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Assessment of Mangroves in Guang-guang, Dahican, Mati City, Davao Oriental

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ABSTRACT

This study aims to identify mangrove species in Guang-guang, Dahican, Mati City, and Davao Oriental. Guang-guang served as the sampling site of the study. Three stations were established in each forest type or zone. The presence or absence of a particular mangrove species within a 100m^2 plot and their identification code were recorded. Plots were randomly established in each forest type or zone. Mature mangroves (DBH > 4 cm) found in each plot were counted and measured for diameter at breast height 1.5m. If the density of saplings (< 4cm DBH and height > 1m) was high and uniform, a 5m x 5m plot was established inside the 10m x 10m plot, and the saplings were counted. The density of seedlings (height < 1m) was high and uniform. A 1m x 1m subplot was established for actual counts. There were nine mangrove species, identified these were *Ceriops tagal, Rhizophora stylosa, Rhizophora apiculata, Bruguiera gymnorhiza, Sonneratia alba, Avicennia officinalis, Pemphis acidula, Aegiceras corniculatum,* and *Avicennia alba.* These were common mangrove species found in the study area.

Keywords: Mangrove ecosystem, marine conservation, Pujada Bay, *Rhizophora stylosa*

INTRODUCTION

Mangroves are trees and shrubs that grow in salty coastal ecosystems in the tropics and subtropics. Mangroves come from the word “mangue,” the Senegal term for tree. The Spaniards modified this to “mangle”. This was added with the English word grove for trees, thus the word mangroves (Field, 1999, as cited by Yao, 1997). Mangroves are generally found in various coastal areas around the Philippines. Mangrove species share four important traits that allow them to live successfully under environmental conditions that often exclude other species. According to Walsh (1974), as cited by Tomlinson (1988), some of these adaptations include morphological specialization, i.e., aerial prop roots, cable roots, vivipary, and other features that enable mangroves to adapt and thrive in their environments; the ability to excrete or exclude salts; habitat specificity within isolation from other generically related species inhabiting upland communities. Their habitats are restricted to the tidal mud-flat areas at the mouth of rivers, estuaries, and lagoons where water is brackish. Mangroves are specially adapted to tidal and mud flats, with their particular anchoring roots that act as props or stilts that may grow outward from the trunk for several feet and arch into the land, allowing the tree to withstand considerable buffeting from the waves (Magdaraog, 1998). Mangroves are vital to the inhabitants of coastal areas. They provide building materials, tanbark for tanning and preserving fishnets, nipa sap for fermenting into beverages and vinegar, and leaves for roof shingles. They also serve as home for fishes, shrimp, crabs, clams, and snails. Thus, the value of fishery products often exceeds that of their forest product (Magdaraog, 1998). The mangrove forest is also one of the most valuable coastal resources, important for its multiple economic, ecological, scientific, and cultural resources for the present and future generations. Generally, the world’s mangroves are drastically exploited due mainly to excessive wood gathering and fishpond operation. Other activities that heavily pressure mangroves include tin mining, aquaculture, waste disposal, construction, and industrialization (Zamora, 1991).

In recent years, this exploitation and unplanned conversion resulted in a critical imbalance in the coastal ecosystem. It should be recognized and acknowledged that, in some ways, human survival depends on this balance, which is a function of mangrove preservation and rehabilitation. There are direct (human) and indirect (natural phenomenon) ways of destroying our mangrove resources. The direct or human-induced activities led to the conversation of mangroves to fishponds and salt beds, reclamation of mangroves for various developments (such as wharves, piers, airports, and housing projects), pollution and siltation, dikes and structures obstructing waterways and tidal inundation, over-exploitation utilization and disturbance due to gleaning and fish landing (Melana et al.,1998). The indirect or natural phenomenon threats to mangroves are pests/diseases, typhoons, and sea level rise due to global warming, causing the polar ice cap to melt (Melana et al., 1998).

The mangrove ecosystem is diverse and home to many birds, fish, mammals, crustaceans, and other animals. Algae, barnacles, oysters, sponges, and bryozoans are among the creatures that live in places where roots are permanently buried, all requiring a hard surface for anchoring while they filter feed. Mangroves provide one of the primary food chain resources for marine organisms. The leaves of mangroves last for approximately a year before falling into the water, where bacteria and fungi decompose the leaves. Mangroves provide physical habitat and nursery grounds for various marine organisms, protecting many from predators. This study assessed the mangroves in Guang-guang, Dahican, Mati, and Davao Oriental. Specifically, it aimed to identify mangroves and population density in the study area and determine whether the mangrove species found there are basin or riverine type. In the basin type, the species were categorized based on distinctive zonation, such as seaward, middle, and landward zones. Sampling covered for three months, from October to December. Sampling was done during the lowest tide of the month for convenience. The study results are meant to provide baseline information that could be utilized for mangrove conservation. This would also serve as a reference for future researchers doing related studies.

