Assessment of Mangrove Forest Diversity and Community Structure in Barangay Dao, San Jose N. Samar, Philippines

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ABSTRACT:
This study assessed the mangrove forest in Barangay Dao, San Jose N. Samar, Philippines, focusing on its diversity, community structure, and ecological significance. The transect line plot method was used to sample and assess mangrove species in the study area, while participatory resource appraisal was conducted to gather information on their major uses and recommended conservation measures. Physico-chemical characteristics were measured on-site, except for salinity which required laboratory analysis.

The study revealed that the mangrove forest in Barangay Dao, San Jose N. Samar, is environmentally and economically important to the community. Mangroves provide natural infrastructure, protecting the land and people from erosion, waves, storms, tsunamis, and floods. Charcoal production emerged as a significant utilization of mangroves. The study identified eight species belonging to five families, with Rhizophora apiculata (Bakauan lalaki) being the most abundant, while Ceriops decandra (malatangal) and Aegiceras corniculatum (saging-saging) were regenerating species in the area. The community structure analysis revealed a total of 594 individuals across the representative plots, with Rhizophora apiculata exhibiting the highest density.

Overall, this study provides valuable insights into the diversity, community structure, and ecological significance of mangrove forests in Barangay Dao, San Jose N. Samar. The findings contribute to the development of conservation and management strategies for these crucial ecosystems, highlighting the need for their protection and sustainable utilization for the benefit of both the environment and the local community.

Keywords: *Mangrove forest, Barangay Dao, San Jose, N. Samar, Diversity, Community structure, Transect line plot method, Participatory resource appraisal, Physico-chemical characteristics, Salinity, Major uses, Protection, Conservation, Environmental benefits, Economic benefits, Charcoal production, Species composition, Rhizophora apiculate, Ceriops decandra, Aegiceras corniculatum, Density, Relative density, Ecosystem significance, Conservation strategies, Sustainable utilization*

INTRODUCTION

Mangrove forests are vital coastal ecosystems that provide numerous benefits to both the environment and local communities. In the Philippines, the extent and distribution of mangrove coverage have been of particular interest, with efforts made to estimate and protect these valuable ecosystems. A study conducted in 2013 by Jordan B. Long and Chandra Giri, contractors of the US Geological Survey (USGS), utilized global Landsat imaging from 1990-2010 to estimate the total mangrove area in the Philippines. Their findings revealed a total coverage of 256,185 hectares in 2000, slightly higher than the estimate provided by the Department of Environment and Natural Resources (DENR) in 2003, which reported 247,362 hectares.

The study also identified the provinces with the highest percentages of mangrove areas relative to their total national area. Palawan ranked highest at 22.2%, followed by Sulu at 8%, and Zamboanga del Norte and Sur at 9.86%. Other provinces with significant mangrove coverage included Surigao del Norte and Sur, Eastern and Western Samar, Quezon, Tawi-Tawi, Bohol, and Basilan. Furthermore, a substantial portion of the mangrove areas, accounting for 19% of the national total, was protected by the International Union for Conservation of Nature (IUCN) for long-term conservation purposes. These

protected mangroves were found in various locations such as Palawan, Siargao, Malampaya Sound, Biri Larosa, El Nido, Tanon Strait, Northern Sierra Madre, Dumanquilas Bay, Sibuyan Islands, and Calauit Island.

Northern Samar, one of the provinces situated in Samar Island, Philippines, is characterized by its coastal areas, encompassing 20 municipalities and 219 barangays out of a total of 569. The coastal region accommodates approximately 53% of the province's total population of 632,000. Mangrove stands in Northern Samar cover an estimated 9,300 hectares, accounting for around 5% of the province's total forest area. The local communities heavily rely on mangroves for sustenance, as they serve as a source of food, fuelwood, and housing materials. Moreover, the communities recognize the protective role of mangroves against typhoons and tidal surges, and they value these ecosystems for their contributions to food and income generation.

Despite the significance of mangroves, several sites in Northern Samar remain unprotected. The responsibility for mangrove management lies with the DENR, which has implemented various reforestation and rehabilitation projects. Between 2012 and 2017, DENR initiatives covered a total area of 4,630 hectares, while the Bureau of Fisheries and Aquatic Resources (BFAR) undertook mangrove rehabilitation programs from 2012 to 2015, covering approximately 2,289 hectares. In addition, non-governmental organizations (NGOs) and local government units (LGUs) have also implemented mangrove reforestation projects, contributing to the expansion of mangrove areas from 6,814 hectares (old growth stand) to a total of 12,426 hectares.

Overall, understanding the extent, distribution, and conservation efforts of mangroves in Northern Samar is crucial for developing effective management strategies and safeguarding these valuable coastal ecosystems.

OBJECTIVES OF THE STUDY

This study aimed to evaluate the mangrove forest in Barangay Dao, San Jose, Northern Samar. The objectives of the study were as follows:

1. Assess the socio-demographic profile of the respondents in Barangay Dao, San Jose, Northern Samar, focusing on factors such as age, sex, marital status, monthly income, educational attainment, source of livelihood, employment status, length of service for employed individuals, membership in organizations, and participation in environment-related seminars.

