SUMMARY FIELD REPORT
SAVING PHILIPPINE REEFS

BOHOL

A joint project of the
COASTAL CONSERVATION AND EDUCATION FOUNDATION, INC.
UNICO CONSERVATION FOUNDATION, INC.
And with the participation and support of the
EXPEDITION VOLUNTEERS

APRIL 30-MAY 7, 2023

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Citation: White, A.T., Agnes Sabonsolin-Bautista, Dionel Molina, Roxie Diaz, Danilo Delizo Jr., and A.J. Lozada, 2023. Summary Field Report for Saving Philippine Reefs 2023 Coral Reef Monitoring Expedition to Province of Bohol, Philippines, January, 2024 . The Coastal Conservation and Education Foundation, Inc., Cebu City, 89p.

Cover photo (front): A green sea turtle “flying” over the expedition team; winner of “Best Underwater Photo” during the 2023 SPR expedition. Photo by: Julia Cichowsky

Cover photo (back): Juvenile golden damselfishes take refuge within a vibrant sea fan; winner of “Best Fish” during the 2023 SPR expedition. Photo by: Alastair Pennycook

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List of Acronyms and Abbreviations

BPEMO	Bohol Provincial Environment Management Office
BFAR	Bureau of Fisheries and Aquatic Resources
BIDEF	Bohol Integrated Development Foundation
BIUPOP	Balicasag Island United People's Organization for Progress
BMT Project	Biodiversity Conservation and Management of the Bohol Marine Triangle Project
CCEF	Coastal Conservation and Education Foundation, Inc.
DA	Department of Agriculture
DENR	Department of Environment and Natural Resources
FARMC	Fisheries and Aquatic Resource Management Council
FPE	Foundation for the Philippine Environment
MCDP	Marine Conservation and Development Project
MPA	marine protected area
SU	Silliman University
BIFA	Bil-isan Fishermen Association
BIDR	Balicasag Island Dive Resorts
BMT	Bohol Marine Triangle
CESO	Canadian Executive Service Organization
CRM	coastal resource management
DOT	Department of Tourism
DPFA	Doljo-Panglao Fishermen's Association
ELAC	Environmental Legal Assistance Center
FISH Project	Fisheries Improved for Sustainable Harvest Project
PACAP	Philippine Australian Community Assistance Program
PADAYON	Panglao, Dauis and Baclayon Project (formerly BMT Project)
SISO	San Isidro Fisherfolk Organization
SPR	Saving Philippine Reefs
SUML	Silliman University Marine Laboratory
WWF	World Wide Fund for Nature

ABSTRACT

This report contains the results of the 2023 Saving Philippine Reefs research expedition conducted at seven (7) marine sanctuaries in Bohol, Philippines: Pamilacan Island Fish Sanctuary, San Isidro-Dao Marine Sanctuary, Balicasag Island Marine Sanctuary, Bil-isan Marine Sanctuary, Bolod, Marine Sanctuary, Doljo Marine Sanctuary, and Tawala Marine Sanctuary. In addition, the results of surveys conducted from 1985 to 2023 that have assessed the management, coral abundance, and reef fish trends at each site are included herein.

Pamilacan Island Fish Sanctuary, established in 1985, shows a sustained management effort by the Pamilacan Fishermen's Association. The coral abundance has shown an increasing trend from 1984 to 2023, with the reefs in fair condition (>25% living coral cover). While fish densities decreased, biomass increased, especially in target fish species indicating that the fish sanctuary has been enforced.

San Isidro-Dao Marine Sanctuary, established in 2002, initially faced challenges in fish density but improved its management to an "established phase" by 2007. However, the 2023 survey observed a decline in coral cover and fish populations, suggesting management issues. This site was also impacted by the typhoon of 2021 that severely damaged reefs with windward exposure.

Balicasag Island Marine Sanctuary, established in 1986, faced challenges in management commitment by 2007. The 2023 survey revealed damage to the shallow reef flat caused by Typhoon Odette in 2021. Live hard coral cover decreased, with an increase in dead coral with algae. Fish biomass inside the sanctuary increased, but the overall trend in fish populations declined.

Bil-isan Marine Sanctuary, established in 1998, exhibited positive trends in coral growth from 1999 to 2023, with strict enforcement contributing to live hard coral cover increases as well as the reef being situated on the leeward side of Panglao Island and thus not directly affected by the typhoon of 2021. Fish densities and biomass increased over the years, showcasing effective management.

Bolod Marine Sanctuary, established in 1998, showed a decline in branching corals and live hard coral cover from 2007 to 2023 since this reef was also exposed to the recent typhoon waves. Despite fluctuations, target fish biomass increased, suggesting some recovery and enforcement of the no-fishing regulation in the marine sanctuary.

Doljo Marine Sanctuary, established in 1986 and maintained since 1998, demonstrated consistent live hard coral cover improvements, effective management, and positive fish population trends, despite a slight decrease from 2007. Doljo also benefited from being on the leeward side of Panglao and thus not directly impacted by the typhoon of 2021.

Tawala Marine Sanctuary, established in 1998, showed a decline in live hard coral cover from 2007 to 2023, with a significant decrease in branching corals being directly affected by the 2021 typhoon. Fish biomass and density also decreased, emphasizing the need for improved management.

Overall, the findings highlight the complex interactions between management practices, environmental factors, storm events and the status of coral reefs and fish populations in Bohol's marine sanctuaries. Effective management, community engagement, and adaptive strategies are crucial for the conservation and sustainability of these ecosystems.

ACKNOWLEDGEMENTS

This Saving Philippine Reefs Expedition and its outcome are credited to the 12 volunteers (see Appendix 2) from Australia, United Kingdom, and the United States who dedicated their time and funding to the research work. Equally important are the Coastal Conservation and Education Foundation staff, partners, and volunteers (see Appendix 3) who prepared for the trip, worked long hours and have all done their part in the overall successful completion of the Expedition.

Bohol Beach Club (BBC), in Panglao, Bohol and its resort manager, Mr. Alan Santos, and the BBC Staff are thanked for being committed to the needs of the expedition team and providing excellent service, accommodations, food and diving services and assistance with traditional Filipino hospitality.

Our guests from Bohol LGUs made our presence even more welcome and gave us a chance to share our views and initiatives on reef conservation: Engr. Paquito D. Melicor, Jr. CESO IV, Regional Executive Director of DENR, Bohol Vice Governor Hon. Dionisio A. Balite, Ph. and staff Maria Villa I. Pelindingue CRM Division Head of Bohol Provincial Environment Management Office (BPEMO), and Mr. Rojeine L. Sedillo- Municipal Agriculturist, Panglao.

The CCEF Foundation returned to Bohol for this expedition due to the enthusiasm and support of the Bohol Provincial Environmental Management Office as well as the local municipal government support for the management and improvement of their marine protected areas. We also thank the coastal communities who directly protect their marine sanctuaries and allowed us to conduct surveys in their regulated areas.

The final production of this report has been accomplished by Agnes Sabonsolin, consultant for CCE Foundation, and Dionel Molina, CCEF Staff. Finally, any unpopular opinions or remaining errors are assumed by the authors.

Alan T. White

Principal Investigator

INTRODUCTION

The Saving Philippine Reefs (SPR) Project was initiated in the 1980's and is a research project intended to improve the quality and quantity of information available on coral reefs for use in improving management and creation of appropriate policies for conservation and sustainable use of resources. SPR expanded through collaboration with the Earthwatch Institute and eventually taken over by the Coastal Conservation and Education (CCE) Foundation, Inc of Cebu as its prime organizer. SPR depends on the support of regular volunteers and donors from Australia, United Kingdom and the United States working together with the staff of the CCE Foundation with overall guidance from Evangeline and Alan White.

Management History of Bohol Marine Triangle, Philippines

One of SPR's sites is Bohol (Figure 1), which in recent years has gained acknowledgement as an important marine heritage site, harboring sea turtles, manta rays, sting rays, seahorses, giant clams, and a variety of mollusks (BMT 2001, Christie, et al., 2002). The area is frequented by important pelagic fish and whale sharks and is the migratory route for whales and dolphins. The area ranks among the top 10 dive sites in the country with beautiful white-sand beaches and diverse reefs. This area is also a traditional fishing ground for locals and fishers from neighboring provinces.

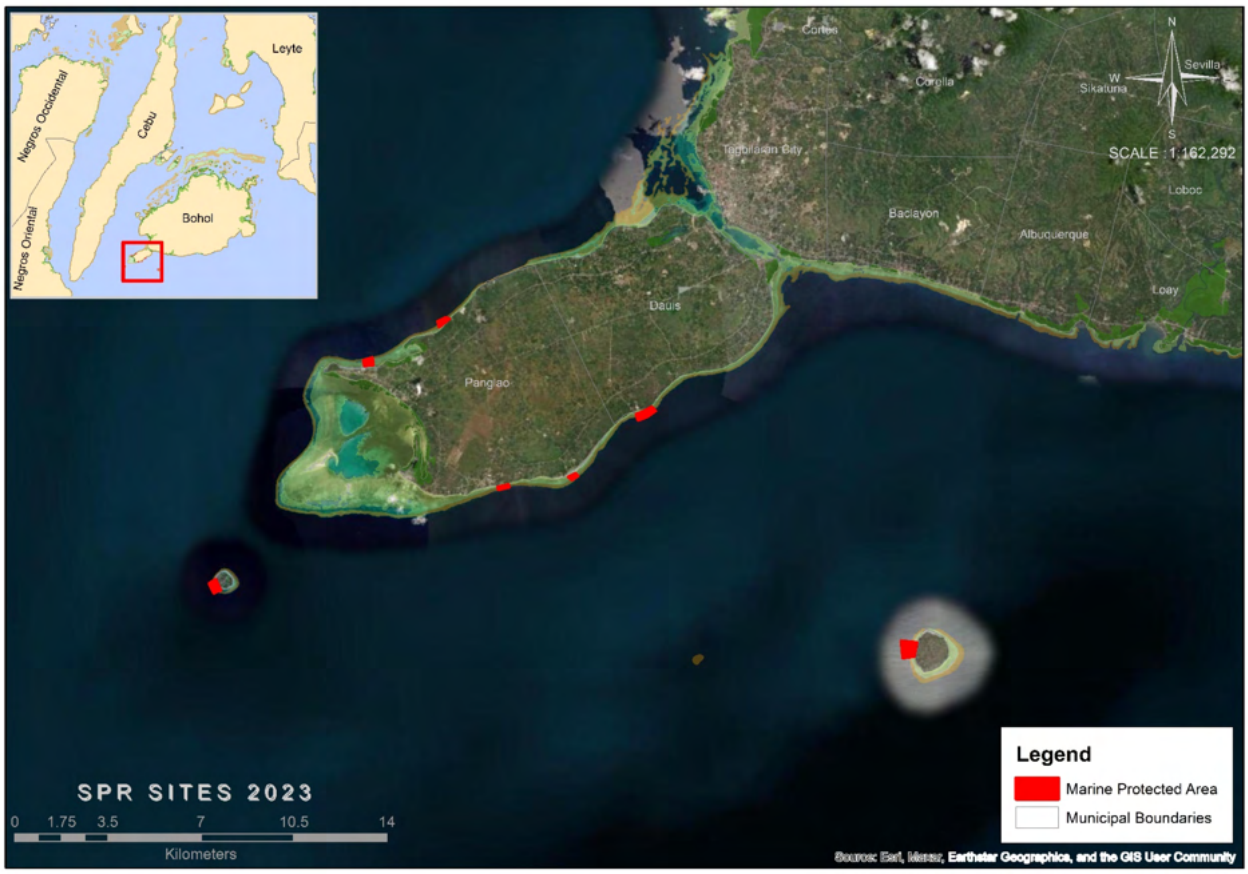

Figure 1. Saving Philippine Reefs Expedition (2023) survey sites, Bohol, Central Philippines.

In 1978, Balicasag Island (Panglao, Bohol) was surveyed and recommended for national marine park status, but was never declared as one. In 1985, baseline reef assessments were conducted in Balicasag and Pamilacan Islands (Baclayon, Bohol) by researchers from Silliman University through its Marine Conservation Development Program (MCDP). A year later, marine sanctuaries were established in Balicasag and Pamilacan Islands through community participation and support from the local government (MCDP, 1986).

The SPR Project, through the support of Earthwatch Institute and in collaboration with the Silliman University conducted a reef monitoring expedition in 1999 in the same area. SPR conducted a follow-up survey in 2003 in collaboration with the Bohol Marine Triangle Conservation Project and then another SPR survey in 2007 that collected the last set of monitoring data prior to the current SPR of 2023 summarized in this report.

This Expedition – 2023

This SPR Expedition 2023 conducted in Bohol involved a team of 12 volunteers and eight staff. The team surveyed seven marine sanctuaries from April 30 to May 7, 2023. Locations of all study sites are shown in Figure 1 and on separate maps (Figures 3 to 8). The expedition itinerary is shown in Appendix 1. The team resided at the Bohol Beach Club (BBC) Resort in Bolod, Panglao Island. Bohol Beach Club provided excellent service and an enjoyable and worry-free experience for the expedition team (Figure 2).

Figure 2. The SPR Dive Expedition Team 2023. (Left to Right) Tom Matula, Dionel Molina, Agnes Sabonsolin, Auburn Samson, AJ Lozada, Pablita Huerbana, Mariz Calumpang, Mark Copley, Alan White, Roxie Diaz (back), Vittoria Thornley, Simon Thornley, Dominique Estival, Alastair Pennycook, Roland Thomas, Danilo Delizo Jr., Mark Hillebrand, Julia Cichowski. (Front; left to right) Sheree Marris, Evangeline White.

Data Collected and Methods

Study Site:

Baclayon Municipality

1. Pamilacan Marine Sanctuary

Dauis Municipality

1. San Isidro-Dao Marine Sanctuary

Panglao Municipality

1. Balicasag Marine Sanctuary
2. Bil-isan Marine Sanctuary
3. Bolod Marine Sanctuary
4. Doljo Marine Sanctuary
5. Tawala Marine Sanctuary

Substrate Cover. Systematic snorkeling surveys were carried out in the shallow reef flat at 2–3 meters depth, covering 0.5–1 kilometer parallel to the reef crest. The substrate was evaluated within an estimated area of 1m^2 quadrat at every 50meter station. The following data was recorded:

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

Scuba surveys were carried out in the deep area (6–10m depth) parallel to the reef crest using a systematic point-intercept method. Transects were laid on sections of a reef flat, reef crest or slope. Substrate was evaluated at 25cm intervals along a 50m transect. Data gathered during scuba surveys were the same type as those collected during snorkel surveys.

Fish Estimates. Fish abundance and diversity were estimated using a 50 x 10m transect using an underwater visual census (UVC: n = 6) technique done by four specialists. Substrate transects were utilized during UVC. The abundance of target species, indicator species and numerically dominant and visually obvious were all counted. Biomass of target species was computed by converting estimated fish lengths to biomass using species-specific length to weight relationships from Fishbase.

Data Analysis

Coral and Fish Abundance. The classification for live hard corals (LHC) followed that of Gomez et al. 1994. Comparisons between years for both LHC percent cover and fish densities used one-way Analysis of Variance (1-ANOVA) or t-test whenever appropriate.

Table 1. Substrate cover condition categories (Gomez et al., 1994)

Poor	Fair	Good	Excellent
<25%	25%-49.9%	50%-74.9%	75%-100%

Fish Biomass. Fish biomass was computed using the formula: $W = a*L^b$ (Fishbase), where: W = weight of fish and a and b are species-specific constants. Biomass of target fish (commercially important food fish) species were computed on the species level and summed up per family: Epinephilinae (Serranidae), Lethrinidae, Lutjanidae, Acanthuridae, Caesionidae, Carangidae, Haemulidae, Nemipteridae, Mullidae, Scaridae, and Siganidae.

Figure 3. Location of survey sites in Pamilacan Island, Baclayon, Bohol.

Figure 4. Location of survey sites in Bolod Marine Sanctuary, Panglao, and San Isidro-Dao Marine Sanctuary, Dauis, Bohol.

Figure 5. Survey locations in Balicasag Island, Panglao, Bohol.

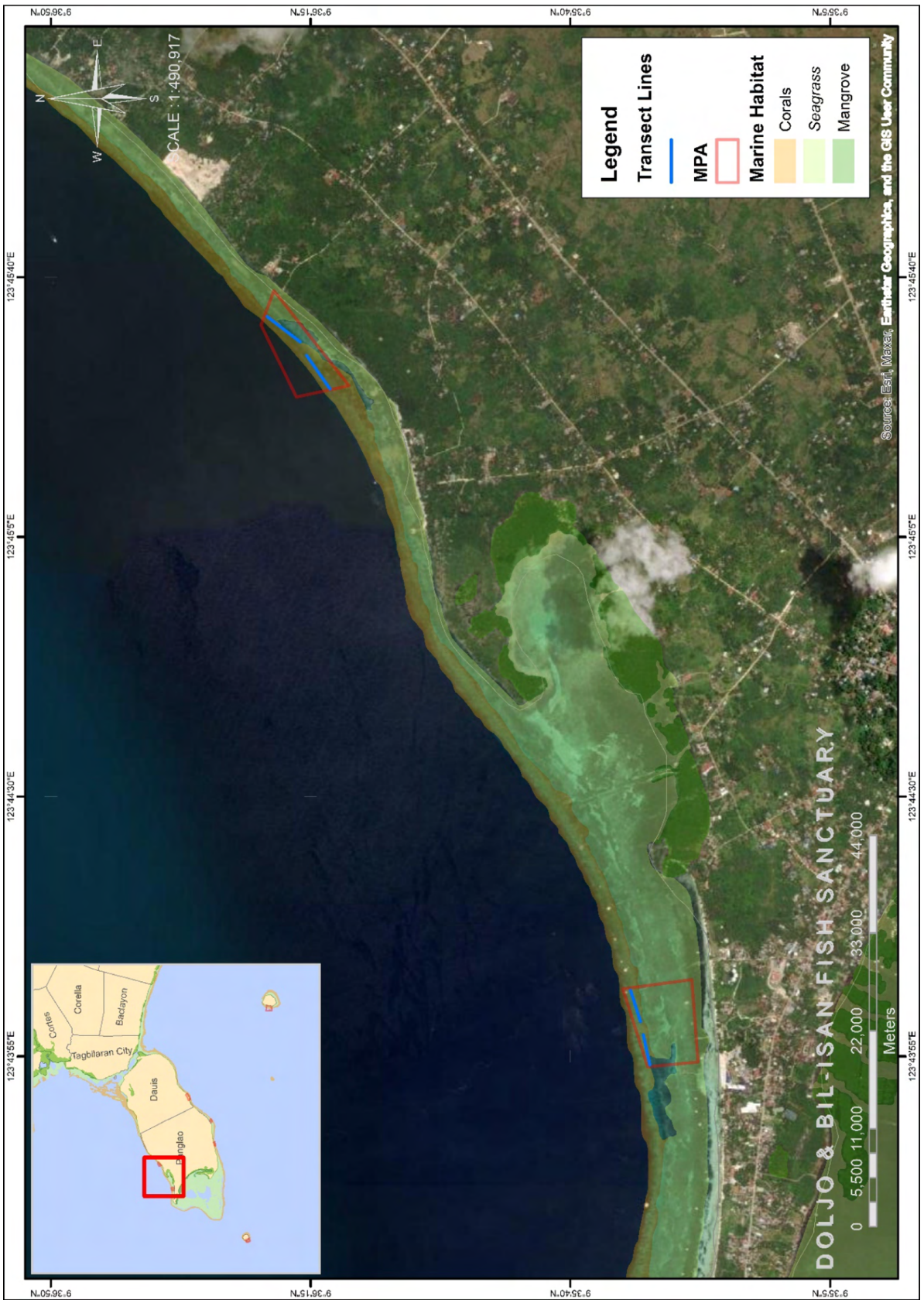

Figure 6. Location of survey sites at Doljo Marine Sanctuary and Bil-isan Marine Sanctuary, Panglao, Bohol.

Figure 7. Survey site at Tawala Marine Sanctuary, Panglao, Bohol.

OVERVIEWS AND RESULTS OF SITES SURVEYED

BACLAYON

PAMILACAN ISLAND MARINE SANCTUARY

Site Description and Management. Pamilacan Island Fish Sanctuary was surveyed by Silliman University in 1985 and survey results led to the declaration of the entire coral reef area surrounding Pamilacan Island a Marine Reserve with an 11.9 hectare Fish Sanctuary (White, et al., 2003). The island sanctuary encloses a rock and block area with giant clam species and seagrass in the shallow area (3-4 m depth). The reef crest begins at about 5 meters depth and the slope extends down with dominantly rock and block features with small overhangs and ravine-like areas. The Pamilacan Fishermen's Association (PFA - an island people's organization) is commendable for their unwavering effort to enforce the law since its establishment. In the 2003 survey, the Pamilacan Island Fish Sanctuary obtained the highest management rating among the sites surveyed. It achieved a level 4 which is a "sustained phase". The management problems and issues identified during that time were the creation of a long-term management plan, capacity building activities for locals, and providing alternative livelihood options for the community.

Trends in Coral Abundance and Reef Fish. The live hard coral (LHC) cover inside the sanctuary has shown a consistent increasing trend from 1984 to 2023, reaching a fair condition. Outside the MPA, LHC cover has also increased over the past 16 years but remains in fair condition.

Live hard coral (LHC) inside the Pamilacan Island Fish Sanctuary shows an increasing trend from 1984 to 2023 with 6% change. The reef is in FAIR condition (Table 1), with 34% LHC of which 23% of the total composition is branching corals (CB) (Figure 8). Meanwhile, an increasing trend of LHC cover is also

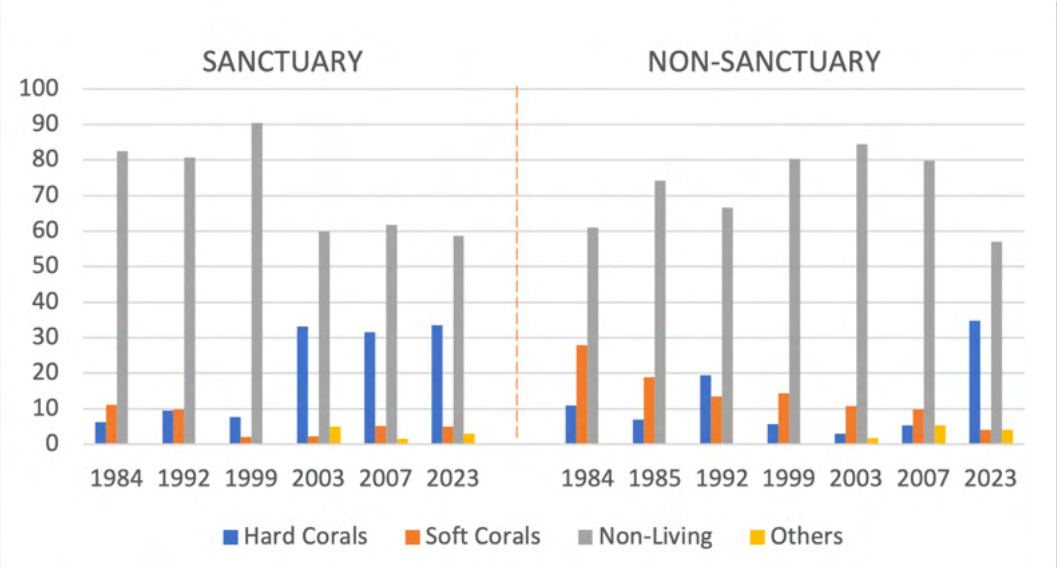

Figure 8. Changes in substrate (% mean ±SE) inside and outside the Pamilacan Island Fish Sanctuary from 1984 to 2023 (6-8m depth).

displayed outside the MPA that has expanded over the past 16 years. The reef outside the sanctuary is also in FAIR condition, with 35% LHC, made up mostly of branching corals (25%). LHC in the shallow area of the fish sanctuary appears to have remained poor condition over 16 years (Figure 9). Substrate inside and outside the MPA are dominated by non-living substrate (59% and 57%, respectively), although these numbers appear to be lower compared to 2007.

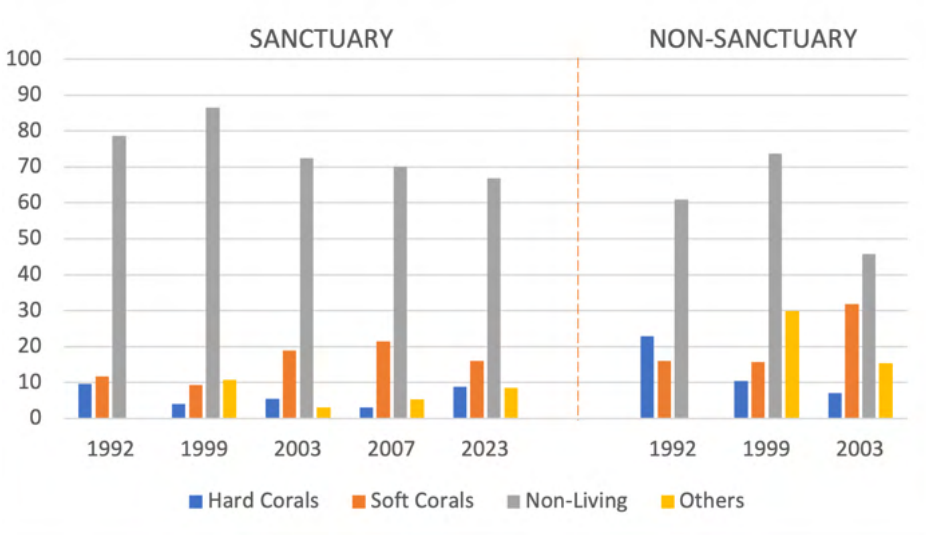

Figure 9. Changes in substrate (% mean ±SE) inside and outside the Pamilacan Island Marine Sanctuary from 1992 to 2023 (3-4m depth).

Both all reef and target species densities have decreased by approximately 40% from 1986 to 2023, while biomass has increased. Species diversity has increased inside the MPA. Some specific fish populations like Caesionids decreased, but Acanthurids and Scarids increased since 2007.

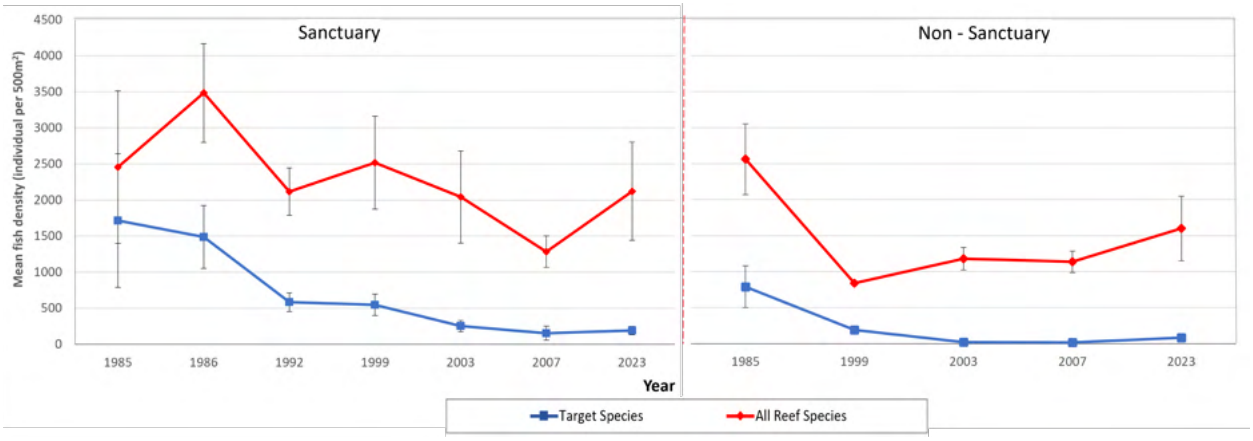

Figure 10. Mean (±SE) density (individuals/500m^2) at Pamilacan Marine Sanctuary, Baclayon from 1986 to 2023.

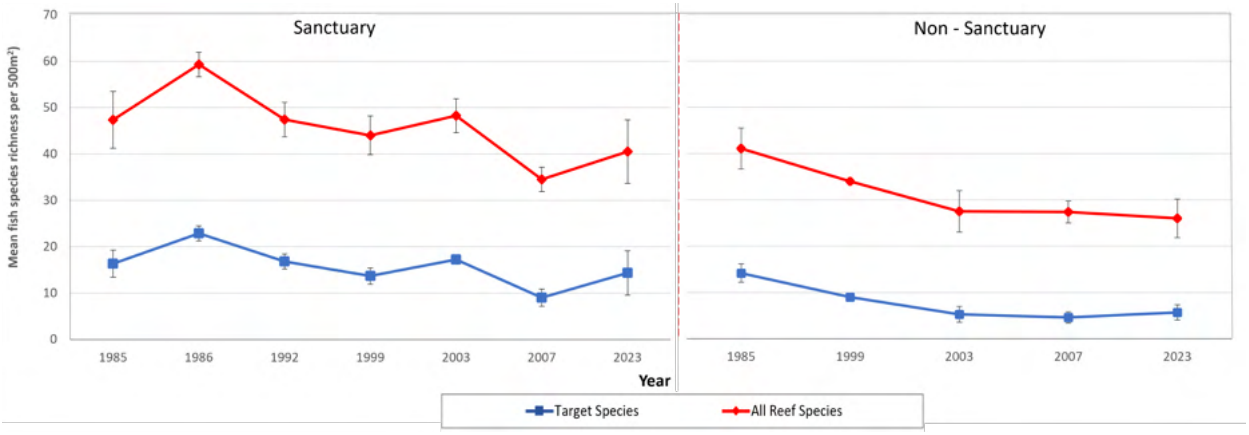

Figure 11. Mean (±SE) number of species/500m² at Pamilacan Marine Sanctuary, Baclayon from 1985 to 2023.

Fish densities for both all reef and target species inside and outside Pamilacan Island sanctuary decreased from 1986 to 2023 by approximately 40% (Figures 10), although we see an increase in biomass from 2007 to 2023 (Figure 12). Species diversity has increased inside the MPA, while outside, the number seems to decline continuously since 1985. Caesionid population decreased by 54%, but Acanthurids and Scarids appear to have increased since 2007. Both aquarium target fishes such as butterflyfishes and angelfishes also increased. It is important to note that target fish biomass in Pamilacan Island sanctuary was lower (7.9 kg/500m²) compared to Balicasag Island Marine Sanctuary (target fish biomass: 34.177.9 kg/500m²) in 2007. Both biomass numbers have now increased with Pamilacan at 44.4 kg/500m² and Balicasag Island at 41.4.9 kg/500m². Both MPAs are of the same age.

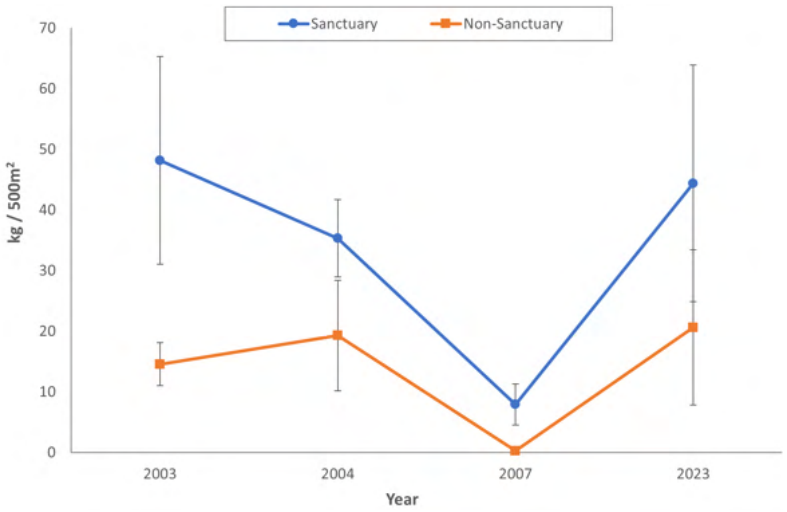

Figure 12. Mean Target Fish Biomass (kg/500m²) in Pamilacan Marine Sanctuary from 2003 to 2023.

DAUIS

SAN ISIDRO-DAO MARINE SANCTUARY

Site Description and Management. San Isidro-Dao Marine Sanctuary was established in 2002 and covers 11.1 hectares. The area encloses patches of corals and large areas of sand in shallow water. The reef crest starts at about 5 meters depth with intact branching and massive coral formations. The San Isidro-Daoosanctuary reef extends down to mostly wall-like features. This sanctuary is seated between the barangays of Dau and San Isidro and is under their joint jurisdiction.

The baseline assessment of San Isidro-Dao MPA was taken during the 2003 survey. This site showed the lowest fish density among all the sites surveyed. Management concerns at that time were the need for stricter enforcement, formation of a management group, and creation of a long-term management plan (White, et al., 2003).

Management Perceptions. In the 2007 survey, results of the perception survey show that the level of awareness of the San Isidro-Dao MPA was high and community support positive. The management of San Isidro-Dao Marine Sanctuary was headed by the barangay captains of Dao and San Isidro with members from San Isidro Fisherfolk Organization (SIFO) and the Dau Farmers and Fishermen's Association (DFFA).

The management rating of San Isidro-Dao MPA had improved in 2007 since the 2003 survey attaining an "established phase" or level 2. The identified top management issues were the need for a more open and better working arrangement between barangays Dao and San Isidro, the need to address the prevalent fishing inside the sanctuary. In 2023, management appeared to have stopped altogether with little evidence of it being an MPA.

Trends in Coral Abundance and Reef Fish. Significant decreases in live hard coral cover in both deep and shallow areas indicate potential coral death. Poor MPA management is likely contributing to the poor fish community conditions. Between 2007 and 2023, there was a significant decrease in live hard coral cover in the deep areas of the sanctuary, dropping from 64.5% to 24.6%. The data shows a 61.9%

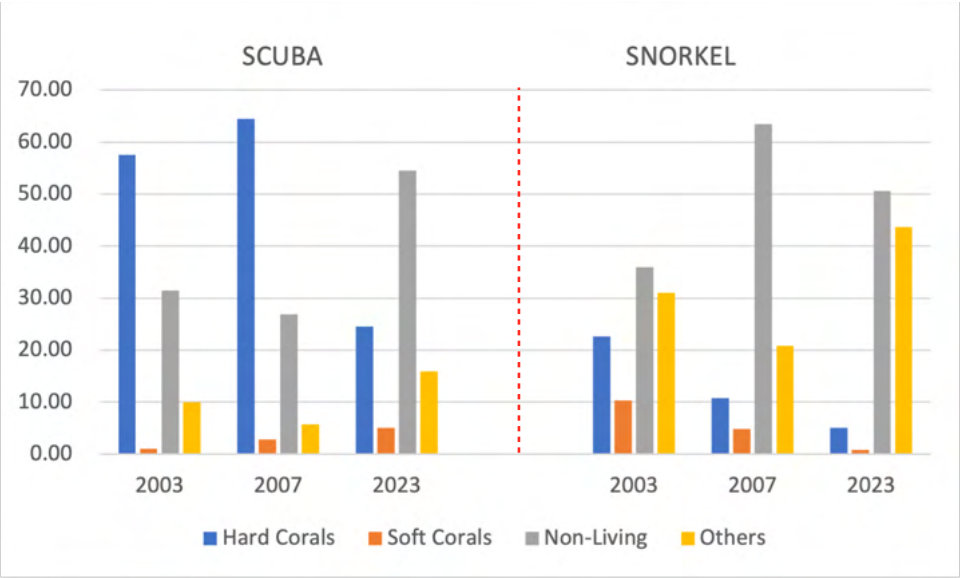

Figure 13. Substrate comparison (% mean) in San Isidro-Dao Marine Sanctuary from 2003 to 2023 (6-8m and 3-4m depth).

decrease over the past 16 years. In the shallow areas, live hard coral cover decreased by -52.8%, while coral rubble cover increased by 140.6%. This pattern may indicate live hard coral death, with approximately -77.6% of branching coral and -66.4% of massive coral loss, likely a result of being directly exposed to the typhoon waves of 2021.

