

Assessment of Mangrove Species in the Coastal Area of Kusiong, Datu Odin Sinsuat, Maguindanao

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Abstract: This study aimed to assess the mangrove species present in the coastal area of Kusiong, Datu Odin Sinsuat, Maguindanao. The study paved a way for species identification on areas which are potential of being rich in biodiversity in the near future. Furthermore, the study was conducted for the purpose of making an up-to-date list of mangrove species and conservation of this ecosystem. Random sampling was used with a total number of 4 stations measuring in 15 x 15 meters' quadrat and mangrove species were identified and classified taxonomically using the Field Guide Manual to Philippines Mangroves by Primavera et al., (2006). Mangrove species in this field guide are sorted by genera. Close-up photographs of distinctive features (leaves, flowers, fruits, bark, roots) were provided for visual comparison to facilitate the identification of species. Samples were checked and confirmed by a licensed botanist. The results of the study concluded that the identified species of mangroves in Kusiong, Datu Odin Sinsuat, Maguindanao were species *Bruguiera sexangula* (Lour.) Poir. and *Bruguiera parviflora* (Roxb.) Wight & Arn ex Griff. and classified under the family of Rhizophoraceae. Moreover, the *Bruguiera* species dominate the ecosystem due to its high efficiency in initial salt exclusion. For further studies, it is highly recommended to have a comprehensive assessment on the conservation and development of mangrove ecosystem of Kusiong, Datu Odin Sinsuat, Maguindano.

Key words: Mangrove species, biodiversity, marine biology, ecology, conservation

I. INTRODUCTION

The Philippines is an archipelago country made up of 7,107 islands located within the tropics of the South-eastern Coast of Asia. The Philippine coastline extends 36,289 km and is surrounded by the waters of the Celebes and Sulu Seas along its southern coast, the South China Sea along the western coast, and the Philippine Sea along its eastern coast (Long & Giri, 2011). The Philippine Islands are considered one of the top biodiversity "hot spot" areas of the world, supporting 1.9% of the world's endemic plants and vertebrate species (Myers et al., 2000). In research from Patindol and Casas (2019), the Philippines considered as one of the richest diversity of coastal plants in the world.

According to the checklist of Philippine mangroves by Primavera (2006), there are at least 32 species known and found in the Philippine coastal areas. The Philippines has estimated mangrove forests of about 356,000 ha, with a recent decadal deforestation rate of 0.5% (Gevaña, Camacho, & Pulhin, 2018).

In the coastal area of Kusiong, Datu Odin Sinsuat, Maguindanao where the mangroves are located and where the study area was conducted, information and classification of these mangroves are very limited and there is no known record of these mangroves on the Local Department of Environment and Natural Resources of the Bangsamoro Autonomous Region in Muslim Mindanao corresponding to the study of Fortes, M., Salmo, S. III (n.d) entitled "Status of Mangrove Research and Management in the Philippines: Challenges and Opportunities" stated that Region XII (Central Mindanao) and the Autonomous Region of Muslim Mindanao (ARMM), which have the lowest contributions on academic and research about the mangroves. Also, identification and classification of mangrove species present in different areas of BARMM that have mangroves as well as of the researcher's study have not been studied by any researchers. This study aim to identify and classify what type of mangrove species are present in the coastal area of Kusiong, Datu Odin Sinsuat, Maguindanao. The information generated in this study will give a complete list of the mangrove species thriving in the area before it will be extinct due to coastal development and it will also provide reliable baseline information for determining threatened species. The researcher also hopes to discover a new species of mangroves in the study area so that the outcome of this research can help to provide an up-to-date list of the mangrove species and for every individual to be able to recognize the mangrove ecosystem near the coastal area of Kusiong, Datu Odin Sinsuat, Maguindao in the near future.

