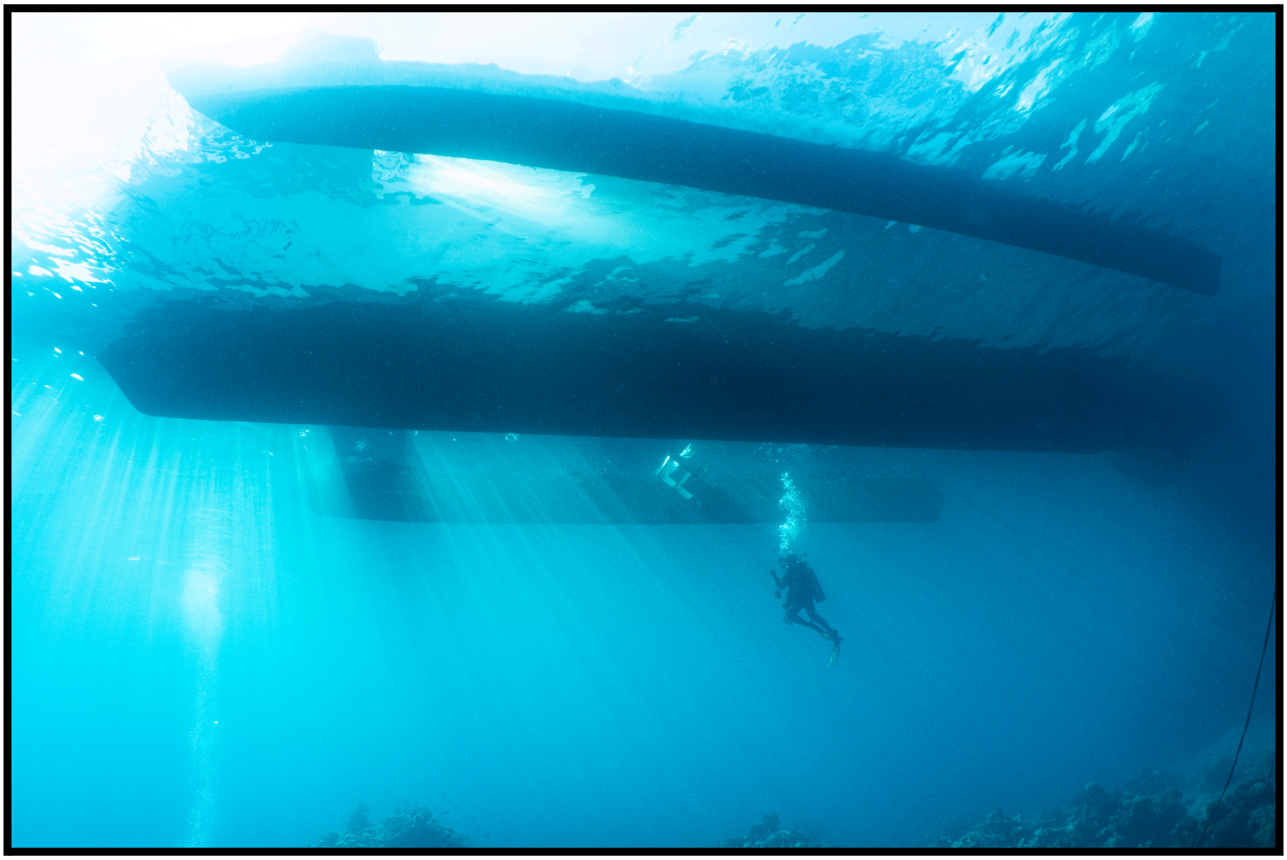
Summary Field Report

32nd Annual Saving Philippine Reefs



A Coral Reef Monitoring Expedition

Siquijor, Philippines

May 3-11, 2025

A project of the Coastal Conservation and Education Foundation, Inc.

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

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CCEF is a non-stock and non-profit organization registered under the laws of the Philippines. It is composed of innovative and collaborative professionals working "on the ground", primarily through local governments, with the people of the coastal communities who most directly benefit from a healthy marine ecosystem.

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Cover Photo: "Ascending" by Julia Cichowski

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EXECUTIVE SUMMARY

In May 2025, the "Saving Philippine Reefs" (SPR) Expedition team embarked on their 32nd annual coral reef monitoring project at one of many prior CCEF survey sites in Siquijor, Philippines. The project was implemented by nine CCEF staff members with the help of nine international volunteers from the United States, Australia, and England. Many of the volunteers had participated in the annual SPR data collection prior to this trip and are experienced researchers or have technical expertise in the environmental field.

The SPR surveys started in 1992 in collaboration with EarthWatch Research team and have since been continued by CCEF since its founding in 1998. The last three decades of data collection have spanned more than 50 large and small Marine Protected Areas (MPAs) across the Philippines including locations such as Cebu, Negros Oriental, Bohol, Batangas, and Palawan as well as in Siquijor. These expeditions have generated essential long-term data on the composition and health of coral reefs, forming a robust dataset that tracks the status and trends of reefs across all surveyed sites. The information collected has been instrumental in supporting local government units (LGUs) in the protection and ongoing monitoring of coastal resources and serves as a foundation for improving sustainable management practices at the local level.

This report presents the findings from the 2025 Siquijor expedition and contributes to the growing dataset used to identify long-term trends in reef condition and inform science-based policy for improved MPA management. Live hard coral cover within MPAs in Siquijor ranged from 13.3% to 62.8% at 7-8 m depth, and from 15.7% to 62.7% at 2–3 m depth. The average live hard coral cover throughout the deeper and shallower sites were 38.88% and 33.99% respectively. No general trends in coral cover appeared across sites since 2017. Whereas some sites showed drastic declines in coral cover, likely due to storm damage; other sites seem to have gradually recovered despite recent storms, when compared with data from previous years. Fish biomass surveys taken between 7-8m depth at the same sites in 2025 ranged from 1.82kg/500m^2 to 20.8kg/500m^{2}and yielded an average biomass of 10.41kg/500m^2. Fish biomass has increased gradually since the last Siquijor SPR surveys in 2017, though the lack of data prior to that makes long-term trends difficult to assess. Survey results revealed differences in substrate composition and fish community metrics across Siquijor's MPAs. Caticugan stood out for its high fish biomass, density, and diversity, despite its relatively low coral cover. This contrast likely reflects strong enforcement of MPA boundaries and effective management at this site. In contrast, Catulayan recorded low values across all fish metrics, which may reflect challenges in enforcement and ongoing fishing pressure. MPAs in the municipality of San Juan generally had higher coral cover, while sites in Maria and Lazi exhibited greater proportions of abiotic substrate including sand and rubble.

While many sites showed trends consistent with their MEAT ratings from 2022 and 2023, others with strong ecological indicators scored poorly due to documentation gaps or outdated management plans. This suggests that while MEAT evaluations are valuable, they may not fully reflect ecological conditions – particularly when administrative requirements are unmet despite tangible improvements in site management. Key recommendations include improving the enforcement capacity of LGUs by enhancing boundary markers and mooring infrastructure within Siquijor's MPAs. In addition, strengthening IEC outreach in coastal barangays, addressing Crown-of-thorns (COT) outbreaks, and establishing sustainable financing mechanisms at the local level can all support long-term MPA effectiveness.

ACKNOWLEDGEMENTS

This coral reef monitoring expedition and its outcome are credited to the nine international volunteers from Australia, England and the United States who dedicated their time and funding to the research work. Equally important are the Coastal Conservation and Education Foundation (CCEF) 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: AJ Lozada, Nicholson Tan, Dionel Molina, Agnes Sabonsolin, Pablita Toyong-Huerbana, Vangie White, Rachel Davis and our CCEF Director, Evelyn Deguit and Administrative Officer, Marilou Gallarde.

We want to give special thanks to 3 participants who paid their fare but did not join due to health reasons: Geof and Denise Iling and Barbara Best. Your contributions have allowed more CCEF staff to join and enhanced the SPR funds that support CCEF.

Special thanks goes to Dr. Aileen Maypa who met with our team in Dumaguete and made a special trip to Siquijor to share her work and advice with our group. We were very fortunate to have the participation of Dr. Alison Green in identifying and counting fish to provide essential data on fish biomass for this analysis and the participation of Dr. Graham Edgar of Reef Life Survey, who also identified fish with unequaled expertise so that our report on fish species diversity is much enhanced.

The Provincial Government of Siquijor through the representation of Mr. Darrel Pascu and his staff are thanked for joining our team at several sites for their invaluable support and inspiration to the volunteers during the dive expedition. We were equally welcomed through the presence one evening of representatives from each of the 6 Siquijor Municipalities as well as several staff from Siquijor State College, all of whom helped inform us about the progress in marine conservation in the island.

The completion of this report was ably facilitated by Rachel Davis, a Peace Corps Volunteer working with CCEF, in coordination the AJ Lozada, Nicholson and Dionel Molina who together did the data analysis and writing which is much appreciated! The excellent photos from Agnes Sabonsolin among others have made our report more informative and colorful.

The Coco Grove Beach Resort staff and management hosted our group with traditional Filipino hospitality and provided excellent service, accommodations, and food. We would like to thank the Coco Grove Dive Shop and their staff for providing excellent diving services and assistance and for making the expedition a safe and smooth trip.

Alan T. White
Principal Investigator

LIST OF ABBREVIATIONS

AFR	Adjacent Fished-Reef
BFAR	Bureau of Fisheries and Aquatic Resources
CCEF	Coastal Conservation and Education Foundation
COT	Crown-of-thorns (seastar)
DENR	Department of Environment and Natural Resources
FVC	Fish Visual Census
IEC	Information, Education and Communication
LAFA	Lamugan Fisherfolk Association
LGU	Local Government Unit
MAO	Municipal Agriculture Office
MARDA	Maite Resource Development Association
MEAT	MPA Effectiveness Assessment Tool
MENRO	Municipal Environment and Natural Resources Office
MPA	Marine Protected Area
NGO	Non-Governmental Organization
SE	Standard Error
SP	Species
SPR	Saving Philippine Reefs

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INTRODUCTION

Brief Management History and Status of Siquijor MPAs

Siquijor is an island province located within the Central Visayas Region of the Philippine Islands. The province lies south of Cebu, southeast of Negros Oriental, southwest of Bohol, and north of Mindanao. In terms of both population and land area, Siquijor is the third smallest province in the country. Nonetheless, the island harbors exceptional marine biodiversity and is renowned for its coastal reserves in both the fisheries and tourism industry. Like many other Philippine islands, Siquijor may have formed relatively recently in geological terms. Its history as a coralline island is supported by the discovery of giant clam (*Tridacna*) fossils, which are often found in plowed inland fields. Numerous molluscan shells of present day marine species have also been uncovered on the island's hilltops as well as in its coastal waters. The ocean depths between Siquijor, Bohol, and Mindanao reach approximately 640 meters.

The province of Siquijor is composed of six municipalities – namely the capital Siquijor along with Enrique Villanueva, Larena, Lazi, Maria, and San Juan. The biophysical assessments conducted during the 2025 Saving Philippine Reefs (SPR) project covered four selected municipalities and included surveys of 11 marine protected areas (MPAs) across the province. Over 20 MPAs are officially registered in Siquijor which are supported by the island's local government units (LGUs) and volunteer *bantay dagat* teams (community sea wardens). The 2025 SPR expedition conducted surveys both within and adjacent to each of the 11 MPAs to document differences in biodiversity and reef health between protected areas and those open to fishing activities.

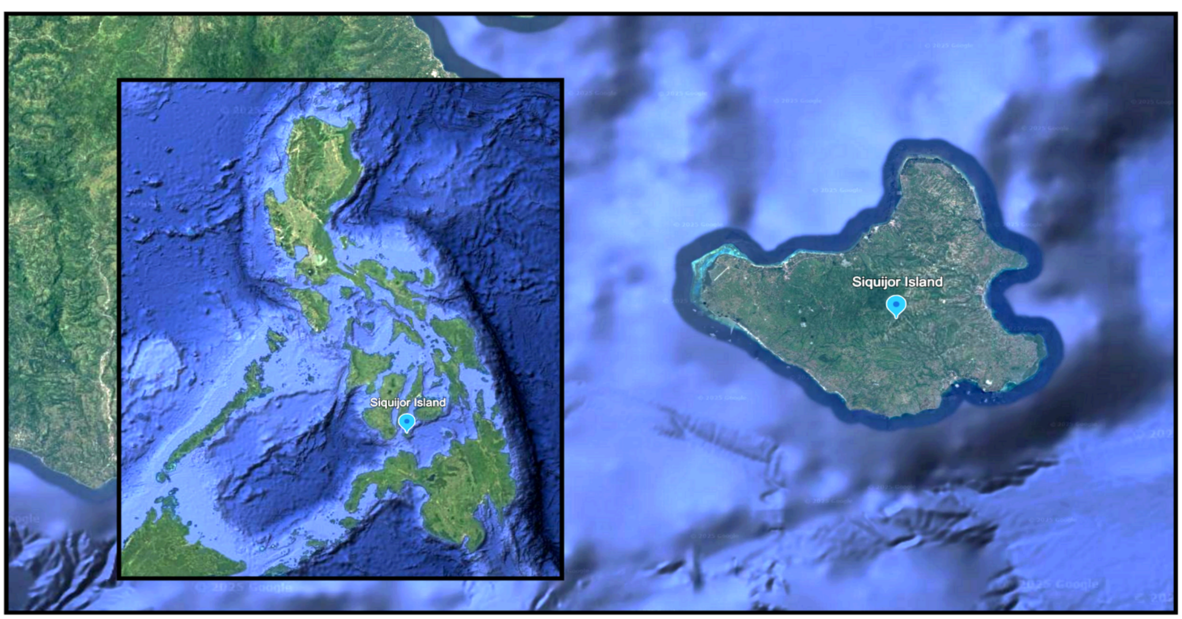


Figure 1. Map location of Siquijor Island, Philippines.

2025 Expedition

This SPR expedition was the fourth survey done by CCEF throughout Siquijor since the inception of SPR surveys in 1992. The first expedition to Siquijor as part of ongoing SPR surveys took place in 2002, followed by monitoring visits in 2009, 2017, and this year's expedition in 2025.

The 2025 trip was hosted by Coco Grove Beach and Dive Resort and benefited from collaboration with LGUs and *bantay dagat* operations throughout Siquijor. Divers were transported on the Coco Adventurer – a custom-built double-outrigger catamaran operated by the dive shop at Coco Grove. The vessel measures approximately 30 meters in length and is configured for marine tourism and inter-island transport around Siquijor.

Throughout the nine-day expedition, the SPR research team completed 13 underwater surveys of MPAs across four selected municipalities of Siquijor. Each day in the field consisted of two scuba dives to collect data on coral reef biota including fish and invertebrate diversity, abundance, and biomass. Additional information was collected to characterize the benthic environment and any observed anthropogenic impacts. Dives were conducted simultaneously by nine sets of dive teams assigned to transects both within and just outside of MPA boundaries to chronicle differences between protected areas and fishing zones. Divemasters from Coco Grove assisted with navigation and transect deployment. Snorkel surveys were conducted daily between each set of dives to gain a general understanding of substrate conditions across the shallow reef inside each MPA. A total of 11 MPAs were surveyed across all municipalities. The team conducted two surveys on either side of the largest two MPAs – Olang and Candaping – resulting in 13 total dive surveys throughout the trip.

This report documents changes and trends in reef fish abundance and coral health over three decades of monitoring. It also aims to identify factors contributing to changes in reef health and fish patterns over the years. Observations from the 2025 SPR surveys may generate policy recommendations for improved management and protection of Siquijor's MPAs.

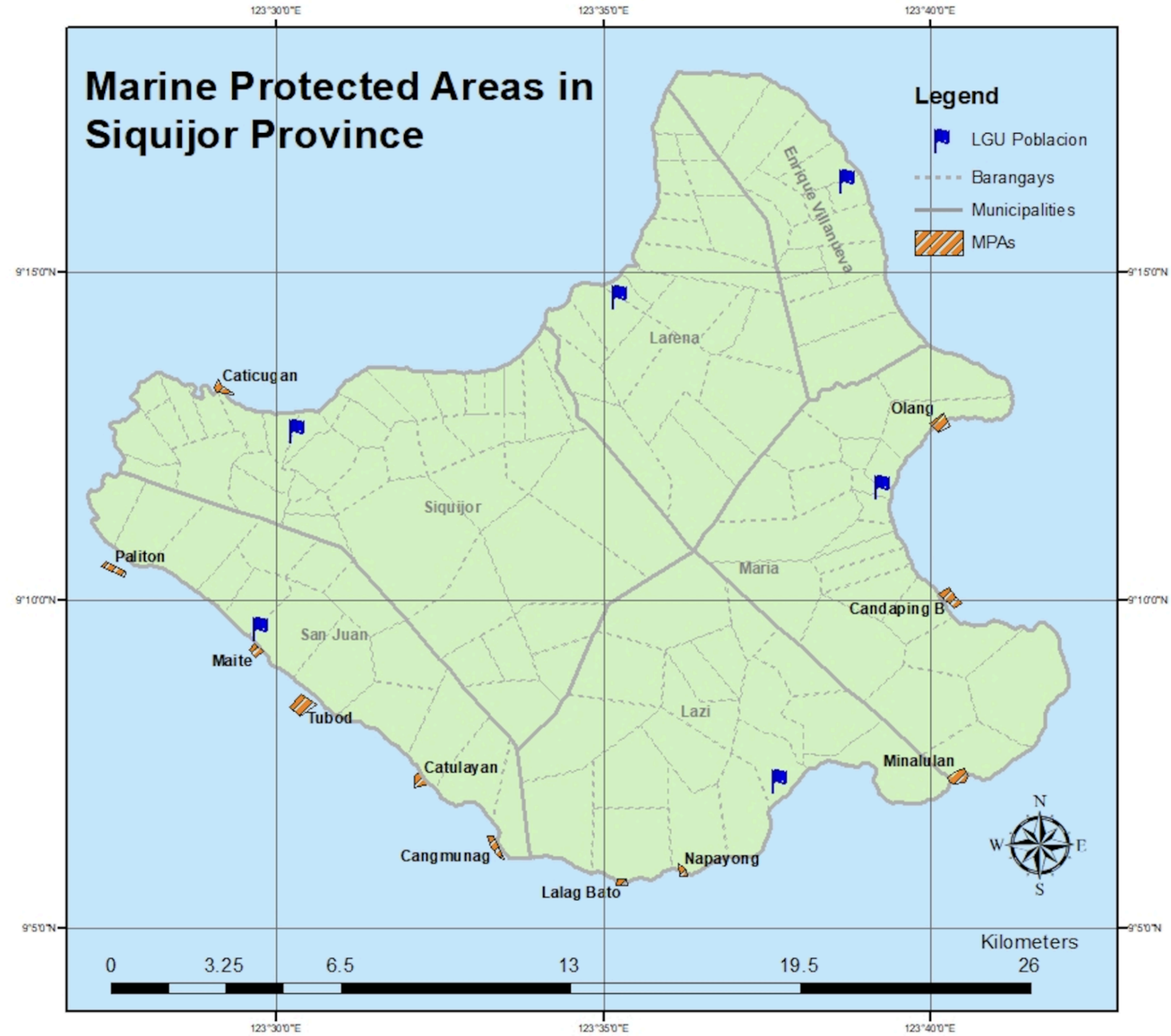


Figure 2. Map of MPAs in Siquijor, Philippines

MATERIALS AND METHODS

Benthic Habitat Characterization

Scuba surveys were conducted an average of twice daily throughout the expedition, except on the final day, when only one dive was completed. Most surveys were carried out at depths of 7 to 10 meters, with adjustments to shallower depths made as needed based on site conditions.

The team employed a systematic point-intercept method along 50-meter transects laid parallel to the reef crest and positioned on reef flats, crests, or slopes. Substrate data were recorded at 25-centimeter intervals along each transect, capturing the following metrics:

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, snails and others)
5. Presence of large marine life (e.g., sharks, manta rays, sea turtles, cetaceans and others)
6. Causes of reef damage

Substrate categories included total live hard coral (branching, massive, encrusting, and foliose), soft coral, rubble, non-living substrates (e.g., white dead standing coral, rock, sand, and silt), and other living components (e.g., sponges, algae, seagrass). These data were analyzed and presented graphically, with only years containing complete raw data included in comparative assessments.

In addition to scuba surveys, systematic snorkel surveys were conducted once per day between the two daily dives. These were carried out in the shallow reef flat (2-4 meters depth) and covered a distance of 0.5 to 1 kilometers of substrate parallel to the reef crest. Observations were recorded within 1 m² quadrats at every 50-meter interval. The same substrate and species categories used in the scuba surveys were applied for consistency in data collection.

Due to time constraints, snorkel surveys were conducted only after the first morning dive at the same survey site. In total, the SPR team completed 13 scuba dives and 7 snorkel surveys.

Fish Visual Census (FVC)

Fish abundance and diversity were estimated using a 50 x 10 m underwater visual census (UVC; n = 3 - 5) technique done by three fish specialists (A Green, N Tan, and A White). 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). 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:

Epinephelinae (Serranidae), Lethrinidae, Lutjanidae, Acanthuridae, Caesionidae, Carangidae, Haemulidae, Nemipteridae, Mullidae, Scaridae, Siganidae, Labridae (larger species, i.e., Choerodon spp., Cheilinus spp.), including a non-reef family, Scombridae and Sphyraenidae. For this report, biomass computations were based on consensus with species-specific lengths (n = 3-10). The data was also adjusted to reflect fish/500m^2. Fish biomass was categorized using the system developed by Nañola et al. (2011), which defines biomass levels as stated below.

Species Richness (species/500m^2)			
Low	Moderate	High	Very High
<24	24-37	37-50	>50
Fish Density (individual/500m^2			
Low	Moderate	High	Very High
<338	338-1133	1134-3796	>3796
Fish Biomass (MT/Km^2)			
Low	Moderate	High	Very High
<10	10-20	20-40	>40
Fish Biomass (Kg/500m^2)			
Low	Moderate	High	Very High
<5	5-10	10-20	>20

Figure 3. 'Fish Condition Ratings' chart taken from Nañola et al. 2004.

MPA Effectiveness Assessment Tool (MEAT)

The MPA MEAT is a tool for evaluating MPA governance in terms of enforcement, implementation, and maintenance. The Marine Support Network (MSN) applied this 48-item rating, adapted from the CCEF system, to assess the status and progress of MPAs in the Philippines. The MPA MEAT classifies MPAs into four levels: 1) Established, 2) Strengthened, 3) Sustained, and 4) Institutionalized. Levels 3 and 4 also require a minimum MPA age of five years and seven years, respectively.

The MPA MEAT assessment was conducted in 11 MPAs across four municipalities in Siquijor between 2022 and 2023. Data were collected through focus group discussions with MPA management group members, barangay officials, people's organization (PO) members, and a representative from the LGU. Discussions followed a structured questionnaire to determine responses and assess the knowledge and participation of management body members. Total cumulative scores were calculated by combining the scores across all levels. MPA MEAT results can be translated in three ways: 1) the overall score or rating measures the level of management effort. High scores indicate that more effort has been invested into MPA management, which can potentially increase MPA effectiveness; 2) MPA management effectiveness will be defined by the minimum number of years since establishment, minimum overall scores, and threshold satisfied in each level; and 3) performance based on the management focus, which has been divided into 9 key categories (MPA management plan, management, legal instrument, enforcement, site development, IEC, financing, and community participation).

MUNICIPALITY OF SAN JUAN MARINE PROTECTED AREAS

1. Paliton Marine Sanctuary

Site Overview: Paliton Marine Sanctuary spans 12 hectares in the municipality of San Juan. It was established in 2008, though it only gained legal recognition and reinforced implementation efforts in 2020. The site is co-managed by the Ilak Fisherfolk Association and the San Juan LGU. Known as a tourism hotspot, it features the offshore Paliton Reef and the popular Paliton Wall dive site, which attract both snorkelers and divers.

MEAT Score Analysis: In its most recent MEAT assessment, Paliton received a score of 52 out of 84 points, which corresponds to Level 3 – "Sustained" management performance. However, several challenges remain. Many members of the Ilak Fisherfolk Association have resigned, leaving a few individuals responsible for management. The *bantay dagat* team would benefit from skills enhancement and deputization training, as it has been several years since their last session. Coordination between the management body and external NGOs conducting scientific monitoring is also limited. The site will likely benefit from continued SPR data collection in the future.

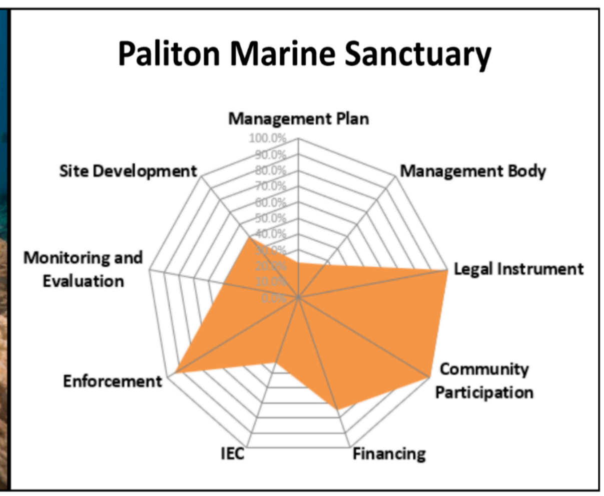


Figure 4a. Underwater view of the MPA. **Figure 4b.** Radar chart of 2023 MEAT score.

Benthic Habitat Characterization: Benthic cover data from Paliton Marine Sanctuary between 2006 and 2025 indicate significant change in reef composition. Hard coral cover increased substantially from 15.60±0.4% in 2006 to 57.83±10.35% in 2025, suggesting considerable recovery and growth despite a temporary decline observed in 2017. In contrast, soft coral cover exhibited a fluctuating but overall decreasing trend, declining from 10±0.5% to 4.67±2.19% over the same period. The proportion of dead coral with algae, which may indicate coral mortality or stress, increased from 1.50±0.07% in 2006 to a highest of 22.73±4.6% in 2017, then declined to 13.67±9.5% by 2025, suggesting partial ecological recovery. Abiotic substrate cover increased to 43.80±2.19% in 2007 before gradually decreasing to 16.17±6.17% by 2025, likely due to recolonization by benthic organisms. The "Others" category, which include sponges, macroalgae, and other benthic taxa, declined significantly from 62.20±3.11% in 2006 to 7.67±3.34% in 2025. Overall, the data suggest an improving trend in reef condition at Paliton MS, characterized by increased hard coral dominance and reduced presence of non-living and opportunistic benthic components.

In contrast, the adjacent fished reef within Paliton MS shows a different trajectory. Hard coral cover was initially much higher, starting at 67.70±3.39% in 2006, but declined sharply to 34.85±1.97% by 2017 before a slight recovery to 41.50±10.26% in 2025. Soft coral cover remained low throughout but increased modestly to 8.30±3.42% by 2025. Dead coral with algae fluctuated, starting at 20.40±1.02% in 2006, dropping sharply to 1.20±0.1% in 2007, then rising again to 9.00±2.84% by 2025. Abiotic substrate steadily increased from 7.50±0.38% in 2006 to a peak of 52.65±0.86% in 2017 before falling to 26.67±11.69% in 2025. The "Others" category remained consistently low but showed slight increases towards 2025.

Shallow-area snorkeling surveys between 2009 and 2017 depict localized reef decline, with hard coral cover dropping from 23.8±3.77% to 8.85±2.66% and soft coral decreasing from 4.0±0.2% to 1.96±0.9%. Dead coral with algae more than doubled from 3.6±0.2% to 8.83±4.8%, while abiotic substrate increased sharply from 37.4±1.6% to 70.34±6.2%, and the "Others" category declined from 31.2±1.9% to 10.03±3.2%. These changes suggest substantial degradation of the shallow reef flat, likely due to site-specific stressors such as wave exposure, sedimentation, or high tourist activity. Comparing these datasets highlights notable spatial and management-related differences within Paliton MS. The protected monitoring sites demonstrate significant reef recovery, particularly in live hard coral cover, while the adjacent fished reef shows a more variable and generally declining hard coral trend, alongside increasing non-living substrate indicative of habitat degradation. Meanwhile, the shallow snorkeling area reveals localized deterioration during 2009–2017, underscoring the influence of localized stressors.

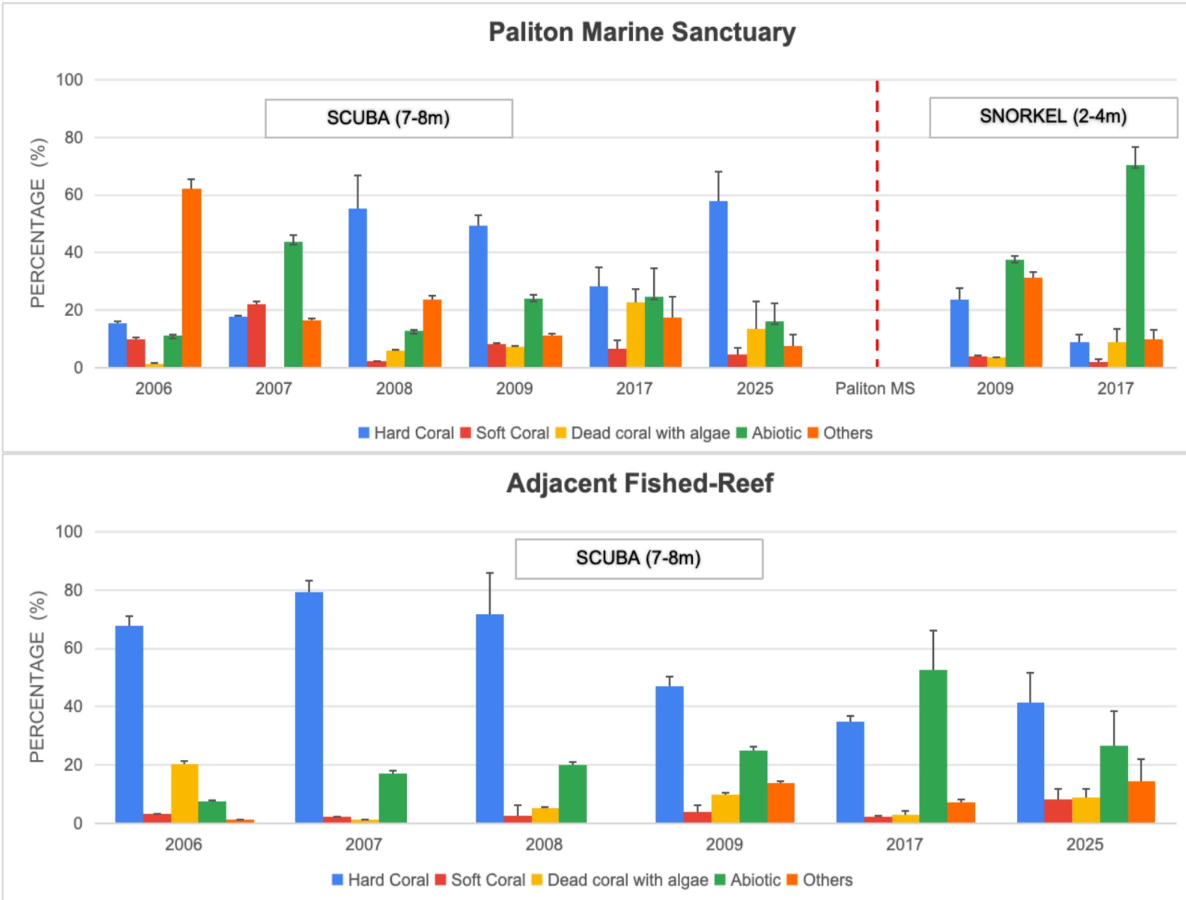


Figure 4c. Changes in substrate composition (mean ± SE%) at Paliton MPA and its adjacent fished reef from 2006 to 2025. Data were compiled from both snorkel and SCUBA surveys.

FVC Diversity: A total of 92 species belonging to 19 families and subfamilies were observed. Species richness in the sanctuary is 56±2.08 species/500m², a value slightly higher than the adjacent fished reef with 53±1.41 species/500m² (Appendix Table A1)

FVC Biomass: Mean reef fish biomass was very high at 33.32 kg/500m² (66.64 mt/km²), it was largely dominated by target species at 20.24 kg/500m² (40.48 mt/km²) (Figure 11d, which is about 30% of the total fish biomass in 2025. Parrotfishes accounted for the bulk of the total target biomass. It was moderate in 2017 at 7.39 kg/500m² (14.78 mt/km²).

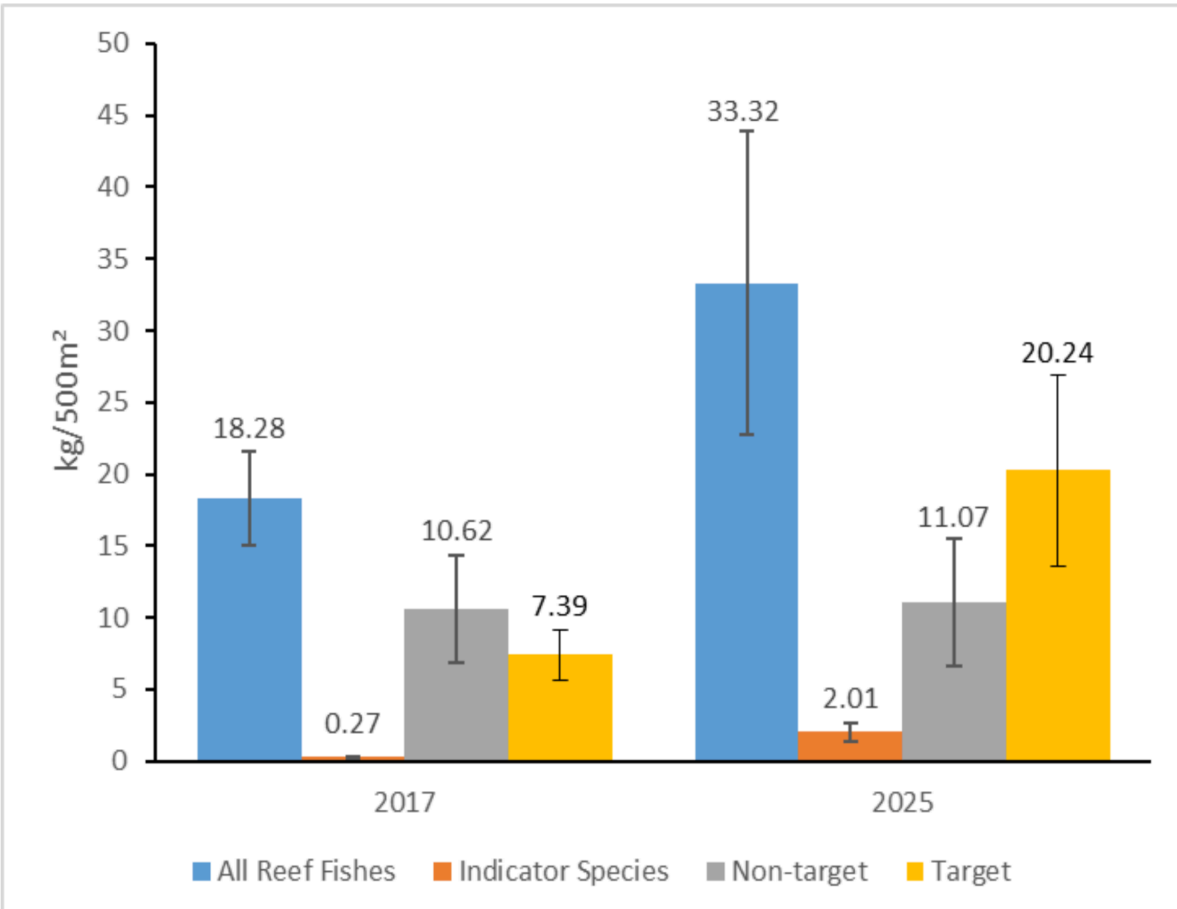


Figure 4d. Changes in fish biomass by functional group (mean ± SE) at Paliton MPA from 2017 to 2025. Species were categorized as target species (commercially important), indicator species (butterflyfish), or non-target species.

FVC Density: Mean reef fish density was at 809 individuals/500m² in 2025 and 1792 individuals/500m² in 2017 (Figure 11e). In 2017, mean density of target fish families was estimated at 104 individuals/500m², largely contributed by wrasses (Labridae), fusiliers (Caesionidae) and parrotfishes (Scaridae). This slightly decreased in 2025 to 83 individuals/500m², dominated by parrotfishes (Scaridae) and surgeonfishes (Acanthuridae).

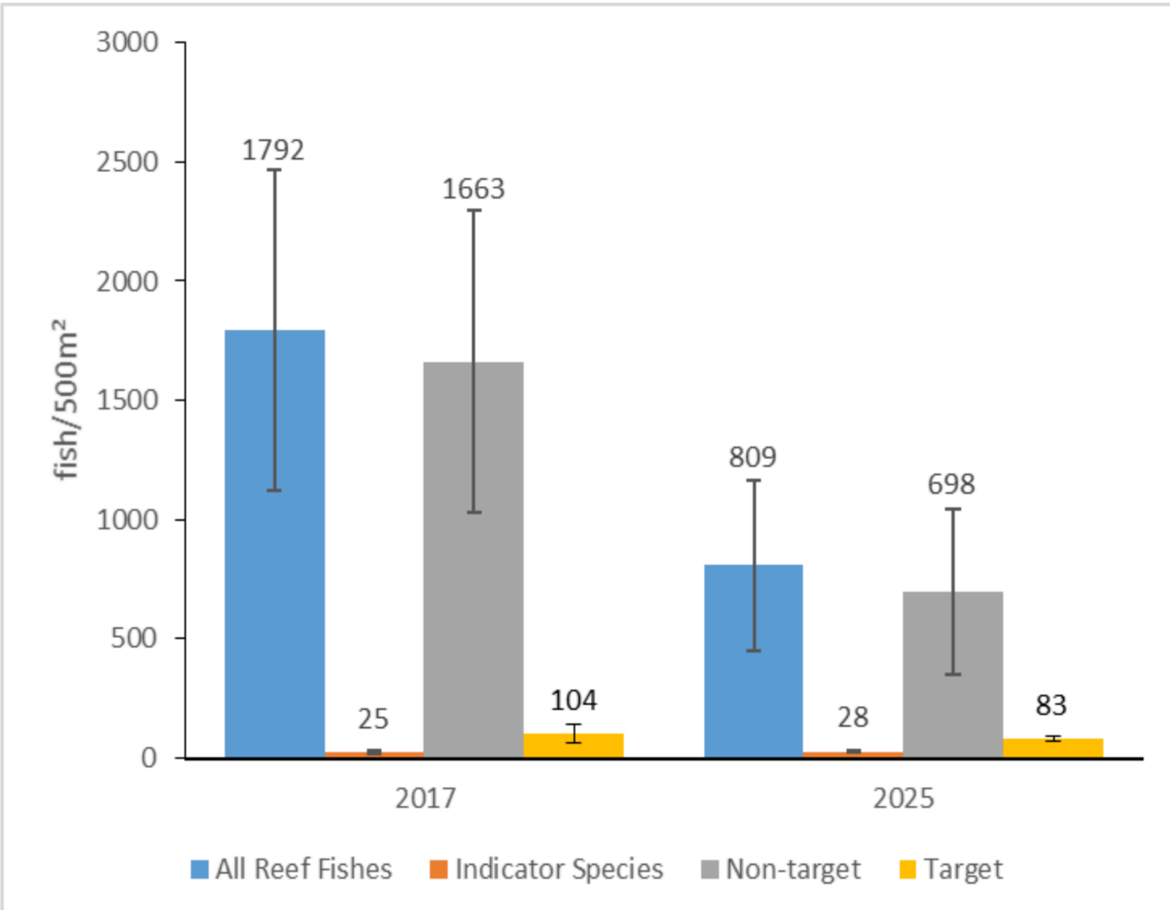
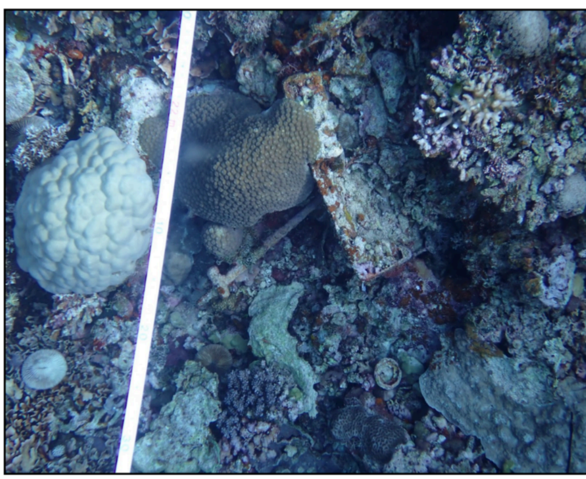


Figure 4e. Changes in fish density by functional group (mean ± SE) at Paliton MPA from 2017 to 2025. Species were categorized as target species (commercially important), indicator species (butterflyfish), or non-target species.

