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Environmental, Economic, and Social Impacts of Coastal Resource Management: A Case Study of Sagay Marine Reserve

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***Abstract*—**The study sought to assess the environmental, economic, and social impacts of coastal resource management of Sagay Marine Reserve Coastal Resource Management on the local fisher folks of the coastal barangays of Sagay City. The descriptive method was employed and data were gathered through Focus Group Discussion. Quantitative data were taken from the demographic profile of the participants and descriptive statistics were used to analyze the data. Qualitative data gathered were analyzed using Krueger's systematic analysis process. Results of the study revealed that coastal and marine reserve resources have been rehabilitated through the various management schemes employed by Sagay Marine Reserve namely: resource conservation, resource preservation, resource protection, and resource utilization. There was high biodiversity of both flora and fauna present in the area. The coastal resource management schemes have affected the environmental, economic and social conditions of the coastal communities. The environmental impact was very evident. The economic impact however was found to be minimal because the economic conditions of most of the fisher folks remain to be low. Socially, the coastal resource management schemes have improved the human relationships and human interactions. The role of education and information dissemination was identified as crucial in the success of the implementation and participation of stakeholders of the program. Overall, the coastal resource management schemes have positively improved the conditions of the coastal and marine ecosystems of the Sagay Marine Reserve.

Keywords—coastal resource management; fisher folks; coastal communities; management schemes

I. INTRODUCTION

The Philippines is an archipelago consisting of more than 7,100 islands, with a total coastline of 36,289 km. The area of territorial water (including the EEZ) is 2,200,000 km², comprising a coastal area of 266,000 km² and an oceanic area of 1,934,000 km². The country's shelf (depth of 200 m) and coral reef (within the 10-20 fathoms where reef fisheries occur) areas cover 184,600 km² and 27,000 km², respectively (BFAR, 2020). Seventy percent (70%) of the 1,525 municipalities, including 10 cities, are coastal and it is in the coastal zone where 80% of the population lives (Baling and Recide, 2017).

The Philippines is blessed with rich natural resources thriving in its various coastal, marine and inland waters. It has been identified as an epicenter of marine biodiversity as it is located within the biogeographic core of the Coral Triangle, together with its coral reef area representing 9 percent of the global total which makes it the third-largest reef area in the world after Australia and Indonesia (Carpenter and Springer, 2005; Burke et al., 2002). The coral reefs and other coastal and marine ecosystems which include mangroves, sea grass beds, estuaries and upwelling zones are responsible for higher fish catch and marine production in the country (White & Cruz-Trinidad, 1998).

Highlights of the Fisheries Profile 2019 show that the Philippines ranked 8th among the top fish producing countries in the world in 2018 with its total production of 4.354 million metric tons of fish, crustaceans, mollusks, and aquatic plants (including seaweeds) which constitutes 2.06% of the total world production of 211.87 million metric tons. The country is also the world's 4th largest producer of aquatic plants having produced a total of 1.478 million metric tons or nearly 4.56 % of the total world production of 32.386 million metric tons (FAO Statistics as cited in BFAR, 2020).

The total volume of fisheries production in 2019 reached 4,415,002 metric tons after several years of declining output. It increased by 1.3% from the previous year's production of 4.36 million metric tons. Fisheries production was valued at P281.652 billion worth of various marine and aquaculture products higher than the P265.349 billion production value of the preceding year, with Region III, Region VI and Region XII as the top three producing regions in the country (BFAR, 2020).

Nevertheless, like most megadiversity countries in the world, the Philippine coastal and marine environments are faced with greater risk of habitat loss and destruction. Ani and Castillo (2020) noted that the Philippines has been tagged as one of the world's biodiversity hotspots and a top priority in conservation. The biodiversity hotspot concept was first introduced in 1988 by Norman Myers, a British ecologist, which was adopted and referred to by Conservation International a year after as "places on Earth that are both biologically rich — and deeply threatened" (Conservation International, 1989).

The environmental crisis is a critical issue affecting all people from all walks of life in that the condition of the environment represents a real and significant threat to the survival of humans and other life forms. The marine resources of the Philippines are experiencing the highest level of threats,

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both anthropogenic and climatic (Roberts et al., 2002 and Burke et al., 2012 as cited in Cabral et al., 2014). The threats and drivers of degradation of the coastal marine ecosystems in the country are overfishing, overexploitation, siltation, unsustainable fishing practices, lack of awareness, pollution, climate change, and unsustainable coastal development (Baling and Recide, 2017). To over a million Filipinos living in coastal communities who rely on seafood, especially fish which is the main ingredient of their diet, and whose livelihood depends on catching and selling fish, the threats facing the oceans and coasts are daunting. Results of several research studies reveal that there has been a growing environmental awareness among stakeholders, individuals, groups or communities not just in the country but around the world (Galang, 2010; Wagner, 2012; Raut, 2014). Committed conservation groups operate throughout the country, striving to salvage the hotspot from its precarious environmental position (Posa et al., 2008). The involvement of the public in the need to be environmentally conscious through education programs and campaigns, and information dissemination campaigns for several decades now has been a critical driving force to effectively address ecological issues and increasing capacity for conservation efforts. Other than awareness-raising, one of the solutions to protect fishery resources and promote biodiversity is the marine protected area (MPA).

The researcher was prompted to conduct this study to determine the various coastal and marine resources management schemes implemented by the Sagay Marine Reserve by looking into their environmental, economic, and social impacts on the quality of life of the fisher folks, with the aim of helping the governing agencies, the academe as well as other stakeholders make informed decisions on how to best manage and utilize the coastal marine resources while uplifting the lives of the people relying on these bounties. Results of this study, therefore, will provide direction to the resource managers towards achieving a sustainable management, protection and support of our natural coastal ecosystem.