II. MATERIALS AND METHODS

Research Site

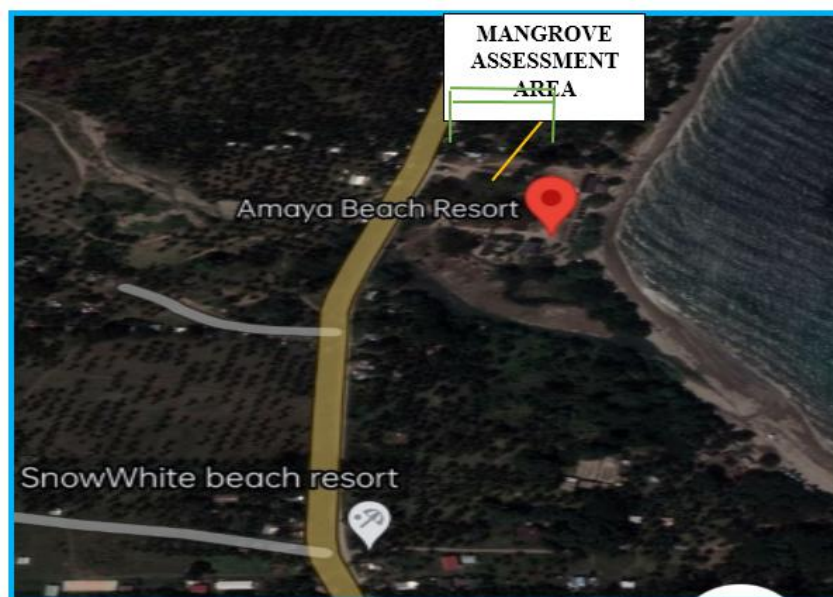


Figure 1. Aerial view of Mangrove ecosystem in Kusiong, Datu Odin Sinsuat, Maguindanao using Google Earth.



Figure 2. Aerial view of the mangrove sampling stations in Kusiong, Datu Odin Sinsuat, Maguindanao using Google Earth. The study area was within the mangroves near the shoreline of Kusiong, Datu Odin Sinsuat, Maguindanao. The mangrove sampling station area are represented by letters (A, B, C, D) in sequential manner respectively. The study was conducted from March to April 2022.

2.1 REASEARCH DESIGN

This research is carried out descriptively including the assessment of mangrove species found in Kusiong mangrove ecosystem. The mangroves were identified in situ and classify taxonomically. The mangrove species were determined using the field guide manual to Philippine Mangroves by Primavera et al (2006) and confirmed by a botanist from the University of Southern Mindanao, Kabacan, Cotabato.

Random sampling is used in the study specifically quadrat method. Each station had a transect line ranges from 20 meters perpendicular to the shoreline. Every station and transect line (4) four 15m x 15m plots were established randomly with a distance

ranges from 15 meters to 20 meters and depend on the structure and terrain of the mangrove community. A measuring tape approximately 30 meters, a handmade quadrat frame of 1m x 1m measurement, a three-way meter pH soil tester, a pH indicator strips (non-bleeding) and a smartphone with a high megapixel camera was used by the researcher in the study. A list of the organisms is formed and the mangrove organisms are listed by photos taken of their root, flower, leaves and fruits. There were 4 sampling stations established with 15m x 15m quadrats per site.

2.2 Sampling station establishment

Four permanent sampling stations were established within the mangrove areas. Every stations were measured by 15m x 15m quadrat. Random sampling was used to allow the researcher to easily determine the composition of mangroves and its type of species. In each station the researcher takes a photo of the selected mangroves including their roots, leaves, fruits and flowers that are in the 1m x 1m plot measurement between in each mangrove. Because individuals are rarely evenly distributed within an area, it is important to sample randomly to ensure that the researcher will get a true representation of the population. The selected mangroves in each station that have been taken a picture in each part of a mangrove (leaves, roots, fruits and flowers) may vary in each other in every stations because each station have a different terrain and landscape. Station A in its middle part is very muddy and the access to the mangrove trees within the area is very difficult as well as with station B, C and D. In addition that these 3 stations are much near the seashore and is occupied by seawater at high tides with 6 ft. average deep.

2.3 Identification of Mangrove Species

This study utilized the "Field Guide to Philippine Mangroves," by J.H. Primavera, Ph. D. developed with support from the Pew Fellows Program in Marine Conservation and SEAFDEC Aquaculture Department, and published by the Zoological Society of London-Philippines in identifying of what particular type of mangrove species are found near the coastal area of Kusiong, Datu Odin Sinsuat, Maguindano. Mangrove species in this field guide are sorted by genera. Close-up photographs of distinctive features (leaves, flowers, fruits, bark, roots) are provided for visual comparison to facilitate identification of species. The mangroves within each stations were identified and classified taxonomically using the field guide manual to Philippines' Mangroves by Primavera et al.

2.4 Measurement of Soil and saltwater pH of every Sampling Station of Mangrove Ecosystem

The researcher selected 4 spots within each sampling station as a representative for the measurement of soil pH using a three way soil tester. Only sampling station C and D had the measurement of pH of saltwater using pH indicator strips because these 2 stations are the only exposed area and are near the seawater compared to sampling station A and B that are located on dried area of the mangrove ecosystem.

2.5 Confirmation of Species

After identifying and classifying the species of samples using the field guide, the sample were checked and confirmed by a botanist from the University of Southern Mindanao, Kabacan, North Cotabato.