2. **Maite Marine Sanctuary**

Site Overview: Maite Marine Sanctuary is a 6.3-hectare protected marine area located in the municipality of San Juan. It was established in 2009 through a municipal ordinance and is now managed collaboratively by the Maite Resource Development Association (MARDA) and the San Juan LGU. Maite covers coral reef areas, seagrass beds, and intertidal flats, which all provide important habitats for various marine species. It is noted for its ecological diversity despite its relatively small size.

MEAT Score Analysis: The 2022 MEAT evaluation rated the site as Level 4 – “Institutionalized” in management effectiveness, with a cumulative score of 65 out of 84 points – unchanged from its 2019 MEAT score. The report highlighted a few key improvements, including the construction of a new guardhouse through the efforts of the MARDA in partnership with the international NGO “Seacology”. Additionally, the sanctuary is in the process of expanding its area from 6.3 to 10.62 hectares and will be formally supported by a San Juan Municipal Ordinance. However, the MEAT noted that no ecological or socioeconomic assessments have been conducted at the site, and the sanctuary has not sustained its information, education, and communication (IEC) efforts for over seven years.



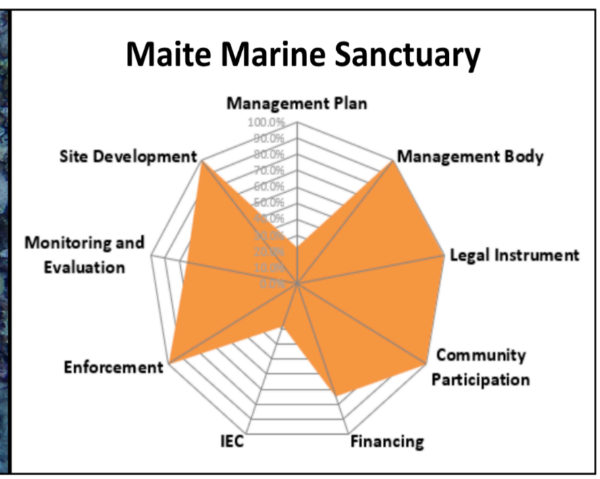


Figure 5a. Underwater view of the MPA.

Figure 5b. Radar chart of 2022 MEAT score.

Benthic Habitat Characterization: Benthic monitoring data from Maite Marine Sanctuary and its adjacent fished reef spanning 2008 to 2025 reveal contrasting trends in coral and substrate composition. Within the sanctuary, hard coral cover exhibited fluctuations but generally maintained moderate to high levels, ranging from 43.64% to 76.00%, with a slight decline to 54.33±2.5% in 2025. Soft coral cover remained low throughout, averaging between 0.46% and 5.50%. Dead coral with algae showed an increasing trend from negligible values in early years to a peak of 37.70±1.13% in 2022, before declining to 14.33±7.1% in 2025, indicating sporadic coral mortality events followed by partial recovery. Abiotic (non-living) substrates within the sanctuary ranged from 15.46% to 43.00%, with a notable decline in recent years. The "Others" category remained consistently low, below 7%.

In contrast, the adjacent non-sanctuary reef exhibited higher initial hard coral cover peaking at 89±4.45% in 2012, followed by a sharp decline to 27.65±3.1% in 2022 and a partial recovery to 51.83±4.17% by 2025. Soft coral cover in the non-sanctuary area was consistently low, ranging from 1.00% to 4.50%. Dead coral with algae fluctuated moderately, peaking at 11.71±2.31% in 2017 but remaining relatively low overall. Abiotic substrate in the non-sanctuary reef displayed high variability, with a marked increase to 50.23±6.52% in 2022, suggesting extensive substrate degradation or algal colonization during that period. The "Others" category was generally low but showed a slight increase over time. These data indicate that while Maite Marine Sanctuary maintains more stable coral cover and substrate conditions, the adjacent fished reef experiences greater fluctuations and episodes of degradation, highlighting the benefits of sanctuary protection for reef resilience.

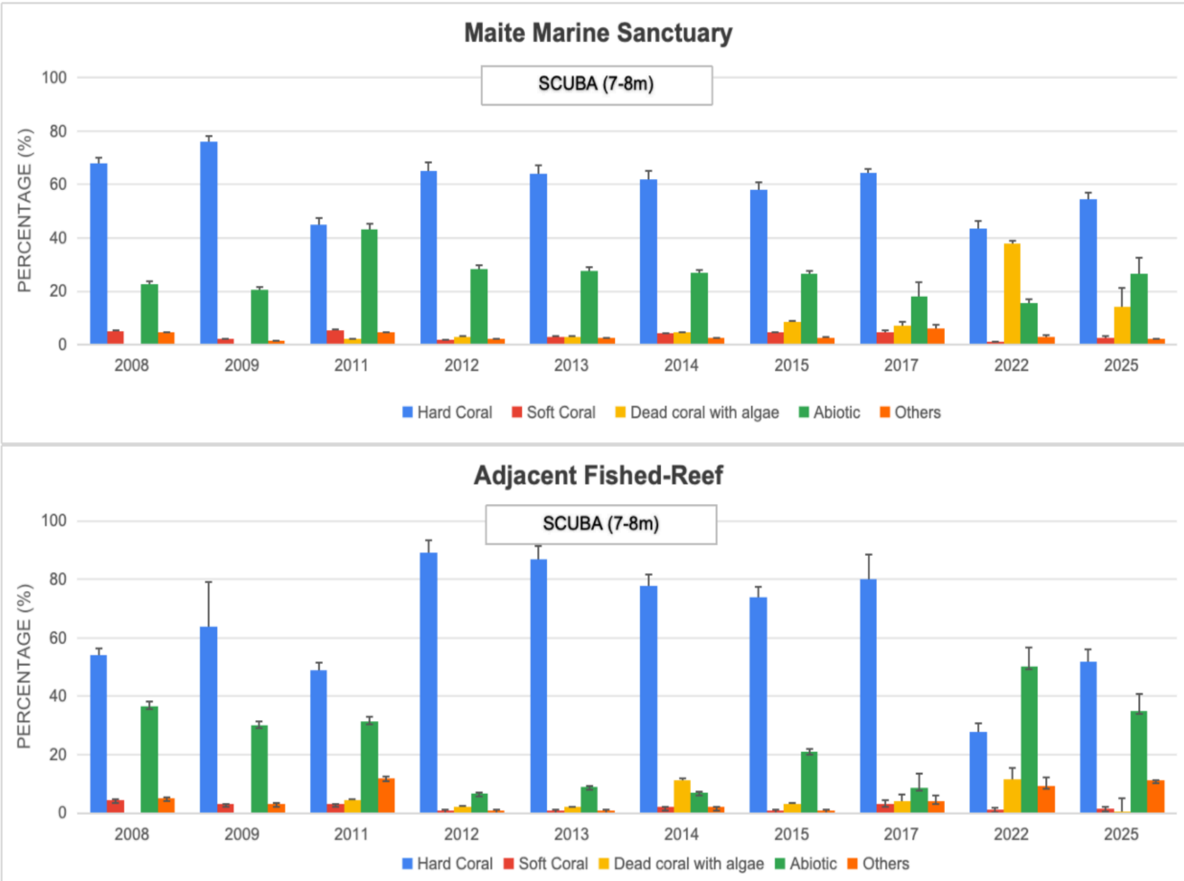


Figure 5c. Changes in substrate composition (mean ± SE%) at Maite MPA and its adjacent fished reef from 2008 to 2025. Data were collected from SCUBA surveys only.

FVC Diversity: Around 82 coral reef fish species belonging to 21 families and subfamilies were identified. Reef fish diversity in Maite Marine Sanctuary was very high based on the modified scale derived from Hilomen et al. (2000), with a mean species richness estimated at 45±1.15 species/500m². Non-target/non-indicator species such as Damselfishes (Pomacentridae), wrasses (Labridae) and Cardinalfishes (Apogonidae), dominated the fish assemblage in terms of species richness.

FVC Biomass: Mean biomass was higher in 2025 at 21.93 kg/500m² (43.86 mt/km²) than in 2017 at 19.97 kg/500m² (39.94 mt/km²), but both are high and very high category respectively (Figure 12d). Commercially important fish families had a mean biomass of 11.87 kg/500m² (23.74 mt/km²) and 15.59 kg/500m² (31.18 mt/km²) in 2025. Biomass was mainly contributed by parrotfishes and groupers) in 2017 and jacks and parrotfishes in 2025

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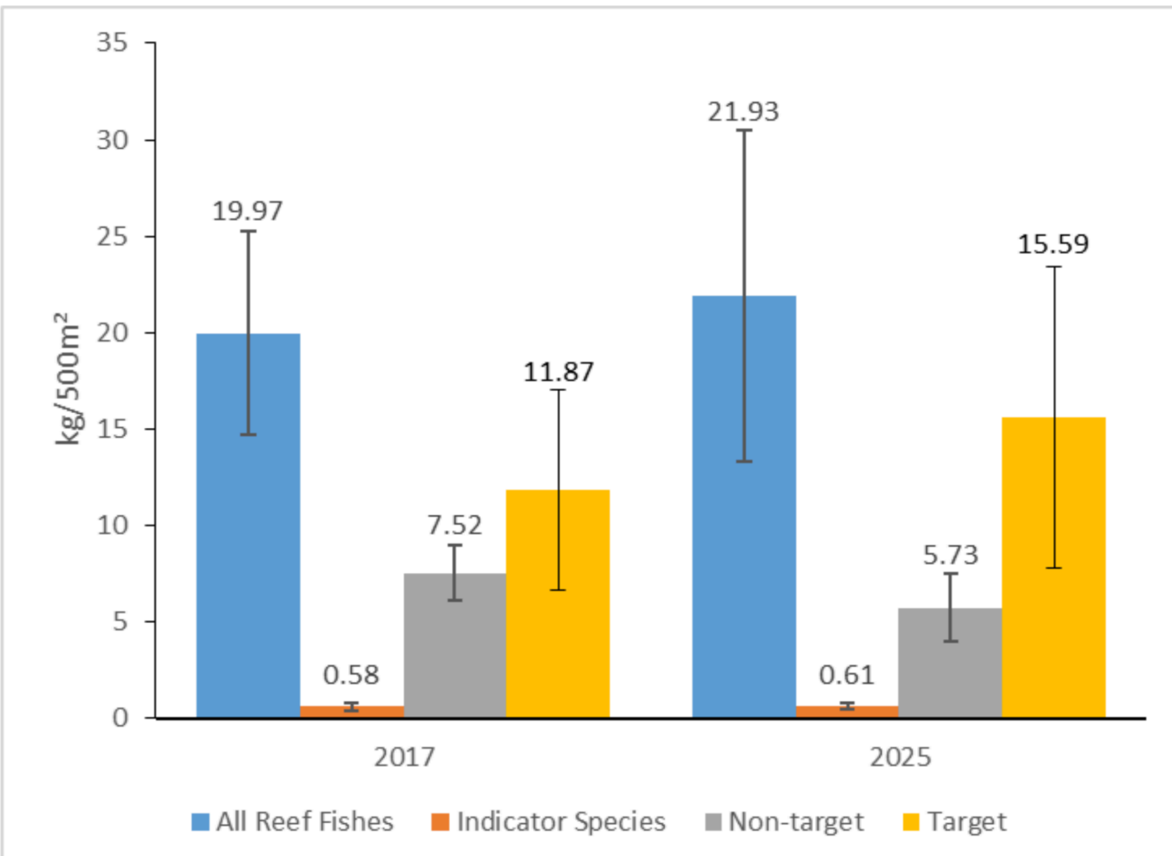


Figure 5d. Changes in fish biomass by functional group (mean ± SE) at Maite MPA from 2017 to 2025. Species were categorized as target species (commercially important), indicator species (butterflyfish), or non-target species.

FVC Density: Mean reef fish density in 2017 was high at 1476 individuals/500m² and 696 individuals/500m² in 2025 which is within the moderate category of the scale defined in Hilomen et al. (2000) (Figure 12e). In 2017, mean density of target fish families was estimated at 123 individuals/500m², largely contributed by surgeonfishes (Acanthuridae), wrasse (Labridae) and parrotfishes (Scaridae). This decreased in 2025 to 57 individuals/500m², dominated by surgeonfishes (Acanthuridae), parrotfishes (Scaridae), jacks (Carangidae) and triggerfishes (Balistidae).

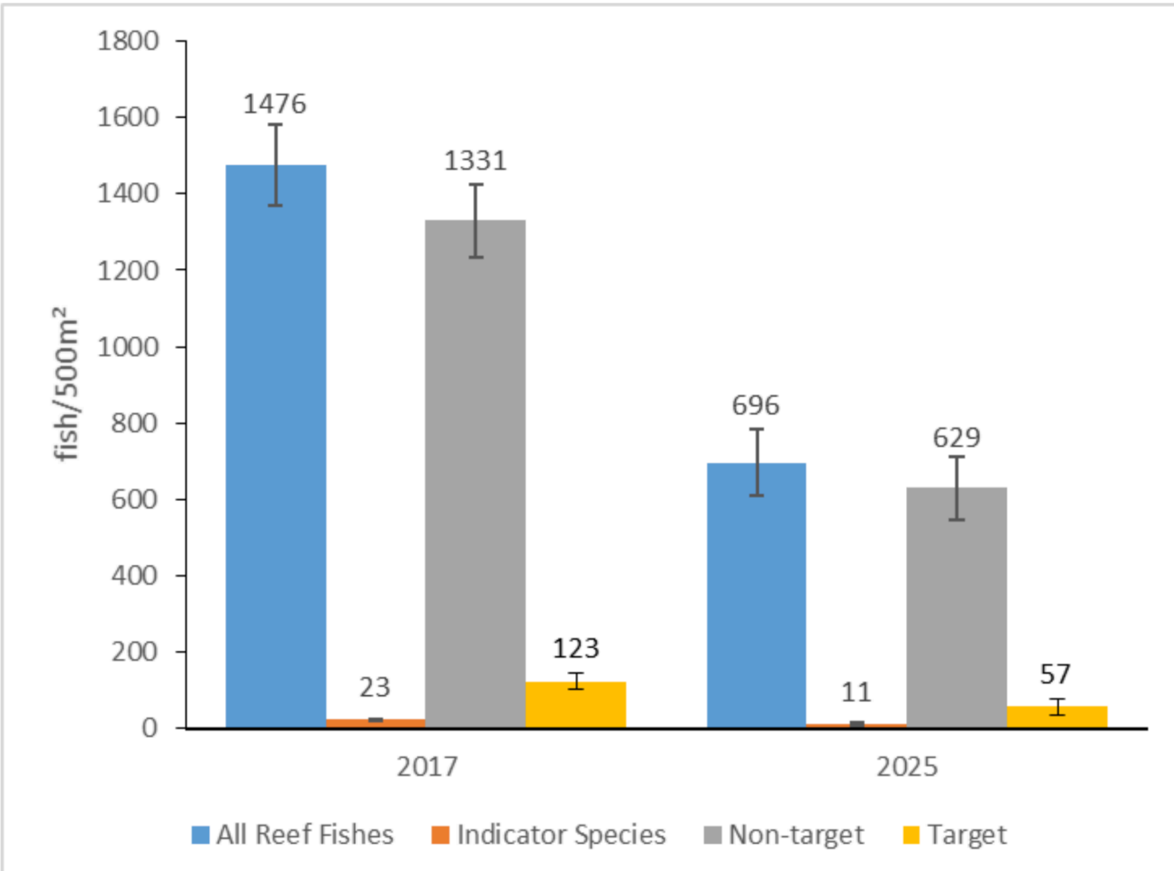


Figure 5e. Changes in fish density by functional group (mean ± SE) at Maite MPA from 2017 to 2025. Species were categorized as target species (commercially important), indicator species (butterflyfish), or non-target species.

3. **Tubod Marine Sanctuary**

Site Overview: Tubod Marine Sanctuary is a 7.5-hectare protected area located directly in front of Coco Grove Beach Resort in San Juan, Siquijor. Originally established in 1989 and re-established in 2003, it is managed by the Tubod Fishermen's Association together with the local government as well as the resort. The sanctuary hosts many snorkelers and divers from Coco Grove due to its clear waters with sandy bottoms and seagrass beds as well as frequent sea turtle sightings, and schools of jackfish, surgeonfish and others that appear to reside inside the sanctuary. Tubod's perimeter is clearly marked by buoys and benefits from consistent supervision by resort staff, which reduces enforcement challenges at this site.

MEAT Score Analysis: The sanctuary earned 26 out of 84 points at its most recent MEAT assessment in 2022, which translates to a score of Level 2 – "Strengthened". Despite a lack in financial record-keeping as well as the need for deputization training of their *bantay dagat* enforcers, the site shows visible effort to maintain operations through tourism revenue. Management efforts currently focus on securing sustainable funding for the MPA, which is greatly supported by income from the resort.

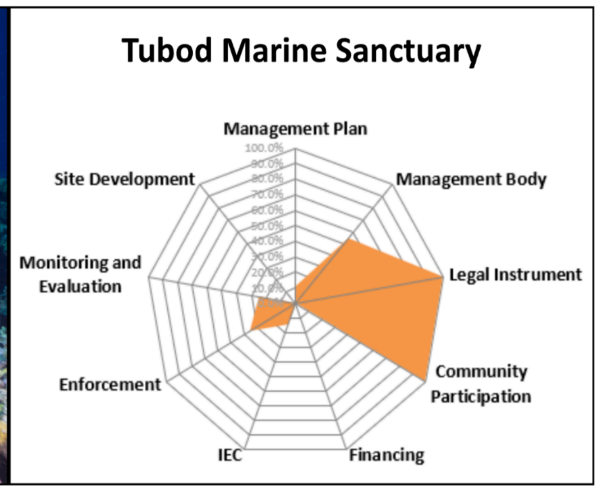


Figure 6a. Underwater view of the MPA.

Figure 6b. Radar chart of 2022 MEAT score.

Benthic Habitat Characterization: Benthic survey data from Tubod Marine Sanctuary and its adjacent fished reef (ARF) from 2002 to 2025 reveal significant shifts in reef condition. In the sanctuary, hard coral cover increased sharply, reaching 81.7±8.16% in 2006, but declined substantially to 44.67±8.64% by 2025. A similar trend was observed in the fished reef, where hard coral peaked at 71.8±3.59% in 2006 before falling to 45.0±1.26% in 2025. These parallel declines indicate that reef stressors are affecting both protected and fished areas. There was also a marked increase in dead coral with algae, rising to 19.33±3.58% in the sanctuary and 12.7±3.09% in the fished reef by 2025, reflecting recent coral mortality and potential overgrowth by algae.

Shallow snorkeling surveys within Tubod MS revealed a different benthic pattern. Hard coral cover increased from 22.7±1.14% in 2002 to 45.1±4.42% in 2009 but remained lower than both the sanctuary and fished reef transects, stabilizing at 35.6±3.59% in 2025. Dead coral with algae increased steadily to 9.9±3.58% by 2025, while abiotic cover remained high across all years (44.0 - 67.9%), reflecting the naturally sedimented or wave-exposed nature of the shallow reef flat.

Overall, the data suggest that although Tubod Marine Sanctuary initially supported strong coral recovery, recent years have shown a decline in hard coral cover accompanied by an increase in degraded benthic components. Similar patterns are evident in the adjacent fished reef, although the changes there are slightly less pronounced. In contrast, the shallow reef flat, despite being within the sanctuary, appears more vulnerable to chronic stressors and has not reached the same levels of coral cover as the deeper areas. These shallow zones are frequently used as snorkeling areas for tourists, which may contribute to their heightened exposure and stress. Major storms, such as Typhoon Odette in December 2021 and Tropical Storm Kristine in October 2024, have likely also contributed to declines in living coral, particularly on the south side of Siquijor. This comparison highlights the importance of maintaining consistent sanctuary management while also implementing targeted interventions to address emerging threats that impact reefs across different depths and management zones.

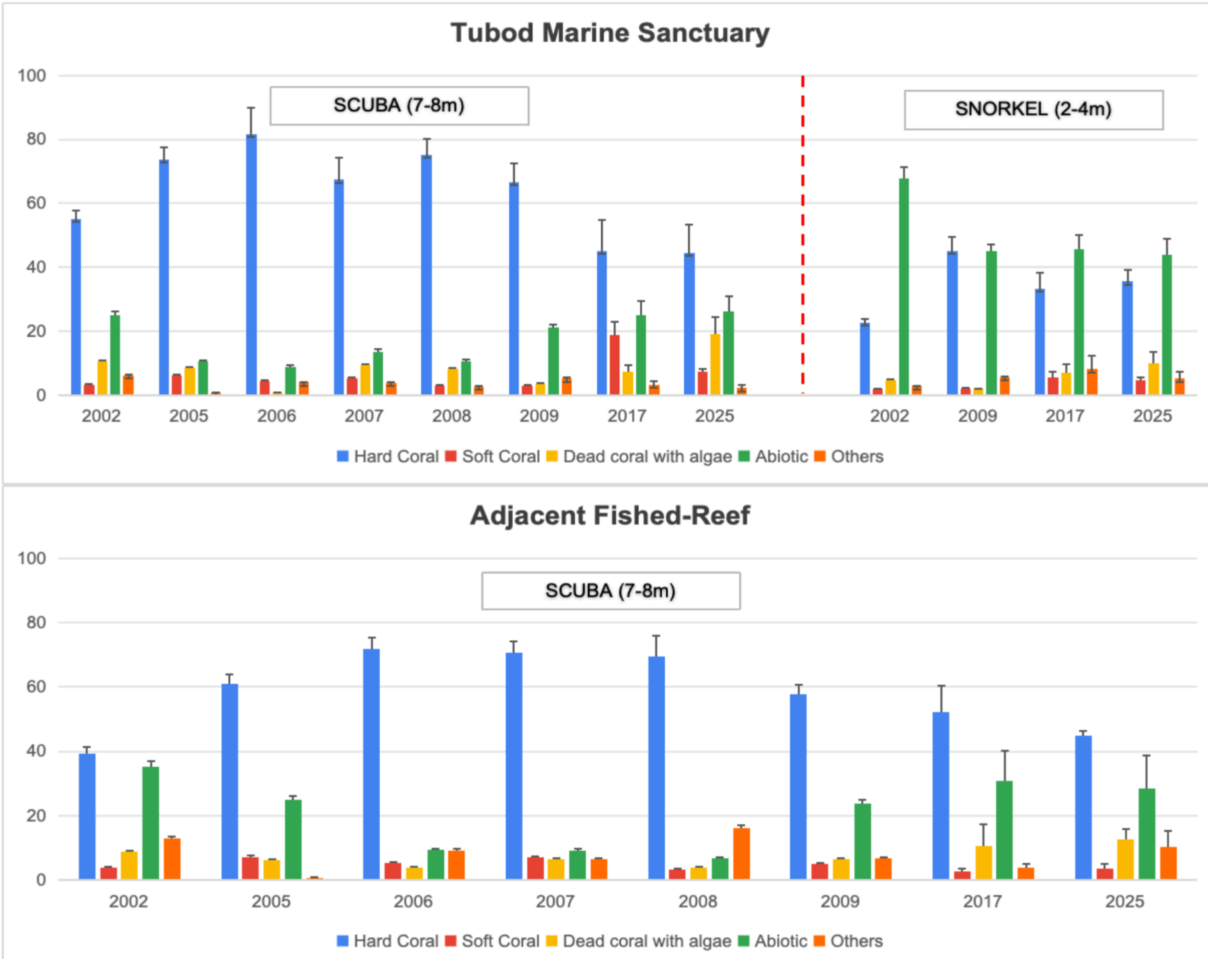


Figure 6c. Changes in substrate composition (mean ± SE%) at Tubod MPA and its adjacent fished reef from 2002 to 2005. Data were compiled from both snorkel and SCUBA surveys.

FVC Diversity: Species richness was generally high in Tubod Marine Sanctuary based on the scale defined by Hilomen et al. (2000), with overall mean species richness estimated at 49±3.61 species/500m². Non-target species like Damselfishes (Pomacentridae) and Fairy basslets (Serranidae subfamily Anthiinae), dominated the fish assemblage of diversity.

FVC Biomass: Mean reef fish biomass was estimated at 12.58 kg/500m² (25.16 mt/km²) in 2017, or "high" based on the ranges set by Nañola et al. (2011). It was very high in the year 2025 at 31.49 kg/500m² (71.16 mt/km²) (Figure 12d) which is within the very high category. Most of this biomass was accounted for by target species, which ranged in mean biomass from 6.02 kg/500m² in 2017 to a high of 31.49 kg/500m² in 2025. Target species were largely dominated by jacks (Carangidae) and parrotfishes (Scaridae).

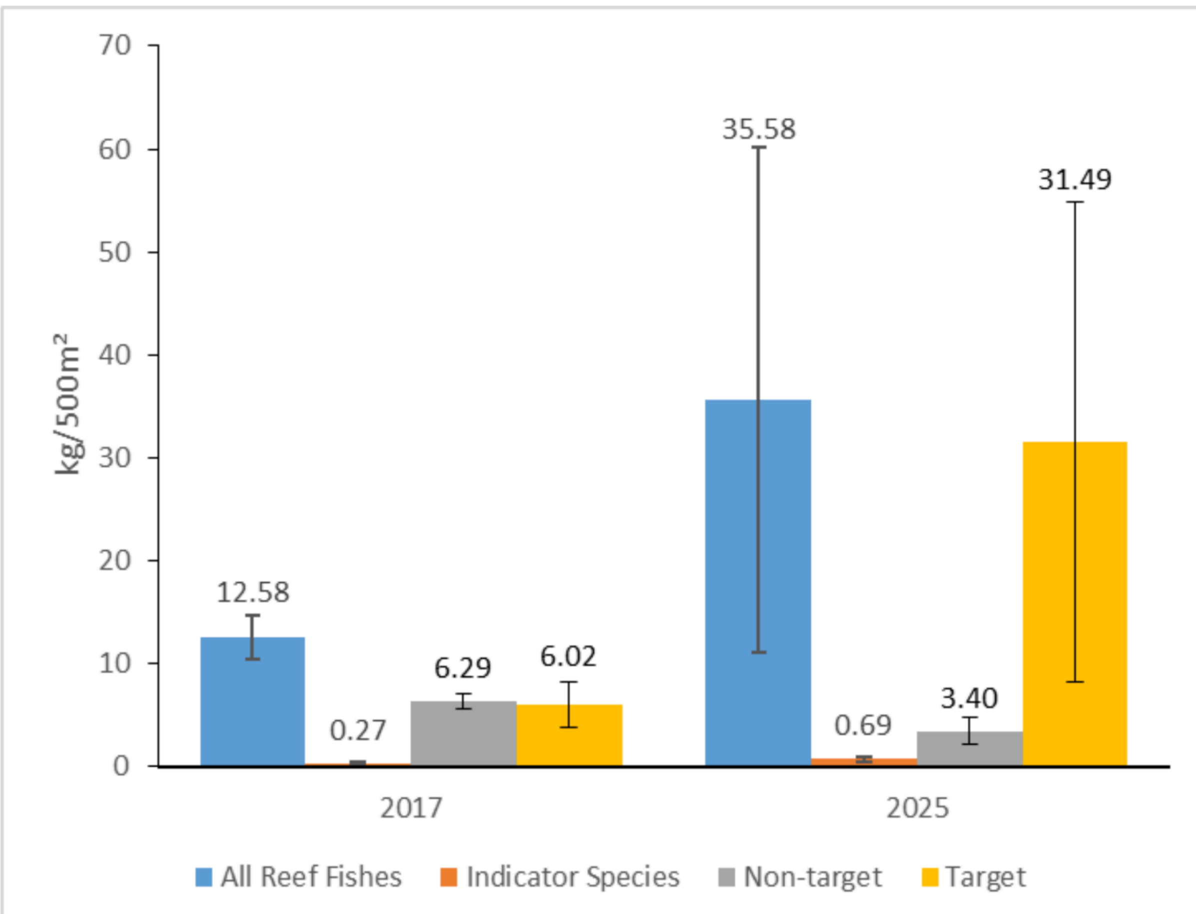


Figure 6d. Changes in fish biomass by functional group (mean ± SE) at Tubod MPA from 2017 to 2025. Species were categorized as target species (commercially important), indicator species (butterflyfish), or non-target species.

FVC Density: Mean reef fish density was high at 1923 individuals/500m² in 2017, reef fish communities were largely dominated by non-target/non-indicator species, specifically damselfishes (Pomacentridae). In 2025, mean reef fishes were moderate at 484 individuals/500m² (Figure 12e) which is within the moderate category.

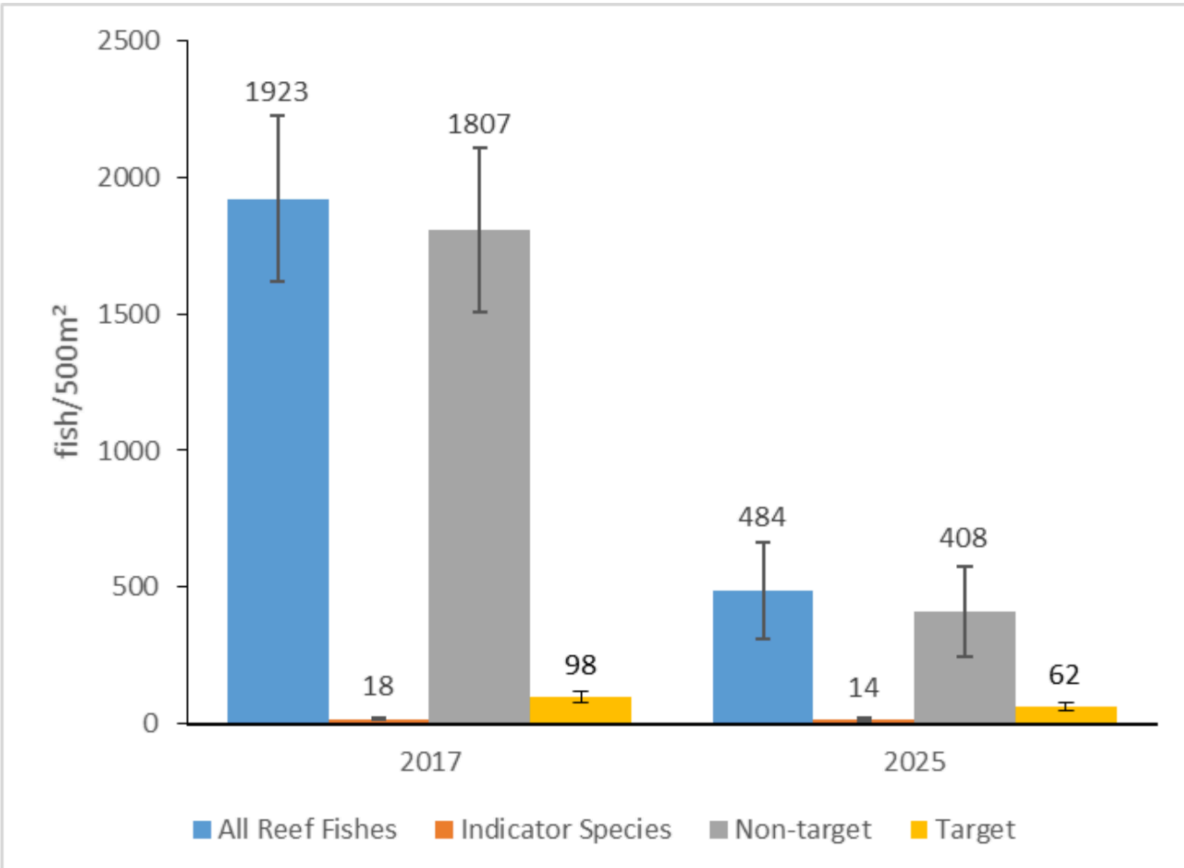


Figure 6e. Changes in fish density by functional group (mean ± SE) at Tubod MPA from 2017 to 2025. Species were categorized as target species (commercially important), indicator species (butterflyfish), or non-target species.

4. **Catulayan Marine Sanctuary**

Site Overview: Catulayan MPA was established in 2015 through the efforts of the Bulihisan Fisherfolk Association, with support from the Catulayan LGU. The 9.5-hectare sanctuary is situated off the southwestern coast of Siquijor in the municipality of San Juan. During the 2025 expedition, SPR divers observed abundant fish populations and noted the presence of *Tridacna* sp. (giant clams) just outside the formal transect area. However, they also recorded *Acanthaster planci* (Crown-of-thorns) sea stars, which pose a threat to coral health.

MEAT Score Analysis: In the most recent MEAT survey conducted by CCEF staff in January 2023, the MPA received a score of 49 out of 84 points, earning a Level 3 – "Sustained" rating. While the management body conducts active and regular patrolling, record-keeping of enforcement documentation – including apprehensions and violations – relies heavily on the San Juan LGU's Municipal Agriculture Office (MAO). Additionally, the management body lacks experience in fund outsourcing and primarily depends on annual infrastructure allocations from the LGU.

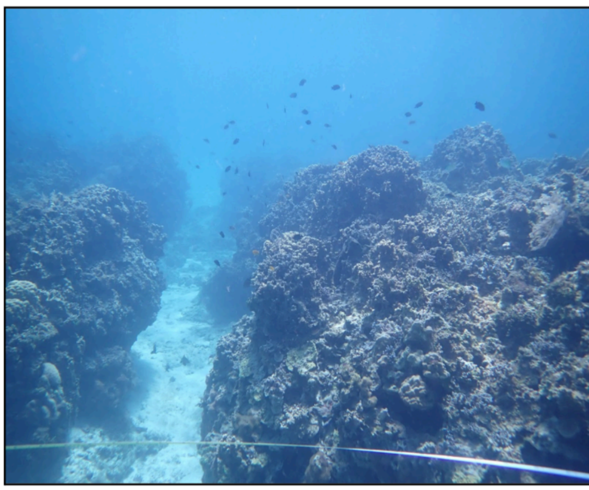


Figure 7a. Underwater view of the MPA.

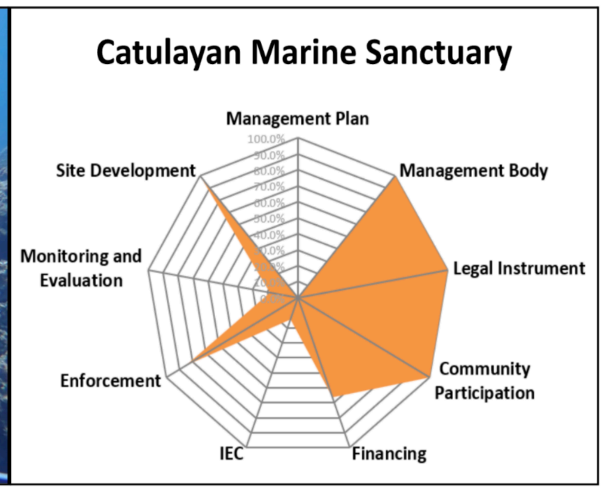


Figure 7b. Radar chart of 2023 MEAT score.

Benthic Habitat Characterization: Benthic survey data from Catulayan Marine Sanctuary, a newly selected site for the 2025 Saving Philippine Reefs expedition in Siquijor, reveal distinct spatial variation in reef condition between depth zones and in comparison to the adjacent fished reef (AFR). Located in the municipality of San Juan, which hosts five established marine sanctuaries, Catulayan exhibited relatively high hard coral cover in its deeper (scuba) transects at 49.17±7.22%, indicating moderate reef health. In contrast, the shallow snorkeling area showed significantly lower hard coral cover at 15.73±1.87%, along with elevated abiotic substrate (58.27±4.85%) and a notably high "Others" category at 16.97±3.84%. The "Others" component includes algae, sponges, other benthic fauna, and seagrass, which may indicate increased competition for space or shifts in benthic community structure. The adjacent fished reef presented intermediate values, with 36.17±2.35% hard coral, 38.67±5.89% abiotic cover, and 19.50±3.62% dead coral with algae, reflecting moderate reef degradation. This intermediate status suggests ongoing impacts from fishing and possibly other anthropogenic pressures. Notably, the shallow zone within the sanctuary was in poorer condition than even the fished reef, highlighting potential localized stressors such as sedimentation, wave exposure, or tourism-related impacts that may be disproportionately affecting the nearshore habitat.

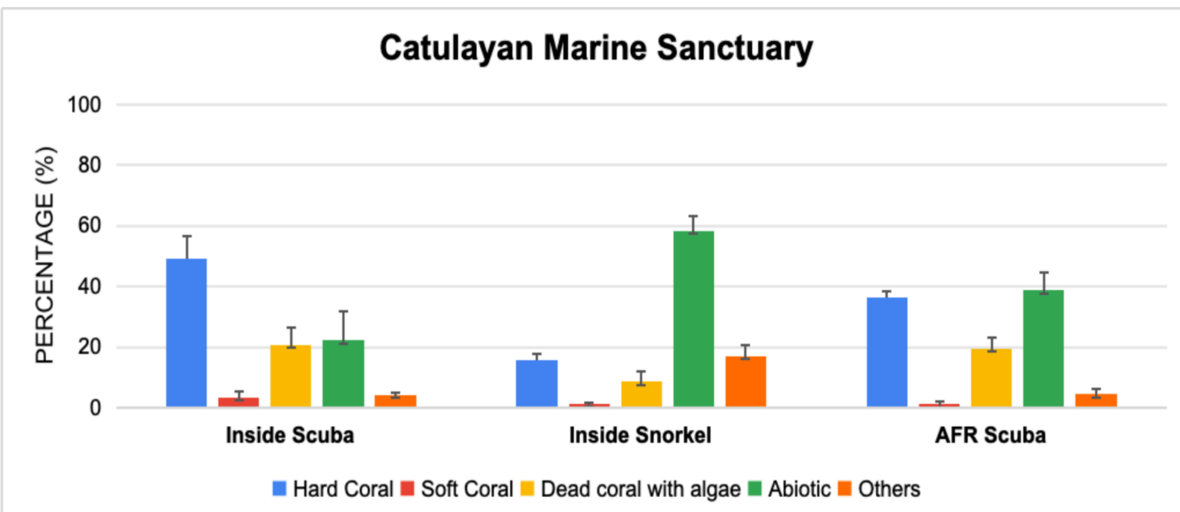


Figure 7c. Substrate composition (mean ± SE%) at Catulayan MPA and its adjacent fished reef in 2025. Data were compiled from both snorkel and SCUBA surveys. No prior data were available for comparison.

FVC Diversity: A total of 63 coral reef species belonging to 18 families and subfamilies were observed in Catulayan Marine Sanctuary. Species richness in the sanctuary is 38±2.33 species/500m², a value lower than the adjacent fished reef with 49±2.12 species/500m².

FVC Biomass: Mean reef fish biomass was estimated at 6.03 kg/500m² (12.06 mt/km²), or "moderate" based on the ranges set by Nañola et al. (2011). It was slightly higher in the adjacent fished reef at 8.12 kg/500m² (16.24 mt/km²) which is within the moderate category (Figure 2d). Target species, with an estimated biomass of 2.02 kg/500m² (4.04 mt/km²). The dominant fish families in terms of biomass included surgeonfishes and parrotfishes.

