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Coastal Environment and Marine Resources Conditions in Ozamiz City, Philippines

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Abstract:- The marine and coastal ecosystems are economically and culturally important, especially for the people depending on them. However, these resources are vulnerable to over-harvesting, pollution, coastal development, and destructive fishing. The condition of small-scale fisheries in the Philippines has deteriorated due to these anthropogenic activities. Given this situation, greater efforts are required for the country to develop sustainable strategies to rehabilitate the coastal environment and mitigate the declining marine resources. This study is conducted to explore the views and experiences of the local communities of their coastal environment and resource conditions and the various sea-related activities or situations that are happening in their coastal areas. A total of 14 focus group discussions were conducted in the 14 coastal barangays in Ozamiz City. Five major themes emerged from the focus group discussions: declining fish caught, the disappearance of once-abundant fishes and marine resources, fishers using illegal fishing methods or gears, domestic wastes in coastal areas, and fishers traveling a long distance to catch fish. The result of this study may generate useful information and ideas that will serve as input for the coastal rehabilitation plan of the local government in the city.

Keywords:- *Coastal Rehabilitation, Destructive Fishing, Local Communities, Marine Pollution, Overfishing.*

I. INTRODUCTION

Around 775 million people were found to be relatively highly dependent on marine ecosystems (Selig et al., 2019). Of the overall production of aquatic animals, over 157 million tons (89 percent) were used for human consumption (FAO, 2022). Coastal and inland populations derive a range of monetary and nonmonetary benefits from marine ecosystems, including nutritional, economic, cultural, and coastal protection benefits (Selig et al., 2019). Traditional and emerging human activities in coastal and coastal/open marine waters, have increased greatly in recent years (OSPAR, 2009).

Global consumption of aquatic foods, excluding algae, has increased significantly, with the world consuming more than five times the quantity consumed nearly 60 years ago (FAO, 2022). Of the 158 million tons of aquatic foods available for human consumption in 2019, Asia accounted for 72 percent of the total, while its population represented 60 percent of the world population (FAO, 2022). With the increasing coastal populations worldwide, there is a need for new resources to support that accelerated growth (Borja et al., 2016).

However, marine species and significant ecosystems face severe and ever-increasing threats of downfall by destructive human activities (Thomas et al., 2014). It is apparent that with the continued degradation of coastal fisheries, the communities reliant on them will be forced to change. Coastal inhabitants in the less developed world face growing challenges associated with dependence on marine resources in decline (Porter et al., 2015).

The Philippines is a global center for marine biodiversity covering a major portion of the Coral Triangle, with more than 16800 sq km of coral reef. Its central region, Luzon to Mindanao, has more marine species per unit area than other places (Garry, 2019). In 2018, the Philippines ranked 8th among the top fish-producing countries in the world, with a total production of 4.35 million metric tons (MT) of fish, crustaceans, mollusks, and aquatic plants (FAO, 2022).

Marine and coastal ecosystems are economically and culturally important, especially for people living near coastlines in the Philippines (Schrim & Schwab, 2014). However, these resources are vulnerable to over-harvesting, pollution, coastal development, destructive fishing, and the effects of climate change, presenting serious threats to both species and people alike, all of which are exacerbated by high population growth and rural poverty, creating food insecurity concerns (Ibid.).

Ocean pollution, overfishing and climate change threaten the Philippines' stature as the leader in global marine biodiversity and are already affecting communities that rely on rich marine ecosystems for food (Greenpeace Philippines, 2012). The condition of small-scale fisheries in the Philippines has deteriorated since the 1970s. However, initial signs of severe depletion of fish stocks to the level indicative of biological and economic overfishing occurred in the 1990s. The increasing fishing population was the main cause of the decline in the fishery (Muallil et al., 2014).

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A study published in the Philippine Journal of Science reports that reefs in the country's territorial waters are no longer in excellent condition and that 90% are classified as either poor or fair. Another 2017 report by the United Nations predicted that all World Heritage coral reefs, including one in the Philippines, will die out by 2100 unless carbon emissions are drastically reduced (Garry, 2019). Communities in countries with somewhat unfavorable conditions and limited access to alternatives and fishing households in communities with overall favorable economic conditions are at the highest vulnerability as they have the highest dependence on coastal fisheries resources (Kronen et al., 2010).