III. RESULTS AND DISCUSSION

Species composition and ecological status

Table 1. Species composition

Quadrat	Station A	Station B	Station C	Station D
# individuals counted	18	32	52	27
Total number of organism sampled is 129 individuals				

Table 1 shows how many stations were established in the area of mangroves and the number of species taken by random sampling in each station and the total number of species sampled. Each station is labeled A, B, C and D respectively. Station A has 18 samples, Station B has 32 samples and Stations C and D has 52 and 27 samples respectively.

Table 2. Species Identified

Species Found/Family Rhizophoraceae	Number of Species found in each station			
	Station A	Station B	Station C	Station D
species <i>Bruguiera sexangula</i> (Lour.) Poir.	16	31	0	0
species <i>Bruguiera parviflora</i> (Roxb.) Wight & Arn ex Griff.	2	1	52	27

A total of 2 species of mangroves were identified under 1 family within the mangrove areas of Kusiong, Datu Odin Sinsuat, Maguindanao. Family Rhizophoraceae dominated the whole area, under this family, species *Bruguiera sexangula* (Lour.) Poir. (local name: pototan) were the most abundant in sampling station A and B and species *Bruguiera parviflora* (Roxb.) Wight & Arn ex Griff. (local name: langarai) dominated the sampling station C and D.

Based on <https://www.nparks.gov.sg/florafaunaweb>, a site for flora and fauna references, both species *Bruguiera sexangula* and species *Bruguiera parviflora* can thrive, tolerate and lived in moist soils, waterlogged soils, well-drained soils, saline soils or even salt spray and alkaline high pH soils

Table 4 Species Identified.













(a) <i>Bruguiera sexangula</i> (Lour.) Poir.			
			
(b) <i>Bruguiera parviflora</i> (Roxb.) Wight & Arn ex Griff.			
			

Table 4 shows the sample pictures of the mangrove species found in the study area.

Figure 3. Pictures of all mangrove species in found in the coastal area of Kusiong, Datu Odin Sinsuat, Maguindanao. (a. *Bruguiera sexangula* (Lour.) Poir and b. *Bruguiera parviflora* (Roxb.) Wight & Arn ex Griff.

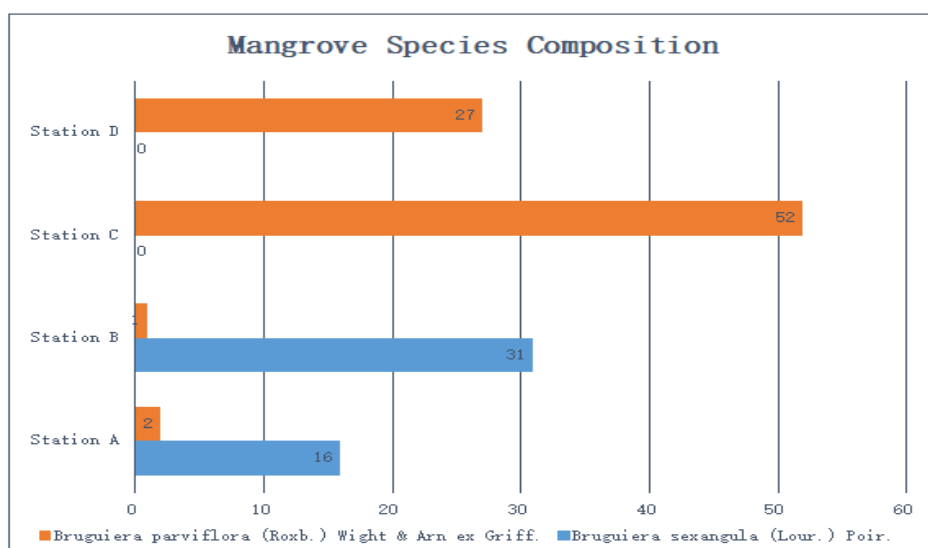


Figure 4. Mangrove Species Composition of Kusiong, Datu Odin Sinsuat, Maguindanao

The figure shows the mangrove species composition in each respective stations. Station A have 18 species sampled, 16 of these are species *Bruguiera sexangula* (Lour.) Poir. and the rest two species are species *Bruguiera parviflora* (Roxb.) Wight & Arn ex Griff. Station B have 32 species, 31 of these mangroves are species *Bruguiera sexangula* (Lour.) Poir. and the rest 1 species is *Bruguiera parviflora* (Roxb.) Wight & Arn ex Griff. Station C have 52 species and Station D have 27 species and all of these are species *Bruguiera parviflora* (Roxb.) Wight & Arn ex Griff.