This study aimed to determine the environmental, economic and social impacts of Sagay Marine Reserve Coastal Resource Management Schemes on the lives of the people in its six coastal barangays namely: Himoga-an Baybay, Old Sagay, Taba-ao, Bulanon, Vito, and Molocaboc.

Specifically, this study sought to answer the following questions:

1. What are the coastal and marine resources found in Sagay Marine Reserve?

2. What are the management schemes implemented by Sagay Marine Reserve to protect the environment and biodiversity of marine organisms in Sagay City?

3. What are the environmental, economic, and social impacts of the coastal resource management schemes of Sagay Marine Reserve on the six coastal communities?

II. LITERATURE REVIEW

Marine Protected Area or MPA is a generic term that refers collectively to areas in the marine region, whether coastal or offshore, set aside for management and conservation measures or to areas where some semblance of protection, whether legislated or not, is exercised. The use of the term is common at the national level to refer to any such marine or coastal protected area, often within the context of a broader coastal management regime or program. Other types of marine protected areas established through city or municipal ordinances include marine reserves, refuges, and sanctuaries (DENR et al., 2001b). These areas have become the frontrunners when it comes to coastal resource management in the country.

Since the 1950s, the community-based resource management approach has been used by community developers concerned with agricultural resources in the country. This approach was applied to the management of coastal resources in the mid-1970s when the Sumilon Marine Reserve, the first municipal marine reserve in Sumilon Island, Cebu was established. In the 1980s, the community-based approach to coastal resource management was rapidly accepted by non-government organizations (NGOs) and academic institutions. Since then, an increasing number of Marine Protected Areas (MPAs) have been established (Alcala, 1998; Arceo et al., 2013 as cited in Cabral et al., 2014).

The substantial increase of municipal marine fish sanctuaries or MPAs that have been established to address rapidly depleting coastal and marine resources may be attributed to the strong interest shown by the national government, local government units (LGUs), non-government organizations (NGOs) and funding institutions, and to the innovations of coastal resource management thriving in the country. In general, the MPAs are established and managed through the Local Government Code (LGC) of 1991, the National Integrated Protected Areas System (NIPAS) Act of 1992, the Fisheries Code of 1998, and many local government ordinances (White, et al. 2002). As of June 2021, the number of MPAs declared in the country is more than 1,500 since the 1970s when the Philippines pioneered a community-based approach to marine protected area management. Yet, experts say that only a third of these MPAs are well-managed (Chavez, 2021). The Sagay Marine Reserve (SMR) is one example of MPA that showcases its rich natural wealth after more than three decades of effective conservation and management. It is among those included in the Guidebook to Protected Areas of the Philippines (BMB-DENR, 2015).

Sagay is considered as one of the significant fishing coastal communities in the province of Negros Occidental. The idea of protecting and conserving the coral reefs and other marine habitats in Sagay was conceived by Alfredo G. Marañon, Jr. (former municipal mayor and later the governor of the province), with the help and technical expertise of Silliman University Marine Laboratory then headed by Dr. Angel C. Alcala. The Sagay Marine Reserve (SMR) was established in 1983 first as a marine sanctuary in Carbin Reef by virtue of Municipal Ordinance Number 2 and was later extended to Panal, Macahulom and the fringing reefs of Molocaboc Islands. The passage of Proclamation No. 592 in

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1995 which declared the islands of Molocaboc, Diutay, Matabas, and Suyac, as well as their surrounding reefs and the reefs of Carbin and Maca as protected landscape/seascape under the National Integrated Protected Areas System (NIPAS) Act of 1992 (Republic Act No. 7586) institutionalized the protection efforts. A landmark legislation of Sagay Marine Reserve, authored by Congressman Alfredo G. Marañon, Jr., is Republic Act No. 9106, "An Act for the Establishment and Management of Sagay Marine Reserve, defining its Scope, coverage and for other purposes" (known as the "Sagay Marine Reserve Law") which was signed into law on April 4, 2001 (SMR Office, 2021; Webb et al., 2004).

While the Sagay Marine Reserve is one of the few prosperous marine protected areas as far as a community-based management approach is concerned, there is still a dearth of information about the beneficial impact of this strategy on the lives of the people living in the coastal communities. Research in this area is needed as there is much that could be learned from the experience, especially of those affected by the establishment of the marine reserve, in order to further increase awareness and participation and strengthen commitment of various stakeholders on environmental concerns, promote conservation and management of coastal marine resources, and provide directions for future plans on environmental sustainability.

III. Research Method

The protection of the participants is important in all research through the application of appropriate ethical principles. Ethical considerations in a qualitative study have particular resonance due to the in-depth nature of the process (Arifin, 2018). Ethical guidelines include voluntary participation, informed consent, data confidentiality, data privacy, and integrity of data reporting. The researcher used safety measures to protect the anonymity of the information gathered and guaranteed adherence to data privacy regulations. Both participant identities and personal information were kept with utmost confidentiality.

The researcher made sure that each participant signed a consent form indicating that they were participating voluntarily. Participants were given the freedom to choose whether to participate or not in the study without fear of repercussion since they were given full information about the nature and objectives of the study. The focus group discussion was sensitively facilitated by the researcher, who created a safe space for participants to share their ideas and feelings. The participants were asked to provide the answers with honesty and integrity and privacy was ensured during the discussion. The researcher was open and objective to preserve integrity in data reporting.