Given these conditions of the Philippine fisheries, greater efforts are required for the country to develop sustainable strategies to rehabilitate the coastal environment and mitigate the declining marine resources. Furthermore, since the Philippines lies at the worldwide center of marine biodiversity, the country's marine conservation efforts are critical to protecting global biodiversity (Lowry et al., 2009).

Further expansion of the contribution of the fisheries to food security requires the acceleration of transformative changes in policy, management, innovation, and investment to achieve sustainable and equitable global fisheries and aquaculture (FAO, 2022). For the past four decades, fisheries research and development work in the Philippines has provided the building blocks for the accumulated know-how and strengthened advocacy for the proper and sustainable use of fishery resources (Armada et al., 2018).

The coastal environment and marine resources in Ozamiz City also have a fair share of the increasing threats of destruction. The local government of Ozamiz City is planning to implement an "Integrated Ozamiz City Coastal Rehabilitation and Sustainable Management Plan, with a proposal to establish a 20-hectare Marine Protected Area. Before the program implementation, the LGU finds the need for baseline information to guide the crafting and drafting of the program design and strategies to be adopted. Relevant baseline data is always critical for performance evaluation, as it is only possible to measure changes with reliable data on the situation before the intervention begins (Bamberger, 2010). Most of the studies conducted on the marine ecosystem in Ozamiz dealt with the physical and hydrological assessment of the coastal areas. There needed to be a study on the local communities concerning the coastal environment and resource conditions.

This study is conducted to explore the views and experiences of the local communities of their coastal environment and resource conditions and the various sea-related activities or situations that are happening in their coastal areas. This study may generate useful information and ideas that will serve as input to the Integrated Ozamiz City Coastal Rehabilitation and Sustainable Management Plan and help design steps that will ensure success in the future. The result may also be useful in creating Information, Education and Communication (IEC) materials to be produced by the agency as part of the Integrated Coastal Rehabilitation and Sustainable Management activity. There was also a proposal for amending the Fisheries Code of Ozamiz City. The result of the study can likewise serve as input for the amendment.

II. RESEARCH METHODOLOGY

The study was conducted in the coastal barangays of Ozamiz City, Misamis Occidental, Philippines. The city has 15 coastal barangays, with a coastal population of 69,842 and 903 fishing families (PSA, 2017). There are no commercial fisheries in Ozamiz City. The fisherfolks are fishing in the municipal waters with an average production of 429.1 MT (low) to 1,072.8 MT high) (Office of the City Agriculturist, 2017). Recently, the city's local government has been planning to execute an Integrated Coastal Rehabilitation and Sustainable Management Plan. Part of the plan is establishing a Marine Protected Area (MPA) with an ideal size of 20 hectares.

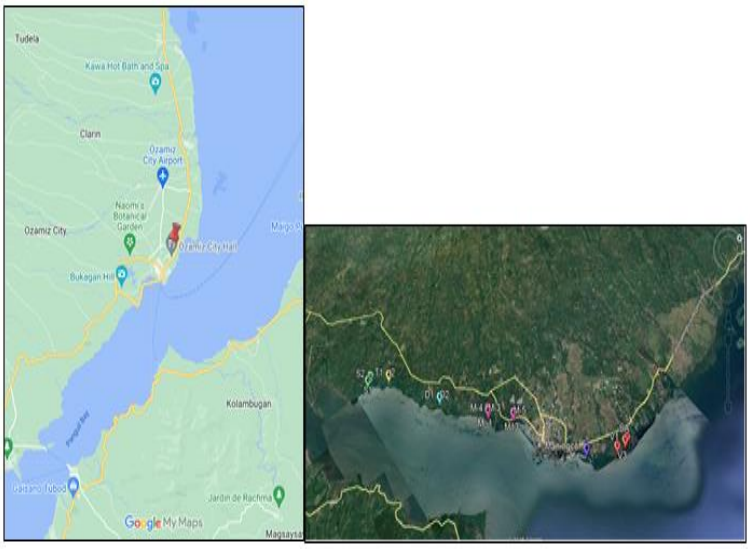

Fig 1. Map of Coastal Areas of Ozamiz City, Philippines

A total of 14 focus group discussions were conducted in the 14 coastal barangays in the city. Trained moderators and co-moderators facilitated these. There were 7-8 participants in each group, consisting of the following: Barangay

Committee Chairmen for Fisheries, Fisheries Association officers, representatives from the *bantay-dagat* (sea patrol), and the elderly, young, men, and women fisherfolks in each barangay. The participants were recruited through the nominations of the barangay leaders. Each FGD lasted for about 60 to 90 minutes, and the whole process was tape-recorded with the participant's consent. The recorded FGDs were transcribed and analyzed thematically using NVivo Pro software.

