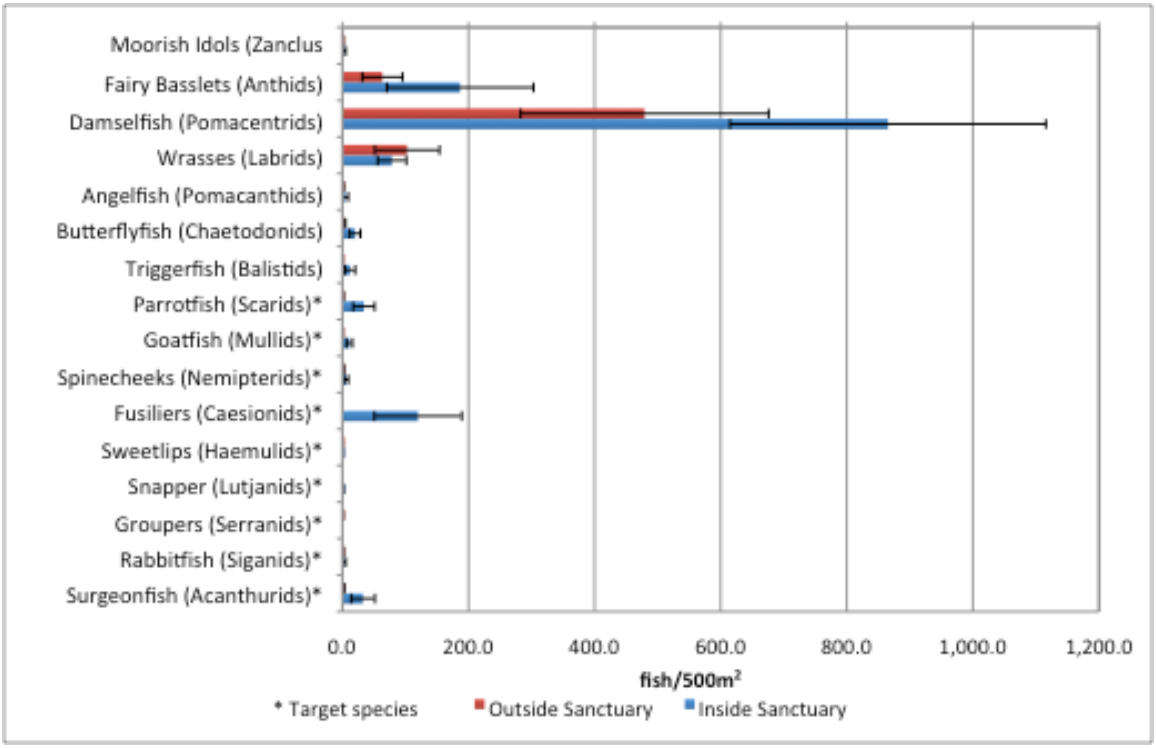

Figure 33. Fish density (fish/500m^2) at South Poblacion Marine Sanctuary, Guinsiliban in 2015.

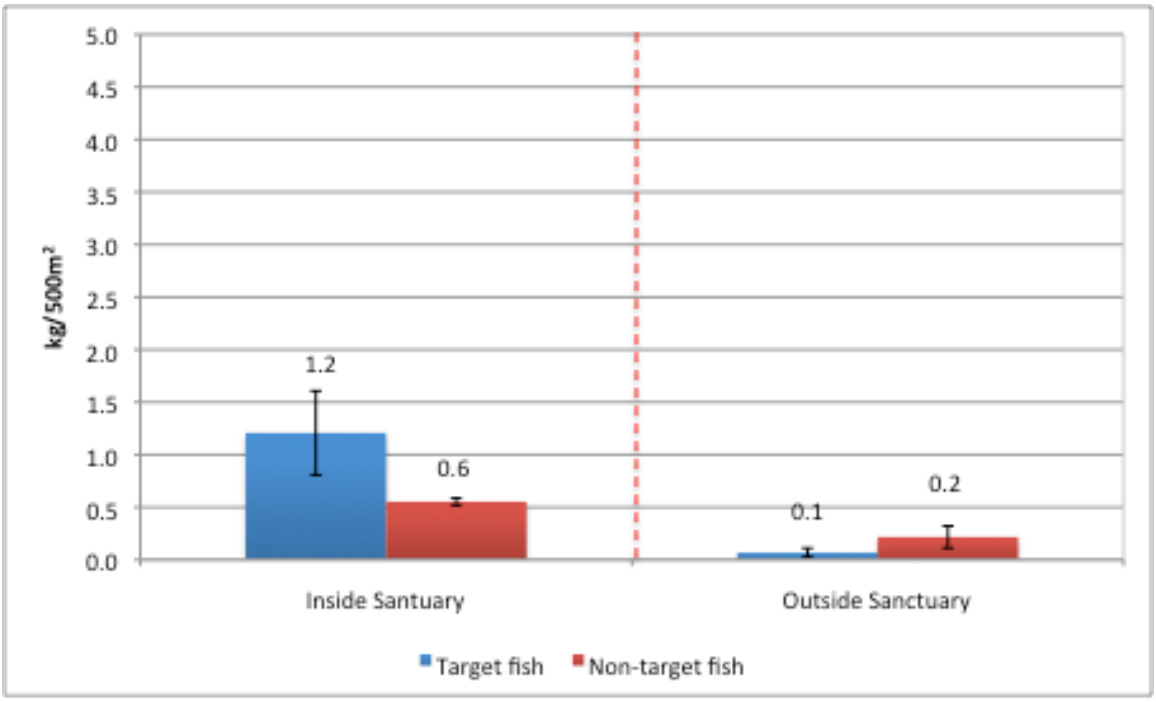

Figure 34. Total target and non-target fish biomass (kg/500m^2) at South Poblacion Marine Sanctuary, Guinsiliban in 2015.

Inside the sanctuary, the biomass of target fish was recorded at 1.2 kg/500m^2 and for non-target fish was 0.6 kg/500m^2, which rated at Very Poor for both. The area is well patrolled by the community and is evident in the significant differences between the fish biomass inside the sanctuary and outside the sanctuary. Outside the sanctuary, fish biomass was very low at 0.1 kg/500m^2 and 0.2 kg/500m^2 for target fish and non-target fish, respectively. With continued enforcement and patrolling, the community can look forward to improved biomass over the next few years.

San Roque Marine Sanctuary, Mahinog

Site Overview. The San Roque Marine Sanctuary is a 6-hectare marine protected area declared by municipal ordinance in 2007. Located at mainland Camiguin in the town of Mahinog, it is directly in front of the terminal for boats bound for Mantigue Island. Between the two islands, the sanctuary experiences a lot of boat traffic near its core zone. The San Roque Sanctuary is managed by the adjacent *barangay* that has a *Bantay Dagat* that patrols the area. The area is not marked with proper buoys or signs and it is unclear whether fishing is really prevented inside the sanctuary.

The reef is a gradual slope with sand and corals interspersed with a low fish population in the shallow areas. Based on the survey, fish are reportedly below 15 meters depth. The shallow reef flat has relatively good live hard coral cover upon initial observation which is a good sign of recovery especially considering that a large storm, Typhoon Pablo, damaged reefs on the east side of Camiguin Island in late 2012. Based on the *2014 Status of Camiguin Coral Reefs Report*, San Roque Marine Sanctuary rates at

Level 1 on the MPA-MEAT, which describes the MPA as established and is corroborated by the 2015 survey team.

Substrate. San Roque Marine Sanctuary had Poor live hard coral, at 7 to 8 meters depth, with 17.6% inside the sanctuary and 6.3% outside the sanctuary (Table 18). The sanctuary substrate was made up mostly of sand and rubble (Figure 35). The rubble may have been caused by the most recent big storm (Typhoon Pablo) that hit in 2012. The shallow reef had a higher live hard coral cover, 53.5%, which is rated as Good. Another pre-dominating substrate component in the shallow reef was rock and block (23.2%).

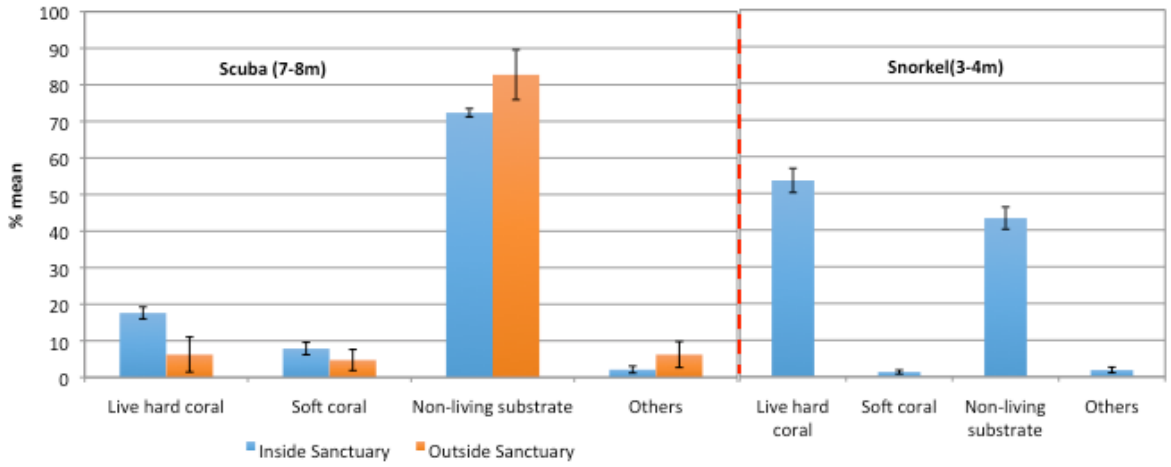

Figure 35. Substrate composition (%mean ±SE) at San Roque Marine Sanctuary, Mahinog in 2015.

Fish Diversity, Abundance, and Biomass. Overall, fish density and species diversity was low inside and outside of San Roque Marine Sanctuary. Target fish density inside the sanctuary was Very Poor at 27.3 fish/500m^2 and for all reef fish density it was rated at Moderate at 808 fish/500m^2 (Table 19). Fish density was mainly composed of damselfish and wrasses. Fish species richness for target fish species was Very Poor at 5.3 species/500m^2 and Poor for all reef fish species at 28.3 species/500m^2. Most target fish present were parrotfish and surgeonfish (Figure 36 & 37).

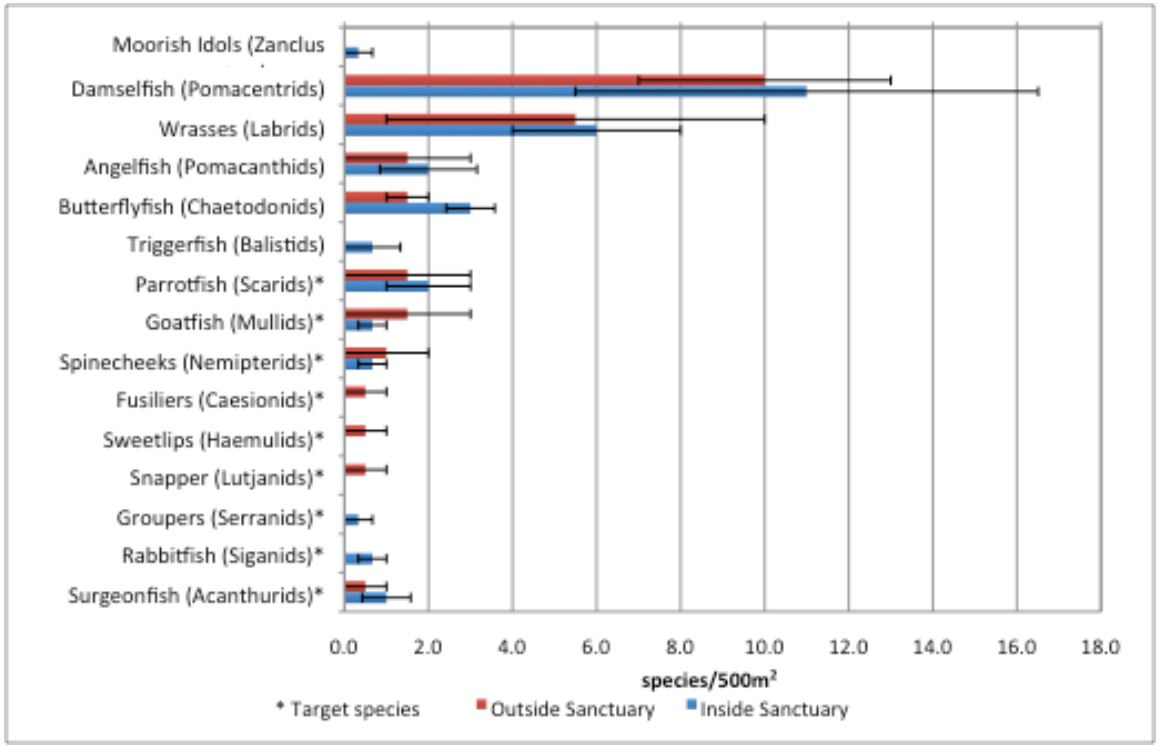

Figure 36. Fish species richness (species/500m^2) at San Roque Marine Sanctuary, Mahinog in 2015.

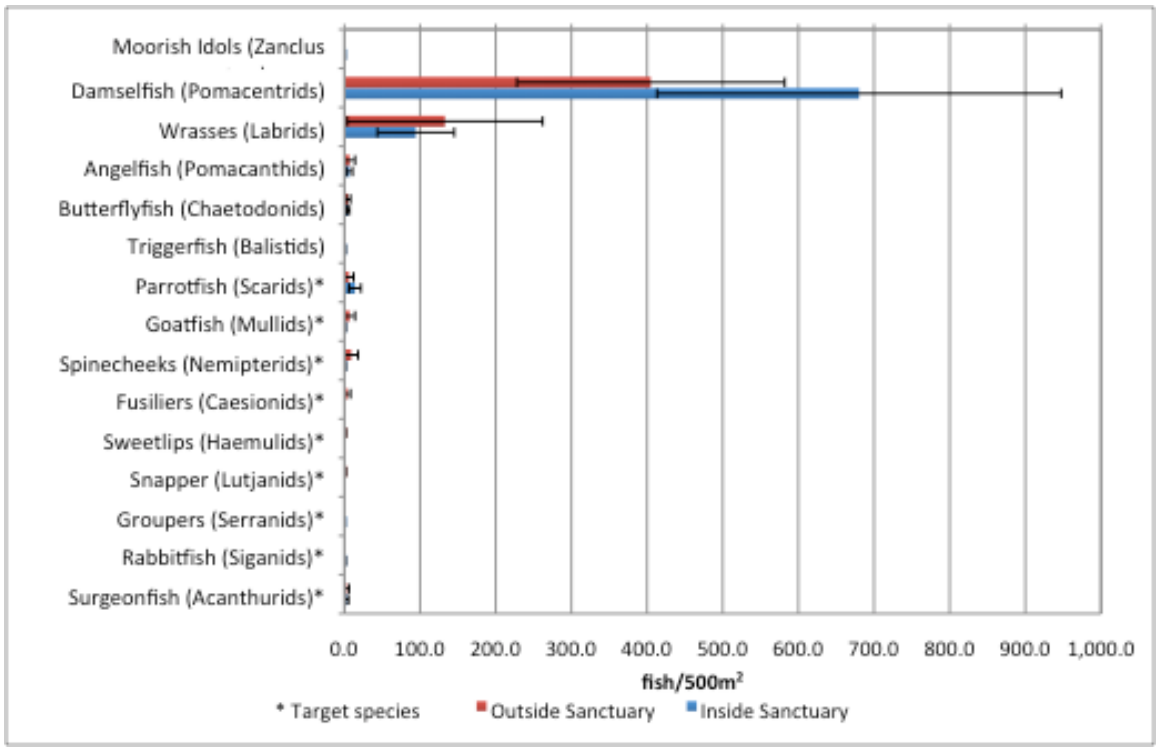

Figure 37. Fish density (fish/500m^2) at San Roque Marine Sanctuary, Mahinog in 2015.

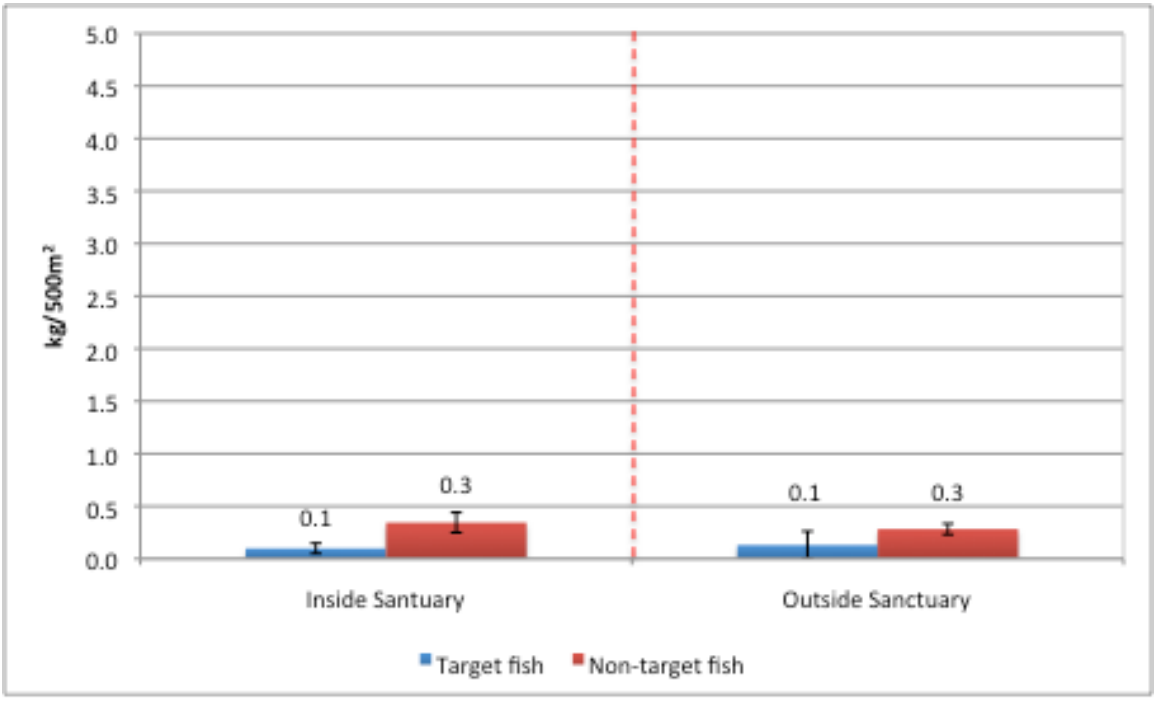

Figure 38. Total target and non-target fish biomass (kg/500m^2) at San Roque Marine Sanctuary, Mahinog in 2015.

The biomass was recorded as Very Poor in both the inside and the outside of the sanctuary (Figure 38). Target fish were at 0.1 kg/500m^2 (inside sanctuary) and 0.1 kg/500m^2, while non-target fish were at 0.3 kg/500m^2 (inside sanctuary) and 0.3 kg/500m^2 (outside sanctuary).

Mantigue Island MPA, Mahinog

Site Overview. Mantigue Island was declared as a protected island in 1998 due to its forestland, through DENR Administrative Order 98-13. However, previous to that in 1987, DENR had declared the island as alienable and disposable, therefore a community began to settle there. Because of the 1998 order, the island has been surrounded by controversy as the national government has begun to relocate community members from the island due to its protected status. The town of Mahinog has also declared the area as protected due to the islands' rich marine resources.

