International Journal for Educational and Vocational Studies
E-ISSN: 2684-6950
Homepage: https://ojs.unimal.ac.id/ijevs/index

Implications of mangrove diversity on planted land area mangrove forest Pematang Kuala Serdang Bedagai

Dian Hendrawan[1]* & Pandu Prabowo Warsodirejo[2]
[1] Faculty of Agriculture, North Sumatera Islamic University, Medan, 20217, Indonesia
[2] Faculty of Teachers Training & Education, North Sumatera Islamic University, Medan, 20217, Indonesia
dianhendrawan@uisu.ac.id; panduprabowo@fkip.uisu.ac.id
*Corresponding Author: dianhendrawan@uisu.ac.id | Phone: +62811-657-313

ARTICLE INFO
Received: 15-01-2022
Received in revised: 12-03-2022
Accepted: 20-03-2022
Available online: 30-4-2022

KEYWORDS
Mangrove Diversity;
Planted Land Area;
Mangrove Forest;

A B S T R A C T

Pematang Kuala Village is one of the villages in the Mengkudu Bay District which has an area of almost 80% of which is mangrove forest. The existence of the Mangrove Forest is very important in addition to being a source of livelihood for the population, most of whom are fishermen, its function is also to protect coastal areas from increasingly severe coastal abrasion. The mangrove forest in this village is a mangrove forest that is managed jointly by the community to meet the needs of the community. Most of the village areas that are not mangrove forests are now converted into oil palm plantations or ponds which can damage mangrove ecosystems and coastal areas. This study aims to analyze the level of abundance, biomass, diversity and potential of fauna, distribution patterns of mangrove plants and fauna as well as the effect of conversion of mangrove diversity and the components contained therein on planted areas in the mangrove area to obtain data in Pematang Kuala Village, Teluk Mengkudu District, Serdang Be different. This research was conducted from January to March 2022. The study used data analysis techniques for diversity and abundance of the Shanon Winner index. There were 11 Mangrove species in total which were obtained at 3 research sites. Each research station is divided into 3 data collection, namely Trees, Trunks, and Seedlings. The highest diversity index was found in trees at station 1, which was 2.52%. and the lowest index is station 2 tree type was 0.15%.

INTRODUCTION

The mangrove ecosystem is an ecosystem found in coastal areas, where this ecosystem is between land and sea and is influenced by tides. The mangrove ecosystem has a very important role in terms of its physical, ecological and economic aspects. The benefits that can be obtained by coastal communities such as can also be made for tourist attractions and mangrove fruit that can be processed into various types of food, wood that can be made as charcoal and building materials, and others. Mangrove forests have a dual function and are a very important link in maintaining the balance of the biological cycle in a waters. The influence and pressure on mangrove habitat stems from the human desire to convert mangrove forest areas into residential areas, the fishing industry and agriculture causing overexploitation of mangrove forests so that it can cause ecological damage on the coast, one of which is on the coast of Pematang Kuala Village, Teluk Mengkudu District. Mangrove forests are converted into fishponds and settlements. Indirectly, these conditions are related to the role of mangroves which are the habitat of a wide variety of aquatic fauna. In line with that, Genisa (2006) argues that the level of species diversity is influenced by many factors, one of which is environmental quality. Pematang Kuala Village is one of the villages in the Mengkudu Bay District which has an area of almost 80% of which is mangrove forest. The existence of the Mangrove Forest is very important in addition to being a source of livelihood for the population, most of whom are fishermen, its function is also to protect coastal areas from increasingly severe coastal abrasion. The mangrove forest in this village is a mangrove forest that is managed jointly by the community to meet the needs of the community. Most of the village areas that are not mangrove forests are now converted into oil palm plantations or ponds which can damage mangrove ecosystems and coastal areas. The benefits contained in the mangrove ecosystem make many activities obtained by the

community, with activities that do not damage the ecosystem. However, there are also many mangroves that are self-destructing, resulting in a decrease in the function of the mangroves. Likewise, the potential for fauna around mangroves needs to be known about the distribution pattern of aquatic macrofauna in the area. So that it affects the income of residents who work as fishermen.