This study used both quantitative and qualitative designs. According to Creswell (2003), it is a mixed method approach in which the fundamental principle is the collection of multiple data with different strategies and methods providing insights, rich and in-depth data not possible when only qualitative or quantitative data are collected. The approach employs strategies of inquiry that involve collecting data either simultaneously or sequentially to best understand the research problem.

The secondary sources of information used in the study were drawn from documents and records provided by government agencies, non-government organizations, and other researchers. The data obtained from these sources served as the basis to describe the profile of Sagay Marine Reserve, its physical features, present condition, and management. The study used the cumulative frequency and percentage to analyse the socio-demographic characteristics of the participants.

The qualitative data were generated using Focus Group Discussion (FGD). FGD uses closed and open-ended questions to gather data. It is an "interview with a small group of people on a specific topic" (Patton, 1990 as cited in Flick, 2002). useful to obtain a rich understanding of participants' experiences and beliefs (Mishra, 2016) in the context of the environmental, economic, and social impacts of the coastal resource management schemes of Sagay Marine Reserve.

In the conduct of the study, the researcher asked permission by writing a formal letter addressed to the Protected Area Superintendent of Sagay Marine Reserve, Mr. Antonio M. Cueva. After permission was granted, the researcher was given access to look into the documents and records available in the office of Sagay Marine Reserve that are relevant to capture the objectives of the study.

Letters were also sent to the presidents of the different fisher folks associations in Sagay City Fisheries Aquatic Resource Management Council (FARMC) to conduct a focus group discussion among their members. The focus group discussions commenced on January 6, 2020 until January 28, 2020. The FGDs were taped and transcribed. Summary matrices were developed from the raw transcriptions based on Krueger's (2013) systematic analysis of data collected during the focus group sessions. It involved key themes, following the identified management practices and their environmental, economic, and social impacts under each of the four resource management schemes implemented by Sagay Marine Reserve. The data were interpreted to uncover insights related to the research questions.

The research instruments consisted of a Personal Data Sheet and a Guide for the Focus Group Discussion. The Personal Data Sheet contained information about the socio-demographic characteristics of the participants, which included age, sex, marital status, number of children, educational attainment, number of years of fishing, source of knowledge/experience in fishing, employment of spouse, and affiliation to fisherfolk association. The guide for the FGD was composed of twenty-two (22) probing questions about the management practices, their impacts, and the problems/issues encountered in relation to the resource management schemes implemented by Sagay Marine Reserve.

The participants of the study were small fisherfolk. These are residents in the coastal barangays who have been fishing or doing related fishing activities such as gleaning, fish vending, dried fish production and others in the area for not less than 5 years. All are members of the different fisherfolk associations in the Sagay City Fisheries Aquatic Resources Management Council (FARMCs). The participants were taken from the population of fisher folks in the six coastal barangays. Based on the SMR data for 2021, there are 54 fisher folk associations in Sagay City, 9 of which were newly

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organized, with 1,711 registered members. Ten (10) members of the different fisher folk associations in each of the six coastal barangays were randomly selected and were invited to participate in the focus group discussion. One FGD in each of the six (6) coastal barangays was conducted in coordination with the presidents of various fisher folk associations.

Of the twenty-five (25) barangays in the City of Sagay, six are coastal barangays. The study was undertaken in the coastal barangays of Himoga-an Baybay, Old Sagay, Taba-ao, Bulanon, Vito and the island barangay of Molocaboc which are all within the area of the Sagay Marine Reserve.

IV. Findings and Discussion

Management Schemes and Impact

Resource Preservation Scheme

There are three identified management practices implemented by the office of the Sagay Marine Reserve under Resource Preservation. These are the Closed Season, Biodiversity Monitoring, and Mangrove Cutting Restrictions.

1. Environmental Impacts
   a. Closed Season
      The most positive thing about the implementation of the Closed Season from November 15 to February 15 of every year was that it eased up the pressure on marine resources and protected sexually mature fishes as well as the larvae, fry and young. This was confirmed and supported by all of the respondents. (*For us, the closed season is necessary because you will really see the increase in fish population. That is the time when fishes spawn and hatch.*)

   b. Biodiversity Monitoring
      Some of the participants said that the biodiversity monitoring activity gave them an idea on the state of their coastal and marine resources, helping them come up with informed decisions or solutions to existing problem.

   c. Mangrove Cutting Restrictions
      Participants viewed mangrove cutting restrictions as essential for coastal conservation. With enforcement assured, these regulations protect mangroves from illegal logging, as emphasized by those from Suyac Island. *(The mangroves have protected our island against big waves and storms. If the mangroves were not here during typhoon Yolanda, the island will not probably be here anymore, because as you can see, this island is just a piece of white sand which can easily be washed out or eroded by the waves.*)

2. Economic Impacts
   a. Closed Season
      Most participants reported the closed season from November 15 to February 15 did not affect their livelihoods, as prohibited fish were not their main catch and they had alternative income sources like gleaning, crab fishing, and eco-tourism. They felt optimistic, noting that fish catches typically increased after the season ended. (*We are not really affected because the prohibited species of fish during the closed season are rare here in our area. We do not rely on those for a living.*)

   b. Biodiversity Monitoring
      Some participants felt optimistic about biodiversity monitoring for enhancing oyster production, while most were concerned it disturbed fish populations. In Barangay Himogaan Baybay, participants shared about the problem they encountered during the monitoring of nylon shells in their fishing area: (*Constant diving of nylon shells disturbed fish, like the smooth belly sardinella, which are abundant near our shores. Nylon shells are like corals down under, which attract the fish. However, the diving activities during biodiversity monitoring drove the fish away.*)

   c. Mangrove Cutting Restrictions
      Most participants reported the restrictions had no economic effect, while some Taba-ao residents noted benefits like support for the Suyac Mangrove Eco-Park and alternative income sources. Molocaboc Island participants agreed, as the restrictions offer shelter for young fish.