The Mantigue Island Marine Sanctuary is located within the protected area of Mantigue Island. It is zoned for different uses with a 7-hectare no-take zone for diving and snorkeling; and zones for fishing, mariculture, boat landing; and a native forest zone on the island. The sanctuary on the south side of the island has a wide shallow reef flat with a reef crest near the edge and drop off with a 60-75 degree slope into deeper water. The reef survey and dive revealed an abundance of large fish (jacks, snappers, rabbit fishes and a few others) not present anywhere else in Camiguin.

The area is well maintained with markers, buoys, signs, and guards. The sanctuary is small relative to the size of the overall reef, which is about 60+ hectares, but it is protected. According to the local

barangay official that interacted with the researchers, there is little or no illegal fishing in the area at present as compared to past years. The island beach is frequented by day visitors for picnics, snorkeling, and a short forest walk on the island, which has a good vegetation cover with native beach and coastal forest species. Based on the *2014 Status of Camiguin Coral Reefs Report*, Mantigue Island Marine Sanctuary rates at Level 4 on the MPA-MEAT, which describes MPA management to be effectively institutionalized for at least seven years. The Level 4 rating is generally corroborated by the 2015 survey based on the apparently good protection being provided to the sanctuary.

Substrate. Live hard coral, at 7 to 8 meters depth, at the Mantigue Island Marine Sanctuary was Fair (inside the sanctuary) at 32.4% and Poor (outside the sanctuary) at 11.9% (Figure 39). Major components that made up the substrate in the general area were rubble and sand. In the shallow reef, live hard coral was also Fair at 35.6% with another major substrate component being sand (Table 20).

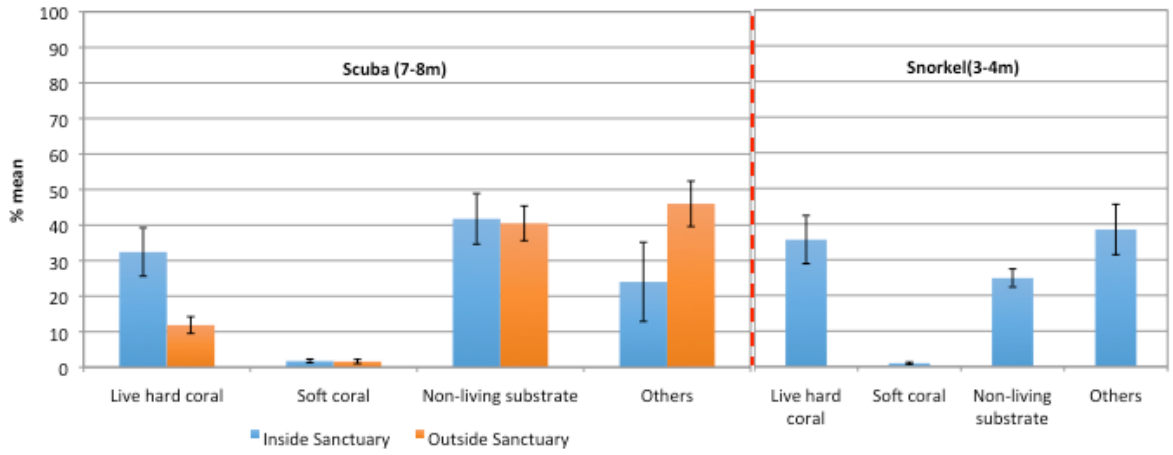

Figure 39. Substrate composition (%mean ±SE) at Mantigue Island Marine Sanctuary, Mahinog in 2015.

Fish Diversity, Abundance, and Biomass. At Mantigue Island Marine Sanctuary, fish density and species diversity were noticeably higher inside the sanctuary than outside the sanctuary. Inside the sanctuary, target fish species density rated at Very Poor at 158.7 fish/500m^2, while all fish species density rated at Moderate at 904 fish/500m^2 (Table 21). Fish species richness inside the sanctuary was Very Poor at 17 species/500m^2 while all fish species richness was Poor at 40 species/500m^2. The fish population of the survey samples was mainly made up of damselfish and wrasses. Target fish that were present in the general area were parrotfish, surgeonfish, snappers, rabbitfish, and goatfish (Figures 40 & 41).

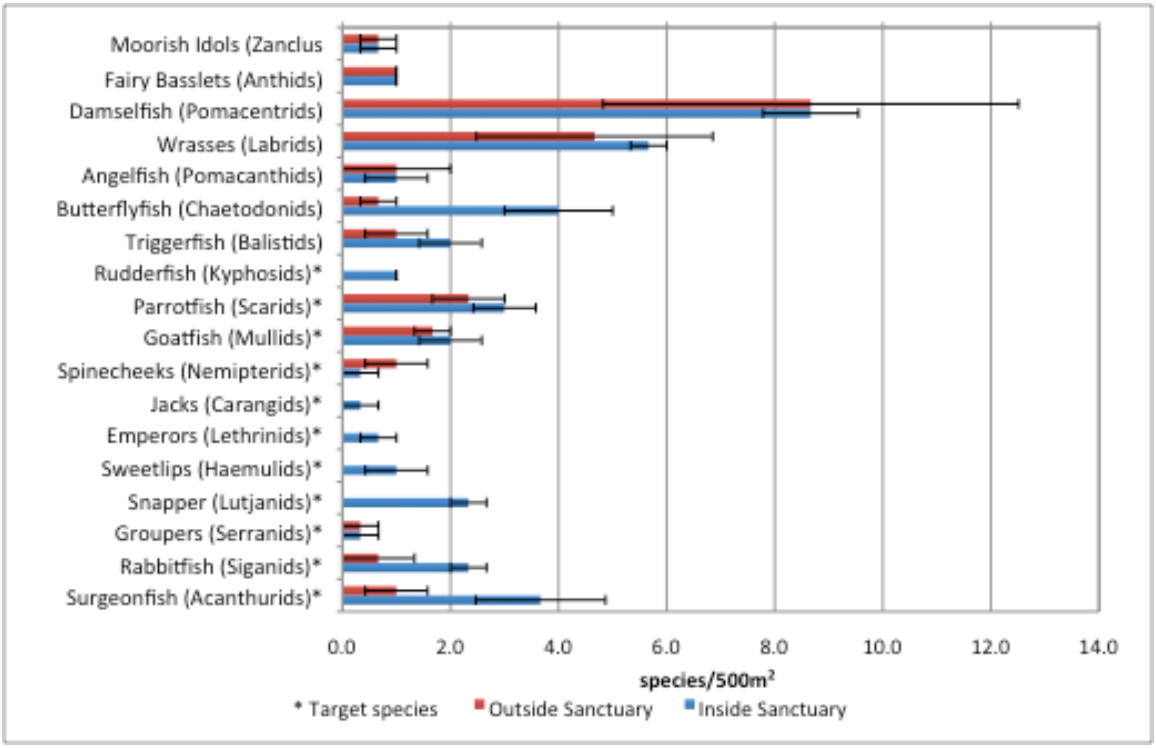

Figure 40. Fish species richness (species/500m^2) at Mantigue Island Marine Sanctuary, Mahinog in 2015.

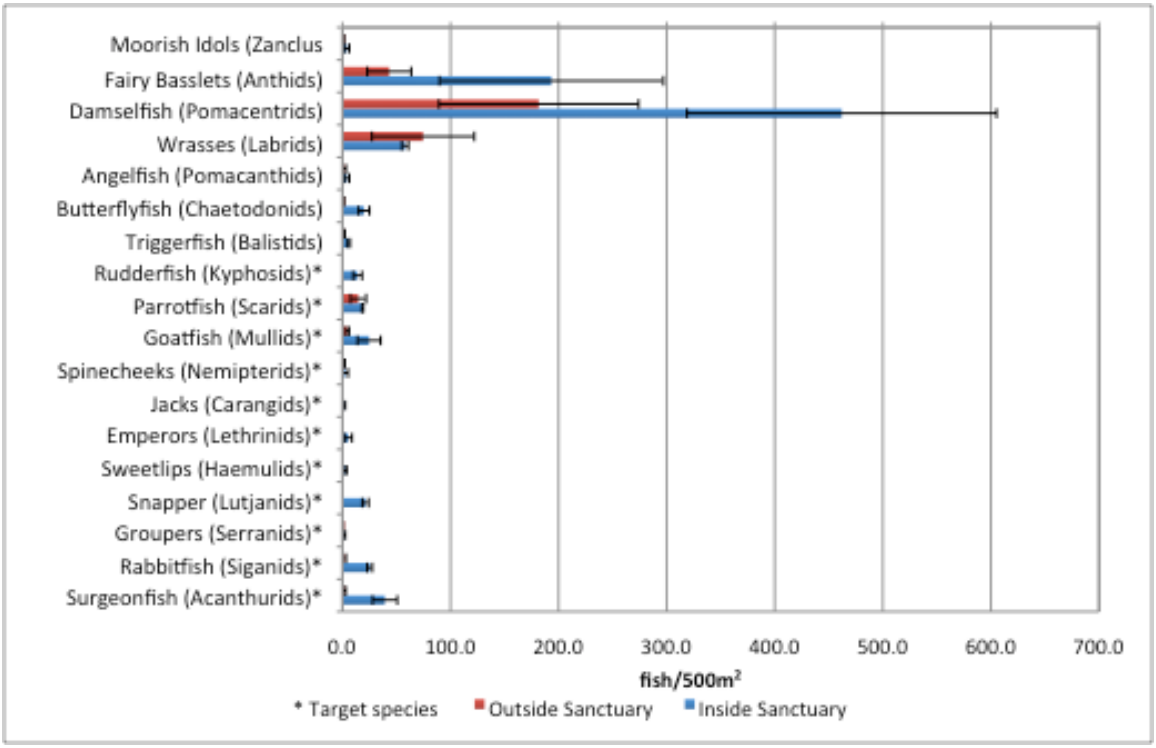

Figure 41. Fish density (fish/500m^2) at Mantigue Island Marine Sanctuary, Mahinog in 2015.

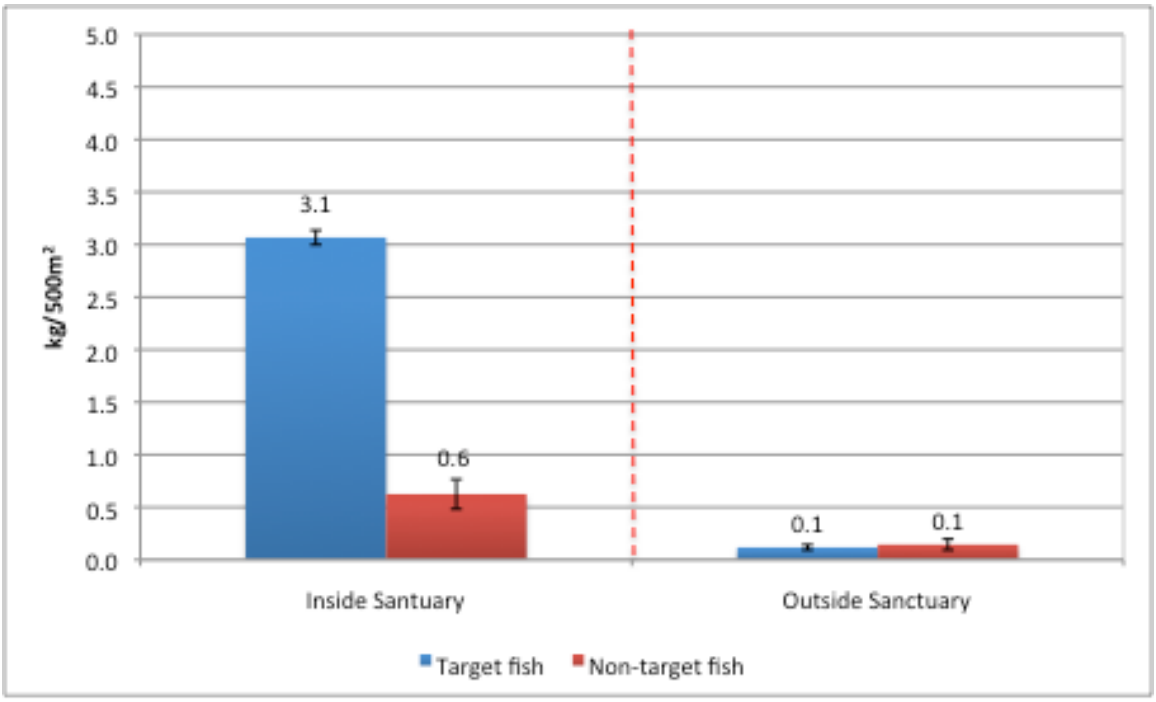

Figure 42. Total target and non-target fish biomass (kg/500m^2) at Mantigue Island Marine Sanctuary, Mahinog in 2015.

The fish biomass inside Mantigue Island Marine Sanctuary was the highest recorded among all the sites surveyed with target fish biomass at 3.1 kg/500m^2 and non-target fish biomass at 0.6 kg/500m^2 (Figure 42). However, based on the Hilomen categories, the biomass is still Very Poor for target fish and Very Poor for non-target fish. Clearly there is a significant difference between fish biomass inside the sanctuary and outside the sanctuary, which shows that sanctuary enforcement is working. With continued strict enforcement, the community on this island can look forward to higher biomass trends in the future.

Table 1. Species list of butterflyfish in the Province of Camiguin, Philippines

Butterflyfish Species	Common Name	White Island	Kabiling Tupsan	Lawigan	Pasil Sunken Cemetery	Alangilan	Balite	Cabuan	South Poblacion	San Roque	Mantigue Island
Chaetodon adiergastos	Philippine butterflyfish			X							X
Chaetodon auriga	Threadfin butterflyfish	X			X			X			X
Chaetodon baronessa	Eastern triangular butterflyfish	X	X	X	X	X	X	X	X	X	X
Chaetodon bennetti	Bluelashed butterflyfish										
Chaetodon citrinellus	Speckled butterflyfish							X		X	
Chaetodon ephippium	Saddle butterflyfish							X			
Chaetodon kleinii	Klein's butterflyfish	X	X	X	X	X	X	X	X	X	X
Chaetodon lineolatus	Lined butterflyfish	X			X						
Chaetodon lunula	Raccoon butterflyfish		X	X			X	X			X
Chaetodon lunulatus	Pacific redfin butterflyfish	X	X	X	X	X	X	X	X	X	X
Chaetodon melannotus	Blackback butterflyfish	X			X					X	
Chaetodon mertensii	Merten's butterflyfish										
Chaetodon meyeri	Meyer's butterflyfish										
Chaetodon ocellicaudus	Spottail butterflyfish	X	X	X	X		X		X	X	X
Chaetodon octofasciatus	Eightband butterflyfish		X	X		X	X		X		
Chaetodon ornatissimus	Ornate butterflyfish	X	X		X		X	X			X
Chaetodon oxycephalus	Spot-nape butterflyfish							X	X		X
Chaetodon plebeius	Blueblotch butterflyfish										
Chaetodon punctatofasciatus	Spotband butterflyfish		X	X	X						
Chaetodon rafflesi	Latticed butterflyfish	X	X	X	X					X	X
Chaetodon reticulatus	Mailed butterflyfish		X						X		
Chaetodon selene	Yellowdotted butterflyfish				X	X					
Chaetodon semeion	Dotted butterflyfish										
Chaetodon speculum	Mirror butterflyfish				X						X
Chaetodon trifascialis	Chevron butterflyfish		X	X	X	X	X	X		X	X
Chaetodon ulietensis	Pacific doublesaddle butterflyfish	X			X						
Chaetodon unimaculatus	Teardrop butterflyfish										
Chaetodon vagabundus	Vagabond butterflyfish	X		X	X	X	X	X	X	X	X
Chaetodon xanthurus	Pearscale butterflyfish										
Chelmon rostratus	Beaked coralfish										
Forcipiger flavissimmus	Forcepsfish				X						X
Forcipiger longirostris	Longnose butterflyfish		X		X						X
Hemitaurichthys polylepis	Pyramid butterflyfish				X			X			
Heniochus acuminatus	Pennant coralfish										
Heniochus chrysostomus	Threeband pennantfish	X	X	X			X	X	X		
Heniochus diphreutes	Schooling bannerfish										
Heniochus monoceros	Masked bannerfish										
Heniochus pleurotaenia	Phantom bannerfish	X		X	X	X	X	X			X
Heniochus singularius	Singular bannerfish				X						X
Heniochus varius	Horned bannerfish	X	X	X	X	X	X	X	X	X	X
Coradion chrysozonus	Goldengirdled coralfish										
Coradion melanopus	Two-eyed coralfish			X		X					
Parachaetodon ocellatus	Ocellate coralfish										
Total number of species/site		**14**	**14**	**15**	**21**	**10**	**12**	**15**	**10**	**10**	**18**

Total number of species in Camiguin Island in 2015:30 species

Table 2. Substrate composition (%mean ±SE) at White Island Marine Sanctuary, Mambajao in 2015.

SUBSTRATE COVER	OUTSIDE SANCTUARY			
	Scuba (7-8m)		Snorkel (3-4m)	
	% cover	SE	% cover	SE
Live hard coral	***57.8***	3.9	***12.0***	3.3
Branching	32.1	5.4	2.7	1.1
Massive	15.4	2.6	9.1	2.4
Foliose/Cup	6.2	2.1	0.2	0.2
Encrusting/Flat	4.2	1.0	0.0	0.0
Soft Coral	***2.8***	0.7	***0.7***	0.4
Non-living	***23.8***	3.1	***14.5***	2.3
Rock and Block	6.1	2.0	7.6	1.3
Rubble	2.3	0.5	0.1	0.1
Dead Coral with Algae	9.2	2.2	0.4	0.3
White Dead Coral	2.2	1.0	0.4	0.2
Sand	3.9	0.9	5.9	1.6
Silt	0.0	0.0	0.1	0.1
Others	***15.6***	2.2	***72.8***	4.3
Turf Algae	1.2	0.9	0.0	0.0
Fleshy Algae	9.9	2.0	1.3	1.3
Coralline Algae	3.4	1.1	70.9	5.2
Sponges	0.6	0.2	0.1	0.1
Seagrasses	0.0	0.0	0.0	0.0
Other Animals	0.6	0.2	0.5	0.3
TOTAL	***100.0***		***100.0***	
Environmental Parameters				
Reef Zone	Slope/Flat		Slope/Flat	
Mean Topography (m) *	~		~	
Mean Depth/Range (m)	6.8		3.6	
Horizontal Visibility (m)	15.1		15.3	
No. of 50 m Transects	8		10	

~ no data available

* mean distance between lowest and highest point on the horizontal transect line

Table 3. Mean (±SE) fish species richness (species/500m^2) and density (fish/500m^2) per family at White Island Marine Sanctuary, Mambajao, Camiguin Island in 2015.