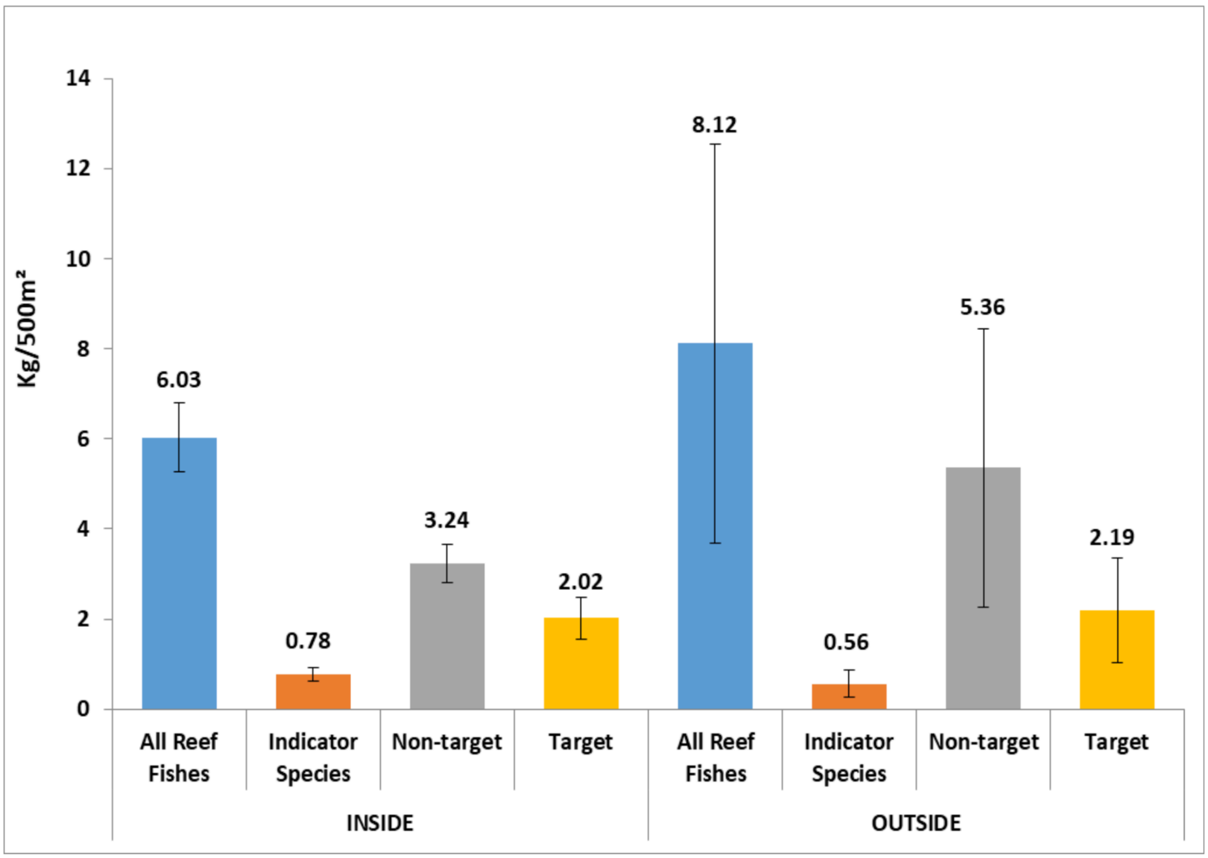


Figure 7d. Fish biomass by functional group (mean ± SE) at Catulayan MPA and its adjacent fished reef in 2025. Species were categorized as target species (commercially important), indicator species (butterflyfish), or non-target species. No prior data were available from this site; therefore, data from inside the MPA and from the adjacent fished reef (labeled as "Outside") are presented for comparison.

FVC Density: Mean reef fish density was estimated at 443 individuals/500m², which is within the moderate category of the scale defined by Hilomen et al. (2000). It was higher in the adjacent fished reef at 580 individuals/500m² (Figure 2e). Reef fish density was dominated by damselfishes, wrasses and butterflyfishes. The density of commercially targeted reef fishes inside the Catulayan Marine Sanctuary was estimated at 19 individuals/500m² largely represented by surgeonfishes (Acanthuridae) and parrotfishes (Scaridae) while in the adjacent fished reef at 41 individuals/500m².

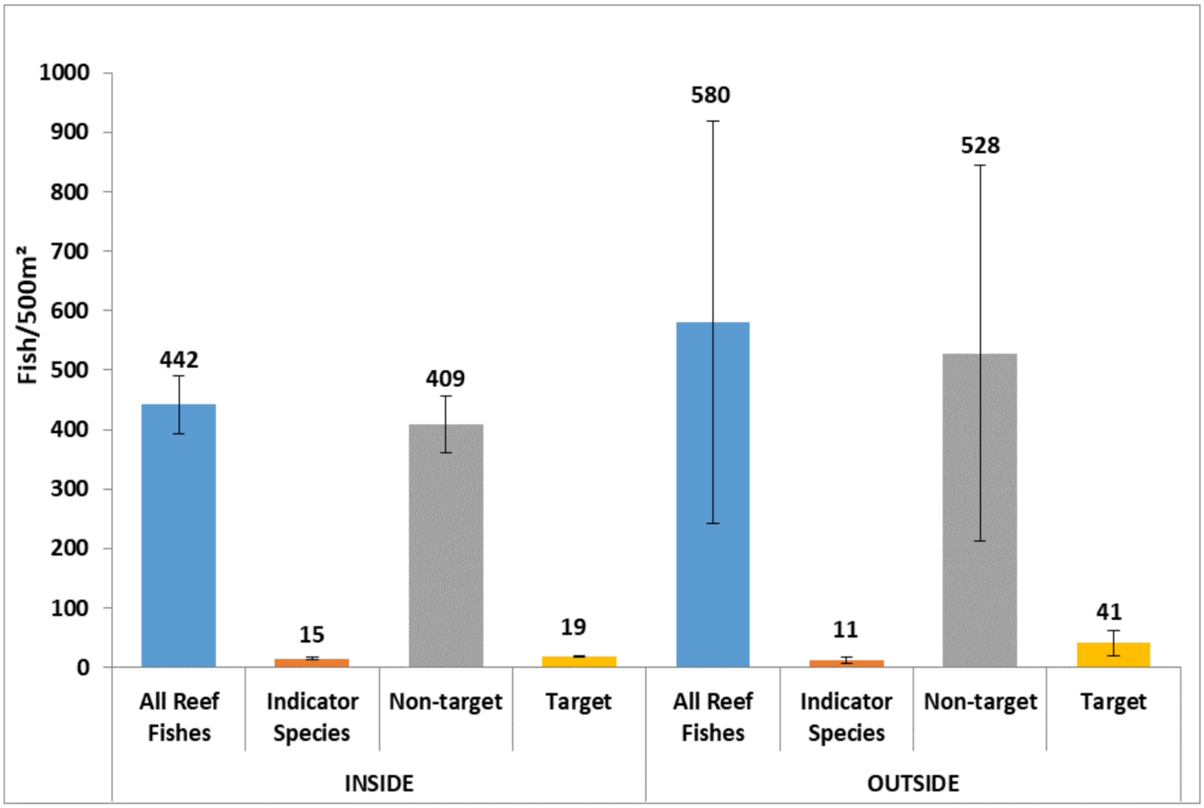
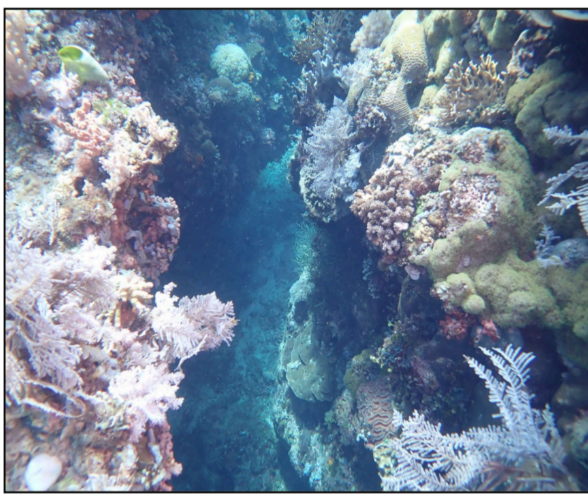


Figure 7e. Fish density by functional group (mean ± SE) at Catulayan MPA and its adjacent fished reef in 2025. Species were categorized as target species (commercially important), indicator species (butterflyfish), or non-target species. No prior data were available from this site; therefore, data from inside the MPA and from the adjacent fished reef (labeled as "Outside") are presented for comparison.

5. Cangmunag Marine Sanctuary

Site Overview: Located at the southern extent of the Municipality of San Juan, the 12-hectare Cangmunag Marine Sanctuary was established through Municipal Ordinance No. 2009-004 and reestablished in 2010. The sanctuary is marked by steep limestone cliffs and no beach access, making it one of the more physically challenging MPAs to reach. To address this, a bamboo ladder has been installed to allow descent from the cliffside to the waterline. Cangmunag is managed locally by the Lamugan Fisherfolk Association (LAFA), with support from the Cangmunag LGU. During the SPR 2025 biophysical assessments, the dive team observed a decent amount of coral diversity, though few invertebrates were noted.

MEAT Score Analysis: In the 2023 MEAT (Management Effectiveness Assessment Tool) evaluation, the sanctuary scored only 16 out of 84 points (or 19%), placing it in Level 1 – "Established" category for management effectiveness. This reflects major gaps in management planning, community education, enforcement capacity, and monitoring activities. Despite modest biological indicators, the site has potential for recovery and ecological benefit if stronger governance structures and regular monitoring are established in the future.



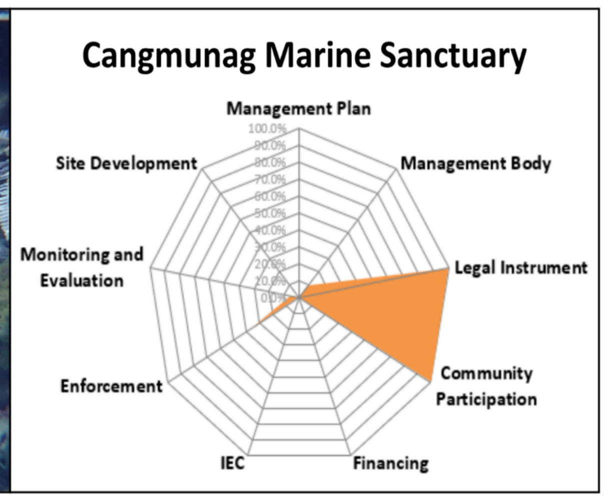


Figure 8a. Underwater view of the MPA.

Figure 8b. Radar chart of 2023 MEAT score.

Benthic Habitat Characterization: Benthic monitoring data from Cangmunag Marine Sanctuary between 2009 and 2025 indicate relatively stable and healthy reef conditions, characterized by consistently high hard coral cover. Although a notable decline occurred in 2011 at 31.7±11.2%, coral cover recovered to 71.8±12.8% in 2013 and remained above 60% in subsequent years, reaching 62.8±5.84% in 2025. Soft coral remained a minor component throughout the period, while the proportion of dead coral with algae stayed below 7.0%, suggesting limited recent coral mortality. Abiotic substrate peaked in 2011 at 49.3±9.3% but declined to 22.5±5.5% by 2025. The "Others" category, which includes fleshy algae, sponges, seagrass, and other benthic fauna, remained consistently low.

In comparison, the adjacent fished reef also supported high hard coral cover, peaking at 83.5±7.5% in 2013, but this gradually declined to 54.3±5.17% by 2025. Soft coral cover was generally higher than in the sanctuary in later years, reaching 13.5±0.68% in 2014 and 6.5±0.5% in 2025. However, dead coral with algae increased to 13.7±2.09% by 2025, nearly double the value recorded within the sanctuary, indicating greater recent coral stress. Abiotic substrate remained lower and more stable compared to the sanctuary, while the "Others" category rose to 11.7±3.42% in 2017 before decreasing to 5.24±4.42% in 2025.

Overall, while both sites maintained relatively high coral cover over the long term, the sanctuary showed more consistent conditions and lower indicators of recent coral stress. The adjacent fished reef, despite periods of high coral cover, exhibited increasing signs of degradation in recent years, highlighting the potential benefits of long-term protection within the sanctuary boundaries.

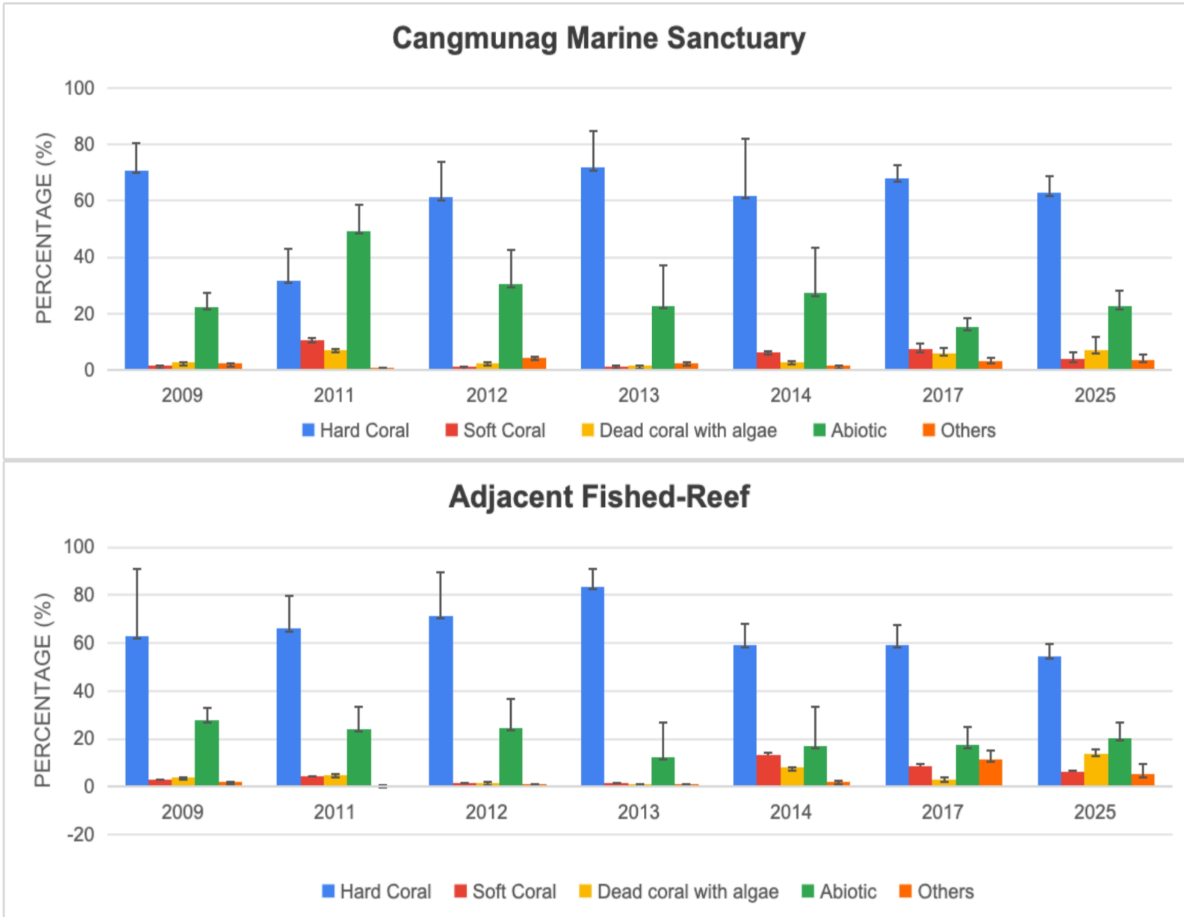


Figure 8c. Changes in substrate composition (mean ± SE%) at Cangmunag MPA and its adjacent fished reef from 2009 to 2025. Data were collected from SCUBA surveys only.

FVC Diversity: Around 84 coral reef fish species belonging to 19 families and subfamilies were identified in the Cangmunag MS. Species richness in the sanctuary is 52±7.77 species/500m² falling within the very high category of the scale defined by Hilomen et al. (2000). It was slightly lower in the adjacent fished reef at 48±8 species/500m².

FVC Biomass: Mean fish biomass was higher in 2025 at 22.92 kg/500m² (45.84 mt/km²) than in 2017 (20.80 kg/500m² or 41.6 mt/km²), but still within the 'very high' (Figure 9d). Commercially important fish families had a mean biomass of 5.74 kg/500m² in 2017 and 8.93 kg/500m² in 2025. Biomass was mainly contributed by damselfishes (Pomacentridae) for both 2017 and 2025 surveys.

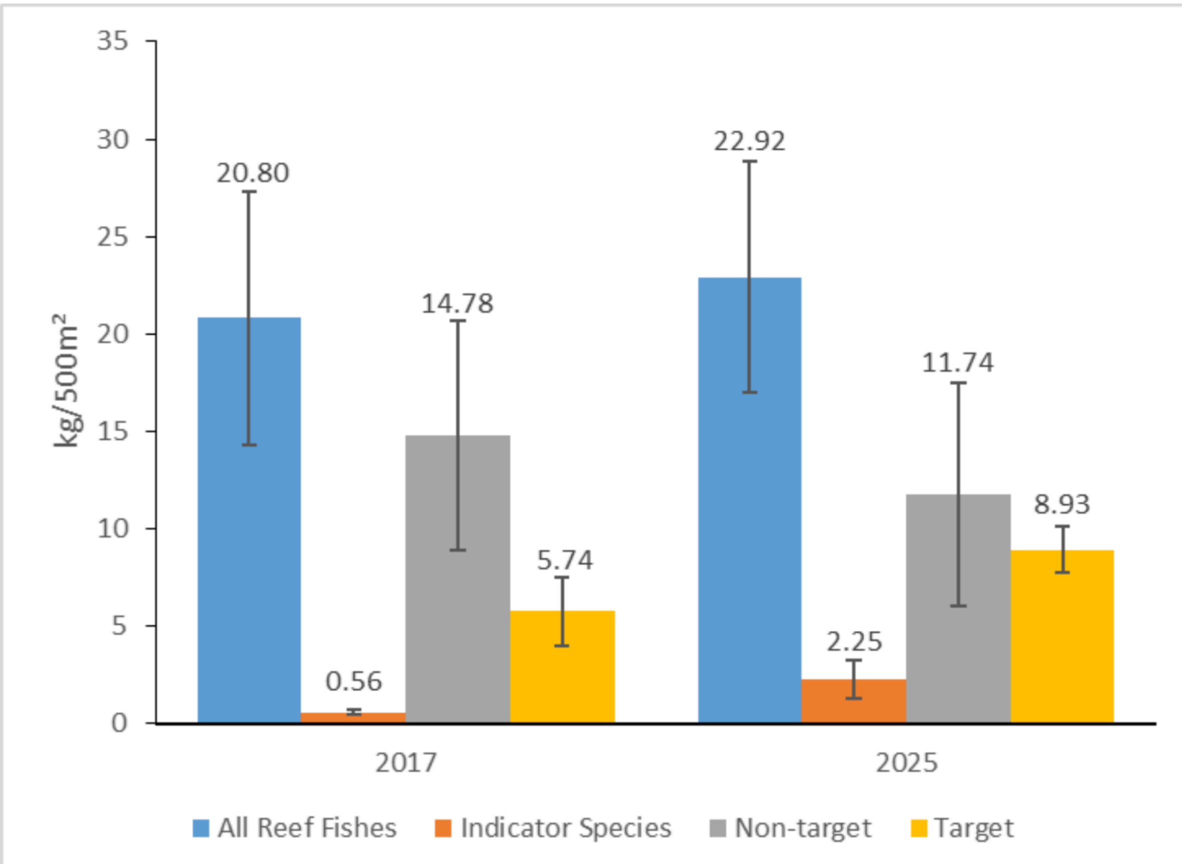


Figure 8d. Changes in fish biomass by functional group (mean ± SE) at Cangmunag MPA from 2017 to 2025. Species were categorized as target species (commercially important), indicator species (butterflyfish), or non-target species.

FVC Density: Mean reef fish density was estimated at 1074 individuals/500m², which is within the moderate category of the scale defined by Hilomen et al. (2000). It was highest in 2014 at 1815 individuals/500m² and lowest during 2009 at 297 individuals/500m² (Figure 9e). Reef fish density was dominated by damselfishes (Pomacentridae) and wrasses (Labridae). The density of commercially targeted reef fishes was estimated at 46 individuals/500m², represented by surgeonfishes (Acanthuridae) and parrotfishes (Scaridae).

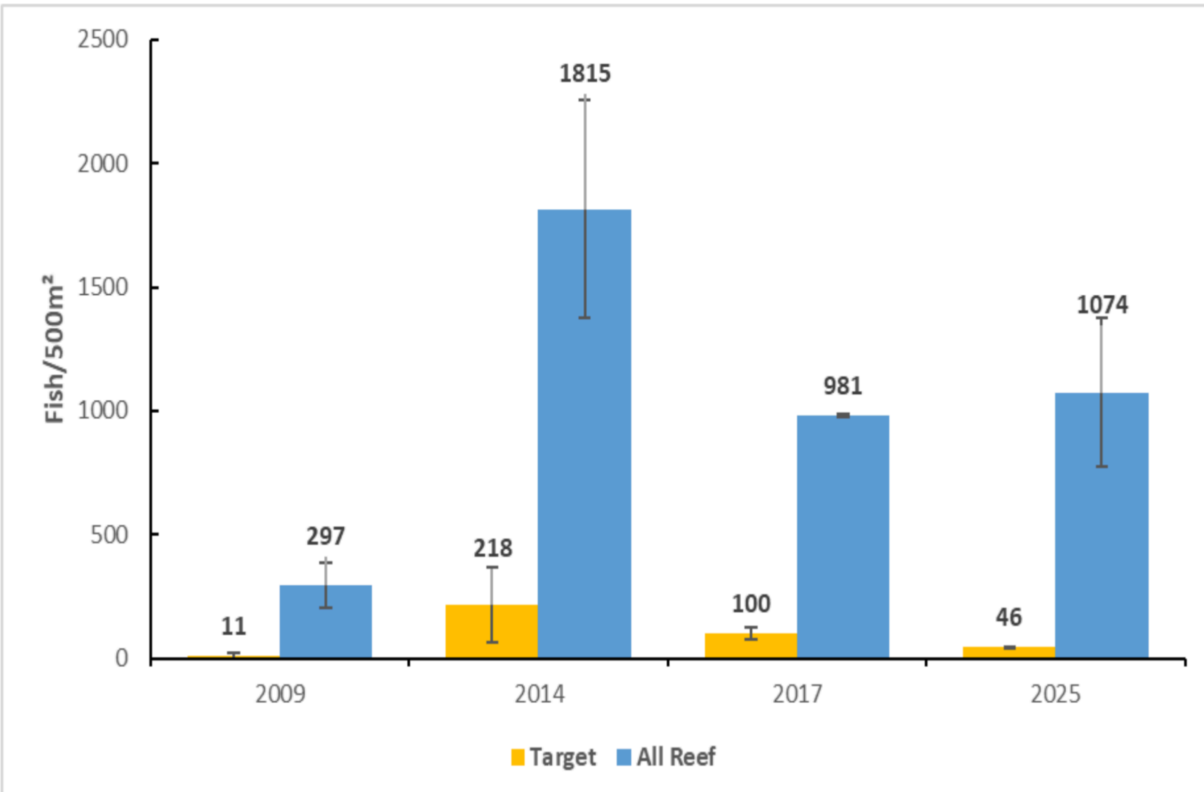


Figure 8e. Changes in fish density by functional group (mean ± SE) at Cangmunag MPA from 2009 to 2025. Species were categorized as target species (commercially important), indicator species (butterflyfish), or non-target species.

MUNICIPALITY OF LAZI MARINE PROTECTED AREAS

6. Lalag Bato Marine Sanctuary

Site Overview: Established in 2003, the 8.23-hectare marine sanctuary locally known as "Lower Cabancalan" is managed by the Napayong Marine Management Committee in coordination with the Lazi LGU. Ecologically, the sanctuary features algal beds, a fringing reef, and scattered shoal environments. During the SPR 2025 dive assessments, the team observed a very calm underwater environment with patchy reef structures interspersed with large sandbeds. Despite its relatively quiet and sheltered conditions, the reef appears fragmented and may benefit from habitat enrichment and more active management intervention.

MEAT Score Analysis: Though it has been operational for 19 years, a 2023 MEAT report classifies Lalag Bato as Level 1 – "Established" with a score of 24 out of 84 points due to its lack of management plan. Additionally, the sanctuary boundaries remain undelineated due to the aftermath of Typhoon Odette. The identification of MPA enforcers is still pending, and the site has not generated or accessed funding in the last two years. Violations are typically settled at the barangay level, meaning there has been no experience in prosecuting or sanctioning violators. It is recommended that the Lazi LGU register municipal ordinances and/or resolutions that would serve as legal support for the establishment, development, management, and conservation of its MPA in the future.

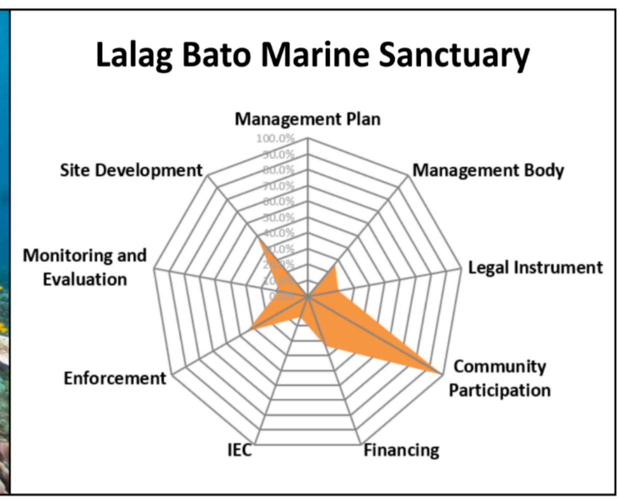


Figure 9a. Underwater view of the MPA.

Figure 9b. Radar chart of 2022 MEAT score.

Benthic Habitat Characterization: Benthic surveys from 2005 to 2025 indicate a gradual recovery in Lalag Bato Marine Sanctuary. Hard coral cover increased from 6.6±2.75% to 21.53.97%, while soft coral remained relatively high, reaching 27.5±11.46% by 2025. Although dead coral with algae spiked to 24.93±2.37% in 2022, it declined to 5±3.77% in 2025, suggesting a recovery following a possible disturbance. Abiotic substrate remained a dominant component throughout the period, while the category labeled "Others," which includes fleshy algae, sponges, seagrass, and other fauna, gradually decreased.

Shallow reef flat surveys within the sanctuary showed more favorable trends. Hard coral cover increased from 21.7±3.46% in 2009 to 33.5±3.21% in 2025, accompanied by a notable decline in abiotic cover from 55.6±0.06% to 28.1±4.6%. However, a modest increase in dead coral with algae points to localized stress, likely related to snorkeling activities in the area.

In comparison, the adjacent fished reef exhibited more fluctuating and generally lower coral cover. Hard coral declined from a peak of 31.6±1.58% in 2007 to 16.5±6.09% in 2025. At the same time, dead coral with algae steadily increased, reaching 18.6±1.69%%, and soft coral declined to 2.73±4.34%. These findings emphasize the positive effects of sanctuary protection and the continuing degradation observed in nearby unprotected reefs.

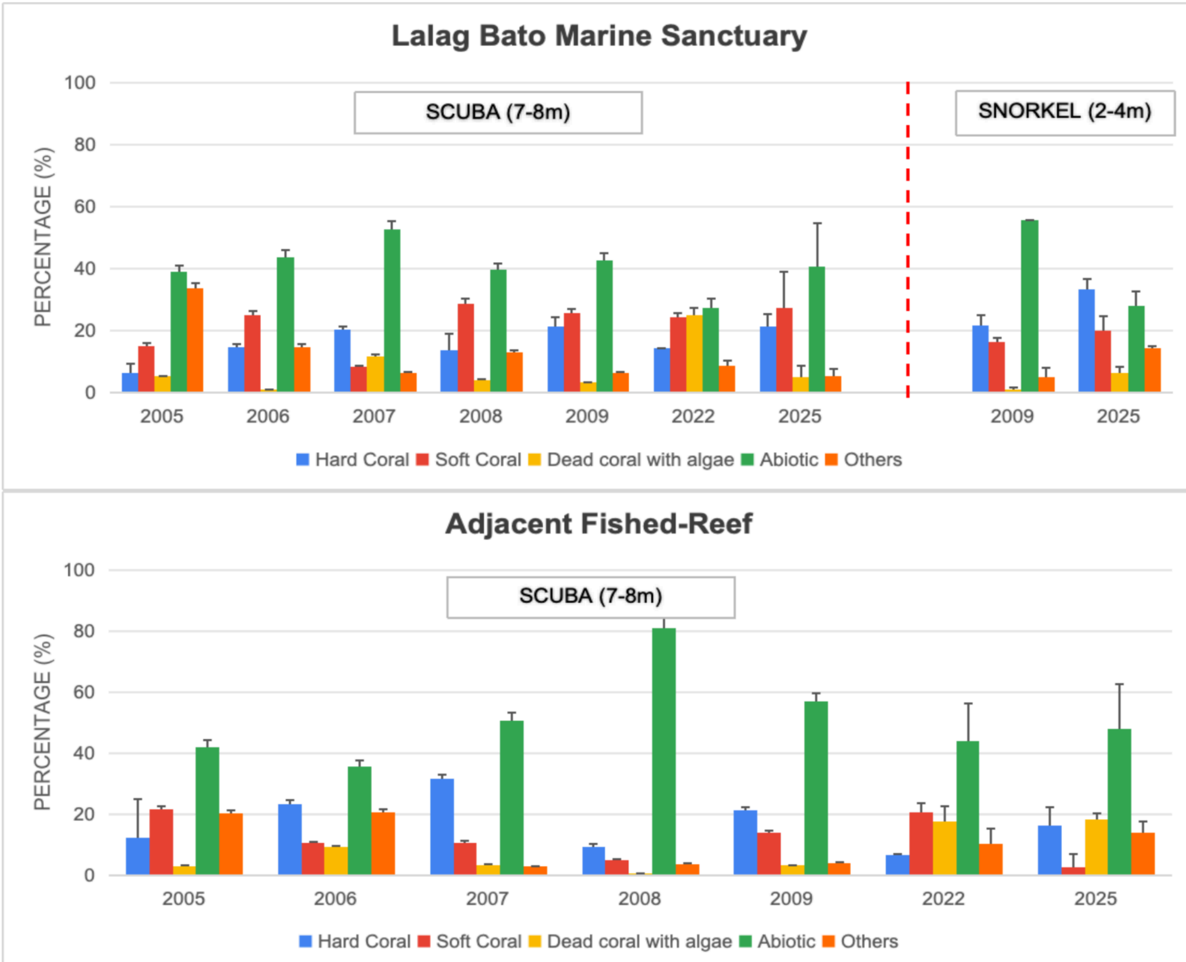


Figure 9c. Changes in substrate composition (mean ± SE%) at Lalag Bato MPA and its adjacent fished reef from 2005 to 2025. Data were compiled from both snorkel and SCUBA surveys.

FVC Diversity: A total of 89 reef fish species belonging to 18 families and subfamilies were observed. In terms of species richness, the fish assemblage was dominated by non-target species, particularly damselfishes (Pomacentridae). Mean species richness was high at 49 species/500m² inside the marine sanctuary and a moderate of 36±12 species/500m² in the adjacent fished reef.

FVC Biomass: Reef fish biomass inside the Marine Sanctuary was rated very high on the assessment scale set by Nañola et al. (2011) with a mean of 33.04 kg/500m² (66.08 mt/km²). The adjacent fished reef had 10.23 kg/500m² (20.46 mt/km²) which falls to the high category. Biomass was largely dominated by target species, such as surgeonfishes (Acanthuridae), goatfishes (Mullidae) and emperors (Lethrinidae), with mean biomass of 20.98 kg/500m² or about 64% of the total fish biomass. (Figure 8d).

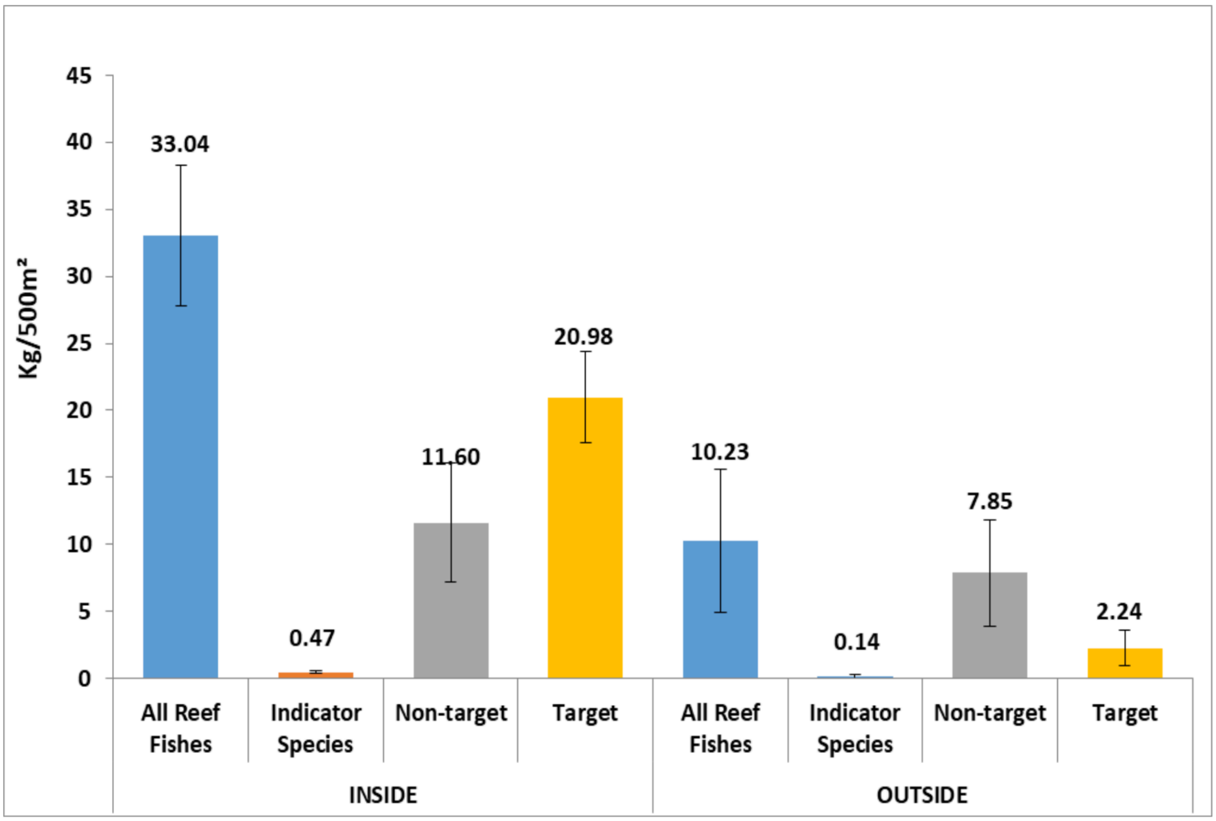


Figure 9d. Fish biomass by functional group (mean ± SE) at Lalag Bato MPA and its adjacent fished reef in 2025. Species were categorized as target species (commercially important), indicator species (butterflyfish), or non-target species. No prior data were available from this site; therefore, data from inside the MPA and from the adjacent fished reef (labeled as "Outside") are presented for comparison.

FVC Density: Fish density was generally moderate in both Marine Sanctuary and Adjacent Fished Reef based on the rating scale by Hilomen et al. (2000). Mean density in the MS was estimated at 1087 individuals/500m² and 765 individuals/500m² in the AFR. Density was largely dominated by non-target species, damselfishes (Pomacentridae) at 1008 individuals/500m². Target species contributed about 93% to the total density and was dominated by surgeonfishes (Acanthuridae), goatfishes (Mullidae) and parrotfishes (Scaridae). (Figure 8e)

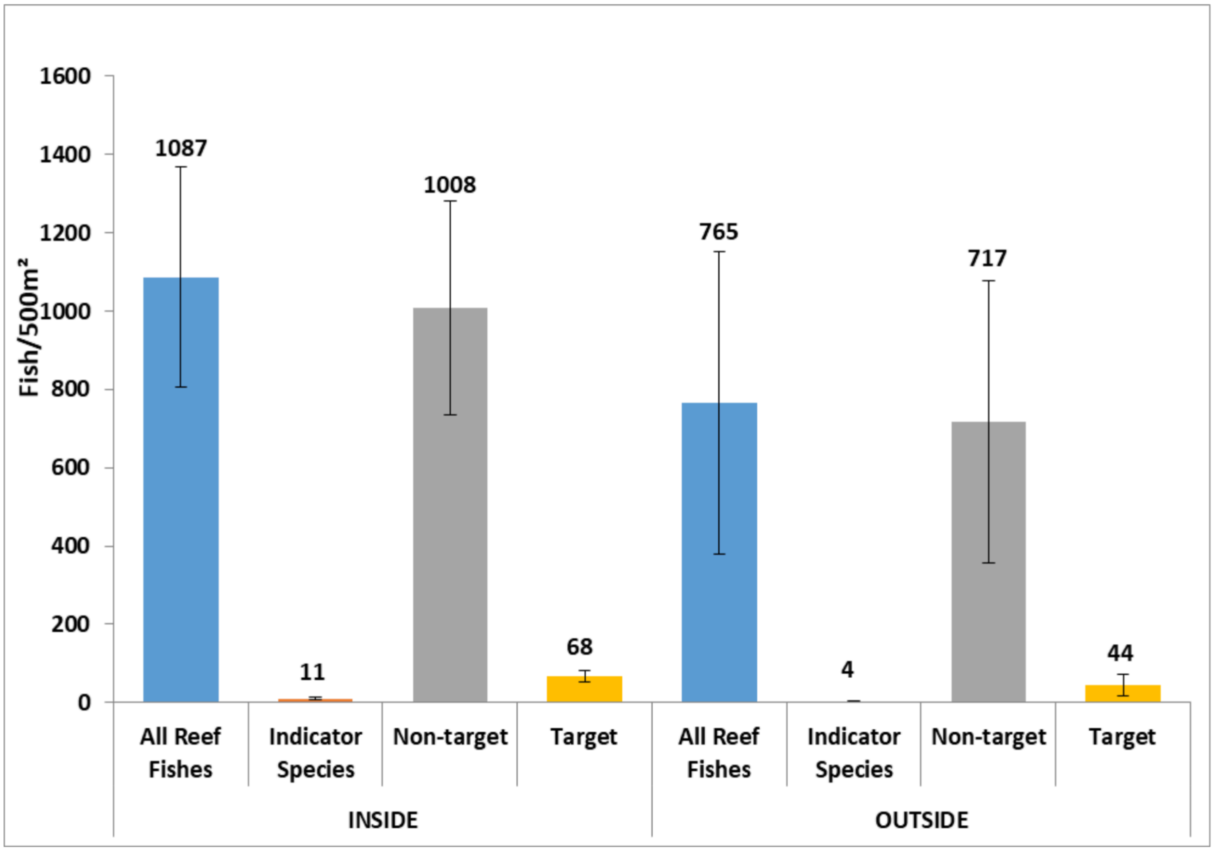
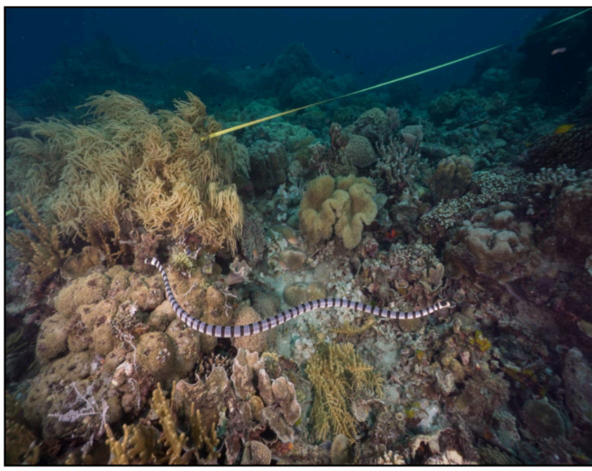


Figure 9e. Fish density by functional group (mean ± SE) at Lalag Bato MPA and its adjacent fished reef in 2025. Species were categorized as target species (commercially important), indicator species (butterflyfish), or non-target species. No prior data were available from this site; therefore, data from inside the MPA and from the adjacent fished reef (labeled as "Outside") are presented for comparison.

7. **Napayong Marine Sanctuary**

Site Overview: Also locally known as the Talayong Marine Sanctuary, this 6.68-hectare MPA is located near Lower Cabancalan on the southern tip of Siquijor. It was legally established in 2003 through Municipal Ordinance No. 12-2003. The sanctuary is jointly overseen by the Napayong Marine Management Committee, the Lazi LGU, and CCEF. During the 2025 SPR biophysical assessments, the dive team noted the presence of vibrant and healthy coral assemblages across the fringing reef and algal beds of Napayong sanctuary.