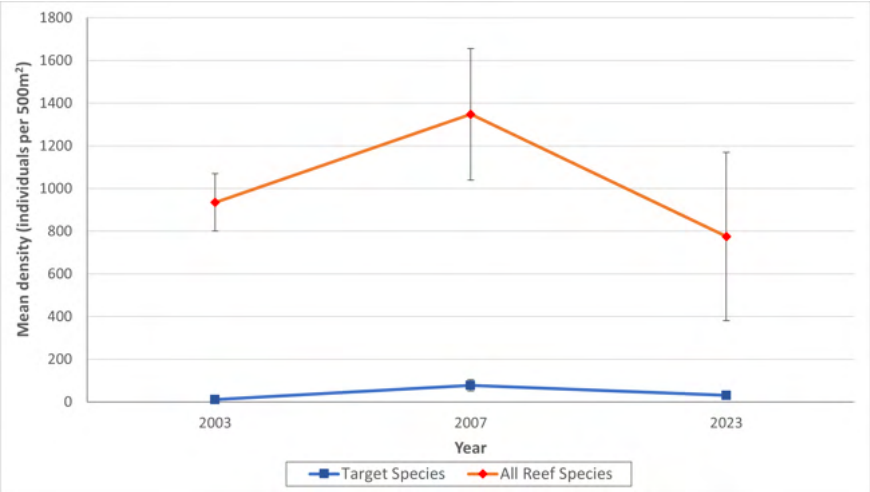

Figure 14. Mean (±SE) density (individuals/500m²) at San Isidro-Dao Marine Sanctuary, Dauis, from 2003 to 2023.

Fish data shows target fish density decreasing from 2007 to 2023. Figure 14 shows all reef species have decreased by 42.5% , while target reef species decreased by 61%. Based on dialogues with local guides, MPA management has not been active in the recent years, which may explain the poor condition of fish communities as shown in Figures 14-16.

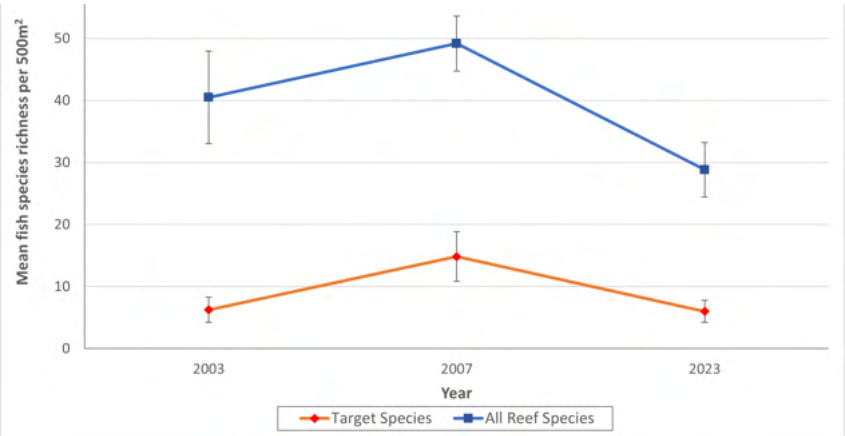

Figure 15. Mean (±SE) number of species/500m² at San Isidro-Dao Marine Sanctuary, Dauis from 2003 to 2023.

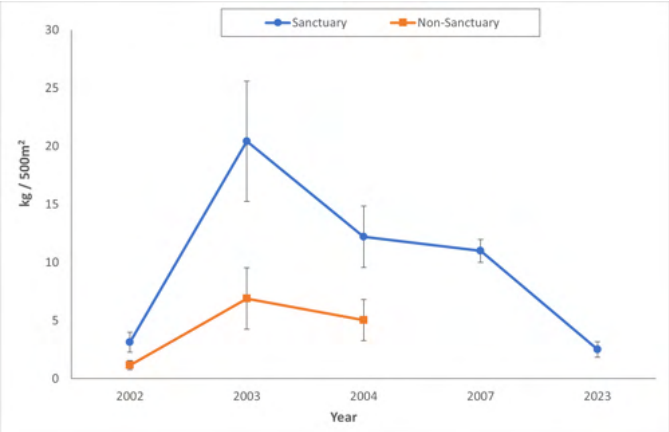

Figure 16. Mean Target Fish Biomass (kg/500m^2 at San Isidro-Dao Marine Sanctuary, Dauis from 2003 to 2023.

PANGLAO

BALICASAG ISLAND MARINE SANCTUARY

Site Description and Management. Balicasag Island Marine Sanctuary is a 5.4-hectare MPA containing a shallow crest at about 3 to 4 meters with a wall and dramatic overhanging features covered by dense hard corals.

Balicasag Island Marine Sanctuary was established in 1986 through the assistance of Silliman University. This was prompted by the reef survey in 1985, which showed high marine biodiversity with signs of stress from destructive fishing and unregulated tourism. A follow-up survey in 1999 showed that this coral reef area remained healthy and stable despite the coral bleaching event in 1998 and continuing pressures of fishing and diving in the area. It was observed at the time that sanctuary management effort had weakened (White, et al, 1999 and the Balicasag Island United People's Organization for Progress (BIUPOP) was inactive. This observation on sanctuary management showed that there was not much improvement in management by 2003. However, the sanctuary's fish density and target fish diversity was highest in this area compared to the rest of the sanctuaries surveyed in 2003. Reef damage observed was mostly associated with increasing tourism activity in the area (White, et al., 2003). In 2023 it was observed that the Balicasag sanctuary shallow reef flat was badly damaged by the storm Odette in 2021.

Management Perceptions. Balicasag Marine Sanctuary management rating in 2007 was level 2 meaning that it had attained an "established phase" in implementation. In 2007 and after 21 years since establishment, the BIUPOP had lost its commitment and motivation to manage the sanctuary and there were issues causing slow progress in management.

The existing municipal ordinances on fishery management, marine protected areas, and tourism management for this site, although adequate and practical, are not fully enforced by the local government. The problem lies in the absence of an implementation framework and lack of support for field operations. In 2023, it was observed that the island reef hosts hundreds of scuba divers every day, which is apparently not carefully managed, but none of the boats were seen dropping anchors and reef did not show damage from the high level of visitors. Furthermore, the fish abundance on the non-sanctuary side of the island appeared very high and suggested that little if any fishing is occurring on the island reef.

Trends in Coral Abundance and Reef Fish. LHC inside the MPA is in poor condition, with a 57% decrease since 2007. Dead Coral with Algae (DCA) increased significantly. Outside the MPA, DCA also increased. Snorkel data shows a slight increase in LHC. Live hard coral (LHC) inside the MPA is in poor condition with only 21% live coral composition. This seems to have decreased by 57% compared to 2007 (48%). Dead Coral with Algae (DCA) on the other hand increased from only 5% in 2007 to 38% in 2023. This was easily observed from start to end of the survey. Outside the MPA, DCA also increased from 10% in 2007 to 29% in 2023. LHC is in fair condition as it has been since the 1992 survey; although LHC has decreased with a 12% percent change.

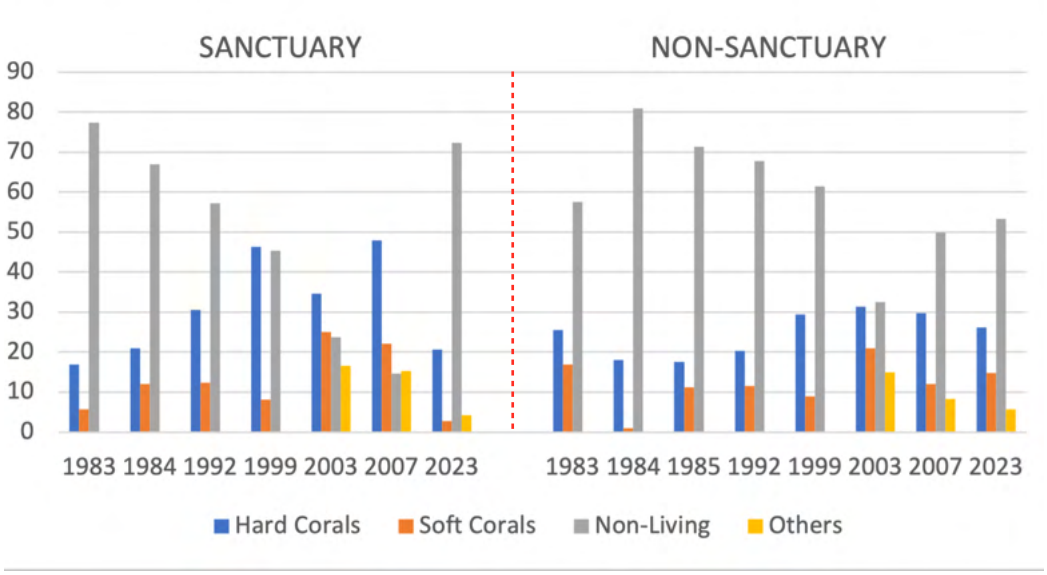

Figure 17. Changes in substrate (% mean ±SE) inside and outside Balicasag Island Marine Sanctuary from 1984 to 2023 (6-8m depth).

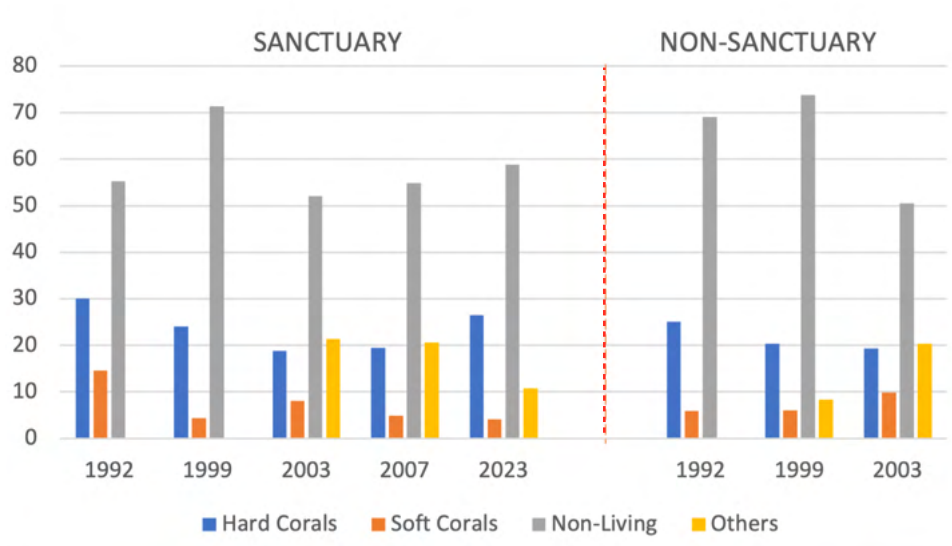

Figure 18. Changes in substrate (% mean ±SE) inside and outside Balicasag Island Marine Sanctuary from 1984 to 2023 (3-4m depth).

Snorkel data shows a slightly different story with LHC recorded at 36% increase compared to only 20% in 2007. This puts the reef LHC from poor to fair condition (Figure 18). DCA, unfortunately, has also increased in the shallow area by 560%, from only 3% in 2007 to 18% in 2023.

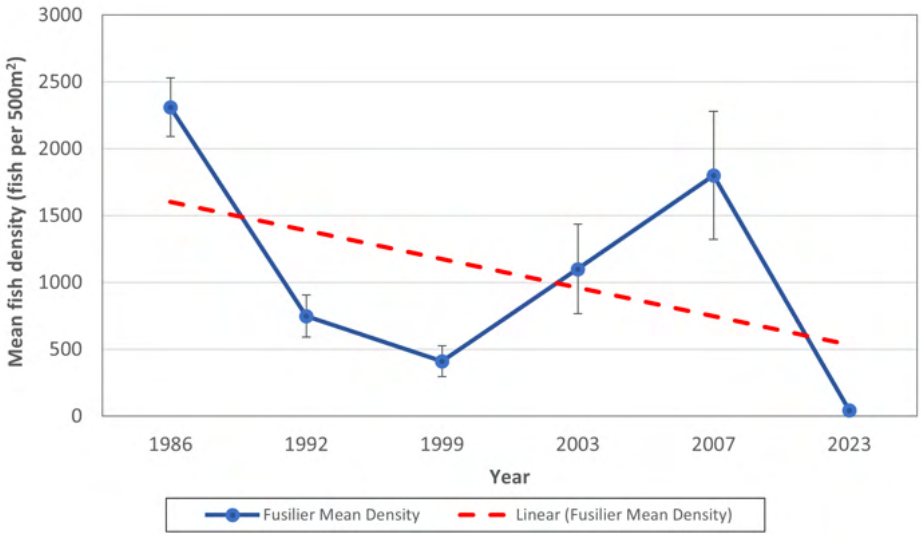

Figure 19. Mean (±SE) density (individuals/500m²) of fusiliers (Caesionids) from 1986 to 2023 in Balicasag Marine Sanctuary.

The MPA consistently harbored schools of fusiliers, but a 98% decrease was observed from 2007 to 2023 (Figure 19). Overall, fish abundances for all reef and target species appeared to decrease inside and outside the MPA. The fish surveys over time show that the Balicasag MPA, consistently harbors schools of fusiliers (Pterocaesio spp., Caesio spp.) whose densities have been maintained over 20 years. This is not reflected on this year's data, with a 98% decrease in number from 2007 to 2023. The team believes this may be a difference in transect location or the caesionid population may have shifted outside the sanctuary, where they are observed during a non survey dive.

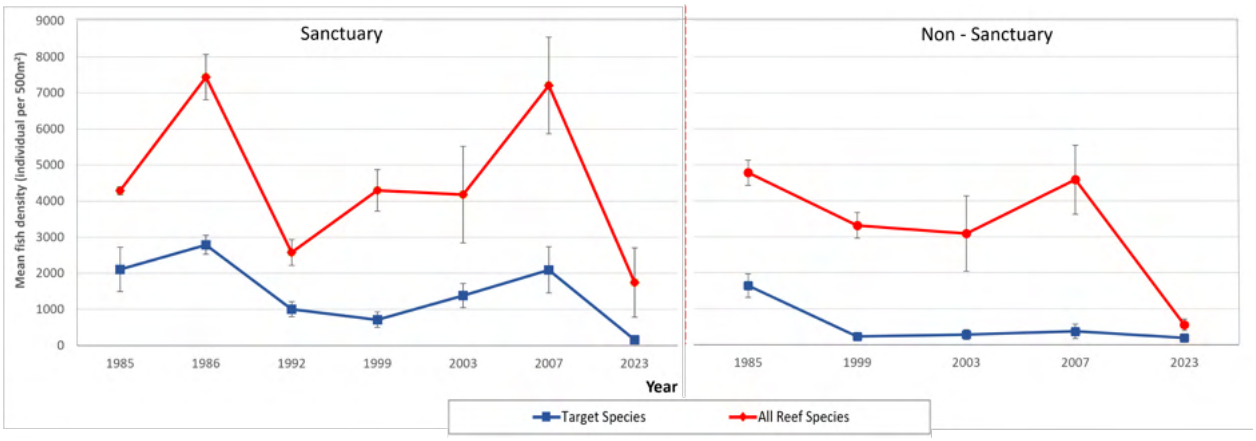

Figure 20. Mean (±SE) density (individuals/500m²) inside and outside Balicasag Marine Sanctuary, Panglao from 1985 to 2023.

Over the past decades, fish density of fusilier a family of Caesionidae was numerous on counts except for the year 2023 which has recorded the lowest at about 44.0 ± 27.8 fish per 500m^2. The conceivable result may be due to the limitation of the proximity of fusiliers on some transects having them to feed on profuse plankton far from the reef wall.

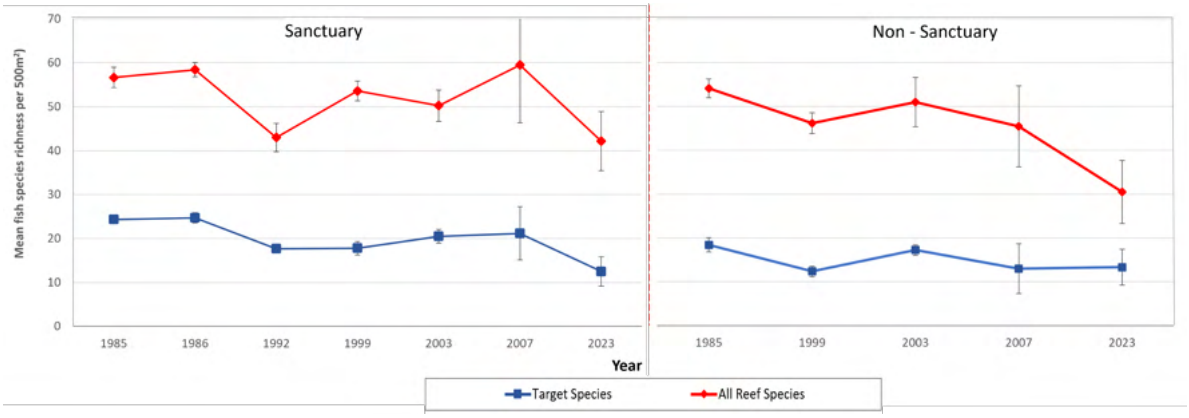

Figure 21. Mean (±SE) number of species/500m^2) inside and outside Balicasag Marine Sanctuary, Panglao from 1985 to 2023.

The fish species of fusilier noted in the area were Pterocaesio pisang, and Caesio caerulaurea. Moreover, wrasses (42.0 fish/500m^2) and surgeonfish (46.0 fish/500m^2) were also observed with the most common species of *Cirrhilabrus cyanopleura*, and *Ctenochaetus striatus*.

Overall fish abundances for all reef and target species also appeared to increase. It is worth noting that target fish density inside the MPA in the year 2007 appeared higher compared to previous years, and similar to 1986. The density of jacks (77.5 fish/500m^2, Table 14) was especially high in 2003. Jacks are highly mobile and this sudden increase in density may just be due to a school recorded on one

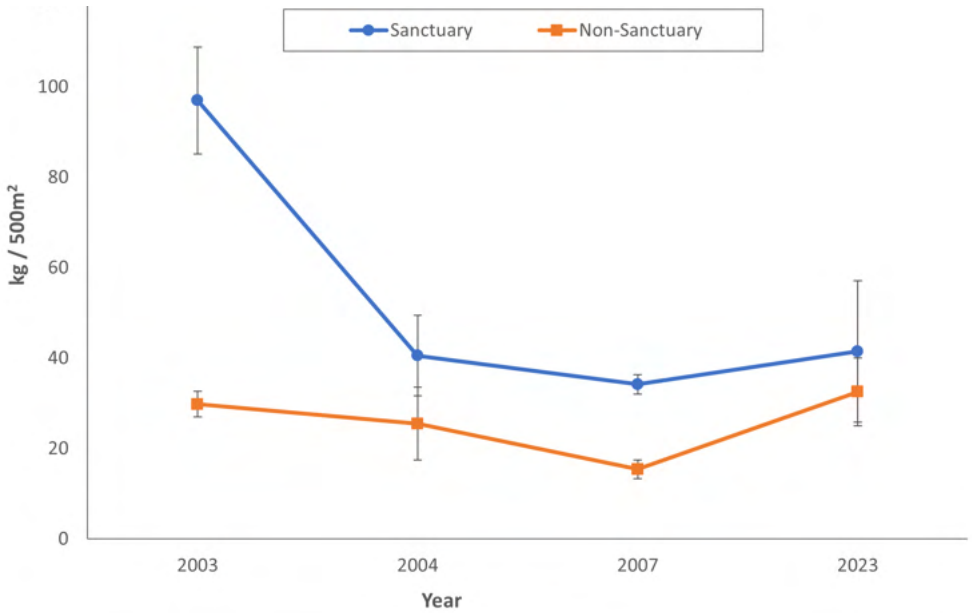

Figure 22. Mean Target Fish Biomass (kg/500m^2 at Balicasag Island Marine Sanctuary, Dauis from 2003 to 2023.

transect. However, jacks have always been noted in Balicasag MPA on the deeper part of the reef slope (60-70 ft) over the years since the mid-1990s (A. Maypa, personal observation). In 2023, they were observed in the opposite side of the island at a deeper depth (20-30m). All reef and target species numbers appear to decrease inside and outside the MPA (Figure 19-21, Table 13-15).

BIL-ISAN MARINE SANCTUARY, Panglao

Site Description and Management. Bil-isan Marine Sanctuary was established in 1998 in Panglao. Bil-isan MPA is an 8.2-hectare MPA containing patches of corals interspersed with seagrasses in shallow water. The reef crest begins at 7 to 9 meters with large patches of Padina algae and delicate branching corals. The Bil-isan reef extends down to wall-like features with branching and massive corals.

In 2003, Bil-isan MPA was managed by the Bil-isan Barangay Government but was not properly enforced. There were no indications that a sanctuary existed there because there were no boundary markers or signage to indicate to the public that the area was protected. Fish counts, at the time, showed a decreasing trend. The management problems/issues identified were the need for assistance to revive management and the need to conduct an education program to obtain interest and support (White, et al., 2003).

Management Perception. In 2007, results of the perception survey showed that the level of awareness about Bil-isan Marine Sanctuary was high and community support positive and active. The management rating of Bil-isan MPA in 2007 showed improvement since 2003 with an increase in two levels, achieving an "enforced phase" in implementation or level 3. In 2007, the Bil-isan MPA was among the better-managed sanctuaries in Panglao and in 2023, the strict control over entry to the MPA appeared to still be in place and as evidenced by the good quality reef within the MPA boundary.

Trends in Coral Abundance and Reef Fish. Increasing trends in live hard coral cover were observed from 1999 to 2023. The reef is considered to be in good condition in 2023. Reef rehabilitation efforts may have contributed to increased coral cover. Live hard coral cover in the deep area of Bil-isan

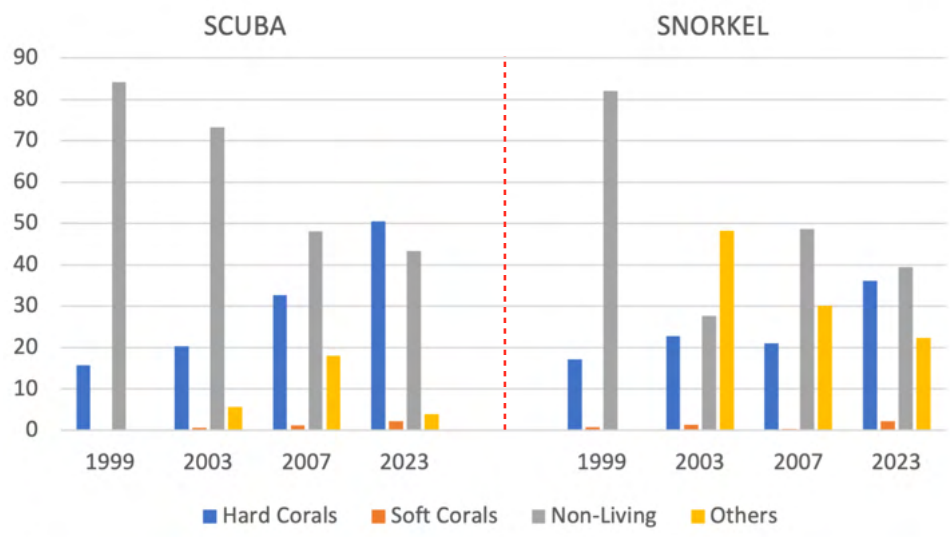

Figure 23. Substrate comparison (% mean) in Bil-isan Marine Sanctuary from 2003 to 2023 (6-8m and 3-4m depth).

sanctuary and the adjacent fishing ground is fair at 32.7% and 21.1% respectively. An increasing trend is shown from 1999 to 2023 with and accompanying decrease in the non-living substrate, especially sand and silt and coral rubble. These patterns suggest coral growth (Figures 23, Table 16). In the shallow, the substrate is dominantly sand and silt, rock and block, and fleshy macroalgae, however, live hard coral cover increased from 21% in 2007 to 36% in 2023, categorizing the reef in fair condition.

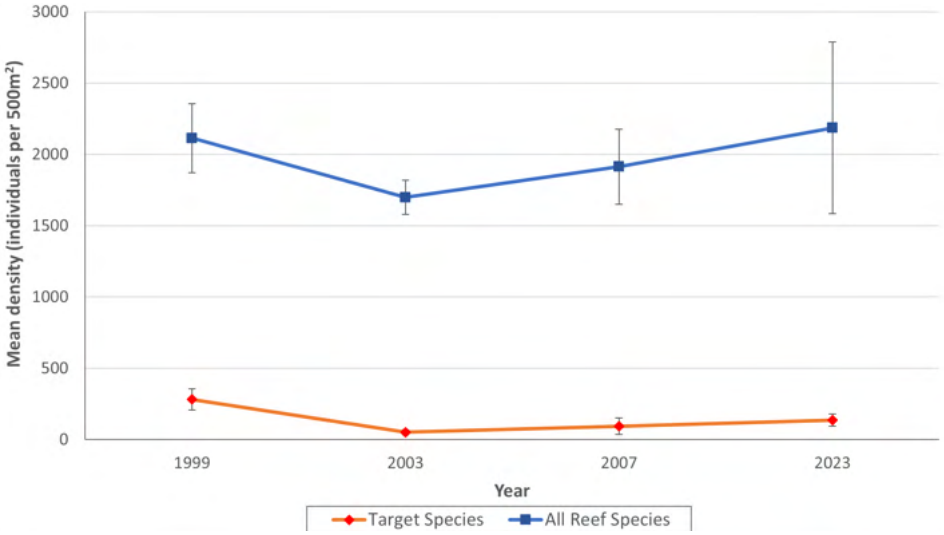

Figure 24. Mean (±SE) density (individuals/500m^2) inside Bil-isan Marine Sanctuary, Panglao from 1999 to 2023.

In the 2023 reef assessment, the live hard coral cover in the deep area of Bil-isan sanctuary was determined to be 55%, which shows the reef to be in good condition, while the shallow area had a live hard coral cover of 36.1% (Fair condition). An increasing trend was observed from 2007 to 2023, accompanied by a decrease in non-living substrate, particularly sand, silt, and coral rubble, which decreased by -9.8%. It was noted that a reef rehabilitation was conducted in the fish sanctuary, which

Figure 25. Mean (±SE) number of species/500m^2) inside Bil-isan Marine Sanctuary, Panglao from 1999 to 2023.

contributed to the increase in live hard coral cover by 54.7%. This can easily be attributed to the local government's strict enforcement of their MPA protection. The team had to procure special permission to be able to survey inside the MPA.

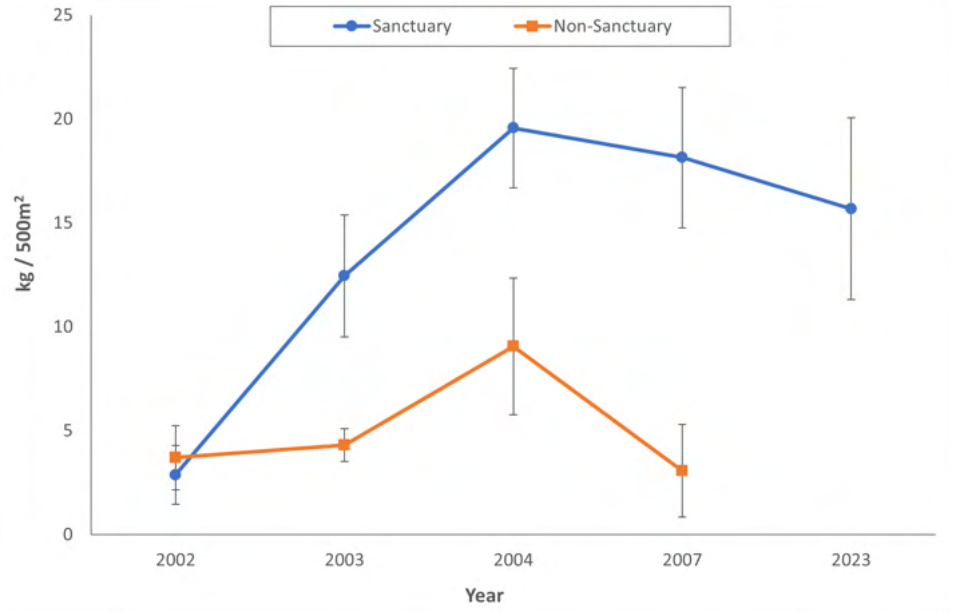

Figure 26. Mean Target Fish Biomass (kg/500m^2 at Bil-isan Marine Sanctuary, Panglao from 2002 to 2023

Fish densities for all reef and target species inside the sanctuary have increased from 2002.Fish densities in the sanctuary for all reef and target species have increased. Figure 24 shows mean density of all reef species at a 14% increase from 2007, while target species density shows an increase of 45%. Caesionids show a decrease compared to 2007 but its number is 100% higher compared to 1999, when it was established. Mean target fish biomass inside the sanctuary appeared to increase by 2007 from 3 to 20 kg/500m^2, but this number decreased to 15.7 18 kg/500m^2 by 2023 (Figure 26).

BOLOD MARINE SANCTUARY, Panglao

Site Description and Management. Bolod Marine Sanctuary was established in 1998 along with Tawala, Doljo, Bil-isan and other MPAs in Panglao. Bolod Marine Sanctuary is a 3.9-hectare MPA enclosing patches of seagrass beds and corals in shallow water. The reef crest is about 8 to 10 meters that consisted of large branching corals and massive coral patches in 2007. But in 2023, the almost no branching corals were observed presumably a result of the major Odette storm in 2021 that came from the southeast. Bolod Marine Sanctuary reef has sloping-to wall-like topography. This area is popular for divers and beach picnickers and is in front of a public beach and a number of resorts frequented by up to 500 tourists every weekend during summers. The Bolod MPA management issues identified during the 2003 survey were weak law enforcement, continuing fishing violations, and increasing tourism pressure (White, et al., 2003).

Management Perceptions. In the 2007 survey, the results of the perception survey show that the level of awareness on the Bolod Marine Sanctuary was high and community support positive. Bolod MPA was managed by the Bolod Barangay Government. The management rating of Bolod Marine Sanctuary had improved in 2007 since the survey in 2003. It had attained one level higher on the MPA Rating System, reaching an "established phase" in implementation or level 2. The identified top management problems and issues were weak support from the Panglao Municipal Government, sporadic fishing inside the sanctuary and the need for collaborative efforts of stakeholders to strengthen enforcement of MPA guidelines and policies. Observations in 2023 suggest continuing lack of vigilance and weak enforcement of the area.

Trends in Coral Abundance and Reef Fish. Live hard coral decreased by only 2%, but branching corals have decreased by 38% from 2007 to 2023. Non-living substrate increased by 10%,with RCK dominating this change at 28%. Poor MPA enforcement and potential impacts from tourism are suggested as causes of the observed decline. Conditions outside the MPA seems to be worse with non living having increased by 31%, dominated by sand and silt at 44% (Figure 27). In the shallow area, a similar situation was observed, with an increase in non living category by 28%, this time dominated by 38% of rubble (Figure 28).

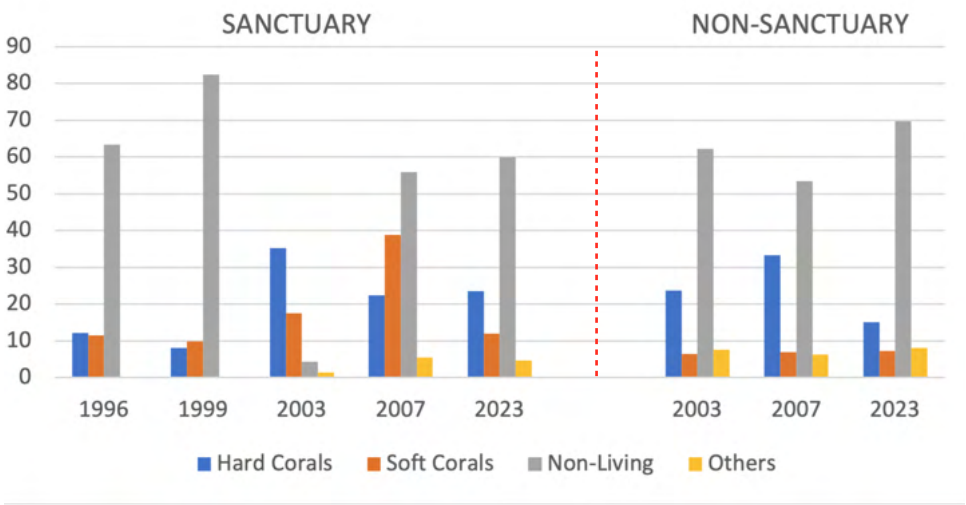

Figure 27. Changes in substrate (% mean ±SE) inside and outside Bolod Marine Sanctuary from 1996 to 2023 (6-8m depth).

Furthermore, LHC was observed to be in steady decline since 2003, with this year showing a 46% decrease in number. This is also observed in the shallow area of the reef (Figure 28). This MPA is right in front of the Bohol Beach Club, and while natural occurrences can cause this decline, we can't dismiss the possibility of the rise of tourism and human activities as a direct cause to the reef's declining condition. 2003 showed the highest LHC percentage for Bolod at 35%, putting the reef in fair condition. However, the reef has been in poor condition since 2007 until this year with only 22% LHC for both survey years.