Family	OUTSIDE SANCTUARY							
	Species		Size Class				Density	
	Mean	SE	1-10 cm**	11-20 cm	21-30 cm	>30 cm	Mean	SE
Surgeonfish (Acanthurids)*	1.5	0.3	0.0	5.8	0.0	0.5	6.3	2.7
Rabbitfish (Siganids)*	0.3	0.3	0.0	1.0	0.0	0.0	1.0	1.0
Groupers (Serranids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Barramundi cod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Snapper (Lutjanids)*	0.5	0.3	0.0	12.5	0.0	60.0	72.5	57.1
Sweetlips (Haemulids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Emperors (Lethrinids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jacks (Carangids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fusiliers (Caesionids)*	0.5	0.5	0.0	25.0	10.0	0.0	35.0	35.0
Spinecheeks (Nemipterids)*	0.5	0.3	0.0	0.8	0.0	0.0	0.8	0.5
Goatfish (Mullids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Parrotfish (Scarids)*	1.0	0.4	0.0	5.3	0.0	0.0	5.3	2.5
Bumphead parrotfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rudderfish (Kyphosids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Triggerfish (Balistids)	1.5	0.3	0.0	2.5	2.3	0.0	4.8	1.5
Butterflyfish (Chaetodonids)	4.3	0.8	1.5	10.5	0.0	0.0	12.0	1.6
Angelfish (Pomacanthids)	1.0	0.4	2.5	0.8	0.0	0.0	3.3	1.7
Wrasses (Labrids)	4.0	0.7	34.3	11.3	0.5	0.0	46.0	20.8
Humphead wrasse	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Damselfish (Pomacentrids)	11.3	1.3	299.5	154.5	2.5	0.0	456.5	85.2
Fairy Basslets (Anthids)	1.5	0.3	95.0	60.0	0.0	0.0	155.0	60.2
Moorish Idols (*Zanclus cornutus*)	0.8	0.3	0.0	1.8	0.0	0.0	1.8	0.6
Total (target reef spp.):	**4.3**	**0.3**	**0.0**	**50.3**	**10.0**	**60.5**	**120.8**	**87.5**
Total (all reef spp.):	**28.5**	**1.7**	**432.8**	**291.5**	**15.3**	**60.5**	**800.0**	**103.8**

* Target species/families

** Surgeonfish in this size class are not counted as targets

Note: Hemigymnus Fasciatus & Hemigymnus Melapterus of Labrid family considered targets

Table 4. Substrate composition (%mean ±SE) at Kabiling Tupsan Marine Sanctuary, Mambajao in 2015.

SUBSTRATE COVER	INSIDE SANCTUARY		OUTSIDE SANCTUARY	
	Scuba (7-8m)		Scuba (7-8m)	
	% cover	SE	% cover	SE
Live hard coral	***51.1***	16.2	***10.6***	2.4
Branching	41.8	15.3	6.4	1.8
Massive	2.8	1.6	3.3	1.3
Foliose/Cup	1.5	0.9	0.6	0.5
Encrusting/Flat	5.1	2.3	0.4	0.4
Soft Coral	***1.1***	0.1	***3.5***	1.3
Non-living	***45.5***	16.5	***78.5***	1.4
Rock and Block	2.5	0.7	4.5	1.8
Rubble	10.8	4.4	12.4	3.8
Dead Coral with Algae	10.8	3.2	4.9	1.2
White Dead Coral	0.0	0.0	1.8	1.8
Sand	21.5	15.4	55.0	5.0
Silt	0.0	0.0	0.0	0.0
Others	***2.3***	1.2	***7.4***	4.4
Turf Algae	*0.5*	0.5	*0.9*	0.5
Fleshy Algae	*0.0*	0.0	*5.6*	4.2
Coralline Algae	0.1	0.1	0.0	0.0
Sponges	0.9	0.4	0.9	0.2
Seagrasses	0.0	0.0	0.0	0.0
Other Animals	0.8	0.5	0.0	0.0
TOTAL	***100.0***		***100.0***	
Environmental Parameters				
Reef Zone	Slope/Flat		Slope/Flat	
Mean Topography (m) *	~		~	
Mean Depth/Range (m)	6.8		7.3	
Horizontal Visibility (m)	15.0		13.3	
No. of 50 m Transects	4		4	

~ no data available

* mean distance between lowest and highest point on the horizontal transect line

Table 5. Mean (±SE) fish species richness (species/500m^2) and density (fish/500m^2) per family at Kabiling-Tupsan Marine Sanctuary, Mambajao, Camiguin Island in 2015.

Family	INSIDE SANCTUARY								OUTSIDE SANCTUARY							
	Species		Size Class				Density		Species		Size Class				Density	
	Mean	SE	1-10 cm**	11-20 cm	21-30 cm	>30 cm	Mean	SE	Mean	SE	1-10 cm**	11-20 cm	21-30 cm	>30 cm	Mean	SE
Surgeonfish (Acanthurids)*	2.0	1.2	0.0	6.0	0.0	0.0	6.0	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rabbitfish (Siganids)*	0.7	0.3	2.3	0.7	0.0	0.0	3.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Groupers (Serranids)*	1.0	0.6	0.0	1.3	0.3	0.0	1.7	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Barramundi cod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Snapper (Lutjanids)*	0.7	0.3	0.0	0.7	0.3	0.0	1.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sweetlips (Haemulids)*	0.7	0.7	0.0	1.0	0.3	0.0	1.3	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Emperors (Lethrinids)*	0.3	0.3	0.0	0.3	0.0	0.0	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jacks (Carangids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fusiliers (Caesionids)*	0.3	0.3	0.0	5.0	0.0	0.0	5.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spinecheeks (Nemipterids)*	1.0	0.0	0.3	1.7	0.0	0.0	2.0	0.6	0.7	0.3	0.0	1.3	0.0	0.0	1.3	0.7
Goatfish (Mullids)*	1.7	0.3	1.7	2.0	0.0	0.0	3.7	0.7	1.0	0.6	0.0	5.3	0.0	0.0	5.3	2.9
Parrotfish (Scarids)*	2.0	1.2	1.3	7.3	0.0	0.0	8.7	4.7	2.0	0.6	0.0	8.7	0.0	0.0	8.7	3.5
Bumphead parrotfis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rudderfish (Kyphosids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Triggerfish (Balistids)	1.3	0.7	0.0	2.7	0.0	0.0	2.7	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Butterflyfish (Chaetodonids)	4.3	0.3	5.7	3.0	0.0	0.0	8.7	0.9	2.0	0.6	0.0	6.0	0.0	0.0	6.0	2.3
Angelfish (Pomacanthids)	1.7	0.9	4.7	3.3	0.0	0.0	8.0	7.0	1.0	0.6	1.3	4.0	0.0	0.0	5.3	2.9
Wrasses (Labrids)	9.7	3.3	14.3	32.0	0.0	0.0	46.3	8.2	9.0	1.2	43.3	38.0	0.0	0.0	81.3	6.4
Humphead wrasse	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Damselfish (Pomacentrids)	7.3	3.2	1028.0	19.7	0.0	0.0	1047.7	297.3	13.3	1.3	349.3	2.0	0.0	0.0	351.3	65.9
Fairy Basslets (Anthids)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	16.7	0.0	0.0	0.0	16.7	16.7
Moorish Idols (*Zanclus cornutus*)	0.3	0.3	0.0	0.3	0.0	0.0	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total (target reef spp.):	**10.3**	**3.7**	**5.7**	**27.7**	**1.0**	**0.0**	**34.3**	**15.0**	**3.7**	**1.2**	**0.0**	**15.7**	**0.0**	**0.0**	**15.7**	**3.8**
Total (all reef spp.):	**35.0**	**12.0**	**1058.3**	**87.0**	**1.0**	**0.0**	**1146.3**	**325.7**	**29.3**	**4.1**	**410.7**	**65.3**	**0.0**	**0.0**	**476.0**	**85.3**

* Target species/families

** Surgeonfish in this size class are not counted as targets

Note: Hemigymnus Fasciatus & Hemigymnus Melapterus of Labrid family considered targets

Table 6. Substrate composition (%mean ±SE) at Lawigan Marine Sanctuary, Catarman in 2015.

SUBSTRATE COVER	INSIDE SANCTUARY		OUTSIDE SANCTUARY	
	Scuba (7-8m)		Scuba (7-8m)	
	% cover	SE	% cover	SE
Live hard coral	***43.0***	3.1	***31.5***	5.5
Branching	22.1	3.9	12.3	3.7
Massive	7.9	1.2	7.4	2.6
Foliose/Cup	8.4	2.2	5.9	2.1
Encrusting/Flat	4.6	2.9	6.0	4.3
Soft Coral	***32.8***	4.7	***14.4***	6.7
Non-living	***18.1***	5.2	***38.0***	7.7
Rock and Block	11.0	3.3	10.6	4.3
Rubble	0.5	0.3	1.0	0.5
Dead Coral with Algae	4.5	2.7	4.5	2.1
White Dead Coral	0.1	0.1	0.5	0.4
Sand	2.0	1.3	21.4	6.4
Silt	0.0	0.0	0.0	0.0
Others	***6.1***	2.1	***16.1***	5.6
Turf Algae	*1.1*	1.0	*3.0*	1.4
Fleshy Algae	*2.6*	2.2	*0.1*	0.1
Coralline Algae	1.1	1.0	1.4	0.9
Sponges	0.9	0.5	8.8	3.7
Seagrasses	0.0	0.0	0.0	0.0
Other Animals	0.4	0.2	2.9	1.4
TOTAL	***100.0***		***100.0***	
Environmental Parameters				
Reef Zone	Slope/Crest		Slope	
Mean Topography (m) *	~		~	
Mean Depth/Range (m)	6.3		6.9	
Horizontal Visibility (m)	13.3		10.3	
No. of 50 m Transects	4		4	

~ no data available

* mean distance between lowest and highest point on the horizontal transect line

Table 7. Mean (±SE) fish species richness (species/500m^2) and density (fish/500m^2) per family at Lawigan Marine Sanctuary, Catarman, Camiguin Island in 2015.

Family	INSIDE SANCTUARY								OUTSIDE SANCTUARY							
	Species		Size Class				Density		Species		Size Class				Density	
	Mean	SE	1-10 cm**	11-20 cm	21-30 cm	>30 cm	Mean	SE	Mean	SE	1-10 cm**	11-20 cm	21-30 cm	>30 cm	Mean	SE
Surgeonfish (Acanthurids)*	1.7	0.3	0.0	6.7	7.3	2.0	16.0	7.2	0.3	0.3	0.0	0.7	0.0	0.0	0.7	0.3
Rabbitfish (Siganids)*	0.7	0.7	0.0	0.0	3.3	0.0	3.3	3.3	0.3	0.3	0.0	5.0	0.0	0.0	5.0	5.0
Groupers (Serranids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Barramundi cod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Snapper (Lutjanids)*	1.0	0.6	0.0	1.3	6.7	0.0	8.0	6.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sweetlips (Haemulids)*	0.3	0.3	0.0	0.0	0.0	0.7	0.7	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Emperors (Lethrinids)*	0.7	0.3	0.0	0.7	0.0	1.3	2.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jacks (Carangids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fusiliers (Caesionids)*	0.3	0.3	0.0	13.3	0.0	0.0	13.3	13.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spinecheeks (Nemipterids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.3	0.7	0.0	0.0	1.0	0.0
Goatfish (Mullids)*	0.3	0.3	0.0	0.7	0.0	0.0	0.7	0.7	1.0	0.6	0.0	2.0	0.0	0.0	2.0	1.2
Parrotfish (Scarids)*	3.0	0.6	0.0	12.7	4.7	2.0	19.3	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bumphead parrotfis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rudderfish (Kyphosids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Triggerfish (Balistids)	1.0	1.0	0.0	4.0	1.3	0.0	5.3	5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Butterflyfish (Chaetodonids)	4.7	0.9	0.0	26.0	0.0	0.0	26.0	6.1	1.7	0.7	0.7	1.0	0.0	0.0	1.7	0.7
Angelfish (Pomacanthids)	1.0	0.0	2.7	1.3	0.0	0.0	4.0	2.3	0.3	0.3	0.7	0.0	0.0	0.0	0.7	0.7
Wrasses (Labrids)	8.7	1.2	26.7	36.7	0.7	0.0	64.0	16.7	4.3	1.7	12.3	8.3	0.0	0.0	20.7	11.3
Humphead wrasse	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Damselfish (Pomacentrids)	14.7	0.3	837.3	97.3	0.0	0.0	934.7	41.0	7.7	3.8	511.0	24.0	0.0	0.0	535.0	257.0
Fairy Basslets (Anthids)	0.7	0.3	86.7	0.0	0.0	0.0	86.7	59.3	1.3	0.3	111.3	0.0	0.0	0.0	111.3	56.4
Moorish Idols (*Zanclus cornutus*)	0.3	0.3	0.0	2.0	0.0	0.0	2.0	2.0	0.7	0.3	0.0	2.3	0.0	0.0	2.3	1.2
Total (target reef spp.):	**8.0**	**2.1**	**0.7**	**36.3**	**22.0**	**6.0**	**65.0**	**23.0**	**2.7**	**0.9**	**0.3**	**8.3**	**0.0**	**0.0**	**8.7**	**5.4**
Total (all reef spp.):	**39.0**	**1.5**	**953.3**	**202.7**	**24.0**	**6.0**	**1186.0**	**33.0**	**18.7**	**6.4**	**636.3**	**44.0**	**0.0**	**0.0**	**680.3**	**299.8**

* Target species/families

** Surgeonfish in this size class are not counted as targets

Note: Hemigymnus Fasciatus & Hemigymnus Melapterus of Labrid family considered targets

Table 8. Substrate composition (%mean ±SE) at Pasil Marine Sanctuary, Catarman in 2015.

SUBSTRATE COVER	INSIDE SANCTUARY				OUTSIDE SANCTUARY	
	Scuba (7-8m)		Snorkel (3-4m)		Scuba (7-8m)	
	% cover	SE	% cover	SE	% cover	SE
Live hard coral	***68.9***	6.5	***45.5***	5.1	***70.3***	1.1
Branching	26.9	2.9	21.5	3.2	21.0	3.7
Massive	18.9	1.3	20.6	2.4	16.4	3.3
Foliose/Cup	10.3	1.9	2.4	1.0	10.3	3.0
Encrusting/Flat	12.9	4.2	1.0	0.9	22.5	4.8
Soft Coral	***5.5***	1.5	***2.0***	0.7	***4.6***	3.0
Non-living	***23.3***	4.6	***50.6***	5.3	***18.7***	2.3
Rock and Block	5.1	1.8	40.7	5.4	3.9	1.3
Rubble	6.0	1.4	2.6	1.1	3.8	1.5
Dead Coral with Algae	8.4	2.4	1.3	0.4	10.3	1.8
White Dead Coral	0.0	0.0	0.7	0.5	0.0	0.0
Sand	3.8	1.6	5.1	2.1	0.7	0.7
Silt	0.0	0.0	0.3	0.3	0.0	0.0
Others	***2.4***	1.0	***1.9***	0.7	***6.5***	1.6
Turf Algae	*0.1*	0.1	*0.1*	0.1	*1.5*	0.9
Fleshy Algae	*1.4*	0.4	*0.2*	0.1	*2.0*	0.8
Coralline Algae	0.5	0.5	1.4	0.7	2.0	0.9
Sponges	0.3	0.1	0.1	0.1	0.8	0.4
Seagrasses	0.0	0.0	0.0	0.0	0.0	0.0
Other Animals	0.1	0.1	0.2	0.2	0.3	0.1
TOTAL	***100.0***		***100.0***		***100.0***	
Environmental Parameters						
Reef Zone	Slope/Flat		Slope/Flat		Slope/Flat	
Mean Topography (m) *	~		~		~	
Mean Depth/Range (m)	6.9		3.2		7.2	
Horizontal Visibility (m)	11.8		14.0		15.3	
No. of 50 m Transects	4		12		4	

~ no data available

* mean distance between lowest and highest point on the horizontal transect line

Table 9. Mean (±SE) fish species richness (species/500m^2) and density (fish/500m^2) per family at Pasil Marine Sanctuary, Catarman, Camiguin Island in 2015.

Family	INSIDE SANCTUARY								OUTSIDE SANCTUARY							
	Species		Size Class				Density		Species		Size Class				Density	
	Mean	SE	1-10 cm**	11-20 cm	21-30 cm	>30 cm	Mean	SE	Mean	SE	1-10 cm**	11-20 cm	21-30 cm	>30 cm	Mean	SE
Surgeonfish (Acanthurids)*	2.0	1.0	0.0	23.3	0.0	0.0	23.3	2.7	0.7	0.3	0.0	1.3	0.0	0.0	1.3	0.7
Rabbitfish (Siganids)*	0.3	0.3	0.0	1.3	0.0	0.0	1.3	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Groupers (Serranids)*	0.7	0.3	0.0	0.7	1.3	0.0	2.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Barramundi cod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Snapper (Lutjanids)*	0.3	0.3	0.0	0.0	2.0	8.0	10.0	7.2	0.3	0.3	0.0	0.0	0.3	0.0	0.3	0.3
Sweetlips (Haemulids)*	0.7	0.3	0.0	0.0	0.0	2.0	2.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Emperors (Lethrinids)*	0.7	0.3	0.0	2.7	0.0	3.3	6.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jacks (Carangids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fusiliers (Caesionids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spinecheeks (Nemipterids)*	0.7	0.3	0.0	2.0	0.0	0.0	2.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Goatfish (Mullids)*	0.3	0.3	0.0	0.7	0.0	0.0	0.7	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Parrotfish (Scarids)*	2.0	0.6	0.0	8.0	3.3	2.7	14.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bumphead parrotfis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rudderfish (Kyphosids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Triggerfish (Balistids)	2.7	0.3	0.0	8.0	4.0	0.0	12.0	2.0	1.0	0.6	0.0	1.0	0.3	0.0	1.3	0.9
Butterflyfish (Chaetodonids)	5.0	0.0	5.3	27.3	0.0	0.0	32.7	0.7	4.7	0.3	2.3	12.3	0.0	0.0	14.7	2.7
Angelfish (Pomacanthids)	1.7	0.7	2.0	4.0	3.3	0.0	9.3	1.8	1.3	0.3	5.0	0.3	0.0	0.0	5.3	2.4
Wrasses (Labrids)	6.7	1.5	13.3	25.3	2.7	0.0	41.3	11.6	4.7	1.8	2.7	4.3	0.0	0.0	7.0	1.5
Humphead wrasse	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Damselfish (Pomacentrids)	8.0	1.2	621.3	20.0	0.0	0.0	641.3	172.0	8.3	3.7	419.3	9.0	0.0	0.0	428.3	208.2
Fairy Basslets (Anthids)	0.7	0.3	70.0	0.0	0.0	0.0	70.0	47.3	0.7	0.3	6.7	12.7	0.0	0.0	19.3	9.7
Moorish Idols (*Zanclus cornutus*)	0.3	0.3	0.0	2.7	0.0	0.0	2.7	2.7	0.3	0.3	0.0	0.7	0.0	0.0	0.7	0.7
Total (target reef spp.):	**7.7**	**1.3**	**0.0**	**40.7**	**7.7**	**16.0**	**64.3**	**7.8**	**1.0**	**0.6**	**0.0**	**2.0**	**0.3**	**0.0**	**2.3**	**0.9**
Total (all reef spp.):	**32.7**	**2.7**	**712.0**	**126.0**	**16.7**	**16.0**	**870.7**	**234.6**	**22.0**	**5.0**	**436.0**	**41.7**	**0.7**	**0.0**	**478.3**	**220.1**

* Target species/families

** Surgeonfish in this size class are not counted as targets

Note: Hemigymnus Fasciatus & Hemigymnus Melapterus of Labrid family considered targets

Table 10. Substrate composition (%mean ±SE) at Alangilan Marine Sanctuary, Sagay in 2015.