3. Social Impacts
   a. Closed Season
      All participants were aware of the Closed Season, which prohibits the catching of specified fishery species, particularly sexually mature sardines, herrings or mackerels and their larvae, fry or young, from November 15 to February 15 annually. Information came from BFAR and association meetings. FARMC associations informed members, discussed livelihood issues, and used the closed season to organize, empower communities, and support affected members.

   b. Biodiversity Monitoring
      Most participants were aware of biodiversity monitoring activities in their area, including monitoring of coral reefs, nylon shells, and oyster farms. These activities were mainly conducted by BFAR and DENR, with occasional involvement from private organizations and academic institutions. Community members assisted as guides, worked with researchers, met new people, and learned from these

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monitoring activities. (*Our responsibility as members of our association is to assist/accommodate visitors coming to Barangay Vito.*)

c. Mangrove Cutting Restrictions
All respondents were aware of and complied with laws restricting mangrove cutting, with some guarding mangroves against illegal cutting. In Molocaboc Island, the community and local government established *Bantay Katunggan* to protect and rehabilitate mangroves. However, some community members believed mangroves should be freely used for household needs, highlighting the need for community education to prevent conflict and improve compliance.

4. Problems/Issues
   a. Closed Season
   Several issues brought up by participants on the implementation of the closed season include lack of information, education and communication and inadequate alternative livelihood opportunities. Some participants emphasized the need for stricter implementation of the closed season as they saw some fishermen from other cities encroaching in the area during the closed season. Some participants from Molocaboc Island claimed to have sighted hulbot-hulbot, dynamite and triple net fishing activities near their area during the period the closed season was observed.

   b. Biodiversity Monitoring
   One of the main issues that participants had concerning biodiversity monitoring was that the results were not directly communicated to them. Those who had assisted the researchers got access to the raw data and that was it. A few of the participants claimed that during the monitoring was the failure to directly communicate the result to them. Those who had assisted the researchers got access only to the raw data. The participants claimed that in the conduct of the biodiversity monitoring frequent diving disturbed the fish habitat, causing complaints from some fishermen. When asked if findings of biodiversity monitoring were validated by the community or were shared by the researchers, one respondent said: "(*Findings were not presentation and discussed with us. They only informed us of fish found in the area.*)"

   c. Mangrove Cutting Restrictions
   Participants had issues regarding the mangrove cutting restrictions. Among which was the lack of strict implementation. Violators were often just reprimanded but no penalty was given. They also stated that the regulations were vague or unclear. Some of the community residents argued: *"*(*That is who they are. Why are we not allowed to cut the mangrove tree when we were the ones who planted them.*)" One predominant issue was the lack of strict implementation. Violators were often just reprimanded but no penalty was given. They also stated that the regulations were vague. Some of the community residents argued: "(That is who they are. Why are we not allowed to cut the mangroves when we were the ones who planted them?)"; one respondent emphasized the need for continuing community education and information dissemination on the use and conservation of mangroves.

Resource Conservation

The five (5) identified management practices implemented by the office of the Sagay Marine Reserve under Resource Conservation are the following: Mangrove Reforestation, Solid Waste Management, Education and Information Dissemination, Clam Seeding, and Pollution and Disease Monitoring.

1. Environmental Impacts
   a. Mangrove Reforestation
   The program benefited the coastal communities by improving and increasing mangrove habitats, strengthening protection against coastal erosion, winds, and waves, and providing shelter for young fish. Participants Suyac Island in Barangay Taba-ao expressed gratitude to mangroves for reducing damage from typhoon Yolanda, while those from Molocaboc Island observed coastal land expansion. All participants joined the BFAR-funded mangrove reforestation project, and the annual Bakhawan Festival on August 16 supported large-scale mangrove rehabilitation.

   b. Solid Waste Management
   Participants agreed that solid waste management is vital for clean coastal communities and protects marine life from waste pollution.

   c. Education and Information Dissemination
   Information and education dissemination raise awareness of environmental issues and empower participants to maintain a healthy coastal and marine environment.

   d. Pollution and Disease Monitoring
   Participants noted siltation from oyster farming but didn't specifically observe the effects of disease and

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pollution monitoring. However, they agreed that such monitoring is vital for public health and marine resources.

2. Economic Impact
   a. Mangrove Reforestation
   The program has provided most participants an additional source of income. One participant from Suyac Island confirmed that mangrove planting helped financially. *(It helped me a lot. I was able to buy a television set since I earned about P12,000).* FARMC association members in the mangrove reforestation program received some financial incentives through various payment schemes. Participants from Old Sagay, Taba-ao, and Bulanon received ₱4.00 for every seedling they sowed, and an additional ₱2.50 for every seedling that survived. Those from Himoga-an Baybay received daily pay from SMR (amount undisclosed). On the other hand, participants from barangay Vito received a sum of ₱500 per 15 days, while in Molocaboc Island, participants received no direct payment but earned extra income by selling mangrove seedlings.