Data on the diversity of aquatic macrofauna species found in the waters around the mangrove area based on environmental conditions can be used to provide recommendations for sustainable mangrove management in the area. As a village that has a fairly large land area, people who work as farmers also have planting land that is affected by the change in land function. Of course, if viewed from the importance of the functions and benefits for the ecosystem, what must be prioritized first is the area of the most vital mangrove ecosystem because it protects the coast from abrasion, then the importance of the planting area which is also a source of livelihood for the Pematang Kualaya community, most of whom are also farmers. Therefore, there needs to be a balance between rural communities who work as fishermen and farmers, in this case understanding the implications and potential of the mangrove ecosystem and the components in it for planting land in dry land areas or outside mangrove areas.

METHODS

The study was conducted in the Mangrove Forest Ecosystem in Pematang Kuala Village, Teluk Mengkudu District, Serdang Bedagai Regency. The research was conducted in January until March 2022. The tools used are wooden stakes, raffia rope, meter, plastic bag, digital camera, GPS, ruler, millimeter paper, Thermometer, DO Meter, digital scale, container, pH meter, mangrove identification book, Bio Marine fish taxonomy book, tanggok, nets, traps, and stationery. The materials used are fish samples, aquatic fauna, aquades, tissue, 70% alcohol, label paper, duct tape.

The techniques of determining the research location is the purposive sampling method. Station I is located in front of the coastline which is a place for visitors, station I is also in the fishing area. The structure of the station I area is a little gritty. Station II, this station has good mangrove conditions and at this location many community activities and tourism activities are found. The structure of Region II is a muddy area. Station III, this station is a station that is close to residential areas and borders the mangrove forest area and planted area. The data collected were in the form of density, frequency, mangrove dominance, density, diversity, abundance and biomass of fauna, types of aquatic fauna in mangroves, and physical and chemical parameters of the waters. Data collection was carried out in situ and laboratory observations. Sources of data used are primary data and secondary data. The primary data used is the results of transects (direct observations in the field) in the form of density, frequency, mangrove dominance, density, diversity, abundance and biomass of fauna, types of aquatic fauna in mangroves, and physical and chemical parameters of the waters. Data collection was carried out in situ and laboratory observations. Meanwhile, secondary data covers the area of mangroves from the cooperative office for mangrove ecosystem management in Kampung Nipah Village. The data collection technique used in this research is by purposive method.

Data Analysis Techniques

Sampling *(collection of data through consideration)* by determining 3 points of observation stations based on the presence or absence of community activities. Determination of station coordinates is done using a GPS *(Global Positioning System)*. Complementary data in this study in the form of photo documentation used to describe the actual situation, literature study is a technique used to obtain secondary data, in the form of mangrove area data, research locations, area and other data needed in research. Data were obtained from the relevant agency or agency that provided data assistance to complement the results of this study. Analysis of Mangrove Ecosystem Conditions The results of the measurement of mangrove vegetation data in the mangrove area of Pematang Kuala Village, Teluk Mengkudu District, Serdang Bedagai Regency which have been collected are then processed and then analyzed as follows:

Type Density:
K= Total index / LPC

Description:
K= Specific Density in individual units/ha
LPC = Area of Sample Plot

Relative Density = Kr= (K of a Species/K Total of all Species) X100%

Frequency The frequency of a species shows the distribution of a species in an area. can be calculated by the formula (Odum, 1995):

Frequency:
F = Total sub-plots found species / total of all sample sub-plots

Relative Frequency:
Fr = (F of a species / F Total of all species) x100%
Dominance:
D = LBDS / LPC

Description:
D = Dominance in m/Ha
LBDS = area of the base of fields
LBDS = 1/4 x n x D

