

# Awareness and Participation in Mangrove Management of Coastal Communities in Baler, Aurora, Philippines

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## ABSTRACT

Mangrove forests are among the most vulnerable ecosystems, necessitating unique protection regimes from the community through management and participation. Mangrove management is an efficient method of preserving and protecting forest functions while also providing a source of income for the surrounding communities. The study's objective is to ascertain community awareness of mangroves and participation in mangrove management in selected areas of Baler, Aurora, and the correlations between community awareness and participation. Three hundred thirty-five civilians from four distinct communities participated in the study. The study made use of descriptive techniques such as questionnaires and field observations. The findings indicate that community awareness of mangroves is relatively high in selected coastal areas of Baler, Aurora, with a weighted mean of 3.79. It was also noted that community participation in mangrove management is moderate in the selected coastal portion of Baler, Aurora. Community awareness is positively correlated with coastal communities' participation in mangrove management in Baler, Aurora. Furthermore, the respondents' perceptions of the mangrove management interventions and extension programs required by the community in Baler Aurora's selected coastal areas to include natural mangrove protection, seminars on the importance of mangrove resources, at least annual mangrove maintenance, mangrove planting, training on mangrove nursery establishment and plantation management, and mangrove nursery establishment, ranked from highest to lowest. The study concluded that the community is aware of mangroves' characteristics, nature, and uses; they participate in mangrove management in a limited manner. Awareness has a positive effect on coastal communities' involvement in mangrove management.

*Key words:* Coastal communities, Mangrove forests, Mangroves management

## Introduction

Philippine coasts have a powerful natural defense which is the mangroves. Mangroves and other natural resources along the coast can significantly reduce flooding and erosion, protecting people and property from the damage caused by storms, sea-level rise, and king tides. Mangroves' aerial roots retain sediment and prevent erosion, while their roots, trunks, and canopy absorb the force of approaching

waves and storm surges, thereby reducing flooding (United Nations Office for Disaster Risk Reduction, 2017). Furthermore, a study discovered that a kilometer-wide mangrove tract might reduce the force of tsunamis by 70% (Mendoza, 2017).

However, mangroves are being degraded and lost despite their enormous benefits for climate change mitigation, adaptation, and resilience. Conversion to coastal aquaculture ponds, agricultural

land, and mangrove clearance for urban development harm mangroves. The construction of coastal infrastructures such as roads and ports has increased losses, especially among rapidly growing coastal populations (Worthington and Spalding, n.d).

Public awareness and comprehension of the mangrove’s values are critical to guaranteeing the resource’s correct management. In Malaysia, Rahman and Asmawi (2016) argues that a lack of local community understanding is the primary factor limiting local community participation in mangrove management. The findings of his study illustrate that a lack of awareness initiatives results in locals receiving less knowledge, which ultimately results in low engagement in mangrove management. This emphasizes the need for community knowledge and mangrove ecosystem management since the community is entirely accountable for the mangrove ecosystem’s maintenance and upkeep, which prompted the study’s conduct. This study assessed the community awareness and the participation in mangrove management of Coastal Communities in Baler, Aurora. The study was conducted in 2021.

**Materials and Methods**

**Location of the Study**

The study was conducted in four separate

barangays in Baler, Aurora with coordinates (15° 45’ 11.13” N, 121° 35’ 9.62” E) of Brgy. Zabali, (15° 46’ 59.34” N, 121° 32’ 37.72” E) of Brgy. Reserva, (15° 46’ 15.60” N, 121° 33’ 24.10” E) of Brgy. Buhangin and (15° 45’ 12.01’ N, 121° 34’ 37.08” E) of Brgy. Sabang. The study locations were selected based on the presence of mangroves and the proximity of actual populations that rely on mangroves.

**Respondents of the Study**

There were three hundred thirty-five (335) respondents from the 2,107-total population in the coastal communities of Reserva, Sabang, Buhangin, and Zabali in Baler, Aurora (Table 1). The total number of respondents was decided based on the result obtained from Slovin’s Formula.

**Table 1.** Number of Respondents

Barangay	Number of Respondents
Sabang	200
Zabali	82
Reserva	42
Buhangin	11
Total	335

**Data Gathering Procedure**

A Likert-type questionnaire with 1-5 possible responses was presented to the respondents with prior approval to each Barangay Captain and themselves.



**Fig. 1.** Location of the Study Sites.

All data gathered were treated with confidentiality.