   Mangrove reforestation not only benefits participants financially but also support fish larvae, leading to increased catches and income for fishermen.

   b. Solid Waste Management
   Waste segregation and recycling offered participants extra income from selling recyclables, but its main economic benefit was enhancing Suyac Island's eco-tourism, highlighting the importance of solid waste management for attracting visitors. (*Waste management is important in our area because we do not have a dumping site here, especially since our island is a tourist attraction.*)

   c. Education and Information Dissemination
   Community meetings on coastal resource conservation offered members financial assistance and livelihood opportunities, while also providing training to increase fish catch and promote financial stability through education.

   d. Pollution and Disease Monitoring
   Sagay City coastal barangays did not experience disease outbreaks from marine pollution, but nearby red tide reports harmed local fishermen's economy, as consumers hesitated to buy seafood. Some fishermen reported consuming their own products. (*It was really a problem because shell products became unsellable. There was one customer before who ordered oysters and then later cancelled the same because of a red tide alert in Cadiz City.*)
3. Social Impact
   a. Mangrove Reforestation
   All participants knew about the mangrove reforestation program and engaged in it, fostering community collaboration. However, some planters conflicted with those unaware of or disregarding mangrove cutting restrictions. (*There were complaints about people who intentionally cut mangroves and violate the law. This is a serious problem here because it undermines the effort of the Sagay Marine Reserve to rehabilitate the mangrove area.*)

   b. Solid Waste Management
   All participants were aware of the importance of solid waste management, though some community members did not strictly practice it. In Suyac Island, plastic waste was collected weekly and transported to the mainland due to lack of disposal facilities. Participants reported positive social effects, noting that proper waste disposal kept communities clean, fostered pride, and encouraged others to follow good practices. (*They feel ashamed if they see us cleaning our surroundings.*)

   c. Education and Information Dissemination
   Most participants knew about community meetings on coastal conservation in their barangay, including mangrove reforestation and alternative livelihood training. FARMC associations hold monthly meetings with a Sagay Marine Reserve representative, providing a platform for members to express concerns, build relationships, and foster cooperation and unity.

   d. Clam Seeding
   Participants from Old Sagay were aware of the clam seeding program but felt no impact due to their lack of direct involvement in managing local clam species.

   e. Pollution and Disease Monitoring
   Most participants reported no pollution and disease monitoring in their area, as no outbreaks had occurred. Those from Molocaboc felt their area was immune to issues affecting fishermen elsewhere. (*Red tide is not a problem here because we live far from the factory. Even when there is a red tide warning, the people will still eat seashells if they knew these came from Molocaboc.*) Participants from Barangay Taba-ao confirmed that Sagay Marine Reserve personnel regularly monitor clam mortality, and while reports of disease outbreaks concern them, they feel generally safe in their community.

4. Problems and Issues
   a. Mangrove Reforestation
   Few concerns were raised regarding the program. Participants from Barangay Taba-ao noted a lack of knowledge about mangrove reforestation and unclear mangrove-related policies among local community members. Barangay Bulanon participants reported that some individuals intentionally cut planted mangroves, disregarding their importance to the community. Those from Barangay Vito mentioned areas where mangroves could not survive, wasting their efforts.

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Molocaboc Island participants expressed that the taught planting method (i.e. one meter away) led to high mortality rates among young trees, as the distance allowed waste to enter the plantation, killing them. They also hoped that the mangrove planting area would avoid zones with gleaning activities and seagrass growth, as suggested by researchers from the University of the Philippines who previously visited the island.

b. Solid Waste Management
Participants from the six barangays noted that solid waste management began strong but waned over time. Those from Molocaboc Island expressed serious concerns, reporting that their cemetery had become a dumping site, with waste gradually covering most graves.

c. Education and Information Dissemination
Participants noted a need for increased information and education dissemination, as not everyone participated in the coastal resource management conservation activities. The support of Northern Negros State College of Science and Technology was largely unnoticeable to them.

Resource Protection

The office of the Sagay Marine Reserve under Resource Protection implements five (5) identified management practices. These management practices include the Bantay Dagat Law enforcement, prohibition of commercial fishing boats, prohibition on blast and cyanide fishing, prohibition on collecting marine plants and animals for hobby, and coastal clean-up.

1. Environmental Impacts
   a. Bantay Dagat
   Participants noted that the Bantay Dagat team deters illegal fishing, protecting corals and fish. (*The presence of Bantay Dagat has helped protect our natural resources. Some fishermen have become apprehensive in using blast fishing which is very destructive to the corals because of the Bantay Dagat in the area.)*

   b. Prohibition of Commercial Fishing Boats
   Participants agreed that the ban on commercial fishing boats benefited fishers and the marine environment, with strong enforcement preventing overfishing and ensuring sustainable resource management.

   c. Prohibition of Blast and Cyanide Fishing
   Participants recognized the harm of blast and cyanide fishing and agreed that banning these practices is essential for restoring coral reefs and marine life in Sagay City, especially in Barangay Bulanon, where they were once common. *(There was an incident before where the use of dynamite injured and killed a fisherman. The dynamite exploded right in front of him leaving a big hole in his stomach. That incident discouraged fishermen from using blast fishing, unlike before where explosions could be heard almost every night in the open sea.)*

   d. Prohibition on Collecting Marine Plants and Animals for Hobby
   Involvement in local conservation efforts heightened participants' awareness to protect marine resources, reducing the hobby of collecting marine plants and animals due to their importance for biodiversity.

   e. Coastal Clean-up
   Participants agreed that regular coastal clean-ups benefit marine resources by preventing waste from harming coastal ecosystems.