Fig 2. Photos During Focus Group Discussions

III. RESULTS AND DISCUSSIONS

The study explores the views and experiences of the local communities of their coastal environment and resource conditions and the various sea-related activities or sitations in the coastal areas. Five major themes emerged from the focus group discussions. These are as follows; declining fish caught, the disappearance of once-abundant fishes and marine resources, fishers using illegal fishing methods or gears, domestic wastes in coastal areas, and fishers traveling a long distance to catch fish.

- *Declining fish caught*

The participants were asked to describe the volume of their fish catch and the trends by comparing the catch then and now. In all the FGDs, the participants commonly claimed that they have experienced declining fish caught. This decreasing catch volume has been a problem among their fishers. They observed that they had good catches before, but they gradually declined. They also expressed that apart from the declining volume of their fish caught, their fish sizes are getting smaller than their known size. They conveyed that the catch has become very scanty nowadays that they could hardly get 3 kilos of fish when they go fishing which they claimed they could easily get in the past years. Most of them articulated the big changes in the fish catch, then and now. They used the terms *apiki* (cramped) and *mingaw* (lonely) in referring to their fish catch. These are expressed in the following statements:

"Before, we could get as much as 10 to 15 kilos every time we went to the sea. Now, we are lucky if we can get 3 kilos in a day."
"The catch nowadays is cramped. It is somewhat lonely as compared to the past."

The catch seemed scanty, and the participants expressed that fishers must resort to other ways to adapt to their present situation. Many fishers must resort to other jobs to augment their income. Some fishers work in construction, others drive motor cabs, while some opt to put up mini sari-sari stores for additional income. This situation means they can no longer fully rely on fishing as a means of living. Those with no other income sources have no choice but to go fishing more frequently to provide for their needs. Some even have to resort to illegal means to increase their catch. Some statements are expressed as follows:

"Nowadays, the income from fishing is very meager. You can hardly live by it. So you have to find other means if you want to survive."
"Sometimes, others have to spend the whole day in the sea just to be able to bring catch."

The participants have identified several factors that contributed to the situation. First, they blame the illegal fishing methods adopted by some fishers, the infrastructures built near the coastal areas, and water pollution due to the garbage and improper waste disposal of households in the coastal areas as the cause of the decline in fish catch. They believed that these activities have contributed to the destruction of the coral reefs and mangroves, which are essential for the propagation of fish. Another factor they recognized is the increased number of fishers in the area. They expressed that there were somehow only a few fishers before, but it gradually increased with time.

"There are already many fishers nowadays. They are competing for the catch."
"Those who do not have jobs resort to fishing."

The situation in the fisheries of Ozamiz City is not distinct from the other parts of the country and even in the coastal areas outside the Philippines. The analysis of Anticamara and Go (2016) on the Philippine fisheries production indicates that Philippine fisheries production is declining, with the high production volume of the aquaculture sector masking the stagnating or declining fish catch of most capture fisheries in recent times. The decline in the catch volume of most provincial and municipal fisheries throughout the country is reflected in the low incomes of many Filipino fishers (Anticamara and Go, 2016).

The condition of small-scale fisheries in the Philippines has deteriorated since the 1970s. However, initial signs of severe depletion of fish stocks to the level indicative of biological and economic overfishing occurred in the 1990s (Muallil et al., 2014). Increasing fishing population, excessive fishing pressure, and overexploitation in the fishing grounds are common reasons for fishery decline (Macusi et al., 2022; Muallil et al., 2014; Trinidad et al., 2001)).

The coastal ecosystems of the Philippines are among the most heavily fished areas in the world. An expanding population's high dependency on fishery resources has resulted in overexploited and deteriorated fish stocks, perpetuating widespread poverty in fishing communities (Muallil et al., 2011). Intrinsically, small-scale fishing communities are expected to adapt to fish catch fluctuations linked to global environmental change (Silas et al., 2020).

- *Use of illegal fishing methods*

Among the factors resulting in the decline in fish catch is the use of illegal fishing methods by some fishermen. For example, the participants expressed that there are still fishers who are engaged with the use of compressor fishing (motorized *sudsod*), fine-meshed nets (3 ply/ *dumbol-dumbol*), filter nets (*sanggab*), dynamite, and poison in the fishing activities, despite the active monitoring of the maritime police in the coastal zone. Some fishers were arrested for such violations.