MEAT Score Analysis: Napayong Marine Sanctuary received a cumulative score of 48 out of 84 in the 2023 MEAT survey, placing it in Level 3 – "Sustained" management category. This indicates that management at the site has been effectively strengthened according to the MEAT assessment. Despite its strong ecological potential, gaps in planning and the absence of a consistent managing body for this MPA suggest that further improvements are still needed.



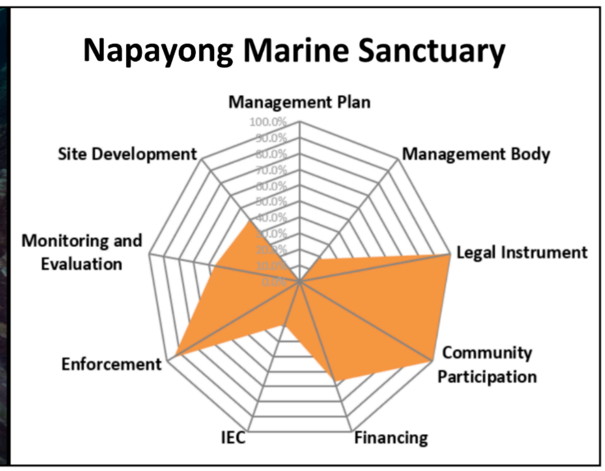


Figure 10a. Sea krait, *Lauticada* sp. swimming near transect inside the MPA.

Figure 10b. Radar chart of 2023 MEAT score

Benthic Habitat Characterization: Benthic surveys at Napayong Marine Sanctuary from 2005 to 2025 show sustained reef health with a strong rebound in live hard coral cover, increasing from 37.3±0.39% in 2009 to 59.2±14.92% in 2025 after earlier fluctuations. This recovery is accompanied by a relatively low and stable presence of dead coral with algae, which remained below 9%, indicating limited recent coral mortality and minimal algal overgrowth. Soft coral cover declined gradually over time, while abiotic components and the "Others" category, including fleshy algae, sponges, seagrass, and other fauna, also decreased, suggesting a shift toward more consolidated coral-dominated substrate.

In the shallow snorkeling area surveyed in 2009, hard coral cover was lower at 23.8±3.33% and abiotic and "Others" categories were higher, reflecting greater exposure to wave action and tourism-related stress. The adjacent fished reef showed more variability, with hard coral dropping from 55.0±2.75% in 2005 to 33.6±1.68% in 2009 before increasing to 49.0±1% by 2025. However, this was accompanied by a noticeable rise in dead coral with algae, especially in 2025 at 15.3±0.6%, suggesting higher disturbance or slower recovery compared to the sanctuary. Overall, these patterns emphasize the sanctuary's effectiveness in maintaining higher live coral cover and lower degradation, particularly at deeper sites.

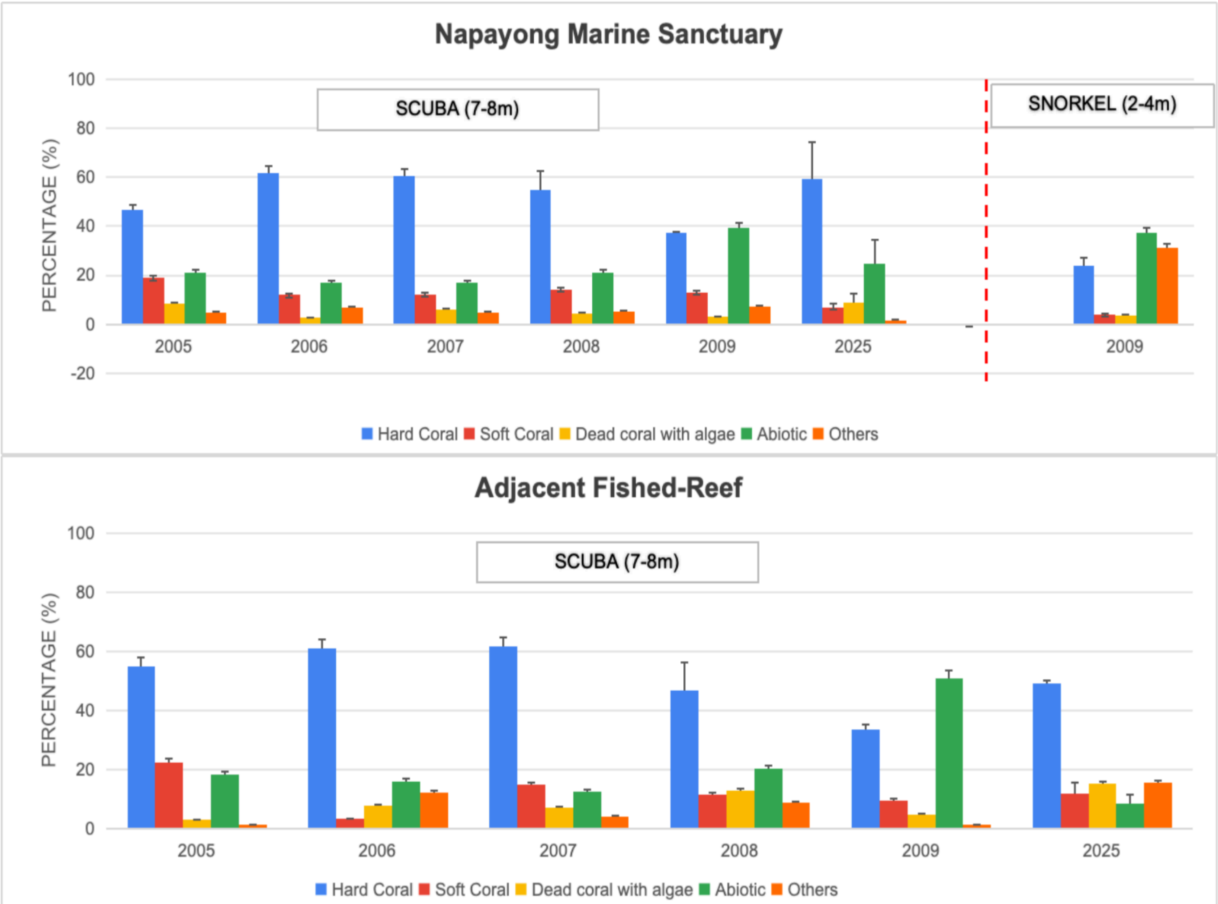


Figure 10c. Changes in substrate composition (mean ± SE%) at Napayong MPA and its adjacent fished reef from 2005 to 2025. Data were compiled from both snorkel and SCUBA surveys.

FVC Diversity: A total of 104 coral reef fishes belonging to 21 families and subfamilies were observed in Napayong Marine Sanctuary. Mean species richness was very high at 57±3.84 species/500m² in the marine sanctuary. In contrast, the adjacent fished reef had a lower total number of fish species listed (72 species), species richness was at 37±17.13 species/500m².

FVC Biomass: Mean reef biomass was rated generally very high on the assessment scare by Nañola et al. (2011). With the mean biomass estimated at 30.55 kg.500m² (61.1 mt/km²) inside the Napayong Marine Sanctuary. Mean biomass in the adjacent fished reef was estimated at 20.41 kg/500m² (40.82 mt/km²). About 59% of the overall biomass in MS was contributed by target species like goatfishes (Mullidae), fusiliers (Caesionidae) and triggerfishes (Balistidae) at 18.03 kg/500m². (Figure 7d)

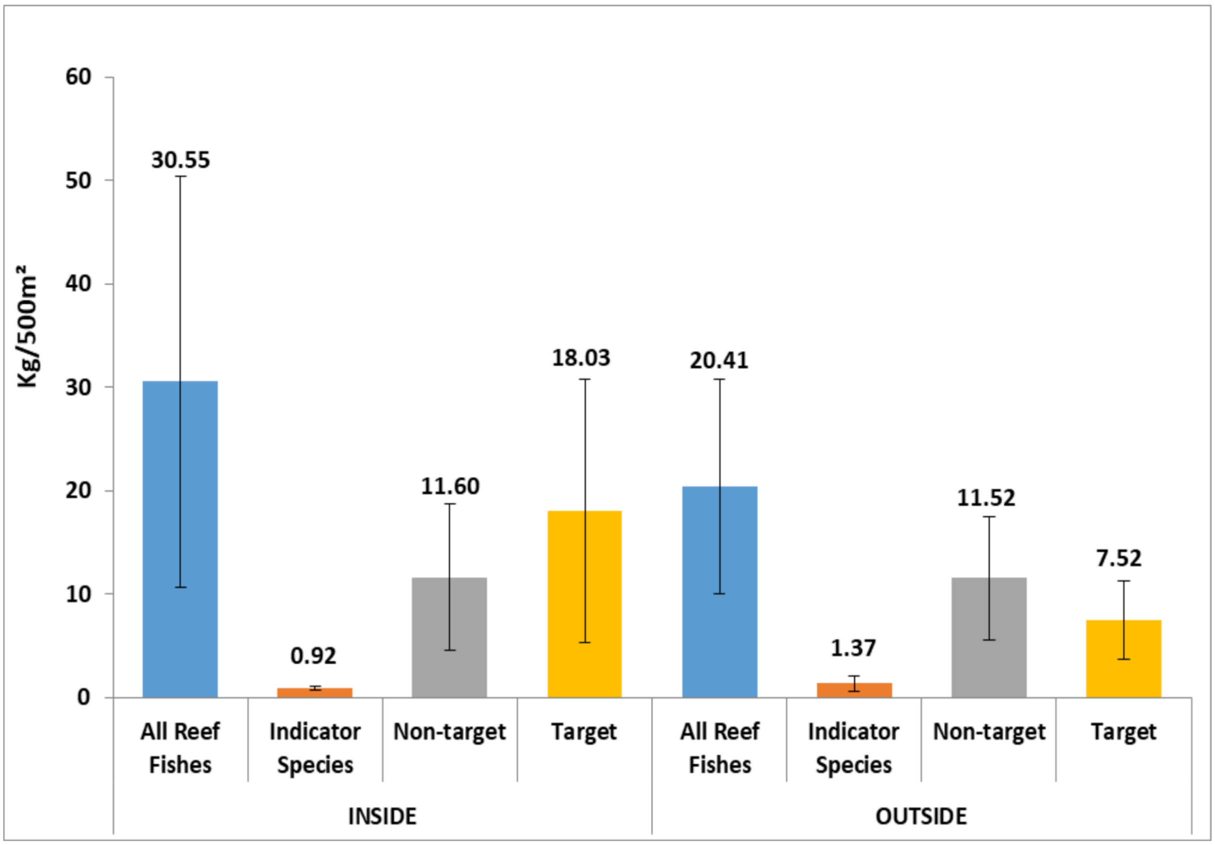


Figure 10d. Fish biomass by functional group (mean ± SE) at Napayong MPA and its adjacent fished reef in 2025. Species were categorized as target species (commercially important), indicator species (butterflyfish), or non-target species. No prior data were available from this site; therefore, data from inside the MPA and from the adjacent fished reef (labeled as "Outside") are presented for comparison.

FVC Density: Density was dominated by non-target/non-indicator species like damselfishes (Pomacentridae) and wrasses (Labridae). Density of commercially important reef fish families was estimated at 96 individuals/500m², and was dominated by surgeonfishes (Acanthuridae), squirrelfishes (Holocentridae) and goatfishes (Mullidae). (Figure 7e)

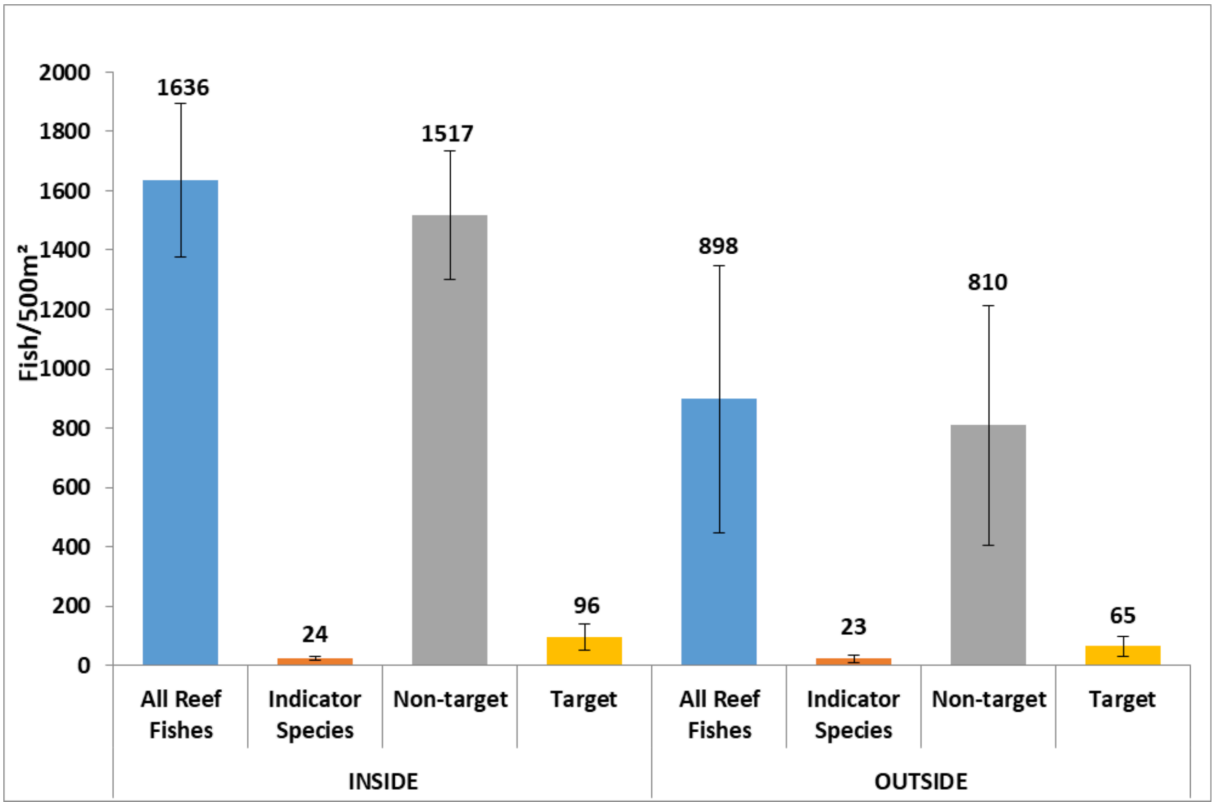


Figure 10e. Fish density by functional group (mean ± SE) at Napayong MPA and its adjacent fished reef in 2025. Species were categorized as target species (commercially important), indicator species (butterflyfish), or non-target species. No prior data were available from this site; therefore, data from inside the MPA and from the adjacent fished reef (labeled as "Outside") are presented for comparison.

MUNICIPALITY OF MARIA MARINE PROTECTED AREAS

8. Olang Marine Sanctuary

Site Overview: Established in 2002, Olang is the second largest MPA on Siquijor and covers 21.4 hectares along the eastern coast in the Municipality of Maria. The area was severely damaged by Typhoon Yolanda in 2013, and experienced the loss of nearly 90% of its live hard coral cover. Since 2014, coral restoration efforts led by Silliman University under Dr. Aileen Maypa have helped stabilize coral fragments and rehabilitate fish habitats. The sanctuary's strong management earned it the Isla de Fuego award for Best Enforcement Team in 2019. For the 2025 biophysical assessment, data was collected at both the eastern and western boundaries of the MPA due to its size. Although surveyed separately, the two sites were combined into one overall evaluation during data processing.

MEAT Score Analysis: Olang scored 76 out of 84 points in a 2022 MEAT assessment, which translates to Level 4 – "Institutionalized" rating, thus reflecting its excellent conservation status and community involvement. Despite its high MEAT score, several areas for improvement remain. These include a lack of capacity in documenting meetings, filing apprehensions, record keeping, and bookkeeping. The management body also lacks tourism training, such as orienting visitors before entering the MPA, and would benefit from support in drafting formal letters to request assistance.

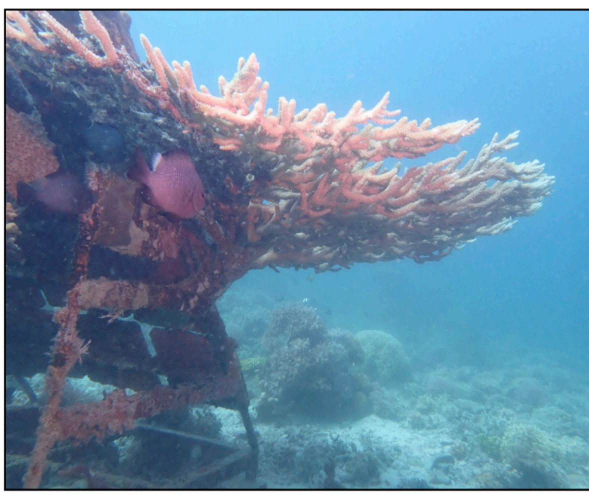


Figure 11a. Underwater view of the MPA.

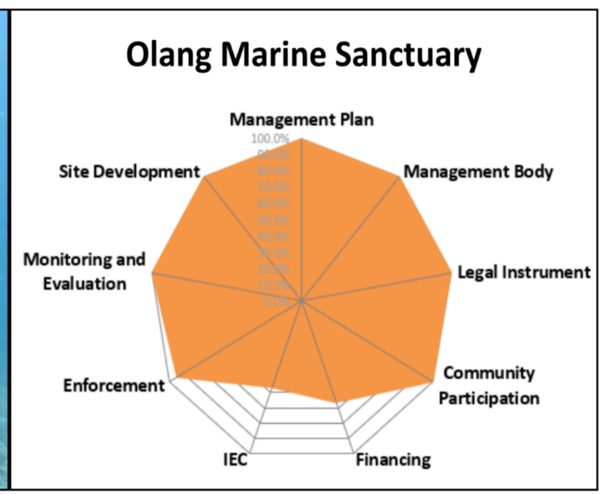


Figure 11b. Radar chart of 2022 MEAT score.

Benthic Habitat Characterization: The benthic survey in Olang Marine Sanctuary reflects long-term trends shaped by disturbance and recovery, particularly influenced by natural events and management interventions. Coral cover within the sanctuary at 7 to 8 meters depth declined significantly to just 5.83±2.19% in 2013, following major typhoons in 2011 (Sendong) and 2012 (Pablo) that caused extensive damage. In response, coral rehabilitation efforts were implemented between 2012 and 2015, leading to a notable recovery by 2022, when hard coral cover reached 33.78±10.71% in these deeper rehabilitation zones.

In 2025, surveys at shallower depths of 4 to 6 meters recorded 13.33±3.63% hard coral cover. However, a concurrent snorkeling survey at 2 to 4 meters revealed a much higher coral cover of 62.72±5.26. Averaging these two 2025 datasets gives an estimated hard coral cover of 38.03%, suggesting healthier coral conditions in upper reef zones within the sanctuary.

Comparatively, the adjacent fished reef showed a declining trajectory. After peaking at 38.33±22.62% hard coral cover in 2009, it fell to 14.92±5.67% by 2022 and further to 10±2.80% in 2025. Abiotic components also remained high, reaching 66.60±7.78% in the most recent survey, reflecting habitat degradation. These results highlight the importance of implementing active rehabilitation efforts to support coral recovery following storm-wave damage from typhoons, particularly after Tropical Storm Kristine in October 2024.

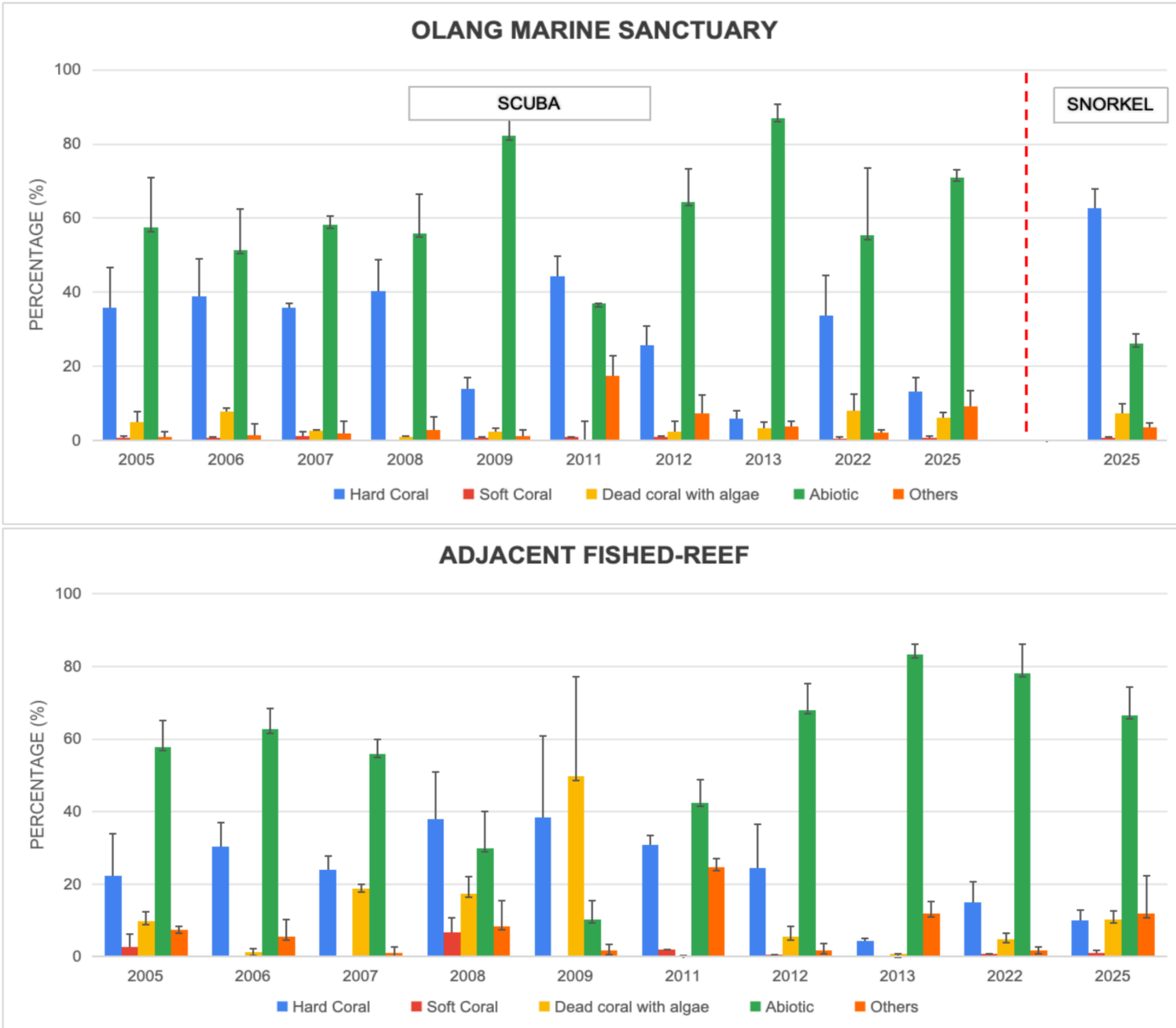


Figure 11c. Changes in substrate composition (mean ± SE%) at Olang MPA and its adjacent fished reef from 2005 to 2025. Data were compiled from both snorkel and SCUBA surveys.

FVC Diversity: A total of 94 coral reef species from 28 families and subfamilies were observed in Olang Marine Sanctuary. Mean species richness was high at 40±4.21 species/500m². Non-target/non-indicator species such as Damselfishes (Pomacentridae) and Fairy basslet (Serranidae subfamily Anthiinae) dominated the reef. The adjacent fished reef recorded a total of 76 coral reef species belonging to 18 different families. Species richness was moderate at 31±7.48 species/500m² based on the scale developed by Hilomen et al. (2000).

FVC Biomass: Mean reef biomass in Olang Marine Sanctuary was estimated at 11.73±2.68 kg/500m² (23.46 mt/km²), or "high" based on the ranges set by Nañola et al. (2011). Target species, with an estimated biomass of 5.94±1.97 kg/500m², largely dominated the fish assemblage by about 51%. The dominant fish families in terms of biomass included parrotfishes (Scaridae), surgeonfishes (Acanthuridae), goatfishes (Mullidae) and groupers (Serranidae). Biomass for the adjacent fished reef is at 5.32±2.11 kg/500m² (10.64 mt/km²) falls within the moderate category. (Figure 4c)

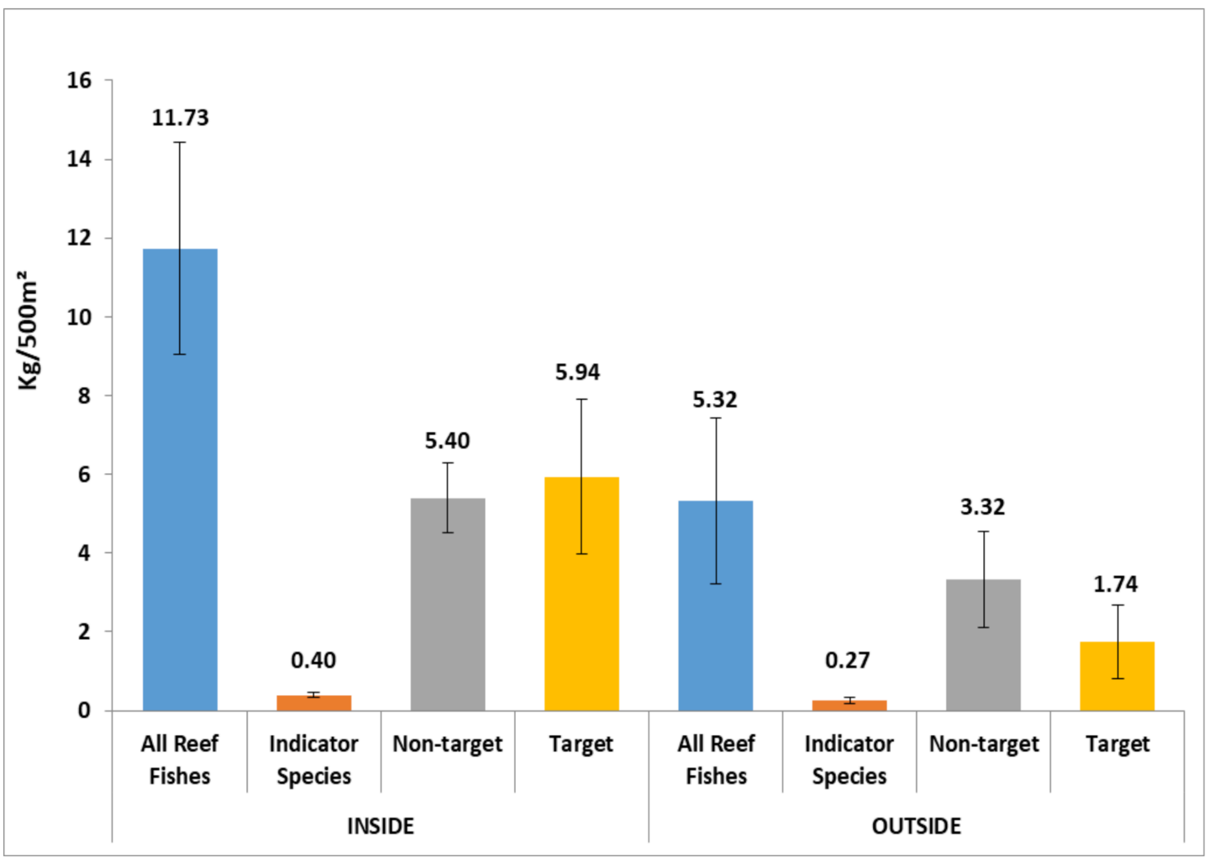


Figure 11d. Fish biomass by functional group (mean ± SE) at Olang MPA and its adjacent fished reef in 2025. Species were categorized as target species (commercially important), indicator species (butterflyfish), or non-target species. No prior data were available from this site; therefore, data from inside the MPA and from the adjacent fished reef (labeled as "Outside") are presented for comparison.

FVC Density: Fish density was moderate in both Marine Sanctuary and Adjacent Fished Reef based on the rating scale by Hilomen et al. (2000). Mean density in MS was estimated at 839±103.76 individuals/500m² and slightly lower in the AFR at 637±163.56 individuals/500m², mainly dominated by non-target species. Target species contributed 4% to the total density with an estimated density of 35±8.86 individuals/500m². (Figure 4d)

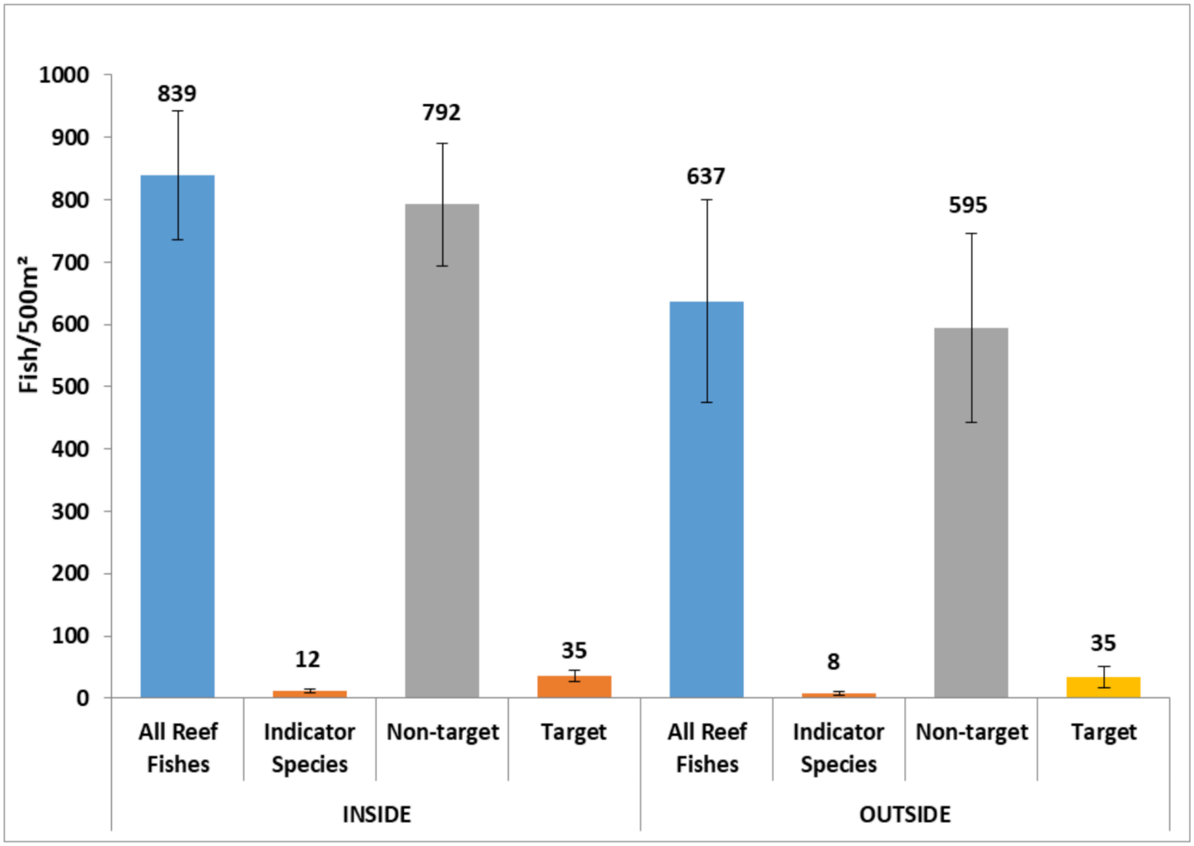


Figure 11e. Fish density by functional group (mean ± SE) at Olang MPA and its adjacent fished reef in 2025. Species were categorized as target species (commercially important), indicator species (butterflyfish), or non-target species. No prior data were available from this site; therefore, data from inside the MPA and from the adjacent fished reef (labeled as "Outside") are presented for comparison.

9. **Candaping B Marine Sanctuary**

Site Overview: Candaping B Marine Sanctuary is a 20.42 ha protected area established in 1996 through the initiatives of LGU Maria, with official legal support gained in 2003. The MPA is currently managed by the Candaping Marine Management Committee, with a focus on both conservation and development. During SPR's 2025 biophysical assessments, the dive team was approached by members of the Coast Guard, Philippine National Police, and *bantay dagat*, which indicates active enforcement within the sanctuary. However, the team observed that some of the MPA's buoy lines appeared to be anchored directly into massive coral heads, which may pose risks to the reef structure and warrant reassessment. A number of disease-ridden corals were also noted throughout the site. Due to the size of the MPA, surveys were conducted separately at the north and south boundaries. Although these were two distinct survey sites, the data was combined into a single evaluation during processing.

MEAT Score Analysis: Its most recent MEAT assessment in 2023 yielded a cumulative score of 70 out of 84 points, corresponding to a Level 4 – "Institutionalized" rating and positive recognition of its management efforts. Despite its high score, Candaping B has not yet conducted any IEC activities or developed written plans to indicate future ones. Its management plan and ordinance are outdated and thus require review and possible amendment. Furthermore, the management body would benefit from capacity building training on topics such as fund outsourcing and basic accounting to strengthen resource mobilization and sustainability.

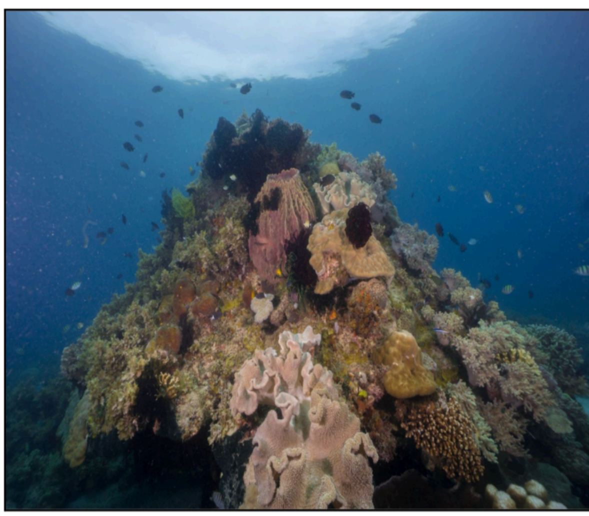


Figure 12a. Underwater view of the MPA.

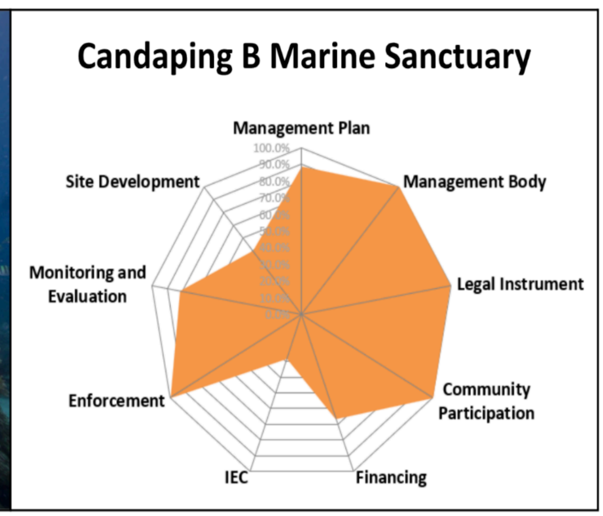


Figure 12b. Radar chart of 2023 MEAT score.

Benthic Habitat Characterization: The benthic survey in Candaping B Marine Sanctuary conducted in 2011 and 2025 highlights the effects of typhoon disturbances and coral rehabilitation efforts. Hard coral cover inside the sanctuary showed a slight decrease from 27.50±7.25% in 2011 to 25.42±7.19% in 2025 at deeper transects, while the 2025 snorkeling survey at 3-4 meters depth recorded a higher hard coral cover of 31.20±399%, indicating better recovery in shallower areas. Abiotic cover within the sanctuary increased from 39.50±8.78% to 64.17±6.77% in deeper zones, whereas dead coral with algae rose from 3.10±1.82% to 7.25±2.11%.

In contrast, the adjacent fished reef demonstrated a modest increase in hard coral from 27.38±19.87% to 30.67±7.94% over the same period. However, abiotic cover also increased markedly from 36.90±11.96% to 57.42±8.50%, and dead coral with algae appeared, rising to 6.92±1.71% by 2025. Soft coral remained low and relatively stable in both sites. The significant reduction in 'Others' category inside the fished reef from 34.70±10.81% to 3.42±2.34%, compared to a smaller decrease inside the sanctuary, reflects differing benthic community dynamics. Overall, these data underscore spatial variability between protected and fished areas, with coral rehabilitation contributing to some recovery but persistent abiotic expansion and algal presence indicating ongoing challenges for reef resilience.

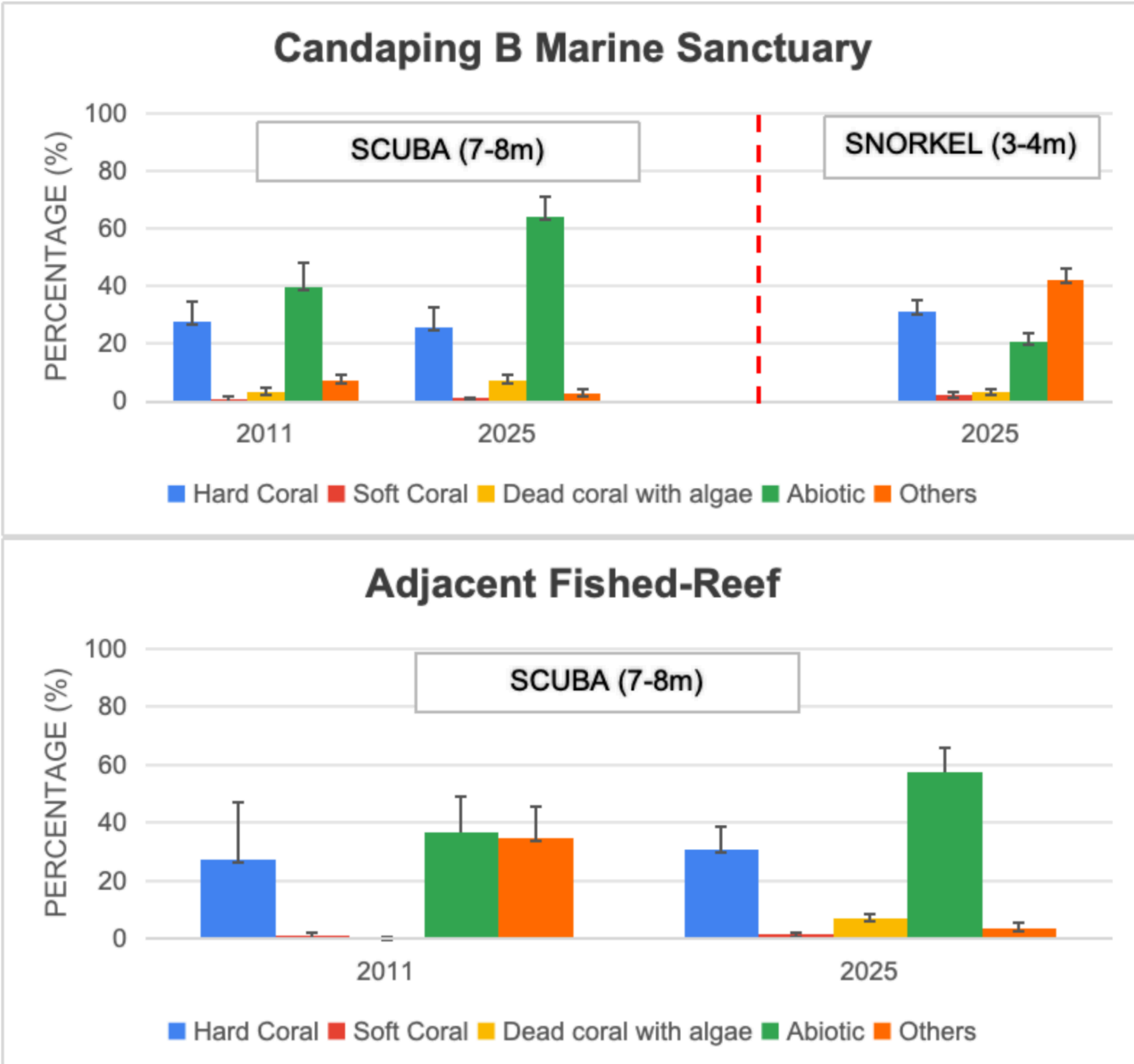


Figure 12c. Changes in substrate composition (mean ± SE%) at Candaping B MPA and its adjacent fished reef from 2011 to 2025. Data were compiled from both snorkel and SCUBA surveys.