SUBSTRATE COVER	INSIDE SANCTUARY				OUTSIDE SANCTUARY	
	Scuba (7-8m)		Snorkel (3-4m)		Scuba (7-8m)	
	% cover	SE	% cover	SE	% cover	SE
Live hard coral	***32.0***	4.4	***2.3***	0.7	***1.3***	1.3
Branching	7.2	1.9	1.0	0.3	0.8	0.8
Massive	9.9	1.7	0.9	0.4	0.5	0.5
Foliose/Cup	8.5	3.0	0.4	0.3	0.0	0.0
Encrusting/Flat	6.4	3.1	0.0	0.0	0.0	0.0
Soft Coral	***16.1***	6.4	***0.1***	0.1	***1.8***	1.8
Non-living	***27.2***	3.4	***97.4***	1.0	***96.8***	3.3
Rock and Block	6.9	1.9	45.5	14.4	1.0	1.0
Rubble	3.6	0.4	0.0	0.0	0.5	0.5
Dead Coral with Algae	6.1	2.2	0.0	0.0	0.8	0.8
White Dead Coral	0.1	0.1	0.0	0.0	0.3	0.3
Sand	8.7	1.9	49.2	15.4	94.3	5.8
Silt	1.8	1.0	2.7	2.7	0.0	0.0
Others	***24.7***	4.4	***0.1***	0.1	***0.3***	0.3
Turf Algae	*2.2*	1.4	*0.1*	0.1	*0.0*	0.0
Fleshy Algae	*19.4*	3.6	*0.0*	0.0	*0.0*	0.0
Coralline Algae	1.3	0.5	0.0	0.0	0.3	0.3
Sponges	1.6	0.4	0.0	0.0	0.0	0.0
Seagrasses	0.0	0.0	0.0	0.0	0.0	0.0
Other Animals	0.2	0.1	0.0	0.0	0.0	0.0
TOTAL	***100.0***		***100.0***		***100.0***	
Environmental Parameters						
Reef Zone	Slope/Flat		Slope/Flat		Slope/Flat	
Mean Topography (m) *	~		~		~	
Mean Depth/Range (m)	7.0		4.2		5.7	
Horizontal Visibility (m)	8.0		6.6		5.0	
No. of 50 m Transects	5		5		2	

~ no data available

* mean distance between lowest and highest point on the horizontal transect line

Table 11. Mean (±SE) fish species richness (species/500m^2) and density (fish/500m^2) per family at Alangilan Marine Sanctuary, Sagay, Camiguin Island in 2015.

Family	INSIDE SANCTUARY								OUTSIDE SANCTUARY							
	Species		Size Class				Density		Species		Size Class				Density	
	Mean	SE	1-10 cm**	11-20 cm	21-30 cm	>30 cm	Mean	SE	Mean	SE	1-10 cm**	11-20 cm	21-30 cm	>30 cm	Mean	SE
Surgeonfish (Acanthurids)*	0.7	0.3	0.0	7.3	0.0	0.0	7.3	3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rabbitfish (Siganids)*	0.3	0.3	0.0	0.7	0.0	0.0	0.7	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Groupers (Serranids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Barramundi cod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Snapper (Lutjanids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sweetlips (Haemulids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Emperors (Lethrinids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jacks (Carangids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fusiliers (Caesionids)*	0.3	0.3	0.0	2.7	0.0	0.0	2.7	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spinecheeks (Nemipterids)*	1.3	0.3	0.0	4.7	0.0	0.0	4.7	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Goatfish (Mullids)*	0.3	0.3	0.0	1.3	0.0	0.0	1.3	1.3	0.5	0.5	0.0	0.5	0.0	0.0	0.5	0.5
Parrotfish (Scarids)*	1.7	0.3	0.0	6.7	1.3	0.7	8.7	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bumphead parrotfis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rudderfish (Kyphosids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Triggerfish (Balistids)	0.7	0.3	0.0	0.7	0.7	0.0	1.3	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Butterflyfish (Chaetodonids)	2.7	0.3	0.0	14.7	0.0	0.0	14.7	1.8	0.5	0.5	0.5	0.0	0.0	0.0	0.5	0.5
Angelfish (Pomacanthids)	1.7	0.9	2.0	2.0	0.7	0.0	4.7	2.4	0.5	0.5	0.5	0.0	0.0	0.0	0.5	0.5
Wrasses (Labrids)	6.3	0.7	24.7	18.0	0.0	0.0	42.7	12.3	1.5	1.5	0.5	2.0	0.0	0.0	2.5	2.5
Humphead wrasse	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Damselfish (Pomacentrids)	9.7	1.3	291.3	25.3	0.0	0.0	316.7	77.9	2.5	2.5	95.0	15.0	0.0	0.0	110.0	110.0
Fairy Basslets (Anthids)	1.0	0.0	80.0	0.0	0.0	0.0	80.0	11.5	0.5	0.5	0.0	2.5	0.0	0.0	2.5	2.5
Moorish Idols (*Zanclus cornutus*)	0.3	0.3	0.0	1.3	0.0	0.0	1.3	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total (target reef spp.):	**4.7**	**0.3**	**0.0**	**23.3**	**1.3**	**0.7**	**25.3**	**1.8**	**0.5**	**0.5**	**0.0**	**0.5**	**0.0**	**0.0**	**0.5**	**0.5**
Total (all reef spp.):	**27.0**	**0.6**	**398.0**	**85.3**	**2.7**	**0.7**	**486.7**	**84.1**	**6.0**	**6.0**	**96.5**	**20.0**	**0.0**	**0.0**	**116.5**	**116.5**

* Target species/families

** Surgeonfish in this size class are not counted as targets

Note: Hemigymnus Fasciatus & Hemigymnus Melapterus of Labrid family considered targets

Table 12. Substrate composition (%mean ±SE) at Balite Marine Sanctuary, Sagay in 2015.

SUBSTRATE COVER	INSIDE SANCTUARY				OUTSIDE SANCTUARY	
	Scuba (7-8m)		Snorkel (3-4m)		Scuba (7-8m)	
	% cover	SE	% cover	SE	% cover	SE
Live hard coral	***72.3***	2.2	***60.6***	5.0	***68.1***	6.1
Branching	40.6	4.6	17.1	2.9	32.9	4.1
Massive	9.0	2.2	40.0	3.8	9.6	2.9
Foliose/Cup	7.1	1.9	2.9	1.0	5.5	1.5
Encrusting/Flat	15.5	4.2	0.5	0.5	20.1	4.1
Soft Coral	***8.1***	2.3	***2.4***	1.1	***8.6***	1.4
Non-living	***17.5***	2.7	***36.6***	5.0	***21.9***	4.8
Rock and Block	2.8	0.6	27.9	4.6	4.0	1.5
Rubble	4.5	1.4	0.7	0.5	10.8	3.4
Dead Coral with Algae	5.1	0.7	0.5	0.3	4.5	2.8
White Dead Coral	1.1	1.0	1.6	1.3	0.1	0.1
Sand	4.0	2.7	5.8	1.4	2.5	0.8
Silt	0.0	0.0	0.0	0.0	0.0	0.0
Others	***2.1***	0.4	***0.4***	0.2	***1.4***	0.5
Turf Algae	*0.0*	0.0	*0.1*	0.1	*0.3*	0.3
Fleshy Algae	*0.0*	0.0	*0.1*	0.1	*0.3*	0.1
Coralline Algae	1.1	0.5	0.1	0.1	0.0	0.0
Sponges	0.6	0.2	0.0	0.0	0.6	0.3
Seagrasses	0.0	0.0	0.0	0.0	0.0	0.0
Other Animals	0.4	0.2	0.2	0.1	0.3	0.1
TOTAL	***100.0***		***100.0***		***100.0***	
Environmental Parameters						
Reef zone	Slope		Slope/Flat		Slope/Flat	
Mean Topography (m) *	~		~		~	
Mean Depth/Range (m)	7.5		2.9		7.0	
Horizontal Visibility (m)	9.0		13.0		12.3	
No. of 50 m Transects	4		10		4	

~ no data available

* mean distance between lowest and highest point on the horizontal transect line

Table 13. Mean (±SE) fish species richness (species/500m^2) and density (fish/500m^2) per family at Balite Marine Sanctuary, Sagay, Camiguin Island in 2015.

Family	INSIDE SANCTUARY								OUTSIDE SANCTUARY							
	Species		Size Class				Density		Species		Size Class				Density	
	Mean	SE	1-10 cm**	11-20 cm	21-30 cm	>30 cm	Mean	SE	Mean	SE	1-10 cm**	11-20 cm	21-30 cm	>30 cm	Mean	SE
Surgeonfish (Acanthurids)*	2.0	0.6	1.3	28.7	0.0	0.0	30.0	9.1	2.0	0.0	2.7	10.7	0.0	0.0	13.3	1.8
Rabbitfish (Siganids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Groupers (Serranids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Barramundi cod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Snapper (Lutjanids)*	2.0	1.5	0.0	0.0	0.3	0.0	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sweetlips (Haemulids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Emperors (Lethrinids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jacks (Carangids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fusiliers (Caesionids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spinecheeks (Nemipterids)*	0.3	0.3	0.0	0.3	0.0	0.0	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Goatfish (Mullids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.0	1.3	0.0	0.0	1.3	1.3
Parrotfish (Scarids)*	0.3	0.3	0.0	1.0	0.0	0.0	1.0	1.0	1.3	0.7	0.0	8.7	0.0	0.0	8.7	4.4
Bumphead parrotfis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rudderfish (Kyphosids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Triggerfish (Balistids)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.9	0.0	3.3	0.0	0.0	3.3	1.8
Butterflyfish (Chaetodonids)	3.3	0.3	8.3	4.3	0.0	0.0	12.7	1.7	4.0	0.6	1.3	14.7	0.0	0.0	16.0	2.3
Angelfish (Pomacanthids)	0.3	0.3	0.0	0.3	0.0	0.0	0.3	0.3	0.3	0.3	0.0	0.0	0.7	0.0	0.7	0.7
Wrasses (Labrids)	2.7	1.8	53.3	6.7	0.0	0.0	60.0	49.3	4.3	0.9	28.0	6.0	0.0	0.0	34.0	14.0
Humphead wrasse	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Damselfish (Pomacentrids)	8.0	3.5	612.7	20.3	0.0	0.0	633.0	282.3	10.3	1.3	419.3	13.3	0.0	0.0	432.7	91.8
Fairy Basslets (Anthids)	2.0	0.0	109.3	31.7	0.0	0.0	141.0	99.2	1.3	0.3	133.3	0.0	0.0	0.0	133.3	83.5
Moorish Idols (*Zanclus cornutus*)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total (target reef spp.):	**4.7**	**1.2**	**0.0**	**30.0**	**0.3**	**0.0**	**30.3**	**9.6**	**3.7**	**0.3**	**0.0**	**20.7**	**0.0**	**0.0**	**20.7**	**3.5**
Total (all reef spp.):	**21.0**	**3.6**	**785.0**	**93.3**	**0.3**	**0.0**	**878.7**	**378.3**	**25.3**	**1.8**	**584.7**	**58.0**	**0.7**	**0.0**	**643.3**	**166.4**

* Target species/families

** Surgeonfish in this size class are not counted as targets

Note: Hemigymnus Fasciatus & Hemigymnus Melapterus of Labrid family considered targets

Table 14. Substrate composition (%mean ±SE) at Cabuan Marine Sanctuary, Guinsiliban in 2015.

SUBSTRATE COVER	INSIDE SANCTUARY				OUTSIDE SANCTUARY	
	Scuba (7-8m)		Snorkel (3-4m)		Scuba (7-8m)	
	% cover	SE	% cover	SE	% cover	SE
Live hard coral	***18.3***	4.2	***23.4***	2.0	***10.1***	1.5
Branching	10.5	5.0	5.6	1.0	2.5	0.4
Massive	4.8	1.2	14.5	1.6	3.0	0.7
Foliose/Cup	2.4	0.9	3.1	1.3	4.4	1.2
Encrusting/Flat	0.6	0.4	0.1	0.1	0.3	0.1
Soft Coral	***15.1***	3.7	***19.7***	2.7	***9.6***	2.2
Non-living	***61.4***	5.6	***55.9***	3.1	***77.4***	1.5
Rock and Block	11.6	6.5	38.9	4.2	5.0	1.6
Rubble	21.3	6.8	4.8	1.5	19.4	5.6
Dead Coral with Algae	3.1	1.7	4.0	1.4	2.3	0.9
White Dead Coral	0.1	0.1	0.1	0.1	0.4	0.4
Sand	25.3	5.9	8.0	1.7	50.1	5.0
Silt	0.0	0.0	0.1	0.1	0.3	0.3
Others	***5.3***	2.0	***1.1***	0.5	***2.9***	1.0
Turf Algae	*0.3*	0.3	*0.2*	0.2	*0.9*	0.4
Fleshy Algae	*1.4*	1.2	*0.0*	0.0	*0.3*	0.3
Coralline Algae	0.8	0.8	0.3	0.2	0.0	0.0
Sponges	2.3	1.4	0.2	0.2	0.8	0.6
Seagrasses	0.0	0.0	0.0	0.0	0.0	0.0
Other Animals	0.6	0.5	0.4	0.3	1.0	0.6
TOTAL	***100.0***		***100.0***		***100.0***	
Environmental Parameters						
Reef Zone	Slope/Flat		Slope/Flat		Slope/Flat	
Mean Topography (m) *	~		~		~	
Mean Depth/Range (m)	6.8		3.1		7.2	
Horizontal Visibility (m)	15.0		16.2		14.7	
No. of 50 m Transects	4		13		4	

~ no data available

* mean distance between lowest and highest point on the horizontal transect line

Table 15. Mean (±SE) fish species richness (species/500m^2) and density (fish/500m^2) per family at Cabuan Marine Sanctuary, Guinsiliban, Camiguin Island in 2015.

Family	INSIDE SANCTUARY								OUTSIDE SANCTUARY							
	Species		Size Class				Density		Species		Size Class				Density	
	Mean	SE	1-10 cm**	11-20 cm	21-30 cm	>30 cm	Mean	SE	Mean	SE	1-10 cm**	11-20 cm	21-30 cm	>30 cm	Mean	SE
Surgeonfish (Acanthurids)*	2.0	0.6	1.3	14.7	0.0	0.0	16.0	6.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rabbitfish (Siganids)*	0.3	0.3	0.0	0.7	0.0	0.0	0.7	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Groupers (Serranids)*	0.7	0.3	0.0	0.7	0.7	0.0	1.3	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Barramundi cod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Snapper (Lutjanids)*	0.7	0.3	0.0	0.0	1.3	0.0	1.3	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sweetlips (Haemulids)*	0.3	0.3	0.0	0.0	0.0	0.7	0.7	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Emperors (Lethrinids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jacks (Carangids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fusiliers (Caesionids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spinecheeks (Nemipterids)*	0.7	0.3	0.0	4.0	0.0	0.0	4.0	2.0	1.3	0.3	0.3	4.0	0.0	0.0	4.3	2.0
Goatfish (Mullids)*	2.3	0.3	0.0	17.3	0.0	0.0	17.3	6.4	1.0	1.0	0.0	5.0	0.0	0.0	5.0	5.0
Parrotfish (Scarids)*	4.3	0.9	2.0	18.7	3.3	2.7	26.7	4.7	1.7	1.7	0.0	8.0	0.7	0.0	8.7	8.7
Bumphead parrotfis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rudderfish (Kyphosids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Triggerfish (Balistids)	0.3	0.3	0.0	1.3	0.0	0.0	1.3	1.3	1.0	0.6	0.0	1.3	0.0	0.0	1.3	0.7
Butterflyfish (Chaetodonids)	3.3	0.9	0.0	18.0	0.0	0.0	18.0	4.0	0.7	0.3	0.3	1.3	0.0	0.0	1.7	1.2
Angelfish (Pomacanthids)	1.0	0.6	0.0	2.7	1.3	0.0	4.0	3.1	1.3	0.3	1.3	0.7	0.0	0.0	2.0	0.6
Wrasses (Labrids)	7.7	1.5	31.3	28.7	2.0	0.0	62.0	16.2	6.3	1.8	64.3	9.0	0.0	0.0	73.3	39.8
Humphead wrasse	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Damselfish (Pomacentrids)	4.7	0.7	330.0	0.0	0.0	0.0	330.0	111.7	6.3	3.2	229.3	10.0	0.0	0.0	239.3	109.1
Fairy Basslets (Anthids)	0.7	0.3	73.3	0.0	0.0	0.0	73.3	46.7	1.0	0.0	42.0	1.7	0.0	0.0	43.7	22.0
Moorish Idols (*Zanclus cornutus*)	0.7	0.3	0.0	6.7	0.0	0.0	6.7	4.8	0.3	0.3	0.7	0.0	0.0	0.0	0.7	0.7
Total (target reef spp.):	**11.3**	**1.9**	**2.0**	**56.0**	**5.3**	**3.3**	**66.7**	**17.8**	**4.0**	**3.0**	**0.3**	**17.0**	**0.7**	**0.0**	**18.0**	**15.5**
Total (all reef spp.):	**29.7**	**0.9**	**438.0**	**113.3**	**8.7**	**3.3**	**563.3**	**120.8**	**21.0**	**8.9**	**338.3**	**41.0**	**0.7**	**0.0**	**380.0**	**185.8**

* Target species/families

** Surgeonfish in this size class are not counted as targets

Note: Hemigymnus Fasciatus & Hemigymnus Melapterus of Labrid family considered targets

Table 16. Substrate composition (%mean ±SE) at South Poblacion Marine Sanctuary, Guinsiliban in 2015.

SUBSTRATE COVER	INSIDE SANCTUARY		OUTSIDE SANCTUARY	
	Scuba (7-8m)			
	% cover	SE	% cover	SE
Live hard coral	***12.3***	4.7	***8.1***	1.9
Branching	3.9	2.1	1.4	0.9
Massive	3.1	1.3	2.3	0.8
Foliose/Cup	2.9	0.9	2.1	0.4
Encrusting/Flat	2.4	0.7	2.4	1.0
Soft Coral	***43.6***	10.0	***41.6***	9.5
Non-living	***35.9***	7.0	***38.8***	9.3
Rock and Block	2.5	0.7	5.0	3.1
Rubble	20.1	4.4	13.4	4.1
Dead Coral with Algae	7.3	2.5	14.1	7.6
White Dead Coral	0.1	0.1	0.3	0.3
Sand	4.6	3.3	6.0	1.3
Silt	1.3	0.8	0.0	0.0
Others	***8.3***	4.4	***11.5***	4.5
Turf Algae	*3.9*	3.2	*5.6*	2.8
Fleshy Algae	*3.0*	2.0	*4.0*	1.4
Coralline Algae	0.1	0.1	1.0	0.4
Sponges	0.4	0.1	0.4	0.2
Seagrasses	0.0	0.0	0.1	0.1
Other Animals	0.9	0.9	0.4	0.2
TOTAL	***100.0***		***100.0***	
Environmental Parameters				
Reef Zone	Slope/Flat		Slope	
Mean Topography (m) *	~		~	
Mean Depth/Range (m)	7.0		6.7	
Horizontal Visibility (m)	14.8		15.3	
No. of 50 m Transects	4		4	

~ no data available

* mean distance between lowest and highest point on the horizontal transect line

Table 17. Mean (±SE) fish species richness (species/500m^2) and density (fish/500m^2) per family at South Pobacion Marine Sanctuary, Guinsiliban, Camiguin Island in 2015.