2. Determine the presence and extent of mangrove forests in Barangay Dao, San Jose, Northern Samar.

3. Identify the primary uses of the mangrove forest in Barangay Dao, San Jose, Northern Samar.

4. Analyze the physico-chemical characteristics of the mangrove ecosystem, including pH levels, salinity, temperature, turbidity, and substrate composition.

5. Evaluate the state of the mangrove forest in Barangay Dao, San Jose, Northern Samar, with a specific focus on community structure.

6. Propose recommended measures for the protection and conservation of the mangrove forest in Barangay Dao, San Jose, Northern Samar.

By conducting this research, the study aimed to gather comprehensive information about the mangrove forest in Barangay Dao, San Jose, Northern Samar, and provide valuable insights for the development of conservation strategies and management plans.

METHODOLOGY

The study was conducted in Barangay Dao, San Jose, Northern Samar, which has a population of 1,610 individuals residing in 370 households. The community is surrounded by mangrove forests that provide protection from natural

disasters and serve as habitats for various organisms, supporting the livelihoods, income, and food sources of the residents.

Barangay Dao is located in the municipality of San Jose, which is classified as a 5th class municipality in the Province of Northern Samar, Philippines. The municipality is situated at approximately 12°N latitude and 124°E longitude, in the north central part of the province. It is approximately 19 kilometers west of Catarman, the provincial capital, and about 30 kilometers east of Allen, where the ferry terminal connects Luzon, Samar, Leyte, and Mindanao. Tacloban City, the Regional Center of Region VIII or Eastern Visayas, is around 150 kilometers to the north-northeast of San Jose.

This study employed a descriptive design to provide an explanation of the phenomenon and situation of the mangrove forest in Barangay Dao, San Jose, Northern Samar. The sampling procedure involved the use of various tools and equipment. Transect tape, a tape measure, and geo-tagging were utilized to determine the presence and extent of the mangrove forest. Additionally, a pH meter, hydrometer, thermometer, and water samples were collected for laboratory testing to determine the physicochemical characteristics of the mangrove forest, including salinity.

The transect line method was employed to assess the mangrove community. Five transect lines were established, each consisting of five quadrats with ten intervals between them. There were 50 intervals between each transect line. Each quadrat followed a 10x10 approach, covering an area of 100 square meters. Thus, the total area covered by the five transect lines was 2,500 square meters, resulting in a density of 0.25.

Data for the quadrats were recorded on prepared tally sheets, including information such as tree number, species, height, and DBH (Diameter at Breast Height). Samples of species were collected for identification, involving at least a one-foot-long branch containing leaves, fruits, and flowers.

By employing this methodology, the study aimed to provide a coherent assessment of the mangrove forest in Barangay Dao, San Jose, Northern Samar, focusing on its community structure and physicochemical characteristics.

REVIEW OF LITERATURE

Mangroves play a crucial role in global carbon sequestration by acting as significant carbon sinks within tropical coastal zones. Despite occupying less than 1% of the coastal area, mangroves are estimated to contribute approximately 20% of carbon emissions arising from deforestation. They have the remarkable ability to sequester atmospheric carbon in both their above and belowground biomass, as well as in sediments. Mangroves not only absorb carbon dioxide but also absorb carbon monoxide and sulfur dioxide, thereby potentially mitigating the impacts of global warming and releasing substantial amounts of oxygen into the atmosphere. The global benefits associated with carbon sequestration in mangroves include the removal of harmful greenhouse gases, making them crucial in mitigating the effects of climate change.

The term "mangrove" refers to both the ecosystem and the plant families that have evolved specialized adaptations to thrive in this tidal environment. Mangroves possess various features that make them uniquely adaptable to their stressful surroundings. They are halophytic or salt-tolerant, possess aerial roots for oxygen absorption, and germinate their seeds while still attached to the tree. Regardless of the range of species and forest types, mangrove ecosystems play a highly significant ecological, economic, and social role. Mangroves are estimated to have an annual global carbon burial of approximately 18.4 Terra grams of carbon, showcasing their potential as efficient carbon dioxide sinks.

Mangroves are among the most carbon-rich forests in the tropics and provide essential ecosystem services. These forests are integral to the carbon stored in coastal and marine ecosystems, known as "blue carbon." They have the potential to contribute significantly to emission reduction while also supporting biodiversity conservation, fisheries habitat protection, and disaster risk reduction. However, despite their ecological importance, mangroves have experienced significant declines, with some areas witnessing reductions of up to 50%.

Mangroves store carbon not only in their aboveground biomass, such as woody material and leaves, but also in their belowground biomass, including roots and fine root structures. Additionally, approximately 25% of the leaf litter gets trapped in the sediments. Mangroves also play a crucial role in trapping suspended sediments, aiding in retaining

transported carbon in soils. While the specific percentages may vary depending on tidal flow, geographic location, and soil type, mangroves generally store more carbon belowground than aboveground. However, if mangroves are converted to other uses, such as aquaculture, the stored carbon can be released relatively quickly.