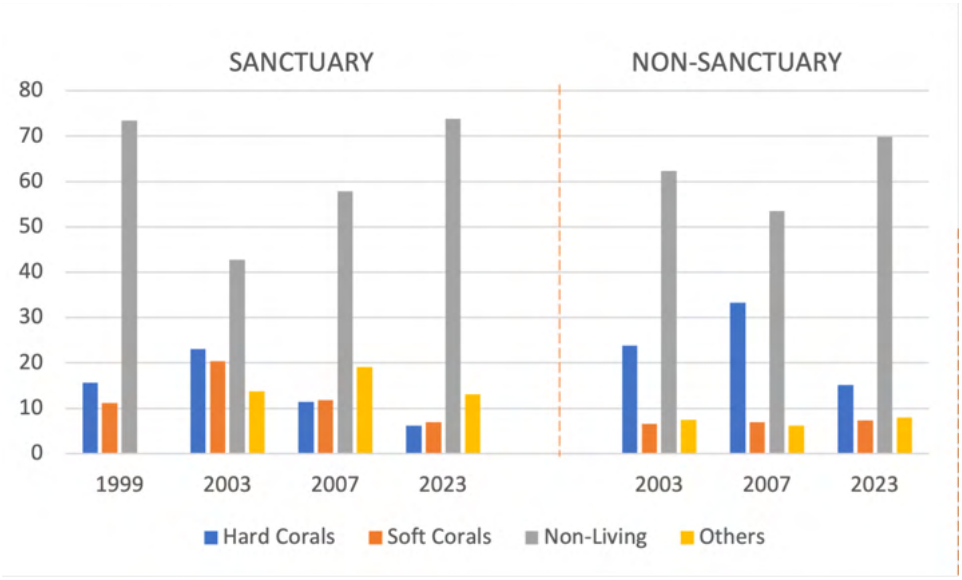

Figure 28. Changes in substrate (% mean ±SE) inside and outside Bolod Marine Sanctuary from 1999 to 2023 (3-4m depth).

Acanthurids and caesionids increased since 2007, but all reef species showed a 6% decline. Target species density, however, showed a positive outcome with a 298% increase.

Acanthurids and caesionids both appear to have increased since 2007, compared to other families. While all reef species show a 6% decline from 2007 to 2023, target species density show a more positive outcome with a 298% increase this year. Outside the sanctuary, even though acanthurids also show a high increase at 652%, both all reef species and target species appear to have decreased since 2007, with all reef species decreased by 76%, and target density by 31%.

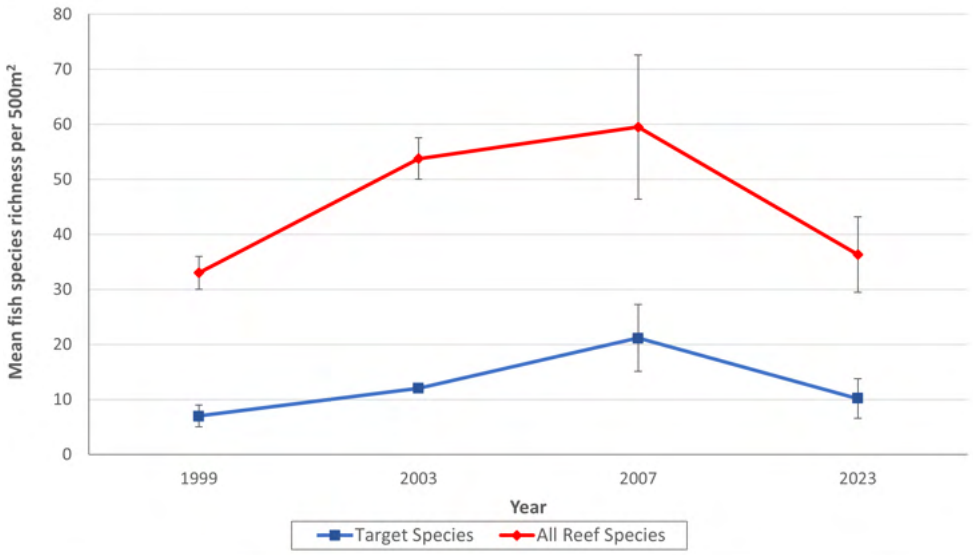

Figure 29. Mean (±SE)

In 2007, the low fish density has since been a result of poor enforcement of the MPA as well as that the boundary of the sanctuary only encloses the shore side. Hopefully, the results of this year's report can encourage MPA Managers to increase enforcement and improve the protection of the Bolod MPA and the surrounding area.

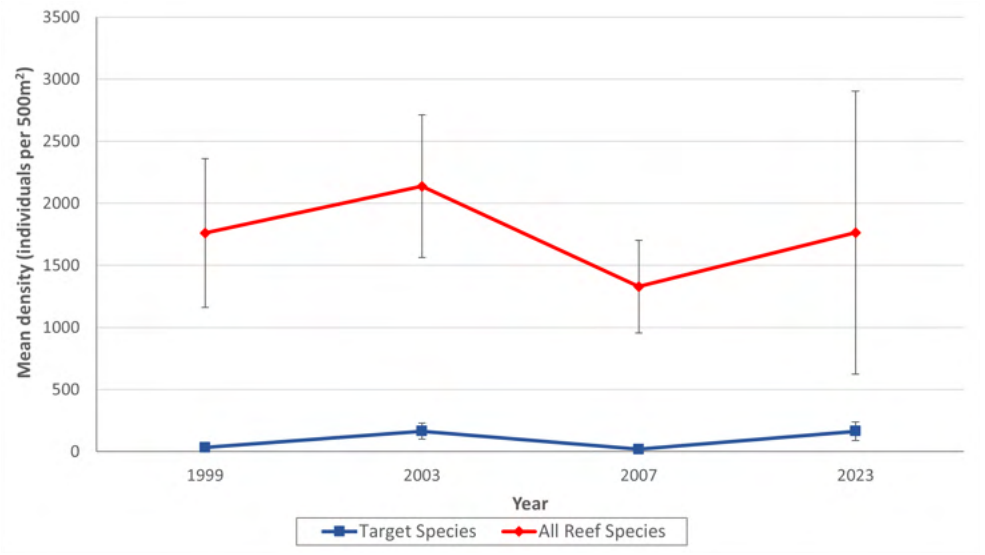

Figure 30. Mean (±SE) density (individuals/500m²) inside Bolod Marine Sanctuary, Panglao from 1999 to 2023.

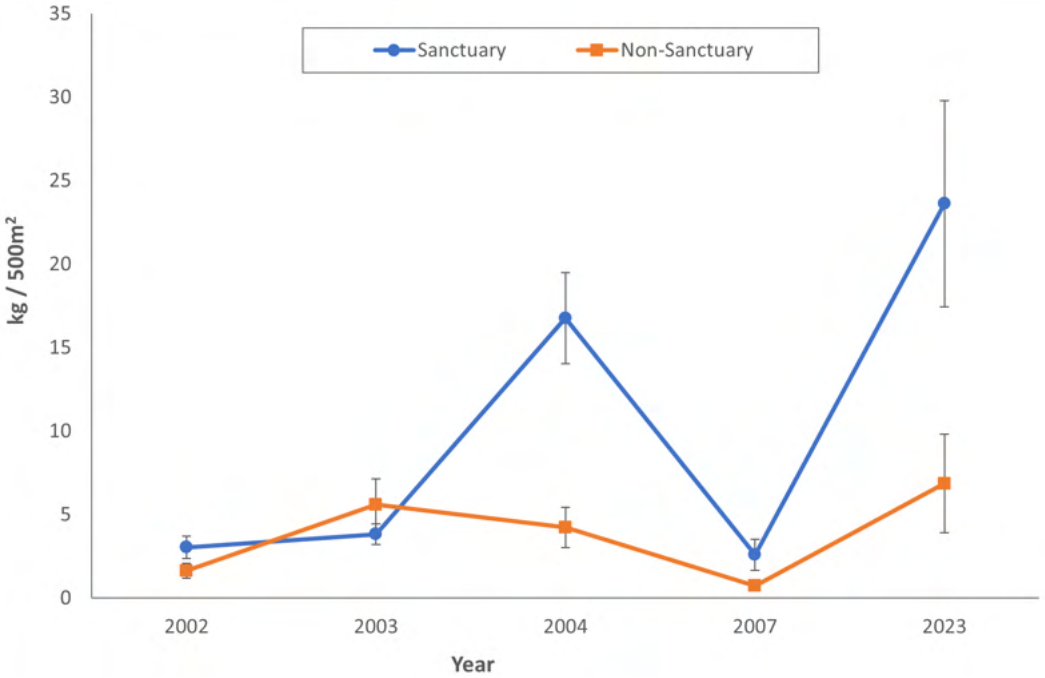

Figure 31. Mean Target Fish Biomass (kg/500m²) at Bolod Marine Sanctuary, Dauis from 2002 to 2023.

DOLJO MARINE SANCTUARY, Panglao

Site Description and Management. Doljo Marine Sanctuary is a 7.3-hectare MPA covering patches of corals interspersed with seagrasses in the shallow area. The reef crest is at about 7 to 9 meters deep with areas covered with delicate branching corals and large patches of Padina algae. The Doljo Marine Sanctuary reef extends down to wall-like features with a mix of branching and massive corals.

The surrounding waters of Doljo were first declared as a marine park with a 20-hectare sanctuary in 1986. This was amended in 1998 retaining only 7.7-hectare of sanctuary under protection. Doljo sanctuary has remained a part of Panglao's MPA network as stipulated in the 2005 Panglao MPA Ordinance. When surveyed in 2003, Doljo sanctuary was managed by the Doljo Barangay Government and major management problems and issues identified were the sustainability of MPA protection activities and the maintenance of MPA enforcement structures (White, et al., 2003).

Management Perception. In the 2007 survey, the result of the perception survey shows that the level of awareness on Doljo Marine Sanctuary was high and community support was relatively strong. Its management rating in 2003 and 2007 was level 2 rating which is the "established phase" in implementation. In 2023, the Doljo Sanctuary was being strictly guarded with the indication that generally no divers are allowed to dive inside and indeed the quality of the reef was in good condition.

Trends in Coral Abundance and Reef Fish.Doljo MPA has maintained a good reef condition since 1996, with a 32% increase in LHC cover from 2007 to 2023. Strict enforcement of MPA rules and regulations is attributed to the positive reef condition.

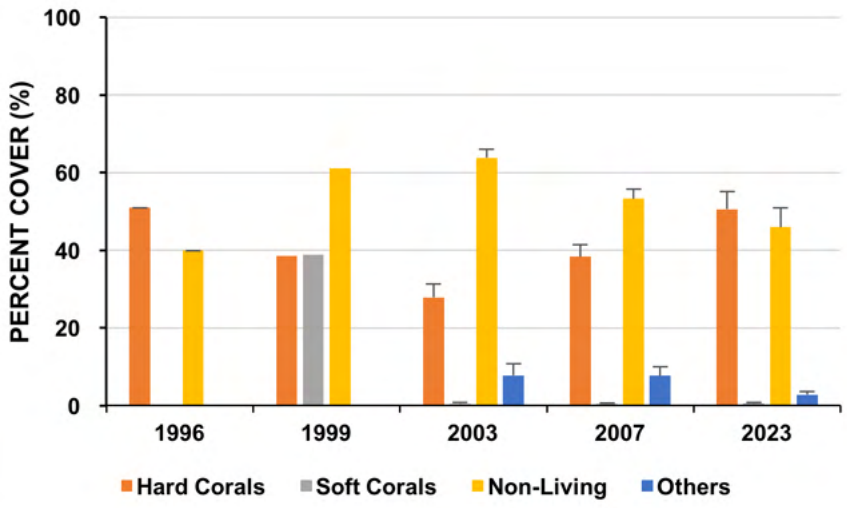

Figure 32. Changes in substrate (% mean ±SE) inside Doljo Marine Sanctuary from 1999 to 2023 (6-8m depth).

Live hard coral percent cover in Doljo is in good condition at 50% inside the MPA for 2023, showing a 32% increase since 2007. Branching corals dominate this increase composing 46.5% of the substrate. Non Living substrate shows to have decreased as a whole by 14% (Figure 32). This goes to show how strict enforcement of the MPA's rules and regulations have a positive impact on the reef's condition.

Doljo MPA has more or less maintained its reef condition since 1996, with only 2003 having the lowest recorded LHC at 28%, making the reef in fair condition that year.

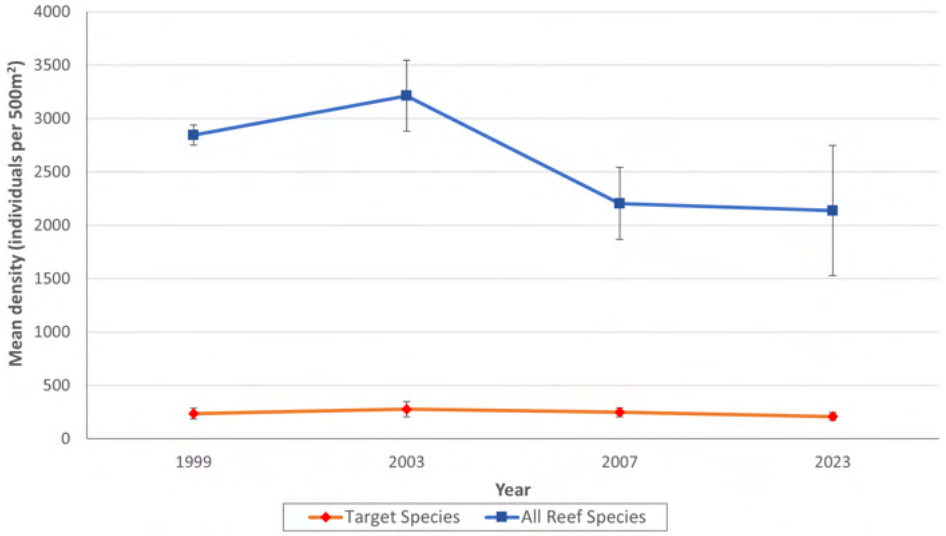

Figure 33. Mean (±SE) density (individuals/500m²) inside Doljo Marine Sanctuary, Panglao from 1999 to 2023.

Despite a 16% decrease from 2007, Doljo MPA showed high fish density, diversity, and biomass in 2023. A positive recovery trend is observed for Acanthurids and butterflyfish. Target fish density, diversity and biomass inside the Doljo MPA are among the highest recorded for 2023. This is despite a 16% decrease observed in the 2007 survey. Acanthurids increased by 206% in 2023, as well as butterflyfish at 680%. The latter has an average of 5 species per transect, with a total of 31 species observed during FVC. A more detailed table of this can be found in the species list for Bohol 2023 (Table 4). This positive result

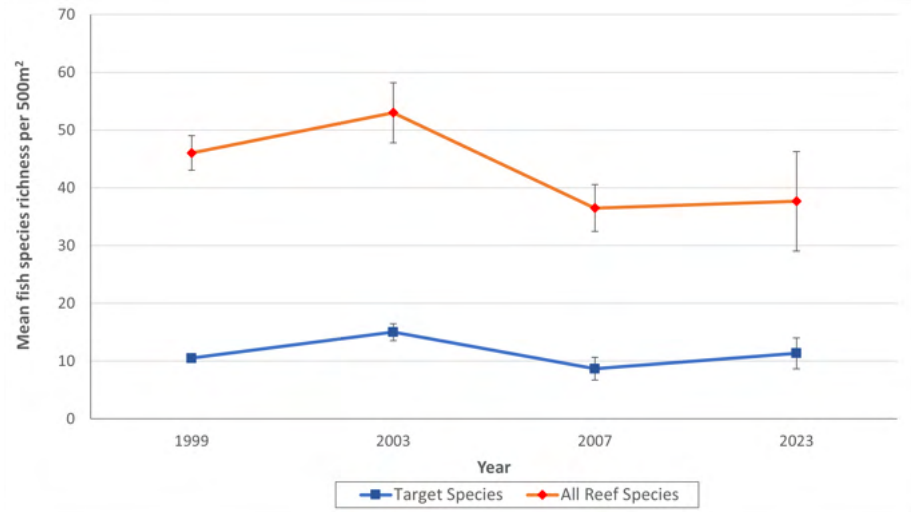

Figure 34. Mean (±SE) number of species/500m²) inside Doljo Marine Sanctuary, Panglao from 1999 to 2023.

in the data shows that even though the numbers have declined since its baseline survey in 1999, the fish population seem to be making some progress towards increased density. With continued enforcement and active management, Doljo MPA can well be on the road to sustaining fish populations for its neighboring barangays as well.

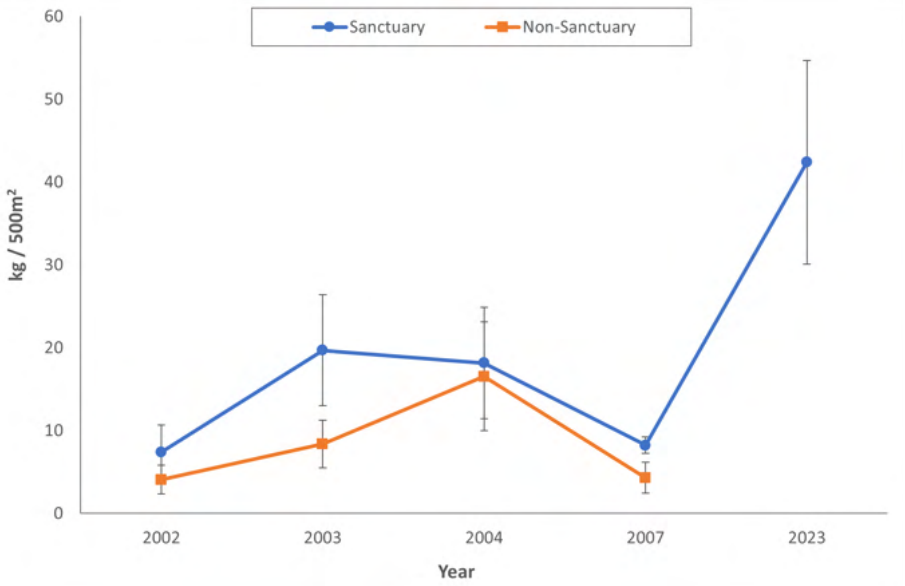

Figure 35. Mean Target Fish Biomass (kg/500m² at Doljo Marine Sanctuary, Panglao from 2002 to 2023.

TAWALA MARINE SANCTUARY, Panglao

Site Description and Management. Tawala Marine Sanctuary was established in 1998 along with a new group of MPAs in Panglao. Tawala Marine Sanctuary is a 5.4-hectare MPA enclosing areas with seagrasses and algae and dense branching coral growth in shallow water. The reef crest begins at 5 to 7 meters with some old-growth massive corals. The Tawala sanctuary reef extends down to wall-like features with some overhanging areas creating a dramatic reef.

Tawala Marine Sanctuary is located between Bolod and Danao beach resorts, with over 20 dive shops combined. It was managed by the Tawala Barangay Government in 2007 but in 2023 appeared to have no management and no marker buoys or signs indicating an MPA.

Management Perceptions. In the 2007 survey, results of the perception survey showed that the level of awareness on Tawala Marine Sanctuary was high and there was strong community support. The management rating of Tawala Marine Sanctuary in 2007 had improved since the 2003 survey and had achieved an “enforced phase” in implementation (level 3). Thus, it was disappointing to see in 2023 that management had lapsed, given its earlier record for protection.

Trends in Coral Abundance and Reef Fish. The live hard coral cover in Tawala decreased from good at 60.5% in 2007 to poor condition by 2023 at 24% (Figure 36, Table 28). Branching corals made up most of the cover recorded (35.5%) in 2007 and this has gone down to only 10%, showing a decrease of 70% by 2023. From 2007 and 2023, there was a significant decrease in live hard coral cover in the deep areas of the sanctuary, dropping from 60.5% to 24%, representing a 60.3% decrease over the past 16 years.

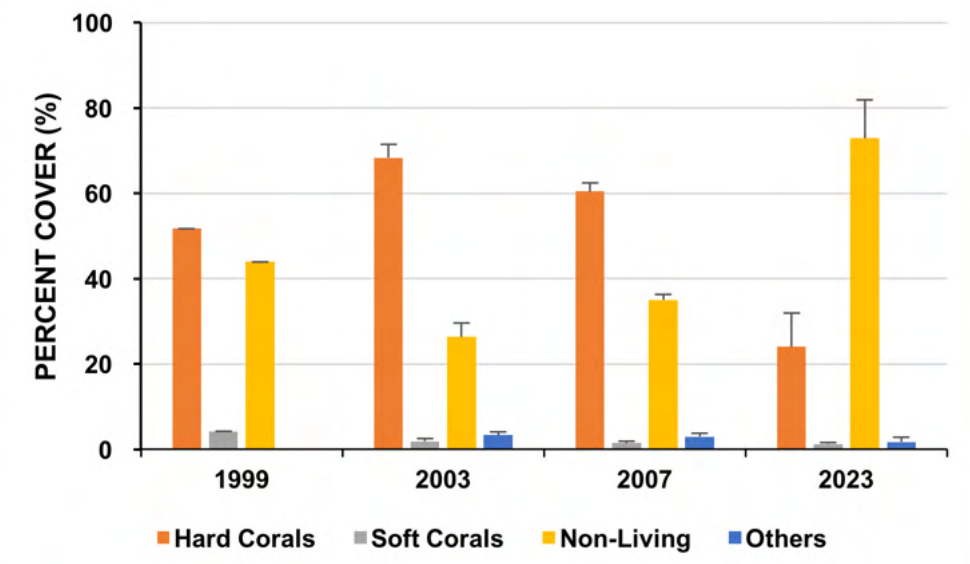

Figure 36. Changes in substrate (% mean ±SE) inside Tawala Marine Sanctuary from 1999 to 2023 (6-8m depth).

This decreasing trend was accompanied by an increase in non-living substrate, particularly sand, silt, rock, block, and dead coral with algae, which changed by 108.6%. Additionally, reef rehabilitation structures were observed in the sanctuary. These measures may have been taken in response the the MPA managers' observation of the reef's decline, as well as to assist in the reef's recovery from natural calamities such as strong typhoons like Odette, which happened at the end of 2021.

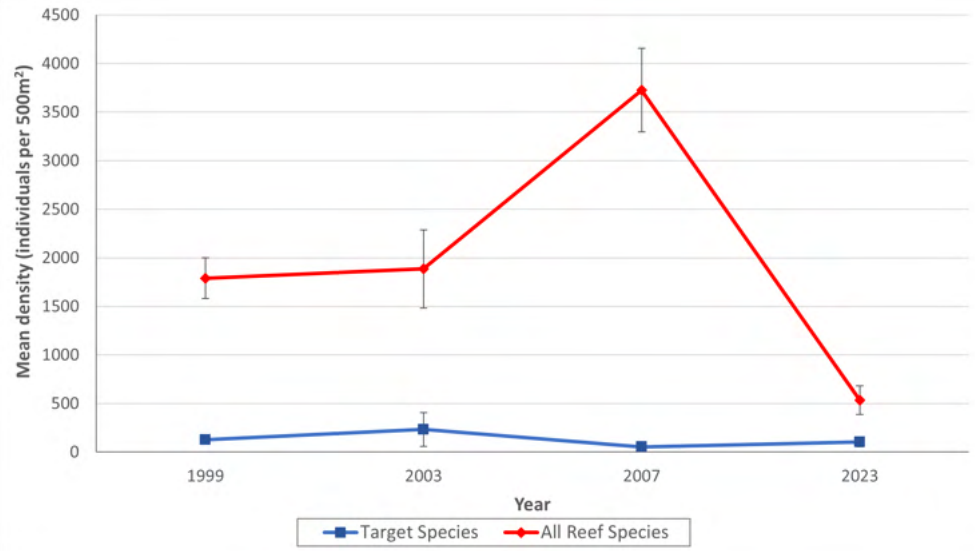

Figure 37. Mean (±SE) density (individuals/500m^2) inside Tawala Marine Sanctuary, Panglao from 1999 to 2023.

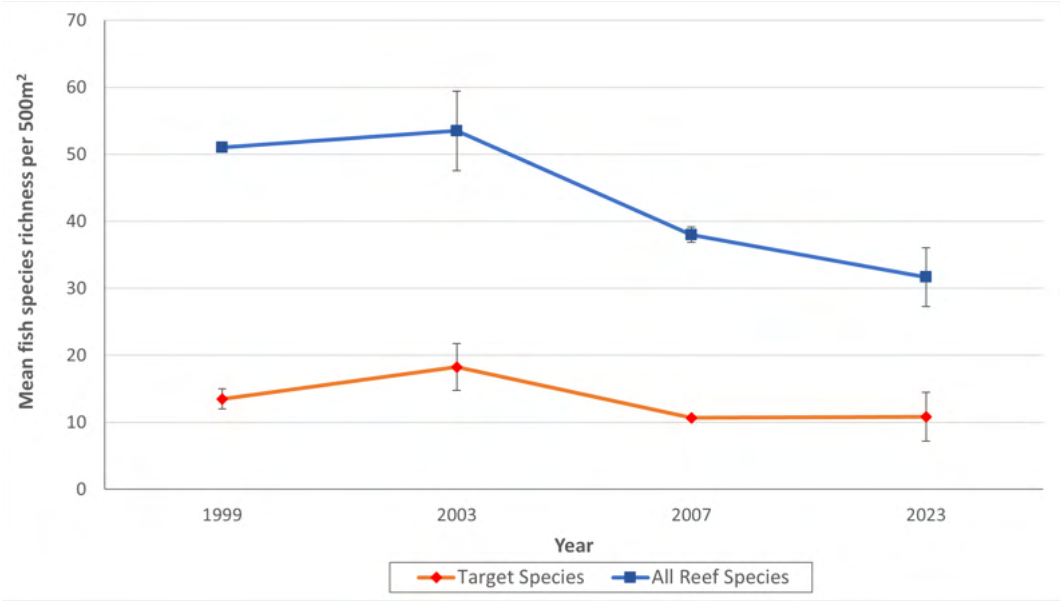

Figure 38. Mean (±SE) number of species/500m²) inside Tawala Marine Sanctuary, Panglao from 1999 to 2023.

Tawala MPA had the highest fish biomass at 60.07kg/500m² in 2007. This year, Tawala only recorded having 23 kg/500m². Substantial decreases in substrate and fish data indicate a need for improved MPA management. It also showed the lowest in all reef fish density at 534 ind/500m², although numbers show that there have been an increase of 94% for target reef species by 2023 (Tables 30). Acanthurids, lutjanids, and scarids make up most of the biomass, showing an increase ranging from 380-1017%. Meanwhile, the numerically dominant pomacentrids and anthids appear to have decreased dramatically, showing 88% and 99% decrease, respectively. The decline in both substrate and fish data should be a call for improved MPA management and tighter enforcement measures.

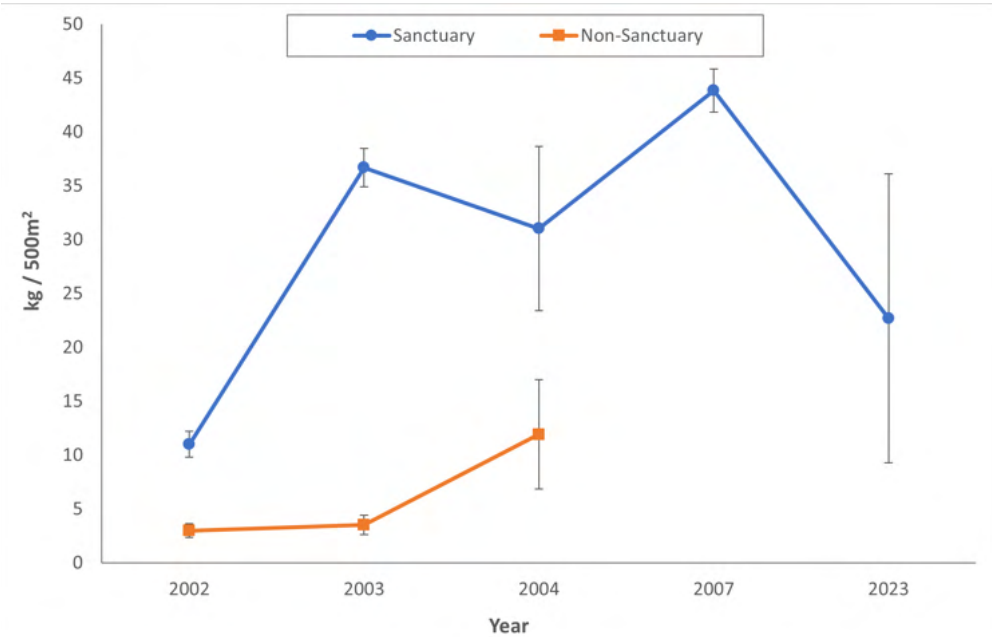

Figure 39. Mean Target Fish Biomass (kg/500m²) at Tawala Marine Sanctuary, Dauis from 2002 to 2023.

SUMMARY

Several MPAs like Doljo and Bil-isan showed positive trends in live hard coral cover, while others like Tawala and Balicasag experienced significant declines, due to natural calamities or poor MPA management.
Fish Community Trends: Fish densities and species diversity varied across MPAs. Enforcement of MPA rules and regulations played a crucial role in maintaining or improving fish populations.
Human Impact: Tourism and human activities, if not managed properly, can contribute to the decline of coral reefs, as seen in Bolod Marine Sanctuary.
Typhoon Impact: Super Typhoon Odette in December 2021 had measurable effects on some MPAs, impacting live hard coral cover. Those affected include Balicasag Island Fish Sanctuary, San Isidro-Dao MS and Tawala MPA. All the MPAs that lie on the windward side of the islands in relation to the typhoon direction were directly impacted while those on the leeward sides of the islands such as Pamilacan Island, Doljo and Bil-isan MPAs were spared damage and displayed stable or improving coral cover.

Conclusion: The overall health of coral reefs and fish communities in the surveyed MPAs depends on various factors, including MPA management, natural events, and human activities. The data emphasizes the importance of effective conservation and management measures to ensure the resilience and sustainability of the coral reef ecosystems in light of impacts from a major storm and the increasing threat from climate related events such as warming seas and future storms.

Over the past 16 years, there have been significant changes in live hard coral (LHC) cover in all surveyed Marine Protected Areas (MPAs). Two adjacent MPAs located in the northern part of Panglao Island; Doljo, and Bil-isan, showed a significant increase in LHC cover. However, two of the three MPAs located in the southern part of Panglao Island; San Isidro-Dao MS and Tawala MS, experienced a drastic loss of live hard coral cover, with a decrease of approximately 60%. The other three surveyed MPAs; Balicasag Island, Pamilacan Island, and Doljo, maintained their LHC cover over time (Figure 40).

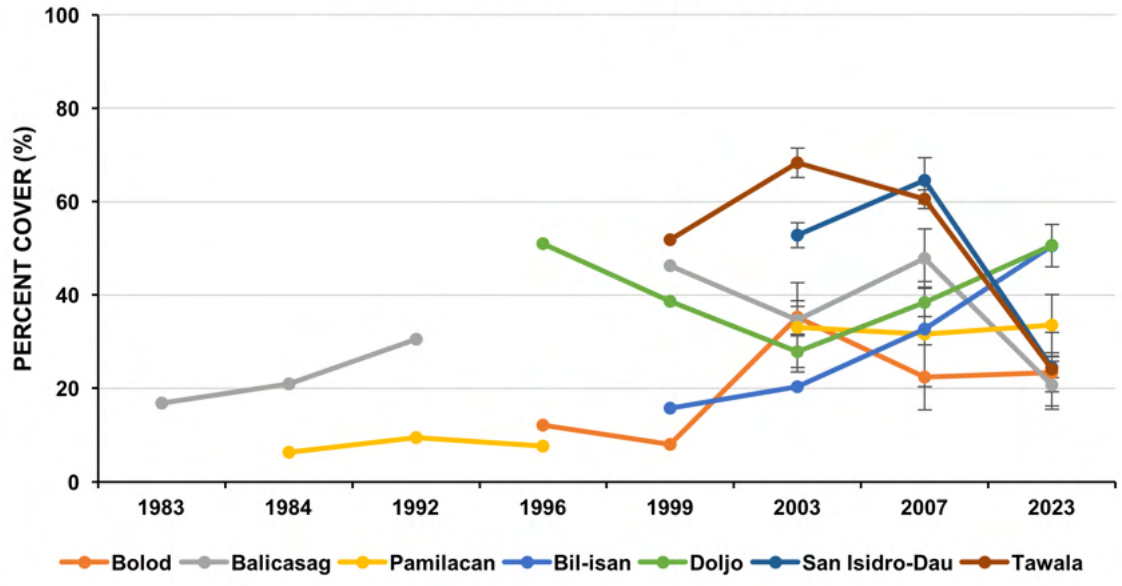

Figure 40. Changes in Live Hard Coral cover (% mean ±SE) in seven selected MPA sites in Bohol from 2003 to 2023 (6-8m depth).

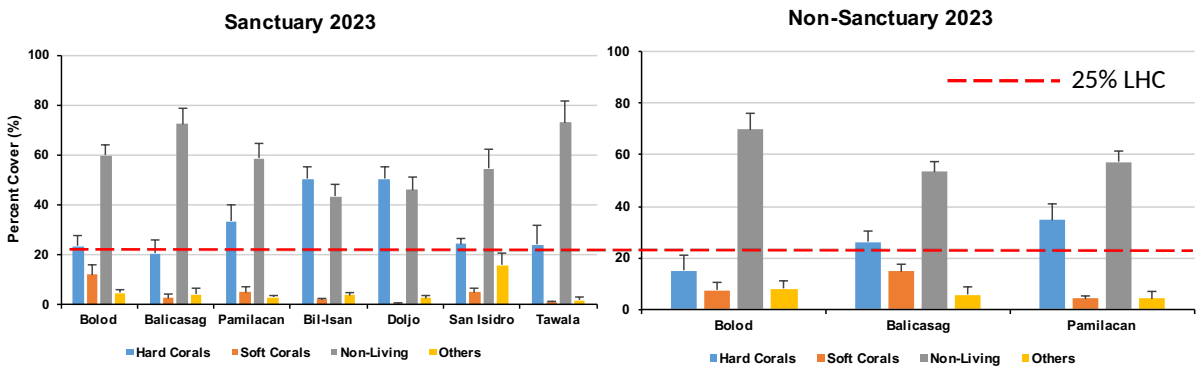

Figure 41. Substrate comparison (% mean ±SE) in seven selected MPA SPR sites in Bohol of Year 2023 (6-8m depth).

The recent assessment (2023) of reef habitats in selected MPAs showed that most had LHC cover above 23% (Figure 41) which is slightly higher than the country's average hard coral cover of the country's average hard coral cover of 22.8% ± 1.2 SE (Licuanan et al. 2019). Balicasag Island Fish Sanctuary experienced a decline in LHC cover due to the impact of Super Typhoon Odette in December 2021. Local guide divers confirmed the change in LHC cover, and it was also observed that most MPA sites in the southern part of Panglao were affected by Typhoon Odette.