Family	INSIDE SANCTUARY								OUTSIDE SANCTUARY							
	Species		Size Class				Density		Species		Size Class				Density	
	Mean	SE	1-10 cm**	11-20 cm	21-30 cm	>30 cm	Mean	SE	Mean	SE	1-10 cm**	11-20 cm	21-30 cm	>30 cm	Mean	SE
Surgeonfish (Acanthurids)*	1.7	0.3	0.0	12.7	20.0	0.0	32.7	18.8	1.3	0.3	0.3	1.7	0.0	0.0	2.0	1.0
Rabbitfish (Siganids)*	0.3	0.3	0.0	2.7	0.0	0.0	2.7	2.7	0.3	0.3	0.0	1.0	0.0	0.0	1.0	1.0
Groupers (Serranids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.7	0.0	0.0	0.0	0.7	0.7
Barramundi cod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Snapper (Lutjanids)*	0.7	0.3	0.0	1.3	0.0	0.0	1.3	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sweetlips (Haemulids)*	0.3	0.3	0.0	0.7	0.0	0.0	0.7	0.7	0.3	0.3	0.0	0.3	0.0	0.0	0.3	0.3
Emperors (Lethrinids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jacks (Carangids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fusiliers (Caesionids)*	0.7	0.3	0.0	120.0	0.0	0.0	120.0	69.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spinecheeks (Nemipterids)*	0.7	0.3	0.0	6.0	0.0	0.0	6.0	3.5	1.0	0.6	0.0	1.7	0.0	0.0	1.7	0.9
Goatfish (Mullids)*	1.3	0.3	0.0	11.3	0.0	0.0	11.3	4.7	0.3	0.3	0.0	0.3	0.0	0.0	0.3	0.3
Parrotfish (Scarids)*	3.3	0.7	1.3	31.3	1.3	0.0	34.0	17.1	0.3	0.3	0.0	1.0	0.0	0.0	1.0	1.0
Bumphead parrotfis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rudderfish (Kyphosids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Triggerfish (Balistids)	1.3	0.7	0.0	12.0	0.0	0.0	12.0	8.3	0.3	0.3	0.0	0.3	0.0	0.0	0.3	0.3
Butterflyfish (Chaetodonids)	3.0	0.6	0.0	20.0	0.0	0.0	20.0	8.3	2.7	0.9	3.0	0.7	0.0	0.0	3.7	1.3
Angelfish (Pomacanthids)	0.3	0.3	1.3	3.3	0.0	0.0	4.7	4.7	0.7	0.3	0.0	1.3	0.0	0.0	1.3	0.9
Wrasses (Labrids)	5.7	0.7	50.7	28.0	0.0	0.0	78.7	22.8	5.0	2.1	86.0	16.7	0.0	0.0	102.7	51.2
Humphead wrasse	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Damselfish (Pomacentrids)	14.7	1.2	844.7	20.7	0.0	0.0	865.3	250.5	10.0	4.7	475.3	4.0	0.0	0.0	479.3	196.6
Fairy Basslets (Anthids)	0.7	0.3	186.7	0.0	0.0	0.0	186.7	116.2	0.7	0.3	3.3	60.0	0.0	0.0	63.3	31.8
Moorish Idols (*Zanclus cornutus*)	0.3	0.3	0.0	2.7	0.0	0.0	2.7	2.7	0.3	0.3	0.0	0.7	0.0	0.0	0.7	0.7
Total (target reef spp.):	**9.0**	**1.0**	**1.3**	**186.0**	**21.3**	**0.0**	**208.7**	**109.5**	**4.0**	**1.0**	**0.7**	**6.0**	**0.0**	**0.0**	**6.7**	**2.4**
Total (all reef spp.):	**35.0**	**2.1**	**1084.7**	**272.7**	**21.3**	**0.0**	**1378.7**	**266.8**	**23.7**	**8.3**	**568.7**	**89.7**	**0.0**	**0.0**	**658.3**	**279.7**

* Target species/families

** Surgeonfish in this size class are not counted as targets

Note: Hemigymnus Fasciatus & Hemigymnus Melapterus of Labrid family considered targets

Table 18. Substrate composition (%mean ±SE) at San Roque Marine Sanctuary, Mahinog in 2015.

SUBSTRATE COVER	INSIDE SANCTUARY				OUTSIDE SANCTUARY	
	Scuba (7-8m)		Snorkel (3-4m)		Scuba (7-8m)	
	% cover	SE	% cover	SE	% cover	SE
Live hard coral	***17.6***	1.6	***53.5***	3.3	***6.3***	4.8
Branching	6.8	1.1	27.2	2.7	2.9	2.0
Massive	5.9	0.7	20.4	2.5	3.1	2.5
Foliose/Cup	3.8	1.5	2.2	1.0	0.3	0.3
Encrusting/Flat	1.3	0.6	3.8	0.9	0.0	0.0
Soft Coral	***7.9***	1.7	***1.3***	0.5	***4.8***	2.9
Non-living	***72.4***	1.1	***43.3***	3.0	***82.8***	6.8
Rock and Block	2.6	1.0	23.2	2.6	0.1	0.1
Rubble	31.5	10.5	4.1	1.6	10.0	10.0
Dead Coral with Algae	5.1	2.0	6.7	1.9	2.8	1.6
White Dead Coral	0.1	0.1	0.7	0.7	0.0	0.0
Sand	30.1	12.7	8.4	1.7	69.9	17.3
Silt	2.9	2.9	0.2	0.2	0.0	0.0
Others	***2.1***	0.9	***1.9***	0.8	***6.3***	3.5
Turf Algae	*1.3*	0.6	*0.0*	0.0	*0.4*	0.2
Fleshy Algae	*0.1*	0.1	*0.1*	0.1	*1.4*	1.1
Coralline Algae	0.4	0.2	0.8	0.4	0.0	0.0
Sponges	0.3	0.1	0.5	0.5	0.4	0.4
Seagrasses	0.1	0.1	0.0	0.0	4.1	4.0
Other Animals	0.0	0.0	0.5	0.4	0.0	0.0
TOTAL	***100.0***		***100.0***		***100.0***	
Environmental Parameters						
Reef Zone	Slope/Flat		Slope/Flat		Slope/Flat	
Mean Topography (m) *	~		~		~	
Mean Depth/Range (m)	6.0		2.7		6.3	
Horizontal Visibility (m)	11.0		12.6		10.5	
No. of 50 m Transects	4		13		4	

~ no data available

* mean distance between lowest and highest point on the horizontal transect line

Table 19. Mean (±SE) fish species richness (species/500m^2) and density (fish/500m^2) per family at San Roque Marine Sanctuary, Mahinog, Camiguin Island in 2015.

Family	INSIDE SANCTUARY								OUTSIDE SANCTUARY							
	Species		Size Class				Density		Species		Size Class				Density	
	Mean	SE	1-10 cm**	11-20 cm	21-30 cm	>30 cm	Mean	SE	Mean	SE	1-10 cm**	11-20 cm	21-30 cm	>30 cm	Mean	SE
Surgeonfish (Acanthurids)*	1.0	0.6	0.0	3.3	0.0	0.0	3.3	2.0	0.5	0.5	0.0	3.0	0.0	0.0	3.0	3.0
Rabbitfish (Siganids)*	0.7	0.3	0.0	1.0	0.0	0.0	1.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Groupers (Serranids)*	0.3	0.3	0.0	0.0	0.3	0.0	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Barramundi cod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Snapper (Lutjanids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.0	1.0	0.0	0.0	1.0	1.0
Sweetlips (Haemulids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5	1.0	0.0	0.0	0.0	1.0	1.0
Emperors (Lethrinids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jacks (Carangids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fusiliers (Caesionids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.0	4.0	0.0	0.0	4.0	4.0
Spinecheeks (Nemipterids)*	0.7	0.3	0.0	1.0	0.0	0.0	1.0	0.6	1.0	1.0	0.0	9.0	0.0	0.0	9.0	9.0
Goatfish (Mullids)*	0.7	0.3	0.7	0.3	0.0	0.0	1.0	0.6	1.5	1.5	0.0	7.0	0.0	0.0	7.0	7.0
Parrotfish (Scarids)*	2.0	1.0	0.0	14.0	0.0	0.0	14.0	7.8	1.5	1.5	6.0	0.0	0.0	0.0	6.0	6.0
Bumphead parrotfis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rudderfish (Kyphosids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Triggerfish (Balistids)	0.7	0.7	0.0	0.7	0.0	0.0	0.7	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Butterflyfish (Chaetodonids)	3.0	0.6	2.0	3.0	0.0	0.0	5.0	1.7	1.5	0.5	0.0	5.0	0.0	0.0	5.0	3.0
Angelfish (Pomacanthids)	2.0	1.2	4.0	2.7	0.0	0.0	6.7	4.1	1.5	1.5	6.0	1.0	0.0	0.0	7.0	7.0
Wrasses (Labrids)	6.0	2.0	84.0	10.3	0.0	0.0	94.3	50.9	5.5	4.5	92.0	41.0	0.0	0.0	133.0	129.0
Humphead wrasse	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Damselfish (Pomacentrids)	11.0	5.5	656.7	23.7	0.0	0.0	680.3	267.1	10.0	3.0	404.0	1.0	0.0	0.0	405.0	177.0
Fairy Basslets (Anthids)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Moorish Idols (*Zanclus cornutus*)	0.3	0.3	0.0	0.3	0.0	0.0	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total (target reef spp.):	**5.3**	**2.3**	**5.7**	**21.3**	**0.3**	**0.0**	**27.3**	**13.0**	**6.0**	**6.0**	**7.0**	**25.0**	**0.0**	**0.0**	**32.0**	**32.0**
Total (all reef spp.):	**28.3**	**11.8**	**747.3**	**60.3**	**0.3**	**0.0**	**808.0**	**329.0**	**24.5**	**14.5**	**509.0**	**72.0**	**0.0**	**0.0**	**581.0**	**341.0**

* Target species/families

** Surgeonfish in this size class are not counted as targets

Note: Hemigymnus Fasciatus & Hemigymnus Melapterus of Labrid family considered targets

Table 20. Substrate composition (%mean ±SE) at Mantigue Island Marine Sanctuary, Mahinog in 2015.

SUBSTRATE COVER	INSIDE SANCTUARY				OUTSIDE SANCTUARY	
	Scuba (7-8m)		Snorkel (3-4m)		Scuba (7-8m)	
	% cover	SE	% cover	SE	% cover	SE
Live hard coral	***32.4***	6.8	***35.6***	6.8	***11.9***	2.3
Branching	20.3	7.0	23.7	6.5	3.0	1.1
Massive	7.5	3.0	11.0	1.9	5.8	1.3
Foliose/Cup	1.8	0.3	0.4	0.2	1.8	1.1
Encrusting/Flat	2.9	1.0	0.6	0.4	1.4	0.7
Soft Coral	***1.8***	0.5	***1.0***	0.3	***1.6***	0.6
Non-living	***41.8***	7.1	***24.9***	2.5	***40.5***	4.9
Rock and Block	5.8	1.9	5.7	1.8	11.4	3.4
Rubble	20.2	8.5	2.1	0.9	3.5	0.5
Dead Coral with Algae	5.0	2.8	0.8	0.4	3.3	1.3
White Dead Coral	0.0	0.0	0.1	0.1	0.5	0.3
Sand	10.3	1.6	16.1	2.2	21.9	1.9
Silt	0.5	0.3	0.2	0.2	0.0	0.0
Others	***24.0***	11.1	***38.5***	7.1	***46.0***	6.4
Turf Algae	*0.0*	0.0	*0.0*	0.0	*4.5*	2.5
Fleshy Algae	*1.5*	0.6	*0.0*	0.0	*15.4*	3.7
Coralline Algae	0.1	0.1	2.1	1.2	0.1	0.1
Sponges	0.4	0.2	0.0	0.0	3.3	1.9
Seagrasses	20.8	11.7	35.7	6.5	22.1	7.7
Other Animals	1.3	0.6	0.7	0.4	0.6	0.2
TOTAL	***100.0***		***100.0***		***100.0***	
Environmental Parameters						
Mean Slope (degrees)	Slope/Crest		Slope/Flat		Slope	
Mean Topography (m) *	~		~		~	
Mean Depth/Range (m)	7.0		3.4		6.5	
Horizontal Visibility (m)	16.8		16.7		16.3	
No. of 50 m Transects	4		13		4	

~ no data available

* mean distance between lowest and highest point on the horizontal transect line

Table 21. Mean (±SE) fish species richness (species/500m^2) and density (fish/500m^2) per family at Mantigue Island Marine Sanctuary, Mahinog, Camiguin Island in 2015.

Family	INSIDE SANCTUARY								OUTSIDE SANCTUARY							
	Species		Size Class				Density		Species		Size Class				Density	
	Mean	SE	1-10 cm**	11-20 cm	21-30 cm	>30 cm	Mean	SE	Mean	SE	1-10 cm**	11-20 cm	21-30 cm	>30 cm	Mean	SE
Surgeonfish (Acanthurids)*	3.7	1.2	0.0	19.3	8.0	12.0	39.3	11.4	1.0	0.6	0.0	2.0	0.0	0.0	2.0	1.2
Rabbitfish (Siganids)*	2.3	0.3	0.0	0.7	19.3	5.3	25.3	2.4	0.7	0.7	1.0	0.7	0.0	0.0	1.7	1.7
Groupers (Serranids)*	0.3	0.3	0.0	0.0	0.0	1.3	1.3	1.3	0.3	0.3	0.3	0.0	0.0	0.0	0.3	0.3
Barramundi cod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Snapper (Lutjanids)*	2.3	0.3	0.0	0.0	4.0	17.3	21.3	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sweetlips (Haemulids)*	1.0	0.6	0.0	0.0	0.0	2.7	2.7	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Emperors (Lethrinids)*	0.7	0.3	0.0	2.7	0.0	2.7	5.3	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jacks (Carangids)*	0.3	0.3	0.0	0.0	0.0	1.3	1.3	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fusiliers (Caesionids)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spinecheeks (Nemipterids)*	0.3	0.3	0.0	2.7	0.0	0.0	2.7	2.7	1.0	0.6	0.0	1.3	0.0	0.0	1.3	0.9
Goatfish (Mullids)*	2.0	0.6	0.0	24.7	0.0	0.0	24.7	10.7	1.7	0.3	1.3	3.3	0.0	0.0	4.7	1.5
Parrotfish (Scarids)*	3.0	0.6	0.0	13.3	2.7	2.7	18.7	0.7	2.3	0.7	5.7	9.0	0.0	0.0	14.7	7.3
Bumphead parrotfis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rudderfish (Kyphosids)*	1.0	0.0	0.0	0.0	4.7	9.3	14.0	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Triggerfish (Balistids)	2.0	0.6	0.0	3.3	2.7	0.0	6.0	1.2	1.0	0.6	0.0	1.3	0.0	0.0	1.3	0.9
Butterflyfish (Chaetodonids)	4.0	1.0	0.7	19.3	0.0	0.0	20.0	5.0	0.7	0.3	0.7	0.3	0.0	0.0	1.0	0.6
Angelfish (Pomacanthids)	1.0	0.6	0.0	2.7	1.3	0.0	4.0	2.3	1.0	1.0	1.3	0.3	0.0	0.0	1.7	1.7
Wrasses (Labrids)	5.7	0.3	26.7	12.0	19.3	0.0	58.0	3.1	4.7	2.2	62.7	11.7	0.3	0.0	74.7	47.3
Humphead wrasse	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Damselfish (Pomacentrids)	8.7	0.9	458.7	3.3	0.0	0.0	462.0	143.2	8.7	3.8	173.0	8.7	0.0	0.0	181.7	92.4
Fairy Basslets (Anthids)	1.0	0.0	193.3	0.0	0.0	0.0	193.3	103.5	1.0	0.0	30.0	13.3	0.0	0.0	43.3	20.3
Moorish Idols (*Zanclus cornutus*)	0.7	0.3	0.0	4.0	0.0	0.0	4.0	2.3	0.7	0.3	0.0	1.0	0.0	0.0	1.0	0.6
Total (target reef spp.):	**17.0**	**1.2**	**0.0**	**64.3**	**39.7**	**54.7**	**158.7**	**15.4**	**7.0**	**1.5**	**8.3**	**16.7**	**0.0**	**0.0**	**25.0**	**9.3**
Total (all reef spp.):	**40.0**	**3.2**	**679.3**	**108.0**	**62.0**	**54.7**	**904.0**	**242.9**	**24.7**	**7.9**	**276.0**	**53.0**	**0.3**	**0.0**	**329.3**	**157.8**

* Target species/families

** Surgeonfish in this size class are not counted as targets

Note: Hemigymnus Fasciatus & Hemigymnus Melapterus of Labrid family considered targets

SUMMARY OF RESULTS AND TRENDS

Coral Reef and Other Substrate

Among all the survey sites in this study, the MPAs with the highest hard coral cover at 7-8 meters depth, rating at Good (50% - 74.9% mean LHC cover, Gomez categories), were Balite (72.3%) in Sagay, Pasil Sunken Cemetery Reef (68.9%) in Catarman, and White Island (57.8%) and Kabiling-Tupsan (51.1%) in Mambajao. MPAs with a Fair rating (25% - 49.9% mean LHC cover, Gomez categories) were Lawigan (43%) in Catarman, Mantigue Island (32.4%) in Mahinog, and Alangilan (32%) in Sagay. In Balite, the outside reef also displayed a Good rating at 68.1% as did the non-sanctuary area of Pasil Reef at 70.3% hard coral cover (Figure 43).

In the shallow reef, at 3 to 4 meters depth, only Balite in Sagay and San Roque in Mahinog had Good hard coral cover at 60.6% and 53.5%, respectively. Marine protected areas with Fair hard coral cover were Pasil (45.5%) in Catarman and Mantigue Island (35.6%) in Mahinog (Figure 44).

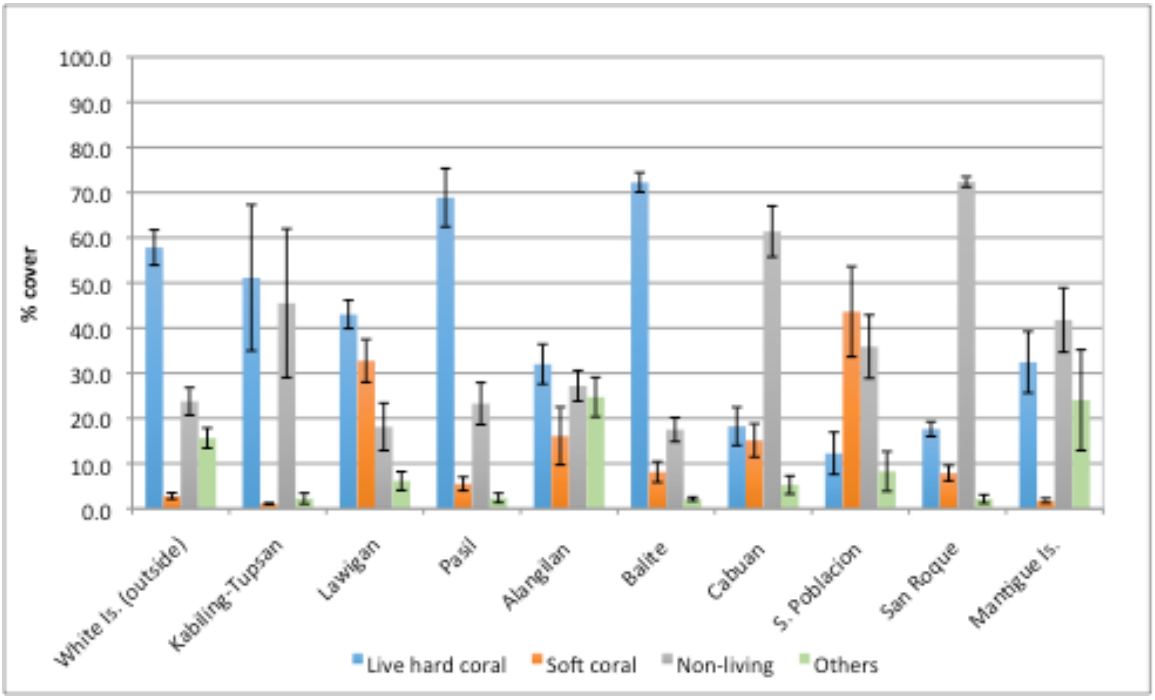

Figure 43. Substrate composition (%mean ±SE) at 7-8 m depth in survey site at Camiguin Island, 2015.