FVC Diversity: A total of 92 coral reef species belonging to 21 families and subfamilies were identified. This is categorized as very high based on the modified scale derived from Hilomen et al. (2000). Mean species richness was also high at 41±2.33 species/500m².
Non-target/non-indicator species dominated the fish assemblage in terms of species richness and were largely comprised of damselfishes (Pomacentridae), wrasses (Labridae) and cardinalfishes (Apogonidae). The adjacent fished reef showed 83 coral reef species belonging to 15 families and subfamilies were observed with a mean species richness of 34±3.12 species/500m².

FVC Biomass: Mean reef biomass in Candaping B Marine Sanctuary was 19.61±5.57 kg/500m² (39.22 mt/km²), and falls within the high category based on the scale defined by Nañola et al. (2011) (Figure 5d).

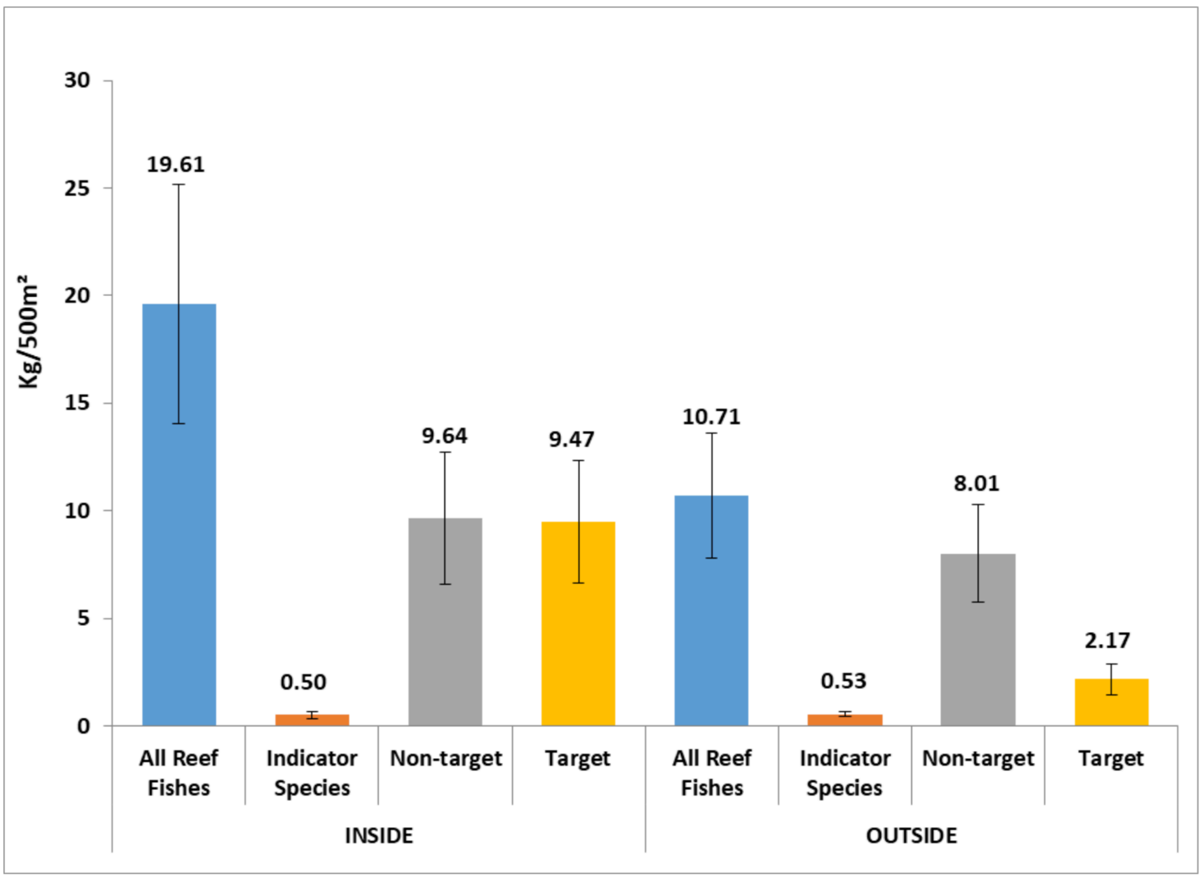


Figure 12d. Fish biomass by functional group (mean ± SE) at Candaping B MPA and its adjacent fished reef in 2025. Species were categorized as target species (commercially important), indicator species (butterflyfish), or non-target species. No prior data were available from this site; therefore, data from inside the MPA and from the adjacent fished reef (labeled as "Outside") are presented for comparison.

FVC Density: Mean reef density in the Candaping B Marine Sanctuary was estimated at 1009±214.17 individuals/500², which is within the moderate category of the scale defined by Hilomen et al (2000). Reef fish density was dominated by damselfishes, wrasses and cardinalfishes. The density of commercially targeted reef fishes was estimated at 75±22.46 individuals/500m², represented by goatfishes and parrotfishes. The mean reef density in the adjacent fished reef was estimated at 1052±256.98 individuals/500m², which is slightly higher than in MS. (Figure. 5e)

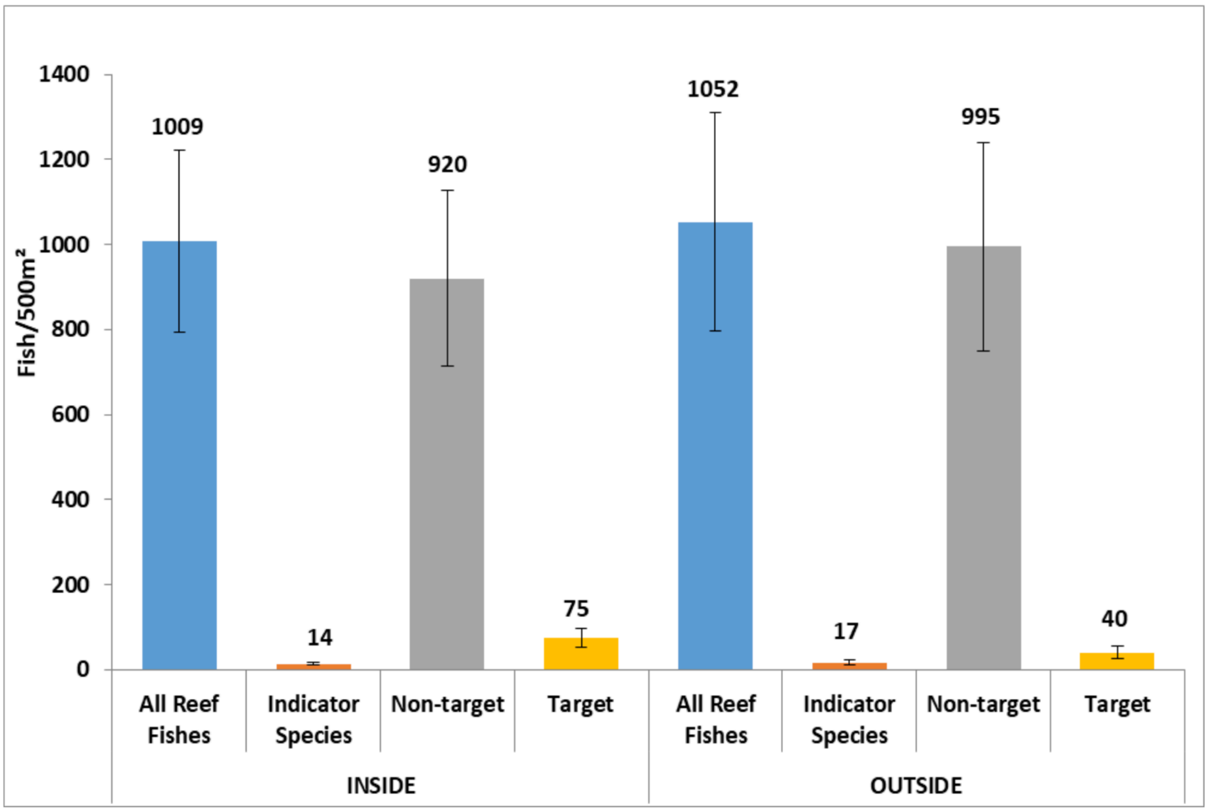


Figure 12e. Fish density by functional group (mean ± SE) at Candaping B MPA and its adjacent fished reef in 2025. Species were categorized as target species (commercially important), indicator species (butterflyfish), or non-target species. No prior data were available from this site; therefore, data from inside the MPA and from the adjacent fished reef (labeled as "Outside") are presented for comparison.

10. Minalulan Marine Sanctuary

Site Overview: Also known as the Minalulan Fish and Shellfish Sanctuary, this 10.5-hectare MPA in Maria was established in 2003 and re-established in 2012 to protect the once-abundant Lampirong (windowpane oysters). It is managed by the Minalulan Marine Management Committee under the LGU of Maria, with active enforcement from the local *bantay dagat*. In October 2024, CCEF conducted multiple site visits to install an artificial clay reef in collaboration with the Swiss NGO “Rrreefs” to promote coral recruitment in the area. CCEF was supported in the construction by the MAO, the Municipal Environment and Natural Resources Office (MENRO), and the Department of Environment and Natural Resources (DENR) – members of whom received local deputization training in the months following the installation. Unfortunately, the initial reef structure was destroyed by a strong typhoon later that October. In response, CCEF returned in December 2024 to rebuild the structure using a reinforced design that incorporated metal rebar for greater storm resilience. Quarterly coral recruit monitoring continues at the site as part of long-term restoration efforts.

MEAT Score Analysis: According to MEAT results, Minalulan Marine Sanctuary earned a score of 41 out of 84 points, placing it in Level 3 – “Sustained” category for management effectiveness. However, the management body has not recently participated in capacity building or skills development training such as fund outsourcing, and key infrastructure has not been well maintained. Additionally, there is no established feedback mechanism in place with NGO partners conducting research at the site.

Figure 13a. Underwater view of the artificial clay reef inside the MPA.

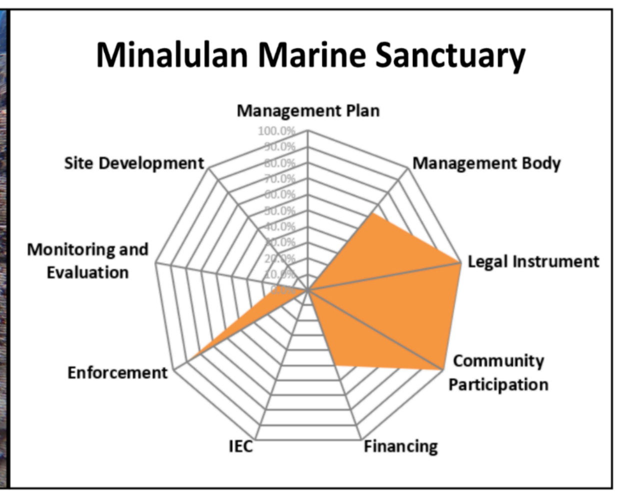


Figure 13b. Radar chart of 2023 MEAT score.

Benthic Habitat Characterization: Minalulan Marine Sanctuary is a newly selected site for the Saving Philippine Reefs as part of the Siquijor Expedition. In December 2024, a coral reef rehabilitation project was implemented within the sanctuary through a collaboration among rrreefs, CCEF, and the LGU of Maria, involving the installation of Artificial Clay Reefs to support recovery from damage caused by typhoons in recent years. The 2025 benthic survey inside Minalulan Marine Sanctuary showed hard coral cover at 15±3% in scuba surveys and a higher 25±4.14% in snorkeling surveys, indicating better coral presence in shallower zones. Soft coral cover was recorded at 7.50±4% (scuba) and 5.80±2.28% (snorkeling). Dead coral with algae accounted for 12±11.5% in scuba surveys and 7.61±1.9% in snorkeling surveys, while abiotic substrates dominated at 62.25±11.25% and 42.56±5.05%, respectively. The 'Others' category, including fleshy algae, sponges, and other fauna, was relatively low in scuba surveys at 3.25±1.25% but higher in snorkeling surveys at 18.36±3.92%.

In contrast, the adjacent fished reef exhibited considerably lower hard coral cover at 5.50±2.65% and soft coral at 0.83±0.44%. Dead coral with algae was also less prevalent at 4.33±3.59%, but abiotic cover remained high at 60.67±10.59%. The 'Others' category was most abundant in the adjacent reef at 28.67±16.33%. These differences underscore the importance of continued protection and active rehabilitation within the sanctuary to support coral recovery and resilience.

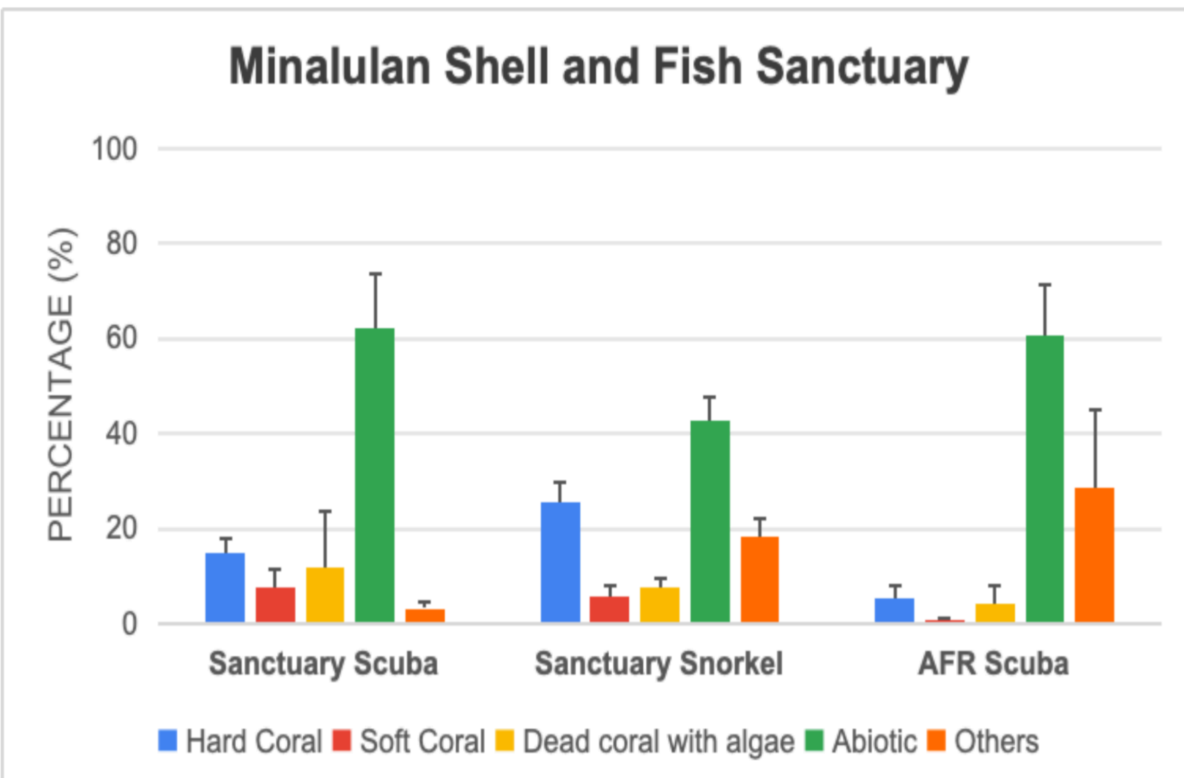


Figure 13c. Substrate composition (mean ± SE%) at Minalulan MPA and its adjacent fished reef in 2025. Data were compiled from both snorkel and SCUBA surveys. No prior data were available for comparison.

FVC Diversity: A total of 105 coral reef fish species belonging to 19 families and subfamilies were identified in Minalulan Marine Sanctuary. In general, non-target/non-indicator species such as damselfishes (Pomacentridae), wrasses (Labridae), fairy basslets (Serranidae subfamily Anthiadinae) dominated the fish assemblage in terms of species richness. Mean species richness was categorized as very high with about 56±4.06 species/500m² for Minalulan Marine Sanctuary and 43±12.02 species/500m² for the adjacent fished reef, falling within the high category of the scale defined by Hilomen et al. (2000).

FVC Biomass: Mean reef fish biomass was estimated at 28.59±15.09 kg/500m² (57.18 mt/km²), or "very high" based on the ranges set by Nañola et al. (2011). Target species, with an estimated biomass of 14.80 kg/500m² (29.6 mt/km²) (figure 6d). Largely dominated the fish assemblage by about 52%. The dominant fish families in terms of biomass included surgeonfishes (Acanthuridae), fusiliers (Caesionidae), goatfishes (Mullidae) and parrotfishes (Scaridae). Mean fish biomass in the adjacent fish reef is at 15.90 kg/500m² (31.8 mt/km²) considered high in standard fish biomass metrics.

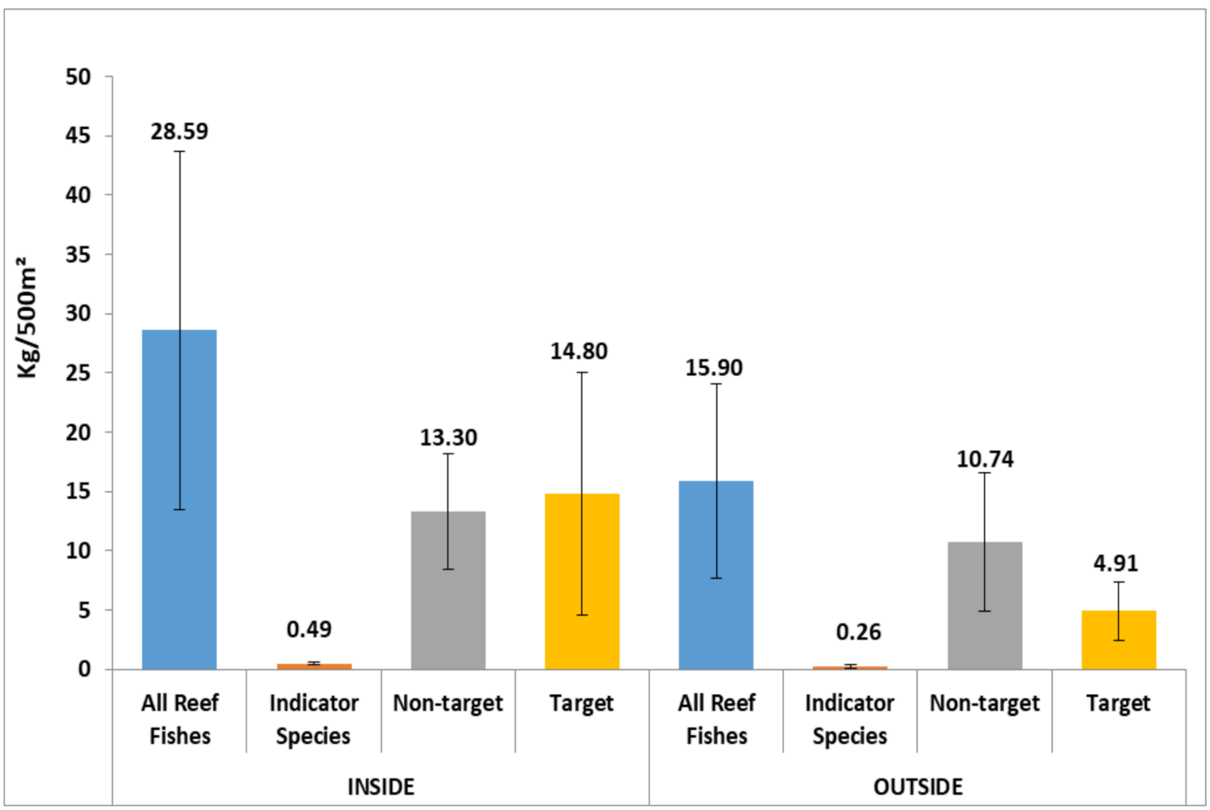


Figure 13d. Fish biomass by functional group (mean ± SE) at Minalulan MPA and its adjacent fished reef in 2025. Species were categorized as target species (commercially important), indicator species (butterflyfish), or non-target species. No prior data were available from this site; therefore, data from inside the MPA and from the adjacent fished reef (labeled as "Outside") are presented for comparison.

FVC Density: Mean reef density was estimated at 956 individuals/500m², which is within the moderate category of the scale defined by Hilomen et al. (2000). It was higher in the adjacent fish reef at 1036 individuals/500m² (Figure 6e). The density of commercially targeted reef fishes was estimated at 89 individuals/500m², largely represented by surgeonfishes (Acanthuridae), fusiliers (Caesionidae), goatfishes (Mullidae) and parrotfishes (Scaridae).

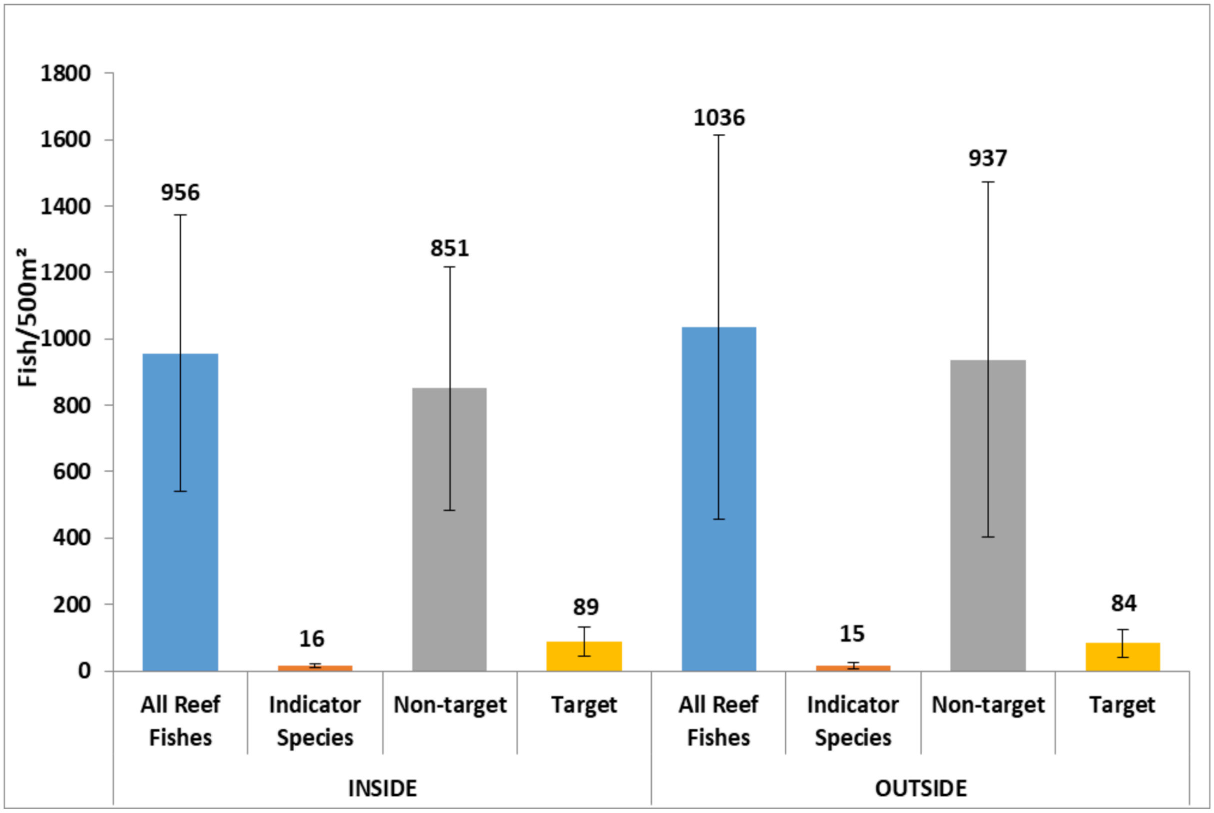


Figure 13e. Fish density by functional group (mean ± SE) at Minalulan MPA and its adjacent fished reef in 2025. Species were categorized as target species (commercially important), indicator species (butterflyfish), or non-target species. No prior data were available from this site; therefore, data from inside the MPA and from the adjacent fished reef (labeled as "Outside") are presented for comparison.

MUNICIPALITY OF SIQUIJOR MARINE PROTECTED AREAS

11. Caticugan Marine Sanctuary

Site Overview: Established originally in 1987 and legally reestablished in 2003, the 13.5-hectare Caticugan Marine Sanctuary is managed by the Caticugan Marine Management Council, in partnership with the LGU. The sanctuary features diverse marine habitats, supporting a rich variety of species including notable sightings of eagle rays by tourists visiting the area. Caticugan has been recognized for its effective management efforts and received the Most Improved Fish Stocks Award in 2016, thus reflecting the positive ecological impact of sustained conservation activities in the areas.

MEAT Score Analysis: In the 2023 MEAT assessment, Caticugan scored 78 out of 84 points, which translates to Level 4 – "Institutionalized" rating for management effectiveness. This score reflects strong governance, community engagement, and robust monitoring efforts that have contributed to the sanctuary's health and resilience.

Figure 14a. Underwater view of the MPA.

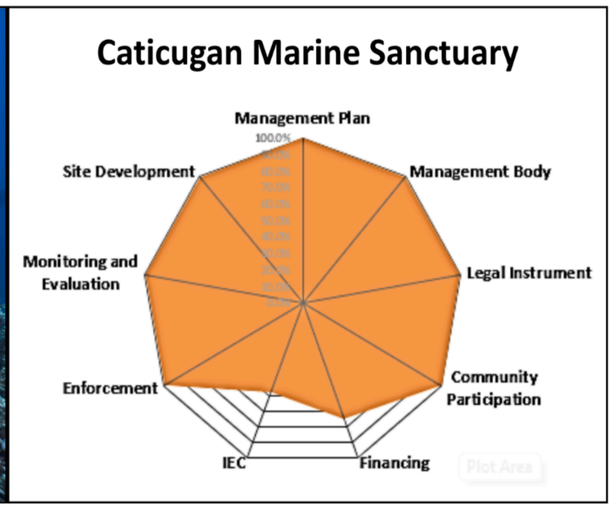


Figure 14b. Radar chart of 2022 MEAT score

Benthic Habitat Characterization: The 2025 benthic survey inside Caticugan Marine Sanctuary recorded an increase in hard coral cover to 24.42±4.75% in scuba surveys, while snorkeling surveys in shallower areas showed even higher hard coral cover at 33.47±5.12%. Soft coral cover inside the sanctuary was 3.83±2.12% for scuba and 20.18±3.69% for snorkeling. Dead coral with algae decreased to 6.42±3.19% in scuba surveys but was slightly higher at 6.83±2.7% in snorkeling surveys. Abiotic substrate was lower in snorkeling surveys at 25.22±1.21% compared to 60.92±4.11% in scuba surveys, reflecting different depth zones. The 'Others' category, including fleshy algae and other fauna, was 4.42±3.33% in scuba and 14.30±6.94% in snorkeling.

In contrast, the adjacent fished reef (AFR) data from 2005 to 2022 show fluctuating but generally lower hard coral cover, peaking at 28.25±0.75% in 2017 but declining to 16.49±1.59% in 2022. The adjacent reef also experienced an increase in dead coral with algae to 18.57±11.32% in 2022, indicating greater coral degradation. Abiotic cover remained moderate to high in the adjacent reef, while the 'Others' category was higher than inside the sanctuary, suggesting more fleshy algae and other organisms. These results underscore that the marine sanctuary continues to foster coral recovery and healthier benthic conditions across depths, while the adjacent fished reef shows more variability and signs of coral decline.

Caticugan Marine Sanctuary was also among the reef areas severely impacted by typhoons in 2011 and 2012, which caused substantial coral damage. In response, coral rehabilitation efforts were implemented within the sanctuary in 2012 and 2013, led by the Coastal Conservation and Education Foundation (CCEF). These restoration initiatives likely contributed to the improving reef conditions observed in recent years, particularly in the shallower zones.

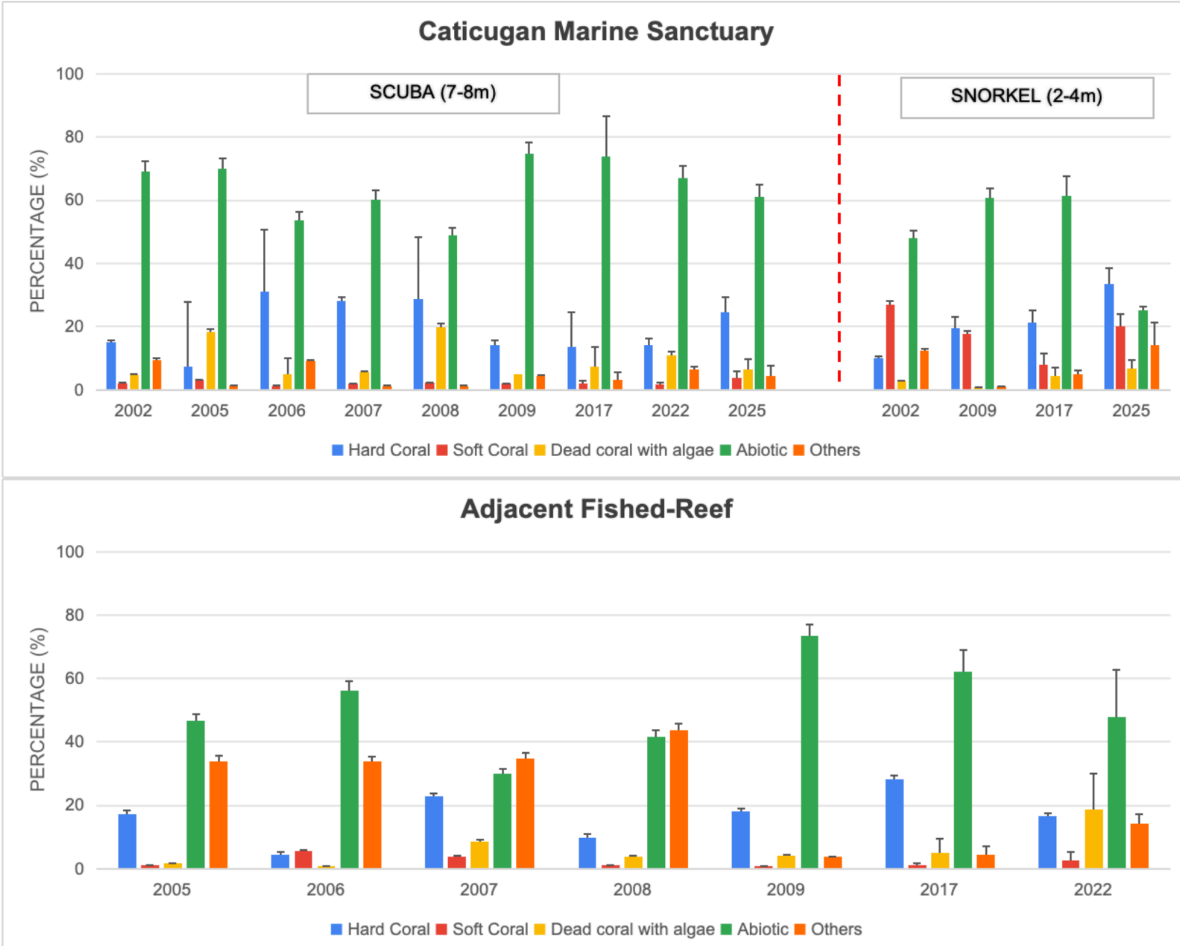


Figure 14c. Changes in substrate composition (mean ± SE%) at Caticugan MPA and its adjacent fished reef from 2005 to 2025. Data were compiled from both snorkel and SCUBA surveys.

FVC Diversity: A total of 131 coral reef fish species belonging to 25 families and subfamilies were identified in Caticugan Marine Sanctuary. Species richness was dominated by non-target/non-indicator species such as damselfishes (Pomacentridae), wrasses (Labridae), and fairy basslets (Serranidae, subfamily Anthiadinae). Mean species richness was very high at 61±2.58 species/500m² based on the rating scale developed by Hilomen et al. (2000).

FVC Biomass: Mean biomass was higher in 2025 at 55.84 kg/500m² (111.68 mt/km² than in 2017 at 13.47 kg/500m² (26.94 mt/km²). Based on the ranges set by Nañola et al. (2011), the mean biomass in 2017 falls in the high category and very high during 2025 respectively (Figure 10d). Target species in 2025 were estimated around 40.74 kg/500m², largely dominated the fish assemblage by about 73%. The dominant fish families in terms of biomass included parrotfishes, snappers, jacks and fusiliers. In 2017, commercially important fish families had a mean biomass of 6.98 kg/500m², biomass was mainly contributed by parrotfishes and surgeonfishes.

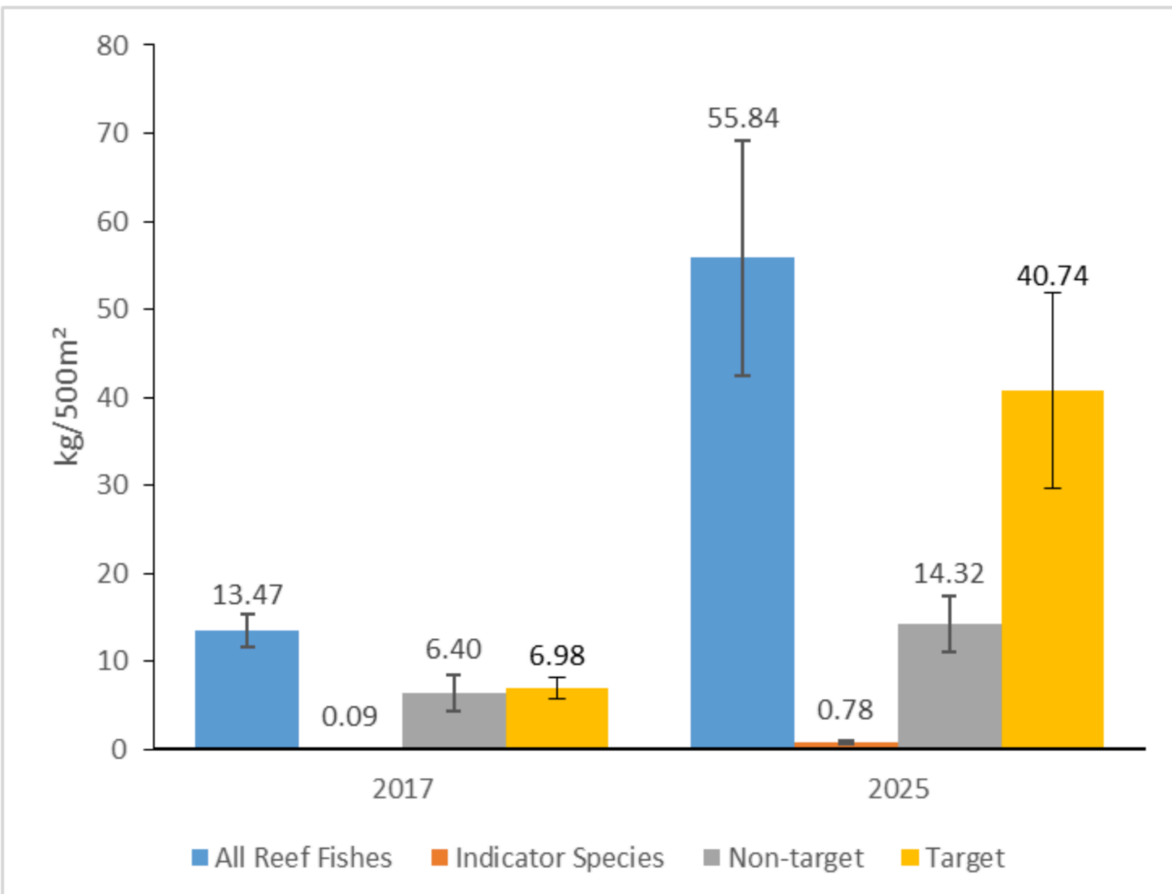


Figure 14d. Changes in fish biomass by functional group (mean ± SE) at Caticugan MPA from 2017 to 2025. Species were categorized as target species (commercially important), indicator species (butterflyfish), or non-target species.

FVC Density: Mean reef fish density in 2017 was estimated at 538 individuals/500m², which is within the moderate category of the scale defined by Hilomen et al. (2000). Density of commercially important reef fish families was estimated at 102 individuals/500m², and was dominated by Congridae (Heteroconger hassi) a popular for aquarium trade rather than for commercial fishing, surgeonfishes and fusiliers. In 2025, mean reef fish density was high at 1888 individuals/500m² (Figure 10e). But it must be noted that non-target species, particularly damselfishes (Pomacentridae), were the most abundant species observed.

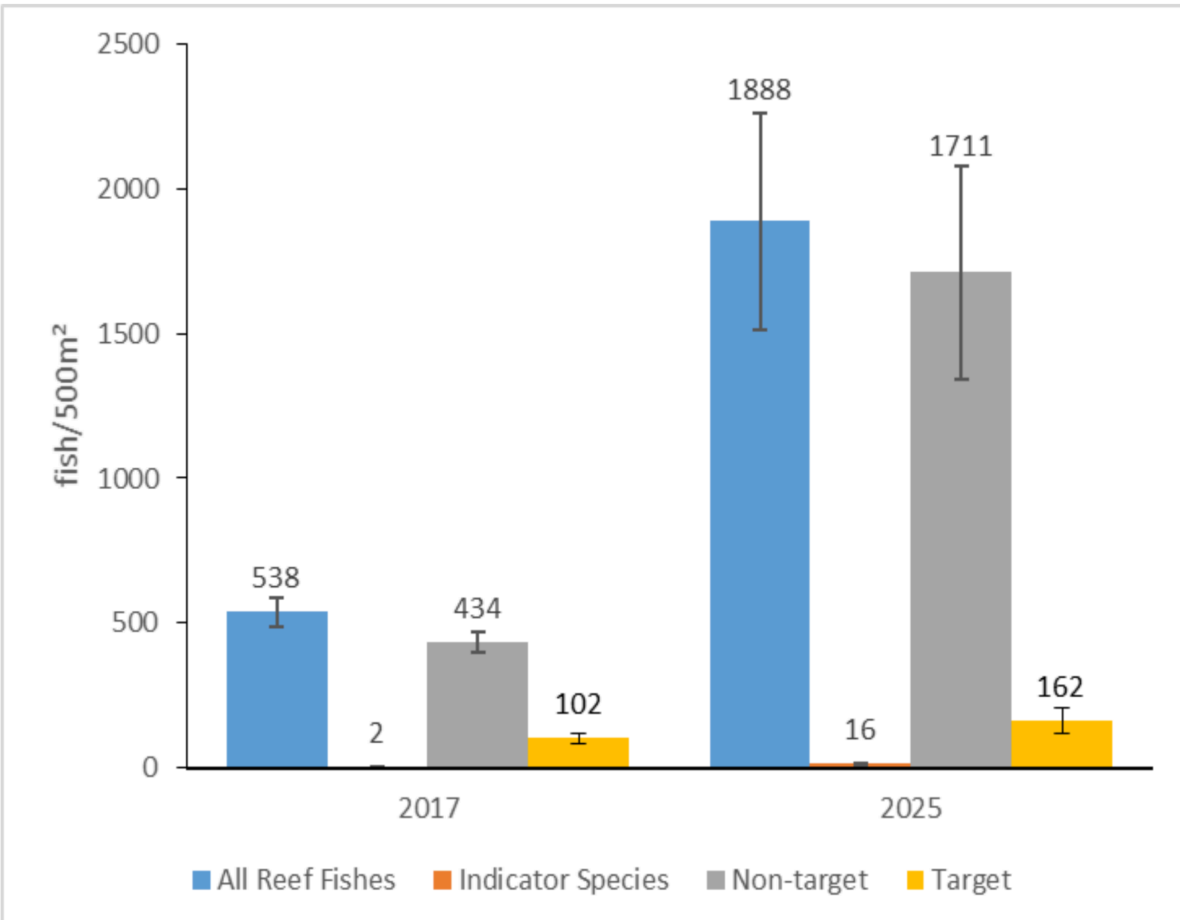


Figure 14e. Changes in fish density by functional group (mean ± SE) at Caticugan MPA from 2017 to 2025. Species were categorized as target species (commercially important), indicator species (butterflyfish), or non-target species.