Snorkel data also suggests an increasing trend of non-living substrate, with only Bil-isan having a reef in good condition, and the lowest recorded non-living substrate compared to the rest of the surveyed MPAs (Figure 42). Based on our observations during the survey, Bil-isan had the strictest MPA enforcement compared to the other sites, and thus showing that strict MPA enforcement usually results in positive outcomes in reef conservation.

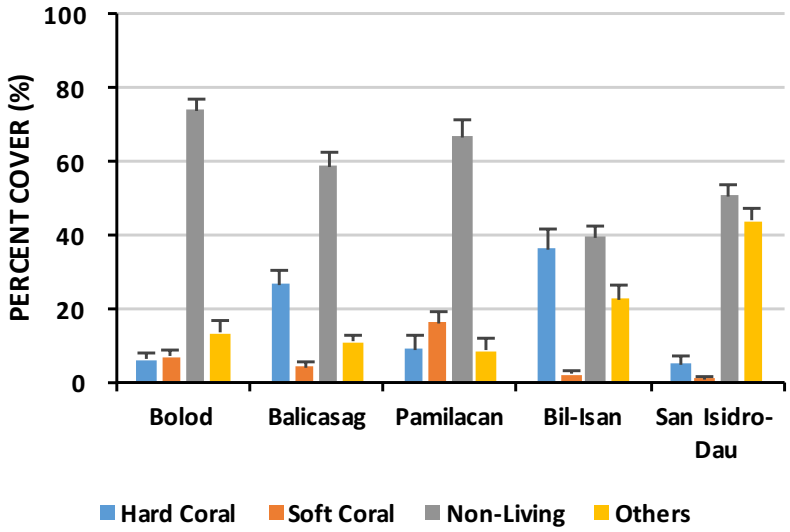

Figure 42. Substrate comparison (% mean ±SE) in five selected MPA SPR sites in Bohol of Year 2023 (3-5m depth).

Fish densities and species diversity varied across MPAs. Doljo, and Pamilacan Island had the highest recorded fish densities inside the MPA, followed by Balicasag Island, and Bolod. San Isidro-Dao had the lowest density recorded for 2023 (Figure 43).

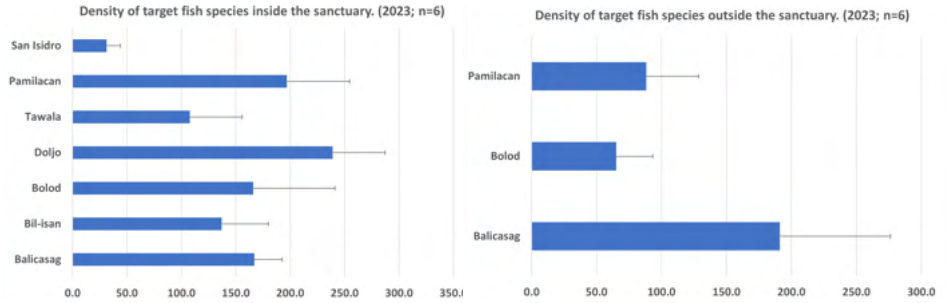

Figure 43. Target fish species density (individuals/500m^2) inside and outside the seven sites in Bohol 2023.

Both island MPAs (Balicasag Island, and Pamilacan Island) had the highest recorded species richness for the 2023 survey (Figure 44). Balicasag also had the highest number of species recorded outside the MPA. Islands often exhibit higher fish species diversity compared to mainland areas. This could be due to factors like diverse habitats within the island, or ocean currents and upwellings, which bring about nutrient rich waters in the surface, where coral reefs are found.

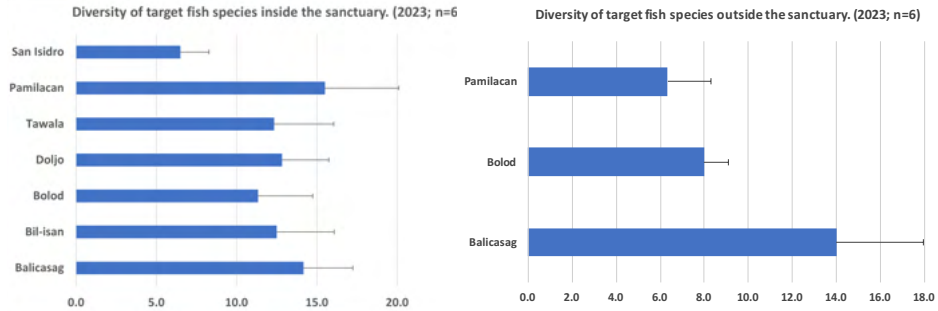

Figure 44. Target fish species richness (species/500m^2) inside and outside the seven sites in Bohol 2023.

Pamilacan Island, Balicasag Island, and Doljo also had the highest recorded biomass for 2023. San Isidro-Dao was recorded to have the lowest fish biomass (Figure 45). This indicates that enforcement of MPA rules and regulations played a crucial role in maintaining or improving fish populations.

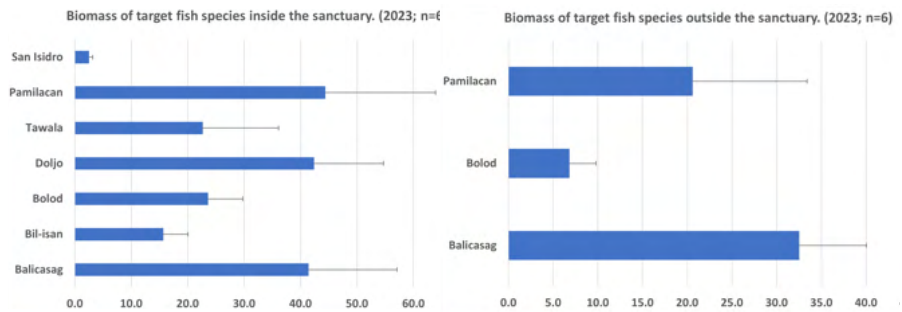

Figure 45. Target fish biomass (kg) inside and outside the seven sites in Bohol 2023.

RECOMMENDATIONS

The small marine protected areas and marine sanctuaries surveyed are all within the Bohol Marine Triangle, an area known for its healthy coral reefs, good diving and snorkeling with a growing economic dependence on marine tourism from both domestic and foreign visitors. In this context, it is essential to maintain the existing MPAs, and to expand them in some cases since the main economic income now for the larger Panglao area is from tourism and not fishing. Larger and better managed MPAs will also support improved fisheries in the area. Presently, the MPAs are too small and poorly managed to serve both the tourism and fishing sectors that dominate the area.

The declining trends in fish densities and biomass in most sites indicate a need to improve enforcement and require strong support from the local governments. It has been a recurrent lesson in coastal resource management that successful MPAs have to be strongly supported by the mayor and management bodies. To improve the MPAs in the southern Bohol area, we recommend the following:

1. Refine MPA management by resolving conflicts among management groups and between stakeholders. Conflict resolution is a tough task. It often requires a good facilitator who can communicate well and can facilitate discussions to evaluate matters and arrive at a fair compromise between parties. It is suggested that the respective municipal governments intervene to facilitate discussions to resolve existing conflicts. Community and barangay leaders need to lobby for the mayor's support to address problems and ensure long-term support from the municipal government.

2. Empower MPA management groups. It was observed that some of the management groups are weak in MPA management and enforcement.

3. Strengthen partnership of LGUs and community management groups. A few actions needed are:
a) LGU adoption of the MPA management plans. Budget and technical assistance can be allocated and provided systematically by the LGU if the management plans have administrative approval.

b) Initiate networking activities among MPAs within the southern Bohol area involving the management groups. On the ground-level, it will be beneficial to initiate networking activities in the form of periodic meetings that allows management groups to share their experiences and lessons learned. This will motivate the management groups to work persistently towards an area-wide common goal. Moreover, common MPA IEC programs and enforcement strategies could also be adopted by member MPAs. These networking activities could be facilitated and supported by the municipal governments of Panglao, Dauis, and Baclayon. Direct interaction between the mayors and the management groups could eliminate discord.

4. Develop a simple and practical user-fee system implementation framework coupled with strong institutional support. Panglao and Dauis are supposed to collect user-fees as stipulated in their MPA Ordinances. The municipal governments have not acted to implement this.

5. Assess MPA boundaries. It has been observed that the offshore MPA boundaries enclose mostly the reef flat or crest and not the slope. Fishers were observed fishing along the MPA slopes. This is detrimental to the fish stocks inside the MPA since many of the larger sizes of fish reside along the crest

to slope. If the larger sizes are depleted, this will lead to a non-functional MPA. Thus, MPA boundaries should be expanded as feasible and the placement of the marker buoys adjusted. In addition, it needs to evaluate the location of core zone whether it encloses habitats that require protection, and where protection efforts will be worthwhile.

6. Setting a minimum size for all no-take sanctuaries in the Bohol Marine Triangle of at least 10 hectares would serve to improve opportunities for fish densities and biomass to increase substantially inside the MPAs. This would improve benefits to fishers outside of the sanctuaries and ensure that boundaries are sufficiently far offshore to protect an entire coral reef area, including the reef slope into deeper water.

7. Education and awareness campaigns for the sanctuaries with a decreasing trend in management initiative and activities. It is vital for such sanctuaries which aim at reviving or retraining management bodies in terms of sanctuary planning and implementation.

8. Regular implementation and updating of the management rating system for each site and incorporation of coral and fish parameters to reflect the current management status and needs. Such results can assist management groups in creating proper policies and actions for MPA improvement.

9. When doable, conduct a regular management effectiveness assessment using the MPA-MEAT to update the management bodies on the status their respective MPAs. The results of this assessment will not only allow the managers to see an updated status of their MPAs, it will also provide them a clear roadmap as to where they need to focus their attention to offset their limitations to address current and emerging threats, strategically allocate their resources to maximize opportunities, and to sustainably improve management.

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Table 2. Changes in substrate composition (% mean ±SE) in Pamilacan Marine Sanctuary, Baclayon from 1984 to 2023.

TYPE OF SUBSTRATUM	Sanctuary												
	SCUBA							SNORKEL					
	1984	1992	1999	2003	2007	2023	% Change 2007-2023	1992	1999	2003	2007	2023	% Change 2007-2023
Non-living:													
Sand and silt	30.8	17.8	21.3	14.5	20.7	8.5	-58.9	22.8	19.7	18.1	15	19.5	30.0
Coral rubble	31.1	21.4	12.6	18.8	6.5	13.6	109.2	20	18.5	6.8	14.9	15	0.7
Rock and block	19.2	38.8	53.4	24.2	29	16.9	-41.7	33.3	45.3	47.4	39.4	25.5	-35.3
White dead standing coral	1.4	2.7	0.1	0.3	0.1	0.3	200.0	2.5	0	0	0.6	1	66.7
Dead coral with algae	0	~	3	2.1	5.4	19.3	257.4	0	3.1	0.1	0	5.8	+
SUBTOTAL non-living	**82.4**	**80.7**	**90.4**	**59.9**	**61.7**	**58.6**	**-5.0**	**78.7**	**86.6**	**72.5**	**70**	**66.8**	**-4.6**
Living:													
Hard coral:													
Branching	2.8	~	6.1	25.6	26.5	22.8	-14.0	4.4	~	3.1	2.3	5.3	130.4
Massive	3.3	~	0.8	3.6	2.2	3.2	45.5	3.9	~	1.9	0.6	1.5	150.0
Flat/Encrusting	0.2	~	0.4	2.9	2.7	4.9	81.5	0.7	~	0.4	0.2	1.5	650.0
Foliose/Cup	0	~	0.4	0.9	0.3	2.6	766.7	0.7	~	0.1	0	0.6	100.0
Subtotal hard coral	**6.3**	**9.5**	**7.7**	**33.1**	**31.6**	**33.5**	**6.0**	**9.7**	**4.1**	**5.5**	**3.1**	**8.9**	**187.1**
Soft coral	11.2	9.8	2.1	2.2	5.2	5	-3.8	11.7	9.4	19	21.5	16.1	-25.1
SUBTOTAL corals	**17.5**	**19.3**	**9.8**	**35.2**	**36.8**	**38.5**	**4.6**	**21.4**	**13.5**	**24.4**	**24.6**	**25**	**1.6**
Others:													
Other animals	~	~	~	0.4	0.5	0.6	20.0	~	~	0	1.3	1.1	-15.4
Seagrasses	0	0	0	0	0	0		0	10.8	0.3	1.1	5	354.5
Algae													
Fleshy	~	~	~	0.2	0.3	0.4	33.3	~	~	1.1	2.9	1.1	-62.1
Turf	~	~	~	1.2	0.2	1.5	650.0	~	~	0.7	0	0.9	100.0
Coralline	~	~	~	1.6	0	0.2	+	~	~	0.2	0.1	0.4	300.0
Sponges	~	~	~	1.6	0.7	0.2	-71.4	~	~	0.6	0.1	0	-100.0
SUBTOTAL others	**0**	**0**	**0**	**4.9**	**1.6**	**2.9**	**81.3**	**0**	**10.8**	**3.1**	**5.4**	**8.5**	**57.4**
GRAND TOTAL	**100**	**100**	**100**	**100**	**100**	**100**		**100**	**100**	**100**	**100**	**100**	
Other relevant information													
Slope (degrees)	~	~	11.7	76.9	39	~		~	~	5.7		12.5	
Topography*(m)	0.8	2	2.2	1.6	1	~		1.5	0.8	0		0.4	
Depth range/average(m)	7.2	6	5.9	7	7.3	6.4		3.8	2.6	2.9	2.4	2	
Visibility (m)	~	20	19	14.9	13.2	14.8		~	19.9	16.3	5.6	10.4	
Sample size (Transects)	2	16	18	9	6	5		11	11	10	11	10	

* 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								SNORKEL					
	1984	1985	1992	1999	2003	2007	2023	% Change 2007-2023	1992	1999	2003	% Change 2003-2007
Non-living:														
Sand and silt	~	37.6	32.1	34.5	52.6	61	9.1	-85.1	25.4	31.9	16.9	-47		
Coral rubble	~	15	13	21.3	23.2	8	18	125.0	15.5	10.5	3.7	-65.1		
Rock and block	~	21	19.1	19	6.4	9.8	9.1	-7.1	17.3	27.2	24.3	-10.8		
White dead standing coral	~	0.7	2.3	0.2	0.3	0	0.4	+	2.8	0.6	0.1	-91.7		
Dead coral with algae	~	0	~	5.3	1.8	0.9	20.4	2166.7	0	3.6	0.9	-75		
SUBTOTAL non-living	**61**	**74.2**	**66.5**	**80.3**	**84.4**	**79.7**	**57**	-28.5	**61**	**73.8**	**45.8**	**-38**		
Living:														
Hard coral:														
Branching	~	3.3	~	3.8	2.4	3.2	25.4	693.8	14.3	~	3	N/A		
Massive	~	2.2	~	1.7	0.4	0.9	1.9	111.1	4.6	~	3.8	N/A		
Flat/Encrusting	~	1	~	0.2	0	1	5.3	430.0	0.8	~	0.2	N/A		
Foliose/Cup	~	0.5	~	0	0.1	0.3	2.1	600.0	3.2	~	0.1	N/A		
Subtotal hard coral	**11**	**7**	**19.4**	**5.7**	**2.9**	**5.3**	**34.7**	554.7	**22.9**	**10.4**	**7.1**	**-31.9**		
Soft coral	28	18.8	13.4	14.3	10.8	9.8	4.1	-58.2	16	15.7	31.8	102.5		
SUBTOTAL corals	**39**	**25.8**	**32.8**	**20**	**13.7**	**15.1**	**38.8**	157.0	**38.8**	**26.1**	**38.9**	**48.9**		
Others:														
Other animals	~	~	~	~	0.3	0.4	0.9	125.0	~	~	0	N/A		
Seagrasses	0	0	0	0	0.2	0	0	0.0	0	29.9	4.6	-84.8		
Algae														
Fleshy	~	~	~	~	0.1	3.3	0.7	-78.8	~	~	6.8	N/A		
Turf	~	~	~	~	0.7	0.2	2.2	1000.0	~	~	1.4	N/A		
Coralline	~	~	~	~	0.1	0.5	0.1	-80.0	~	~	1.2	N/A		
Sponges	~	~	~	~	0.4	0.9	0.2	-77.8	~	~	1.4	N/A		
SUBTOTAL others	**0**	**0**	**0**	**0**	**1.8**	**5.3**	**4.1**	-22.6	**0**	**29.9**	**15.4**	**-48.7**		
GRAND TOTAL	**100**	**100**	**100**	**100**	**100**	**100**	**100**		**100**	**100**	**100**			
Other relevant information														
Slope (degrees)	~	~	~	0.7	8.3	90	12		~	2	3.3			
Topography*(m)	1	1	1	2.4	7	~	0.9		1.5	1.4	1.5			
Depth range/average(m)	6.7	7.5	7.5	5.4	7.1	6.8	7.3		3.2	2.8	2.6			
Visibility (m)	~	~	~	31.2	15	14.3	13.8		~	28.8	16.9			
Sample size (Transects)	4	4	3	6	9	7	6		11	14	12			

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

∞ Data not included in grand total (S26)

~ No data

Table 3. Incidence of butterflyfish species in sites surveyed in 1999, 2003, 2007 and 2023.

Butterflyfish species	Common Name	BOHOL																
		Pamilacan Marine Sanctuary					San Isidro-Dao Marine Sanctuary			Balicasag Marine Sanctuary					Bil-isan Marine Sanctuary			
		1992	1999	2003	2007	2023	2003	2007	2023	1992	1999	2003	2007	2023	1999	2003	2007	2023
Chaetodon adiergastos	Philippine butterflyfish	♣		♣						♣	♣	♣	♣	♣	♣			
Chaetodon auriga	Threadfin butterflyfish	♣	♣	♣	♣	♣	♣				♣			♣				
Chaetodon baronessa	Eastern triangular butterflyfish	♣	♣	♣	♣	♣	♣	♣	♣	♣	♣	♣	♣	♣	♣	♣	♣	♣
Chaetodon bennetti	Bluelashed butterflyfish	♣				♣				♣	♣	♣						
Chaetodon citrinellus	Speckled butterflyfish	♣		♣						♣								
Chaetodon ephippium	Saddle butterflyfish							♣						♣				
Chaetodon kleinii	Klein's butterflyfish	♣	♣	♣	♣	♣				♣	♣	♣	♣	♣		♣		♣
Chaetodon lineolatus	Lined butterflyfish	♣		♣				♣	♣	♣	♣	♣						
Chaetodon lunula	Raccoon butterflyfish	♣		♣			♣	♣		♣	♣	♣	♣	♣				
Chaetodon lunulatus	Redfin butterflyfish	♣	♣	♣	♣	♣	♣	♣		♣	♣	♣	♣	♣	♣	♣	♣	♣
Chaetodon melannotus	Blackback butterflyfish	♣	♣	♣				♣		♣	♣	♣	♣					
Chaetodon mertensii	Merten's butterflyfish																	
Chaetodon meyeri	Meyer's butterflyfish	♣								♣		♣		♣				
Chaetodon ocellicaudus	Spottail butterflyfish					♣					♣	♣	♣	♣			♣	
Chaetodon octofasciatus	Eightband butterflyfish						♣	♣							♣	♣	♣	♣
Chaetodon ornatissimus	Ornate butterflyfish	♣	♣	♣		♣	♣			♣	♣	♣		♣	♣		♣	
Chaetodon oxycephalus	Spot-nape butterflyfish										♣	♣		♣				
Chaetodon plebeius	Blueblotch butterflyfish		♣							♣				♣				
Chaetodon punctatofasciatus	Spotband butterflyfish	♣	♣				♣	♣			♣	♣	♣	♣				
Chaetodon rafflesi	Latticed butterflyfish	♣		♣		♣	♣	♣		♣	♣	♣	♣	♣		♣		
Chaetodon reticulatus	Mailed butterflyfish									♣	♣							
Chaetodon selene	Yellowdotted butterflyfish																	
Chaetodon semeion	Dotted butterflyfish																	
Chaetodon speculum	Mirror butterflyfish	♣		♣						♣		♣	♣	♣				
Chaetodon trifascialis	Chevron butterflyfish				♣			♣		♣	♣	♣	♣	♣			♣	♣
Chaetodon ulietensis	Pacific double saddle butterflyfish	♣	♣	♣						♣	♣	♣	♣	♣				
Chaetodon unimaculatus	Teardrop butterflyfish	♣										♣						
Chaetodon vagabundus	Vagabond butterflyfish	♣	♣	♣		♣	♣	♣	♣	♣	♣	♣	♣	♣				♣
Chaetodon xanthurus	Pearscale butterflyfish																	
Chelmon rostratus	Beaked coralfish														♣			
Forcipiger flavissimmus	Forcepsfish	♣	♣	♣	♣	♣	♣			♣	♣	♣	♣	♣		♣		
Forcipiger longirostris	Longnose butterflyfish		♣	♣		♣					♣			♣				
Hemitaurichthys polylepis	Pyramid butterflyfish	♣	♣	♣	♣	♣				♣	♣	♣	♣	♣				
Heniochus acuminatus	Pennant coralfish										♣	♣						
Heniochus chrysostomus	Threeband pennantfish	♣									♣	♣	♣			♣		
Heniochus diphreutes					♣													
Heniochus singularius	Singular bannerfish	♣				♣				♣	♣	♣	♣					
Heniochus varius	Horned bannerfish	♣	♣	♣	♣	♣	♣	♣	♣	♣	♣	♣	♣	♣	♣	♣	♣	♣
Parachaetodon ocellatus	Six spine butterflyfish																♣	
Coradion chrysozonus	Goldengirdled coralfish															♣		
Coradion melanopus	Two spot coralfish										♣					♣		
Total per site		23	14	18	9	14	11	12	4	22	26	25	18	22	7	10	8	7

Table 3. (Continued) Incidence of butterflyfish species in sites surveyed in 1999, 2003, 2007 and 2023.

Butterflyfish species	Common Name	BOHOL											
		Bolod Marine Sanctuary				Doljo Marine Sanctuary				Tawala Marine Sanctuary			
		1999	2003	2007	2023	1999	2003	2007	2023	1999	2003	2007	2023
Chaetodon adiergastos	Philippinebutterflyfish	♣	♣	♣		♣							
Chaetodon auriga	Threadfinbutterflyfish		♣				♣			♣	♣	♣	
Chaetodon baronessa	Easterntriangularbutterflyfish		♣	♣	♣	♣	♣	♣	♣	♣	♣	♣	♣
Chaetodon bennetti	Bluelashedbutterflyfish												
Chaetodon citrinellus	Speckledbutterflyfish												
Chaetodon ephippium	Saddlebutterflyfish				♣		♣					♣	
Chaetodon kleinii	Klein's butterflyfish		♣	♣	♣	♣	♣	♣	♣	♣	♣	♣	
Chaetodon lineolatus	Linedbutterflyfish					♣		♣		♣		♣	
Chaetodon lunula	Raccoonbutterflyfish		♣				♣		♣		♣	♣	♣
Chaetodon lunulatus	Redfin butterflyfish				♣	♣	♣	♣	♣	♣	♣	♣	♣
Chaetodon melannotus	Blackbackbutterflyfish		♣		♣		♣					♣	
Chaetodon mertensii	Merten's butterflyfish												
Chaetodon meyeri	Meyer's butterflyfish		♣			♣							
Chaetodon ocellicaudus	Spottailbutterflyfish		♣		♣	♣	♣	♣	♣		♣		
Chaetodon octofasciatus	Eightbandbutterflyfish					♣	♣	♣			♣	♣	
Chaetodon ornatissimus	Ornatebutterflyfish					♣	♣						♣
Chaetodon oxycephalus	Spot-napebutterflyfish	♣	♣				♣					♣	
Chaetodon plebeius	Blueblotchbutterflyfish												
Chaetodon punctatofasciatus	Spotbandbutterflyfish			♣			♣	♣		♣	♣	♣	
Chaetodon rafflesi	Latticedbutterflyfish		♣			♣	♣	♣	♣	♣	♣	♣	♣
Chaetodon reticulatus	Mailed butterflyfish		♣			♣				♣			♣
Chaetodon selene	Yellowdottedbutterflyfish												
Chaetodon semeion	Dotted butterflyfish						♣	♣				♣	
Chaetodon speculum	Mirror butterflyfish		♣	♣			♣						
Chaetodon trifascialis	Chevronbutterflyfish									♣	♣	♣	♣
Chaetodon ulietensis	Pacificdoublesaddlebutterflyfish									♣			
Chaetodon unimaculatus	Teardropbutterflyfish												
Chaetodon vagabundus	Vagabondbutterflyfish		♣	♣	♣		♣	♣	♣	♣	♣		♣
Chaetodon xanthurus	Pearscalebutterflyfish												
Chelmon rostratus	Beakedcoralfish												
Forcipiger flavisimmus	Forcepsfish		♣										
Forcipiger longirostris	Longnosebutterflyfish			♣			♣						♣
Hemitaurichthys polylepis	Pyramid butterflyfish		♣					♣					
Heniochus acuminatus	Pennantcoralfish				♣	♣							
Heniochus chrysostomus	Threebandpennantfish					♣	♣			♣			
Heniochus diphreutes													
Heniochus singularius	Singularbannerfish	♣				♣	♣				♣		
Heniochus varius	Horned bannerfish	♣	♣	♣	♣	♣	♣	♣	♣	♣	♣	♣	♣
Parachaetodon ocellatus	Sixspinebutterflyfish												
Coradion chrysozonus	Goldengirdledcoralfish			♣			♣	♣	♣	♣			
Coradion melanopus	Twospotcoralfish												
Total per site		**4**	**16**	**9**	**9**	**15**	**21**	*13*	**9**	**14**	**13**	**15**	**10**

Table 4. Fish species list for 2023

	Species	Pamilacan	San Isidro	Balicasag	Bil-isan	Bolod	Doljo	Tawala
Acanthuridae - surgeonfishes								
	Acanthurus japonicus	✓	✓	✓			✓	✓
	Acanthurus lineatus			✓				
	Acanthurus mata	✓						
	Acanthurus nigricans	✓	✓	✓			✓	✓
	Acanthurus nigricaudus			✓				
	Acanthurus nigrofuscus	✓	✓	✓	✓	✓	✓	
	Acanthurus pyroferus	✓	✓	✓	✓	✓	✓	✓
	Acanthurus thompsoni			✓		✓		
	Acanthurus xanthopterus			✓		✓		
	Ctenochaetus binotatus	✓	✓	✓	✓	✓	✓	✓
	Ctenochaetus cyanocheilus	✓				✓		
	Ctenochaetus sp.					✓		
	Ctenochaetus striatus	✓	✓	✓	✓	✓	✓	✓
	Ctenochaetus tomienensis			✓				
	Ctenochaetus tominiensis	✓		✓		✓		✓
	Naso caeruleacauda	✓					✓	✓
	Naso hexacanthus	✓		✓	✓	✓	✓	✓
	Naso lituratus	✓	✓	✓	✓	✓	✓	✓
	Naso lopezi	✓					✓	
	Naso minor	✓		✓	✓	✓		
	Naso unicornis	✓	✓	✓		✓	✓	✓
	Naso vlamingii	✓		✓			✓	
	Zebrasoma scopas	✓	✓	✓	✓	✓	✓	✓
Anthiinae - anthias								
	Pseudanthias huchti	✓	✓	✓	✓	✓	✓	✓
	Pseudanthias tuka	✓	✓	✓	✓	✓	✓	
Apogonidae - cardinalfishes								
	Apogon aureus	✓			✓	✓	✓	
	Apogon bandanensis			✓				
	Apogon sealei				✓			
	Cheilodipterus macrodon	✓						
	Cheilodipterus quinquelineatus				✓	✓	✓	
	Sphaeramia nematoptera						✓	
Aulostomidae-trumpetfishes								
	Aulostomus chinensis	✓		✓	✓	✓		✓
Balistidae - triggerfishes								
	Balistapus undulatus	✓	✓	✓	✓	✓	✓	✓
	Balistoides viridescens			✓		✓		
	Melichthys niger			✓		✓		✓
	Melichthys vidua	✓	✓	✓	✓	✓	✓	✓
	Odonus niger			✓		✓	✓	
	Sufflamen bursa				✓	✓	✓	
	Sufflamen chrysopterus	✓						✓
Belonidae - needlefishes								
	Tylosurus crocodilus							✓
Blenniidae - blennies								
	Meiacanthus atrodorsalis	✓	✓			✓		
	Meiacanthus grammistes		✓	✓	✓			✓
	Plagiotremus rhinorhynchos	✓						✓
	Plagiotremus tapeinosoma			✓				
Caesionidae - fusiliers								
	Caesio caerulaurea	✓		✓	✓	✓	✓	✓
	Caesio cuning					✓		
	Caesio lunaris						✓	
	Caesio teres	✓		✓		✓	✓	
	Pterocaesio marri	✓						
	Pterocaesio pisang	✓	✓	✓	✓	✓	✓	
	Pterocaesio randalli	✓						
	Pterocaesio tile	✓	✓	✓		✓	✓	✓
Carangidae - jacks, trevallies								
	Carangoides bajad	✓						
	Carangoides ferdau			✓			✓	
	Caranx melampygus	✓						
	Caranx sexfasciatus			✓		✓		
	Elagatis bipinnulatus					✓		
	Scomberoides lysan			✓				
Centriscidae - shrimpfishes								
	Centriscus scutatus		✓					

Table 4. Fish species list for 2023

	Species	Pamilacan	San Isidro	Balicasag	Bil-isan	Bolod	Doljo	Tawala
Chaetodontidae - butterfyfishes								
	Chaetodon adiergastos	✓		✓	✓			
	Chaetodon auriga						✓	
	Chaetodon baronessa	✓	✓	✓	✓	✓	✓	✓
	Chaetodon bennetti		✓	✓	✓			
	Chaetodon citrinellus			✓	✓			
	Chaetodon ephippium	✓		✓	✓			
	Chaetodon kleinii	✓	✓	✓	✓	✓	✓	✓
	Chaetodon lunula	✓		✓	✓		✓	
	Chaetodon lunulatus	✓	✓	✓	✓	✓	✓	✓
	Chaetodon melannotus	✓	✓			✓	✓	✓
	Chaetodon meyeri			✓				
	Chaetodon ocellicaudus	✓	✓	✓	✓	✓		
	Chaetodon ornatissimus	✓	✓	✓	✓	✓		✓
	Chaetodon oxycephalus			✓				
	Chaetodon punctatofasciatus	✓	✓	✓	✓	✓		✓
	Chaetodon rafflesi	✓	✓	✓	✓	✓	✓	✓
	Chaetodon reticulatus					✓		
	Chaetodon speculum	✓		✓			✓	
	Chaetodon trifascialis		✓	✓				
	Chaetodon ulietensis	✓		✓	✓	✓	✓	
	Chaetodon unimaculatus						✓	
	Chaetodon vagabundus	✓	✓		✓	✓	✓	✓
	Chaetodon xanthurus		✓					
	Coradion melanopus					✓	✓	
	Forcipiger flavissimus	✓	✓	✓	✓	✓	✓	✓
	Hemitaurichthys polylepis	✓		✓	✓	✓	✓	
	Heniochus chrysostomus	✓		✓		✓		
	Heniochus singularis			✓				
	Heniochus varius	✓	✓	✓	✓	✓	✓	✓
Cirrhitidae - hawkfishes								
	Cirrhitichthys falco		✓		✓	✓	✓	
	Paracirrhites arcatus						✓	
	Paracirrhites forsteri			✓				
Echeneidae - remoras								
	Echeneis naucrates		✓					
Fistulariidae - cornetfishes								
	Fistularia commersoni			✓				
Gobiidae - gobies								
	Valenciennea strigata	✓		✓				
Haemulidae - sweetlips								
	Plectorhinchus chaetodonoides		✓	✓				
	Plectorhinchus lineatus							✓
Holocentridae - squirrelfishes								
	Myripristis adusta	✓						
	Myripristis botche	✓						
	Myripristis hexagona	✓				✓		✓
	Myripristis kuntee	✓						
	Sargocentron diadema	✓		✓			✓	
	Sargocentron spiniferum		✓		✓			
Kyphosidae - rudderfishes								
	Kyphosus bigibbus			✓	✓			✓
	Kyphosus cinerascens			✓				
Labridae - wrasses								
	Anampses meleagrides					✓		
	Anampses neoguinaicus				✓		✓	
	Anampses twistii		✓		✓	✓		
	Bodianus axillaris					✓	✓	
	Bodianus diana	✓		✓		✓	✓	
	Bodianus mesothorax	✓	✓	✓		✓	✓	✓
	Cheilinus chlorourus		✓	✓				✓
	Cheilinus fasciatus	✓		✓	✓	✓	✓	
	Cheilinus trilobatus		✓	✓	✓	✓	✓	✓
	Cheilinus undulatus			✓		✓		
	Cheilio inermis	✓	✓	✓		✓		
	Choerodon anchorago					✓	✓	✓
	Cirrhilabrus cyanopleura	✓	✓	✓	✓	✓	✓	
	Cirrhilabrus exquisitus	✓			✓	✓		
	Cirrhilabrus katherinae		✓					
	Coris batuensis	✓		✓	✓	✓	✓	
	Coris gaimard	✓		✓	✓	✓	✓	✓
	Epibulus insidiator	✓	✓		✓	✓	✓	✓
	Gomphosus varius	✓	✓	✓	✓	✓	✓	
	Halichoeres chrysus				✓	✓	✓	
	Halichoeres hortulanus		✓	✓	✓	✓	✓	✓