MATERIALS AND METHODS

Study Area

The study was conducted in Guang-guang, Dahican, Mati, Davao Oriental. It is located in the littoral zone of Guang-guang, Dahican, Mati, Davao Oriental. This thirty-hectare area is located 2 km away from the national highway. There are three stations established in the study. The size of each sampling station covers approximately an area of 10m x 10m. Every station is composed of three transect lines.

Figure 1. Map shows the Mangrove Forest in Guang-guang, Dahican, Mati City, Davao Oriental.

Data Gathering

This study was conducted using the transect line plot method. A 10m x 10m ($100m^2$) plot was established in each forest type or zone. Seedlings (height<1m) and saplings (<4cm DBH and height>1m) found in each plot were counted and measured for diameter at breast height (1.5m) using an vernier caliper. The presence or absence of a particular mangrove species within a 100 m^2 plot and their identification code were recorded.

Identification

The primary references used for identifying the mangroves in Guang-Guang were the “FIELD GUIDE TO THE COMMON MANGROVE, SEAGRASSES AND ALGAE OF THE PHILIPPINES” of Calumpong H.P and E. G. Menez (1997) and “BOTANICAL IDENTIFICATION HANDBOOK ON PHILIPPINE MANGROVE TREES” of Aragones E.G., Rojo J.P., and Pitargue F.C. (1998) in order to identify the species.

Importance Values

The importance value of each component was calculated based on the following formula in order to give information on relative frequency, relative density, and relative dominance.

(a) $$\text{Relative frequency} = \frac{\text{Frequency of species}}{\sum \text{Frequency of all species}} \times 100$$

(b) $$\text{Relative density} = \frac{\text{no. of individuals per category (stems/ha)}}{\text{area of the plot}} \times 100$$

(c) $$\text{Relative Dominance} = \frac{\text{Total basal area of species}}{\text{basal area of all species}} \times 100$$

Diameter at breast height or dbh

The diameter at breast height (dbh) was computed from the tree's girth (gbh) measurement. The gbh values were converted to dbh by dividing the former by the value (English *et al.*, 1994).

Basal Area

The BA for each tree is the cross-sectional area at breast height. The basal area (BA) for the stand in m^2 per hectare (ha) was calculated using the formula (English *et al*., 1997):

$$\text{(d)}\quad BA = \frac{\pi\, DBH^2}{4}\ (m^2 / ha)$$

The BA was converted (cm^2 to m^2), and the ground area from m^2 to hectares (ha)

Where:

$$1\ m^2 = 1000\ cm^2 \text{ and } 1\ ha = 10{,}000\ m^2$$

$$\text{(e)}\quad \text{stand } BA = \frac{\sum BA}{\text{Area of the plot}}\ (m^2 / ha)$$

The number of stems per hectare was calculated using the formula below. This was also used in determining the densities of trees, saplings and seedlings and their diameter at class level.

$$\text{(f)}\quad \text{Stems per ha} = \frac{\text{no. of stems in the plot}}{\text{Area of the plot}} \times 1000$$

Distribution

The distribution of mangrove trees, saplings, and seedlings was determined in terms of their count per transect. Chi-square test, X^2 (Poole, 1974) was used to determine the pattern using the formula:

$$X^2 = \sum \frac{(X-x)^2}{X}$$

Where:

x = is the no. of individual per (category) for all species in each plot

X = is the mean density

Values resulting from the formula were plotted in the Poisson diagram. Variance to mean ratio was used to confirm the results of the Chi-square test. Variance was calculated using the following formula:

$$S^2 = E \frac{(x-X)^2}{n-1}$$

where :

x = is the no. of individuals (per category) in each plot
n = is the number of plots
X = is the mean density

$$\text{And the variance to mean Ratio} = \frac{S^2}{X}$$

RESULTS AND DISCUSSION

Species composition

Primary and secondary growth of mangroves was mainly observed in different plots in Guang-guang, DahicaFn, Mati, and Davao Oriental. A total of 9 species of mangroves were listed during the sampling. *Ceriops tagal, Rhizophora stylosa, Rhizophora apiculata, Bruguiera gymnorrhiza, Sonneratia alba, Avicennia officinalis, Pemphis acidula, Aegiceras corniculatum, Avicennia alba* were common mangrove species in Guang-guang sampled. Of the nine mangrove species sampled, the densest vegetation of mangrove trees, saplings, and seedlings was the *Ceriops tagal,* with 309 stems. The lowest is the *Bruguiera gymnorhiza,* with eight stems, and *Avicennia officinalis,* with four stems.

Distribution and diversity

From the three stations, the highest variance value is *Ceriops tagal,* with 1967.87 and a mean value of 30.90. On the other hand, the lowest value of variance is *Bruguiera gymnorhiza*, with 6.4. Among the nine species of mangrove identified, *Rhizophora stylosa and Sonneratia alba* have the highest relative frequency value of 17.9 %. The lowest relative frequency value consists of *Rhizophora apiculata,* with 3.6 %, P*emphis acidula,* with 3.6 %, and *Avicennia officinali*s, with 3.6 %.