### Data Analysis

The Statistical Packages for the Social Sciences (SPSS) V28 and the Microsoft Excel Program for Windows 2016 were used in processing the data. The following statistical techniques such as frequency, weighted mean, and Pearson's r were employed in data analysis and interpretation.

## Results and Discussion

### Level of Community Awareness on Mangroves by the Coastal Communities

Table 2 below shows the level of community awareness of mangroves in the selected coastal areas of Baler, Aurora. The data indicate the overall level of community awareness about mangroves. The average mean is 3.79 implying that local residents have great extent of awareness about the uses and relevance of mangroves.

Based on the highest weighted mean (4.18), the

findings imply that the people of coastal communities in Baler, Aurora, significantly believed that mangroves protect coastal areas from erosion, storm surge, and tsunamis and reduce the energy of waves which made it rank 1 in their knowledge of mangroves. The same finding was recorded in the study of Hashim *et al.*, (2017) wherein most of the local people are aware that mangroves diminish the effects of disturbances such as tsunamis, storm surges, and climate change. According to Quevedo *et al.*, (2019), the high awareness of local communities on mangroves was based on their personal experience and observations during typhoons. In the case of Baler, the locals became aware of the importance of mangroves during typhoons since every year, the Philippines is experiencing an average of 6-9 typhoon landfall (Strobl, 2019). In areas where there are no mangrove forests, coastal damage from natural calamity are much worse (Gomez and Baldago, 2016).

They also significantly believed that mangroves improve water quality by filtering pollutants, stabi-

**Table 2.** Level of community awareness on mangroves in coastal areas of Baler, Aurora.

Statement	Weighted Mean	Rank
1. Mangrove serves as a tourist attraction for its cultural, aesthetic, and recreational values.	3.95	4
2. Mangroves have an enormous capacity for sucking up carbon dioxide and other greenhouse gases. They are among the most carbon-rich tropical forests and can store twice as much carbon per area.	3.71	7
3. Mangroves protect coastal areas from erosion, storm surge, and tsunamis and reduce the energy of waves.	4.18	1
4. Mangroves improve water quality by filtering pollutants, stabilizing and improving the soil, and protecting shorelines from erosion.	4.15	2
5. Mangroves are essential to the ecosystem because their dense roots help bind and build soils producing living and arising platforms and forming a nutrient-rich breeding/nursery ground for numerous marine species.	4.10	3
6. Mangrove serves as a source of food. The large diversity of seafood ranges from crabs, shellfish, oysters, and snails to octopus, sea cucumbers, sea urchins, and fish, many of which are permanent residents within the mangroves and can be directly harvested from within.	3.81	5
7. Mangroves are an excellent source of wood and timber and nipa shingles for housing materials, firewood and charcoal, and poles of fish traps.	3.41	9
8. Mangroves also serve as a source of livelihood. Mangrove seeds and propagules can be harvested and sold. Fish, crustaceans, and mollusks can also be harvested from mangroves.	3.79	6
9. Mangroves produce leaf litter and detrital matter, valuable food sources for animals in estuaries and coastal waters.	3.60	8
10. Mangroves are also a good source of tannin (used in coffee and wines), alcohol, and medicine (from mangroves ashes and barks infusions).	3.16	10
Average Weighted Mean	3.79	

lizing and improving the soil, and protecting shorelines from erosion, ranking 2 with a weighted mean of 4.15. This finding supports the study (Ellision *et al.*, 2020) wherein mangroves provide regulating services such as coastal protection and pollutant assimilation. Respondents are also aware that mangroves are essential to the ecosystem because their dense roots help bind and build soils producing living and rising platforms and forming a nutrient-rich breeding/nursery ground for numerous marine species, with a weighted mean of 4.10. Mangrove forest has high biodiversity containing many marine organisms since it is a strategic place for nursery ground, feeding area and refuge from predators (Hashim *et al.*, 2021). The local residents of Baler are very much aware of these since they are collecting various marine life in the forest as additional food and income source. In an study on mangrove utilization in Aurora province, it was found out that mollusks, gastropods, bivalves, crabs, and some species of fishes were collected by the local communities in the area (Cañada *et al.*, 2022).