Table 4. Fish species list for 2023

Species	Pamilacan	San Isidro	Balicasag	Bil-isan	Bolod	Doljo	Tawala
Halichoeres melanurus		✓	✓	✓	✓	✓	✓
Halichoeres p	✓		✓				
Halichoeres prosopeion				✓	✓		
Halichoeres richmondi			✓				✓
Halichoeres s	✓	✓	✓	✓	✓		
Halichoeres solorensis					✓		
Halichoeres nigrescens							✓
Hemigymnus	✓	✓	✓		✓		✓
Hemigymnus	✓			✓	✓	✓	✓
Hologymnosus annulatus			✓		✓	✓	✓
Hologymnosus doliatus			✓				
Labrichthys u	✓	✓	✓	✓	✓	✓	✓
Labroides bic	✓	✓			✓	✓	
Labroides dim	✓	✓	✓	✓	✓	✓	✓
Labroides pec	✓				✓		✓
Labropsis alleni				✓	✓		
Macropharyngodon meleag	✓		✓	✓	✓	✓	✓
Macropharyngodon negrosensis				✓			
Novaculichth	✓		✓		✓	✓	✓
Oxycheilinus	✓	✓	✓	✓	✓		
Oxycheilinus	✓	✓		✓	✓	✓	✓
Oxycheilinus rhodochrous							✓
Oxycheilinus unifasciatus			✓				
Pseudocheilinus evanidus		✓	✓		✓		
Pseudocheilin	✓		✓	✓			✓
Stethojulis ba	✓	✓	✓		✓	✓	
Stethojulis trilineata		✓	✓				✓
Thalassoma h	✓	✓	✓	✓	✓	✓	✓
Thalassoma jansenii				✓	✓	✓	
Thalassoma l	✓	✓	✓	✓	✓	✓	✓
Thalassoma l	✓	✓	✓	✓	✓		
Lethrinidae - emperorfishes							
Gnathodente	✓		✓	✓			
Lethrinus erythropterus			✓	✓	✓		✓
Lethrinus harak			✓				
Lethrinus lentjan				✓	✓		
Lethrinus olivaceus						✓	
Lethrinus sp.						✓	
Monotaxis gr	✓		✓	✓	✓	✓	✓
Lutjanidae - snappers							
Aphareus furca			✓				
Lutjanus bigu	✓			✓			
Lutjanus bohar			✓				
Lutjanus decu	✓		✓	✓	✓	✓	✓
Lutjanus ehre	✓				✓		
Lutjanus fulviflamma							✓
Lutjanus fulvus			✓	✓			
Lutjanus gibb	✓						
Lutjanus monostigma		✓	✓			✓	✓
Macolor macularis		✓	✓	✓	✓		✓
Macolor niger			✓				
Monacanthidae - filefishes							
Aluterus scrip	✓		✓				
Amanses scopas					✓		
Cantherhines pardalis					✓		
Mullidae - goatfishes							
Mulloidichth	✓				✓		
Mulloidichthys sp.			✓				
Mulloidichth	✓		✓				
Parupeneus barberinoides			✓		✓		
Parupeneus b	✓	✓	✓	✓	✓		✓
Parupeneus b	✓	✓	✓	✓	✓	✓	✓
Parupeneus bifasciatus			✓		✓		
Parupeneus c	✓		✓	✓	✓		
Parupeneus m	✓	✓	✓	✓	✓	✓	✓
Upeneus tragula			✓				
Muraenidae - moray eels							
Echidna nebulosa					✓		
Nemipteridae - breams							
Pentapodus aureofasciatus					✓		
Scolopsis bilir	✓	✓	✓	✓	✓	✓	✓
Scolopsis bilir	✓		✓	✓			
Scolopsis ciliata					✓		
Scolopsis lineatus		✓					
Scolopsis margaritifer			✓				
Scolopsis sp.	✓	✓	✓	✓	✓		✓
Scolopsis trili	✓	✓			✓	✓	✓

Table 4. Fish species list for 2023

	Species	Pamilacan	San Isidro	Balicasag	Bil-isan	Bolod	Doljo	Tawala
Ostraciidae - boxfishes								
	Ostracion cubicus	✓	✓	✓				✓
	Ostracion meleagris	✓	✓	✓				
	Ostracion solorensis	✓						✓
Pempheridae - sweepers								
	Pempheris adusta				✓			
	Pempheris vanicolensis					✓		
Pholidichthyidae - convict blennies								
	Pholidichthys leucotaenia	✓	✓					
Pinguipedidae - sand perches								
	Parapercis clathrata	✓						
	Parapercis cylindrica	✓						
Pomacanthidae - angelfishes								
	Apolemichthys trimaculatus	✓				✓		
	Centropyge bicolor	✓	✓		✓	✓	✓	
	Centropyge bispinosus	✓				✓		
	Centropyge nox	✓			✓			
	Centropyge tibicen	✓				✓		
	Centropyge vrolikii	✓	✓	✓	✓	✓	✓	✓
	Chaetodontoplus mesoleucus					✓	✓	✓
	Pomacanthus imperator	✓		✓				
	Pomacanthus navarchus			✓				
	Pomacanthus semicirculatus	✓		✓				
	Pygoplites diacanthus	✓	✓	✓	✓	✓	✓	✓
Pomacentridae - damselfishes								
	Abudefduf sexfasciatus				✓	✓		✓
	Abudefduf vaigiensis	✓	✓		✓	✓	✓	✓
	Amblyglyphidodon aureus	✓	✓	✓	✓	✓	✓	✓
	Amblyglyphidodon curacao	✓	✓	✓	✓	✓	✓	✓
	Amblyglyphidodon leucogaster	✓	✓	✓	✓	✓	✓	✓
	Amblyglyphidodon sp.			✓				
	Amphiprion clarkii	✓	✓	✓	✓	✓	✓	✓
	Amphiprion frenatus	✓	✓	✓	✓	✓	✓	✓
	Amphiprion ocellaris					✓		
	Amphiprion perideraion	✓	✓	✓		✓		✓
	Amphiprion sandaracinos			✓		✓		
	Chromis alpha	✓	✓			✓		
	Chromis amboinensis	✓	✓	✓	✓	✓	✓	✓
	Chromis analis			✓	✓	✓	✓	
	Chromis atripectoralis							✓
	Chromis atripes	✓			✓	✓		
	Chromis caudalis				✓	✓		
	Chromis margaritifer	✓	✓	✓	✓	✓	✓	✓
	Chromis opercularis				✓	✓	✓	
	Chromis retrofasciata	✓	✓	✓	✓	✓	✓	✓
	Chromis ternatensis	✓	✓	✓	✓	✓	✓	✓
	Chromis viridis	✓		✓	✓	✓	✓	✓
	Chromis weberi	✓		✓		✓	✓	
	Chromis xanthura	✓	✓	✓	✓	✓	✓	✓
	Chrysiptera cyanea	✓	✓	✓	✓	✓		✓
	Chrysiptera parasema			✓		✓		
	Chrysiptera rollandi	✓		✓				
	Chrysiptera springeri				✓		✓	
	Chrysiptera talboti	✓	✓	✓	✓	✓	✓	✓
	Dascyllus aruanus	✓		✓	✓	✓	✓	✓
	Dascyllus melanurus	✓		✓				
	Dascyllus reticulatus	✓		✓	✓	✓	✓	✓
	Dascyllus trimaculatus	✓	✓	✓	✓	✓	✓	✓
	Dischistodus melanotus	✓						✓
	Dischistodus perspicillatus	✓						
	Hemiglyphidodon plagiometopon	✓		✓				✓
	Neoglyphidodon melas	✓	✓		✓			✓
	Neoglyphidodon nigroris	✓	✓	✓	✓	✓	✓	✓
	Neoglyphidodon polyacanthus	✓						
	Neoglyphidodon thoracotaeniatus	✓			✓			
	Neogylphidodon thoracotaeniatus	✓						
	Plectroglyphidodon lacrymatus	✓	✓	✓	✓	✓	✓	✓
	Pomacentrus alexanderae	✓	✓	✓	✓		✓	✓
	Pomacentrus amboinensis	✓	✓	✓	✓	✓	✓	
	Pomacentrus bankanensis	✓	✓	✓		✓	✓	
	Pomacentrus brachialis	✓	✓	✓	✓	✓	✓	✓
	Pomacentrus burroughi	✓			✓		✓	
	Pomacentrus coelestis	✓		✓		✓	✓	
	Pomacentrus lepidogenys	✓	✓	✓		✓	✓	✓
	Pomacentrus moluccensis	✓	✓	✓	✓	✓	✓	✓
	Pomacentrus nigromarginatus				✓	✓		

Table 4. Fish species list for 2023

Species	Pamilacan	San Isidro	Balicasag	Bil-isan	Bolod	Doljo	Tawala
Pomacentrus philippinus	✓	✓	✓	✓	✓	✓	✓
Pomacentrus simsiang		✓					✓
Pomacentrus stigma	✓	✓	✓	✓	✓		✓
Pomacentrus vaiuli	✓	✓	✓				
Premnas biaculeatus						✓	
Pseudochromidae - dottybacks							
Labracinus cyclophthalmus			✓				✓
Pseudochromis diadema		✓		✓	✓		
Ptereleotridae - dartfishes							
Nemateleotris magnifica			✓				
Ptereleotris evides	✓			✓	✓		
Ptereleotris heteroptera			✓				
Scaridae - parrotfishes							
Cetoscarus bicolor	✓		✓		✓		✓
Chlorurus bleekeri	✓	✓	✓	✓	✓	✓	✓
Chlorurus bowersi	✓				✓		
Chlorurus microrhinos	✓					✓	
Chlorurus sordidus	✓	✓		✓	✓	✓	✓
Hipposcarus longiceps	✓						
Scarus chameleon	✓		✓	✓	✓	✓	✓
Scarus dimidiatus	✓		✓	✓	✓		✓
Scarus dimitiatus	✓						
Scarus flavipectoralis	✓		✓	✓		✓	
Scarus forsteni	✓		✓	✓		✓	
Scarus frenatus							✓
Scarus ghobban	✓		✓		✓	✓	✓
Scarus globiceps		✓					
Scarus hypselopterus			✓	✓		✓	✓
Scarus longiceps		✓			✓		
Scarus niger	✓	✓	✓	✓		✓	✓
Scarus oviceps	✓	✓	✓				✓
Scarus psittacus							✓
Scarus rubroviolaceus	✓		✓		✓		
Scarus russelii					✓		
Scarus schlegeli	✓		✓	✓		✓	✓
Scarus sp.	✓	✓	✓	✓	✓	✓	✓
Scarus tricolor	✓		✓	✓	✓		
Scombridae - tuna, mackerels							
Katsuwonus pelamis							✓
Rastrelliger kanagurta			✓			✓	
Scorpaenidae = lionfishes							
Pterois antennata	✓						
Pterois volitans					✓		
Serranidae - groupers							
Cephalopholis argus	✓		✓		✓		✓
Cephalopholis boenak			✓	✓	✓		
Cephalopholis cyanostigma	✓	✓	✓		✓		✓
Cephalopholis leopardus			✓	✓	✓	✓	✓
Cephalopholis microprion	✓	✓	✓	✓	✓	✓	✓
Cephalopholis miniata				✓			
Cephalopholis sexmaculata	✓				✓		
Epinephelus fasciatus				✓			
Epinephelus merra		✓	✓	✓	✓		
Epinephelus urodeta	✓		✓	✓	✓	✓	
Plectropomus leopardus			✓				
Siganidae - rabbitfishes							
Siganus canaliculatus		✓					
Siganus corallinus					✓		
Siganus doliatus				✓	✓		✓
Siganus guttatus						✓	✓
Siganus puellus			✓				✓
Siganus punctatissimus			✓				
Siganus unimaculatus	✓			✓		✓	
Siganus virgatus	✓		✓			✓	✓
Siganus vulpinus	✓		✓	✓		✓	✓
Synodontidae - lizardfishes							
Saurida gracilis			✓	✓			
Synodus variegatus					✓		
Tetraodontidae - pufferfishes							
Arothron nigropunctatus	✓	✓	✓	✓	✓	✓	✓
Canthigaster papua	✓				✓		
Canthigaster valentini		✓	✓			✓	
Zanclidae - moorish idol							
Zanclus cornutus	✓	✓	✓	✓	✓	✓	✓
Grand Total	191	120	200	149	188	140	134

Table 5. Mean (±SE) fish species richness (species/500m^2) and density (individuals/500m^2) per family in Pamilacan Marine Sanctuary in 2023.

FAMILY	Sanctuary n = 6								Non-Sanctuary n = 6							
	# of species	SE	Count per size class (Abundance) 1-10 cm**	11-20 cm	21-30 cm	>30 cm	Total abundance	SE	# of species	SE	Count per size class (Abundance) 1-10 cm**	11-20 cm	21-30 cm	>30 cm	Total abundance	SE
Surgeonfish (*Acanthurids*)*	4.5	1.0	1.3	73.2	11.0	2.7	88.2	21.9	1.8	0.4	0.0	18.3	0.0	3.3	21.7	10.8
Rabbitfish (*Siganids*)*	0.5	0.3	0.0	1.0	0.2	0.0	1.2	1.0	0.2	-	0.0	0.2	0.0	0.0	0.2	0.2
Groupers (*Serranids*)*	0.8	0.5	0.2	1.0	0.3	0.0	1.5	1.0	0.5	0.3	0.0	1.5	0.2	0.0	1.7	1.3
Barramundi Cod	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Snapper (*Lutjanids*)*	0.7	0.2	0.0	2.5	0.2	0.7	3.3	2.3	0.5	0.0	0.0	2.3	14.2	10.0	26.5	15.1
Sweetlips (*Haemulids*)	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Emperors (*Lethrinids*)*	0.3	-	0.0	2.2	0.0	0.0	2.2	2.2	0.2	-	0.0	0.0	0.3	0.0	0.3	0.3
Jacks (*Carangids*)*	0.3	0.0	0.0	0.0	0.2	0.8	1.0	0.8	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Fusiliers (*Caesionids*)*	1.2	0.2	0.0	46.7	9.0	0.0	55.7	41.4	0.3	0.0	13.3	1.7	0.0	0.0	15.0	13.1
Spinecheeks (*Nemipterids*)*	0.7	0.0	0.5	1.3	0.0	0.0	1.8	0.9	0.2	-	0.0	0.7	0.0	0.0	0.7	0.7
Goatfish (*Mullids*)*	1.3	1.2	0.0	10.5	1.0	0.0	11.5	10.3	0.3	-	0.0	7.7	0.0	0.0	7.7	7.7
Parrotfish (*Scarids*)*	4.0	1.2	1.7	6.7	12.2	7.0	27.5	10.5	1.7	0.7	0.0	6.8	0.8	0.7	8.3	4.8
Bumphead parrotfish	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Rudderfish (*Kyphosids*)*	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Triggerfish (*Balistids*)	0.8	0.2	0.2	3.0	1.2	0.0	4.3	2.3	0.5	0.3	0.0	6.8	0.0	0.0	6.8	6.4
Butterflyfish (*Chaetodontids*)	4.8	1.9	1.7	22.0	0.0	0.0	23.7	11.2	2.3	0.5	0.0	8.5	0.0	0.0	8.5	3.8
Angelfish (*Pomacanthids*)	2.0	0.5	6.8	3.5	0.0	0.0	10.3	5.9	1.5	0.3	8.2	2.2	0.2	0.0	10.5	5.7
Wrasses (*Labrids*)	5.7	1.9	20.8	6.7	0.3	0.0	27.8	13.4	2.0	0.7	8.0	2.2	0.0	0.0	10.2	7.1
Humphead wrasse	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Damselfish (*Pomacentrids*)	10.8	3.6	1213.0	187.7	0.0	0.0	1400.7	703.6	12.7	2.4	1317.8	72.2	0.0	0.0	1390.0	479.6
Fairy Basslets (*Anthids*)	1.3	0.2	453.8	5.0	0.0	0.0	458.8	282.9	0.8	0.2	88.0	0.0	0.0	0.0	88.0	48.6
Moorish Idol (*Zanclids*)	0.7	0.0	0.0	2.2	0.0	0.0	2.2	0.9	0.5	0.0	0.0	4.0	0.0	0.0	4.0	2.3
Total (all reef species)	**40.5**	**6.8**	**1700.0**	**375.0**	**35.5**	**11.2**	**2121.7**	**681.1**	**26.0**	**4.2**	**1435.3**	**135.0**	**15.7**	**14.0**	**1600.0**	**448.7**
Total (target reef species)*	**14.3**	**4.8**	**2.3**	**145.0**	**34.0**	**11.2**	**192.5**	**58.5**	**5.7**	**1.7**	**13.3**	**39.2**	**15.5**	**14.0**	**82.0**	**35.7**

Table 6. Mean (±SE) density (individuals/500m^2) and percentage change of fish families between years in Pamilacan Marine Sanctuary from 1985 to 2023.

FAMILY	Sanctuary							% Difference in abundance 2003-2023	Non-Sanctuary					% Difference in abundance 2003-2023
	1985	1986	1992	1999	2003	2007	2023		1985	1999	2003	2007	2023	
	n = 3	n=6	n = 3	n = 5	n = 4	n = 6	n=6		n = 11	n = 1	n = 4	n = 5	n=6	
Surgeonfish (*Acanthurids*)*	244.7	279.1	262.8	179.3	28.5	14.3	88.2	516.6	225.4	35	0.3	0.2	21.7	10733.3
Rabbitfish (*Siganids*)*	4	~	0.2	1	0.3	0	1.2	+	1.3	0	0	0.8	0.2	-79.2
Groupers (*Serranids*)*	0.3	2.1	3	1.3	1	0.5	1.5	200.0	0.5	0	0.3	0	1.7	+
Barramundi Cod	~	~	~	~	0	0	0.0	0.0		~	0	0	0.0	0.0
Snapper (*Lutjanids*)*	2	12.5	7	0.7	0.5	0.3	3.3	1011.1	5.6	3	0	0	26.5	+
Sweetlips (*Haemulids*)	0	4.8	2	0	0.8	0	0.0	0.0	1	0	0	0	0.0	0.0
Emperors (*Lethrinids*)*	0	#	7.2	0	1	0	2.2	+	0.4	0	0	1	0.3	-66.7
Jacks (*Carangids*)*	3	2.7	0	0	11.5	0	1.0	+	0.8	0	0	0	0.0	0.0
Fusiliers (*Caesionids*)*	1205	765.2	173.2	225.3	175.5	121.7	55.7	-54.3	419.7	0	7.5	0	15.0	+
Spinecheeks (*Nemipterids*)*	6	#	4.4	3.7	0.8	2.7	1.8	-32.1	7.1	0	0	2.2	0.7	-69.7
Goatfish (*Mullids*)*	185	47.3	52.2	8	2	3.2	11.5	259.4	24.3	9	3	10.2	7.7	-24.8
Parrotfish (*Scarids*)*	65	60.6	71.4	129	38.3	13.3	27.5	106.8	103.7	0	6.8	1.6	8.3	420.8
Bumphead parrotfish	~	~	~	~	0	0	0.0	0.0		~	0	0	0.0	0.0
Rudderfish (*Kyphosids*)*	0	0	0	0	0	0	0.0	0.0	0	0	0	0	0.0	0.0
Triggerfish (*Balistids*)	2	2.5	3.6	7.3	1.5	1.2	4.3	261.1	6.2	0	0	0.2	6.8	3316.7
Butterflyfish (*Chaetodontids*)	35	34	25	18.7	7	5	23.7	373.3	34.1	4	3.3	3	8.5	183.3
Angelfish (*Pomacanthids*)	8.7	22.6	23.6	9.3	4.5	6.3	10.3	64.0	16.2	9	5.5	8.8	10.5	19.3
Wrasses (*Labrids*)	38	42.1	111	44.7	126	112.3	27.8	-75.2	55.4	87	92.3	75.2	10.2	-86.5
Humphead wrasse	~	~	~	~	0	0	0.0	0.0		~	0	0	0	0.0
Damselfish (*Pomacentrids*)	387	965.1	888	1458.3	1182.5	527	1400.7	165.8	1316.7	1381	1002.8	729	1390	90.7
Fairy Basslets (*Anthids*)	263	445.6	475.2	428.7	457.5	477.2	458.8	-3.8	336.4	138	57.5	303.6	88	-71.0
Moorish Idol (*Zanclids*)	9	8.7	7.2	2.3	3.5	0.2	2.2	983.3	7.5	0	0	0	4	0.0
Total (all reef species)	**2457.7**	**2694.9**	**2117**	**2517.6**	**2042.5**	**1285.2**	**2121.7**	**65.1**	**2562.2**	**1666**	**1179**	**1135.8**	**1600**	**40.9**
Total (target reef species)*	**1715**	**1174.3**	**583.4**	**548.3**	**254.5**	**154**	**192.5**	**25.0**	**789.8**	**47**	**17.8**	**16**	**82**	**412.5**

Table 7. Mean (±SE) fish species (species/500m^2) and percentage change between years in Pamilacan Marine Sanctuary from 1985 to 2023.

FAMILY	Sanctuary							% Difference in species 2003-2023	Non-Sanctuary					% Difference in species 2003-2023
	1985	1986	1992	1999	2003	2007	2023		1985	1999	2003	2007	2023	
	n =	n = 5	n = 3	n = 5	n = 4	n = 6	n = 6		n = 11	n = 1	n = 4	n = 5	n = 6	
Surgeonfish (*Acanthurids*)*	9.3	12.1	8.2	8.3	4.8	2.8	4.5	60.7	7	2	0.3	0.6	1.8	205.6
Rabbitfish (*Siganids*)*	0.7	0.7	0.2	0.3	0.3	0	0.5	-	0.4	0	0	0	0.2	-
Groupers (*Serranids*)*	0.3	1.6	1.4	0.7	0.8	0.5	0.8	66.7	0.5	0	0.3	0	0.5	-
Barramundi Cod	~	~	~	~	0	0	0.0	-	~	~	0	0	0.0	-
Snapper (*Lutjanids*)*	0.7	1.9	1.8	0.7	0.5	0.3	0.7	122.2	1.3	1	0	0	0.5	-
Sweetlips (*Haemulids*)	0	0.6	0.4	0	0.5	0	0.0	-	0.3	0	0	0	0.0	-
Emperors (*Lethrinids*)*	0	0.3	0.8	0	0.8	0	0.3	-	0.2	0	0	0.2	0.2	-16.7
Jacks (*Carangids*)*	0.3	0.7	0	0	1	0	0.3	-	0.1	0	0	0	0.0	-
Fusiliers (*Caesionids*)*	2.3	2.4	1.2	1	0.8	0.5	1.2	133.3	1.4	0	0.3	0	0.3	-
Spinecheeks (*Nemipterids*)*	0.7	0.6	0.8	0.7	0.8	0.7	0.7	-4.8	1.1	0	0	0.8	0.2	-79.2
Goatfish (*Mullids*)*	1	1	1	1	1	1.2	1.3	11.1	1	1	2.3	2.4	0.3	-86.1
Parrotfish (*Scarids*)*	1	1	1	1	6.3	3	4.0	33.3	1	0	2.3	0.6	1.7	177.8
Bumphead parrotfish	~	~	~	~	0	0	0.0	-	~	~	0	0	0.0	-
Rudderfish (*Kyphosids*)*	0	0	0	0	0	0	0.0	-	0	0	0	0	0.0	-
Triggerfish (*Balistids*)	1.3	1.3	0.8	2	0.8	0.5	0.8	66.7	1.5	0	0	0.2	0.5	150.0
Butterflyfish (*Chaetodontids*)	7.7	11.1	6	5.7	3	2.5	4.8	93.3	5.4	1	1.8	1.4	2.3	66.7
Angelfish (*Pomacanthids*)	6	2.7	3.2	3	2	1.3	2.0	53.8	2.4	1	1.8	1.6	1.5	-6.3
Wrasses (*Labrids*)	4.3	6	5.4	4.3	7.5	6.3	5.7	-10.1	5.3	7	9.3	8.8	2.0	-77.3
Humphead wrasse	~	~	~	~	0	0	0.0	-	~	~	0	0	0.0	-
Damselfish (*Pomacentrids*)	9	12.4	12.8	13.3	15.5	13.3	10.8	-18.5	10.5	16	8.8	9.2	12.7	37.7
Fairy Basslets (*Anthids*)	1.7	1.9	1.6	1.3	1.8	1.3	1.3	2.6	1.3	2	0.8	1.6	0.8	-47.9
Moorish Idol (*Zanclids*)	1	1	0.8	0.7	0.5	0.2	0.7	233.3	0.7	0	0	0	0.5	-
Total (all reef species)	**47.3**	**59.3**	**47.4**	**44**	**48.3**	**34.5**	**40.5**	17.4	**41.1**	**31**	**27.5**	**27.4**	**26.0**	-5.1
Total (target reef species)*	**16.3**	**22.9**	**16.8**	**13.7**	**17.3**	**9**	**14.3**	59.3	**14.2**	**4**	**5.3**	**4.6**	**5.7**	23.2

Table 8. Changes in substrate composition (% mean ±SE) in San Isidro-Dao Marine Sanctuary, Dauis from 2003 to 2023.

TYPE OF SUBSTRATUM	Sanctuary								Non-Sanctuary	
	SCUBA			% Change	SNORKEL			% Change	SCUBA	SNORKEL
	2003	2007	2023	2007-2023	2003	2007	2023	2007-2023	2003	2003
Non-living:										
Sand and silt	8.3	5.8	1.8	-69.0	15.5	15.9	24.8	56.0	22.9	19.5
Coral rubble	5.8	5.3	2.4	-54.7	6.2	6.9	16.6	140.6	7.2	5.1
Rock and block	7.2	9.3	24.6	164.5	11	39.5	8.8	-77.7	6.1	10.3
White dead standing coral	0.3	0	0	0.0	0.2	0.3	0.2	-33.3	0.2	0
Dead coral with algae	8.1	6.6	25.8	290.9	3.2	0.9	0.2	-77.8	9.2	2.2
SUBTOTAL non-living	**29.6**	**26.9**	**54.6**	103.0	**36**	**63.5**	**50.6**	-20.3	**45.5**	**37.1**
Living:										
Hard coral:										
Branching	26.7	34.1	7.8	-77.1	13.2	5.6	1.2	-78.6	22.6	3.1
Massive	11.7	12.5	4.2	-66.4	8.1	4.1	2.1	-48.8	11.2	4.4
Flat/Encrusting	11.2	12.2	11.3	-7.4	0.9	0.9	1.2	33.3	4.6	0
Foliose/Cup	3.3	5.8	1.3	-77.6	0.4	0.2	0.6	200.0	3.4	0.7
Subtotal hard coral	**52.8**	**64.5**	**24.6**	-61.9	**22.6**	**10.8**	**5.1**	-52.8	**41.8**	**8.2**
Soft coral	5.2	2.8	5.1	82.1	10.3	4.9	0.8	-83.7	3.5	5.7
SUBTOTAL corals	**57.9**	**67.3**	**29.7**	-55.9	**33**	**15.8**	**5.9**	-62.7	**45.3**	**13.8**
Others:										
Other animals	0.7	1	0.8	-20.0	0	0.3	0.5	66.7	0.4	0
Seagrasses	0.5	0	0	0.0	1.4	4	5	25.0	1	5.5
Algae										
Fleshy	3.4	0.5	5.8	1060.0	28.2	16.3	34.7	112.9	0.8	34.5
Turf	0.4	0	5.4	+	0.2	0	3.4	+	1.8	0.1
Coralline	6	3.8	3.4	-10.5	0.8	0.1	0.1	0.0	4.6	8.7
Sponges	1.5	0.5	0.5	0.0	0.4	0.1	0	-100.0	0.6	0.2
SUBTOTAL others	**12.5**	**5.8**	**15.9**	174.1	**31**	**20.8**	**43.7**	110.1	**9.3**	**49.1**
GRAND TOTAL	**100**	**100**	**100**		**100**	**100**	**100**		**100**	**100**
Other relevant information										
Slope (degrees)	88	69.2	90		8.2	16.7	~		70	5
Topography* (m)	1.9	2.4	~		2.3	1.1	~		0.8	~
Depth range/average (m)	7.7	7.4	5.4		3	3.1	1.9		7.3	2
Visibility (m)	13.2	13.5	17.3		15.2	19.8	~		14	13
Sample size (Transects)	16	6	6		19	11	13		6	5

* Mean distance between lowest and highest point on the horizontal

~ No data

Table 9. Mean (±SE) fish species richness (species/500m^2) and density (individuals/500m^2) per family in San Isidro-Dao Marine Sanctuary in 2023.

FAMILY	Sanctuary n = 6							
	# of species	SE	Count per size class (Abundance)				Total abundance	SE
			1-10 cm**	11-20 cm	21-30 cm	>30 cm		
Surgeonfish (*Acanthurids*)*	2.0	1.1	0.7	10.5	0.0	0.0	11.2	9.0
Rabbitfish (*Siganids*)*	0.2	-	0.0	0.8	0.0	0.0	0.8	0.8
Groupers (*Serranids*)*	0.5	-	0.0	0.8	0.0	0.0	0.8	0.8
Barramundi Cod	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Snapper (*Lutjanids*)*	0.3	0.0	0.0	0.3	0.0	0.0	0.3	0.2
Sweetlips (*Haemulids*)	0.2	-	0.0	0.2	0.0	0.0	0.2	0.2
Emperors (*Lethrinids*)*	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Jacks (*Carangids*)*	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Fusiliers (*Caesionids*)*	0.3	0.0	0.0	11.7	0.0	0.0	11.7	9.8
Spinecheeks (*Nemipterids*)*	0.7	0.2	0.0	1.0	0.0	0.0	1.0	0.5
Goatfish (*Mullids*)*	0.5	0.3	0.0	0.5	0.2	0.0	0.7	0.5
Parrotfish (*Scarids*)*	1.3	0.3	0.3	1.3	2.5	0.0	4.2	1.5
Bumphead parrotfish	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Rudderfish (*Kyphosids*)*	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Triggerfish (*Balistids*)	0.5	0.3	0.0	2.7	0.0	0.0	2.7	1.9
Butterflyfish (*Chaetodontids*)	2.8	2.0	1.5	8.7	0.2	0.0	10.3	7.4
Angelfish (*Pomacanthids*)	1.5	0.3	3.3	3.5	0.0	0.0	6.8	2.8
Wrasses (*Labrids*)	6.3	2.9	43.3	16.3	0.3	0.0	60.0	46.6
Humphead wrasse	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Damselfish (*Pomacentrids*)	10.8	2.0	524.8	127.0	0.0	0.0	651.8	389.6
Fairy Basslets (*Anthids*)	0.5	0.0	10.8	0.0	0.0	0.0	10.8	5.2
Moorish Idol (*Zanclids*)	0.3	0.0	0.0	1.8	0.0	0.0	1.8	1.3
Total (all reef species)	**28.8**	**4.4**	**584.8**	**187.2**	**3.2**	**0.0**	**775.2**	**394.4**
Total (target reef species)*	**6.0**	**1.8**	**0.3**	**27.2**	**2.7**	**0.0**	**30.2**	**12.4**

Table 10. Mean (±SE) density (individuals/500m^2) and percentage change of fish families between years in San Isidro-Dao Marine Sanctuary from 2003 to 2023.

FAMILY	Sanctuary			% Difference in abundance 2003-2023	Non-Sanctuary
	2003	2007	2023		2003
	n = 4	n = 6	n = 6		n = 4
Surgeonfish (*Acanthurids*)*	2.5	7.8	11.2	43.2	2.8
Rabbitfish (*Siganids*)*	0.8	3.5	0.8	-76.2	0.5
Groupers (*Serranids*)*	0.5	3.2	0.8	-74.0	0.3
Barramundi Cod	0	0	0.0	0.0	0
Snapper (*Lutjanids*)*	1	1.3	0.3	-74.4	0.5
Sweetlips (*Haemulids*)	0	0.2	0.2	-16.7	0
Emperors (*Lethrinids*)*	1.3	1.5	0.0	-100.0	0
Jacks (*Carangids*)*	0	1	0.0	-100.0	0
Fusiliers (*Caesionids*)*	0	35.8	11.7	-67.4	15
Spinecheeks (*Nemipterids*)*	0.8	3.8	1.0	-73.7	4.5
Goatfish (*Mullids*)*	0.8	7	0.7	-90.5	6.3
Parrotfish (*Scarids*)*	3	14.8	4.2	-71.8	3.5
Bumphead parrotfish	0	0	0.0	0.0	0
Rudderfish (*Kyphosids*)*	0	0	0.0	0.0	0
Triggerfish (*Balistids*)	2	2.7	2.7	-1.2	0
Butterflyfish (*Chaetodontids*)	6.8	7.7	10.3	34.2	7.8
Angelfish (*Pomacanthids*)	5	6	6.8	13.9	5.3
Wrasses (*Labrids*)	78.3	32	60.0	87.5	181
Humphead wrasse	0	0	0.0	0.0	0
Damselfish (*Pomacentrids*)	662.8	835.3	651.8	-22.0	907.3
Fairy Basslets (*Anthids*)	167.5	383	10.8	-97.2	303.8
Moorish Idol (*Zanclids*)	1.8	0.8	1.8	129.2	1.5
Total (all reef species)	**934.5**	**1347.5**	**775.2**	**-42.5**	**1439.8**
Total (target reef species)*	**10.5**	**76.7**	**30.2**	**-60.7**	**33.3**

Table 11. Mean (±SE) fish species (species/500m^2) and percentage change between years in San Isidro-Dao Marine Sanctuary from 2003 to 2023.

FAMILY	Sanctuary			% Difference in species 2007-2023	Non-sanctuary
	2003	2007	2023		2003
	n = 4	n = 6	n =6		n = 4
Surgeonfish (*Acanthurids*)*	1.8	2.2	2.0	-9.1	1
Rabbitfish (*Siganids*)*	0.5	1.5	0.2	-88.9	0.3
Groupers (*Serranids*)*	0.5	1.2	0.5	-58.3	0.3
Barramundi Cod	0	0	0.0	-	0
Snapper (*Lutjanids*)*	0.5	0.3	0.3	11.1	0.3
Sweetlips (*Haemulids*)	0	0.2	0.2	-16.7	0
Emperors (*Lethrinids*)*	0.5	0.7	0.0	-100.0	0
Jacks (*Carangids*)*	0	0.3	0.0	-100.0	0
Fusiliers (*Caesionids*)*	0	1	0.3	-66.7	0.8
Spinecheeks (*Nemipterids*)*	0.5	1.5	0.7	-55.6	1.3
Goatfish (*Mullids*)*	0.3	1.8	0.5	-72.2	1.3
Parrotfish (*Scarids*)*	1.8	4.2	1.3	-68.3	2
Bumphead parrotfish	0	0	0.0	-	0
Rudderfish (*Kyphosids*)*	0	0	0.0	-	0
Triggerfish (*Balistids*)	1.3	1.3	0.5	-61.5	0
Butterflyfish (*Chaetodontids*)	3.3	3.7	2.8	-23.4	3
Angelfish (*Pomacanthids*)	3	2.2	1.5	-31.8	1.5
Wrasses (*Labrids*)	10.3	9.5	6.3	-33.3	10.8
Humphead wrasse	0	0	0.0	-	0
Damselfish (*Pomacentrids*)	14.3	15.7	10.8	-31.0	18.5
Fairy Basslets (*Anthids*)	1.5	1.5	0.5	-66.7	1.5
Moorish Idol (*Zanclids*)	0.8	0.5	0.3	-33.3	0.3
Total (all reef species)	**40.5**	**49.2**	**28.8**	**-41.4**	**42.5**
Total (target reef species)*	**6.3**	**14.8**	**6.0**	**-59.5**	**7**

* Target species

% change = {(Yr2-Yr1)/Yr1} x 100

(+) increase

(-) decrease

- no data available

Table 12. Changes in substrate composition (% mean ±SE) in Balicasag Island Marine Sanctuary, Panglao from 1983 to 2023.