Relative Dominance:
Dr = (D A species / D total of all species) X100%

Important Value Index = is an index that gives an overview of the important role or influence of a mangrove vegetation. To calculate the important value index, the formula is used, namely:

INP = Relative Density (%) + Relative Frequency (%) + Relative Dominance (%).
Description = INP = Important value index

RESULTS AND DISCUSSIONS

Important Value Index

The highest important value index in the tree category is A. marina at station 3, the sapling category is A. marina at station 3, while the seedling category is R. mucronata at station 1. The INP values obtained from tree species, saplings and seedlings can be seen in (**Table 1**, **Table 2** and **Table 3**).

Table 1. Tree Significance index

No.	Species	Stasiun		
		I	II	III
1.	Avicennia alba	94	76.0	60.5
2.	Avicennia marina	67.75	105.0	164.7
3.	Rhizophora apiculata	92.52	118.9	74.8
4.	Rhizophora mucronata	46.13	-	-
	Total	300	300	300

Table 2. Stack Significance index

No.	Species	Stasiun		
		I	II	III
1.	Avicennia alba	-	55.91	27.37
2.	Avicennia marina	25.2	78.6	91.6
3.	Rhizophora apiculata	25.2	78.50	65.47
4.	Rhizophora mucronata	16.11	-	15.47
5.	Rhizopora stylosa	76.39	-	-
	Total	200	200	200

Table 3. Seedling Significance index

No.	Species	Stasiun		
		I	II	III
1.	Avicennia alba	-	-	34.09
2.	Avicennia marina	-	66.6	113.63
3.	Rhizophora apiculata	83.3	133.3	-
4.	Rhizophora mucronata	166.67	-	52.27
	Total	200	200	200

Mangrove Diversity Index The highest mangrove species diversity index value was found at station 1, namely the tree category. The diversity index values in each category can be seen in the following table:

Table 4. Mangrove Species Diversity Index

Station	Type	Diversity Index
Station I	Tree	2.52
	Stack	1.07
	Seedling	0.63
Station 2	Tree	0.15
	Stack	1.06
	Seedling	0.45
Station 3	Tree	0.68
	Stack	1.13
	Seedling	1.15

The tree category that has the highest frequency value of 1 is the A. marina, A. alba, and R. apiculata species found at station 1 and the A. marina and R. apiculata at station 3. A frequency value of 1 means that the species is present in every plot of a station In the sapling category, mangrove species that have a frequency value of 1 are A. marina and R. stylosa at station 1, as well as all species found at station 2. The frequency values obtained from the seedling category at the three research stations showed that none of the mangrove species had a value 1. The highest frequency value obtained is 0.33, namely the types of R. apiculata and R. mucronata found at station 1 Dominance The highest dominance of the three stations was type A. marina with a relative dominance of 50.1% found at station 3 and the lowest dominance was species R. mucronata with a relative dominance of 22.13% found at station 1.