2. Economic Impact
   a. Bantay Dagat Law Enforcement
   The law enforcement team curbed illegal fishing in Sagay City, protecting marine resources. However, participants noted minimal economic impact from Bantay Dagat, which could not address population growth in coastal communities relying on fishing.

   b. Prohibition of Commercial Fishing Boats
   The prohibition on commercial fishing boats reduced competition, but fisher folks' catch and income remained similar due to non-resident fishermen encroaching on their grounds.

   c. Prohibition of Blast and Cyanide Fishing
   Participants had mixed reactions to the ban on blast and cyanide fishing. Fishermen saw a slight increase in catch, but vendors reported reduced income. Overall, they believed the ban would promote long-term sustainability and protect marine resources. *(Back then, this area used to be teeming with mackerels that you would get the fright of your life if you sail your pumpboat from the port to Molocaboc Island because mackerels were jumping everywhere. And if you are doing fly fishing, you would hear the wailing sounds of sea turtles behind you. In the 1980s, dynamite fishing became prevalent which resulted to the decimation of fish stocks. The use of*

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modified Danish seine or known locally as hulbot also became popular.)

d. Prohibition of Collecting Marine Plants and Animals for Hobby
Participants stated that the ban on collecting marine life had no impact on their income, as it wasn't their primary source of earnings.

e. Coastal Clean-up
Coastal clean-ups were mainly voluntary. The fisher folks gained little, except for those who sold recyclables. Participants from Barangay Taba-ao noted indirect economic benefits from maintaining the eco-park's appeal. In Molocaboc Island, FARMC associations and 4Ps received some funding from NGOs for their efforts.

3. Social Impact
   a. Bantay Dagat Law Enforcement
   All participants knew of Bantay Dagat. In Barangays Himoga-an Baybay and Vito, it responded only to calls but improved community safety. Participants noted that blast and cyanide fishing ceased. Bantay Dagat patrolled waters, enforced laws, and aided distressed fishing boats.

   b. Prohibition on Commercial Fishing Boats (CFB)
   Participants reported that commercial fishing boats were not operating in most areas, except in Barangay Old Sagay, where many local operators are licensed. However, in Barangay Vito and Molocaboc Island, commercial fishing boats from Cadiz City and Escalante City, and occasionally from Cebu, were spotted fishing near Sagay City's waters. These barangays are close to the Sagay Marine Reserve, and the intrusion of these boats has been acknowledged. The local patrols, Bantay Dagat, have apprehended violators, imposed fines and impounded their boats.

   c. Prohibition on Blast and Cyanide Fishing
   Participants, except those from Barangay Vito, reported a cessation of blast and cyanide fishing in their areas, largely due to the enforcement of laws by Bantay Dagat. Fishermen involved in illegal practices were not part of FARMC associations, highlighting the associations' role in promoting sustainable fishing and community engagement. Members of these groups also took initiative to protect marine resources by reporting illegal activities.

   d. Prohibition on Collecting Marine Plants and Animals
   Most community members were unaware of any apprehensions related to the illegal collection of marine plants and animals for hobby purposes, although they acknowledged that such activities were prohibited and punishable. They recognized the decline of their coastal and marine resources and collectively agreed that hobby collection was harmful to the environment.

   e. Coastal Clean-up
   All participants were aware of and actively involved in coastal clean-up activities. Most fisher folk associations conducted these monthly, while Molocaboc Island did it weekly with barangay officials. The activities promoted teamwork, kept the coastal environment clean, and fostered the bayanihan spirit.

4. Problems/Issues
   a. Bantay Dagat
   The participants raised issues about Bantay Dagat law enforcement. Some complained that fines were too low for violators to afford easily. They noted that a lack of facilities and equipment limited Bantay Dagat's ability to pursue violators, with some escaping before authorities arrived in response to tips. Participants from Barangay Himoga-an Baybay wished for increased Bantay Dagat presence, while those from Molocaboc Island expressed concern over *tumbok* fishers in their waters, hoping for action against fishermen using fish-scaring techniques. Despite Bantay Dagat's presence, some illegal fishers were not residents of the area.

   b. Prohibition of Commercial Fishing Boats
   Commercial fishing boats from nearby cities and as far as Cebu were observed to have entered the area, particularly near Barangay Vito and Molocaboc Island.

   c. Prohibition on Blast and Cyanide Fishing
   Fishermen from nearby cities violated regulations on blast and cyanide fishing. Fisher folks from Suyac Island raised their concern about the use of derris root, locally known as *tubli,* as a fish poison by some fishermen, which poses greater dangers than blast fishing.

   d. Coastal Clean-up
   Coastal clean-up issues included poor garbage disposal facilities, lack of waste management education, and human waste on shores. Participants

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noted that commercial developments like beach resorts drew tourists but also increased waste. Additionally, more migrants living in coastal areas were highlighted as a concern.

Resource Utilization

The five (5) identified management practices implemented by the office of the Sagay Marine Reserve under Resource Utilization are as follows: Zoning, Eco-tourism, Alternative Livelihood, Capture Fisheries, and Coastal Aquaculture.

1. Environmental Impact

a. Zoning
The participants identified zoning as a tool to increase fish stocks. It preserved and saved the endangered marine organisms and guarded breeding grounds, especially those identified as marine sanctuaries.

b. Eco-tourism
Eco-tourism minimized the fishing pressure by providing alternative livelihoods and promoting conservation of coastal and marine resources. It raised community awareness, encouraged cleanliness, and fostered a sense of ownership among fisher folks, supporting collaborative resource management with the Local Government Unit.

c. Alternative Livelihood
Alternative livelihood decreased the fisher folks' reliance on fishing, minimizing the pressure on coastal resources and giving them time to recover from fishing impacts. Most participants noted that these opportunities helped eliminate illegal fishing in their area.

d. Capture Fishes
Capture fisheries regulations protected juvenile and sexually mature marine species, giving fish and shellfish time and space to spawn, grow, and replenish stocks for future use.

e. Coastal Aquaculture
Participants with fish cages viewed them as beneficial, providing hiding places for juvenile fish and supporting filamentous algae growth, serving as food for grazer fish (siganids).