The participants claimed that the use of filter nets (*sanggab*) was abundant in the 1960s, but there was a decline in the 70s up to the present. They identified the implementation of the national laws and policies by the maritime police and sea patrol (*bantay-dagat*) as the main reason for its decline. However, some fishers are still doing it discreetly. Although, they stated that those who do illegal fishing are not coming from their place, as they are usually those fishers from neighboring towns. These are expressed in the following:

"We know there are still fishers doing that; they do poison and dynamite fishing up to this day. However, unfortunately, they are not caught."

"That was popular before, around the 1960s (the use of "sanggab") but gradually declined in the 70s, but even up to now, some are still into it, although maybe only a few because they are afraid of the maritime police."

"There were some who were arrested for using motorized "sudsud" (compressor fishing). I heard the culprits were asked to pay bail."

"The maritime police apprehended some fishers for using the three-ply net, but they are from a town nearby."

"Sometimes, we hear pounding in the middle of the night, and we know it is from the dumbol-dumbol (three-ply net)."

The decline in the fisherfolks' income brought about by the decrease in fish caught has led them to find other means to stay alive. As a result, some fishers are forced to resort to illegal means to increase their catch, especially those with no other means to survive. According to Pauly (1990), this can be described as a condition of "Malthusian overfishing," when poor fishermen, confronted with declining catches and lacking any other option, initiate extensive resource destruction in their effort to maintain their incomes (ibid.).

- *Domestic wastes in coastal areas*

According to the participants, the physical environment of the marine waters in Ozamiz City is contaminated with domestic wastes. Since houses surround the coastal area, improper waste disposal and the absence of septic tanks for their comfort rooms are of top concern. Some of the households raised livestock in their homes built above the waters, which contributed greatly to the critical water condition. Some even dumped their waste directly into the sea. They were stated in the following:

"Some houses, actually many, have no septic tanks for their comfort rooms. So, all household wastes go directly to the water, from dishwashing, laundry… just everything."

"They need to learn how to dispose of their garbage properly despite the orders of the barangay to segregate and throw garbage in proper places. It causes much trouble to our neighbors who are properly disposing of our garbage."

"There are even those who raise pigs near the shore; where else do you think the wastes go?"

Despite the concerted efforts of the barangay council and fishers' organizations, the domestic waste problem is said to be hard to control. There were provisions from the local government for materials to construct their comfort room with a proper septic tank, but only a few complied. Some of the materials given were dumped and left unused. As expressed by a participant,

"The LGU gave materials for the comfort room and septic tank, but they did not use them. So, some are just left to rot."

The presence of coastal construction on the foreshore was also observed to have an unfavorable effect on the coastal waters. The water stagnation, partially blocked with such construction, has caused the inner coastal water to become smelly and filthy. The existence of domestic wastes in the coastal areas aggravated this condition. They expressed that:

"If it is low tide, the foul smell from the stagnating water is obvious. It is from the waste, and there is no outlet."

Even though infrastructures provide utility to the citizens in the area, it disrupts the natural flow and waves of water in the sea. Therefore, it adversely changes the ways of living of the sea's resources.

This finding finds support in some studies conducted in the Philippine waters. Many anthropogenic activities have negatively affected the water quality of the seas. Improper waste disposal and dumped solid waste are among the identified causes of water pollution in low-income and developing countries like the Philippines (Pacyao & Barail, 2020; Felisilda et al., 2018). Water pollution is worsened by sanitation problems in slum communities, especially along rivers, creeks, and coastal areas where very few households can build toilets (Ballesteros, 2010).

➢ *The disappearance of once-abundant fishes and marine resources*

The Panguil Bay surrounding the city is rich in fish and marine resources. The major fish species available in the area include *asoos*, *gisaw*, *danglay*, *pugapo*, *puti-an*, *laya*, *danggit* and *kitong* (Municipal Fisheries Profile, 2017). Most of these are considered highly valued types. According to the participants, these species and others were abundant before, but the quantity tended to decline over time. They have also observed that many types of fish cannot be found/caught. Such fishes and marine species tended to disappear over time. Among the species mentioned were *bongcawil*, *salay-salay*, *gapas-gapas*, *tambangungo*, *tampirong*, *bilong-bilong*, *indangan*, along many others.