Table 5. Physicochemical properties of mangrove sampling station

Physicochemical properties	Mangrove sampling station			
	A	B	C	D
Soil pH	7	5	5	6
Saltwater pH	N/A	N/A	7	7

Table 5 shows the physicochemical properties of every sampling station. Based on the results on Soil pH station A is neutral in pH, station B is mildly acidic and station C and D are also acidic because they got lower score below than 7. There was no data gathered on saltwater pH in sampling station A and B because only sampling station C and D are tested in pH of saltwater because these 2 stations are the only exposed area and are near the seawater compared to sampling station A and B that are located on dried area of the mangrove ecosystem. Both station C and D is neutral based on the pH indicator.

According to Sipito et al., (2018) found that water near the mangroves has a higher pH (8.1) compared to seawater from the coastal mangroves (pH 7.3). This data implies that species of *Bruguiera* under the family of Rhizophoraceae can live and thrive at any harsh soil and water conditions and physicochemical properties is not significant on what area they should grow.

Table 6. Species Names

No.	Family	Species	Local Name
1	Rhizophoraceae	<i>Bruguiera sexangula</i> (Lour.) Poir.	Pototan
2	Rhizophoraceae	<i>Bruguiera parviflora</i> (Roxb.) Wight & Arn ex Griff.	Langarai

Table 6 shows the identified mangrove species in Kusiong, Datu Odin Sinsuat, Maguindanao. Two Mangrove species were identified under the Family Rhizophoraceae and classified based on the “Field Guide to Philippine Mangroves,” by J.H. Primavera, samples were checked and confirmed.

Table 7. Mangrove Ecological Status, Occurrences and Population Trends.

IUCN Red List Category		
Mangrove Species	Conservation Status	
<i>Bruguiera sexangula</i> (Lour.) Poir.	Least Concern	Widespread
<i>Bruguiera parviflora</i> (Roxb.) Wight & Arn ex Griff.	Least Concern	Widespread

Mangrove species status are identified using the recorded online tool, the International Union for Conservation of Nature (IUCN) red list. Table 4 shows all species of mangroves identified in all sampling sites were considered widespread throughout the countries and other continents outside the Philippines. Critically Endangered (CR), Endangered (EN) and Vulnerable (VU) species are considered to be threatened with global extinction while Least Concern are species evaluated with a lower risk of extinction.

Based on the findings, there is no discovery of new species of mangroves in the coastal area of Kusiong, Datu Odin, Sinsuat, Maguindanao. This is also related to studies conducted by Demetillo et al. that some species in Caraga Region were threatened and endangered. Though all species are considered widespread and only was vulnerable, all species of mangroves in Kusiong, Datu Odin Sinsuat, Maguindanao are all Least Concern because it has been evaluated against the criteria under and recognized by the IUCN Red List and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.

IV. CONCLUSION

Based on the results and findings of the study, it was concluded that there was no discovery of new species of mangroves in the coastal area of Kusiong, Datu Odin, Sinsuat, Maguindanao. The area has a total number of two mangrove species in only one family. Among the 2 mangrove species, *Bruguiera parviflora* (Roxb.) Wight & Arn ex Griff. (local name: langarai) dominated the the sampling area. Results concluded that physicochemical properties of mangroves were not a factor on their abundance and presence in each sampling station as previous studies found out that water near the mangroves has a higher pH compared to seawater from the coastal mangroves. The study also supported that both species *Bruguiera sexangula* and species *Bruguiera parviflora* can thrive, tolerate and lived in moist soils, waterlogged soils, well-drained soils, saline soils or even salt spray and alkaline high pH soils.

Species of *Bruguiera* under the family of Rhizophorecea can live and thrive at any harsh soil and water conditions and physicochemical properties is not significant on what area they should grow. Though all species are considered widespread and only was vulnerable, all species of mangroves in Kusiong, Datu Odin Sinsuat, Maguindanao are tagged as Least Concern under the criteria of the IUCN Red List and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category. However, knowing that some of the mangrove species are considered threatened with global extinction based on the International Union for Conservation of Nature (IUCN) red list, it is highly recommended to have a comprehensive assessment on the conservation, management, and development of mangrove ecosystem of Kusiong, Datu Odin Sinsuat, Maguindanao by the Local Government Unit and the Local Department of Environment and Natural Resources (DENR) of the Bangsamoro Autonomous Region in Muslim Mindanao (BARMM) to maintain the conservation and preservation of mangroves in the municipality.

V. LIST OF ABBREVIATIONS

BARMM- Bangsamoro Autonomous Region in Muslim Mindanao

CR – Critically endangered

DENR- Department of Environment and Natural Resources

EN-Endangered

IUCN- International Union for Conservation of Nature

VU- Vulnerable

VI. ACKNOWLEDGEMENT

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VII. CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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