The amount of organic carbon stored in mangrove ecosystems depends on various factors, including the sources of carbon, such as tidally suspended organic matter and local production by mangroves themselves. The high carbon content in mangrove soil is a result of high sedimentation rates and sustained anoxic conditions, which lead to low decomposition rates of soil organic matter and the buildup of soil carbon. Carbon sequestration in mangrove ecosystems is an ongoing process, often resulting in substantial carbon deposits. These, together with carbon stored in salt marshes and seagrasses, are collectively referred to as "blue carbon."

RESULTS AND DISCUSSION

The study area in Barangay Dao, San Jose, Northern Samar, exhibited the presence of various mangrove species. The dominant species found were Rhizophora apiculata (Bakauan lalaki), with a total of 426 individuals observed across the five transect lines. Rhizophora mucronata (Bakauan babae) had a total of 69 individuals, while Avicennia marina (Bongalon) and Sonneratia alba (pagat pat) had 25 and 21 individuals, respectively. Bruguiera gymnorrhiza (Busain), Ceriops decandra (malatangal), and Aegiceras corniculatum (saging-saging) had fewer individuals observed, with a total of 3, 2, and 2 individuals, respectively. Notably, Ceriops decandra and Aegiceras corniculatum were regeneration species present in the study area, contributing to the existing mangrove forest.

In terms of the major uses of mangroves identified through surveys in Barangay Dao, San Jose, Northern Samar, charcoal production was the primary utilization. However, the respondents stated that they did not intentionally cut down mangroves for charcoal, but rather utilized naturally fallen and damaged mangroves. Only a small percentage of respondents (less than 20%) reported using charcoal. Additionally, the study revealed that mangroves provided significant environmental and economic benefits to the community. They served as natural infrastructure, offering protection against erosion, strong waves, storms, tsunamis, and floods.

The physico-chemical characteristics of the study area were assessed. The pH level of the water was found to be 7.27, falling within the normal range for surface water systems. Salinity readings indicated brackish water conditions, ranging at approximately 33 parts per thousand (ppt). The average temperature in the mangrove forest was measured at 33°C during a sunny day. Turbidity in the water was observed, indicating reduced water clarity. The substrate within the mangrove forest was predominantly muddy, consistent with the observed mud-covered area.

Regarding the state of the mangrove forest in terms of community structure, a sampling site with five transect lines was established. The species diversity, assessed using the Shannon-Wiener diversity index, indicated medium diversity in the area. The index value of 0.71 suggested that the number of individuals was not evenly distributed among species, despite the presence of numerous species. The family Rhizophoraceae exhibited the highest percentage (0.80) of the species present, while Bruguiera gymnorrhiza (Busain) showed the lowest percentage (0.01) due to the smaller number of individuals.

These findings provide valuable insights into the mangrove ecosystem in Barangay Dao, San Jose, Northern Samar. The presence of diverse mangrove species highlights the ecological significance of the area, while the major uses of mangroves for charcoal production underscore their importance to the local community. The physico-chemical characteristics shed light on the environmental conditions of the study area, and the assessment of community structure provides a baseline for future monitoring and conservation efforts.

SUMMARY

This study aimed to assess the mangrove forest in Barangay Dao, San Jose, Northern Samar. The transect line plot method was used to determine the presence of mangrove species and assess the community structure. Participatory resource appraisal, conducted through a survey questionnaire, was used to gather information on the major uses of mangroves and recommended conservation measures. Most of the physico-chemical characteristics were measured on-site, except for salinity, which required laboratory analysis. The study area exhibited a water pH of 7.27, a water temperature of 33°C, turbid water, and a muddy substrate.

The major uses of mangroves identified in Barangay Dao were primarily for charcoal production. However, it was noted that the community did not intentionally cut down mangroves for charcoal, but rather utilized naturally fallen or damaged mangroves. The community recognized the environmental and economic benefits of mangroves, as they provide natural infrastructure and protection against erosion, strong waves, storms, tsunamis, and floods.

The study area consisted of five transect lines with five quadrats and 10 intervals between quadrats, covering a total of 0.25 hectares. In terms of the community structure, a total of eight mangrove species belonging to five families were identified. Rhizophora apiculata (Bakauan lalaki) was the most abundant species, with 476 individuals, while Ceriops decamdra (malatangal) and Aegiceras corniculatum (saging-saging) had the least number of individuals. Notably, these two species were regeneration species, indicating their presence as part of the existing mangrove forest in the study area.

The overall condition of the mangrove forest in Barangay Dao, San Jose, Northern Samar, was found to be in good condition based on the community structure assessment. A total of 594 individuals were counted across the established plots, with a relative density of 80.13 observed for Rhizophora apiculata (Bakauan lalaki), indicating its high abundance. Conversely, Bruguiera gymnorrhiza (Busain) had the lowest density, with only three individuals and a relative density of 3.54.

These findings provide valuable insights into the mangrove forest in Barangay Dao, highlighting its ecological importance and the need for conservation efforts to preserve its benefits to the community and the environment.

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