TYPE OF SUBSTRATUM	Sanctuary													
	SCUBA								SNORKEL					
	1983	1984	1992	1999	2003	2007	2023	% Change 2007-2023	1992	1999	2003	2007	2023	% Change 2007-2023
Non-living:														
Sand and silt	2.95	~	10.5	1.6	0.6	0.8	3.2	300	15.7	6.3	3.9	12.1	5.9	-51.2
Coral rubble	35	~	9.9	13.1	3.2	4.8	6.9	43.8	12	13.7	11.8	10.8	18.1	67.6
Rock and block	25.3	~	32.5	12.9	6.6	4.1	23.7	478.0	22.3	32.7	26.9	27.5	15.3	-44.4
White dead standing coral	14.2	~	4.3	3.8	0.2	0.1	0.3	200.0	5.3	3.5	1.3	1.8	1.7	-5.6
Dead coral with algae	0	~	~	14	13.2	4.9	38.3	681.6	0	15.1	8	2.7	17.8	559.3
SUBTOTAL non-living	**77.4**	**67**	**57.2**	**45.4**	**23.8**	**14.7**	**72.4**	**392.5**	**55.3**	**71.3**	**52**	**54.9**	**58.8**	**7.1**
Living:														
Hard coral:														
Branching	7.6	~	~	20.4	11	15	9.9	-34	16.8	~	7.1	9.8	10.1	3.1
Massive	1.5	~	~	2.5	4	2.4	2.5	4.2	6.4	~	9.1	7.1	8.8	23.9
Flat/Encrusting	4.2	~	~	5.5	10.3	16.2	6.8	-58.0	3.4	~	0.2	1.4	4.5	221.4
Foliose/Cup	3.55	~	~	17.9	9.3	14.3	1.4	-90.2	3.5	~	2.4	1.3	3.1	138.5
Subtotal hard coral	**16.9**	**21**	**30.5**	**46.3**	**34.6**	**47.9**	**20.6**	**-57.0**	**30.1**	**24.1**	**18.8**	**19.5**	**26.5**	**35.9**
Soft coral	5.75	12	12.3	8.2	25	22.1	2.8	-87.3	14.6	4.4	8	4.9	4.1	-16.3
SUBTOTAL corals	**22.6**	**33**	**42.8**	**54.5**	**59.6**	**70**	**23.4**	**-66.6**	**44.7**	**28.5**	**26.7**	**24.5**	**30.6**	**24.9**
Others:														
Other animals	~	~	~	~	0.3	1.3	0.7	-46.2	~	~	0	0.7	1.6	128.6
Seagrasses	0	0	0	0	0	0	0.1	+	0	2.5∞	0	0.1	0	-100.0
Algae														
Fleshy	~	~	~	~	3.8	7.3	2.5	-65.8	~	~	17.2	17.6	6	-65.9
Turf	~	~	~	~	0.5	0.7	0.5	-28.6	~	~	0.8	1.2	2.3	91.7
Coralline	~	~	~	~	8.8	4.5	0.4	-91.1	~	~	2.6	1	0.5	-50.0
Sponges	~	~	~	~	3.2	1.6	0.1	-93.8	~	~	0.8	0.1	0.3	200.0
SUBTOTAL others	**0**	**0**	**0**	**0**	**16.6**	**15.3**	**4.3**	**-71.9**	**0**	**0**	**21.3**	**20.6**	**10.7**	**-48.1**
GRAND TOTAL	**100**	**100**	**100**	**100**	**100**	**100**	**100**		**100**	**100**	**100**	**100**	**100**	
Other relevant information														
Slope (degrees)	~	~	~	44.6	67.5	72.5	90		~	5.7	8.5	14	~	
Topography*(m)	1	1	2.9	4.7	2.3	3.3			1	1.4	0.5	1	~	
Depth range/average(m)	11	5.6	8	6.4	7.3	7.1	5.3		2	2.8	2.5	2.2	1.75	
Visibility (m)	~	~	24	24	18.4	16.6	13.5		~	21.6	18	19.1	~	
Sample size (Transects)	2	2	15	11	9	6	6		9	27	11	11	12	

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

∞ Data not included in grand total

~ No data

TYPE OF SUBSTRATUM	Non-Sanctuary															
	SCUBA									SNORKEL						
	1983	1984	1985	1992	1999	2003	2007	2023	% Change 2007-2023	1992	1999	2003	2007	2023	% Change 1999-2003
Non-living:															
Sand and silt	14.1	~	56	8.2	20	5.6	13.4	4.5	-66.4	4.8	20	14.3	-28.5		
Coral rubble	14.2	~	10.3	40.6	15.8	12	15.6	6.5	-58.3	45.7	16.9	7	-58.6		
Rock and block	24.8	~	3.3	12.6	13.4	8.5	11	13	18.2	9.8	23.5	23.6	0.4		
White dead standing coral	4.7	~	1.8	6.4	1.3	0.2	0.4	0.1	-75.0	8.8	2.5	0.6	-76.0		
Dead coral with algae	0	~	0	~	11	6.4	9.5	29.2	207.4	0	10.9	5.1	-53.2		
SUBTOTAL non-living	**57.6**	**81**	**71.3**	**67.8**	**61.5**	**32.6**	**49.9**	**53.3**	**6.8**	**69.1**	**73.8**	**50.5**	**-31.6**		
Living:															
Hard coral:															
Branching	12.9	~	10.6	~	17	16	12.5	11.7	-6.4	7.1	~	8.5			
Massive	4.9	~	2.8	~	4.3	2.7	5.5	3.5	-36.4	9.8	~	8.4			
Flat/Encrusting	4.6	~	2.6	~	2.6	8.1	8.4	8.8	4.8	4	~	1.7			
Foliose/Cup	3.2	~	1.6	~	5.5	4.6	3.4	2.3	-32.4	4.3	~	0.6			
Subtotal hard coral	**25.5**	**18**	**17.6**	**20.4**	**29.4**	**31.3**	**29.8**	**26.3**	**-11.7**	**25.1**	**20.3**	**19.3**	**-4.9**		
Soft coral	16.9	1	11.2	11.6	9	21	12.1	14.8	22.3	5.9	6	9.8	63.3		
SUBTOTAL corals	**42.4**	**19**	**28.7**	**32**	**38.4**	**52.4**	**41.9**	**41.1**	**-1.9**	**31**	**26.3**	**29.1**	**10.6**		
Others:															
Other animals	~	~	~	~	~	0.1	0.4	0.5	25.0	~	~	0			
Seagrasses	0	0	0	0	3.8∞	0	0	0.4		0	8.3	0.1	-98.8		
Algae															
Fleshy	~	~	~	~	~	5.7	4.6	1.4	-69.6	~	~	16.5			
Turf	~	~	~	~	~	0.4	1	1.7	70.0	~	~	0.4			
Coralline	~	~	~	~	~	5.3	1.5	1.1	-26.7	~	~	1.6			
Sponges	~	~	~	~	~	3.6	0.8	0.5	-37.5	~	~	1.8			
SUBTOTAL others	**0**	**0**	**0**	**0**	**0**	**15**	**8.3**	**5.6**	**-32.5**	**0**	**8.3**	**20.4**	**145.8**		
GRAND TOTAL	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**		**100**	**100**	**100**			
Other relevant information															
Slope (degrees)	~	~	~	~	34.7	78.8	58.3	45		~	3	30			
Topography*(m)	1.6	1.2	1.2	0.6	2.6	2.2	1.7	~		1.8	1.4	1.5			
Depth range/average(m)	~	10	10	5.5	6.8	7.5	6.4	6.1		3.7	2.7	2.2			
Visibility (m)	~	~	22.5	20	22.7	17	15.3	12.7		20	20.8	17			
Sample size (Transects)	2	2	2	7	25	10	4	6		4	26	13			

* Mean distance between lowest and highest point on

∞ Data not included in grand total

~ No data

Table 13. Mean (±SE) fish species richness (species/500m²) and density (individuals/500m²) per family in Balicasag Island Marine Sanctuary in 2023.

FAMILY	Sanctuary n = 6								Non-Sanctuary n = 6							
	# of species	SE	Count per size class (Abundance) 1-10 cm**	11-20 cm	21-30 cm	>30 cm	Total abundance	SE	# of species	SE	Count per size class (Abundance) 1-10 cm**	11-20 cm	21-30 cm	>30 cm	Total abundance	SE
Surgeonfish (*Acanthurids*)*	4.0	0.7	0.3	39.3	3.7	2.7	46.0	19.1	2.7	1.0	0.0	43.3	10.2	0.0	53.5	38.3
Rabbitfish (*Siganids*)*	0.5	0.3	0.0	1.3	1.7	0.0	3.0	1.9	0.5	0.3	0.0	1.8	0.0	0.0	1.8	1.3
Groupers (*Serranids*)*	1.2	0.6	0.0	2.0	0.7	0.0	2.7	1.1	1.5	1.0	0.0	1.8	1.2	0.5	3.5	1.7
Barramundi Cod	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Snapper (*Lutjanids*)*	1.8	0.5	5.8	0.3	1.0	6.2	13.3	5.2	1.0	0.4	0.0	0.5	1.2	0.3	2.0	1.1
Sweetlips (*Haemulids*)	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.2	-	0.0	0.2	0.0	0.0	0.2	0.2
Emperors (*Lethrinids*)*	0.5	-	0.2	14.0	0.0	0.0	14.2	14.2	0.7	0.2	0.0	0.5	0.5	0.0	1.0	0.5
Jacks (*Carangids*)*	0.2	-	0.0	0.0	0.0	0.8	0.8	0.8	0.5	0.3	0.0	0.2	0.0	0.5	0.7	0.4
Fusiliers (*Caesionids*)*	0.5	0.3	21.7	21.5	0.0	0.8	44.0	27.8	1.0	0.2	0.0	94.3	1.7	0.0	96.0	90.8
Spinecheeks (*Nemipterids*)*	0.7	0.0	0.0	1.2	0.0	0.0	1.2	0.6	0.5	0.3	0.0	1.3	0.0	0.0	1.3	0.8
Goatfish (*Mullids*)*	1.0	0.7	0.3	1.8	2.3	0.0	4.5	2.8	1.7	0.7	0.0	6.2	3.2	0.0	9.3	4.8
Parrotfish (*Scarids*)*	1.7	0.6	0.0	3.7	7.8	0.5	12.0	5.2	2.8	1.2	2.5	12.2	1.8	0.2	16.7	9.6
Bumphead parrotfish	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Rudderfish (*Kyphosids*)*	0.5	0.0	0.0	2.8	5.8	6.7	15.3	9.7	0.3	0.0	0.0	2.3	0.0	1.7	4.0	2.6
Triggerfish (*Balistids*)	2.0	0.4	0.0	13.2	15.0	0.2	28.3	11.7	0.5	0.3	0.0	0.8	0.5	0.0	1.3	1.0
Butterflyfish (*Chaetodontids*)	5.8	1.4	0.3	25.7	0.0	0.0	26.0	7.7	3.2	1.1	1.0	6.8	0.0	0.0	7.8	4.1
Angelfish (*Pomacanthids*)	1.7	0.2	5.7	1.8	0.2	0.0	7.7	3.4	1.3	0.3	3.2	4.2	0.2	0.0	7.5	3.5
Wrasses (*Labrids*)	7.2	2.9	35.2	6.0	0.5	0.3	42.0	23.4	4.2	1.5	8.7	5.7	0.5	0.0	14.8	7.1
Humphead wrasse	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Damselfish (*Pomacentrids*)	11.0	3.9	1087.2	67.8	0.0	0.0	1155.0	976.0	7.0	2.5	172.0	50.2	0.0	0.0	222.2	64.7
Fairy Basslets (*Anthids*)	1.3	0.2	322.8	0.0	0.0	0.0	322.8	94.4	0.8	0.2	107.2	1.7	0.0	0.0	108.8	51.0
Moorish Idol (*Zanclids*)	0.7	0.0	0.0	3.2	0.0	0.0	3.2	1.4	0.2	-	0.0	0.8	0.0	0.0	0.8	0.8
Total (all reef species)	**42.2**	**6.7**	**1479.5**	**205.7**	**38.7**	**18.2**	**1742.0**	**961.3**	**30.5**	**7.2**	**294.5**	**234.8**	**20.8**	**3.2**	**553.3**	**160.4**
Total (target reef species)*	**12.5**	**3.3**	**28.0**	**88.0**	**23.0**	**18.5**	**157.5**	**23.7**	**13.3**	**4.1**	**2.5**	**164.7**	**19.7**	**3.2**	**190.0**	**85.4**

Table 14. Mean (±SE) density (individuals/500m^2) and percentage change of fish families between years in Balicasag Island Marine Sanctuary from 1985 to 2023.

FAMILY	Sanctuary							% Difference in abundance 2003-2023	Non-Sanctuary					% Difference in abundance 2003-2023
	1985	1986	1992	1999	2003	2007	2023		1985	1999	2003	2007	2023	
	n = 3	n = 6	n = 3	n = 5	n = 4	n = 6	n = 6		n = 7	n = 5	n = 4	n = 4	n = 6	
Surgeonfish (*Acanthurids*)*	254	152.5	145.3	21	14.3	23.3	46.0	97.4	657.1	27	10.8	6.3	53.5	749.2
Rabbitfish (*Siganids*)*	2.3	~	0.7	1.2	8	4.2	3.0	-28.6	0.4	1.6	5.5	2	1.8	-8.3
Groupers (*Serranids*)*	2.7	3.1	1.3	2.6	3.3	7	2.7	-61.9	1.9	3	2	1.3	3.5	169.2
Barramundi Cod	~	~	~	~	0	0	0.0	-	~	~	0	0	0.0	-
Snapper (*Lutjanids*)*	0.7	19.6	16	65.2	111.5	125.8	13.3	-89.4	0.7	3.2	1	6.3	2.0	-68.3
Sweetlips (*Haemulids*)	0	0.1	1	0.4	0	2	0.0	-100.0	0.4	0.2	0.5	0	0.2	-
Emperors (*Lethrinids*)*	0.3	#	0	0	0	2.5	14.2	466.7	0.4	0	1.5	0	1.0	-
Jacks (*Carangids*)*	15.3	16	11	5.8	77.5	5.5	0.8	-84.8	7.7	3.2	1	7.8	0.7	-91.5
Fusiliers (*Caesionids*)*	1424	1548.5	749	409.4	1100	1800.3	44.0	-97.6	752.1	143.6	239.5	337.5	96.0	-71.6
Spinecheeks (*Nemipterids*)*	1	#	0	0	0	5.7	1.2	-79.5	4.4	1.8	0	1.8	1.3	-25.9
Goatfish (*Mullids*)*	17	37.3	17	8.6	1.8	15.7	4.5	-71.3	46.7	11	2.5	4.5	9.3	107.4
Parrotfish (*Scarids*)*	385	117.9	65	85.8	10	15	12.0	-20.0	170.1	33	16.3	3.8	16.7	338.6
Bumphead parrotfish	~	~	~	~	0	0	0.0	-	~	~	0	0	0.0	-
Rudderfish (*Kyphosids*)*	2	4.3	1	113.4	54.8	18.8	15.3	-18.4	0	2.8	1.3	1	4.0	300.0
Triggerfish (*Balistids*)	6.3	6.8	9	10.4	3	7.7	28.3	268.0	12.7	3.6	1.3	1.3	1.3	2.6
Butterflyfish (*Chaetodontids)*	38.7	20.6	21.3	17.6	8	12.7	26.0	104.7	30.7	17.4	9.5	4.5	7.8	74.1
Angelfish (*Pomacanthids*)	11.3	15.5	35	12.2	166.5	9.7	7.7	-21.0	16	12.8	8.8	6.3	7.5	19.0
Wrasses (*Labrids*)	48.7	71.9	82	49.4	161.8	589.7	42.0	-92.9	186.3	84	161.8	83.3	14.8	-82.2
Humphead wrasse	~	~	~	~	0	0	0.0	-	~	~	0	0	0.0	-
Damselfish (*Pomacentrids*)	443	781.2	510	2288.8	713.8	1778.3	1155.0	-35.1	1395	2024	1048.5	1210.8	222.2	-81.7
Fairy Basslets (*Anthids*)	1634	2072.6	898	1199.8	1745.3	2782	322.8	-88.4	1486.9	937.4	1575	2906.8	108.8	-96.3
Moorish Idol (*Zanclids*)	5	11.3	17	6.8	2.8	2.7	3.2	17.3	8.1	4.6	3	0.8	0.8	4.2
Total (all reef species)	**4291.3**	**4879.2**	**2579.6**	**4298.4**	**4182**	**7208.5**	**1742.0**	-75.8	**4777.9**	**3314.2**	**3089.5**	**4585.5**	**553.3**	-87.9
Total (target reef species)*	**2104.3**	**1899.3**	**1007.3**	**713.4**	**1380.5**	**2092.5**	**157.5**	-92.5	**1642.1**	**230.4**	**281.5**	**370.8**	**190.0**	-48.8

Table 15. Mean (±SE) fish species (species/500m^2) and percentage change between years in Balicasag Island Marine Sanctuary from 1985 to 2023.

FAMILY	Sanctuary							% Difference in density 2003 - 2023	Non-Sanctuary					% Difference in density 2003-2023
	1985	1986	1992	1999	2003	2007	2023		1985	1999	2003	2007	2023	
	n = 3	n = 6	n = 3	n = 5	n = 4	n = 6	n = 6		n = 7	n = 5	n = 4	n = 4	n = 6	
Surgeonfish (*Acanthurids*)*	14.0	12.6	9.3	5.0	4.5	3.3	4.0	21.2	10.3	4.4	4.3	2.0	2.7	33.3
Rabbitfish (*Siganids*)*	1.0	0.3	0.7	0.4	1.8	1.3	0.5	-61.5	0.1	0.4	1.5	1.0	0.5	-50.0
Groupers (*Serranids*)*	1.3	2.3	1.3	1.6	2.3	2.2	1.2	-47.0	1.3	1.4	1.5	0.8	1.5	87.5
Barramundi Cod	-	-	-	-	0.0	0	0.0	-	-	-	0.0	0.0	0.0	-
Snapper (*Lutjanids*)*	0.7	2.7	1.7	3.4	3.0	3.2	1.8	-42.7	0.4	1.4	1.0	2.5	1.0	-60.0
Sweetlips (*Haemulids*)	0.0	0.1	0.3	0.4	0.0	1	0.0	-100.0	0.1	0.2	0.5	0.0	0.2	-
Emperors (*Lethrinids*)*	0.3	0.4	0.0	0.0	0.0	0.8	0.5	-37.5	0.1	0.0	0.5	0.0	0.7	-
Jacks (*Carangids*)*	1.3	1.0	0.3	1.6	1.5	1.2	0.2	-86.1	0.6	0.8	0.8	1.5	0.5	-66.7
Fusiliers (*Caesionids*)*	2.7	2.9	2.3	2.6	2.3	2.3	0.5	-78.3	2.4	1.0	1.3	1.3	1.0	-23.1
Spinecheeks (*Nemipterids*)*	0.3	0.1	0.0	0.0	0.0	1.2	0.7	-44.4	1.0	0.6	0.0	0.5	0.5	0.0
Goatfish (*Mullids*)*	1.0	0.9	1.0	0.4	1.3	1.7	1.0	-41.2	1.0	0.8	1.0	1.0	1.7	66.7
Parrotfish (*Scarids*)*	1.0	1.0	1.0	1.0	2.8	2.2	1.7	-24.2	1.0	1.0	4.0	2.3	2.8	23.2
Bumphead parrotfish	-	-	-	-	0.0	0	0.0	-	-	-	0.0	0.0	0.0	-
Rudderfish (*Kyphosids*)*	0.7	0.4	0.3	1.4	1.3	0.8	0.5	-37.5	0.0	0.4	1.0	0.3	0.3	11.1
Triggerfish (*Balistids*)	2.3	2.7	1.7	2.2	1.5	2.3	2.0	-13.0	2.7	1.2	0.8	0.5	0.5	0.0
Butterflyfish (*Chaetodontids)*	9.3	8.7	5.3	5.8	1.8	3.5	5.8	66.7	7.0	5.2	4.8	2.8	3.2	13.1
Angelfish (*Pomacanthids*)	3.3	2.7	2.7	2.8	5.0	2.3	1.7	-27.5	4.0	2.4	2.3	2.3	1.3	-42.0
Wrasses (*Labrids*)	5.3	6.0	4.0	7.4	8.0	10.7	7.2	-33.0	7.1	9.2	8.8	8.8	4.2	-52.7
Humphead wrasse	-	-	-	-	0.0	0	0.0	-	-	-	0.0	0.0	0.0	-
Damselfish (*Pomacentrids*)	9.0	9.9	8.7	14.4	9.8	15.8	11.0	-30.4	11.6	12.6	15.3	15.3	7.0	-54.2
Fairy Basslets (*Anthids*)	2.0	2.7	2.0	2.2	3.0	3	1.3	-55.6	2.3	2.2	2.5	2.5	0.8	-66.7
Moorish Idol (*Zanclids*)	1.0	1.0	1.0	1.0	0.8	0.7	0.7	-4.8	1.0	1.0	0.5	0.5	0.2	-66.7
Total (all reef species)	**56.7**	**58.4**	**43.6**	**53.6**	**50.3**	**59.5**	**42.2**	**-29.1**	**54.1**	**46.2**	**51.0**	**45.5**	**30.5**	**-33.0**
Total (target reef species)*	**24.3**	**24.7**	**18.2**	**17.8**	**20.5**	**21.2**	**12.5**	**-41.0**	**18.4**	**12.4**	**17.3**	**13.0**	**13.3**	**2.6**

Emperors and spinecheeks combined with snappers in 1986 data

* Target species

% change = {(Yr2-Yr1)/Yr1} x 100

(+) increase

(-) decrease

- no data available

Table 16. Changes in substrate composition (% mean ±SE) in Bil-isan Marine Sanctuary, Panglao from 1999 to 2023.

TYPE OF SUBSTRATUM	Sanctuary										TYPE OF SUBSTRATUM	Non-Sanctuary			
	SCUBA					SNORKEL						SCUBA			SNORKEL
	1999	2003	2007	2023	% Change 2007- 2023	1999	2003	2007	2023	% Change 2007- 2023		2003	2007	% Change 2003- 2007	2003
Non-living:											**Non-living:**				
Sand and silt	37	18.6	12.5	13.6	8.8	47.8	12.8	24.5	23.2	-5.3	Sand and silt	21.1	8.9	-57.8	27.2
Coral rubble	33	41.4	23.5	17.7	-24.7	12.1	5	2.4	5.1	112.5	Coral rubble	37.6	11.3	-69.9	7
Rock and block	9.8	6.7	3.3	3.3	0.0	16.8	6.8	17.6	7.9	-55.1	Rock and block	8.7	5.3	-39.1	10.5
White dead standing coral	0.1	0.4	0	0	0.0	1	0.4	2.9	0.5	-82.8	White dead standing coral	0.1	0.1	0.0	0.2
Dead coral with algae	4.3	6.1	8.8	8.8	0.0	4.3	2.7	1.2	2.7	125.0	Dead coral with algae	4.5	8.4	86.7	2.9
SUBTOTAL non-living	**84.2**	**73.2**	**48.1**	**43.4**	-9.8	**82**	**27.7**	**48.6**	**39.4**	-18.9	**SUBTOTAL non-living**	**71.9**	**33.9**	-52.9	**47.8**
Living:											**Living:**				
Hard coral:											**Hard coral:**				
Branching	10.3	11.8	15.1	34.8	130.5	~	12.2	10.9	25	129.4	Branching	10.5	13.5	28.6	5.1
Massive	3.4	5.9	6.4	3.9	-39.1	~	7.5	8.1	6.8	-16.0	Massive	5.8	6.9	19.0	3.4
Flat/Encrusting	1.2	1.7	7.2	6.6	-8.3	~	1.9	0.7	1.5	114.3	Flat/Encrusting	1.8	5.7	216.7	0.3
Foliose/Cup	0.8	0.9	4	5.3	32.5	~	1.2	1.3	2.8	115.4	Foliose/Cup	0.8	4.7	487.5	0.4
Subtotal hard coral	**15.7**	**20.4**	**32.7**	**50.6**	54.7	**17.1**	**22.8**	**21.1**	**36.1**	71.1	**Subtotal hard coral**	**18.9**	**30.8**	63.0	**9.3**
Soft coral	0.1	0.7	1.2	2.2	83.3	0.8	1.3	0.3	2.2	633.3	Soft coral	0.7	0.6	-14.3	0.9
SUBTOTAL corals	**15.8**	**21.1**	**33.8**	**52.8**	56.2	**17.9**	**24.2**	**21.4**	**38.3**	79.0	**SUBTOTAL corals**	**19.6**	**31.3**	59.7	**10.2**
Others:											**Others:**				
Other animals	~	0.2	0.2	0.5	150.0	~	0	0.3	0.6	100.0	Other animals	0.2	0.3	50.0	0
Seagrasses	17.9∞	0.9	0.3	2	566.7	32.1∞	35.6	19.7	21	6.6	Seagrasses	4	2	-50.0	20.7
Algae											Algae				
Fleshy	~	2.3	14.1	1.2	-91.5	~	11.4	9.1	0.8	-91.2	Fleshy	1.4	27.1	1835.7	15.2
Turf	~	0.4	0.3	0	-100.0	~	0.3	0	0	0.0	Turf	0.8	0.2	-75.0	0.2
Coralline	~	1.1	1.8	0	-100.0	~	0.6	0.3	0	-100.0	Coralline	1	4.2	320.0	5.1
Sponges	~	0.8	1.3	0.3	-76.9	~	0.3	0.7	0	-100.0	Sponges	1.1	1.1	0.0	0.9
SUBTOTAL others	**0**	**5.7**	**18.1**	**4**	-77.9	**0**	**48.2**	**30.1**	**22.4**	-25.6	**SUBTOTAL others**	**8.4**	**34.8**	314.3	**42**
GRAND TOTAL	**100**	**100**	**100**	**100**		**100**	**100**	**100**	**100**		**GRAND TOTAL**	**100**	**100**		**100**
Other relevant information											**Other relevant information**				
Slope (degrees)	18.4	44.4	48.8	~		1.9	10	0.6	~		Slope (degrees)	30	60		11
Topography* (m)	1.5	0.8	2.8	~		1.6	0	0.7	~		Topography* (m)	0.6	1.6		1.8
Depth range/average (m)	6.7	7.4	6.5	6.4		~	3.1	2	2.8		Depth range/average (m)	7.4	7.1		2.4
Visibility (m)	17.3	20	20.8	15.2		17.4	13.5	22.7	~		Visibility (m)	20	19.3		21.8
Sample size (Transects)	12	9	6	6		16	9	11	7		Sample size (Transects)	9	6		10
* 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											∞ Data not included in grand total				
~ No data											~ No data				

Table 17. Mean (±SE) fish species richness (species/500m^2) and density (individuals/500m^2) per family in Bil-isan Marine Sanctuary in 2023.

FAMILY	Sanctuary n = 6							
	# of species	SE	Count per size class (Abundance)				Total abundance	SE
			1-10 cm**	11-20 cm	21-30 cm	>30 cm		
Surgeonfish (*Acanthurids*)*	2.5	0.6	0.2	55.0	0.3	0.2	55.7	33.4
Rabbitfish (*Siganids*)*	0.5	0.0	0.0	0.5	0.7	0.0	1.2	0.5
Groupers (*Serranids*)*	1.5	0.8	0.0	2.3	0.0	0.0	2.3	1.3
Barramundi Cod	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Snapper (*Lutjanids*)*	0.8	0.9	0.0	0.5	0.2	1.3	2.0	1.3
Sweetlips (*Haemulids*)	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Emperors (*Lethrinids*)*	0.7	-	0.0	1.3	0.2	0.0	1.5	1.5
Jacks (*Carangids*)*	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Fusiliers (*Caesionids*)*	0.8	0.2	0.0	42.0	6.7	0.0	48.7	24.3
Spinecheeks (*Nemipterids*)*	0.7	0.0	0.0	2.5	0.2	0.0	2.7	1.5
Goatfish (*Mullids*)*	1.2	0.6	0.3	2.8	0.3	0.0	3.5	2.7
Parrotfish (*Scarids*)*	2.7	0.6	0.0	12.2	5.7	0.2	18.0	6.7
Bumphead parrotfish	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Rudderfish (*Kyphosids*)*	0.2	-	0.0	0.3	0.0	0.0	0.3	0.3
Triggerfish (*Balistids*)	1.5	0.2	0.0	4.3	0.2	0.0	4.5	2.4
Butterflyfish (*Chaetodontids*)	4.5	2.3	3.2	12.2	0.0	0.0	15.3	9.9
Angelfish (*Pomacanthids*)	1.5	0.5	6.3	4.0	0.0	0.0	10.3	6.6
Wrasses (*Labrids*)	5.8	3.7	83.3	7.3	0.2	0.0	90.8	74.6
Humphead wrasse	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Damselfish (*Pomacentrids*)	13.3	3.0	1580.3	217.8	0.0	0.0	1798.2	635.2
Fairy Basslets (*Anthids*)	1.3	0.0	128.0	0.0	0.0	0.0	128.0	60.3
Moorish Idol (*Zanclids*)	0.7	0.0	0.2	1.5	0.0	0.0	1.7	0.7
Total (all reef species)	**40.2**	**6.5**	**1801.8**	**366.7**	**14.5**	**1.7**	**2184.7**	**601.8**
Total (target reef species)*	**11.5**	**3.6**	**0.3**	**119.5**	**14.2**	**1.7**	**135.7**	**43.0**

Table 18. Mean (±SE) density (individuals/500m^2) and percentage change of fish families between years in Bil-isan Marine Sanctuary from 1999 to 2023.

FAMILY	Sanctuary				% Difference in abundance 2007-2023	Non-Sanctuary		% Difference in abundance 2003-2007
	1999	2003	2007	2023		2003	2007	
	n = 4	n = 4	n = 6	n = 6		n = 4	n = 6	
Surgeonfish (*Acanthurids*)*	52.5	1.3	2.2	55.7	2430.3	8.3	7.2	-13.1
Rabbitfish (*Siganids*)*	22.5	3.5	3	1.2	-61.1	5.3	1.7	-68.3
Groupers (*Serranids*)*	6.5	0.8	1.5	2.3	55.6	1.3	0.3	-73.3
Barramundi Cod	~	0	0.3	0.0	-100.0	0	0	N/A
Snapper (*Lutjanids*)*	5.8	0	0.3	2.0	566.7	0	0	N/A
Sweetlips (*Haemulids*)	0.3	0	0	0.0	0.0	0	0	N/A
Emperors (*Lethrinids*)*	0	0	0	1.5	+	0	2.5	+
Jacks (*Carangids*)*	0.3	0	0.3	0.0	-100.0	0.3	0	-100
Fusiliers (*Caesionids*)*	24	25.8	65.3	48.7	-25.5	40	28	-30
Spinecheeks (*Nemipterids*)*	7.5	2.8	2	2.7	33.3	2.5	1.5	-40
Goatfish (*Mullids*)*	81	2.8	3.2	3.5	9.4	2.8	2.8	3
Parrotfish (*Scarids*)*	81	14.3	15.3	18.0	17.6	23.5	10.7	-54.6
Bumphead parrotfish	~	0	0.3	0.0	-100.0	0	0	N/A
Rudderfish (*Kyphosids*)*	0	0	0	0.3	+	0	0	N/A
Triggerfish (*Balistids*)	6	1.3	2.7	4.5	66.7	2.3	1.2	-48.1
Butterflyfish (*Chaetodontids*)	11	5	3.7	15.3	314.4	5.8	4.3	-24.6
Angelfish (*Pomacanthids*)	12	1.5	2.5	10.3	313.3	2	2.2	8.3
Wrasses (*Labrids*)	109	254.8	171.3	90.8	-47.0	237	79	-66.7
Humphead wrasse	~	0	0	0.0	0.0	0	0	N/A
Damselfish (*Pomacentrids*)	1428	1118	1170.2	1798.2	53.7	1045.5	989.2	-5.4
Fairy Basslets (*Anthids*)	265.8	263.8	468.3	128.0	-72.7	181.3	431.2	137.9
Moorish Idol (*Zanclids*)	1	2.5	0.3	1.7	455.6	0.3	0.5	100
Total (all reef species)	**2114.2**	**1697.8**	**1912.8**	**2184.7**	**14.2**	**1557.8**	**1562.2**	**0.3**
Total (target reef species)*	**281.4**	**51**	**93.5**	**135.7**	**45.1**	**83.5**	**52.3**	**-37.3**

Table 19. Mean (±SE) fish species (species/500m^2) and percentage change between years in Bil-isan Marine Sanctuary from 1999 to 2023.

FAMILY	Sanctuary				% Difference in species 2007-2023	Non-Sanctuary		% Difference in species 2003-2007
	1999	2003	2007	2023		2003	2007	
	n = 4	n = 4	n = 6	n = 6		n = 4	n = 6	
Surgeonfish (*Acanthurids*)*	5	0.3	1.2	2.5	108.3	1.3	1.8	38.5
Rabbitfish (*Siganids*)*	1.8	1	1	0.5	-50.0	1.3	0.8	-38.5
Groupers (*Serranids*)*	1.3	0.5	0.8	1.5	87.5	1	0.2	-80.0
Barramundi Cod	~	0	0	0.0	-	0	0	-
Snapper (*Lutjanids*)*	1.8	0	0.5	0.8	66.7	0	0	-
Sweetlips (*Haemulids*)	0.3	0	0	0.0	-	0	0	-
Emperors (*Lethrinids*)*	0	0	0	0.7	-	0	0.3	-
Jacks (*Carangids*)*	0.3	0	0.3	0.0	-100.0	0.3	0	-100.0
Fusiliers (*Caesionids*)*	1.5	0.8	0.7	0.8	19.0	1.5	0.7	-53.3
Spinecheeks (*Nemipterids*)*	1	1	1.2	0.7	-44.4	0.8	0.7	-12.5
Goatfish (*Mullids*)*	1	1.8	1.3	1.2	-10.3	2	1	-50.0
Parrotfish (*Scarids*)*	1	3.3	4.8	2.7	-44.4	3.5	1.8	-48.6
Bumphead parrotfish	~	0	0	0.0	-	0	0	-
Rudderfish (*Kyphosids*)*	0	0	0	0.2	-	0	0	-
Triggerfish (*Balistids*)	1.5	0.8	1.2	1.5	25.0	1.3	0.7	-46.2
Butterflyfish (*Chaetodontids*)	2	3	2	4.5	125.0	2.3	2	-13.0
Angelfish (*Pomacanthids*)	3.5	1	1.5	1.5	0.0	1.5	1.3	-13.3
Wrasses (*Labrids*)	9	9.8	6.5	5.8	-10.3	10.5	7.5	-28.6
Humphead wrasse	~	0	0	0.0	-	0	0	-
Damselfish (*Pomacentrids*)	16.3	14.8	12.7	13.3	5.0	16.5	14.7	-10.9
Fairy Basslets (*Anthids*)	1.5	1.5	1.8	1.3	-25.9	1.8	1.3	-27.8
Moorish Idol (*Zanclids*)	0.5	0.8	0.2	0.7	233.3	0.3	0.3	0.0
Total (all reef species)	**49.3**	**40**	**37.7**	**40.2**	6.5	**45.5**	**35.2**	-22.6
Total (target reef species)*	**15**	**8.5**	**11.8**	**11.5**	-2.5	**11.5**	**7.3**	-36.5

* Target species

% change = {(Yr2-Yr1)/Yr1} x 100

(+) increase

(-) decrease

- no data available

Table 20. Changes in substrate composition (% mean ±SE) in Bolod Marine Sanctuary, Panglao from 1996 to 2023.