"Most of these fishes were abundant around 10 or 15 years ago, but some started to disappear, especially when illegal fishing was prevalent."

"There is a variety of catch here before, but there are particular types we have not caught for so long. I do not know; maybe they transferred or just really depleted."

They attributed the decline to illegal fishing activities in the past. Moreover, the abundance of fish in the past was attributed by the participants to the mangroves in the area. Marine species also declined and perished with the reduction of mangrove areas. These are expressed as follows:

"Maybe because before, there were mangrove trees in the coastal area, but they were cut down for firewood, house construction, and other domestic uses. Moreover, the area is already surrounded by houses. Therefore, restoring and planting mangrove trees again is difficult since the coast is occupied with houses already."

Although, at present, many mangrove planting activities are already conducted and initiated by the Office of City Agriculture and various government agencies and non-government organizations. The participants also stated that because of the laws and ordinances implemented and spear-headed by the BFAR, the mangrove areas are now starting to recover. However, the quantity and sizes of fish and other resources remain the same because of pollution and infrastructures near the coastal area.

A decline in the fish catch or even the disappearance of certain marine species is a trend in the Philippines and other parts of the world. The study of Tee-Jay & Fisher (2013) on the trends in the capture fisheries in Cuyo East Pass, Philippines, revealed that species richness for the commercial, municipal, and both sectors combined increased from the year 2000-2003 but decreased after that with the municipal sector having the lowest number of species in 2006.

While in other countries, this trend is also manifesting. There was a continued decline of Delta Smelt in San Francisco with a general failure to manage the Delta for the "co-equal goals" of maintaining the Delta as a healthy ecosystem while providing a reliable water supply for Californians (Moyle et al., 2016). In addition, an estimated 9% of the 458 fish species assessed in Lake Malawi were identified as at high risk of extinction. Overfishing has led to less diversity in the kinds of fish caught and has reduced the number of fish caught by individual fishers in this part of Africa (Weyl, 2019). In Germany, native oyster beds, once abundant and ecologically highly important biogenic reef type, have vanished from the North Sea ecosystem in most areas of their former distribution and magnitude (Pagoda, 2019).

➢ *Fishers traveling a long distance to catch fish*

The fishers have experienced declining fish caught for several years, pushing them to travel to other neighboring and far areas to catch fish. The participants revealed that they need to fish in the far waters to get a catch as it is almost impossible to get a good amount of catch if they rely on the areas nearby. Furthermore, with increasing fishers, the adjacent fishing areas can no longer accommodate them. This condition has pushed them to farther fishing grounds. Still, they cannot extend across the neighboring provinces as ordinances prevented them from harvesting in their area. In contrast, the fisherfolks in the other provinces can freely harvest in their area.

"We need to go far to get a good catch. There are many fishers here, and the catch is meager."

"The fisher in the neighboring province is lucky enough. They can freely fish in our areas, while we will be arrested if caught fishing in their areas because they have an ordinance."

There are no commercial fisheries in Ozamiz City. The fisherfolks are fishing in the municipal waters with an average production of 429.1 MT (low) to 1,072.8 MT high) (Office of the City Agriculturist, 2017). The Bureau of Fisheries and Aquatic Resources (BFAR), in coordination with the Office of the City Agriculturist, have implemented the Identification and Color-coding System for the registered fishers in the area. There is strict monitoring to ensure that only those from the respective barangay can do fishing activities in such a barangay. However, there are still fisherfolks from neighboring places who attempt to do fishing activities even without a permit.

IV. CONCLUSION AND RECOMMENDATIONS

The present condition of the coastal environment and marine resources in Ozamiz City suggests that there are threats to both marine species and the people depending on them. There are indications of over-harvesting, pollution, and destructive fishing in the area, which resulted in the decline of the fish caught and forced the fishers to travel long distances to catch fish. These findings are good input for the coastal rehabilitation plan of the local government in the city. Therefore, it is recommended that the proposed Integrated Coastal Rehabilitation and Sustainable Management Plan should be comprehensive enough to develop carefully designed activities that will address the destructive anthropogenic activities present in the area to restore the

coastal environment and marine resources. And since these steps require careful crafting of strategies and long-term activities before significant changes in the fish catch can be felt, plans should also be put in place as to how the fisherfolks in the area can be helped or assisted as the rehabilitation programs will be implemented.

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