2. Economic Impact

a. Zoning
Participants reported increased catches due to reduced competition from the zoning program. However, some were negatively affected by its strict implementation, as it displaced certain resource users to ensure long-term sustainability.

b. Eco-tourism
Most participants in eco-tourism from the coastal barangays responded positively when asked how the program affected them economically. Eco-tourism created jobs and alternative livelihoods, with less reliance on fishing and, thus, reducing fishing pressures. In Suyac Island Eco-Park, the wives of fisher folks were members of the Suyac Island Eco-Tourism Association (SIETA) that managed the eco-park, and earned additional family income.

c. Alternative Livelihood
Participants who availed of alternative livelihood programs from government agencies reported increased income, reducing their reliance on fishing. The programs also provided additional funds for their associations, supporting new or ongoing projects.

d. Capture Fisheries
Capture fisheries regulations provided a sustainable source of income for fisher folks by enabling sustainable harvests, motivating their participation in Sagay Marine Reserve programs and interventions.

e. Coastal Aquaculture
The coastal aquaculture project provided by the government through community organization created an additional source income for the members of FARMC associations. It also provided additional funding for the associations, enabling them to sustain their current activities and projects.

3. Social Impact

a. Zoning
Most participants were aware of the municipal water zoning, with some having participated in Participatory Coastal Resource Assessment (PCRA). They could identify marine reserve boundaries, management zones, and municipal boundaries. Participants viewed zoning positively, as it reduced conflicts and ensured fair distribution of fishing rights among fisher folks.

b. Eco-tourism
The city has two eco-tourism destinations, the Carbin Reef in Barangay Old Sagay which showcases coral beds, marine flora and fauna and the Suyac Island Mangrove Eco-Park in Barangay Taba-ao with its forests. Participants from Barangay Bulanon expressed interest in promoting oysters, mangroves, coral reefs, mangrove bats, and wild honeybees as

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attractions. Eco-tourism socially impacted the fishing community by fostering interactions with tourists, researchers, and academics, sharing knowledge and best practices, boosting self-esteem, and improving relationships among residents.

c. Alternative Livelihood
Most participants were aware of the livelihood programs and projects provided by the national government agencies (BFAR, DENR, DOLE, DSWD, NNARMAC and TESDA) and local government agencies (SMR and Barangay Council). Their associations were recipients of the projects. According to them, it promoted cooperation among members of different fisher folk associations and allowed them to socialize, build positive relationships, and promote unity and active participation among members. It also encouraged others to seek membership in Fisheries and Aquatic Resources Management Council (FARMC) which is identified by the national government as a partner organization in the conservation, management and proper utilization of coastal and marine resources as stipulated in RA 8550 (Philippine Fisheries Code of 1998) as amended by RA 10654 (An Act to prevent, deter and eliminate illegal, unreported and unregulated fishing).

d. Capture Fisheries
The fishing communities positively responded to the regulations on capture fisheries, particularly the regulations on gears and proper utilization of marine and coastal resources imposed by SMR. The regulations promoted cooperation and empowered the community. Fisher folks grouped themselves to create a fisher folk association and improve their way of life.

e. Coastal Aquaculture
Among the six (6) coastal barangays covered by SMR, only four (4) barangays, namely Taba-ao, Bulanon, Vito and Molocaboc Island, are engaged in coastal aquaculture, such as fish cages, fish pens, sea ranches, oyster farms, and artificial reefs. Almost all of the participants in these barangays were directly involved in managing the coastal aquaculture projects acquired by their association. The coastal aquaculture allowed association members to work with one another in co-managing the project, promoting unity and good working relations among members. However, it also created disagreement between members of the association and non-members due to lack of information on how to avail of government projects.

4. Problems/Issues

a. Zoning
The zoning of municipal waters benefited Sagay's fishing community, but open access led to conflicts with local fishers. Some rivers serve as mariculture zones, yet users of fyke and filter nets were not properly informed, causing disputes between oyster bed and fish cage owners.

b. Eco-tourism
Suyac Island Mangrove Eco-park needs explicitly financial support from the Local Government Unit or other Non- Government Organization to sustain activities, as damage from Typhoon Yolanda is still evident.

c. Alternative Livelihood
Lack of monitoring led to the failure of the alternative livelihood project. Participants noted uneven distribution among fisher folk associations and disappointment over unfulfilled promises for project proposals. Some projects were unsustainable.

d. Capture Fisheries
Fish buyers should avoid illegally caught seafood to help eliminate violations of fishing regulations.

e. Coastal Aquaculture
Fish cage owners and oyster culture farm owners (raft method) conflicted with fyke net owners and some other oyster farm owners (pole method) due to lack of proper zones and boundaries along the estuarine river. Participants expressed concern over fish cages, urging strict regulations because these attract fingerlings and the fine screens trap young fish. (*I used to operate two fish cages here in Barangay Vito which could easily trap large number of fingerlings attracted to their light at night, especially since fine nets were used).* Fish cages were also suggested to be prohibited near seagrass beds, which are important habitats for seedlings and fingerlings.

CONCLUSIONS

The implementation of Sagay Marine Reserve Coastal Resource Management Schemes was collectively focused on protecting the environment and sustainable development of coastal and marine ecosystems in the area.

On the bases of the findings of this investigation, the following conclusions were made:

1. The coastal and marine resources of Sagay Marine Reserve are composed of various species of high valued flora and fauna. The interventions through the management of Sagay Marine Reserve have improve its biodiversity as shown by the quantity and quality of aquatic plants and animals found in the Marine Reserve Area. It is a national heritage deserving preservation, conservation, and protection efforts by partner agencies, relevant parties, and community members.