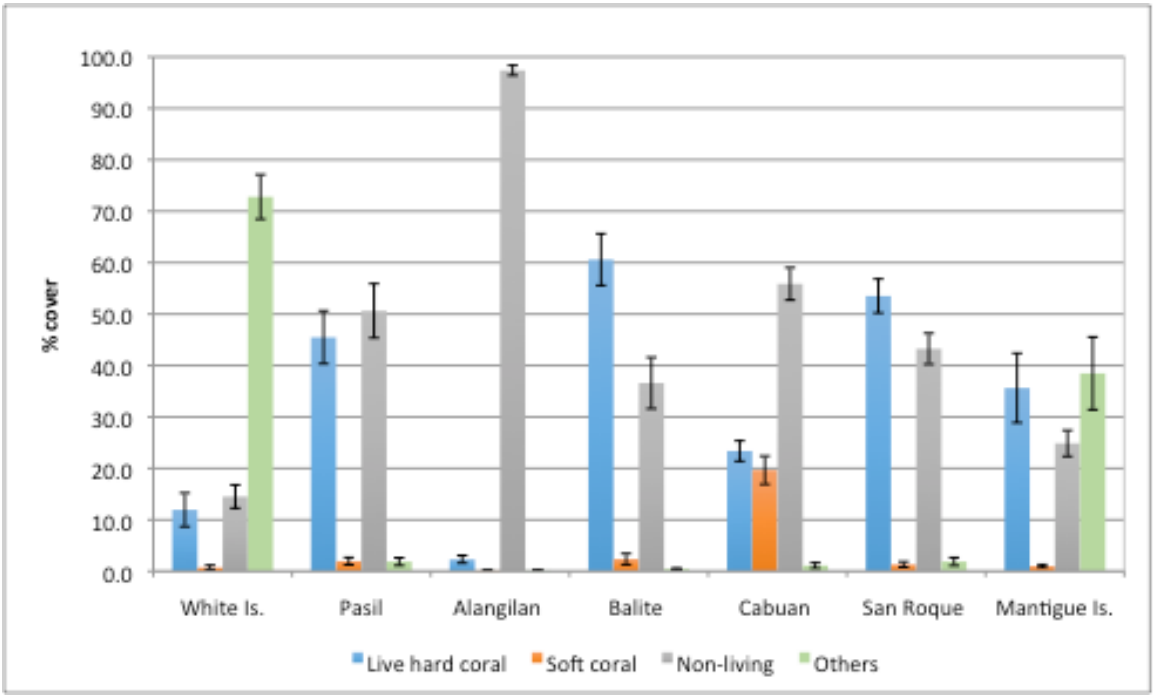

Figure 44. Substrate composition (%mean ±SE) at 3-4 m depth in survey site at Camiguin Island, 2015.

Fish Diversity, Abundance, and Biomass

Target fish densities were generally quite low in all sites surveyed in Camiguin Island. Based on the Hilomen categories, survey sites in Camiguin Island rated at Poor to Very Poor. For target fish species, South Poblacion Marine Sanctuary had the highest density among the sites with 208.7 fish/500m^2 (Figure 45). Following were Mantigue Island with 158.7 fish/500m^2 and White Island Marine Sanctuary with 120 fish/500m^2. For all reef fish species results showed that numbers were rated generally between Poor and Moderate. The highest all reef fish species densities were at South Poblacion (1,378.7 fish/500m^2), Lawigan (1,186 fish/500m^2), and Kabiling-Tupsan (1,146 fish/500m^2). However, it must be noted that a majority of the fish that make up these high numbers are damselfishes (Figure 46). The relative lack of target fish observed on the Camiguin reefs reflects heavy fishing pressure outside of the sanctuaries, some probable fishing inside the sanctuary (no-take zones) and the relatively small size of the core zones whereby target fish can easily move outside of the no-fishing area.

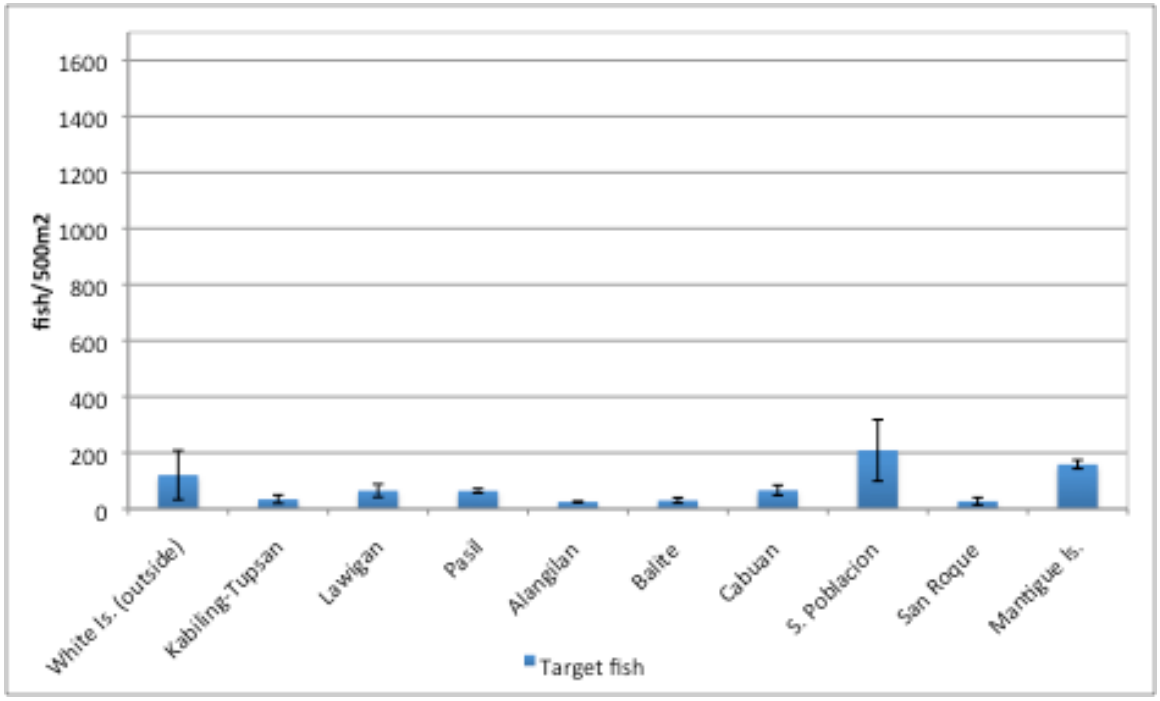

Figure 45. Target fish density (fish/500m^2) at survey sites in Camiguin Island in 2015.

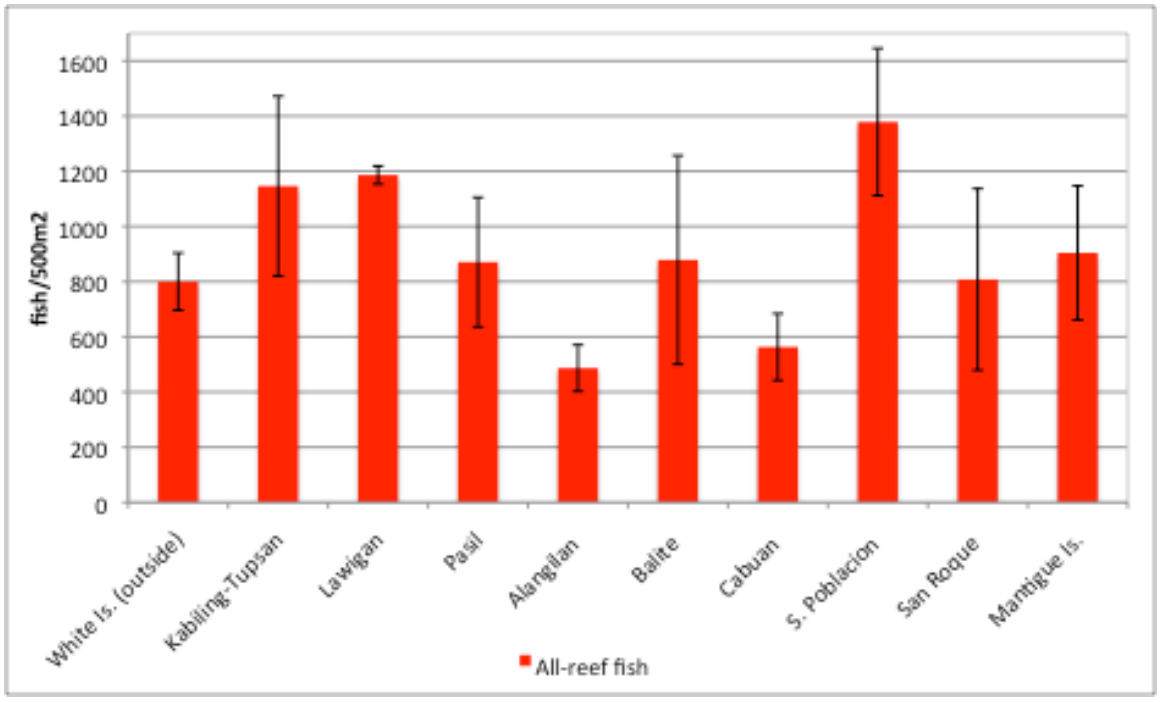

Figure 46. All reef fish density (fish/500m^2) at survey sites in Camiguin Island in 2015.

For target reef species of fish in Camiguin sites, based on the Hilomen categories, all sites rated at Very Poor. The survey site with the highest number of target fish species/500m^2 was Mantigue Island with 17 species/500m^2. This was followed by Cabuan with 11.3 species/500m^2, Kabiling-Tupsan with 10.3 species/500m^2, and South Poblacion with 9 species/500m^2 (Figure 47).

In terms of all reef species of fish in survey sites, rating ranged between Very Poor and Poor. The sites with the highest number of fish/500m^2 of all reef species were Mantigue Island (40 species/500m^2) and Lawigan (39 species/500m^2). These sites were followed closely by South Poblacion (35 species/500m^2), Kabiling-Tupsan (35 species/500m^2), and Pasil (32.7 species/500m^2) (Figure 48).

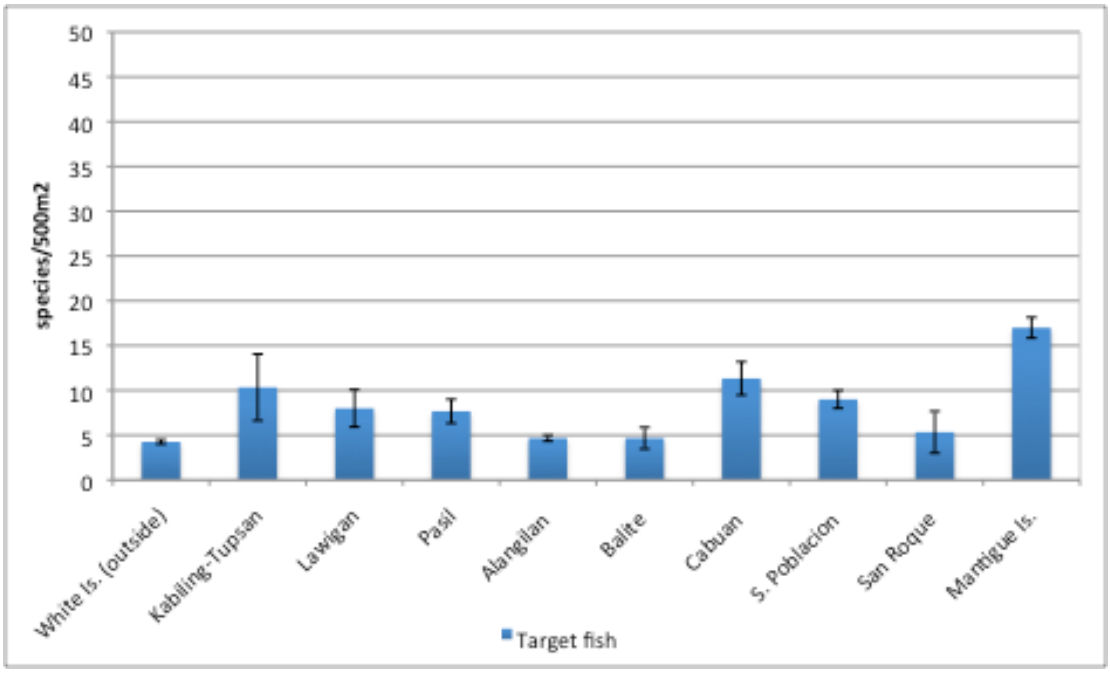

Figure 47. Target fish species richness (species/500m^2) at survey sites in Camiguin Island in 2015.

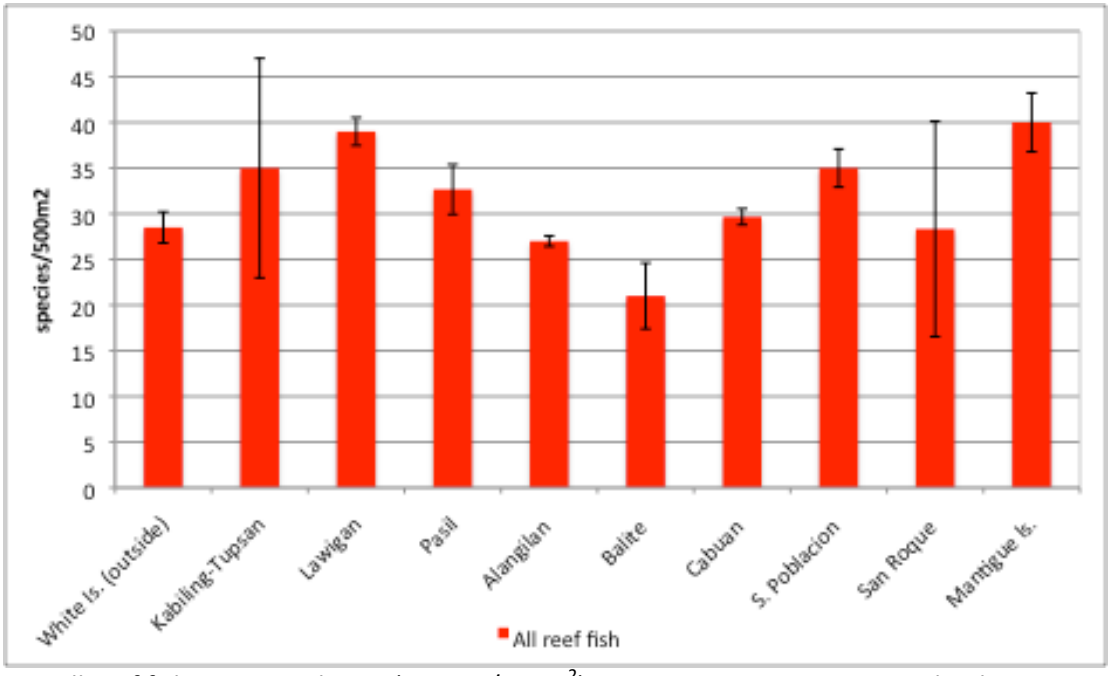

Figure 48. All reef fish species richness (species/500m^2) at survey sites in Camiguin Island in 2015.

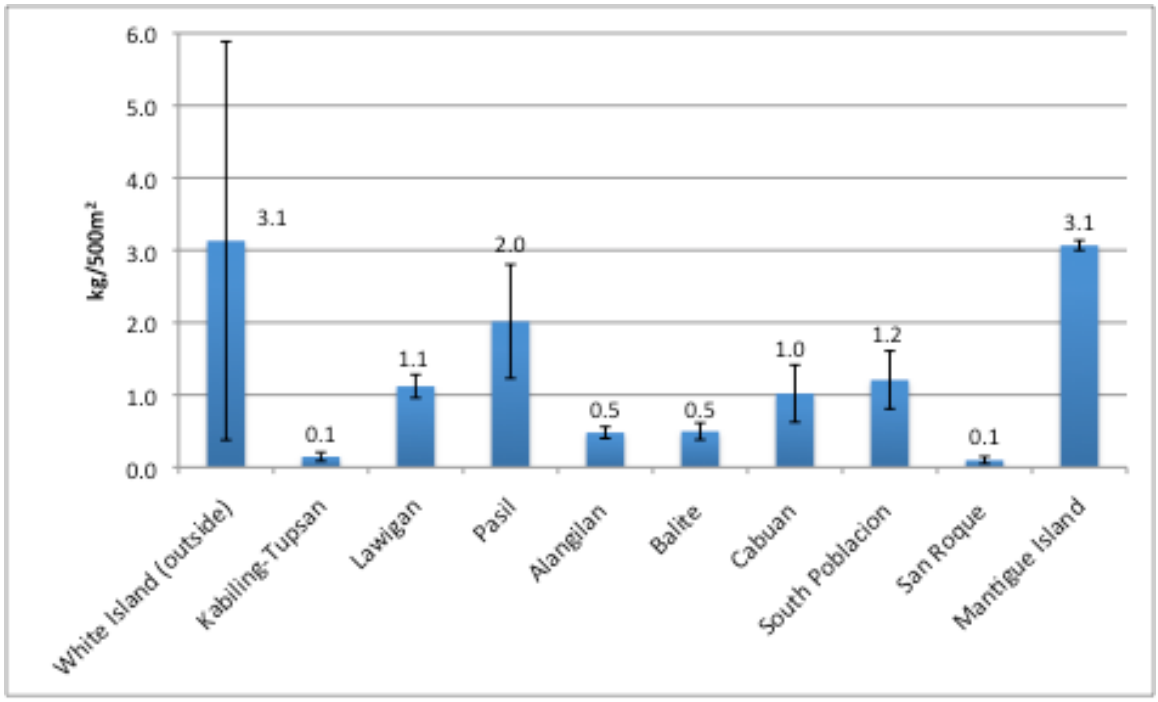

Figure 49. Mean target fish biomass (kg/500m^2) at all survey sites in Camiguin Island in 2015.

The highest biomass of target fish recorded inside a sanctuary among the survey sites of this expedition were at Mantigue Island, Mahinog at 3.1 kg/500m^2, and White Island in Mambajao at 3.1 kg/500m^2

(Figure 49). This was then followed by Pasil in Catarman with 2 kg/500m^2. The lowest target fish biomass was recorded at San Roque Marine Sanctuary at 0.1 kg/500m^2. A general trend when comparing sites is that the sites with better enforcement of MPAs have higher biomass figures than those with little or no enforcement at all. All the survey sites rated Very Poor in terms of fish biomass based on the Hilomen categories. As noted, a contributing factor to the low biomass is the relatively small size of the marine sanctuaries, which makes it more difficult for fish biomass to build up without spilling into fished areas.

RECOMMENDATIONS FOR IMPROVED SURVEYS AND MPA MANAGEMENT

The management groups in Camiguin Island have at least five years of experience in managing their marine protected areas, especially since the Camiguin Coastal Resource Management Project has been implemented there. They are well aware of their successes and areas needing improvement. The suggestions below are intended to help management groups in identifying areas for improvement as well as to share and reflect on a few observations from our 2015 visit to the area. Overall there is much progress in marine resource management resulting from the MPAs established around the island. But, as with any new program, improved results will only come with renewed efforts and investment to make it truly viable and successful.

RECOMMENDATIONS BY SITE:

White Island MPA, Mambajao
The location of the sanctuary needs to be reconsidered because it is on the side of the island where the currents are strong and moving to the south. This means that juvenile fish and larvae will probably aggregate on the southern side of the island which is a non-sanctuary side and which can still experience fishing. Further studies on where the richest area in coral and sea-life may need to be done in the area to support a recommendation to put the sanctuary in an appropriate place but it is strongly suggested that the sanctuary be moved to the south side of the island which can still be compatible with a tourist visitation area.

Kabiling-Tupsan MPA, Mambajao
There are no marker buoys delineating the Kabiling-Tupsan Marine Sanctuary so it is not clear where fishermen should not fish and where people are not allowed to enter. Marker buoys need to be installed, along with mooring buoys. There also needs to be more visible enforcement in the area to ward away violators and remind fishers and visitors that there is an enforced protected area there.

Lawigan MPA, Catarman
This area clearly had active management and enforcement. The site had well-maintained marker buoys to delineate the MPA. However, there were no mooring buoys where the boat could moor during the dive. There is a need to install mooring buoys for visitors and divers so that anchoring and damage to corals in the MPA vicinity can be prevented.