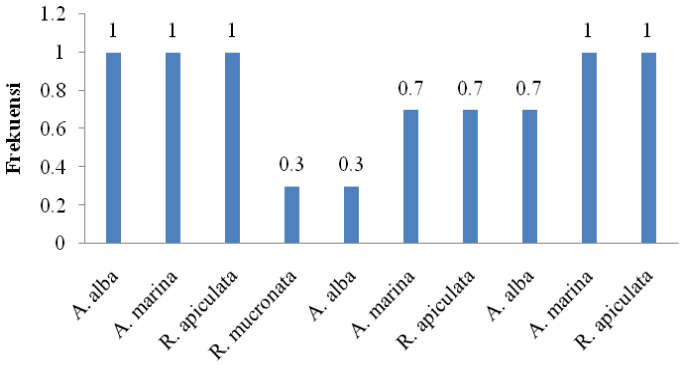

Figure 1. Tree Frequency

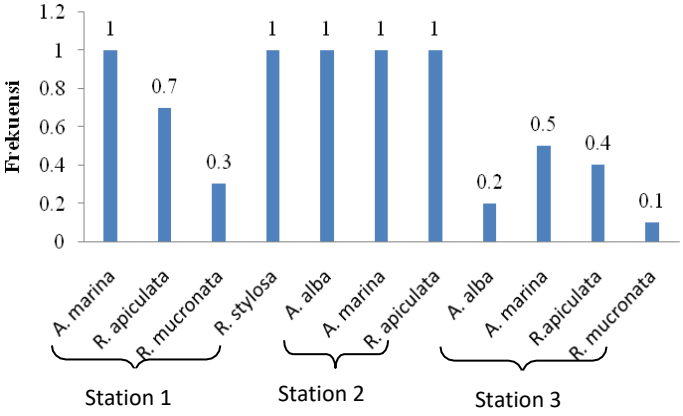

Figure 2. Stack Frequency

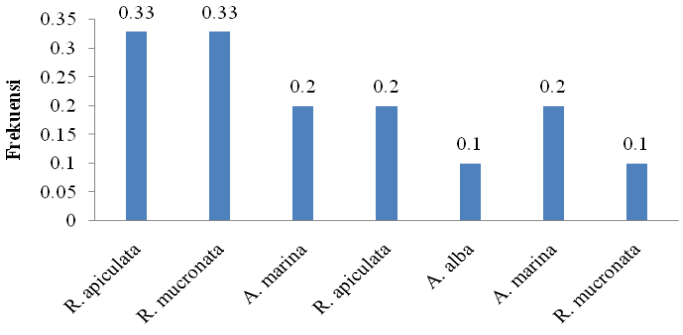

Figure 3. Seedling Frequency

Hypothesis test

The density of mangrove species can be grouped into 3 categories, namely trees, saplings, and seedlings. The density value of mangrove vegetation types in the mangrove area of Kampung Nipah Sei Nagalawan Village from the measurement results obtained by the density value of mangrove species based on the tree category in each plot shows that A. marina has the highest density value of 1233.33 Ind/ha which is found at station 3 when compared with other types. Meanwhile, the lowest category density was A. alba species with a density value of 133.3 Ind/ha which was found at station 3 . This is presumably due to the activity of fishermen around this area which causes damage to the mangroves, causing a reduction in mangrove vegetation at station 3 which will reduce the ecological function of the mangrove ecosystem and reduce the habitat of biota that live around the mangrove area. The highest sapling category density was found at station 1, namely the type of R. stylose at 3733.33 Ind/ha while the lowest density was found in the species. R. mucronata is 80 Ind/ha. As seen at station 2 and station 3, the highest density values were found in the type of R. apiculata and the type of A. marina at station 2 and station 3. It can be seen that the type of R. stylosa at station 1 has a very dense density. While those at station 2 are also still classified as very dense, in contrast to the case at station 3 which has a low density value and is classified as moderate, because this area is a tourist area managed by the local community, the use of this mangrove land as tourism makes many cottage buildings a small hut that can reduce and destroy mangroves.

Dominance is an index that knows certain species that dominate a community (Odum, 1993). If the dominance index value is close to one, then there are certain organisms that dominate a waters. If the dominance index value is zero then there is no dominant organism (Figure 13). The highest dominance of the three stations is type A. marina with a relative dominance of 50.1% found at station 3. So it can be said that type A. marina is very suitable to grow around station 3 because at that station there is not much human activity, such as fishing by fishing, tourism, ponds and so on. Because basically the existence of these activities will be able to affect the condition of the mangrove ecosystem.