Mangroves are considered as an ecosystem that has high biodiversity that consists of many organisms that inhabit the area. As mentioned previously, mangroves are strategic place for many aquatic habitats for nursery ground, feeding area and seeking refuge from predators (Hutchison *et al.*, 2014). The abundance of organisms in the mangroves will benefit the aquaculture product (fish or shrimp) by providing additional nutrients for feeding. According to Nagelkerken *et al.* (2008), after the process of spawning fish, the eggs dispersed all around mangroves and after a certain period of time, they would turn to planktonic larvae. The planktonic larvae would move or carried by currents into other parts of mangroves or in the aquaculture cage in the mangrove area that could be an additional source of food for other aquatic habitats as well as for fish and shrimp in the aquaculture cage.

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groves and after a certain period of time, they would turn to planktonic larvae. The planktonic larvae would move or carried by currents into other parts of mangroves or in the aquaculture cage in the mangrove area that could be an additional source of food for other aquatic habitats as well as for fish and shrimp in the aquaculture cage. Last in rank is their belief that mangroves are also a good source of tannin (used in coffee and wines), alcohol, and medicine (from mangroves ashes and barks infusions), with a weighted mean of 3.16.

The data indicate that the people's level of community awareness about mangroves in the selected coastal areas of Baler, Aurora is to a great extent. They are exceptionally aware of the characteristics, nature, and uses of mangroves.

#### **Level of community participation in the management of mangroves**

Table 3 shows the level of participation in the management of mangroves in the selected coastal areas of Baler, Aurora. The data indicate the overall measure of community participation in the management of mangroves in the selected coastal areas of Baler, Aurora. The level of participation has an average mean of 3.16 indicating that to some extent local residents participates in mangroves management.

Based on the highest weighted mean (4.22), the findings imply that the people of coastal communities in Baler, Aurora significantly participate in reporting violators of Republic Act 7161, which banned the cutting of all species of mangroves, to the authorities, which made it rank 1 in their participation in mangroves management. They also greatly support legal and regulatory institutions to protect mangroves against domestic waste, rated 2 with a weighted mean of 4.02. They also avoid over-exploitation or utilization of mangroves, ranked 3 with a weighted mean of 4.67. The last three (3) in ranks are their participation in plantation management for mangroves, the establishment of mangroves nursery, and attendance in seminars on the importance of mangrove resources, with a weighted mean of 2.15, 2.21, and 2.39, respectively.

#### **Degree of correlation between awareness and participation in mangrove management of coastal communities**

Table 4 shows a very high correlation between the community's awareness and participation in mangrove management of coastal communities in Baler,

**Table 3.** Level of Community Participation on Management of Mangroves in the Selected Coastal Areas of Baler, Aurora.

Statement	Weighted Mean	Rank
1. I attend seminars on the importance of mangrove resources	2.39	8
2. I involve myself in nursery establishment for mangroves	2.21	9
3. I am participating in plantation management for mangroves	2.15	10
4. I help our barangay plan, program, and activities like planting and caring for mangroves.	2.73	7
5. I involve myself in caring for naturally grown mangrove forests.	3.48	4
6. I avoid over-exploitation or utilization of mangroves.	3.67	3
7. I do not convert mangroves to fishponds or any aquaculture ponds.	3.35	6
8. I am not gleaning fishery resources within the mangrove forest areas.	3.42	5
9. I support legal and regulatory institutions set up for the protection of mangroves against domestic wastes.	4.02	2
10. I will report violators of (RA 7161, which banned the cutting of all species of mangroves), to the authorities.	4.22	1
Average Weighted Mean	3.16	

Aurora. The computed *r* is at .971, indicating a very high significant correlation between the community’s level of awareness and participation in mangrove management of coastal communities in Baler, Aurora. Therefore, the null hypothesis, which states that “There is no significant relationship between the level of awareness and level of participation in mangrove management of coastal communities in Baler, Aurora,” is rejected.

This implies that community awareness influences participation in mangrove management of coastal communities in Baler, Aurora. Amsudhajo (2018) confirmed this implication statistically signifi-

cant at the 0.01 level of confidence.

According to a study conducted with 71 forest cooperatives in Turkey’s Kastamoru province, the most critical factors affecting community forestry participation are member involvement, forest ownership and administration, and cooperation within and between cooperatives and the state (Atmis *et al.*, 2009; Daupan, 2016).

As illustrated in Figure 2, the association between awareness and participation in mangrove management among coastal communities in Baler, Aurora is strong and very high. It is positively correlated, with increased awareness accompanying increased participation. The same is true in Bangkok, Thailand, where community awareness has been found to be positively associated with community participation and mangrove forest management (Amsudhajo, 2018).