Pasil Sunken Cemetery MPA, Catarman
Pasil Marine Sanctuary had an active *Bantay Dagat*, had very clear markings as to where the MPA was, and had mooring buoys. As a tourist area, the management group is very vigilant in protecting the area. The only challenge would be to maintain the enforcement being done to control the high volumes of visitors and divers in the area.

Alangilan MPA, Sagay
Alangilan needs to address the lack of marker buoys in the area to show where the MPA core zone is. Further, they may also want to consider placing anchor buoys near the MPA so that visitors have a place to anchor boats when exploring the area.

Balite MPA, Sagay
At only five hectares it is recommended that the management group and the community revisit the consideration in the size of the sanctuary. Balite is an MPA with good hard coral cover and has potential to be a successful sanctuary, especially if increased in size.

Cabuan MPA, Guinsiliban
Cabuan is another small marine protected area that the community should consider making larger. This marine sanctuary has potential to be successful, especially with the active community members. Making it larger can ensure better representation of habitats within the protected area.

South Poblacion MPA, Guinsiliban
South Poblacion is a well-marked, large marine sanctuary with one of the highest fish densities among all the sites. However, the density is still low when compared to other Philippine MPAs and the biomass is also poor. This suggests that there may still be fishing going on in the MPA when enforcement officials are not looking. It is recommended to increase patrolling in the area.

San Roque MPA, Mahinog
This marine protected area is large but is located in a very busy area of the island. It is an area with the lowest fish biomass recording among all the survey sites. This may be because it may still be experiencing fishing in the core zone. It is recommended that enforcement be tightened in the area and that more signboards and buoys be installed to show that it is a no-take area.

Mantigue Island MPA, Mahinog
This area is a well-protected area, yet the fish density and species richness is still not as high as other MPAs in the Philippines that have well-protected core zones. Although it has one of the highest fish biomass readings among the survey sites, 3.1 kg/500m^2 is still rated as Very Poor based on Hilomen categories. It is possible that there is still fishing ongoing in the area. It was observed that there were fish traps underwater located right outside sanctuary boundaries. It may help to increase the core zone area and maybe include a buffer zone around the core zone to lessen fishing pressure on the boundaries.

MPA Size (has.)	MPA Rating (2014)	Suggested MPA Rating	Notes on Needed Improvements
White Island Marine Sanctuary (Municipality of Mambajao)			
19.7	4	3	• Further study and research on possible relocation of MPA to more appropriate coral rich area of the island (southern side of White Island)
Kabiling Tupsan Marine Sanctuary (Municipality of Mambajao)			
11	2	1	• Installation of marker buoys to delineate MPA • Installation of mooring buoys for visiting boats • Need for visible enforcement to ward away violators and remind visitors of MPA regulations
Lawigan Marine Sanctuary (Municipality of Catarman)			
4.9	1	1	• Installation of mooring buoys to prevent coral damage by visiting boats
Pasil Sunken Cemetery Marine Sanctuary (Municipality of Catarman)			
27.2	3	3	• Continue maintenance of enforcement and control of visitors to the area
Alangilan Marine Sanctuary (Municipality of Sagay)			
5	2	1	• Installation of marker buoys to delineate MPA • Installation of mooring buoys for visiting boats
Balite Marine Sanctuary (Municipality of Sagay)			
5	2	2	• Increase MPA size for better protection of coral habitat

MPA Size (has.)	MPA Rating (2014)	Suggested MPA Rating	Notes on Needed Improvements
Cabuan Marine Sanctuary (Municipality of Guinsiliban)			
5	2	2	• Increase MPA size for better protection and habitat representation
South Poblacion Marine Sanctuary (Municipality of Guinsiliban)			
16	2	2	• Increase patrolling
San Roque Marine Sanctuary (Municipality of Mahinog)			
6	1	1	• Stricter enforcement in the area due to boat traffic • More signboards and buoys be installed to show that it is a marine protected area
Mantigue Island Marine Sanctuary (Municipality of Mahinog)			
7	4	4	• More enforcement at boundaries • Increase the core zone area • Include a buffer zone around the core zone to lessen fishing pressure on the boundaries.

GENERAL RECOMMENDATIONS:

In general, the following recommendations are suggested for a majority of the sanctuaries visited during this 2015 expedition:

The need for marker buoys to delineate the core zones (and buffer zones) of the marine sanctuary. Very few of the sanctuaries that were surveyed in this expedition had clear marker buoys that delineated the core zones of the sanctuaries. This made it difficult to determine which area was inside or outside the MPA during the dive assessment day. It is important to install marker buoys to let the public know, fishers and visitors, that there is a no-take zone and that it is a violation to enter and fish there.

Mooring buoys should be installed near the sanctuary, especially for those sanctuaries that have user-fees for visitors and divers. In almost all the sanctuaries that were surveyed, there were no mooring buoys for our boat to moor to and to prevent damage to the substrate beneath. Mooring buoys will make it easier for dive/visitor boats to moor without damaging precious coral reef in the vicinity of the marine sanctuaries.

Regular monitoring of coral and fish health in the sanctuaries should be done. With this initial assessment, along with the fact that the provincial management groups were trained in the same method (PIT and FVC transect belt) by CCEF in 2014 (under the CCRMP), it is advisable to continue assessments annually to see if there is improvement in the health of the marine protected area. With regular results, trends can be determined and management decisions and policies can be appropriately created for improvement.

Stakeholders and adjacent communities should be informed of monitoring results and sanctuary management updates. It is vital for MPA managers to constantly share information about the MPA, its status, and updates in regulations and rules to community and stakeholders. By doing this there will be more community buy-in for the MPA which will make enforcement and management easier.

Sanctuaries should undergo an annual or biannual Marine Protected Area (MPA) Management Effectiveness Assessment Tool review. By implementing a workshop to determine MPA MEAT rating,

both the communities and management groups will be aware of how well their MPA is doing, what the gaps are in proper implementation of a proper protected area, and how they can improve their performance in enforcement and management. It should also be remembered that the MPA-MEAT is a planning and assessment tool that will help the LGU and community attain improved protection and benefits.

Visible and stricter enforcement of sanctuary boundaries and regulations is needed. It was clear that all the sanctuaries had assigned *Bantay Dagat* to enforce MPA rules and regulations. Although some of the MPAs had exceptional visibility in terms of enforcement (e.g. fish wardens approach us when we enter the sanctuary), others had no guards to approach visitors and fishers that enter the core zone. With little or no enforcement, illegal entry and fishing will be common.

Visible markers and billboards to show there is a sanctuary in the area. It is also important to have big, clear, visible signs that a sanctuary begins and ends in a certain area (e.g. for shoreline MPAs) and what the rules and regulations are covering that particular MPA (e.g. penalties, user-fees, do's and don'ts, etc.). With clear signs, visitors and fishers have no reason to hide behind the reason of ignorance or having no knowledge of the MPA being there if they commit infractions or violations.

Increase the size of some of the MPAs, especially those that are 5 hectares and below. Some of the sanctuaries are quite small in Camiguin Island and management groups and communities should think about increasing the size to cover more viable reef habitat for better connectivity to other MPAs. Fish do not stay in one place, and the smaller the sanctuary, the more difficult it is to provide an ample protected area for the fish to live in to reproduce and grow to maturity. There is a standing recommendation in the Philippines through the MPA Support Network that all marine sanctuaries cover at least 10 hectares.

Consider networking MPAs under a provincial network. By networking MPAs under a provincial network, towns will be able to share resources to enforce rules, implement user fees, and improve management. This will allow MPA management and enforcement groups to level off with other MPA groups to standardize training for enforcement and other management strategies under the province. However, networking MPAs needs the support of the governor and all the mayors to make the network succeed.

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Appendix 1. Expedition Itinerary

ITINERARY OF EVENTS
Saving Philippine Reefs, April 12- 20, 2015

DAY	DATE & SITE	TIME	ACTIVITIES
1	Sunday, April 12 Bahay Bakasyunan sa Camiguin (BBC), Mambajao House reef of BBC	9:00 AM 11:00 12:00 1:00 PM 7:00 8:00	Rendezvous at Bahay Bakasyunan sa Camiguin Welcome and Briefing (A. White) About the Camiguin Coastal Resource Management Project-CCRMP (E. Deguit) Lunch Briefing (practice of monitoring techniques to be used) Practice of systematic snorkel and scuba survey monitoring protocols Dinner Slide show/Quiz and Identification Presentation of CCEF (M. Alava)
2	Monday, April 13 White Island MPA, Mambajao	7:00 AM 8:30 12:00 PM 1:30 5:00 7:00	Breakfast Morning briefing Conduct surveys (scuba and snorkel) Lunch Conduct scuba survey Compile and submit completed data entry Dinner Butterflyfish quiz
3	Tuesday, April 14 Lawigan MPA, Catarman Pasil Sunken Cemetery MPA, Catarman	7:00 AM 8:30 12:00 PM 1:30 5:00 7:00	Breakfast Morning briefing Conduct surveys (snorkel and scuba) Lunch Conduct survey (scuba) Compile and submit completed data entry Dinner Presentation on Tubbataha results (A. White)
4	Wednesday, April 15 Alangilan MPA, Sagay Balite MPA, Sagay	7:00 AM 8:30 12:00 PM 1:30 5:00 7:00	Breakfast Morning briefing Conduct surveys (snorkel and scuba) Lunch Conduct surveys (scuba) Compile and submit completed data entry Dinner Optional night dive on house reef

DAY	DATE & SITE	TIME	ACTIVITIES
5	Thursday, April 16 Cabuan MPA, Guinsiliban South Poblacion MPA, Guinsiliban	7:00 AM 8:30 12:00 PM 1:30 5:00 7:00	Breakfast Morning briefing Conduct surveys (snorkel and scuba) Lunch Conduct surveys (scuba) Compile and submit completed data entry Dinner Presentation of TNC work (A. White)
6	Friday, April 17 San Roque MPA, Mahinog Kabiling-Tupsan MPA, Mambajao	7:00 AM 8:30 12:00 PM 1:30 5:00 7:00	Breakfast Morning briefing Conduct surveys (snorkel and scuba) Lunch Conduct surveys (scuba) Compile and submit completed data entry Dinner Optional night dive on house reef
7	Saturday, April 18 Mantigue Island MPA, Mahinog	7:00 AM 8:30 12:00 PM 1:30 5:00 7:00	Breakfast Morning briefing Conduct surveys (snorkel and scuba) Lunch Afternoon scuba fun dive Compile and submit completed data entry Dinner Volunteer photo contest
8	Sunday, April 19 Camiguin Island Tour	7:00 AM 8:30 12:00 PM 6:30 8:00	Breakfast Camiguin Island Tour Lunch Camiguin Island Tour Dinner Summary of Impressions and Debriefing (Alan) Closing/Summary Staff travel back to Cebu City, Cebu (boat)
9	Monday, April 20 BBC – Camiguin Airport	5:30 AM 6:00	Breakfast Volunteers depart for airport (for Cebu or Manila)

Appendix 2. Expedition Volunteers and Staff

Saving Philippine Reefs Volunteers
April 12 - 20, 2015
Camiguin Island, Philippines

	Name/Address	Profession/Affiliations/Interests
1	**Denise Illing**	Financial Department, UNICO Computer Systems. BA in Geography and Sociology. Interested in marine life, reefs, and diving. Wildlife artist. Watercolourist. 12th Saving Philippine Reefs Expedition.
2	**Geoff Illing**	UNICO Computer Systems Technical Director. Interested in marine life, reefs, and diving. Keen amateur musician. 12th Saving Philippine Reefs Expedition.
3	**Thomas J. Mueller**	Educational Consultant; Retired College Professor; PhD in Biology; small boat experience, especially sail; underwater photographer; SCUBA instructor; CCE Foundation, Institutional Development Advisor – Board Member. 16th Saving Philippine Reefs Expedition.
4	**Alexander Douglas Robb**	IP Researcher; Civil Engineer BSC (Hons) Edinburgh; MSC Melbourne – History & Philosophy of Science; 10th Saving Philippine Reefs Expedition.
5	**Alastair Pennycook**	Professor of Language in Education, University of Technology Sydney Yachting Australia Coastal Skipper, PADI Master Diver, underwater photography. 7th Saving Philippine Reefs Expedition.
6	**John Campbell Rowland**	UNICO Computer Systems Managing Director; Engineer; Software Engineering; Certified SSI Advanced Open water Advanced Nitrox; Advanced Decompression: Deep; Night. 6th Saving Philippine Reefs Expedition.
7	**Vittoria Thornley**	BA (Hons) Human Sciences (Oxon.). MSc Ecology (Univ. of Bristol). Advanced ADI Open Water. Officer Manager, Thornley Kelham Ltd. Interest in nature and marine conservation, horticulture, classic cars, travel writing, and yoga; 13th SPR Expedition.
8	**Julia Cichowski**	Lead a user experience design team for a financial services company based in Boston, Fidelity Investments. We design web-based and mobile digital user experiences; On the Board of Directors for a Massachusetts based non-profit, Oceanic Research Group; On the production team for Jonathan Bird's Blue World, an educational underwater adventure series on Public Television in the U.S.; Formal education in Computer Science and economics; Amateur underwater photographer; Favorite ways to relax – yoga, scuba diving, traveling;

	Name/Address	Profession/Affiliations/Interests
		This will be my 16th Saving Philippine Reefs Expedition, and I've loved them all.
9	**Sheree Marris**	Aquatic Scientist/Environmental Communicator; Board member of Unico Conservation Foundation; 4th Saving Philippine Reefs Expedition.
10	**Allie Sifrit**	Student at UH. Marine Biology major; 2nd Saving Philippine Reefs Expedition
11	**Kenneth Mark Hillebrand**	Strategic Management and Marketing Consultant; Augmented Reality; Private pilot; Snow skiing and sailing; 1st Saving Philippine Reefs Expedition.

Saving Philippine Reefs Staff
April 12 – 20, 2015
Camiguin Island, Philippines

	Name/Address	Contact numbers/fax/email	Profession/Affiliations/Interests
1	**Dr. Alan T. White** Principal Investigator	Phone: 808-262-1091 alan_white@tnc.org	Senior Scientist and Coral Triangle Program Manager, The Asia-Pacific Program, The Nature Conservancy President Coastal Conservation and Education Foundation, Inc. (CCEF)
2	**Evangeline White** SPR Project Manager	Phone: 808-489-2460 vangiewhite@hawaiiantel.net	Saving Philippine Reefs Expedition Project Manager; YWCA of Oahu Health and Wellness Program Manager.
3	**Jonathaniel Apurado** Co-Principal Investigator/ Divemaster	Phone: (6332) 233-6909 jonapu@yahoo.com	Research and Monitoring Team (REMOTE) – Team Leader Coastal Conservation and Education Foundation, Inc. (CCEF)
4	**Sheryll Tesch** Logistics Coordinator	Phone: (6332) 233-6909 teschsheryll@gmail.com	Independent Consultant
5	**Agnes Sabonsolin** Logistics Assistant	Mob: 0927 294 0094 ac.sabonsolin@gmail.com	Senior Field Officer Mercy Corps Underwater Photography.
6	**Dalton Dacal** Fish Counter	Mob: 09982528776 eugenia_gracilis@gmail.com	Marine Biologist/GIS Specialist Zoological Society of London (Philippines)
7	**Al Jiereil M. Lozada** Data Coordinator	Phone: 032 414 6716, Cell: 639278298309 ajlozada11012@gmail.com	Computer System and Database Specialist Coastal Conservation and Education Foundation, Inc. (CCEF)

Appendix 3. Fish list

Family/Species	Alangilan	Balite	Cabuan	Kabilang-Tupsan	Lawigan	Mantigue Island	Pasil Reef	San Roque	South Poblacion	White Island
Acanthuridae	1	1	1	1	1	1	1	1	1	1
Acanthurus japonicus							1			
Acanthurus nigricans		1	1							
Acanthurus nigrofuscus				1						
Acanthurus pyroferus		1							1	
Acanthurus thompsoni			1		1					
Ctenochaetus binotatus	1	1	1	1	1	1	1	1	1	1
Ctenochaetus striatus	1	1	1		1	1	1	1	1	1
Ctenochaetus tominiensis		1					1		1	1
Naso brevirostris				1		1				
Naso hexacanthus			1		1	1			1	1
Naso lituratus				1		1				1
Naso unicornis					1	1				
Naso vlamingii						1				
Paracanthurus hepatus		1								
Zebrasoma scopas		1	1	1	1	1	1	1	1	1
Anthiinae	1	1	1	1	1	1	1		1	1
Pseudanthias huchti	1	1	1	1	1	1	1			1
Pseudanthias tuka	1	1			1	1	1		1	1
Apogonidae	1	1		1	1	1			1	
Apogon aureus					1					
Apogon compressus				1		1			1	
Archamia fucata					1					
Archamia lineolata					1					
Cheilodipterus macrodon				1					1	
Cheilodipterus quinquelineatus	1	1		1		1			1	
Aulostomidae						1				
Aulostomus chinensis						1				
Balistidae	1	1	1	1	1	1	1	1	1	1
Balistapus undulatus		1	1	1	1	1	1	1	1	1
Balistoides conspicillum	1									
Balistoides viridescens						1				
Melichthys niger						1	1			
Melichthys vidua				1	1	1	1	1	1	1
Rhinecanthus aculeatus			1							
Rhinecanthus verrucosus		1						1		
Sufflamen bursa	1	1	1		1	1				
Sufflamen chrysopterus			1			1				
Xanthichthys auromarginatus						1				
Blenniidae	1	1	1		1	1	1		1	
Meiacanthus atrodorsalis	1									
Meiacanthus grammistes	1	1	1		1	1	1		1	
Caesionidae	1			1	1			1	1	1
Caesio caerulaurea								1		1
Caesio teres	1			1						
Pterocaesio lativittata										1
Pterocaesio pisang					1				1	
Carangidae						1				
Carangoides plagiotaenia						1				
Caranx sexfasciatus										
Centriscidae					1	1				
Aeoliscus strigatus					1					
Chaetodontidae	1	1	1	1	1	1	1	1	1	1
Chaetodon auriga							1			1
Chaetodon baronessa	1	1	1	1	1	1	1	1	1	1
Chaetodon kleinii	1	1	1	1	1	1	1	1	1	1
Chaetodon lineolatus							1			1
Chaetodon lunula			1	1	1					
Chaetodon lunulatus	1	1		1	1	1	1	1	1	1
Chaetodon ocellicaudus		1			1				1	1
Chaetodon octofasciatus									1	
Chaetodon ornatissimus							1			
Chaetodon oxycephalus			1			1			1	1
Chaetodon punctatofasciatus							1			
Chaetodon rafflesii					1	1	1			1