TYPE OF SUBSTRATUM	Sanctuary											TYPE OF SUBSTRATUM	Non-Sanctuary			
	SCUBA						SNORKEL						SCUBA			
	1996^	1999	2003	2007	2023	% Change 2007-2023	1999	2003	2007	2023	% Change 2007-2023		2003	2007	2023	% Change 2007-2023
Non-living:												**Non-living:**				
Sand and silt	48.7	42.1	14.8	36.8	18.4	-50	26.5	18.5	27.5	23.4	-14.9	Sand and silt	41.5	23.8	44.2	85.7
Coral rubble	6.9	6.4	4.5	1	4.5	350	7	3.2	2.8	38.1	1260.7	Coral rubble	9.3	2.7	1.7	-37.0
Rock and block	5.9	31.1	19	11.6	27.3	135.3	36.1	18.1	26.3	10.6	-59.7	Rock and block	4.3	20.7	12.3	-40.6
White dead standing coral	~	0.8	1.2	0.5	0	-100	1.6	0.5	0.1	0.3	200.0	White dead standing coral	0.3	0.1	0	-100.0
Dead coral with algae	1.8	1.9	4.1	6	11.2	86.7	2.2	2.5	1.1	1.4	27.3	Dead coral with algae	7	6.3	11.6	84.1
SUBTOTAL non-living	**63.3**	**82.3**	**43.7**	**55.8**	**61.4**	**10.0**	**73.4**	**42.7**	**57.8**	**73.8**	**27.7**	**SUBTOTAL non-living**	**62.3**	**53.5**	**69.8**	**30.5**
Living:												**Living:**				
Hard coral:												**Hard coral:**				
Branching	~	4.5	16.8	12.3	7.7	-37.4	~	12.1	5.4	2.8	-48.1	Branching	10.3	16.3	6.7	-58.9
Massive	~	2.2	11.6	6.2	5.1	-17.7	~	9.5	4.9	1.7	-65.3	Massive	7	10.1	2.2	-78.2
Flat/Encrusting	~	0.9	5.7	2.9	5.3	82.8	~	0.9	0.8	0.5	-37.5	Flat/Encrusting	2.8	6	3.5	-41.7
Foliose/Cup	~	0.4	1.2	1	3.9	290	~	0.7	0.2	1.2	500.0	Foliose/Cup	3.8	1	2.7	170.0
Subtotal hard coral	**12.1**	**8**	**35.2**	**22.4**	**22**	**-1.8**	**15.6**	**23.1**	**11.4**	**6.2**	**-45.6**	**Subtotal hard coral**	**23.8**	**33.3**	**15.1**	**-54.7**
Soft coral	11.5	9.8	17.5	16.3	11.2	-31.3	11.2	20.4	11.8	6.9	-41.5	Soft coral	6.5	7	7.3	4.3
SUBTOTAL corals	**23.6**	**17.8**	**52.7**	**38.8**	**33.2**	**-14.4**	**26.8**	**43.5**	**23.2**	**13.1**	**-43.5**	**SUBTOTAL corals**	**30.3**	**40.3**	**22.4**	**-44.4**
Others:												**Others:**				
Other animals	~	~	1	1.7	0	-100	~	0	0.3	0.6	100.0	Other animals	0	1	0.4	-60.0
Seagrasses	~	0	0	0.3	1	233.3	2.8	0.4	3.4	2	-41.2	Seagrasses	0	0	4.2	+
Algae												Algae				
Fleshy	~	~	1.3	0.5	3	500	~	11.8	14.3	7.9	-44.8	Fleshy	5.8	1.1	2.1	90.9
Turf	~	~	0	0.1	0.2	100	~	0.2	0.1	2.3	2200.0	Turf	0	0.3	0	-100.0
Coralline	~	~	0.8	2	0.3	-85	~	0.3	0.9	0.1	-88.9	Coralline	1.5	3.6	0.8	-77.8
Sponges	~	~	0.5	0.9	0.8	-11.1	~	1.1	0.2	0.2	0.0	Sponges	0.3	0.3	0.5	66.7
SUBTOTAL others	**~**	**~**	**3.6**	**5.4**	**5.3**	**-1.9**	**0**	**13.7**	**19.1**	**13.1**	**-31.4**	**SUBTOTAL others**	**7.5**	**6.2**	**8**	**29.0**
GRAND TOTAL		**100**	**100**	**100**	**100**		**100**	**100**	**100**	**100**		**GRAND TOTAL**	**100**	**100**	**100**	
Other relevant information												**Other relevant information**				
Slope (degrees)	~	9.5	80	21	~		7.6	6.9	0.7	~		Slope (degrees)	15	48	~	
Topography* (m)	~	1.7	2.5	1.7	~		1.4	1.3	0.8	~		Topography* (m)	1.5	2.6	~	
Depth range/average (m)	5.7	5.6	7.3	7	6.3		3.5	2.9	2.5	2.8		Depth range/average (m)	7.5	6.5	6.2	
Visibility (m)	~	21.7	16.1	14	12.5		22.2	15.9	13	~		Visibility (m)	17	13.3	13.2	
Sample size (Transects)	1	11	10	6	6		14	12	12	13		Sample size (Transects)	2	6	6	

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

ata not included in grand total

~ No data

* Mean distance between lowest and

∞ Data not included in grand total

~ No data

^ - Silliman University Marine Laboratory, 1996

Table 21. Mean (±SE) fish species richness (species/500m^2) and density (individuals/500m^2) per family in Bolod Marine Sanctuary in 2023.

FAMILY	Sanctuary n = 6								Non-Sanctuary n = 6							
	# of species	SE	Count per size class (Abundance)				Total abundance	SE	# of species	SE	Count per size class (Abundance)				Total abundance	SE
			1-10 cm**	11-20 cm	21-30 cm	>30 cm					1-10 cm**	11-20 cm	21-30 cm	>30 cm		
Surgeonfish (*Acanthurids*)*	2.2	0.2	0.0	51.0	0.3	2.2	53.5	30.2	3.3	0.8	2.2	49.7	0.7	0.2	52.7	28.8
Rabbitfish (*Siganids*)*	0.3	-	0.0	0.5	0.0	0.0	0.5	0.5	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Groupers (*Serranids*)*	1.2	0.9	0.0	1.3	0.2	0.0	1.5	1.0	0.5	0.0	0.0	0.2	0.3	0.0	0.5	0.2
Barramundi Cod	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Snapper (*Lutjanids*)*	0.7	0.2	0.0	0.2	0.8	0.2	1.2	0.8	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Sweetlips (*Haemulids*)	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Emperors (*Lethrinids*)*	0.5	-	0.0	0.3	1.3	0.0	1.7	1.7	0.2	-	0.0	0.2	0.5	0.2	0.8	0.8
Jacks (*Carangids*)*	0.2	-	0.0	0.0	0.0	0.3	0.3	0.3	0.2	-	0.0	0.0	0.2	0.0	0.2	0.2
Fusiliers (*Caesionids*)*	2.0	0.7	0.0	70.7	18.3	0.3	89.3	44.9	0.2	-	0.0	1.2	0.0	0.0	1.2	1.2
Spinecheeks (*Nemipterids*)*	0.8	0.2	1.0	1.7	0.0	0.0	2.7	1.2	0.5	0.3	1.0	1.7	0.0	0.0	2.7	1.8
Goatfish (*Mullids*)*	0.8	0.5	0.0	6.8	0.3	0.0	7.2	4.9	0.7	0.2	0.0	1.3	0.3	0.0	1.7	1.1
Parrotfish (*Scarids*)*	1.5	0.3	0.5	5.0	0.8	0.2	6.5	2.9	1.2	0.4	0.0	0.8	2.3	0.7	3.8	1.4
Bumphead parrotfish	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Rudderfish (*Kyphosids*)*	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Triggerfish (*Balistids*)	1.2	0.6	0.0	3.0	0.2	0.2	3.3	2.8	1.0	0.7	0.0	5.8	0.0	0.0	5.8	5.2
Butterflyfish (*Chaetodontids*)	3.3	2.0	5.2	15.8	0.0	0.0	21.0	13.0	0.5	0.3	0.0	1.8	0.0	0.0	1.8	1.5
Angelfish (*Pomacanthids*)	1.8	0.6	11.7	4.7	0.0	0.0	16.3	11.7	1.2	0.2	2.0	3.0	0.0	0.0	5.0	2.3
Wrasses (*Labrids*)	6.3	3.4	26.0	7.8	0.5	0.2	34.5	26.3	6.3	2.4	11.2	10.3	0.5	0.2	22.2	5.4
Humphead wrasse	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Damselfish (*Pomacentrids*)	12.3	3.9	1026.3	477.7	0.0	0.0	1504.0	1088.0	4.3	2.3	218.8	5.2	0.0	0.0	224.0	144.7
Fairy Basslets (*Anthids*)	0.7	0.0	16.7	0.0	0.0	0.0	16.7	6.3	0.7	0.0	28.5	0.0	0.0	0.0	28.5	13.4
Moorish Idol (*Zanclids*)	0.5	0.0	0.0	2.8	0.0	0.0	2.8	1.8	0.3	0.0	0.0	1.0	0.0	0.0	1.0	0.8
Total (all reef species)	**36.3**	**6.8**	**1087.3**	**649.3**	**22.8**	**3.5**	**1763.0**	**1140.1**	**21.0**	**3.5**	**263.7**	**82.2**	**4.8**	**1.2**	**351.8**	**148.0**
Total (target reef species)*	**10.2**	**3.6**	**1.5**	**137.5**	**22.2**	**3.2**	**164.3**	**75.3**	**6.7**	**1.2**	**1.0**	**55.0**	**4.3**	**1.0**	**61.3**	**26.1**

Table 22. Mean (±SE) density (individuals/500m^2) and percentage change of fish families between years in Bolod Marine Sanctuary from 1999 to 2023.

FAMILY	Sanctuary				% Difference in abundance 2007-2023	Non-Sanctuary		% Difference in density 2007-2023
	1999	2003	2007	2023		2007	2023	
	n = 2	n = 4	n = 6	n = 6		n = 6	n = 6	
Surgeonfish (*Acanthurids*)*	3	0.8	6	53.5	791.7	7	52.7	652.4
Rabbitfish (*Siganids*)*	0	0	1.7	0.5	-70.6	1.3	0.0	-100.0
Groupers (*Serranids*)*	0.5	0.3	2	1.5	-25.0	0.5	0.5	0.0
Barramundi Cod	~	0	0.3	0.0	-100.0	0	0.0	0.0
Snapper (*Lutjanids*)*	3.5	0	0.5	1.2	133.3	1.3	0.0	-100.0
Sweetlips (*Haemulids*)	1	0	0	0.0	0.0	0	0.0	0.0
Emperors (*Lethrinids*)*	0	112.5	0	1.7	+	0	0.8	+
Jacks (*Carangids*)*	0.5	3.3	1	0.3	-66.7	0	0.2	+
Fusiliers (*Caesionids*)*	0	8.5	18.3	89.3	388.2	11.7	1.2	-90.0
Spinecheeks (*Nemipterids*)*	9	5.8	4.7	2.7	-43.3	3	2.7	-11.1
Goatfish (*Mullids*)*	11.5	7.3	5.7	7.2	25.7	3.2	1.7	-47.9
Parrotfish (*Scarids*)*	5	4.8	5.3	6.5	22.6	4	3.8	-4.2
Bumphead parrotfish	~	56.5	0	0.0	0.0	0	0.0	0.0
Rudderfish (*Kyphosids*)*	0	0	0	0.0	0.0	45.5	0.0	-100.0
Triggerfish (*Balistids*)	0	6	1.8	3.3	85.2	1.3	5.8	348.7
Butterflyfish (*Chaetodontids*)	7	0	6.5	21.0	223.1	3.3	1.8	-44.4
Angelfish (*Pomacanthids*)	12.5	32	4	16.3	308.3	10.5	5.0	-52.4
Wrasses (*Labrids*)	117.5	1.3	29.3	34.5	17.7	27.2	22.2	-18.5
Humphead wrasse	~	0	0	0.0	0.0	1	0.0	-100.0
Damselfish (*Pomacentrids*)	1316	1533.3	1266	1504.0	18.8	704.7	224.0	-68.2
Fairy Basslets (*Anthids*)	273.5	363.8	520.2	16.7	-96.8	638.8	28.5	-95.5
Moorish Idol (*Zanclids*)	0	1.8	1.5	2.8	88.9	1.2	1.0	-16.7
Total (all reef species)	**1760.5**	**2137.5**	**1874.8**	**1763.0**	**-6.0**	**1465.5**	**351.8**	**-76.0**
Total (target reef species)*	**34**	**164.5**	**41.3**	**164.3**	**297.9**	**89.3**	**61.3**	**-31.3**

Table 23. Mean (±SE) fish species (species/500m²) and percentage change between years in Bolod Marine Sanctuary from 1999 to 2023.

FAMILY	Sanctuary				% Difference in species 2003-2023	Non-sanctuary		% Difference in species 2003-2023
	1999	2003	2007	2023		2007	2023	
	n = 2	n = 4	n = 6	n = 6		n = 6	n = 6	
Surgeonfish (*Acanthurids*)*	1.5	1.8	1.7	2.2	27.5	1	3.3	233.3
Rabbitfish (*Siganids*)*	0	1	0.8	0.3	-58.3	0.7	0.0	-100.0
Groupers (*Serranids*)*	0.5	0.8	1	1.2	16.7	0.5	0.5	0.0
Barramundi Cod	~	0	0	0.0	-	0	0.0	-
Snapper (*Lutjanids*)*	1.5	0.3	0.7	0.7	-4.8	0.8	0.0	-100.0
Sweetlips (*Haemulids*)	0.5	0	0	0.0	-	0	0.0	-
Emperors (*Lethrinids*)*	0	0	0	0.5	-	0	0.2	-
Jacks (*Carangids*)*	0.5	0	0.7	0.2	-76.2	0	0.2	-
Fusiliers (*Caesionids*)*	0	0.5	0.3	2.0	566.7	0.3	0.2	-44.4
Spinecheeks (*Nemipterids*)*	1	1.8	1.3	0.8	-35.9	1	0.5	-50.0
Goatfish (*Mullids*)*	1	2.5	1.8	0.8	-53.7	1.5	0.7	-55.6
Parrotfish (*Scarids*)*	0.5	3.5	3	1.5	-50.0	2.2	1.2	-47.0
Bumphead parrotfish	~	0	0	0.0	-	0	0.0	-
Rudderfish (*Kyphosids*)*	0	0	0	0.0	-	0	0.0	-
Triggerfish (*Balistids*)	0	1.8	1	1.2	16.7	1	1.0	0.0
Butterflyfish (*Chaetodontids*)	3	5	2.5	3.3	33.3	1.8	0.5	-72.2
Angelfish (*Pomacanthids*)	3	2	1.3	1.8	41.0	1.8	1.2	-35.2
Wrasses (*Labrids*)	6.5	11	8.5	6.3	-25.5	6.5	6.3	-2.6
Humphead wrasse	~	0	0	0.0	-	0	0.0	-
Damselfish (*Pomacentrids*)	12.5	20	14.8	12.3	-16.7	186.2	4.3	-97.7
Fairy Basslets (*Anthids*)	1	1.3	1.5	0.7	-55.6	59.8	0.7	-98.9
Moorish Idol (*Zanclids*)	0	0.8	0.3	0.5	66.7	0.7	0.3	-52.4
Total (all reef species)	**33**	**53.8**	**41.3**	**36.3**	**-12.0**	**265.8**	**21.0**	**-92.1**
Total (target reef species)*	**7**	**12**	**11.3**	**10.2**	**-10.0**	**8**	**6.7**	**-16.7**

Table 24. Changes in substrate composition (% mean ±SE) in Doljo Marine Sanctuary, Panglao from 1996 to 2023.

TYPE OF SUBSTRATUM	Sanctuary										TYPE OF SUBSTRATUM	Non-Sanctuary			
	SCUBA						SNORKEL					SCUBA			SNORKEL
	1996^	1999	2003	2007	2023	% Change 2007-2023	1999	2003	2007	% Change 2003-2007		2003	2007	% Change 2003-2007	2003
Non-living:											**Non-living:**				
Sand and silt	3.6	18.4	13.9	10.3	12.4	20.4	32.4	17.9	18.8	5.4	Sand and silt	13.4	10.8	-19.1	17.1
Coral rubble	16.6	28.1	32.4	24	15	-37.5	13.5	8.2	4.4	-46.1	Coral rubble	27.1	33.9	25.1	9.7
Rock and block	1.9	4	5.7	3.7	1.2	-67.6	20.3	13.3	20.8	57.1	Rock and block	3.6	4.8	33.3	11.9
White dead standing coral	~	1.5	0.3	0.2	0.1	-50.0	1.7	0.3	1.3	371.4	White dead standing coral	0.8	0	-100	0.7
Dead coral with algae	17.8	9.2	11.6	15.2	17.3	13.8	8.7	5.4	2.4	-55.1	Dead coral with algae	8	6.5	-18.2	6
SUBTOTAL non-living	**39.9**	**61.2**	**63.8**	**53.3**	**46**	**-13.7**	**76.6**	**45**	**47.8**	**6.2**	**SUBTOTAL non-living**	**52.8**	**56**	**6.2**	**45.3**
Living:											**Living:**				
Hard coral:											**Hard coral:**				
Branching	~	26.6	22.6	30.7	46.5	51.5	~	18.4	22	20.1	Branching	31.6	19	-39.9	19.8
Massive	~	5	3.1	1.7	1.3	-23.5	~	10	9.5	-4.8	Massive	3.2	2.6	-17.5	10
Flat/Encrusting	~	0.8	1	1.8	2	11.1	~	0.2	1.4	739.6	Flat/Encrusting	1.7	6.7	294.1	0.6
Foliose/Cup	~	6.2	1.3	4.3	0.8	-81.4	~	2.7	1	-61.5	Foliose/Cup	2.1	3.6	75.6	0.9
Subtotal hard coral	**51**	**38.6**	**27.9**	**38.4**	**50.6**	**31.8**	**22.3**	**31.2**	**34**	**9**	**Subtotal hard coral**	**38.5**	**31.9**	**-17.1**	**31.3**
Soft coral	0	0.3	0.5	0.5	0.6	20.0	1.5	3.7	3.9	7	Soft coral	0.8	1.1	46.7	3
SUBTOTAL corals	**51**	**38.9**	**28.4**	**38.9**	**51.2**	**31.6**	**23.8**	**34.9**	**37.9**	**8.8**	**SUBTOTAL corals**	**39.3**	**33**	**-15.9**	**34.3**
Others:											**Others:**				
Other animals	~	~	0.3	0.1	0.3	200.0	~	0	0.3	+	Other animals	0.1	0.7	600	0
Seagrasses	0	19.0∞	5.5	4.3	1	-76.7	14.5∞	6.9	5.8	-17	Seagrasses	2.8	2.2	-20	2.6
Algae											Algae				
Fleshy	~	~	1.1	1.7	0.8	-52.9	~	11.9	6.7	-43.4	Fleshy	2	5.7	192.3	13.4
Turf	~	~	0	0	0.3		~	0.1	0	-100	Turf	0.9	0.4	-52.9	0.9
Coralline	~	~	0.6	1.2	0.1	-91.7	~	0.3	1	203	Coralline	1.8	1	-44.4	2.7
Sponges	~	~	0.3	0.5	0.4	-20.0	~	0.9	0.5	-40.7	Sponges	0.6	1	81.8	0.7
SUBTOTAL others	**0**	**0**	**7.8**	**7.8**	**2.9**	**-62.8**	**0**	**20.1**	**14.3**	**-29**	**SUBTOTAL others**	**8**	**11**	**37.5**	**20.4**
GRAND TOTAL		**100**	**100**	**100**	**100**		**100**	**100**	**100**		**GRAND TOTAL**	**100**	**100**		**100**
Other relevant information											**Other relevant information**				
Slope (degrees)	~	10.8	26.3	37	60		3.4	5	4.6		Slope (degrees)	37.5	51		2
Topography* (m)	~	2.5	1	1.8	~		1.6	0	1.1		Topography* (m)	1	2.3		1
Depth range/average (m)	10	6.4	7.2	6.3	6.25		2.8	2.5	2.8		Depth range/average (m)	7.3	7.6		2.5
Visibility (m)	~	23.8	20.4	21.8	11.6		22	20	21.8		Visibility (m)	24.9	20.6		21.8
Sample size (Transects)	1	13	8	6	6		14	9	11		Sample size (Transects)	10	5		16
* 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											∞ Data not included in grand total				
~ No data											~ No data				

Table 25. Mean (±SE) fish species richness (species/500m^2) and density (individuals/500m^2) per family in Doljo Marine Sanctuary in 2023.

FAMILY	Sanctuary n = 6							
	# of species	SE	Count per size class (Abundance) 1-10 cm**	11-20 cm	21-30 cm	>30 cm	Total abundance	SE
Surgeonfish (*Acanthurids*)*	3.8	0.9	0.0	41.0	6.2	7.0	54.2	27.5
Rabbitfish (*Siganids*)*	0.8	0.2	0.0	0.3	2.0	0.0	2.3	1.2
Groupers (*Serranids*)*	0.5	0.0	0.0	1.0	0.0	0.0	1.0	0.5
Barramundi Cod	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Snapper (*Lutjanids*)*	0.5	0.0	0.0	0.5	1.0	0.0	1.5	0.7
Sweetlips (*Haemulids*)	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Emperors (*Lethrinids*)*	0.7	0.2	0.0	0.2	0.2	0.7	1.0	0.5
Jacks (*Carangids*)*	0.2	-	0.0	0.0	0.0	0.2	0.2	0.2
Fusiliers (*Caesionids*)*	1.5	0.3	0.0	130.3	2.0	0.0	132.3	42.3
Spinecheeks (*Nemipterids*)*	0.5	0.0	0.0	0.5	0.0	0.0	0.5	0.2
Goatfish (*Mullids*)*	0.3	-	0.0	2.3	0.3	0.0	2.7	2.7
Parrotfish (*Scarids*)*	2.5	1.0	0.0	9.5	1.5	0.8	11.8	6.0
Bumphead parrotfish	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Rudderfish (*Kyphosids*)*	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Triggerfish (*Balistids*)	1.7	0.5	0.0	8.0	0.2	0.0	8.2	4.3
Butterflyfish (*Chaetodontids*)	5.2	1.1	2.3	17.2	0.0	0.0	19.5	8.5
Angelfish (*Pomacanthids*)	1.2	0.4	7.7	2.7	0.0	0.0	10.3	6.2
Wrasses (*Labrids*)	6.2	2.5	16.7	5.2	0.5	0.0	22.3	9.8
Humphead wrasse	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Damselfish (*Pomacentrids*)	10.5	2.9	1450.0	199.7	0.0	0.0	1649.7	501.5
Fairy Basslets (*Anthids*)	0.8	0.2	216.2	0.0	0.0	0.0	216.2	106.5
Moorish Idol (*Zanclids*)	0.8	0.0	0.3	2.8	0.0	0.0	3.2	1.0
Total (all reef species)	**37.7**	**8.6**	**1693.2**	**421.2**	**13.8**	**8.7**	**2136.8**	**609.5**
Total (target reef species)*	**11.3**	**2.7**	**0.0**	**185.7**	**13.2**	**8.7**	**207.5**	**37.7**

Table 26. Mean (±SE) density (individuals/500m^2) and percentage change of fish families between years in Doljo Marine Sanctuary from 1999 to 2023.

FAMILY	Sanctuary				% Difference in abundance 2007-2023	Non-Sanctuary		% Difference in abundance 2003-2007
	1999	2003	2007	2023		2003	2007	
	n = 2	n = 4	n = 6	n = 6		n = 4	n = 6	
Surgeonfish (*Acanthurids*)*	51.5	26.5	17.7	54.2	206.0	2.5	3.2	28.0
Rabbitfish (*Siganids*)*	2	4.8	4.2	2.3	-44.4	6.5	0.5	-92.3
Groupers (*Serranids*)*	2	3.5	1	1.0	0.0	3.3	1.7	-48.5
Barramundi Cod	~	0	0	0.0	-	0	0	-
Snapper (*Lutjanids*)*	2	2.5	1	1.5	50.0	1	0.5	-50.0
Sweetlips (*Haemulids*)	0	0	0	0.0	-	0.3	0	-100.0
Emperors (*Lethrinids*)*	0	0.8	0	1.0	-	0.3	0	-100.0
Jacks (*Carangids*)*	16.5	0.3	0.3	0.2	-44.4	7.5	1.3	-82.7
Fusiliers (*Caesionids*)*	25.5	208.8	205.5	132.3	-35.6	52.5	43.3	-17.5
Spinecheeks (*Nemipterids*)*	21	0.3	1.3	0.5	-61.5	0.5	1.2	140.0
Goatfish (*Mullids*)*	81	2.3	1.5	2.7	77.8	0	1.7	-
Parrotfish (*Scarids*)*	33	27.5	16	11.8	-26.0	7	4	-42.9
Bumphead parrotfish	~	0	0	0.0	-	0	0	-
Rudderfish (*Kyphosids*)*	0	0	0	0.0	-	0	0	-
Triggerfish (*Balistids*)	2	2.5	1.3	8.2	528.2	4	1.5	-62.5
Butterflyfish (*Chaetodontids*)	13	5.8	2.5	19.5	680.0	5.8	4.7	-19.0
Angelfish (*Pomacanthids*)	7	5.8	2.5	10.3	313.3	6.5	2.7	-58.5
Wrasses (*Labrids*)	88.5	387	144.8	22.3	-84.6	120.8	136.2	12.7
Humphead wrasse	~	0	0	0.0	-	0	0	-
Damselfish (*Pomacentrids*)	1857	1773.5	1038.5	1649.7	58.9	2174	1662.2	-23.5
Fairy Basslets (*Anthids*)	642	760	765.5	216.2	-71.8	243.8	845.3	246.7
Moorish Idol (*Zanclids*)	0	1.5	0.5	3.2	533.3	1.5	0.5	-66.7
Total (all reef species)	**2844**	**3213**	**2204.2**	**2136.8**	**-3.1**	**2637.5**	**2710.3**	**2.8**
Total (target reef species)*	**234.5**	**276.3**	**247.3**	**207.5**	**-16.1**	**80.8**	**56.8**	**-29.7**

Table 27. Mean (±SE) fish species (species/500m^2) and percentage change between years in Doljo Marine Sanctuary from 1999 to 2023.

FAMILY	Sanctuary				% Difference in species 2007-2023	Non-Sanctuary		% Difference in species 2003-2007
	1999	2003	2007	2023		2003	2007	
	n = 2	n = 4	n = 6	n = 6		n = 4	n = 6	
Surgeonfish (*Acanthurids*)*	2.5	2.3	1.8	3.8	113.0	1.5	1.5	0.0
Rabbitfish (*Siganids*)*	1	2.5	0.7	0.8	19.0	1.3	0.3	-76.9
Groupers (*Serranids*)*	1.5	2.3	0.5	0.5	0.0	1.8	1.3	-27.8
Barramundi Cod	~	0	0	0.0	-	0	0	-
Snapper (*Lutjanids*)*	0.5	1	0.7	0.5	-28.6	0.8	0.3	-62.5
Sweetlips (*Haemulids*)	0	0	0	0.0	-	0.3	0	-100.0
Emperors (*Lethrinids*)*	0	0.8	0	0.7	-	0.3	0	-100.0
Jacks (*Carangids*)*	0.5	0.3	0.3	0.2	-44.4	0.3	0.5	66.7
Fusiliers (*Caesionids*)*	1.5	1.5	1	1.5	50.0	0.5	0.5	0.0
Spinecheeks (*Nemipterids*)*	1	0.3	0.8	0.5	-37.5	0.5	0.8	60.0
Goatfish (*Mullids*)*	1	1.3	0.8	0.3	-58.3	0	0.8	-
Parrotfish (*Scarids*)*	1	3	2	2.5	25.0	3	2	-33.3
Bumphead parrotfish	~	0	0	0.0	-	0	0	-
Rudderfish (*Kyphosids*)*	0	0	0	0.0	-	0	0	-
Triggerfish (*Balistids*)	0.5	1.3	0.8	1.7	108.3	2	1	-50.0
Butterflyfish (*Chaetodontids*)	3	3.8	1.3	5.2	297.4	2	2.8	40.0
Angelfish (*Pomacanthids*)	2.5	1.8	1.3	1.2	-10.3	3	1.2	-60.0
Wrasses (*Labrids*)	7.5	11.5	7.5	6.2	-17.8	10.5	7.8	-25.7
Humphead wrasse	~	0	0	0.0	-	0	0	-
Damselfish (*Pomacentrids*)	20	17	14.7	10.5	-28.6	16.5	16	-3.0
Fairy Basslets (*Anthids*)	2	2	1.8	0.8	-53.7	1.8	1.8	0.0
Moorish Idol (*Zanclids*)	0	0.8	0.3	0.8	177.8	0.5	0.3	-40.0
Total (all reef species)	**46**	**53**	**36.5**	**37.7**	**3.2**	**46.3**	**39.2**	**-15.3**
Total (target reef species)*	**10.5**	**15**	**8.7**	**11.3**	**30.3**	**10**	**8.2**	**-18.0**

* Target species

% change = {(Yr2-Yr1)/Yr1} x 100

(+) increase

(-) decrease

- no data available

Table 28. Changes in substrate composition (% mean ±SE) in Tawala Marine Sanctuary, Panglao from 1999 to 2023.

TYPE OF SUBSTRATUM	Sanctuary									Non-Sanctuary
	SCUBA				% Change	SNORKEL			% Change	SCUBA
	1999	2003	2007	2023	2007-2023	1999	2003	2007	2003-2007	2007
Non-living:										
Sand and silt	5.6	7.1	3.5	9.5	171.4	33.9	19.1	20.2	5.8	0.7
Coral rubble	8.8	9.8	16.3	12.2	-25.2	11.5	6.4	2.3	-64.1	3.3
Rock and block	20.2	3.8	1.8	22.75	1163.9	30.3	32.4	17.8	-45.1	7.3
White dead standing coral	2.1	0.3	0	0.25	+	0.6	0.1	0.7	600.0	1
Dead coral with algae	7.3	5.3	13.3	28.3	112.8	4.5	1.8	1.3	-27.8	5.3
SUBTOTAL non-living	**44**	**26.4**	**35**	**73**	**108.6**	**80.8**	**59.7**	**42.4**	**-29.0**	**17.7**
Living:										
Hard coral:										
Branching	38.8	45.7	35.3	10.4	-70.5	~	5.2	6.2	19.2	52.5
Massive	7	8.9	5.7	4.3	-24.6	~	3.2	3.9	21.9	6.5
Flat/Encrusting	2.4	7	6.3	1.4	-77.8	~	0.5	0.3	-40.0	9.2
Foliose/Cup	3.6	6.8	13.2	7.9	-40.2	~	2.8	1	-64.3	3.2
Subtotal hard coral	**51.8**	**68.3**	**60.5**	**24**	**-60.3**	**8.1**	**11.7**	**11.3**	**-3.4**	**71.3**
Soft coral	4.2	1.9	1.5	1.3	-13.3	11.2	18.9	44.8	137.0	6.2
SUBTOTAL corals	**56**	**70.3**	**62**	**25.3**	**-59.2**	**19.3**	**30.6**	**56.1**	**83.3**	**77.5**
Others:										
Other animals	~	0.1	0.5	0.75	50.0	~	0	0.1	+	0.2
Seagrasses	0	0	0	0	0.0	0	0.7	0	-100.0	0
Algae										
Fleshy	~	0.3	1	0.4	-60.0	~	7.1	1	-85.9	1.2
Turf	~	0.3	0.2	0.3	50.0	~	0.2	0	-100.0	0.3
Coralline	~	2.3	1	0	-100.0	~	1	0.2	-80.0	2.8
Sponges	~	0.4	0.3	0.25	-16.7	~	0.7	0.2	-71.4	0.3
SUBTOTAL others	**0**	**3.4**	**3**	**1.7**	**-43.3**	**0**	**9.6**	**1.5**	**-84.4**	**4.8**
GRAND TOTAL	**100**	**100**	**100**	**100**		**100**	**100**	**100**		**100**
Other relevant information										
Slope (degrees)	12.6	74.2	68.3	30		2.7	5	8		53.3
Topography*(m)	1.7	1.9	3	~		1.1	1.2	0.8		1.5
Depth range/average (m)	4.6	7.3	8	4.8		3	2.5	2.8		6.3
Visibility (m)	21.5	21.7	13.7	10		20.3	19.3	18		14.7
Sample size (Transects)	13	12	6	6		15	12	11		3

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

~ No data

Table 29. Mean (±SE) fish species richness (species/500m^2) and density (individuals/500m^2) per family in Tawala Marine Sanctuary in 2023.