**Table 4.** Degree of correlation between awareness and participation in mangrove management of coastal communities.

		Level of Participation
Level of Awareness	Pearson Correlation	.971**
	Sig. (2-tailed)	.000
	N	335
	Level of Correlation	Very High
	Significance	Significant

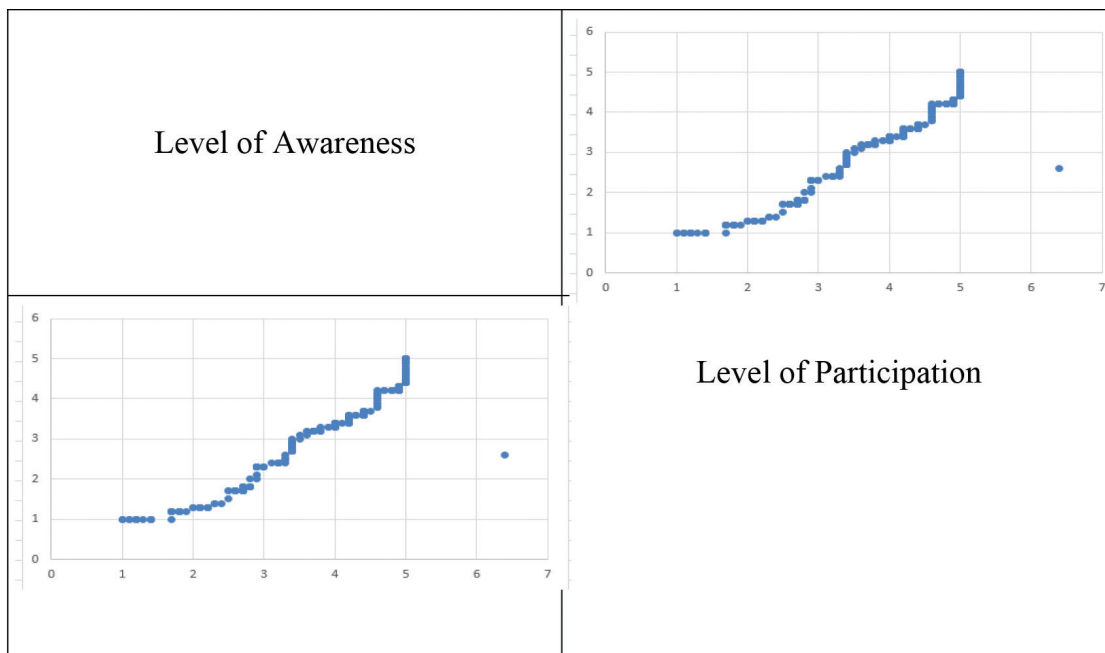
\*\*Correlation is significant at the 0.01 level (2-tailed).

**Mangrove management interventions and extension programs needed by the community**

Table 5 shows the items on the mangrove management interventions and extension programs needed by the community in the selected coastal areas of Baler, Aurora.

**Table 5.** Mangrove Management Interventions and Extension Programs Needed by the Community

Items	Frequency	Rank
Seminars on the importance of mangrove resources	272	2
Training on mangrove nursery establishment and plantation management	235	5
Mangrove nursery establishment	228	6
Mangrove planting	257	4
Natural mangrove protection	274	1
Mangrove maintenance (at least yearly)	264	3



**Fig. 2.** The direction of Correlation between Level of Awareness and Level of Participation in Mangrove Management of Coastal Communities in Baler, Aurora

The data indicate that the community in selected coastal areas of Baler Aurora requires mangrove management interventions and extension programs in the following order: natural mangrove protection, seminars on the importance of mangrove resources, mangrove maintenance at least annually, mangrove planting, training on mangrove nursery establishment and plantation management, and mangrove nursery establishment.

Training and seminars for the local communities about mangrove ecology, including seagrasses and coral reefs, will be helpful (Daupan, 2016).

**Conclusion**

The study found out that the community is very aware of the characteristics, nature, and uses of mangroves. The community also participates in mangrove protection, reports offenders, and advocates against exploitation but rarely attends seminars or establishes plantations and nurseries. Furthermore, it was proved that community awareness influences participation in mangrove management positively. The mangrove management interventions and extension programs needed by the community are natural mangrove protection, seminars on the importance of mangrove resources, man-

grove maintenance at least yearly, mangrove planting, training on mangrove nursery establishment, and plantation management, and mangrove nursery establishment.

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