SYNTHESIS OF KEY FINDINGS

Benthic Habitat Characterization

Substrate surveys conducted across 11 marine sanctuaries in Siquijor Island reveal notable spatial variability in benthic composition, reflecting differing levels of reef health and environmental pressures across municipalities. In the Municipality of San Juan, located in the south of the island, five sanctuaries (Paliton, Maite, Tubod, Catulayan, and Cangmunag) were surveyed. Among these, Cangmunag Marine Sanctuary exhibited the highest hard coral cover at 62.83%, followed by Paliton (57.83%) and Maite (54.33%), indicating relatively healthy reef conditions. Tubod and Catulayan showed moderate hard coral cover at 44.67% and 49.17%, respectively, with Tubod also showing elevated abiotic substrate (45.49%), potentially reflecting physical stressors or sand dominance.

In the Municipality of Lazi, located in the southeast, Lalag Bato and Napayong Marine Sanctuaries showed contrasting trends. Napayong MS had a high hard coral cover (59.17%) and relatively low abiotic cover (24.5%), suggesting a consolidated and healthier reef structure, while Lalag Bato showed low hard coral cover (21.5%) and a dominance of abiotic substrate (40.83%), despite the highest soft coral cover across all sites (27.5%). Though hard coral cover remains low at Lalag Bato, a drastic improvement of 48.3% has been observed since 2022 which likely indicates recovery of the site following Typhoon Odette in 2021.

Surveys in the Municipality of Maria, located on the eastern part of Siquijor Island, covered Olang, Candaping B, and Minalulan sanctuaries. These sites showed generally lower hard coral cover, with Olang at 13.33%, Candaping B at 25.42%, and Minalulan at 15%. Abiotic substrate was consistently high, exceeding 62% in all three sites, and soft coral cover was minimal (<1%) in Olang and Candaping B, but somewhat higher in Minalulan (7.5%), possibly indicating localized variability in reef structure or recent disturbance recovery.

Caticugan Marine Sanctuary, situated in the southwest under the Municipality of Siquijor, recorded a hard coral cover of 24.42%, moderate soft coral (3.83%), and high abiotic substrate (60.92%), suggesting a recovering reef that still bears signs of past damage. These results illustrate a gradient of reef condition across the island, with southern sites (San Juan) generally exhibiting healthier coral assemblages, while eastern and southwestern sites show higher abiotic dominance and lower live coral cover, emphasizing the influence of geographic, environmental, and management factors on reef status.

A comparative benthic assessment across shallow (snorkeling) and deeper (scuba) zones in seven marine sanctuaries around Siquijor Island reveals depth- and location-based patterns in reef health. Shallow zones generally showed higher hard coral cover than deeper areas, particularly in Olang (62.7%), Lalag Bato (33.5%), and Caticugan (33.5%), likely due to better light and recent rehabilitation. Tubod exhibited consistent coral cover across depths, while Catulayan showed low coral and high abiotic presence, suggesting degradation. Eastern sites like Candaping B and Minalulan had moderate coral but elevated benthic competitors (e.g., algae), hinting at ecological stress. Caticugan, Olang, and Candaping B have benefited from past coral rehabilitation following typhoon impacts. Overall, shallow reef flats are emerging as vital zones for coral recovery and should be prioritized in monitoring and management efforts.

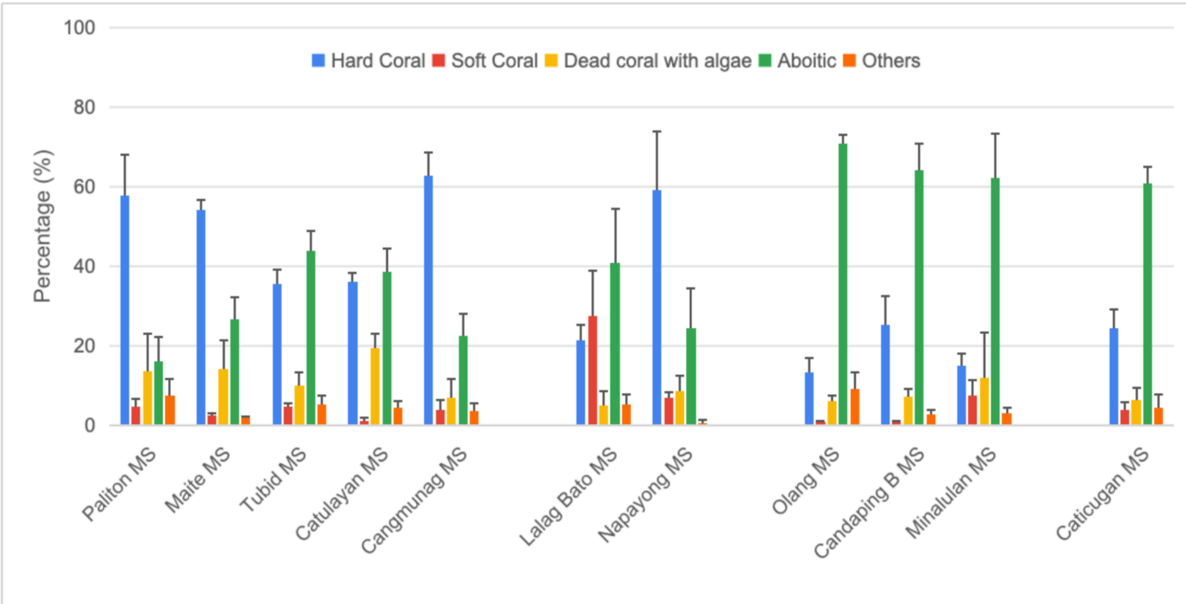


Figure 15. Substrate composition (mean ± SE%) across 11 MPAs in Siquijor, gathered from 7-8 m depth during SCUBA surveys. Only data from inside each MPA are presented for comparison.

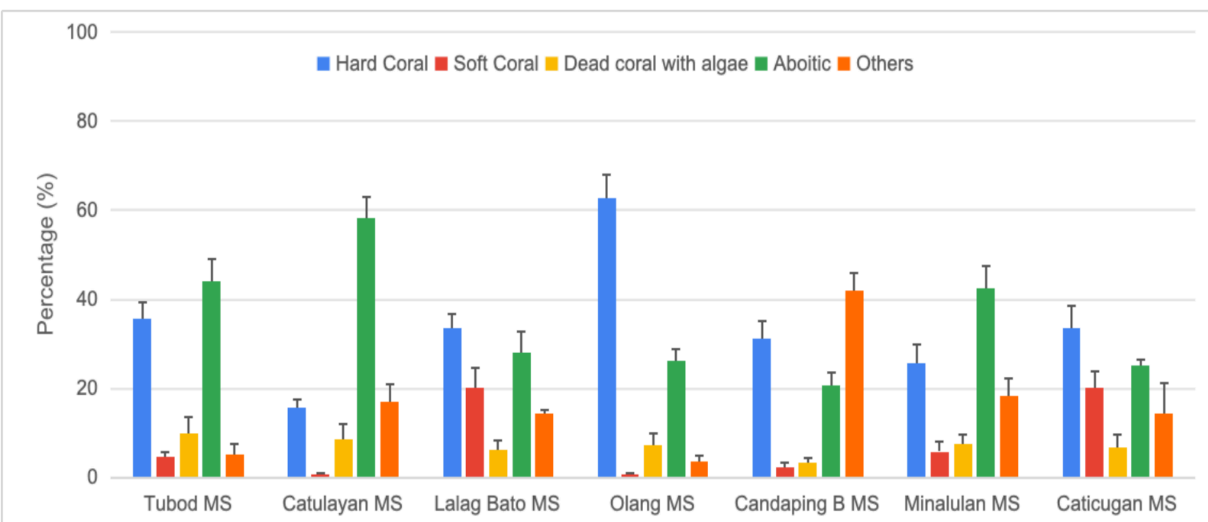


Figure 16. Substrate composition (mean ± SE%) across 7 MPAs in Siquijor, gathered from 2-4 m depth during snorkel surveys. Only data from inside each MPA are presented for comparison.

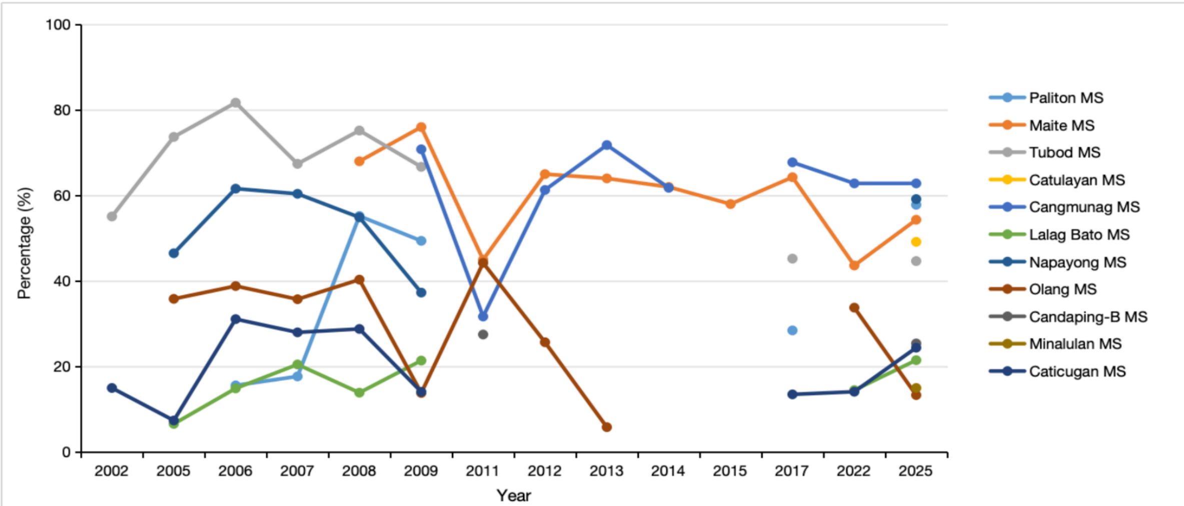


Figure 17. Line graph showing changes in live hard coral cover at 11 MPAs in Siquijor between 2002 and 2025, based on SPR survey data.

Fish Diversity

Fish diversity, measured as species richness, was generally moderate to high across surveyed MPAs. The sites showing the highest species richness values include Caticugan (61 ± 2.58 species/500m²), Napayong (57 ± 3.84 species/500m²), and Minalulan (56 ± 4.06 species/500m²). Assemblages at these sites were often dominated by non-target species such as damselfishes (Pomacentridae), wrasses (Labridae), and fairy basslets (Serranidae subfamily Anthiadinae). However, other sites such as Catulayan (38 ± 2.33 species/500m²) showed noticeably lower diversity within the MPA than in its adjacent fished reef. This inconsistency could potentially be due to spillover effects from the MPA itself, or may point to the occurrence of illegal fishing within its boundaries. These findings underscore the importance of enhancing enforcement and governance capacity across Siquijor's MPAs.

Fish Biomass

Reef fish biomass gathered across the surveyed MPAs followed an expected trend whereby differences in habitat condition and management effectiveness had a noticeable effect on overall results. MPAs such as Caticugan (55.84 kg/500m²), Paliton (33.32 kg/500m²), and Lalag Bato (33.04 kg/500m²) recorded the highest mean biomass, with large occurrences of commercially important species such as parrotfishes (Scaridae), jacks (Carangidae), and surgeonfishes (Acanthuridae). In contrast, Catulayan (6.03 kg/500m²) showed the lowest biomass, likely linked to weaker management capacity and heavier local fishing pressure. It should be noted that several sites, including Tubod and Maite, showed notable increases in biomass compared to previous survey years. These changes in biomass highlight the benefits of improved enforcement and habitat quality when analyzed alongside the recent MEAT scores of their respective sites. However, target species did not appear to account for a substantial portion of total biomass at most sites. This likely indicates illegal fishing occurrences aimed at target species, and further demonstrates the need for more effective MPA patrolling in response to such threats.

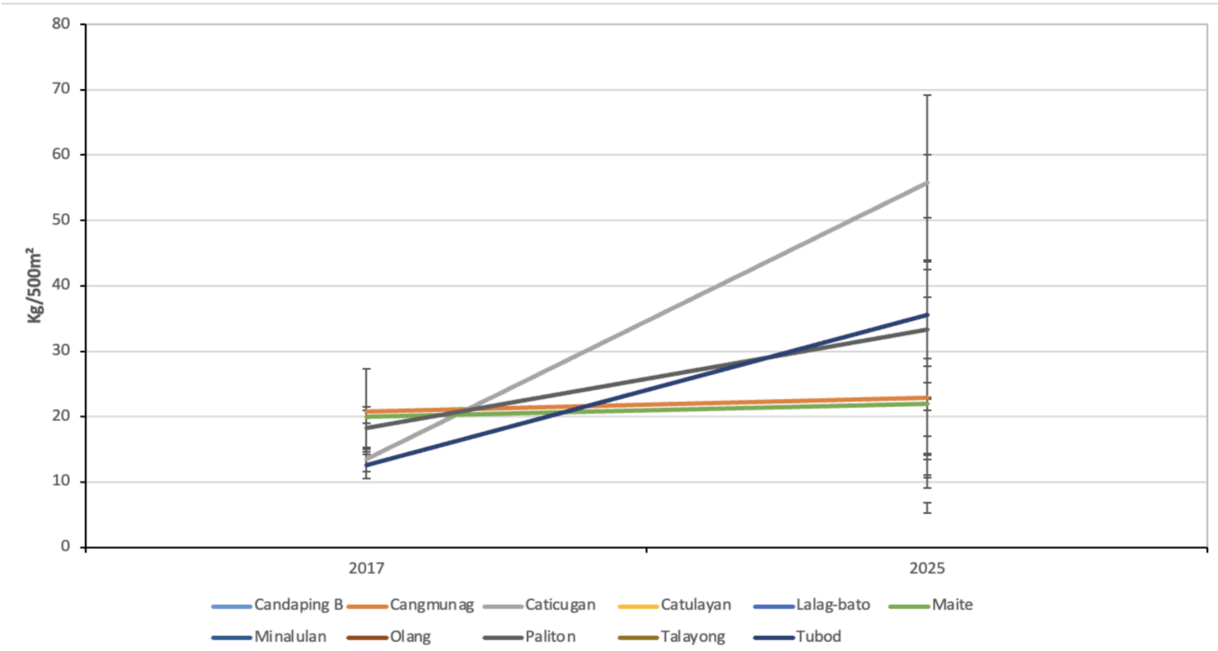


Figure 18. Line graph showing fish biomass trends at 11 MPAs in Siquijor between 2017 and 2025, based on SPR survey data.

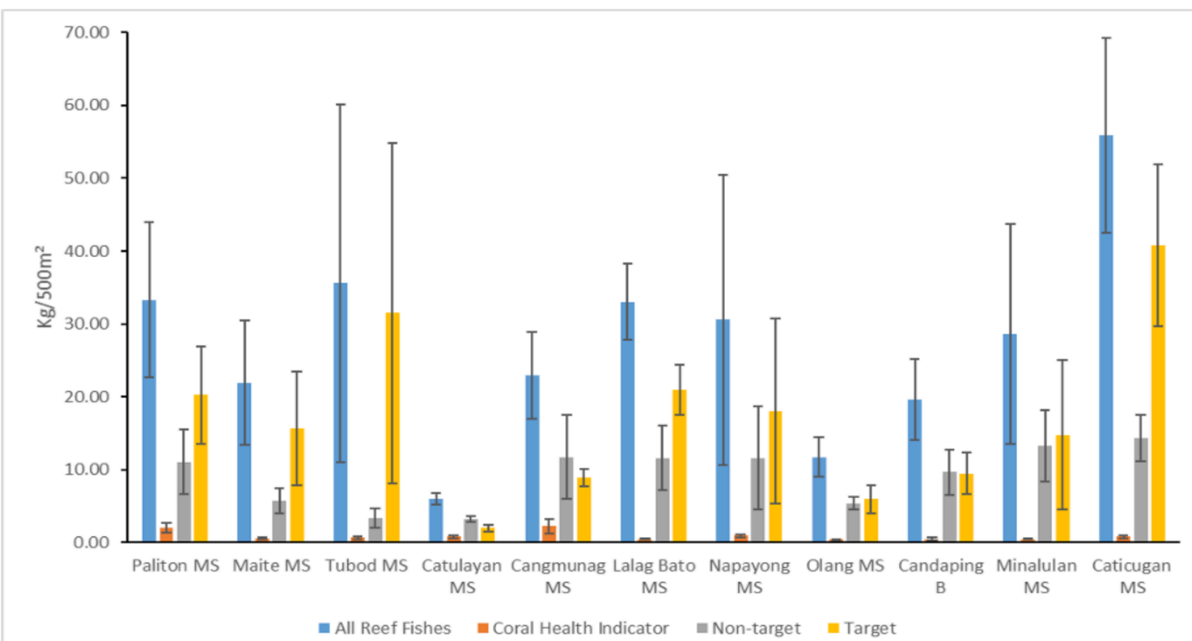


Figure 19. Fish biomass by functional group (mean ± SE) across 11 MPAs in Siquijor, taken during 2025 SPR surveys. Species were categorized as target species (commercially important), indicator species (butterflyfish), or non-target species.

Fish Density

In addition to diversity and biomass, fish density results revealed mixed trends across MPAs, with most sites falling in the moderate category (Hilomen et al., 2000 scale). The highest mean density in 2025 was recorded at Caticugan MPA (1888 individuals/500m²), where composition was yet again dominated by non-target species such as damselfishes (Pomacentridae). Catulayan displayed the lowest density (443 individuals/500m²), while densities in sites throughout the municipality of Maria were moderate. Several sites, including Maite and Tubod, experienced declines in fish density compared to 2017 surveys, potentially due to habitat degradation or damage from Typhoon Odette in 2021. Although total recorded fish density varied greatly in comparison to past data, the density contribution of target species such as butterflyfish remained relatively low across sites.

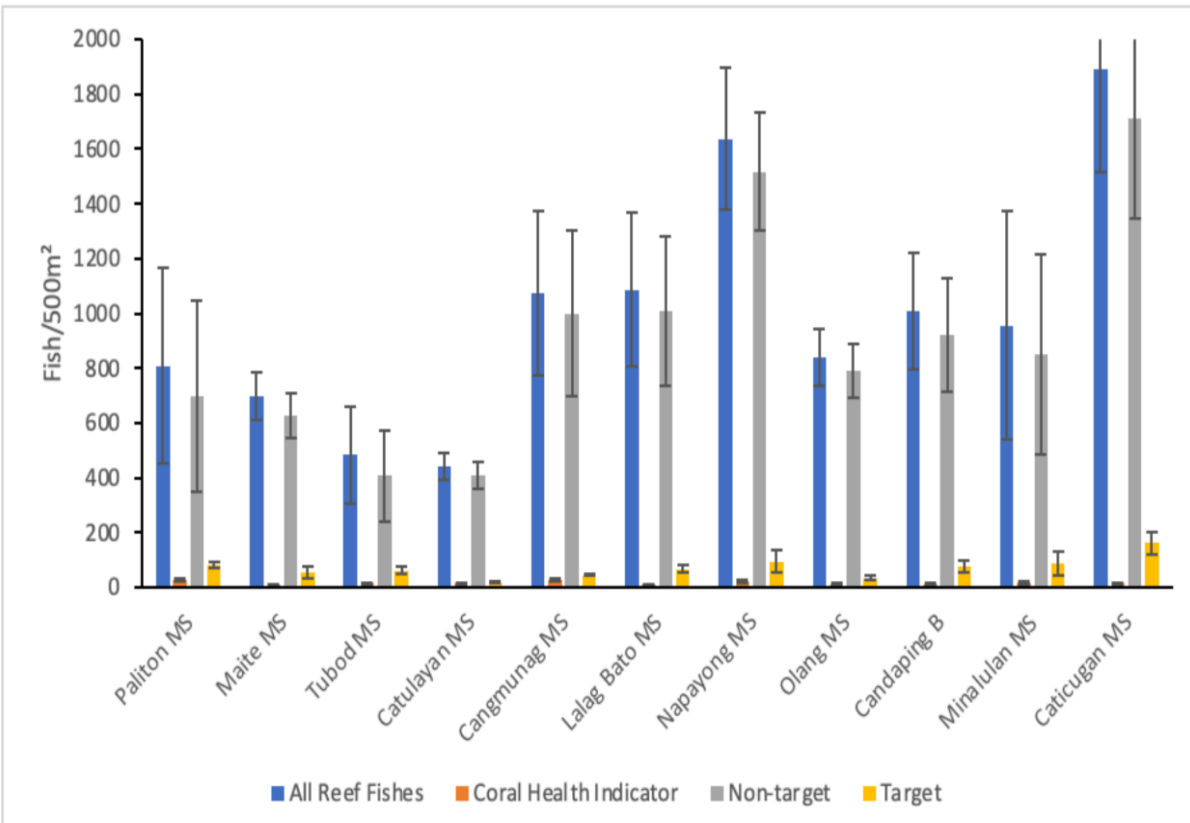


Figure 20. Fish density by functional group (mean ± SE) across 11 MPAs in Siquijor, taken during 2025 SPR surveys. Species were categorized as target species (commercially important), indicator species (butterflyfish), or non-target species.

DISCUSSION

Data gathered from substrate composition surveys revealed variation in reef conditions across the 11 MPAs visited in Siquijor during the 2025 SPR expedition. Southern sites in San Juan generally exhibited higher live hard coral cover and often exhibited greater levels of intact reef structure compared to other municipalities. For example, the municipalities of Maria and Lazi were characterized by higher levels of abiotic substrate and correspondingly sparse biotic communities. It is worth noting that despite having higher levels of abiotic substrate compared to live hard coral, Caticugan MPA recorded some of the highest fish diversity and biomass among all surveyed sites. This suggests that factors other than coral cover – such as reduced fishing pressure or effective enforcement – may be supporting its fish populations.

Fish visual census surveys across the different municipalities exhibited moderate total fish densities and consistently high species richness, though biomass of commercially important target species varied widely among sites. Even sanctuaries with modest coral cover still showed relatively high target species biomass, suggesting that protection from fishing and maintenance of habitat structure can yield positive ecological outcomes even in the absence of fully recovered benthic communities. Conversely, sites with persistently high abiotic substrate and low live coral cover generally exhibited reduced fish biomass. This indicates that habitat degradation can limit the long-term fisheries benefits of marine protected areas (MPAs). It should be noted that both target species biomass and density varied greatly among sites and did not appear to correlate directly with one another.

There were noticeable trends between SPR survey results and recent MEAT scores across sites in Siquijor. Specifically, sites with higher MEAT scores tended to exhibit stronger ecological indicators such as higher coral cover and greater target species biomass. However, several sanctuaries with strong ecological metrics scored lower in MEAT evaluations due to documentation gaps, incomplete management plans, or missed threshold criteria. This may skew the overall alignment between SPR survey results and recent MEAT scores, especially when some sites with higher MEAT ratings still exhibited vulnerabilities, such as weak visitor management protocols or inadequate financial tracking. These findings suggest that while MEAT ratings remain a valuable indicator of management effectiveness, they may not fully capture the ecological changes of a site between years. This discrepancy indicates the need to strengthen both governance processes and ecological monitoring for successful MPA management.

FUTURE RECOMMENDATIONS

The results of these assessments emphasize the need for targeted improvements to enhance the effectiveness and sustainability of Siquijor's MPAs. Several sites were found to lack fully deputized enforcement teams, clear boundary delineation, and consistent patrol schedules, which undermines compliance and long-term protection. Such limitations are often directly linked to insufficient funding. Therefore, efforts should focus on re-deputizing bantay dagat members in partnership with local government units (LGUs) and national agencies such as the Philippine Coast Guard so that multiple agencies contribute to greater management effectiveness through broader financial contributions across multiple institutions. Standardizing patrol documentation across neighboring MPAs could help ensure that violation protocols are clearly defined and consistently applied, and could further optimize limited enforcement resources.

A key recommendation based on 2025 observations during the SPR expedition is to improve MPA boundary demarcation and mooring infrastructure. Many sites relied on small or widely spaced boundary markers that were difficult for fishers and visitors to observe, and some mooring lines were anchored directly to live corals, posing threats to the very biodiversity that the MPAs aim to protect. Installing durable, highly-visible boundary buoys and permanent mooring systems would reduce accidental violations and minimize anchor damage from repeated deployments in varying locations.

Visitor management and information, education, and communication (IEC) activities should also be enhanced. Sites with high tourist visitation, such as Tubod, Paliton, and Olang, would benefit from structured pre-entry briefings, clearly posted rules and maps, and regular orientation sessions for dive and resort staff. Enhancing IEC materials on display in communities bordering MPAs would help rebuild awareness and stewardship, particularly in sites where such efforts have lapsed for several years.

From an ecological perspective, targeted interventions are recommended for specific threats such as Crown-of-thorns (COT) outbreaks. COT outbreaks, which were observed at some of the MPAs, should be addressed by trained community-based removal teams that respond when COT densities exceed ecologically damaging thresholds. Rapid-response protocols should also be established in the case of infrastructure failures including buoy, mooring line, or guardhouse damage. These protocols should also be emphasized during *bantay dagat* training to ensure team members can respond effectively in the case of storms and typhoons.

Finally, sustainable financing mechanisms must be strengthened. A portion of existing entrance or tourism fees should be allocated for MPA management expenses such as fuel for patrols and infrastructure maintenance. At the provincial level, small performance-based grants could be established to support MPAs that successfully meet specific MEAT thresholds, such as the development of updated management plans and consistent enforcement protocols. These incentives would help address chronic funding shortfalls while encouraging continual improvement.

Collectively, these recommendations seek to address both ecological and institutional gaps identified during the 2025 SPR assessments. By prioritizing enforcement, boundary clarity, community engagement, and financial sustainability, the Province of Siquijor can increase the resilience of its coral reef ecosystems and enhance the long-term benefits of its MPA network.

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APPENDICES

Table A1. Presence-absence matrix of all fish species recorded during 2025 SPR surveys across MPAs in Siquijor.

TAXON	Marine Procted Area										
	Candaping B	Cangmunag	Caticugan	Catulayan	Lalag-bato	Maite	Minalulan	Olang	Paliton	Talayong	Tubod
Acanthuridae											
Acanthurus auranticavus	✓										
Acanthurus japonicus		✓									
Acanthurus mata			✓				✓				
Acanthurus nigricans					✓						
Acanthurus olivaceus	✓										
Acanthurus pyroferus	✓		✓	✓	✓	✓	✓	✓	✓	✓	
Acanthurus thompsoni			✓				✓				
Acanthurus tristis			✓		✓			✓			
Ctenochaetus binotatus	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Ctenochaetus cyanocheilus	✓	✓	✓			✓			✓	✓	
Ctenochaetus striatus	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Ctenochaetus tominiensis				✓			✓				
Naso hexacanthus		✓	✓							✓	✓
Naso lituratus			✓			✓			✓	✓	✓
Naso minor			✓			✓	✓		✓		
Naso unicornis					✓	✓				✓	✓
Naso vlamingii			✓		✓		✓		✓		✓
Zebrasoma scopas	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Antennariidae											
Antennarius sp.			✓		✓		✓		✓	✓	
Apogonidae											
Cheilodipterus artus						✓		✓			
Cheilodipterus intermedius	✓										
Cheilodipterus macrodon											✓
Cheilodipterus quinquelineatus	✓		✓	✓			✓	✓			
Ostorhinchus aureus	✓						✓				
Ostorhinchus compressus				✓		✓		✓			
Ostorhinchus cyanosoma			✓			✓		✓			
Ostorhinchus sealei								✓			
Ostorhinchus wassinki	✓							✓			
Aulostomidae											
Aulostomus chinensis		✓			✓						✓
Balistidae											
Balistapus undulatus	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Balistoides viridescens		✓			✓				✓		✓
Melichthys niger		✓			✓						
Melichthys vidua	✓	✓	✓		✓	✓	✓		✓	✓	✓

TAXON	Marine Procted Area										
	Candaping B	Cangmunag	Caticugan	Catulayan	Lalag-bato	Maite	Minalulan	Olang	Paliton	Talayong	Tubod
Odonus niger							✔	✔	✔		
Rhinecanthus verrucosus	✔										
Sufflamen bursa			✔	✔			✔	✔	✔		
Sufflamen chrysopterum	✔						✔	✔			
Xanthichthys auromarginatus			✔						✔		
Blenniidae											
Aspidontus taeniatus			✔								
Cirripectes sp.								✔			
Meiacanthus atrodorsalis		✔		✔		✔				✔	
Meiacanthus grammistes	✔		✔			✔	✔	✔	✔		✔
Caesionidae											
Caesio caerulaurea	✔		✔			✔	✔		✔	✔	
Caesio teres									✔		
Pterocaesio pisang						✔	✔		✔		
Carangidae											
Carangoides bajad											✔
Caranx sexfasciatus											✔
Elagatis bipinnulata			✔			✔					
Centriscidae											
Aeoliscus strigatus							✔				
Chaetodontidae											
Chaetodon adiergastos		✔				✔			✔		
Chaetodon auriga						✔					
Chaetodon baronessa	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Chaetodon kleinii	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Chaetodon lunula			✔					✔			
Chaetodon lunulatus	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Chaetodon melannotus		✔						✔			
Chaetodon ocellicaudus		✔		✔		✔	✔		✔	✔	✔
Chaetodon octofasciatus	✔									✔	
Chaetodon oxycephalus			✔								
Chaetodon punctatofasciatus			✔				✔		✔	✔	
Chaetodon rafflesii	✔			✔		✔	✔	✔	✔	✔	✔
Chaetodon reticulatus									✔	✔	
Chaetodon trifascialis		✔								✔	
Chaetodon ulietensis									✔		
Chaetodon vagabundus		✔		✔	✔	✔	✔		✔	✔	✔
Forcipiger flavissimus		✔							✔	✔	
Forcipiger longirostris						✔					✔
Hemitaurichthys polylepis									✔	✔	
Heniochus chrysostomus							✔				
Heniochus varius	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔

TAXON	Marine Procted Area										
	Candaping B	Cangmunag	Caticugan	Catulayan	Lalag-bato	Maite	Minalulan	Olang	Paliton	Talayong	Tubod
Cirrhitidae											
Cirrhitichthys falco					✔						
Clupeidae											
Spratelloides sp.								✔			
Haemulidae			✔			✔			✔		
Plectorhinchus chaetodonoides			✔						✔		
Plectorhinchus lineatus						✔					
Holocentridae											
Myripristis chryseres								✔			
Myripristis kuntee	✔	✔								✔	
Myripristis murdjan							✔			✔	✔
Myripristis sp.							✔			✔	
Myripristis violacea	✔						✔				✔
Sargocentron caudimaculatum				✔			✔	✔			
Kyphosidae											
Kyphosus cinerascens		✔				✔					
Kyphosus sp.											✔
Kyphosus vaigiensis	✔										
Labridae											
Anampses meleagrides	✔		✔		✔		✔	✔		✔	
Bodianus axillaris	✔	✔								✔	
Bodianus mesothorax	✔	✔		✔	✔	✔	✔	✔	✔	✔	✔
Cheilinus chlorourus	✔	✔		✔	✔	✔	✔	✔	✔	✔	✔
Cheilinus fasciatus	✔	✔	✔	✔		✔			✔	✔	
Cheilinus trilobatus	✔	✔						✔	✔	✔	✔
Cheilio inermis	✔	✔		✔	✔		✔			✔	✔
Choerodon anchorago			✔								✔
Choerodon sp.					✔		✔				
Cirrhilabrus cyanopleura	✔		✔			✔	✔	✔	✔	✔	✔
Cirrhilabrus ryukyuensis	✔	✔	✔	✔	✔	✔		✔	✔	✔	✔
Cirrhilabrus sp.			✔			✔		✔			
Coris batuensis	✔		✔	✔	✔		✔			✔	✔
Coris gaimard	✔	✔	✔		✔		✔	✔	✔	✔	✔
Coris schroederi	✔		✔		✔		✔			✔	
Diproctacanthus xanthurus			✔							✔	
Epibulus brevis		✔				✔				✔	
Epibulus insidiator		✔	✔	✔			✔			✔	✔
Gomphosus varius	✔	✔	✔	✔		✔	✔	✔		✔	
Halichoeres biocellatus			✔		✔						
Halichoeres hortulanus	✔		✔	✔	✔	✔	✔	✔	✔	✔	✔
Halichoeres marginatus		✔			✔						
Halichoeres melanurus	✔		✔		✔		✔	✔		✔	

TAXON	Marine Procted Area										
	Candaping B	Cangmunag	Caticugan	Catulayan	Lalag-bato	Maite	Minalulan	Olang	Paliton	Talayong	Tubod
Halichoeres podostigma	✓			✓			✓			✓	
Halichoeres prosopeion					✓						
Halichoeres scapularis	✓		✓	✓	✓		✓	✓		✓	✓
Halichoeres sp.				✓					✓		✓
Hemigymnus fasciatus										✓	
Hemigymnus melapterus		✓	✓		✓	✓	✓	✓		✓	✓
Hologymnosus annulatus		✓								✓	
Hologymnosus doliatus								✓			
Labrichthys unilineatus	✓	✓	✓			✓	✓	✓	✓	✓	
Labroides bicolor							✓				✓
Labroides dimidiatus	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Macropharyngodon meleagris	✓	✓		✓	✓	✓	✓		✓		
Macropharyngodon negrosensis					✓		✓	✓			
Novaculichthys taeniourus		✓	✓		✓		✓			✓	
Oxycheilinus bimaculatus								✓			
Oxycheilinus celebicus	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
Oxycheilinus digramma	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
Oxycheilinus sp.								✓			
Pseudocheilinus hexataenia	✓					✓		✓	✓		
Stethojulis bandanensis		✓			✓		✓			✓	
Stethojulis interrupta	✓						✓				
Stethojulis strigiventer	✓	✓					✓	✓			✓
Stethojulis trilineata					✓						✓
Thalassoma amblycephalum					✓	✓					
Thalassoma hardwicke	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
Thalassoma lunare	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Thalassoma lutescens	✓	✓			✓		✓			✓	
Lethrinidae											
Lethrinus erythracanthus											✓
Lethrinus erythropterus			✓							✓	
Lethrinus harak	✓		✓					✓			✓
Lethrinus olivaceus					✓						
Lethrinus ornatus			✓								✓
Monotaxis grandoculis		✓	✓		✓				✓		
Lutjanidae											
Aphareus furca									✓	✓	
Lutjanus argentimaculatus			✓			✓					
Lutjanus decussatus			✓			✓					✓
Lutjanus ehrenbergii	✓									✓	
Lutjanus fulvus											✓
Lutjanus monostigma			✓			✓			✓		
Macolor macularis		✓	✓	✓			✓		✓	✓	

TAXON	Marine Procted Area										
	Candaping B	Cangmunag	Caticugan	Catulayan	Lalag-bato	Maite	Minalulan	Olang	Paliton	Talayong	Tubod
Monacanthidae											
Amanses scopas										✓	
Cantherhines dumerilii								✓			
Cantherhines pardalis		✓	✓		✓				✓		✓
Oxymonacanthus longirostris		✓								✓	
Mullidae											
Mulloidichthys flavolineatus	✓	✓	✓	✓	✓		✓	✓	✓		✓
Mulloidichthys vanicolensis										✓	
Parupeneus barberinoides			✓		✓						
Parupeneus barberinus	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Parupeneus crassilabris			✓							✓	
Parupeneus cyclostomus							✓				
Parupeneus heptacanthus								✓			
Parupeneus indicus								✓			
Parupeneus multifasciatus	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Parupeneus sp.				2							
Nemipteridae											
Pentapodus bifasciatus	✓										
Pentapodus caninus								✓			
Scolopsis bilineatus	✓		✓	✓	✓		✓	✓	✓	✓	✓
Scolopsis ciliatus					✓						
Scolopsis lineatus				✓							
Scolopsis margaritifera			✓								
Scolopsis sp.	✓						✓	✓			
Ostraciidae											
Ostracion meleagris		✓									
Ostracion solorense		✓								✓	✓
Pempheridae											
Pempheris oualensis						✓					
Pempheris schwenkii				✓							
Pholidichthyidae											
Pholidichthys leucotaenia	✓		✓	✓							
Pinguipedidae											
Parapercis clathrata					✓		✓	✓			
Parapercis cylindrica							✓	✓			
Parapercis hexophtalma	✓		✓				✓	✓			
Plesiopidae											
Calloplesiops altivelis									✓		
Pomacanthidae											
Centropyge bicolor	✓				✓		✓		✓		
Centropyge nox				✓							
Centropyge tibicen			✓								
Centropyge vrolikii	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

TAXON	Marine Procted Area										
	Candaping B	Cangmunag	Caticugan	Catulayan	Lalag-bato	Maite	Minalulan	Olang	Paliton	Talayong	Tubod
Chaetodontoplus mesoleucus	✓		✓	✓				✓			
Pomacanthus imperator								✓			
Pomacanthus navarchus		✓	✓	✓		✓					
Pygoplites diacanthus	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pomacentridae											
Abudefduf sexfasciatus	✓			✓							
Abudefduf sp.	✓			✓			✓	✓			✓
Abudefduf vaigiensis	✓	✓			✓	✓	✓			✓	
Amblyglyphidodon aureus	✓	✓	✓				✓		✓	✓	
Amblyglyphidodon curacao	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Amblyglyphidodon leucogaster	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
Amphiprion clarkii	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Amphiprion frenatus	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Amphiprion ocellaris		✓	✓		✓					✓	✓
Amphiprion perideraion	✓		✓		✓		✓	✓	✓	✓	
Amphiprion sp.		✓	✓		✓	✓	✓		✓	✓	
Chromis amboinensis	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Chromis analis			✓				✓		✓	✓	
Chromis atripectoralis							✓				
Chromis lepidolepis	✓						✓				
Chromis margaritifer	✓	✓			✓	✓	✓		✓		✓
Chromis retrofasciata	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Chromis ternatensis	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Chromis viridis	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Chromis weberi	✓	✓	✓		✓		✓	✓		✓	✓
Chromis xanthochira			✓								
Chromis xanthura	✓			✓	✓		✓			✓	✓
Chrysiptera rollandi	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Chrysiptera sp.	✓			✓			✓	✓		✓	✓
Chrysiptera springeri				✓		✓		✓		✓	
Chrysiptera talboti	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Dascyllus aruanus	✓	✓	✓		✓		✓	✓	✓	✓	✓
Dascyllus melanurus								✓			
Dascyllus reticulatus	✓		✓	✓	✓		✓	✓	✓	✓	✓
Dascyllus trimaculatus	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Dischistodus melanotus	✓		✓								
Dischistodus perspicillatus				✓				✓			
Dischistodus prosopotaenia								✓			
Neoglyphidodon melas				✓		✓	✓			✓	✓
Neoglyphidodon nigroris	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Neoglyphidodon thoracotaeniatus		✓		✓		✓				✓	✓
Plectroglyphidodon dickii				✓							✓

TAXON	Marine Procted Area										
	Candaping B	Cangmunag	Caticugan	Catulayan	Lalag-bato	Maite	Minalulan	Olang	Paliton	Talayong	Tubod
Plectroglyphidodon lacrymatus	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pomacentrus adelus	✓						✓				
Pomacentrus alexanderae	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pomacentrus amboinensis	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pomacentrus bankanensis					✓	✓			✓		
Pomacentrus brachialis	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pomacentrus coelestis	✓		✓		✓		✓	✓	✓	✓	
Pomacentrus lepidogenys		✓	✓	✓	✓	✓	✓		✓	✓	✓
Pomacentrus moluccensis	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pomacentrus philippinus	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Pomacentrus stigma		✓	✓	✓	✓	✓	✓			✓	✓
Pomacentrus vaiuli		✓	✓	✓	✓	✓	✓		✓	✓	✓
Pseudochromidae											
Labracinus cyclophthalmus						✓					
Ptereleotridae											
Ptereleotris evides		✓		✓							✓
Scaridae											
Chlorurus bleekeri	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Chlorurus bowersi					✓			✓			
Chlorurus sordidus								✓			
Chlorurus spilurus	✓	✓		✓	✓	✓		✓	✓		✓
Scarus altipinnis	✓										
Scarus chameleon	✓			✓		✓	✓				
Scarus dimidiatus	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
Scarus flavipectoralis	✓		✓	✓	✓		✓	✓	✓	✓	✓
Scarus ghobban		✓	✓					✓			
Scarus globiceps				✓			✓	✓			
Scarus hypselopterus	✓		✓	✓		✓		✓			
Scarus niger	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Scarus psittacus	✓										
Scarus quoyi						✓					
Scarus russellii	✓										
Scarus sp.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Scarus tricolor	✓							✓	✓		
Serranidae											
Aethaloperca rogaa			✓								
Cephalopholis argus		✓	✓		✓	✓	✓	✓	✓	✓	✓
Cephalopholis microprion	✓					✓				✓	✓
Cephalopholis miniata			✓								
Cephalopholis sexmaculata						✓					
Cephalopholis sp.		✓									
Cephalopholis urodeta	✓		✓				✓	✓	✓	✓	

TAXON	Marine Procted Area										
	Candaping B	Cangmunag	Caticugan	Catulayan	Lalag-bato	Maite	Minalulan	Olang	Paliton	Talayong	Tubod
Epinephelus merra		✓			✓	✓		✓	✓	✓	✓
Epinephelus tauvina								✓			
Plectropomus sp.			✓								
Pseudanthias huchtii	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pseudanthias tuka		✓	✓	✓		✓			✓	✓	✓
Siganidae											
Siganus doliatus										✓	
Siganus guttatus			✓			✓					
Siganus puellus	✓										
Siganus virgatus			✓			✓					
Siganus vulpinus				✓	✓	✓				✓	✓
Siganus canaliculatus							✓				
Sphyraenidae											
Sphyraena sp.											✓
Synodontidae											
Synodus dermatogenys								✓			
Synodus variegatus	✓		✓	✓	✓	✓		✓		✓	
Tetraodontidae											
Arothron hispidus			✓								
Arothron mappa					✓						
Arothron nigropunctatus		✓	✓	✓		✓			✓	✓	✓
Arothron stellatus										✓	
Canthigaster compressa								✓			
Canthigaster papua				✓			✓		✓	✓	✓
Canthigaster valentini	✓	✓	✓					✓	✓		✓
Zanclidae											
Zanclus cornutus	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table A2. Changes in substrate composition (mean ± SE%) in Paliton MPA and its adjacent fished reef (labeled as "Non-Sanctuary") from 2006 to 2025.