Family/Species	Alangilan	Balite	Cabuan	Kabilang-Tupsan	Lawigan	Mantigue Island	Pasil Reef	San Roque	South Poblacion	White Island
Chaetodon speculum							1			
Chaetodon trifascialis		1		1	1	1	1			1
Chaetodon ulietensis							1			1
Chaetodon vagabundus	1		1		1	1	1		1	1
Forcipiger flavissimus						1				
Forcipiger longirostris							1			
Hemitaurichthys polylepis							1			
Heniochus chrysostomus			1						1	1
Heniochus pleurotaenia	1	1	1		1	1	1			1
Heniochus singularius							1			
Heniochus varius	2	1	1	1	1		1	1	1	1
Cirrhitidae					1				1	
Cirrhitichthys falco					1				1	
Ephippidae						1	1			
Platax boersii							1			
Platax orbicularis						1				
Fistulariidae	1					1			1	
Fistularia commersonii	1					1			1	
Haemulidae			1	1	1	1	1	1	1	
Plectorhinchus chaetodonoides				1		1	1	1	1	
Plectorhinchus lessonii				1	1					
Plectorhinchus lineatus			1			1	1			
Holocentridae	1		1	1	1	1	1		1	1
Myripristis botche	1				1				1	
Myripristis violacea									1	
Neoniphon sammara										1
Sargocentron caudimaculatum			1			1	1			
Sargocentron ittodai						1				
Sargocentron spiniferum				1						
Sargocentron violaceum							1			1
Kyphosidae						1				
Kyphosus bigibbus						1				
Labridae	1	1	1	1	1	1	1	1	1	1
Anampses twistii				1						
Bodianus axillaris		1								
Bodianus diana	1	1	1		1		1			
Bodianus mesothorax	1	1	1	1	1	1	1		1	1
Cheilinus chlorourus	1				1		1	1	1	1
Cheilinus fasciatus	1			1	1			1	1	
Cheilinus trilobatus	1		1	1	1	1				
Cheilio inermis			1			1				
Choerodon anchorago						1				
Cirrhilabrus cyanopleura	1	1	1	1	1	1		1	1	1
Cirrhilabrus lubbocki						1		1	1	
Coris batuensis	1		1	1		1			1	
Coris gaimard	1		1	1	1	1	1			
Epibulus insidiator	1			1	1		1		1	
Gomphosus varius		1		1	1		1			1
Halichoeres argus									1	
Halichoeres biocellatus									1	
Halichoeres chrysus									1	
Halichoeres hortulanus	1	1	1	1	1	1	1			1
Halichoeres melanurus	1		1						1	
Halichoeres nebulosus			1							
Halichoeres podostigma					1	1		1		
Halichoeres prosopeion	1				1	1				
Halichoeres scapularis	1		1	1	1	1		1	1	
Hemigymnus fasciatus				1	1	1	1	1		1
Hemigymnus melapterus			1	1	1	1	1	1		
Hologymnosus doliatus				1						
Labrichthys unilineatus		1		1			1		1	1
Labroides bicolor				1						
Labroides dimidiatus	1	1	1		1	1	1	1	1	1
Macropharyngodon meleagris		1	1	1	1		1		1	
Macropharyngodon negrosensis				1						
Novaculichthys taeniourus						1				
Oxycheilinus celebicus		1		1			1	1		

Family/Species	Alangilan	Balite	Cabuan	Kabilang-Tupsan	Lawigan	Mantigue Island	Pasil Reef	San Roque	South Poblacion	White Island
Oxycheilinus digramma	1	1		1	1	1	1		1	1
Oxycheilinus rhodochrous						1	1	1	1	
Oxycheilinus unifasciatus			1							
Pseudocheilinus octotaenia									1	
Pseudodax moluccanus										1
Stethojulis bandanensis			1	1				1		
Stethojulis trilineata		1	1	1	1			1		
Thalassoma hardwicke		1	1	1	1	1	1	1		1
Thalassoma jansenii					1					
Thalassoma lunare	1	1	1	1	1	1	1	1	1	1
Lethrinidae				1	1	1	1			
Lethrinus erythracanthus					1		1			
Lethrinus erythropterus				1						
Monotaxis grandoculis						1	1			
Lutjanidae		1	1	1	1	1	1	1	1	1
Lutjanus argentimaculatus						1				
Lutjanus decussatus		1	1	1	1		1	1	1	
Lutjanus ehrenbergii					1	1				1
Lutjanus monostigma						1				
Macolor macularis						1	1			
Paracaesio sordidus										1
Monacanthidae					1	1	1			
Oxymonacanthus longirostris							1			
Paraluteres prionurus					1		1			
Pervagor janthinosoma						1				
Mullidae	1	1	1	1	1	1	1	1	1	1
Mulloidichthys flavolineatus			1		1	1				
Mulloidichthys vanicolensis						1		1		
Parupeneus barberinoides						1			1	
Parupeneus barberinus			1	1	1	1	1	1	1	1
Parupeneus indicus			1		1	1		1		
Parupeneus multifasciatus	1	1	1	1	1	1		1	1	
Nemipteridae	1	1	1	1	1	1	1	1	1	1
Pentapodus emeryii	1									
Scolopsis bilineatus	1	1	1	1	1	1	1	1	1	1
Scolopsis bilineatus			1	1	1					1
Scolopsis ciliatus								1		
Scolopsis lineatus	1		1						1	
Scolopsis margaritifer						1				
Scolopsis monogramma			1							
Ostraciidae		1								1
Ostracion cubicus										1
Ostracion meleagris		1								1
Pempheridae					1					
Pempheris adusta					1					
Pempheris vanicolensis					1					
Pinguipedidae	1		1	1		1		1	1	
Parapercis clathrata			1	1		1		1	1	
Parapercis cylindrica	1		1	1		1				
Parapercis hexophtalma			1			1				
Plesiopidae			1							
Calloplesiops altivelis			1							
Plotosidae					1					
Plotosus lineatus					1					
Pomacanthidae	1	1	1	1	1	1	1	1	1	1
Centropyge bicolor	1		1				1	1		
Centropyge nox									1	
Centropyge tibicen	1			1		1		1		
Centropyge vrolikii	1		1	1	1	1	1	1		1
Chaetodontoplus mesoleucus				1		1		1		
Genicanthus lamarck	1									
Pygoplites diacanthus	1	1	1	1	1	1	1	1	1	1
Pomacentridae	1	1	1	1	1	1	1	1	1	1
Abudefduf vaigiensis	1				1			1	1	1
Amblyglyphidodon aureus			1		1	1			1	
Amblyglyphidodon curacao	1	1		1	1	1	1	1	1	1
Amblyglyphidodon leucogaster	1	1		1	1	1	1	1	1	1

Family/Species	Alangilan	Balite	Cabuan	Kabilang-Tupsan	Lawigan	Mantigue Island	Pasil Reef	San Roque	South Poblacion	White Island
Amphiprion clarkii	1	1	1	1	1	1	1	1	1	1
Amphiprion frenatus				1	1	1		1		1
Amphiprion ocellaris			1	1	1					
Amphiprion perideraion	1	1	1	1	1	1			1	
Chromis amboinensis	1	1		1	1	1	1	1	1	1
Chromis analis					1	1				1
Chromis margaritifer	1	1		1	1		1	1	1	1
Chromis retrofasciata	1	1	1	1	1	1	1	1	1	1
Chromis ternatensis		1		1	1	1	1	1	1	1
Chromis viridis		1	1	1	1		1		1	
Chromis weberi	1		1	1	1		1	1	1	1
Chromis xanthura		1					1			1
Chrysiptera parasema	1				1	1				
Chrysiptera rex		1					1			
Chrysiptera rollandi	1	1		1		1	1	1	1	
Chrysiptera springeri				1						
Chrysiptera talboti	1	1	1	1	1	1			1	
Dascyllus aruanus			1	1		1		1	1	
Dascyllus reticulatus	1	1	1	1	1	1	1	1		1
Dascyllus trimaculatus	1		1	1	1	1		1		1
Dischistodus melanotus						1				
Dischistodus perspicillatus				1						
Neoglyphidodon melas								1	1	
Neoglyphidodon nigroris		1		1		1	1	1	1	1
Neoglyphidodon thoracotaeniatus		1			1		1		1	1
Plectroglyphidodon lacrymatus	1			1	1		1	1	1	1
Pomacentrus alexanderae	1	1		1	1	1	1	1	1	1
Pomacentrus amboinensis	1	1	1	1	1	1	1	1	1	1
Pomacentrus auriventris	1		1		1					
Pomacentrus bankanensis			1					1		
Pomacentrus brachialis	1	1	1	1	1	1	1	1	1	1
Pomacentrus burroughi				1				1	1	
Pomacentrus coelestis			1	1				1		
Pomacentrus lepidogenys					1		1			1
Pomacentrus moluccensis	1	1	1	1	1	1	1	1	1	1
Pomacentrus nigromarginatus										1
Pomacentrus stigma	1	1			1			1	1	1
Pomacentrus vaiuli	1			1					1	
Pomacentrus chrysurus										1
Premnas biaculeatus				1		1				
Ptereleotridae		1	1	1			1			1
Ptereleotris evides		1	1	1			1			1
Scaridae	1	1	1	1	1	1	1	1	1	1
Cetoscarus bicolor				1					1	
Chlorurus bleekeri			1	1	1	1	1	1		1
Chlorurus bowersi			1				1			
Chlorurus sordidus	1	1	1	1	1	1		1	1	
Scarus dimidiatus		1	1	1		1	1	1	1	1
Scarus flavipectoralis	1		1	1	1	1			1	1
Scarus forsteni			1							
Scarus frenatus										1
Scarus niger				1	1	1	1	1		
Scarus rivulatus		1	1	1					1	
Scarus rubroviolaceus			1							
Scarus schlegeli						1				
Scarus tricolor	1		1	1	1	1	1	1	1	1
Serranidae			1	1		1	1	1	1	1
Cephalopholis argus			1	1		1	1	1	1	1
Cephalopholis boenak				1						
Plectropomus areolatus						1				
Siganidae	1		1	1	1	1	1	1	1	1
Siganus argenteus			1			1				
Siganus canaliculatus					1				1	
Siganus guttatus					1	1				
Siganus puellus								1		
Siganus spinus						1				
Siganus stellatus					1					

Family/Species	Alangilan	Balite	Cabuan	Kabilang-Tupsan	Lawigan	Mantigue Island	Pasil Reef	San Roque	South Poblacion	White Island
Siganus unimaculatus							1			1
Siganus virgatus	1					1		1	1	
Siganus vulpinus				1						
Sillaginidae				1						
Sillago ciliata				1						
Sphyraenidae			1							
Sphyraena barracuda			1							
Sphyraena flavicauda				1						
Synodontidae					1			1		1
Saurida gracilis					1			1		1
Synodus variegatus					1					1
Tetraodontidae	1	1	1		1	1	1	1	1	1
Arothron nigropunctatus	1					1	1	1	1	1
Canthigaster papua		1	1		1					
Canthigaster valentini	1	1	1		1	1		1	1	
Zanclidae	1		1	1	1	1	1	1	1	1
Zanclus cornutus	1		1	1	1	1	1	1	1	1
TOTAL:	**93**	**83**	**112**	**123**	**134**	**146**	**114**	**95**	**117**	**106**

Total number of species recorded at Camiguin Island survey sites in 2015: 245 fish species

Appendix 4. Expedition Photos

Sunrise view from the BBC as the background for fishermen heading back home after a night at sea.

A couple of polka dot cowries (*Calpurnus verrucosus*) comfortably nestled on a soft coral.

This healthy looking neighborhood of rudderfish (*Kyphosus bigibbus*), soldierfish (*Myripristis murdjan*) and sweetlips (*Plectorhinchus lineatus*) makes one want to live here!

These big-eyed trevallies (*Caranx sexfasciatus*) at Mantigue Island were in the mood for love. During spawning season, the males turn black as seen in this picture.

Colorful feather stars are observed in almost all the dives during the Saving Philippine Reefs (SPR) expedition in Camiguin. This particular yellow shade is quite common but still a treat to see.

A school of young striped catfish (*Plotosus lineatus*) look like they are enjoying their summer vacation.

Reticulated damselfishes (*Dascyllus reticulatus*) are seen battling the current effortlessly by the huge table coral they call home.

A green sea turtle (*Chelonia mydas*) rests among these gorgonian soft corals at Mantigue Island.

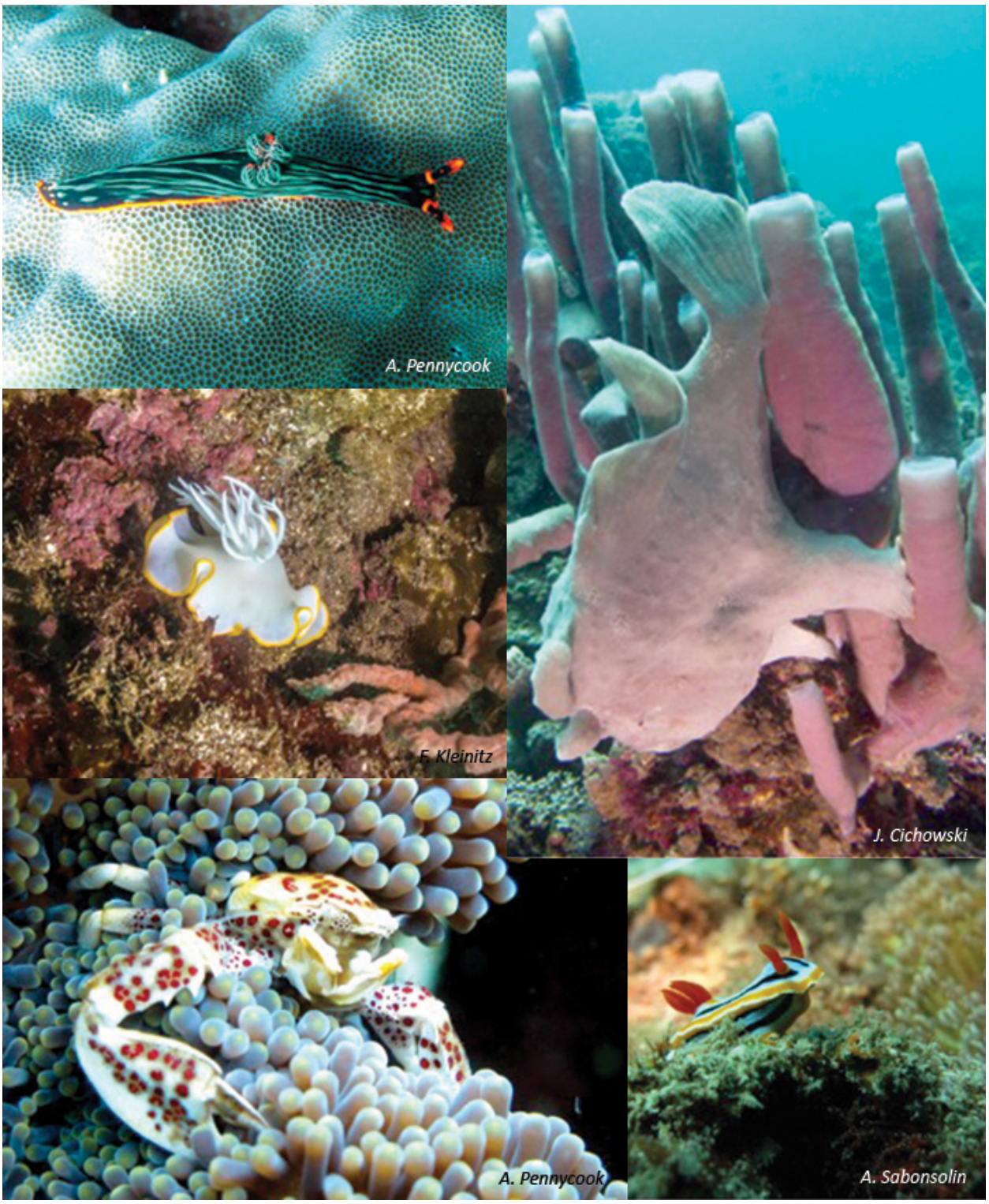
This ghost anemone shrimp is commonly found living on this beautiful purple polka dot anemone.

A scorpionfish (*Scorpaenopsis sp.*) stares right back at the camera lens while sitting camouflaged on the substrate.

A green sea turtle (*Chelonia mydas*) just waking up from its slumber amidst branching corals at around 10m deep.

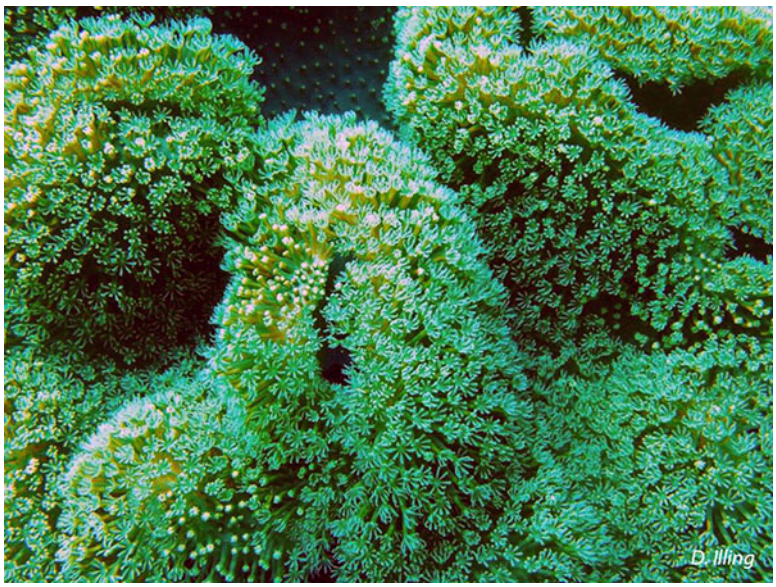
An ever-tempting scene to photograph: a family of clownfishes (*Amphiprion ocellaris*) on the Magnificent Anemone.

Large fish species (>30cm) such as sweetlips (*Plectorhincus chaetodonoides*, juvenile), midnight snappers (*Macolor macularis*), big-eyed trevallies (*Caranx sexfasciatus*) and rabbitfish (*Siganus guttatus*) are easily spotted while diving in Camiguin.



Aside from larger marine life, Camiguin also offers a myriad of fauna perfect for macro lovers. These are just among those found within Camiguin's underwater paradise: colorful nudibranchs, a porcelain crab (*Neopetrolisthes maculatus*) and an inconspicuous frogfish (*Antennarius commersoni*)!

A visit to White Island with Vangie and Alan White. The SPR Team takes a much anticipated lunch break by the island. While only a few swam ashore, the same gorgeous view was shared by all.



In full bloom—polyps out and feeding

The Saving Philippine Reefs Team 2015. (L – R, standing) Jon Apurado, Vittoria Thornley, AJ Lozada, Julia Cichowski, Denise Illing, Allie Sifrit, Mark Hillebrand, Sheryll Tesch, John Rowland, Geoff Illing, Sandy Robb, Agnes Sabonsolin, Alan White, and TJ Mueller. (L – R sitting) Vangie White, Frank Kleinitz, Al Pennycook, and Dalton Dacal.

Appendix 5. Table of MPA Coordinates

Lawigan Marine Sanctuary (Municipality of Catarman)	
Latitude	Longitude
Fr Point 1 9.168356°	124.635573°
to Point 2 9.166880°	124.635440°
to Point 3 9.165925°	124.636518°
to Point 4 9.165720°	124.636340°
to Point 5 9.166700°	124.634420°
to Point 6 9.168060°	124.634320°
to Point 7 9.168356°	124.635573°

Pasil Sunken Cemetery Marine Sanctuary (Municipality of Catarman)	
Latitude	Longitude
Fr Point 1 9.20465°	124.6284°
to Point 2 9.20716°	124.62738°
to Point 3 9.21091°	124.62915°
to Point 4 9.20896°	124.63306°
to Point 5 9.20561°	124.63191°

Cabuan Marine Sanctuary (Municipality of Guinsiliban)
9° 7′ 22″ E 124° 48′ 17″ N
9° 7′ 25″ E 124° 48′ 20″ N
9° 7′ 21.3096″ E 124° 48′ 23.2380″ N
9° 7′ 14.8116″ E 124° 48′ 24.1256″ N

South Poblacion Marine Sanctuary (Municipality of Guinsiliban)
9° 07′ 35.5740″ E 124° 46′ 58.7676″ N
9° 05′ 35.6352″ E 124° 47′ 6.25920″ N
9° 05′ 21.8976″ E 124° 47′ 5.23360″ N
9° 05′ 22.3908″ E 124° 46′ 55.5024″ N

Mantigue Island Marine Sanctuary (Municipality of Mahinog)
124° 49′ 12.5940" E 9° 10′ 57.2628" N
124° 49′ 59.5956" E 9° 10′ 57.2628" N
124° 49′ 59.5956" E 9° 10′ 8.2632" N
124° 49′ 12.5940" E 9° 10′ 8.2632″ N