These observations could be due to the different effects, such as soil types and tidal waves prevailing in each area. According to (Brown *et al*., 1987), areas with sandy substratum promote luxurious growth for the *Avicennia* species. As the soil becomes a modified shelter and the presence of trees and the area turns muddy with the continuous deposition of silt, *Rhizophora* species thrive in this area (Reyes and Hernando Campos, 1992).

According to Encedenia (1981), as cited by Serrano et al. (1987), tidal current is an essential factor in the distribution or dispersal and eventual establishment of mangrove species. Mangrove tree species prefer shore conditions, which are favorable for accretion.

Density and size

Vegetation of mangrove saplings was very abundant in Guang-guang, Dahican, Mati City, Davao Oriental. The highest density of seedlings was the *Ceriops tangal* with 7,600 stems/ha and *Sonneratia alba* with 1,000 stems/ha, while the mean density of mangrove saplings and seedlings (stems/ha) sampled from the three stations. Among the 9 mangrove species, the highest density of saplings consist of *Ceriops tangal* with 17,200 stems/ha and *Rhizophora stylosa* with 3,700 stems/ha. This mangrove species *Ceriops tangal* and *Rhizophora stylosa* are found in the three stations. The most common mangrove species that were found in the different stations were the *Rhizophora stylosa, Sonneratia alba,* and *Ceriops tagal.*

SUMMARY

The study was conducted for identification of mangrove species in Guang-guang, Dahican, Mati City, Davao Oriental. Transect line plot method was used to identify the distribution of mangrove species. An area of 10 m x 10 m (100 m^2) plot was established in each forest type or zone, seedlings (height < 1 m) saplings (<4cm DBH and height > 1m) found in each plot were counted and measured the diameter at breast height using vernier caliper. The presence or absence of a particular mangrove species within a 100 m^2 plot and their identification code were recorded. Three stations were considered as sampling sites of the study. There were nine species that were recorded during the sampling. These are *C. tangal, R. stylosa, R. apiculata, B. gymnorrhiza, S. alba, A. officinalis, A. corniculatum, A. alba,* and *P. acidula.* The density of mangrove species was measured by counting the individual species in the area, which expressed in stems/ha.

CONCLUSION

There were 9 mangrove species and these were *C. tangal, R. stylosa, R. apiculata, B. gymnorrhiza, S. alba, A. officinalis, A. corniculatum, A. alba,* and *P. acidula.* Most of the mangrove species followed a distinctive zonation pattern as influenced by tidal fluctuations, exposure to winds, and water current, soil properties and water and soil salinity. Based on the sampling results, *Sonneratia* and *Rhizophora* species generally thrived in seaward zone and riverine zone. The species that thrived in middle zone were dominated by *Avicennia, Ceriops,* and *Aegiceras species.*

LITERATURE CITED

Aragones, E. G. Jr., Rojo, J. P., and Pitargue, F. C. Jr. (1998). Botanical identification handbook on Philippine mangrove trees.

Brown, S., Day, D. A., & Critchley, C. (1987). Salt tolerance—does leaf respiration have a contribution to make?. *plant mitochondria: structural, functional, and physiological aspects*,393-396

English, S., Wilkinson, C., and Baker, V. (1997). Survey manual for tropical marine resources.Magdaraog, G. (1998). *Environment and natural resources atlas of the Philippines.* Environment Center of the Philippines Foundation.

Field, C. D. (1999). Mangrove rehabilitation: choice and necessity. *In diversity and function in mangrove ecosystems: proceedings of mangrove symposia held in toulouse, France, 9–10 July 1997 and 8–10 July 1998* (pp. 47-52). Springer Netherlands

Magdaraog, G. (1998). Environment and natural resources atlas of the Philippines. Environment Center of the Philippines Foundation.

Melana, D. M., Atchue III, J., Yao, C. E., Edward, R., Melana, E. E., and Gonzales, H. I. (1998). MangroveManagement Handbook. Coastal Resource Management Project of DENR.

Melana, E. and Gonzales, H. (1996). Field Guide to the Identification of some Mangrove Plant Species in the Philippines. ERDS-DENR-7.

Reyes, R., and Campos, H. N. (1992). Macroinvertebrados colonizadores de raíces de Rhizophora mangle en la Bahía de Chengue, Caribe *Colombiano. Boletín de Investigaciones Marinas y Costeras-INVEMA*R, 21(1), 101-116.

Serrano, R. C., Malicsi, L. C. and Bejosano, C. P. (1987). State of the art Mangrove Research. Forestry Research Series No. 4.

Walsh, G. E. (1974). Mangroves: a review. *Ecology of halophytes*, 51-174.

Yao, C. E. (1997). Mangrove species Identification (Dendrology). Mangrove Specialist. Mangrove Management Component Coastal Resources management Project (10/2).

Zamora, P. M. (1991). Managing the Philippine mangal for long-term human survival. *Transactions of the National Academy of Science and Technology (NAST),* 12, 89-125