TYPE OF SUBSTRATUM	Sanctuary									
	SCUBA							SNORKEL		
	2006	2007	2008	2009	2017	2025	% Change 2017-2025	2009	2017	% Change 2009-2017
Non-living:										
Sand and silt	5.1	6.3	8	5.4	2.8	0.67	-75.9	18.3	10.57	-42.2
Coral rubble	1.8	1.8	4.7	6.5	2.4	2.83	19.5	5.6	19.9	255.4
Rock and block	4	35.7	0	10.6	14.6	12.00	-17.9	12.8	38.7	202.3
White dead standing coral	0.2	0	0	1.6	4.9	0.67	-86.5	0.7	1.17	67.1
Dead coral with algae	1.5	0	6	7.1	22.7	13.67	-39.9	3.6	8.83	145.3
SUBTOTAL non-living	**12.6**	**43.8**	**18.7**	**31.2**	**47.4**	**29.83**	**-37.1**	**41**	**79.17**	93.1
Living:										
Hard coral:										
Branching	6.5	7.7	25.4	18.4	11.3	15.33	36.1	10.1	5.62	-44.4
Massive	5.5	10	25.3	18.7	10.3	25.50	148.1	11	2.12	-80.7
Flat/Encrusting	3	0	1	9	5.7	11.67	103.6	2	0.92	-54.0
Foliose/Cup	0.6	0	3.5	3.3	1.2	5.33	349.8	0.7	0.19	-72.9
Subtotal hard coral	**15.6**	**17.7**	**55.2**	**49.4**	**28.5**	**57.83**	**103.2**	**23.8**	**8.85**	-62.8
Soft coral	10	22	2.3	8.1	6.5	4.67	-28.4	4	1.96	-51.0
SUBTOTAL corals	**25.6**	**39.7**	**57.5**	**57.5**	**35.0**	**62.50**	**78.7**	**27.8**	**10.81**	-61.1
Others:										
Sponges	0.2	0	0.7	0.9	4.0	0.50	-87.4	1	0.11	-89.0
Other Animals	0	0	1.2	0.7	2.0	0.17	-91.4	0.5	0.17	-66.0
Algae	**61.6**	**0**	**21.8**	**9.7**	**11.7**	**7.00**	-40.0	**29.7**	**3.74**	-87.4
Turf Algae	~	~	~	1.8	3.6	0.83	-76.7	4.5	0.88	-80.4
Fleshy Algae	~	~	~	7.1	4.3	2.67	-38.6	24.5	2.66	-89.1
Coraline Algae	~	~	~	0.9	3.8	3.50	-6.8	0.8	0.2	-75.0
Seagrass	0.4	16.4	0	0	0.0	0.00		0	6.01	
SUBTOTAL others	**62.2**	**16.4**	**23.7**	**11.3**	**17.6**	**7.67**	**-56.4**	31.2	10.03	-67.9
GRAND TOTAL	**100**	**100**	**100**	**100**	**100.0**	**100**		**100**	**100**	
Other relevant information										
Slope (degrees)	~	~	~	21.7	~	~		5.4	5.7	
Topography* (m)	~	~	~	2.6	~	~		1.8	0	
Depth range/average (m)	7-8 m	7-8 m	7-8 m	10.9m	6.4	9		3.3	2.9	
Visibility (m)	-	-	-	20.4	14.8	16		17.2	16.3	
Sample size (Transects)	3	3	3	7	5	~		225	10	

TYPE OF SUBSTRATUM	Non-Sanctuary						
	SCUBA						
	2006	2007	2008	2009	2017	2025	% Change 2017-2025
Non-living:							
Sand and silt	5	9.2	6.7	6.4	30.7	16.7	-45.7
Coral rubble	1.5	0.9	12.2	8.2	9.3	6.5	-30.0
Rock and block	0	7.1	0	9.5	12.7	2.5	-80.3
White dead standing coral	1	0	1.2	1	0.0	1	
Dead coral with algae	20.4	1.2	5.4	9.9	2.8	9	216.8
SUBTOTAL non-living	**27.9**	**18.4**	**25.5**	**35**	**55.5**	**35.7**	**-35.7**
Living:							
Hard coral:							
Branching	16.3	25.9	32	13.8	18.6	10.2	-45.2
Massive	18.7	52.3	32.9	18.6	10.2	10.7	4.3
Flat/Encrusting	9.3	0.8	5.7	11.6	4.9	4.3	-12.0
Foliose/Cup	23.4	0.3	1.1	3.2	1.1	16.3	1337.3
Subtotal hard coral	**67.7**	**79.3**	**71.7**	**47.2**	**34.8**	**41.5**	**19.1**
Soft coral	3.3	2.3	2.7	3.9	2.3	8.3	265.2
SUBTOTAL corals	**71**	**81.6**	**74.4**	**51.1**	**37.1**	**49.8**	**34.2**
Others:							
Sponges	0.5	0	0	2.9	1.7	2	17.3
Other Animals	0.4	0	0	0.9	0.0	0.3	
Algae	0.3	0	0	10.1	5.7	12.2	114.7
Turf Algae	~	~	~	4.6	0.6	7.2	1167.2
Fleshy Algae	~	~	~	4.6	5.1	3.8	-25.7
Coraline Algae	~	~	~	0.9	0.0	1.2	
Seagrass	0	0	0	0	0.0	0	
SUBTOTAL others	**1.2**	**0**	**0**	**13.9**	**7.4**	**14.5**	**96.3**
GRAND TOTAL	**100**	**100**	**100**	**100**	**100**	**100**	
Other relevant information							
Slope (degrees)	~	~	~	22.5	12	12	
Topography* (m)	~	~	~	2.3	~	~	
Depth range/average (m)	7-8m	7-8m	7-8m	8	8	8	
Visibility (m)	~	~	~	18.8	15	15	
Sample size (Transects)	3	3	3	7	3	3	

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

∞ Data not included in grand total (S26)

~ No data

Table A3. Changes in substrate composition (mean ± SE%) in Maite MPA and its adjacent fished reef (labeled as “Non-Sanctuary”) from 2008 to 2025.

TYPE OF SUBSTRATUM	Sanctuary										
	SCUBA										
	2008	2009	2011	2012	2013	2014	2015	2017	2022	2025	% Change 2022-2025
Non-living:											
Sand and silt	~	~	~	~	~	~	~	5.15	1.3	4.17	220.8
Coral rubble	~	~	~	~	~	~	~	6.05	14.2	15.67	10.7
Rock and block	~	~	~	~	~	~	~	5.26	0.0	6.83	
White dead standing coral	~	~	~	~	~	~	~	1.57	0.0	0.00	
Dead coral with algae	-	-	2	3	3	4.5	8.5	7.05	37.7	14.33	-62.0
SUBTOTAL non-living	**22.5**	**20.5**	**45**	**31.3**	**30.5**	**31.3**	**34.9**	**25.08**	**53.16**	**41.00**	**-22.9**
Living:											
Hard coral:											
Branching	~	~	~	~	~	~	~	39.31	14.8	24.67	66.9
Massive	~	~	~	~	~	~	~	17.58	17.6	17.67	0.6
Flat/Encrusting	~	~	~	~	~	~	~	5.26	8.3	11.00	31.9
Foliose/Cup	~	~	~	~	~	~	~	2.13	3.0	1.00	-66.2
Subtotal hard coral	**68**	**76**	**45**	**65**	**64**	**62**	**58**	**64.28**	**43.6**	**54.3**	**24.5**
Soft coral	**5**	2	5.5	1.7	3	4.2	4.5	4.59	0.5	2.50	443.5
SUBTOTAL corals	**73**	**78**	**50.5**	**66.7**	**67**	**66.2**	**62.5**	**68.87**	**44.10**	**56.83**	**28.9**
Others:											
Sponges	~	~	~	~	~	~	~	0.67	0.5	0.67	31.4
Other Animals	~	~	~	~	~	~	~	0.90	0.6	0.17	-72.1
Algae	~	~	~	~	~	~	~	**4.48**	**1.6**	**1.33**	-18.4
Turf Algae	~	~	~	~	~	~	~	0.67	0.0	0.00	
Fleshy Algae	~	~	~	~	~	~	~	0.11	1.6	1.33	-18.4
Coraline Algae	~	~	~	~	~	~	~	3.70	0.0	0.00	
Seagrass	~	~	~	~	~	~	~	0.00	0.0	0.00	
SUBTOTAL others	**4.5**	**1.5**	**4.5**	**2**	**2.5**	**2.5**	**2.6**	**6.05**	**2.75**	**2.17**	**-21.1**
GRAND TOTAL	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	
Other relevant information											
Slope (degrees)	~	~	~	~	~	~	~	~	~	~	
Topography* (m)	~	~	~	~	~	~	~	~	~	~	
Depth range/average (m)	7	7-8 m	7-8 m	7-8 m	7-8 m	7-8 m	6.4	6.4	7	8	
Visibility (m)	~	~	~	~	~	~	~	~	15	16	
Sample size (Transects)	3	3	3	3	3	3	3	3	3	3	

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

∞ Data not included in grand total (S26)

~ No data

TYPE OF SUBSTRATUM	Non-Sanctuary										
	SCUBA										
	2008	2009	2011	2012	2013	2014	2015	2017	2022	2025	% Change 2022-2023
Non-living:											
Sand and silt	~	~	~	~	~	~	~	2.50	0.06	0.50	733.3
Coral rubble	~	~	~	~	~	~	~	1.83	16.69	13.50	-19.1
Rock and block	~	~	~	~	~	~	~	4.33	25.97	5.50	-78.8
White dead standing coral	~	~	~	~	~	~	~	0.00	7.51	15.33	104.1
Dead coral with algae	~	~	4.5	2.3	2	11.3	3.2	4.00	11.71	0.67	-94.3
SUBTOTAL non-living	**36.5**	**30**	**36**	**9**	**11**	**18.3**	**24.2**	**12.67**	**61.94**	**35.50**	**-42.7**
Living:											
Hard coral:											
Branching	~	~	~	~	~	~	~	51.83	9.64	16.67	72.9
Massive	~	~	~	~	~	~	~	9.33	15.10	11.17	-26.0
Flat/Encrusting	~	~	~	~	~	~	~	4.50	0.84	16.33	1844.4
Foliose/Cup	~	~	~	~	~	~	~	14.50	2.07	7.67	270.4
Subtotal hard coral	**54**	**63.8**	**49**	**89**	**87**	**77.7**	**73.8**	**80.17**	**27.65**	**51.83**	**87.5**
Soft coral	4.5	3	3	1	1	2	1	3.20	1.20	1.50	25.0
SUBTOTAL corals	**58.5**	**66.8**	**52**	**90**	**88**	**79.7**	**74.8**	**83.37**	**28.85**	**53.33**	**84.9**
Others:											
Sponges	~	~	~	~	~	~	~	1.50	1.30	1.17	-10.3
Other Animals	~	~	~	~	~	~	~	0.33	0.10	0.17	66.7
Algae	~	~	~	~	~	~	~	2.17	7.84	9.83	25.4
Turf Algae	~	~	~	~	~	~	~	1.50	-	6.33	
Fleshy Algae	~	~	~	~	~	~	~	0.67	-	0.67	
Coraline Algae	~	~	~	~	~	~	~	0.00	-	2.83	
Seagrass	~	~	~	~	~	~	~	0.00	0.00	0.00	
SUBTOTAL others	**5**	**3.2**	**12**	**1**	**1**	**2**	**1**	**4.00**	**9.24**	**11.17**	**20.9**
GRAND TOTAL	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	
Other relevant information											
Slope (degrees)	~	~	~	~	~	~	~	~	~	~	
Topography* (m)	~	~	~	~	~	~	~	~	~	~	
Depth range/average (m)	7-8 m	7-8 m	7-8 m	7-8 m	7-8 m	7-8 m	7-8 m	7-8 m	7-8 m	8	
Visibility (m)	~	~	~	~	~	~	~	~	~	15	
Sample size (Transects)	3	3	3	3	3	3	3	3	3	3	

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

∞ Data not included in grand total (S26)

~ No data

Table A4. Changes in substrate composition (mean ± SE%) in Tubod MPA and its adjacent fished reef (labeled as "Non-Sanctuary") from 2002 to 2025.

TYPE OF SUBSTRATUM	Sanctuary													
	SCUBA									SNORKEL				
	2002	2005	2006	2007	2008	2009	2017	2025	% Change 2017-2025	2002	2009	2017	2025	% Change 2017-2025
Non-living:														
Sand and silt	7.8	9.4	5.4	8.2	4.3	7.8	6.83	0.83	-87.8	15.7	11.6	15.8	10.9	-31.0
Coral rubble	3.4	0.3	0.7	4.4	4.4	5.1	15.34	14.83	-3.3	3	2.7	2.2	5.5	149.8
Rock and block	13.3	0.7	0.9	0.3	2	6.9	1.57	10.50	569.7	49.1	29.3	26.3	26.8	2.1
White dead standing coral	0.5	0.1	1.9	0.8	0	1.4	1.23	0.00	-100.0	0.1	1.4	1.6	0.8	-48.7
Dead coral with algae	10.5	8.5	0.9	9.4	8.2	3.6	7.39	19.33	161.5	4.7	2	7.1	9.9	41.0
SUBTOTAL non-living	**35.5**	**19**	**9.8**	**23.1**	**18.9**	**24.8**	**32.36**	**45.49**	40.6	**72.6**	**47**	**52.9**	**53.9**	2.0
Living:														
Hard coral:														
Branching	23.8	34.8	37.9	36.1	28.2	34.4	16.01	24.50	53.0	7.2	20.9	16.9	13.9	-17.7
Massive	17.9	22.3	18.1	11.3	12	17.5	15.45	6.83	-55.8	11.1	19.6	13.0	16.0	23.3
Flat/Encrusting	8.3	9.7	20.5	13.3	20.2	7.2	5.94	11.83	99.4	3.5	2.4	3.0	5.00	69.3
Foliose/Cup	5.1	6.9	5.2	6.7	14.8	7.6	7.84	1.50	-80.9	0.9	2.2	0.5	0.72	31.7
Subtotal hard coral	**55.1**	**73.7**	**81.7**	**67.4**	**75.2**	**66.7**	**45.24**	**44.67**	-1.3	**22.7**	**45.1**	**33.4**	**35.6**	6.8
Soft coral	3.3	6.3	4.5	5.4	3	3.1	19.03	7.50	-60.6	2.1	2.2	5.6	4.7	-15.9
SUBTOTAL corals	**58.4**	**80**	**86.2**	**72.8**	**78.2**	**69.8**	**64.27**	**52.17**	-18.8	**24.8**	**47.3**	**38.9**	**40.3**	3.5
Others:														
Sponges	1.8	0.8	1	0.8	0.9	1.3	1.12	1.00	-10.7	0.7	0.1	0.6	0.14	-78.0
Other Animals	0	0	1.2	0.5	0	0.6	0.34	0.33	-1.8	0	0.4	0.4	0.22	-41.9
Algae	**4.4**	**0.2**	**1.9**	**2.7**	**1.9**	**3.4**	**0.64**	**1.00**	57.2	**2.2**	**4.6**	**7.2**	**4.64**	-35.3
Turf Algae	3.1	-	-	-	-	0.7	0.64	0.00	-100.0	1.1	2.2	1.6	2.42	53.9
Fleshy Algae	0.9	-	-	-	-	1.6	0.22	0.50	123.3	0.4	1.7	2.6	2.20	-15.7
Coraline Algae	0.4	-	-	-	-	1	0.11	0.50	346.5	0.7	0.8	3.0	0.03	-99.1
Seagrass	0	0	0	0	0	0	0.30	0.00	-100.0	0	0.6	0.0	0.25	
SUBTOTAL others	**6.2**	**1**	**4.1**	**4**	**2.8**	**5.3**	**3.36**	**2.33**	-30.7	**2.9**	**5.7**	**8.2**	**5.25**	-35.9
GRAND TOTAL	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**		**100**	**100**	**100**	**100**	
Other relevant information														
Slope (degrees)	27.2	-	-	-	10	16	~	~		5.4	~	-		
Topography* (m)	2.2	-	-	-	2.2	3.3	~	~		1.8	0.8	-		
Depth range/average (m)	6.5m	7-8 m	7-8 m	7-8 m	8.8m	7.3	~	8		3.3	2.6	-	4.2	
Visibility (m)	20.9	-	-	-	16.1	14.8	~	16		17.2	19.9	-	7.75	
Sample size (Transects)	16	3	3	3	3	7	~	6		15	12	-	12	

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

∞ Data not included in grand total (S26)

~ No data

TYPE OF SUBSTRATUM	Non-Sanctuary								
	SCUBA								
	2002	2005	2006	2007	2008	2009	2017	2025	% Change 2017-2025
Non-living:									
Sand and silt	10.8	11.9	3.5	1.1	2.5	12.3	18.7	18.2	-2.5
Coral rubble	2.8	4.2	4.6	4.4	1.4	2.6	3.2	2	-36.8
Rock and block	21.5	8	0.5	1	2.9	8.2	7.5	8.2	9.3
White dead standing coral	0	0.8	0.8	2.7	0	0.7	1.5	0	-100.0
Dead coral with algae	8.8	6.2	3.9	6.6	4	6.4	10.5	12.7	21.0
SUBTOTAL non-living	**43.9**	**31.1**	**13.3**	**15.8**	**10.8**	**30.2**	**41.3**	**41.1**	-0.6
Living:									
Hard coral:									
Branching	15.2	12.3	23.5	33.5	29.2	22.3	24.8	18.5	-25.5
Massive	15.5	36.6	28.7	27.3	20.3	19.4	20.5	14.8	-27.6
Flat/Encrusting	6	3.9	15.8	7.6	10	10.4	4.5	9.5	111.1
Foliose/Cup	2.7	8.1	3.8	2.3	10.1	5.7	2.3	2.2	-7.1
Subtotal hard coral	**39.4**	**60.9**	**71.8**	**70.7**	**69.6**	**57.8**	**52.2**	**45**	-13.7
Soft coral	3.9	7.2	5.4	7	3.4	5.1	2.7	3.5	31.2
SUBTOTAL corals	**43.3**	**68.1**	**77.2**	**77.7**	**73**	**62.9**	**54.8**	**48.5**	-11.6
Others:									
Sponges	2.9	0.5	4.6	3.5	6.4	1.8	1.3	1.5	12.5
Other Animals	0	0	3.5	1.1	1.4	0.5	0.2	0.8	380.0
Algae	10	0.3	1	2	8.4	4.6	2.3	8.1	247.1
Turf Algae	3.2	~	~	~	-	2	0.3	2	500.0
Fleshy Algae	5	~	~	~	-	1.9	1.7	5.3	218.0
Coraline Algae	1.8	~	~	~	-	0.7	0.3	0.8	140.0
Seagrass	0	0	0.2	0	0	0	0.0	0	
SUBTOTAL others	**12.9**	**0.8**	**9.3**	**6.6**	**16.2**	**6.9**	**3.8**	**10.4**	171.3
GRAND TOTAL	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	
Other relevant information									
Slope (degrees)	39	~	~	~	~	42	-	12	
Topography* (m)	3.6	~	~	~	~	3.3	-	-	
Depth range/average (m)	6.5m	7-8m	7-8m	7-8m	7-8m	7.6	-	8	
Visibility (m)	17	~	~	~	~	19	-	15	
Sample size (Transects)	13	3	3	3	3	7	-	3	

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

∞ Data not included in grand total (S26)

~ No data

Table A5. Changes in substrate composition (mean ± SE%) in Catulayan MPA and its adjacent fished reef (labeled as "Non-Sanctuary") in 2025.

TYPE OF SUBSTRATUM	Sanctuary		Non-Sanctuary
	SCUBA	SNORKEL	SCUBA
	2025	2025	2025
Non-living:			
Sand and silt	0.5	20.45	18.3
Coral rubble	15.33	1.73	13.5
Rock and block	6.233	35.79	6.7
White dead standing coral	0	0.30	0.2
Dead coral with algae	20.83	8.51	19.5
SUBTOTAL non-living	**42.893**	**66.79**	**58.2**
Living:			
Hard coral:			
Branching	13.33	3.64	10.5
Massive	11.83	8.46	11.8
Flat/Encrusting	14.50	3.33	12.7
Foliose/Cup	9.50	0.30	1.2
Subtotal hard coral	**49.17**	**15.73**	**36.2**
Soft coral	3.50	0.67	1.2
SUBTOTAL corals	**52.67**	**16.40**	**37.3**
Others:			
Sponges	0.5	0.67	0.8
Other Animals	0	0.27	0.3
Algae	3.84	15.88	3.3
Turf Algae	0.17	1.58	1.2
Fleshy Algae	2.5	13.79	1.7
Coraline Algae	1.17	0.52	0.5
Seagrass	0	0.00	0.0
SUBTOTAL others	**4.34**	**16.82**	**4.5**
GRAND TOTAL	**100**	**100**	**100**
Other relevant information			
Slope (degrees)	~	~	~
Topography* (m)	~	~	~
Depth range/average (m)	7.-8m	7.-8m	7.-8m
Visibility (m)	~	~	16
Sample size (Transects)	~	-	3
* Mean distance between lowest and highest point on the horizontal transect line			
∞ Data not included in grand total (S26)			
~ No data			

Table A6. Changes in substrate composition (mean ± SE%) in Cangmunag MPA and its adjacent fished reef (labeled as "Non-Sanctuary") from 2009 to 2025.

TYPE OF SUBSTRATUM	Sanctuary SCUBA 2009	2011	2012	2013	2014	2017	2025	% Change 2017-2025
Non-living:								
Sand and silt	~	~	~	~	~	6.97	1.67	-76.0
Coral rubble	~	~	~	~	~	5.29	11.67	120.6
Rock and block	~	~	~	~	~	3.02	9.00	197.8
White dead standing coral	~	~	~	~	~	0.00	0.17	
Dead coral with algae	2.7	7.2	2.5	1.5	3	6.13	7.00	14.2
SUBTOTAL non-living	**25.2**	**56.5**	**33**	**24.3**	**30.2**	**21.4**	**29.51**	37.8
Living:								
Hard coral:								
Branching	~	~	~	~	~	25.61	21.00	-18.0
Massive	~	~	~	~	~	24.52	26.00	6.0
Flat/Encrusting	~	~	~	~	~	5.79	9.50	64.0
Foliose/Cup	~	~	~	~	~	11.84	6.33	-46.5
Subtotal hard coral	**70.8**	**31.7**	**61.3**	**71.8**	**61.8**	**67.76**	**62.83**	-7.3
Soft coral	1.6	10.8	1.2	1.4	6.5	7.47	4.00	-46.5
SUBTOTAL corals	**72.4**	**42.5**	**62.5**	**73.2**	**68.3**	**75.23**	**66.83**	-11.2
Others:								
Sponges	~	~	~	~	~	0.25	0.33	31.0
Other Animals	~	~	~	~	~	1.18	0.00	-100.0
Algae	~	~	~	~	~	**1.85**	**3.34**	80.8
Turf Algae	~	~	~	~	~	0.42	0.17	-59.5
Fleshy Algae	~	~	~	~	~	0.92	3.00	224.8
Coraline Algae	~	~	~	~	~	0.50	0.17	-66.3
Seagrass	~	~	~	~	~	0.08	0.00	-100.0
SUBTOTAL others	**2.4**	1	4.5	2.5	1.5	**3.36**	**3.67**	9.3
GRAND TOTAL	**103**	**107**	**103**	**102**	**103**	**100**	**100**	
Other relevant information								
Slope (degrees)	~	~	~	~	~	~	~	
Topography* (m)	~	~	~	~	~	~	~	
Depth range/average (m)	7.-8m	7.-8m	7.-8m	7.-8m	7.-8m	7	7.-8m	
Visibility (m)	~	~	~	~	~	~	16	
Sample size (Transects)	~	~	~	~	~	~	3	

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

∞ Data not included in grand total (S26)

~ No data

TYPE OF SUBSTRATUM	Non-Sanctuary SCUBA 2009	2011	2012	2013	2014	2017	2025	% Change 2017-2025
Non-living:								
Sand and silt	~	~	~	~	~	3.0	3.8	27.8
Coral rubble	~	~	~	~	~	7.7	9.3	21.7
Rock and block	~	~	~	~	~	6.7	6.8	2.5
White dead standing coral	~	~	~	~	~	0.0	0.3	
Dead coral with algae	3.8	5	1.8	1.3	8	3.0	13.7	355.6
SUBTOTAL non-living	**31.8**	**29**	**26.5**	**13.8**	**25.2**	**20.3**	**34.0**	**67.2**
Living:								
Hard coral:								
Branching	~	~	~	~	~	12.3	18.2	47.3
Massive	~	~	~	~	~	33.2	12.2	-63.3
Flat/Encrusting	~	~	~	~	~	9.5	16.2	70.2
Foliose/Cup	~	~	~	~	~	4.2	7.8	88.0
Subtotal hard coral	**63**	**66**	**71.5**	**83.5**	**59**	**59.2**	**54.3**	**-8.2**
Soft coral	3	4.2	1.5	1.5	13.5	8.8	6.5	-26.4
SUBTOTAL corals	**66**	**70.2**	**73**	**85**	**72.5**	**68.0**	**60.8**	**-10.5**
Others:								
Sponges	~	~	~	~	~	3.0	0.5	-83.3
Other Animals	~	~	~	~	~	2.0	0.5	-75.0
Algae	~	~	~	~	~	6.7	4.2	-37.6
Turf Algae	~	~	~	~	~	0.8	3.3	299.6
Fleshy Algae	~	~	~	~	~	4.5	0.5	-88.9
Coraline Algae	~	~	~	~	~	1.3	0.3	-75.2
Seagrass	~	~	~	~	~	0.0	0.0	
SUBTOTAL others	**2.2**	**0.8**	**0.5**	**1.2**	**2.3**	**11.7**	**5.2**	**-55.8**
GRAND TOTAL	**104**	**105**	**102**	**101**	**108**	**100**	**100**	
Other relevant information								
Slope (degrees)	~	~	~	~	~	~	~	
Topography* (m)	~	~	~	~	~	~	~	
Depth range/average (m)	7.-8m	7.-8m	7.-8m	7.-8m	7.-8m	7.-8m	7.-8m	
Visibility (m)	~	~	~	~	~	~	16	
Sample size (Transects)	-	-	-	-	-	3	3	

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

∞ Data not included in grand total (S26)

~ No data

Table A7. Changes in substrate composition (mean ± SE%) in Napayong MPA and its adjacent fished reef (labeled as "Non-Sanctuary") from 2005 to 2025.

TYPE OF SUBSTRATUM	Sanctuary							
	SCUBA							SNORKEL
	2005	2006	2007	2008	2009	2025	% Change 2009-2025	2009
Non-living:								
Sand and silt	14.8	9.5	8.8	15.1	29.8	3.50	-88.3	18.3
Coral rubble	6.1	4.1	7.2	2.5	6.2	17.33	179.5	5.6
Rock and block	0.1	2.6	0.8	3.5	3.4	3.67	7.9	12.8
White dead standing	0.1	0.9	0	0.1	0.1	0.00	-100.0	0.7
Dead coral with algae	8.5	2.6	5.9	4.5	3.1	8.67	179.7	3.6
SUBTOTAL non-living	**29.6**	**19.7**	**22.7**	**25.7**	**42.6**	**33.17**	**-22.1**	**41**
Living:								
Hard coral:								
Branching	12.6	28.6	27.9	22.3	18.6	26.67	43.4	10.1
Massive	18.1	17	16	17.2	9.1	11.67	28.2	11
Flat/Encrusting	12.5	12.4	13.7	6.7	3.8	10.00	163.2	2
Foliose/Cup	3.3	3.6	2.8	8.7	5.8	10.83	86.8	0.7
Subtotal hard coral	**46.5**	**61.6**	**60.4**	**54.9**	**37.3**	**59.17**	**58.6**	**23.8**
Soft coral	18.9	11.9	12.1	14.1	13	7.00	-46.2	4
SUBTOTAL corals	**65.4**	**73.5**	**72.5**	**69**	**50.3**	**66.17**	**31.5**	**27.8**
Others:								
Sponges	3.5	0.5	0	1.9	0.4	0.17	-57.5	1
Other Animals	0	2.4	0.1	0.6	0.8	0.33	-58.8	0.5
Algae	**1**	**0.7**	**1.9**	**2.7**	**4.8**	**0.17**	-96.5	**29.7**
Turf Algae	-	-	-	-	2.4	0.00	-100.0	4.5
Fleshy Algae	-	-	-	-	2.1	0.00	-100.0	24.5
Coraline Algae	-	-	-	-	0.3	0.17	-43.3	0.8
Seagrass	0.4	3.2	2.8	0	1.3	0.00	-100.0	0
SUBTOTAL Others	**4.9**	**6.8**	**4.8**	**5.2**	**7.3**	**0.67**	**-90.8**	**31.2**
GRAND TOTAL	**100**	**100**	**100**	**100**	**100**	**100**		**100**
Other relevant information								
Slope (degrees)	-	-	-	-	10	~		6.6
Topography* (m)	-	-	-	-	2.2	~		1.3
Depth range/average (m)	7-8 m	7-8 m	7-8 m	7-8 m	8.8m	8		3.1
Visibility (m)	-	-	-	-	16.1	16		16.3
Sample size (Transects)	16	3	3	3	3	6		14

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

∞ Data not included in grand total (S26)

~ No data

TYPE OF SUBSTRATUM	Non-Sanctuary						
	SCUBA						
	2005	2006	2007	2008	2009	2025	% Change 2009-2025
Non-living:							
Sand and silt	9.2	8	4.2	14.9	46.8	0.8	-98.2
Coral rubble	6.1	7.5	7.4	1.3	2.8	4.5	60.7
Rock and block	2.1	0.5	0.7	3.9	1.2	3.0	150.0
White dead standing	0.9	0	0.2	0.2	0	0.0	
Dead coral with algae	2.9	7.7	7	12.8	4.7	15.3	226.2
SUBTOTAL non-living	**21.2**	**23.7**	**19.5**	**33.1**	**55.5**	**23.7**	**-57.4**
Living:							
Hard coral:							
Branching	9.4	22.8	20.4	17.9	10.9	20.0	83.5
Massive	28.5	20.2	21.2	20.7	8.2	8.8	7.7
Flat/Encrusting	7.2	13.2	13.7	2.3	5.1	10.7	109.2
Foliose/Cup	9.9	4.8	6.2	5.8	9.4	9.5	1.1
Subtotal hard coral	**55**	**61**	**61.5**	**46.7**	**33.6**	**49.0**	**45.8**
Soft coral	22.4	3.2	14.8	11.6	9.5	11.7	22.8
SUBTOTAL corals	**77.4**	**64.2**	**76.3**	**58.3**	**43.1**	**60.7**	**40.8**
Others:							
Sponges	0.2	6.1	0.5	0.5	0.1	0.7	566.7
Other Animals	0	2.6	1	0.4	0.3	2.7	788.9
Algae	1.1	3.5	2.7	7.6	1	12.3	1133.3
Turf Algae	~	~	~	~	0.9	4.0	344.4
Fleshy Algae	~	~	~	~	0	7.5	
Coraline Algae	~	~	~	~	0.1	0.8	733.3
Seagrass	0	0	0	0.2	0	0.0	
SUBTOTAL others	**1.3**	**12.2**	**4.2**	**8.7**	**1.4**	**15.7**	**1019.0**
GRAND TOTAL	**100**	**100**	**100**	**100**	**100**	**100**	
Other relevant information							
Slope (degrees)	~	~	~	~	27.5	12	
Topography* (m)	~	~	~	~	1.3	-	
Depth range/average (m)	7-8m	7-8m	7-8m	7-8m	7.4	7-8m	
Visibility (m)	~	~	~	~	19.3	15	
Sample size	3	3	3	3	5	3	

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

∞ Data not included in grand total (S26)

~ No data

Table A8. Changes in substrate composition (mean ± SE%) in Lalag Bato MPA and its adjacent fished reef (labeled as “Non-Sanctuary”) from 2005 to 2025.

TYPE OF SUBSTRATUM	Sanctuary										
	SCUBA								SNORKEL		
	2005	2006	2007	2008	2009	2022	2025	% Change 2022-2025	2009	2025	% Change 2009-2025
Non-living:											
Sand and silt	22.6	32	21.4	28.7	27.5	17.91	12.33	-31.2	16.2	10.8	-33.3
Coral rubble	10.4	5.6	26.1	6.7	5.3	9.42	17.17	82.3	1.8	2.5	41.5
Rock and block	5.8	6	5.2	4.4	9.9	0.13	11.33	8615.4	37.6	11.6	-69.2
White dead standing coral	0.3	0.1	0	0	0.1	0	0.00		0	3.2	
Dead coral with algae	5.3	1.2	11.7	4.3	3.4	24.93	5.00	-79.9	1.1	6.3	473.8
SUBTOTAL non-living	**44.4**	**44.9**	**64.4**	**44.1**	**46.2**	**52.39**	**45.83**	**-12.5**	**56.7**	**34.4**	-39.3
Living:											
Hard coral:											
Branching	2.7	3.8	3.7	4.8	6.7	4.93	6.17	25.1	7.2	14.87	106.6
Massive	1.4	8.8	15.9	4.3	9.4	7.39	8.17	10.5	10.9	13.12	20.4
Flat/Encrusting	0.1	0.5	0.9	0.5	4.4	0.82	6.50	692.7	2.5	4.96	98.6
Foliose/Cup	2.4	1.8	0	4.3	0.9	1.36	0.67	-51.0	1.1	0.51	-53.4
Subtotal hard coral	**6.6**	**14.9**	**20.5**	**13.9**	**21.4**	**14.5**	**21.50**	48.3	**21.7**	**33.47**	54.2
Soft coral	**15.2**	25.2	8.5	28.9	25.7	24.52	27.50	12.2	16.6	20.18	21.6
SUBTOTAL corals	**21.8**	**40.1**	**29**	**42.8**	**47.1**	**39.02**	**49**	**25.6**	**38.3**	**53.65**	40.1
Others:											
Sponges	2.2	1.4	5.3	2.4	1.6	0.14	0.67	378.6	0.4	1.72	329.4
Other Animals	0.3	3.5	0.8	1.8	1.4	2.61	0.17	-93.5	0	0.69	
Algae	**31.3**	**10**	**0**	**8.8**	**3.6**	**5.63**	**4.50**	-20.1	**4.7**	**1.49**	-68.3
Turf Algae	-	-	-	-	2.1	3.78	0.33	-91.3	0.7	0.64	-8.5
Fleshy Algae	-	-	-	-	1.4	0	3.50		3.8	0.36	-90.5
Coraline Algae	-	-	-	-	0.2	1.85	0.67	-63.8	0.2	0.49	143.5
Seagrass	0	0	0.3	0	0	0.49	0.00	-100.0	0.1	10.40	10297.7
SUBTOTAL others	**33.8**	**14.9**	**6.4**	**13**	**6.6**	**8.87**	**5.34**	**-39.8**	**5.2**	**14.30**	175.0
GRAND TOTAL	**100**	**100**	**100**	**100**	**100**	**100**	**100**		**100**	**102**	
Other relevant information											
Slope (degrees)	-	-	-	-	7.1	-	~		3.3	~	
Topography* (m)	-	-	-	-	2.2	-	~		1.5	~	
Depth range/average (m)	7-8m	7-8 m	7-8 m	7-8 m	7-8 m	7-8 m	8		3	2.75	
Visibility (m)	-	-	19	14.9	16.2	15	16		12.5	10	
Sample size (Transects)	3	3	3	3	7	7	6		12	12	

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

∞ Data not included in grand total (S26)

~ No data

TYPE OF SUBSTRATUM	Non-Sanctuary							
	SNORKEL							
	2005	2006	2007	2008	2009	2022	2025	% Change 2022-2025
Non-living:								
Sand and silt	37.2	34.6	45.1	76.6	44.2	41.22	40.78	-1.1
Coral rubble	1.4	0.7	2.7	0	8.4	2.59	7.18	177.2
Rock and block	3	0.5	0	4	3.9	0	0	
White dead standing coral	0.6	0	2.9	0.2	0.4	0.13	0	-100.0
Dead coral with algae	3.3	9.4	3.6	0.7	3.4	17.65	18.57	5.2
SUBTOTAL non-living	**45.5**	**45.2**	**54.3**	**81.5**	**60.3**	**61.59**	**66.53**	**8.0**
Living:								
Hard coral:								
Branching	1.9	11.9	9.3	3	6.7	1.08	4.65	330.6
Massive	8.4	8.4	10.7	2.8	7.9	3.92	8.65	120.7
Flat/Encrusting	0.8	1.5	11.6	1.3	5.3	0.54	0.47	-13.0
Foliose/Cup	1.3	1.7	0	2.5	1.4	1.14	2.72	138.6
Subtotal hard coral	**12.4**	**23.5**	**31.6**	**9.6**	**21.3**	**6.68**	**16.49**	**146.9**
Soft coral	21.6	10.7	10.9	5.1	14.1	20.8	2.73	-86.9
SUBTOTAL corals	**34**	**34.2**	**42.5**	**14.7**	**35.4**	**27.48**	**19.22**	**-30.1**
Others:								
Sponges	1.3	17.2	0	0.9	1.1	0	0.34	
Other Animals	1.8	3.3	0	0.7	0.1	0	3.53	
Algae	17.3	0.2	3.1	2	2.9	10.6	10.32	-2.6
Turf Algae	~	~	~	~	0.9	0	9.51	
Fleshy Algae	~	~	~	~	1.9	8.9	0	-100.0
Coraline Algae	~	~	~	~	0.1	1.7	0.81	-52.4
Seagrass	0	0	0	0.2	0	0	0.07	
SUBTOTAL others	**20.4**	**20.7**	**3.1**	**3.8**	**4.1**	**10.6**	**14.26**	**34.5**
GRAND TOTAL	**100**	**100**	**100**	**100**	**100**	**100**	**100**	
Other relevant information								
Slope (degrees)	~	~	~	~	10.8		12	
Topography* (m)	~	~	~	~	2.4		-	
Depth range/average (m)	7-8m	7-8m	7-8m	7-8m	7.6		8	
Visibility (m)	~	~	~	~	15.3		15	
Sample size (Transects)	3	3	3	3	3		3	

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

∞ Data not included in grand total (S26)

~ No data

Table A9. Changes in substrate composition (mean ± SE%) in Olang MPA and its adjacent fished reef (labeled as "Non-Sanctuary") from 2005 to 2025.