The Sagay Marine Reserve area can be described as restored, rehabilitated and stable. The presence of thick mangrove forests in coastlines and the underwater treasures of hard and soft corals, sand and reefs teeming with various

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species of fish and other macro invertebrates manifested that the different ecosystems in the area have almost attained balance and stability, thus, providing reliable livelihood to its stakeholders. Despite its current stable condition, it constantly faces the risk of depletion and is threatened by uncontrolled population growth due to coastal migration.

2. The four management schemes employed in coastal resource management of Sagay Marine Reserve are resource preservation, resource conservation, resource protection, and resource utilization, which significantly contributed to the realization of SMR's mission to establish an effective coastal fisheries resources management system.

Resource preservation scheme was implemented to maintain the existing coastal and marine resources. On the one hand, resource conservation scheme was carried out to ensure the sustainable use of coastal marine resources. The latter showed strong collaboration among stakeholders.

Resource protection scheme was on the area of law enforcement, prohibition of commercial fishing boats, blast and cyanide fishing, collecting marine plants and animals and coastal clean-up, whereas resource utilization scheme provided fisher folks with creative ways to utilize their resources and lessened their reliance on coastal waters.

As a whole, there was a high level of awareness among stakeholders of the various management schemes. However, it is important to enhance the education and information dissemination among members of the community as some schemes were found to have weak implementation. In the case of resource protection, a limited number of Bantay Dagat personnel were deployed with few supporting equipment to apprehend illegal (zone incursions) fishing in the coastal areas. With respect to resource utilization, some community residents were forced to sell mangrove seedlings outside Sagay City during closed season out of economic need, while others cut them for household use.

3. The coastal resource management schemes implemented by Sagay Marine Reserve has impacted the environmental, economic, and social conditions of the people in the six coastal barangays of Sagay City.

The environmental impact of the management schemes is remarkably evident. Implementation of the schemes has positively improved the conditions of the coastal and marine ecosystems, particularly on conservation and sustainable management of biodiversity and natural resources.

Despite efforts and interventions through the implementation of the management schemes, the economic conditions of most of the fisher folks remained unstable. The additional livelihood (e.g., ecotourism and planting mangroves) provided them with just enough income to cover the bare necessities for survival. Participants acknowledged that although the management schemes have their present economic status, they were hopeful that sustainable management of the Marine reserve Area in Sagay would eventually provide socio-economic benefits to future generations, such as food, security, cultural activities, and job prospects.

Socially, the impact of management schemes helped improve human relationships and interactions and preserve local culture and traditions.

The following are the unique contributions of the study:

1. Results of the study can serve as reference for long-term research on marine ecosystems and ecosystem services, particularly in the field of marine biology.
2. It can help researchers in the natural and social sciences understand the resource management schemes implemented by the Sagay Marine Reserve and their environmental, economic, and social impacts on the quality of life of the fisher folks.
3. Knowing the environmental, economic, and social impacts of marine resource management can provide opportunities, such as the pleasure of viewing and studying particular species and habitats, local economies, and cultural practices that have lived and used the sea for thousands of years.
4. It can provide direction to the resource managers towards achieving sustainable management, protection and support of the natural coastal ecosystems.
5. The governing agencies, the academe, and other stakeholders can make informed decisions to best manage and utilize the coastal and marine resources.
6. The local marine stewardship efforts of the Sagay Marine Reserve can support international marine conservation objectives, climate change adaptation, and restoration efforts.

This study is focused on the environmental, economic, and social impacts of coastal resource management of Sagay Marine Reserve. The aspects that were considered were limited to the specific objectives of the study. The data gathered were obtained from sixty (60) fisher folks who are residents of the six (6) coastal barangays, using the Focused Group Discussion method. Other sources of information were taken from secondary sources.

LIMITATION & FURTHER RESEARCH

Based on the findings and conclusions of the study, the following recommendations are made:

The Sagay Marine Reserve Protected Area Management Board (SMR-PAMB) may consider strengthening its law enforcement. Policies may be in place but there is a need to effectively and strictly implement these. More Bantay Dagat personnel and additional equipment are

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needed to implement law enforcement in the vast 32,000 hectares marine reserve area. Furthermore, there is a need to initiate stronger collaboration with GOs, NGOs and other stakeholders for funding to improve and ensure the sustainability of Sagay Marine Reserve Coastal Resource Management programs and alleviate poverty among coastal communities. A sustainable alternative livelihood is needed to lessen, if not eliminate, their sole reliance on fishing and open new opportunities for economic growth and secure the necessities of life.

The participation of the community in the success of coastal resource management schemes is very crucial. There is a need to maximize and widen the participation of the community in the planning, implementation, monitoring and evaluation of coastal resource management schemes. This can be done by providing continuous education, relevant trainings, skills development and leadership formation to members of the community especially the small fisher folks.

The Barangay Fisheries and Aquatic Resource Management Councils (FARMCs) may be empowered to manage their coastal aquatic resources. Limited and/or discriminate fishing should be implemented in the Sagay Marine Reserve area so that utilization will redound to the benefit of the resident fisher folks in the six coastal barangays.

Philippine Normal University Visayas (PNUV) as the Environment and Green Technology Education Hub (EGTEH) of the PNU System and State University of Northern Negros (SUNN) may forge collaboration in the area of research, conduct of regular biodiversity monitoring and evaluation of the conditions of the marine and coastal resources to generate new knowledge and understanding to effectively plan for strategies to better manage the said resources found in the Sagay Marine Reserve Area.

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