FAMILY	Sanctuary n = 6							
	# of species	SE	Count per size class (Abundance)				Total abundance	SE
			1-10 cm**	11-20 cm	21-30 cm	>30 cm		
Surgeonfish (*Acanthurids*)*	3.2	0.5	0.0	41.0	2.5	1.2	44.7	26.6
Rabbitfish (*Siganids*)*	1.0	0.7	1.7	2.2	0.3	0.0	4.2	3.6
Groupers (*Serranids*)*	0.7	0.6	0.0	1.0	0.2	0.2	1.3	1.1
Barramundi Cod	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Snapper (*Lutjanids*)*	0.7	0.2	0.0	0.0	0.5	18.7	19.2	18.8
Sweetlips (*Haemulids*)	0.2	-	0.0	0.0	0.0	0.2	0.2	0.2
Emperors (*Lethrinids*)*	0.3	-	0.0	0.5	0.2	0.0	0.7	0.7
Jacks (*Carangids*)*	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Fusiliers (*Caesionids*)*	0.3	0.0	0.0	1.7	5.0	0.0	6.7	4.9
Spinecheeks (*Nemipterids*)*	0.7	0.2	0.2	2.3	0.0	0.0	2.5	1.3
Goatfish (*Mullids*)*	0.7	0.6	0.0	1.3	0.3	0.0	1.7	1.5
Parrotfish (*Scarids*)*	2.8	1.4	1.3	13.8	0.2	0.2	15.5	10.4
Bumphead parrotfish	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Rudderfish (*Kyphosids*)*	0.3	0.0	0.0	0.2	6.7	0.0	6.8	6.6
Triggerfish (*Balistids*)	1.3	0.2	0.0	2.5	0.2	0.0	2.7	1.0
Butterflyfish (*Chaetodontids*)	2.7	1.3	3.2	7.8	0.0	0.0	11.0	7.3
Angelfish (*Pomacanthids*)	2.0	0.4	2.0	3.5	0.2	0.0	5.7	2.1
Wrasses (*Labrids*)	5.0	1.9	3.5	9.2	0.7	0.0	13.3	4.9
Humphead wrasse	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Damselfish (*Pomacentrids*)	9.0	2.8	353.8	36.7	0.0	0.0	390.5	166.6
Fairy Basslets (*Anthids*)	0.2	-	5.5	0.0	0.0	0.0	5.5	5.5
Moorish Idol (*Zanclids*)	0.7	0.0	0.5	1.8	0.0	0.0	2.3	0.9
Total (all reef species)	**31.7**	**4.4**	**371.7**	**125.5**	**16.8**	**20.3**	**534.3**	**147.7**
Total (target reef species)*	**10.8**	**3.7**	**3.2**	**64.0**	**15.8**	**20.3**	**103.3**	**47.8**

Table 30. Mean (±SE) density (individuals/500m^2) and percentage change of fish families between years in Tawala Marine Sanctuary from 1999 to 2023.

FAMILY	Sanctuary				% Difference in density 2003-2023	Non-Sanctuary
	1999	2003	2007	2023		2007
	n = 2	n = 4	n = 3	n = 6		n = 3
Surgeonfish (*Acanthurids*)*	12.5	23	4	44.7	1016.7	3
Rabbitfish (*Siganids*)*	3	8.3	0	4.2	-	0.3
Groupers (*Serranids*)*	1.5	1.5	1	1.3	33.3	1
Barramundi Cod	13	0	0	0.0	-	0
Snapper (*Lutjanids*)*	~	8.8	4	19.2	379.2	0.7
Sweetlips (*Haemulids*)	0	0.8	1	0.2	-83.3	0
Emperors (*Lethrinids*)*	0	1.5	1	0.7	-33.3	0
Jacks (*Carangids*)*	5	0.5	18	0.0	-100.0	0
Fusiliers (*Caesionids*)*	34.5	162.5	0	6.7	-	90
Spinecheeks (*Nemipterids*)*	4.5	0.3	2	2.5	25.0	1.3
Goatfish (*Mullids*)*	1.5	2	0.3	1.7	455.6	1.7
Parrotfish (*Scarids*)*	33	24	2	15.5	675.0	3.7
Bumphead parrotfish	~	0	0	0.0	-	0
Rudderfish (*Kyphosids*)*	16.5	0	20	6.8	-65.8	0
Triggerfish (*Balistids*)	2	3.3	2.7	2.7	-1.2	1.7
Butterflyfish (*Chaetodontids*)	13	9.8	6.3	11.0	74.6	6.7
Angelfish (*Pomacanthids*)	17	5.8	6	5.7	-5.6	4.3
Wrasses (*Labrids*)	47.5	49.8	4.3	13.3	210.1	101.3
Humphead wrasse	~	0	0	0.0	-	0
Damselfish (*Pomacentrids*)	1421	1507.3	3237	390.5	-87.9	1645
Fairy Basslets (*Anthids*)	162	75	415	5.5	-98.7	288.7
Moorish Idol (*Zanclids*)	2	1.8	0.7	2.3	233.3	0
Total (all reef species)	**1789.5**	**1885.5**	**3725.3**	**534.3**	**-85.7**	**2149.3**
Total (target reef species)*	**125**	**233**	**53.3**	**103.3**	**93.9**	**100.3**

Table 31. Mean (±SE) fish species (species/500m^2) and percentage change between years in Tawala Marine Sanctuary from 1999 to 2023.

FAMILY	Sanctuary				% Difference in species 2007-2023	Non-Sanctuary
	1999	2003	2007	2023		2007
	n = 2	n = 4	n = 3	n = 6		n = 3
Surgeonfish (*Acanthurids*)*	2.5	3.5	1.7	3.2	86.3	2.3
Rabbitfish (*Siganids*)*	2	2.8	0	1.0	-	0.3
Groupers (*Serranids*)*	1.5	1	1	0.7	-33.3	1
Barramundi Cod	2.5	0	0	0.0	-	0
Snapper (*Lutjanids*)*	~	2.5	2	0.7	-66.7	0.7
Sweetlips (*Haemulids*)	0	0.8	0.3	0.2	-44.4	0
Emperors (*Lethrinids*)*	0	0.8	1	0.3	-66.7	0
Jacks (*Carangids*)*	1	0.3	1.3	0.0	-100.0	0
Fusiliers (*Caesionids*)*	1.5	0.5	0	0.3	-	0.7
Spinecheeks (*Nemipterids*)*	0.5	0.3	0.7	0.7	-4.8	0.7
Goatfish (*Mullids*)*	0.5	0.5	0.3	0.7	122.2	1
Parrotfish (*Scarids*)*	1	5.5	1.7	2.8	66.7	1.7
Bumphead parrotfish	~	0	0	0.0	-	0
Rudderfish (*Kyphosids*)*	0.5	0	0.7	0.3	-52.4	0
Triggerfish (*Balistids*)	1.5	1.3	1.3	1.3	2.6	1
Butterflyfish (*Chaetodontids*)	4.5	5	3	2.7	-11.1	3.7
Angelfish (*Pomacanthids*)	3	2.5	3	2.0	-33.3	2.7
Wrasses (*Labrids*)	5.5	8.8	4	5.0	25.0	8.7
Humphead wrasse	~	0	0	0.0	-	0
Damselfish (*Pomacentrids*)	20	16	13.3	9.0	-32.3	12
Fairy Basslets (*Anthids*)	2	0.8	2	0.2	-91.7	2
Moorish Idol (*Zanclids*)	1	1	0.7	0.7	-4.8	0
Total (all reef species)	**51**	**53.5**	**38**	**31.7**	**-16.7**	**38.3**
Total (target reef species)*	**13.5**	**18.3**	**10.7**	**10.8**	**1.2**	**8.7**

APPENDICES

Appendix 1. Itinerary of events

ITINERARY OF EVENTS
Saving Philippine Reefs
April 30-May 7, 2023
Bohol, Philippines

DAY	DATE & SITE	TIME	ACTIVITIES
1	April 30 (Sunday) Bohol Beach Club	 12:00 NN 1:00 2:00 3:00 5:00 7:00	Rendezvous at Bohol Beach Club Lunch SPR Expedition Briefing—Alan & CCEF Team Practice of systematic snorkeling technique Scuba survey-test of a 50m transect line by all participants Review of benthos and butterflyfish Agnes, Danilo and team Welcome dinner
2	May 1 (Monday) Bolod MPA	7:00 AM 8:00 12:00 PM 1:30 7:00	Breakfast Daily briefing—Dive master Depart for survey site Scuba survey Snorkel survey Lunch Community perception survey by staff Scuba survey Compile and check data at resort Dinner **Dinner meeting with Governor Aumentado of Bohol.**
3	May 2 (Tuesday) Balicasag Island MPA	7:00 AM 8:00 12:00 PM 1:30 7:00	Breakfast Daily briefing Depart for survey site Scuba survey Snorkel survey Lunch Community perception survey by staff Scuba survey Compile and check data at resort Dinner **CCEF Organizational Project status—** Auburn Samson, CCEF Executive Director
4	May 3 (Wednesday) Pamilacan MPA	7:00 AM 8:00 12:00 PM 1:30 7:00	Breakfast Daily briefing Depart for survey site Scuba survey Snorkel survey Lunch Community perception survey by staff Scuba survey Compile and check data at resort Dinner **Optional night dive**

DAY	DATE & SITE	TIME	ACTIVITIES
5	May 4 (Thursday) Bil-isan MPA	7:00 AM 8:00 12:00 PM 1:30 7:00	Breakfast Daily briefing Depart for survey site Scuba survey Snorkel survey Lunch Community perception survey by staff Scuba survey Compile and check data at resort Dinner **Reef resilience insurance project--**Alan White
6	May 5 (Friday) Doljo MPA	7:00 AM 8:00 12:00 PM 1:30 7:00	Breakfast Daily briefing Depart for survey site Scuba survey Snorkel survey Lunch Community perception survey by staff Scuba survey Compile and check data at resort Dinner **Reef rehabilitation initiatives—**Panglao Environment and Natural Resources Office
7	May 6 (Saturday) San Isidro-Dao MPA Danao MPA Arco Point Tawala MPA	7:00 AM 8:00 12:00 PM 1:30 7:00	Breakfast Daily briefing Depart for survey site Scuba survey Snorkel survey Lunch Community perception survey by staff Scuba PIT and snorkel survey Compile and check data at resort Dinner **Sharing photos and photo contest**
8	May 7 (Sunday)	7:00 AM 8:00 10:00 12:00 PM	Breakfast Debriefing Closing of 2023 SPR Departure to Manila via PAL of some (ETD: ??) Departure to Cebu via Ferry of some (ETD: ??) Lunch of some Departure to Manila via PAL of some 4:45 PM Flt Departure to Cebu via Ferry (ETD: 4:10PM) The rest of the group (refer to flight details summary)

Appendix 2. Research Team volunteers

Saving Philippine Reefs
Research Team Volunteers
April 30-May 7, 2023
Bohol, Philippines

	Name/Address	Contact numbers/fax/email	Profession/Affiliations/Interests
1	**Denise Illing** 34 Oakland Drive Warrandyte 3113 Australia	Mobile: +61 419307653 Email: denise@illing.com.au	BA in Geography and Sociology. Interested in marine life, reefs, and diving. Wildlife artist. Watercolorist. Amateur photographer. 17th SPR Expedition
2	**Geoff Illing** 34 Oakland Drive Warrandyte, VIC 3113 Australia	Mobile: +61 419307047 Email : geoff@illing.com.au	Almost retired IT professional. Keen amateur musician, playing bassoon, and contrabassoon in three orchestras and two concert bands, also other woodwinds in some clarinet, saxophone and other groups.
3	**Vittoria Thornley** Rochford House, Rochford, Tenbury Wells, Worcestershire, WR15 8SL, UK	Mobile: +44 7779 222320 Email: vittoria@kemblemill.com	BA (Hons) Human Sciences (Oxon). MSc Ecology (Univ. of Bristol). Advanced PADI Open Water. Interest in nature conservation, gardens, bees, classic cars, and travel.
4	**Simon Thornley** Rochford House, Rochford, Tenbury Wells, Worcestershire, WR15 8SL, UK	Mobile: +44 7866 458125 Email: vittoria@kemblemill.com	Founder/Director of Thornley Kelham, leading classic car restoration business - still taking up too much of my time (!) No affiliations - to quote Groucho Marx - “I refuse to join any club that would have me as a member.” Interests - travelling, reading, gardening, photography, old cars, and above all: my family.
5	**Julia Cichowski** 41 Gray Street Boston, MA 02116 U.S.A.	Mobile: +1 617 671-8865 Email: julia.cichowski@gmail.com	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. I’ve lost count, but I think this will be my 19th SPR (first one was 1999) … loved every one.

	Name/Address	Contact numbers/fax/email	Profession/Affiliations/Interests
6	**Sheree Marris** 61 Foam Street, Rosebud VIC, Australia 3939 Postal: PO Box 299 Rosebud VIC, Australia 3939	Mobile : 0417 346 963 Email: sheree@shereemarris.com	Aquatic Scientist/Environmental Communicator; Board member of Unico Conservation Foundation
7	**Alastair Pennycook** 408/1 Poplar Street, Surry Hills, NSW 2010 Australia	Mobile: +61 2 92680870 Email: alastair.pennycook@uts.edu.au	Professor of Language Studies, University of Technology Sydney Yachting Australia Coastal Skipper, PADI Master Diver, underwater photography.
8	**Dominique Estival** 408/1 Poplar Street, Surry Hills, NSW 2010 Australia	Mobile: +61 2 92680870 Email: dominique@dominique-estival.net	Linguist/ researcher University of Western Sydney Flight instructor, glider pilot
9	**Roland Thomas** 9 Jersey St Balwyn 3103, Victoria, Australia	Tel: +61418181162 Email: rolandthomas@bigpond.com	Executive in Residence/Business Mentor-Consultant Board Member, Coastal Conservation and Education Foundation, Inc.
10	**Mark Copley** 5 Normandy Cir, Colorado Springs, Colorado 80906 USA	Tel: +1 719 216 2463 Email: mhc@quizdog.com	Engineer.
11	**Kenneth Mark Hillebrand** 2 Ellinis Mews PORT MELBOURNE 3207	Tel: +61 412557766 Email: mkhillebrand@gmail.com	Strategic Management and Marketing Consultant; Augmented Reality; Private pilot; Snow skiing and sailing.
12	**Thomas Matula** 766 6th Avenue Honolulu HI 96816	Mobile: +63 969 436 4684 Email: tmatula@me.com	Retired Anesthesiologist. Dives and Travels! Half time resident of Panglao, Philippines

Appendix 3. Research staff

Saving Philippine Reefs
Research Staff
April 30-May 7, 2023
Bohol, Philippines

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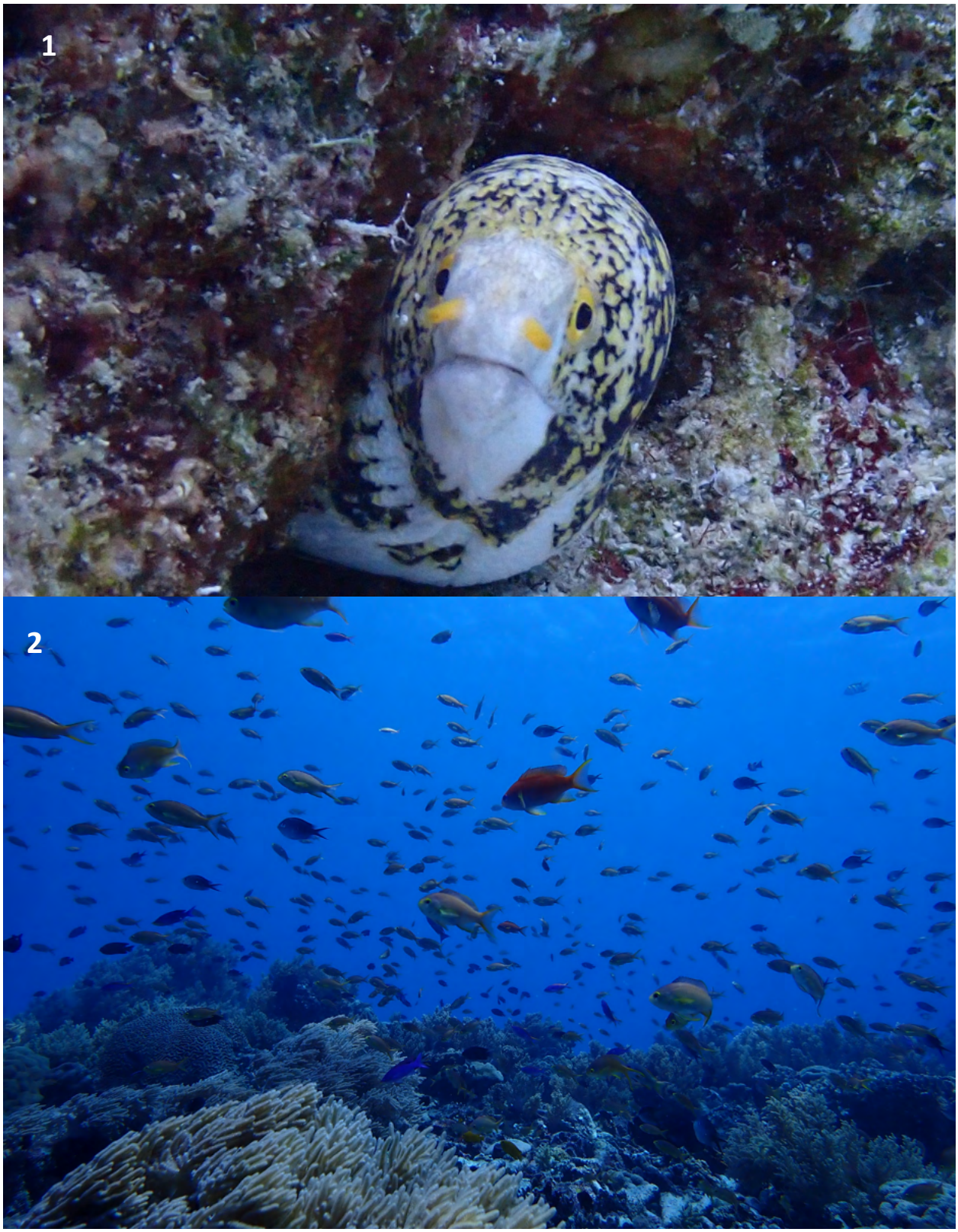
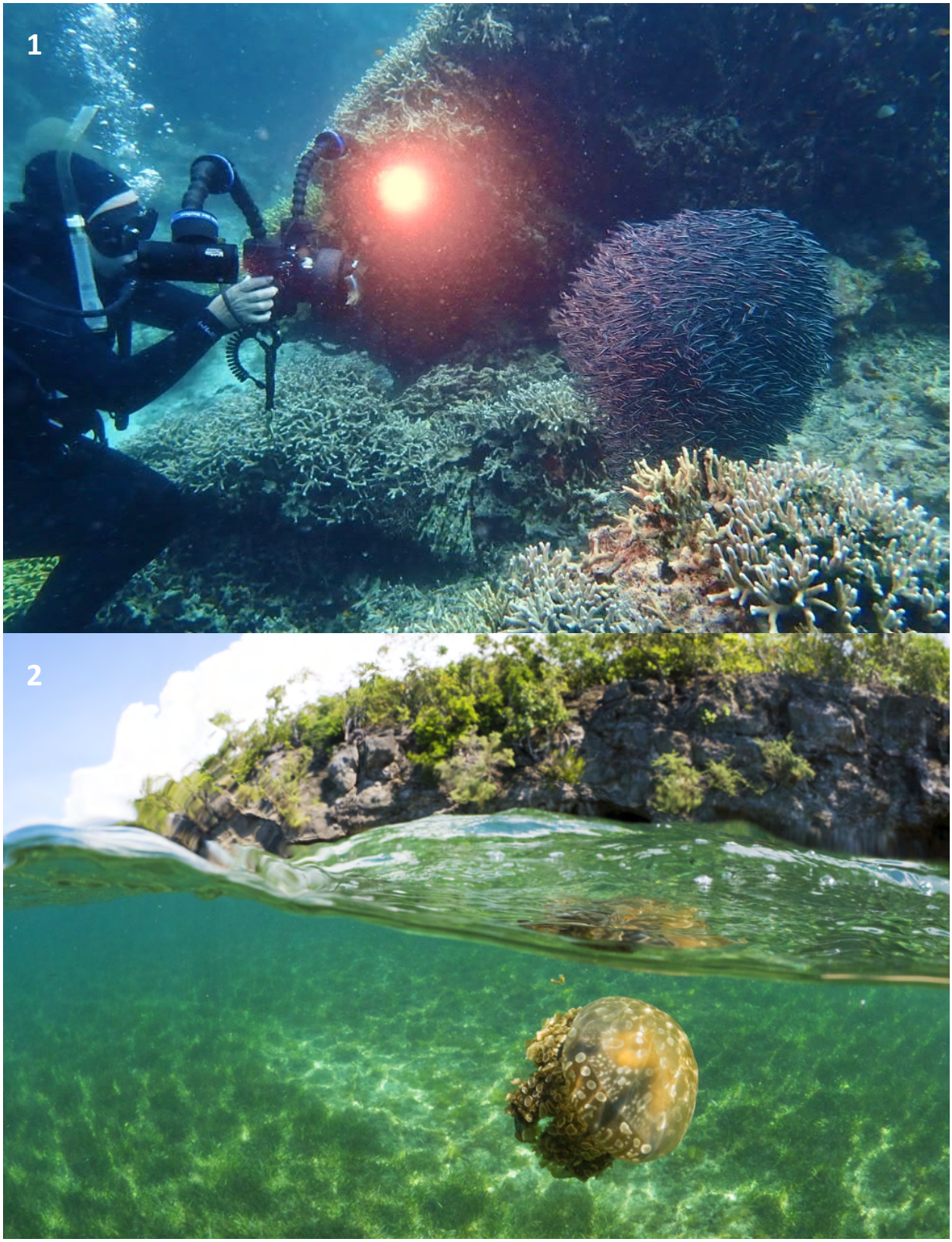
SITE PHOTOS

1 The expedition starts with a beautiful group picture with a beach background. It took quite a few tries to get it right but we did it! **2** An underwater group photo becomes possible with a sandy area on the other side of Balicasag Island.

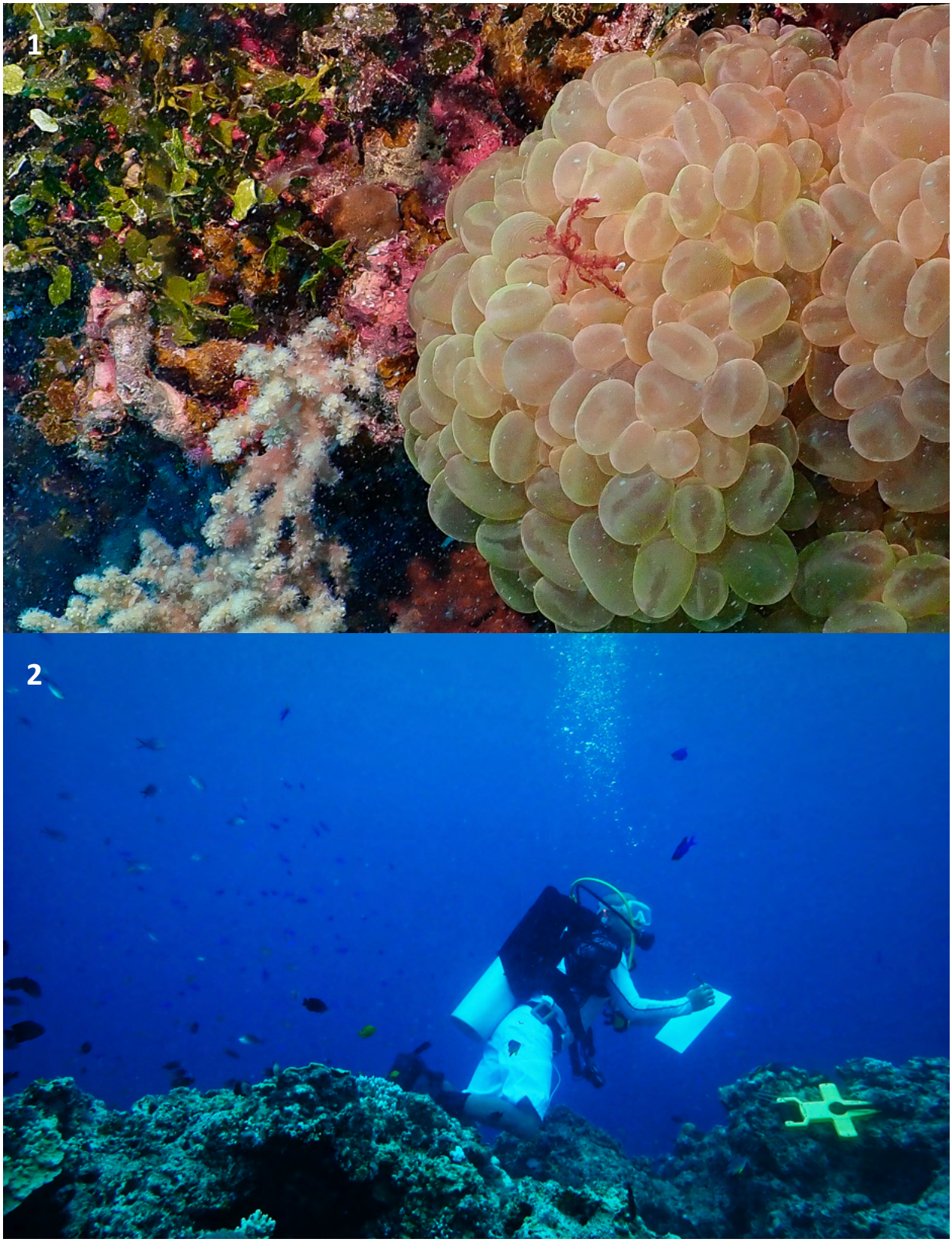


1 Snowflake moray eel (*Echidna nebulosa*)featuring its classic inquisitive look. Photo by Vangie White. **2** A healthy coral reef boasting live corals and diverse fish species. Photo by Alan White

1 Glass shrimps (*Ancylomenes_sarasvati*) are very tricky to shoot but they couldn't get away from persistent photographers. Photo by Alastair Pennycook. **2** Sexy squat shrimps (*Thor amboinensis*) strutting their stuff. Photo by Vittoria Thornley.



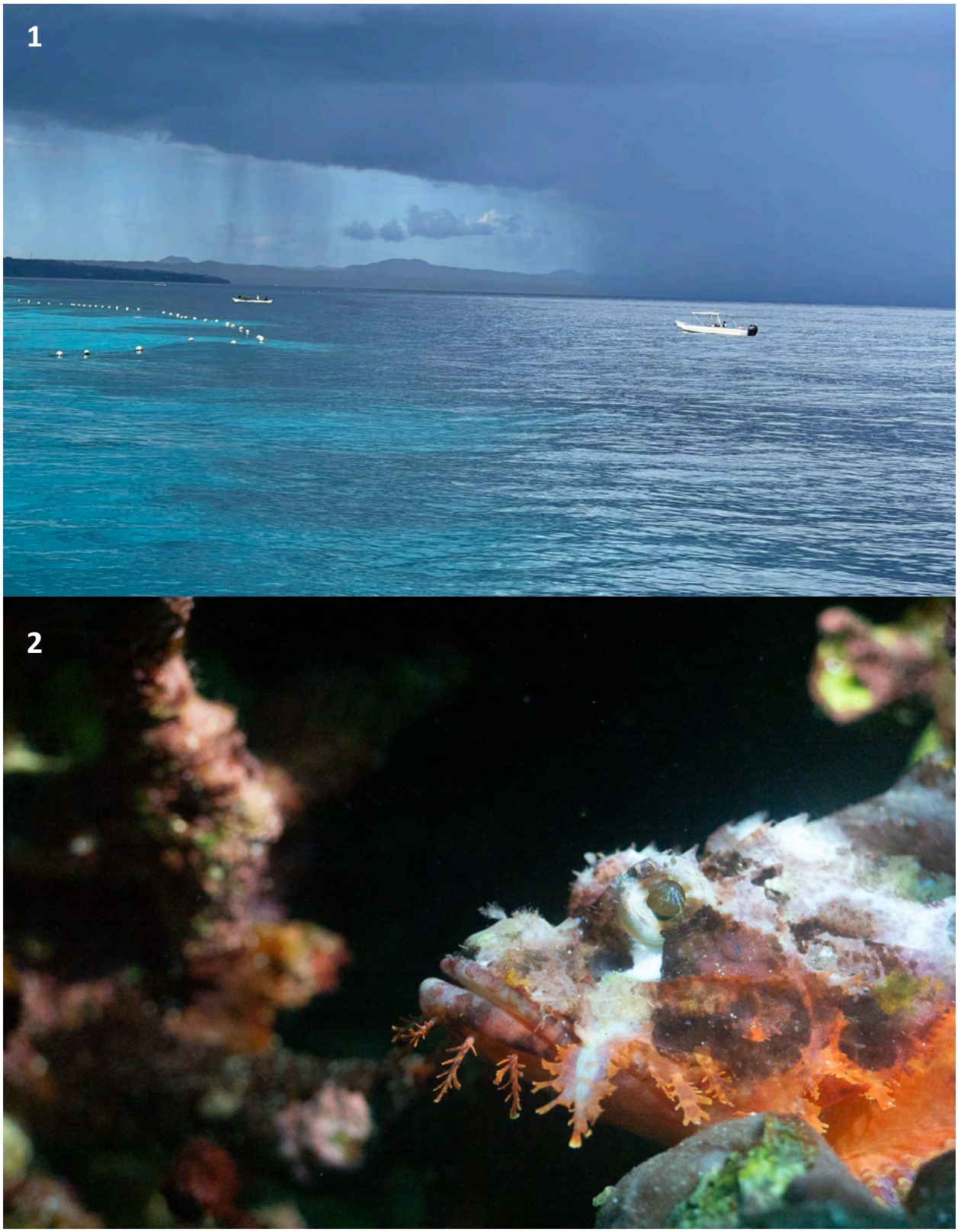
1 Underwater paparazzi Julia C. stoked at finding this ball of juvenile convict blennies (*Pholidichthys leucotaenia*). Photo by: Vittoria Thornley **2** Half and half view of the Panglao seascape with a spotted jelly (*Mastigias papua*). Photo by Sheree Marris



1 Orangutan crab (*Achaeus* japonicus) nestled in between polyps of the bubble coral (*Plerogyra sinuosa*). Photo by: Roland Thomas **2** Fish counter Danilo doesn't let the end of the transect stop him from checking out the fish. Photo by Dionel Molina

1 These clownfishes (*Apmhiprion clarkii*) and their anemone seems to contain the only color in this part of the reef. Photo by Roland Thomas **2** Hawksbill sea turtle (*Eretmochelys imbricata*) gives a serious pose. Photo by: Julia Cichowski

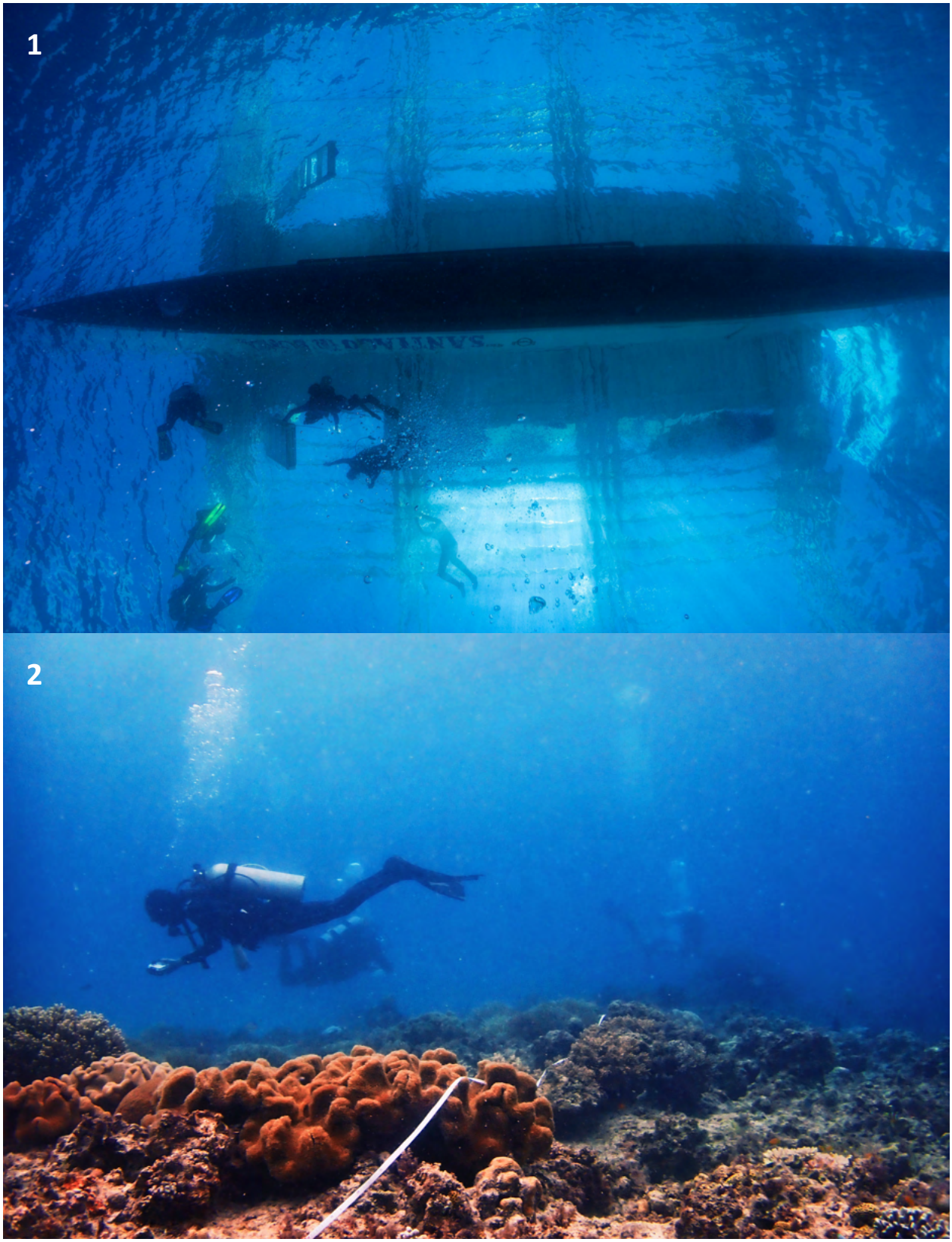
1 The lionfish floats regally in the blue jungle. Photo by AJ Lozada **2** Healthy reef and lifetime buddies. Photo by Ae Sabonsolin



1 The threat of bad weather was not enough to deter the SPR team from the assessing the reefs! Photo by: Simon Thornley **2** This tasseled scorpionfish (*Scorpaenopsis oxycephala*), thought it was successfully hidden from the photographers. Photo by: Roxie Diaz

Some macro shot favorites: **1** *Ardeadoris egretta* AJ Lozada **2** *Chromodoris annae* AJ Lozada **3** *Pseudobiceros bedfordi* Julia Cichowski **4** *Chromodoris elisabethina* Mark Copley, **5** *Nembrotha lineolata* Simon Thornley **6** *Solenostomus paradoxus* Alastair Pennycook **7** *Phyllidia elegans* Vittoria Thornley **8** *Notodoris serenae* Alastair Pennycook **9** *Monetaria moneta* Dionel Molina **10** *Phyllodesmium briareum* Tom Matula

1 First day of the dive expedition, a happy affair of seeing familiar faces after the long Covid pandemic break. Photo by Ae Sabonsolin **2** A lovely dinner under the stars with special guest Bohol Vice Governor Hon. Dionisio A. Balite, Ph. and staff.



1 The SPR Team view from the reef below. Photo by: Agnes Sabonsolin **2** Divers using the transect line for fish, substrate and invertebrate data collection. Photo by: Dionel Molina

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UNICO CONSERVATION FOUNDATION, INC.

with the participation and support of the

SAVING PHILIPPINE REEFS EXPEDITION VOLUNTEERS