TYPE OF SUBSTRATUM	Sanctuary											
	SCUBA											SNORKEL
	2005	2006	2007	2008	2009	2011	2012	2013	2022	2025	% Change 2022-2025	2025
Non-living:												
Sand and silt	45.33	31.83	38.50	40.83	63.83	17.50	25.80	4.50	54.84	51.33	-6.39	13.17
Coral rubble	8.33	18.33	17.50	14.67	13.33	9.75	30.62	78.83	11.38	6.75	-40.69	4.20
Rock and block	1.83	1.00	0.00	0.33	5.00	0.00	3.95	3.67	0.00	2.67		7.33
White dead standing coral	2.00	0.33	2.25	0.00	0.00	9.75	3.90	0.00	0.70	0.17	-76.19	1.53
Dead coral with algae	5.00	7.83	2.75	1.00	2.50	0.00	2.27	3.33	10.76	6.42	-40.37	7.31
SUBTOTAL non-living	**62.50**	**59.33**	**61.00**	**56.83**	**84.67**	**37.00**	**66.54**	**90.33**	**77.68**	**67.33**	**-13.32**	**33.53**
Living:												
Hard coral:												
Branching	20.17	21.83	22.50	18.00	5.83	~	~	-	22.69	8.17	-64.01	39.20
Massive	12.50	14.67	11.50	20.50	3.83	~	~	-	6.60	3.42	-48.23	18.86
Flat/Encrusting	0.67	0.83	1.00	0.17	1.50	~	~	-	1.04	1.42	36.22	2.22
Foliose/Cup	2.50	1.50	0.75	1.67	2.67	~	~	-	3.45	0.33	-90.34	2.45
Subtotal hard coral	**35.83**	**38.83**	**35.75**	**40.33**	**13.83**	**44.25**	25.70	5.83	**33.78**	**13.33**	**-60.53**	**62.72**
Soft coral	**0.33**	0.33	1.25	0.00	0.17	1.00	0.39	0.00	0.00	0.33		0.22
SUBTOTAL corals	**36.17**	**39.17**	**37.00**	**40.33**	**14.00**	**45.25**	**26.09**	**5.83**	**33.78**	**13.67**	**-59.54**	**62.95**
Others:												
Sponges	0.00	1.17	0.00	0.50	0.17	0.00	1.07	0.83	0.14	0.42	197.62	0.22
Other Animals	0.83	0.17	0.00	0.00	0.00	0.00	0.10	0.00	2.61	0.25	-90.42	0.89
Algae	**0.17**	**0.17**	**2.00**	**0.00**	**0.83**	**17.75**	6.20	3.00	**3.26**	**1.75**	-46.32	**0.92**
Turf Algae	0.17	0.17	0.00	0.00	0.00	17.75	6.20	3.00	0.77	1.17	51.52	0.47
Fleshy Algae	0.00	0.00	1.25	0.00	0.67	0.00	0.00	0.00	0.00	0.50		0.45
Coraline Algae	0.00	0.00	0.75	0.00	0.17	0.00	0.00	0.00	2.49	0.08	-96.65	0.00
Seagrass	0.33	0.00	0.00	2.33	0.33	0.00	0.00	0.00	0.49	2.00	308.16	1.50
SUBTOTAL others	**1.33**	**1.50**	**2.00**	**2.83**	**1.33**	**17.75**	**7.37**	**3.83**	**6.50**	**4.42**	**-32.05**	**3.53**
GRAND TOTAL	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**117.96**	**85.42**		**100.01**
Other relevant information												
Slope (degrees)	10.4	-	-	-	-	16	~	~	-	~		
Topography* (m)	1.4	-	-	-	-	3.3	~	~	-	~		
Depth range/average (m)	7	7-8 m	7-8 m	7-8 m	7-8 m	7.3	6.4	6.4	7	5		3.5
Visibility (m)	13.9	-	19	14.9	13.2	14.8	14.8	14.8	15	16		15
Sample size (Transects)	16	3	3	3	3	7	5	5	3	6		13
* Mean distance between lowest and highest point on the horizontal transect line												
∞ Data not included in grand total (S26)												
~ No data												

TYPE OF SUBSTRATUM	Non-Sanctuary										
	SCUBA										
	2005	2006	2007	2008	2009	2011	2012	2013	2022	2025	% Change 2022-2025
Non-living:											
Sand and silt	46.50	27.00	34.50	22.17	7.33	31.00	19.38	60.38	42.59	58.40	37.12
Coral rubble	6.75	34.50	21.50	6.50	3.00	10.75	47.38	18.13	31.62	4.90	-84.50
Rock and block	0.00	1.00	0.00	0.50	0.00	0.00	0.38	4.50	2.77	3.10	11.91
White dead standing coral	4.50	0.17	0.00	0.67	0.00	0.75	0.88	0.38	1.25	0.20	-84.00
Dead coral with algae	9.75	1.33	18.75	17.33	49.67	0.00	5.63	0.25	4.80	10.30	114.58
SUBTOTAL non-living	**67.50**	**64.00**	**74.75**	**47.17**	**60.00**	**42.50**	**73.63**	**83.63**	**83.03**	**76.90**	**-7.38**
Living:											
Hard coral:											
Branching	12.00	20.83	17.75	29.67	14.83	~	~	~	9.61	5.50	-42.77
Massive	6.25	4.50	2.50	4.33	3.67	~	~	~	1.65	1.40	-15.15
Flat/Encrusting	3.00	0.17	0.50	0.83	19.83	~	~	~	0.39	2.50	541.03
Foliose/Cup	1.00	4.83	3.50	3.00	0.00	~	~	~	3.27	0.60	-81.65
Subtotal hard coral	**22.25**	**30.33**	**24.25**	**37.83**	**38.33**	**30.75**	**24.38**	**4.38**	**14.92**	**10.00**	**-32.98**
Soft coral	2.75	0.00	0.00	6.67	0.00	2.00	0.13	0.00	0.20	1.00	400.00
SUBTOTAL corals	**25.00**	**30.33**	**24.25**	**44.50**	**38.33**	**32.75**	**24.50**	**4.38**	**15.12**	**11.00**	**-27.25**
Others:											
Sponges	3.75	1.50	0.00	0.17	0.00	0.25	0.25	0.00	0.00	0.10	
Other Animals	0.50	0.33	0.00	1.33	0.00	0.00	0.00	7.38	0.59	0.20	-66.10
Algae	0.00	3.83	1.00	1.50	0.00	24.50	1.13	0.00	0.93	0.59	-36.39
Turf Algae	0.00	0.00	0.00	0.00	0.00	21.75	1.13	0.00	0.47	0.00	**-100.00**
Fleshy Algae	0.00	3.83	1.00	1.50	0.00	2.75	0.00	0.00	0.47	0.29	-37.30
Coraline Algae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	
Seagrass	3.25	0.00	0.00	5.33	1.67	0.00	0.50	4.63	0.33	10.75	3158.10
SUBTOTAL others	**7.50**	**5.67**	**1.00**	**8.33**	**1.67**	**24.75**	**1.88**	**12.00**	**1.85**	**11.64**	**529.37**
GRAND TOTAL	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	
Other relevant information											
Slope (degrees)	~	~	~	0.7	8.3	90	~	~	~	12	
Topography* (m)	1	1	1	2.4	7	~	~	~	~	-	
Depth range/average (m)	6.7	7.5	7.5	5.4	7.1	6.8	~	~	8	5	
Visibility (m)	~	~	~	31.2	15	14.3	~	~	20	15	
Sample size (Transects)	4	4	3	6	9	7	~	~	3	5	
* Mean distance between lowest and highest point on the horizontal transect line											
∞ Data not included in grand total (S26)											
~ No data											

Table A10. Changes in substrate composition (mean ± SE%) in Candaping B MPA and its adjacent fished reef (labeled as "Non-Sanctuary") from 2011 to 2025.

TYPE OF SUBSTRATUM	Sanctuary				TYPE OF SUBSTRATUM	Non-Sanctuary		
	SCUBA			SNORKEL		SCUBA		
	2011	2025	% Change 2011-2025	2025		2011	2025	% Change 2011-2025
Non-living:					**Non-living:**			
Sand and silt	38.9	37.58	-3.4	11.26	Sand and silt	33	42.8	29.8
Coral rubble	21.7	22.75	4.8	1.72	Coral rubble	0.3	11.8	3844.4
Rock and block	0.8	3.67	358.3	5.67	Rock and block	2.5	2.4	-3.3
White dead standing	5.3	0.17	-96.9	2.10	White dead standing	1.1	0.3	-69.7
Dead coral with algae	1.6	7.25	353.1	3.28	Dead coral with algae	0	6.9	
SUBTOTAL non-living	**68.3**	**71.4**	**4.6**	**24.02**	**SUBTOTAL non-living**	**36.9**	**64.3**	**74.3**
Living:					**Living:**			
Hard coral:					**Hard coral:**			
Branching	~	13.08		17.46	Branching	~	18.4	
Massive	~	6.75		9.02	Massive	~	7.9	
Flat/Encrusting	~	4.42		4.28	Flat/Encrusting	~	1.3	
Foliose/Cup	~	1.17		0.44	Foliose/Cup	~	3.0	
Subtotal hard coral	**27.5**	**25.42**	**-7.6**	**31.20**	**Subtotal hard coral**	**27.4**	**30.7**	**11.9**
Soft coral	0.9	0.42	-53.7	2.23	**Soft coral**	1.1	1.6	43.9
SUBTOTAL corals	**28.4**	**25.83**	**-9.0**	**33.44**	**SUBTOTAL corals**	**28.5**	**32.3**	**13.2**
Others:					**Others:**			
Sponges	0	0.42		0.46	Sponges	0	0.2	
Other Animals	0	0.67		0.56	Other Animals	12.9	0.4	-96.7
Algae	3.3	**1.67**	**-49.5**	**41.26**	**Algae**	0	2.8	
Turf Algae	3.3	0.92	-72.2	2.90	Turf Algae	0	0.4	
Fleshy Algae	0	0.58		38.36	Fleshy Algae	0	2.4	
Coraline Algae	0	0.17		0	Coraline Algae	0	0.0	
Seagrass	0	0.00		0	Seagrass	21.8	0.0	-100.0
SUBTOTAL others	**3.3**	**2.75**	**-16.7**	**42.28**	**SUBTOTAL others**	**34.7**	**3.4**	**-90.1**
GRAND TOTAL	**100**	**100**		**100**	**GRAND TOTAL**	**100**	**100**	
Other relevant information					**Other relevant information**			
Slope (degrees)	~	~		~	Slope (degrees)	~	~	
Topography* (m)	~	~		~	Topography* (m)	~	~	
Depth range/average (m)	7.-8m	7		7.-8m	Depth range/average (m)	7.-8m	7.-8m	
Visibility (m)	~	~		~	Visibility (m)	~	16	
Sample size (Transects)	~	~		-	Sample size (Transects)	-	3	
* Mean distance between lowest and highest point on the horizontal transect line					* Mean distance between lowest and highest point on the horizontal transect line			
∞ Data not included in grand total (S26)					∞ Data not included in grand total (S26)			
~ No data					~ No data			

Table A11. Changes in substrate composition (mean ± SE%) in Minalulan MPA and its adjacent fished reef (labeled as "Non-Sanctuary") in 2025.

TYPE OF SUBSTRATUM	Sanctuary		Non-Sanctuary
	SCUBA	SNORKEL	SCUBA
	2025	2025	2025
Non-living:			
Sand and silt	20.5	21.42	51.8
Coral rubble	39	4.64	8.2
Rock and block	2.75	12.58	0.7
White dead standing	0	3.92	0.0
Dead coral with algae	12	7.61	4.3
SUBTOTAL non-living	**74.25**	**50.17**	**65.0**
Living:			
Hard coral:			
Branching	5	11.33	3.3
Massive	4.25	9.75	0.7
Flat/Encrusting	5	3.50	1.0
Foliose/Cup	0.75	1.08	0.5
Subtotal hard coral	**15**	**25.67**	**5.5**
Soft coral	7.5	5.80	0.8
SUBTOTAL corals	**22.5**	**31.47**	**6.3**
Others:			
Sponges	0	0.39	0.0
Other Animals	0	0.28	0.5
Algae	3.25	17.70	28.2
Turf Algae	0	1.75	0.0
Fleshy Algae	3.25	15.95	28.2
Coraline Algae	0	0.00	0.0
Seagrass	0	0.00	0.0
SUBTOTAL others	**3.25**	**18.36**	**28.7**
GRAND TOTAL	**100**	**100**	**100**
Other relevant information			
Slope (degrees)	~	~	~
Topography* (m)	~	~	~
Depth range/average (m)	7.-8m	7.-8m	7.-8m
Visibility (m)	~	~	16
Sample size (Transects)	~	-	3
* Mean distance between lowest and highest point on the horizontal transect line			
∞ Data not included in grand total (S26)			
~ No data			

Table A12. Changes in substrate composition (mean ± SE%) in Caticugan MPA and its adjacent fished reef (labeled as “Non-Sanctuary”) from 2002 to 2025.

TYPE OF SUBSTRATUM	Sanctuary														
	SCUBA										SNORKEL				
	2002	2005	2006	2007	2008	2009	2017	2022	2025	% Change 2022-2025	2002	2009	2017	2025	% Change 2017-2025
Non-living:															
Sand and silt	50.3	55	41	39.2	47.2	55.4	54.2	54.84	51.33	-6.4	15.8	28.6	22.3	11.0	-50.9
Coral rubble	11.3	8	7	15.1	1.7	12.9	12.1	11.38	6.75	-40.7	4.3	30.4	6.11	2.9	-52.5
Rock and block	7.3	6	0.7	5.4	0	4.6	7.3	0	2.67		27.9	1.4	30.39	10.3	-66.3
White dead standing coral	0.1	0.8	5	0.5	0	1.7	0.3	0.7	0.17	-76.2	0	0.3	2.58	1.1	-57.0
Dead coral with algae	4.6	18.3	4.9	5.5	19.9	5	7.4	10.76	6.42	-40.4	2.8	0.9	4.39	6.8	55.6
SUBTOTAL non-living	**73.6**	**88.1**	**58.6**	**65.7**	**68.8**	**79.6**	**81.3**	**77.68**	**67.33**	**-13.3**	**50.8**	**61.6**	**65.77**	**32.0**	**-51.3**
Living:															
Hard coral:															
Branching	9	1.7	15	15.2	10.8	6.9	3	3.58	7.75	116.5	3.8	7.6	11.03	14.87	34.8
Massive	5.2	5.7	11.6	11	17.2	3.9	6.8	7.72	9.67	25.2	5.7	9.1	8.22	13.12	59.6
Flat/Encrusting	0.4	0	4.2	1.3	0.3	2.6	0.6	0.42	3.92	832.5	0.4	0.3	2.03	4.96	144.5
Foliose/Cup	0.4	0	0.3	0.5	0.5	0.7	3.1	2.4	3.08	28.5	0.2	2.6	0	0.51	
Subtotal hard coral	**15**	**7.4**	**31.1**	**28**	**28.8**	**14.1**	**13.5**	**14.12**	**24.42**	**72.9**	**10.1**	**19.6**	**21.28**	**33.47**	**57.3**
Soft coral	**2.1**	3.1	1.2	1.9	2.3	1.9	1.9	1.66	3.83	130.9	26.8	17.6	7.94	20.18	154.1
SUBTOTAL corals	**17.1**	**10.5**	**32.3**	**29.9**	**31.1**	**16**	**15.4**	**15.78**	**28.25**	**79.0**	**36.9**	**37.2**	**29.22**	**53.65**	**83.6**
Others:															
Sponges	0.4	0.5	3.3	0.2	0.5	0.1	0.1	0.14	0.42	197.6	0.2	0	0	1.72	
Other Animals	0	0	1.3	0.7	0	0.3	0.7	2.61	0.25	-90.4	0	0	0.11	0.69	531.5
Algae	**1.1**	**0.3**	**0.2**	**0.3**	**0**	**0.2**	**1.9**	**3.26**	**1.75**	-46.3	**10.2**	**1**	**1.11**	**1.49**	34.2
Turf Algae	0.3	-	-	-	-	0.1	0.3	0.77	1.17	51.5	0.8	0	0.11	0.64	482.5
Fleshy Algae	0.8	-	-	-	-	0.1	1.2	0	0.50		8.7	1	0.33	0.36	9.8
Coraline Algae	0	-	-	-	-	0	0.4	2.49	0.08	-96.7	0.7	0	0.67	0.49	-27.3
Seagrass	7.9	0.5	4.3	0	0.7	3.9	0.6	0.49	2.00	308.2	2	0.1	3.78	10.40	175.1
SUBTOTAL others	**9.4**	**1.3**	**9.1**	**1.2**	**1.2**	**4.5**	**3.3**	**6.5**	**4.42**	**-32.1**	**12.4**	**1.1**	**5**	**14.30**	**186.0**
GRAND TOTAL	**100**	**100**	**100**	**97**	**101**	**100**	**100**	**100**	**100**		**100**	**100**	**100**	**100**	
Other relevant information															
Slope (degrees)	10.4	-	-	-	-	16	~	-	~		~	~	5.7		
Topography* (m)	1.4	-	-	-	-	3.3	~	-	~		1.5	0.8	0		
Depth range/average (m)	7	7-8 m	7-8 m	7-8 m	7-8 m	7.3	6.4	7	8		3.8	2.6	2.9	3.5	
Visibility (m)	13.9	-	19	14.9	13.2	14.8	14.8	15	16		~	19.9	16.3	15	
Sample size (Transects)	16	3	3	3	3	7	5	3	6		11	11	10	13	

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

∞ Data not included in grand total (S26)

~ No data

TYPE OF SUBSTRATUM	Non-Sanctuary							
	SCUBA							
	2005	2006	2007	2008	2009	2017	2022	% Change 2017-2022
Non-living:								
Sand and silt	34.2	47.6	23.7	18.2	59.9	47.75	40.78	-14.6
Coral rubble	8.8	2.1	5.8	17.4	8.4	8	7.18	-10.3
Rock and block	1.2	5.8	0.3	3	4.6	6	0	-100.0
White dead standing coral	2.3	0.7	0.2	3	0.5	0.25	0	-100.0
Dead coral with algae	1.7	0.1	8.6	3.9	4.1	5	18.57	271.4
SUBTOTAL non-living	**48.2**	**56.3**	**38.6**	**45.5**	**77.5**	**67**	**66.53**	**-0.7**
Living:								
Hard coral:								
Branching	11.2	1.2	18.8	2	9.7	12.25	4.65	-62.0
Massive	3.5	2.8	2.6	5.6	4.8	11	8.65	-21.4
Flat/Encrusting	0.3	0.3	0.3	2.2	2.2	2.5	0.47	-81.2
Foliose/Cup	2.3	0	1	0	1.4	2.5	2.72	8.8
Subtotal hard coral	**17.3**	**4.3**	**22.7**	**9.8**	**18.1**	**28.25**	**16.49**	**-41.6**
Soft coral	0.5	5.7	3.9	1	0.8	0.5	2.73	446.0
SUBTOTAL corals	**17.8**	**10**	**26.6**	**10.8**	**18.9**	**28.75**	**19.22**	**-33.1**
Others:								
Sponges	0	0.2	0.3	0	0.4	0.1	0.34	240.0
Other Animals	0.3	0.6	0.3	0	0.2	0.7	3.53	404.3
Algae	0.8	6.2	0	0	0.7	1	10.32	932.0
Turf Algae	~	~	~	~	0	0	9.51	
Fleshy Algae	~	~	~	~	0.6	1	0	-100.0
Coraline Algae	~	~	~	~	0.1	0	0.81	
Seagrass	32.8	26.7	34.1	43.7	2.4	2.5	0.07	-97.2
SUBTOTAL others	**33.9**	**33.7**	**34.7**	**43.7**	**3.7**	**4.3**	**14.26**	**231.6**
GRAND TOTAL	**99.9**	**100**	**100**	**100**	**100**	**100**	**100**	
Other relevant information								
Slope (degrees)	~	~	~	0.7	8.3		12	
Topography* (m)	1	1	1	2.4	7		-	
Depth range/average (m)	6.7	7.5	7.5	5.4	7.1		8	
Visibility (m)	~	~	~	31.2	15		15	
Sample size (Transects)	4	4	3	6	9		3	

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

∞ Data not included in grand total (S26)

~ No data

Table A13. Current MEAT scores by MPA and required scores to reach the next threshold.

MPA Name	Current Category	Current Score (out of 84)	Score Needed to Advance
Cangmunag	Level 1 – Established	16	25
Lalag Bato	Level 1 – Established	24	25
Tubod	Level 2 – Strengthened	26	40
Minalulan	Level 3 – Sustained	41	62
Talayong	Level 3 – Sustained	48	62
Catulayan	Level 3 – Sustained	49	62
Paliton	Level 3 – Sustained	52	62
Maite	Level 4 – Institutionalized	65	82
Candaping B	Level 4 – Institutionalized	70	82
Olang	Level 4 – Institutionalized	76	82
Caticugan	Level 4 – Institutionalized	78	82

Table A14. Breakdown of MEAT rating system.

Category	Score Range
Level 1 – Established	0 – 24
Level 2 – Strengthened	25 – 39
Level 3 – Sustained	40 – 61
Level 4 – Institutionalized	62 – 84

DAY	DATE & SITE	TIME	ACTIVITIES
1	Saturday, May 3, 2025 Dumaguete City	10:00 AM	Rendezvous Coco Amigos Restaurant/ airport pick up by Coco Grove Van
		10:30	Proceed to Coco Amigos Restaurant for initial briefing; then Dumaguete pier for Siquijor after lunch
		11:30	Welcome and short briefing: Dr. Alan White, Mrs. Vangie White, and Resort Manager
	Travel to Cocogrove Resort in Siquijor Island	12:00 1:30 3:30	Lunch at Coco Amigos then proceed to Dumaguete Pier Boat Depart Dumaguete Pier for Siquijor Meet in dive shop and organize diving gear and make a practice snorkel and/or scuba dive at Cocogrove Resort house reef
		6:00	Continuation of Briefing by SPR Team Substrate: Dionel Fish Visual Census: Agnes Slide show on Butterflyfish/discussion: Allison
		7:00	Dinner Finish introduction on SPR Project and address questions on methods used and other matters (Alan, staff and all participants) Slide show, SPR 2017 (AJ, Database Specialist) , CCEF Projects Presentation (ED)
2	Sunday, May 4, 2025	7:00 AM	Breakfast
		8:00	Briefing (Review procedures and site description, Agnes)
	Catulayan Marine Sanctuary, San Juan	9:00	Reef surveys using 50 m transects (inside and outside): substrate and fish, Snorkeling Survey
		12:00 PM	Lunch on boat
	Tubod Marine Sanctuary, San Juan	1:30	Site briefing Reef surveys using 50 m transects (inside and outside): substrate and fish, Snorkeling Survey
		5:00 7:00	Compile data and submit data electronically Dinner
3	Monday, May 5, 2025	7:00 AM	Breakfast
	Coco grove to Olang Maria	8:00	Boat Travel (1 ½ hrs)
	Olang Marine Sanctuary, Maria	10:00	Morning dive briefing (Agnes and Dionel) Reef surveys using 50 m transects (inside and outside): substrate and fish
		12:00	Lunch on boat
	Olang Marine Sanctuary, Maria	2:00	Snorkeling Survey
		5:00	Compile and submit completed data
	Tubod Marine Sanctuary	*6:00*	*Optional Night Dive*
		7:00	Dinner
4	Tuesday, May 6, 2025	7:00 AM	Breakfast
	Coco Grove to Candaping B	8:00	Morning briefing (Dionel and Agnes)
	Candaping B Marine Sanctuary, Maria	9:30	Reef surveys using 50 m transects (inside and outside): substrate and fish
		12:00 PM	Lunch on boat
	Candaping B Marine Sanctuary, Maria	2:00	Snorkeling Survey

Figure 21a. Itinerary of the 2025 May SPR expedition.

DAY	DATE & SITE	TIME	ACTIVITIES
		5:00	Compile and submit completed data
	Tubod Marine Sanctuary	*6:00*	*Optional Night Dive*
		7:00	Dinner *Provincial Agriculturist: Evangeline J. Baroy* *Provincial CRM Officer: Darrell Pasco* *MAO San Juan:Sara Jumawan* *MAO Lazi: Alreich Duran* *MA Maria: Danilo Casalta* *MA: Joseph Marijess Donde*
5	Wednesday, May 7, 2025	7:00 AM	Breakfast
	Coco Grove to Minalulan	8:00	Morning briefing (Dionel and Agnes)
	Minalulan Marine Sanctuary, Maria	9:00	Reef surveys using 50 m transects (inside and outside): substrate and fish, Snorkeling Survey
		12:00 PM	Lunch on boat
	Napayong Marine Sanctuary, Lazi	1:30	Reef surveys using 50 m transects (inside and outside): substrate and fish, Snorkeling Survey
		5:00	Compile and submit completed data forms
		7:00	Dinner
6	Thursday, May 8, 2025	7:00 AM	Breakfast
	Coco Grove to Cangmunag	8:00	Morning briefing (Dionel and Agnes)
	Lalag Bato Marine Sanctuary, Lazi	9:00	Reef surveys using 50 m transects: substrate and fish, Snorkeling Survey
		12:00 PM	Lunch on boat
	Cangmunag Marine Sanctuary, San Juan	1:30 PM	Reef surveys using 50 m transects (inside and outside): substrate and fishSnorkeling Survey
		5:00	Compile and submit completed data forms
		7:00	Dinner
7	Friday, May 9, 2025	7:00 AM	Breakfast
	Caticugan Marine Sanctuary, Siquijor	8:00	Morning briefing (Dionel and Agnes) Reef surveys using 50 m transects: substrate and fish, inside & outside (scuba and snorkel)
		12:00	Lunch on beach
	Paliton Marine Sanctuary, San Juan	2:00	Reef surveys using 50 m transects: substrate and fish, Snorkeling Survey
		5:00	Compile and submit completed data forms
		7:00	Dinner with Siquijor Island Guests
8	Saturday, May 10, 2025	7:00 AM	Breakfast
	Maite Marine Sanctuary, San Juan	8:00	Morning briefing (Dionel and Agnes) Reef surveys using 50 m transects: substrate and fish, Snorkeling Survey
		12:00 PM	Lunch
		2:00 5:00	Compile and submit completed data Photo contest and photo sharing
		7:00	Dinner
9	Sunday, May 11, 2025	7:00 AM	Breakfast Closing Summary (Alan/Vangie/CCEF Team)
	Travel back to Dumaguete	12 Noon	Lunch; Depart Coco Grove for Dumaguete airport (except for those staff who are going via Ocean jet to Cebu)

Figure 21b. Continued itinerary of the 2025 May SPR expedition.

	Name/Address	Contact numbers/fax/email	Profession/Affiliations/Interests
1	**Dr. Alan T. White** Principal Investigator 322 Aoloa St. #412 Kailua, HI 96734 U.S.A.	+1 808-262-1091 Alanwhite1@hawaiiantel.net	Marine Scientist Consultant Tetra Tech, Inc. President Coastal Conservation and Education Foundation, Inc. (CCEF)
2	**Dionel Molina** Co-Principal Investigator Naawan, Misamis Oriental	+63 906 880 3721 d.l.molina@coast.ph	Coral Reef Rehabilitation & Monitoring Specialist Coastal Conservation and Education Foundation, Inc. (CCEF)
3	**Evangeline White** SPR Project Manager 322 Aoloa St. #412 Kailua HI 96734 USA	+808-489-2460 (mobile) vangiewhite@hawaiiantel.net	Aquatics Manager YWCA Oahu Hawaii CCEF Co-founder
4	**Dr. Alison Green** SPR Fish Counter Unit 701, 3544 Main Beach Parade, Main Beach. Qld. Australia 4217	+61 408 720 493	Consultant Alison Green Marine
5	**Agnes Sabonsolin** Documenter/Photo & Video Zone 2, Fidel Bas St. Mohon, Talisay City, Cebu Philippines	+ 63 916 2877 476 ac.sabonsolin@gmail.com	Marine Biologist - Consultant Cebu Diver City Geotech Solutions, Inc. SSI Master Diver Underwater Photographer
6	**Al Jiereil M. Lozada** Data and Technical Manager #31 Virgo St., Guadalupe Osmena Village, Punta Princesa, Cebu City	+ 63 927 829 8309 a.m.lozada@coast.ph	IT & DB Administrator Coastal Conservation and Education Foundation, Inc. (CCEF)
7	**Pablita Toyong** Block 1 Lot 18-E, Jade St, Hiddenview Subd. Bacayan, Cebu City	0917-3224160 p.t.huerbana@coast.ph	CCEF Admin Assistant/Disbursement Office Coastal Conservation and Education Foundation, Inc. (CCEF)
8	**Nicholson Tan** Fish Counter 86-B T. Padilla St., Cebu City	0926 623 3110 n.d.tan@coast.ph	Ecosystems Research & Monitoring Specialist Coastal Conservation and Education Foundation, Inc. (CCEF) PADI Dive Master
9	**Rachel Davis** Bloq Residences Talamban, 9W9C+EC7, Cebu City	+63 962 553 0269 r.m.davis@coast.ph	US Peace Corps Coastal Conservation and Education Foundation, Inc. (CCEF)

Figure 22a. List of May 2025 SPR expedition staff.

	Name/Address	Profession/Affiliations/Interests
1	**Vittoria Thornley** Kemble Mill, Somerford Keynes, Cirencester, Glos. GL7 6ED, U.K.	My 23rd Saving Philippine Reefs Expedition BA (Hons) Human Sciences (Oxon). MSc Ecology (Univ. of Bristol). Advanced PADI Open Water. Office Manager, Thornley Kelham Ltd. Conservation volunteer; interest in nature conservation, horticulture, classic cars; travel writing and yoga.
2	**Sheree Marris** 61 Foam Street, Rosebud VIC Australia 3939	Aquatic Scientist/Environmental communicator. Board Member of UNICO Conservation Foundation
3	**Roland Thomas** 9 Jersey St Balwyn 3103 Victoria, Australia	Executive in Residence/Business Mentor Consultant Board Member, Coastal Conservation and Education Foundation, Inc.
4	**Mark Hillebrand** 2 Ellinis Mews PORT Melbourne 3297 Australia	Strategic Management & Marketing Consultant. Augmented Reality; Private Pilot; Snow skiing and sailing.
5	**Dr. Graham Edgar** 60 Napoleon St. Battery Point Tas 7004 Australia	Professor, biologist.
6	**Julia Cichowski** 41 Gray Street, Boston, MA 02116 U.S.A.	Co-Founder, changeUp Global, LLC – Innovation consultancy Oceanic Research Group – a US based non-profit producing marine based educational media including YouTube series Jonathan Bird's Blue World (BlueWorldTV.com), and giant screen films including Ancient Caves and Secrets of the Sea
7	**Thomas Matula** Panglao Residences Purok 1 Sitio Regla Libaong Panglao 6340 Bohol Philippines	Retired Navy.
8	**Dia Besida-Matula** Panglao Residences Purok 1 Sitio Regla Libaong Panglao 6340 Bohol Philippines	
9	**Mark Copley** 5 Normandy Circle, Colorado Springs, CO 80906 USA	Engineer

Figure 22b. List of May 2025 SPR expedition volunteers.

Figure 23. Divemaster Elvis reeling in transect at Talayong MPA in Lazi, Siquijor.

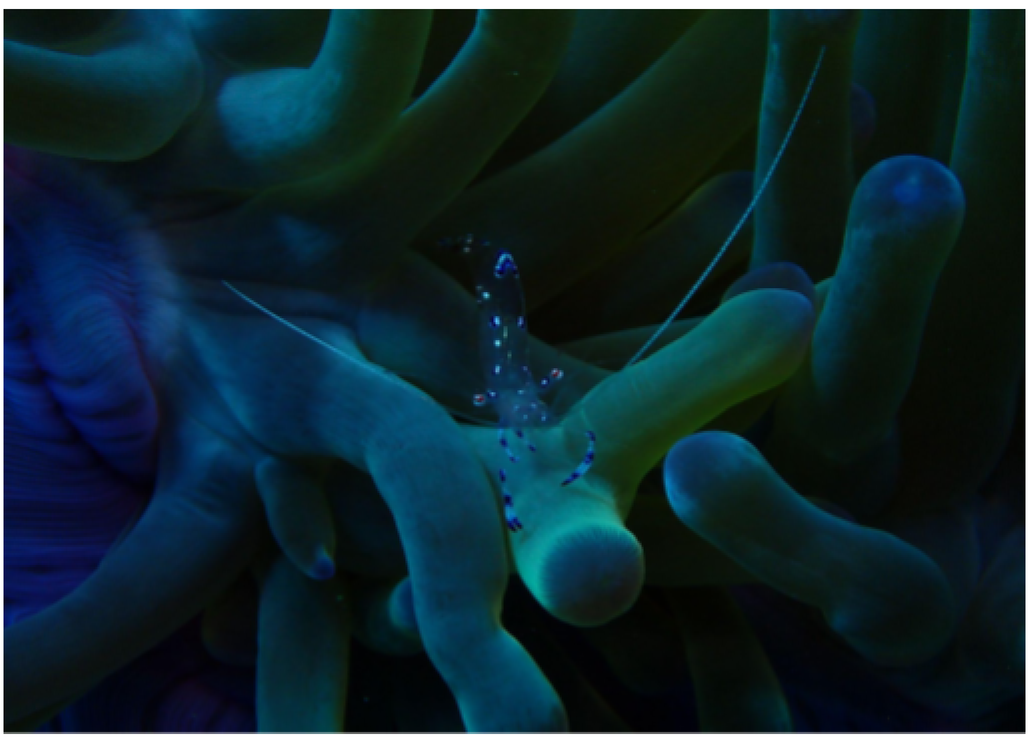

Figure 24. Winning photo of annual SPR contest, “Glass Shrimp” by Mark H.

Figure 25. Bantay dagat members and local Coast Guard actively monitoring the east boundary of Olang MPA in Maria, Siquijor.

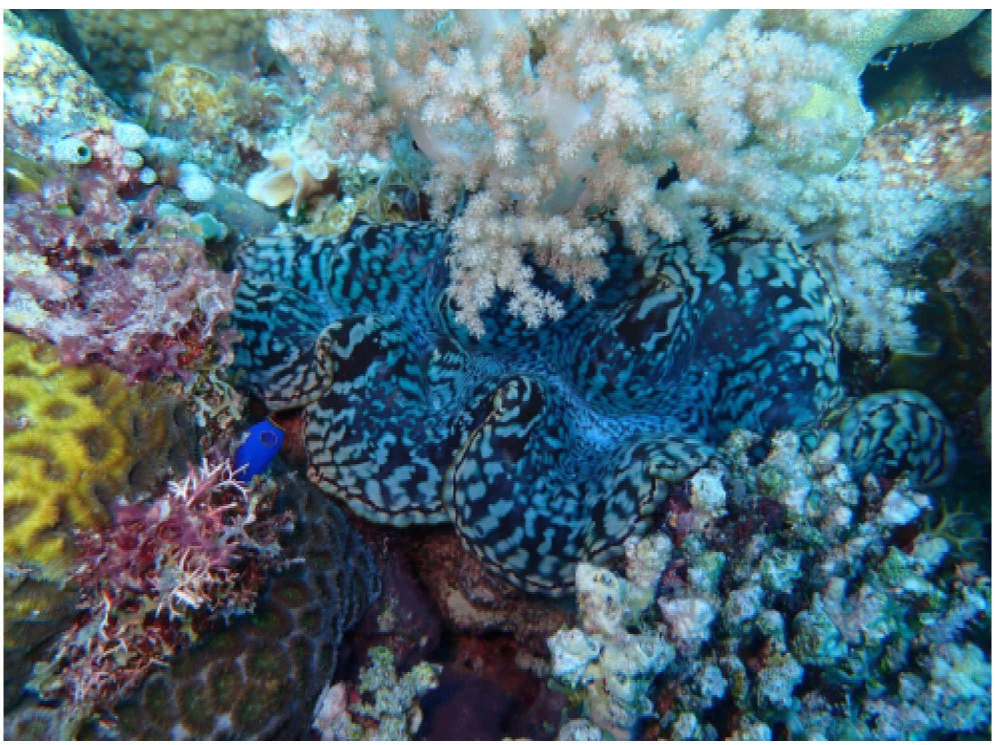

Figure 26. Giant clam, *Tridacna* sp. near the transect at Catulayan MPA in San Juan, Siquijor.

Figure 27. The SPR team processing data at Coco Grove Beach Resort after a long day of diving.

Figure 28. Aerial shot of the *Coco Adventurer* after a morning dive at Lalag Bato MPA in Lazi, Siquijor.

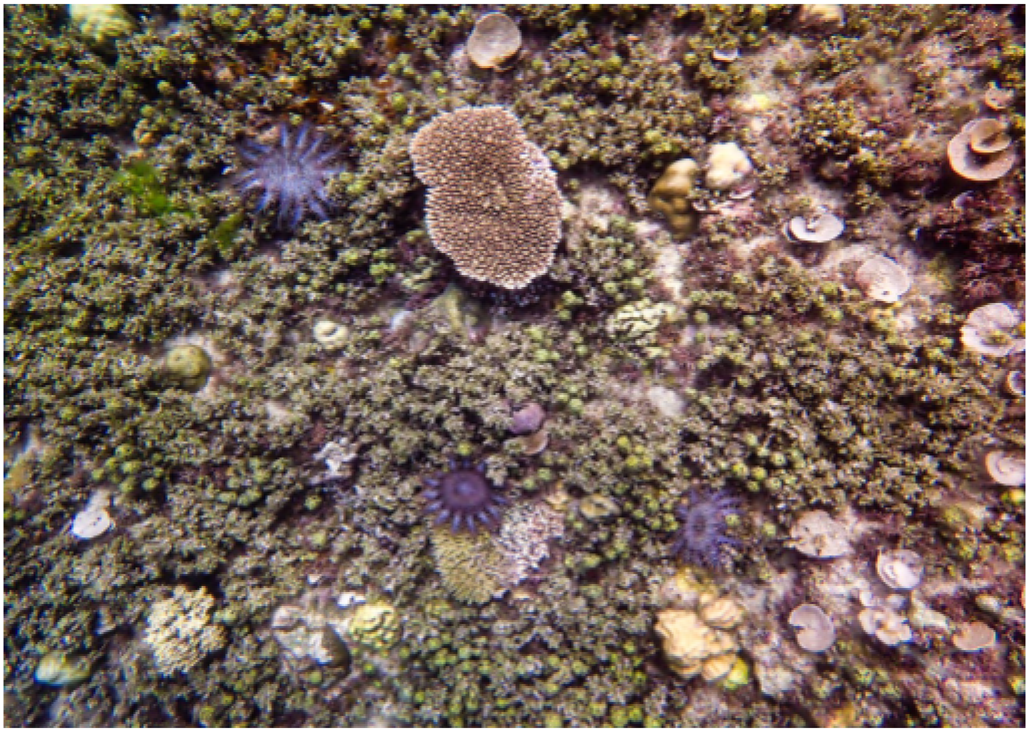

Figure 29. Crown of thorns, *Acanthaster planci*, outbreak at the west boundary of Olang MPA in Maria, Siquijor.

Figure 30. CCEF board member, Roland Thomas, gathering benthic data at Catulayan MPA in San Juan, Siquijor.

Figure 31. Members of SPR team upon arrival at the port of Siquijor.

Figure 32. CCEF administrative staff member, Pablita Toyong-Huerbana, gathering invertebrate data at the south boundary of Candaping B MPA in Maria, Siquijor.

Figure 33. Members of the SPR team board the *Coco Adventurer* on the first day of diving in San Juan, Siquijor.

Figure 34. Group picture at Coco Grove Beach Resort, featuring the 2025 SPR T-shirts.