CONCLUSION

Based on the results of the study, it can be seen that the ecological condition of the mangrove ecosystem in the Coastal Area of Pematang Kuala Village, Teluk Mengkudu District, Serdang Bedagai Regency is relatively rare. Then the level of abundance, biomass, diversity and evenness of aquatic macrofauna is classified as rare because the mangrove area at the research station has started to experience damage and the entry of tides is rare, except at station 3 which is close to the river mouth. 2. Based on the results of the study, it can be seen that the distribution pattern of aquatic macrofauna in the Mangrove Area of Pematang Kuala Village is relatively rare due to the large number of damaged mangrove areas, thereby reducing habitat for biota.

Author's Contributions

All team members contributed equally in the writing of this article. They carry out collaborative activities according to the tasks and functions that have been mutually agreed

upon, from research planning to writing articles for journals.

Conflict of Interest

All authors in this manuscript have no conflict of interest. All team members work professionally according to their expertise.

REFERENCES

Alik. T. S. D., Muh. R. U. dan Dody. P. (2013). Analisis Vegetasi Mangrove di Pesisir Pantai Mara'bombang-Kabupaten Pinrang. Fakultas Matematika dan Ilmu Pengetahuan Alam Universitas Hasanuddin, Makassar.

Alfira. R. (2014). Identifikasi Potensi dan Strategi Pengembangan Ekowisata Mangrove pada Kawasan Suaka Margasatwa Mampie di Kecamatan Wonomulyo Kabupaten Polewali Mandar. Fakultas Ilmu Kelautan dan Perikanan Universitas Hasanuddin, Makassar.

Bengen, G.D. (2001). Ekosistem dan Sumberdaya Pesisir dan Laut serta Pengelolaan Secara Terpadu dan Berkelanjutan. Prosiding pelatihan pengelolaan wilayah pesisir terpadu. Bogor.

Buwono, Y.R. (2000). Potensi Fauna Akuatik Ekosistem Hutan Mangrove di Kawasan Teluk Pangpang Kabupaten Banyuwangi. [*Tesis*]. Universitas Udayana. Denpasar.

Bustaman, J. P. (2014). Keanekaragaman Fauna Vertikal Pada Mangrove Kawasan Suaka Margasatwa Mampie Kecamatan Wonomulyo Kabupaten Polewali Mandar. [Skripsi]. Universitas Hasanuddin. Makassar.

Gumilar, I. (2012). Partisipasi Masyarakat Pesisir dalam Pengelolaan Ekosistem Hutan Mangrove Berkelanjutan di Kabupaten Indramayu. *Jurnal Akuatika*. 3 (2) : 198-211

Gunarto. (2004). Konservasi Mangrove Sebagai Pendukung Sumber Hayati Perikanan Pantai. *Jurnal Litbang Pertanian*, 23 (1). 15-21.

Hafizh, I., Candra, J. K., dan Fahmi, Y. (2013). Studi Zonasi Mangrove di Kampung Gisi Desa Tembeling Kecamatan Teluk Bintan Kabupaten Bintan Provinsi Kepulauan Riau. Universitas Maritim Raja Ali Haji. Tanjung Pinang.

Jesus, A. D. (2012). Kondisi Ekosistem Mangrove di sub District Liquisa Timor Leste. [Jurnal]. Pancasarjana Fakultas Perikana dan Ilmu Kelautan. Universitas Brawijaya. Malang.

Kaunang, T. D. dan Joi, D. K. (2009). Komposisi dan Struktur Vegetasi Hutan Mangrove di Taman Nasional Bunaken Sulawesi Utara. Jurusan Biologi Universitas Manado, Manado. 17 (6) ISSN. 0852-5426.

Kawaroe, M. (2001). Kontribusi Ekosistem Mangrove Terhadap Struktur Komunitas Ikan Di Pantai Utara Kabupaten Subang, Jawa Barat. Jurnal Pesisir dan Kelautan Universitas Haluoleo Kendari Vol.02 No. 03.

Kordi, K.M. G.H. (2012). Ekosistem Mangrove: Potensi, Fungsi, dan Pengelolaan. Jakarta. Penerbit: Rineka Cipta, 256 Hal.

Kustanti, A. (2011). Manajemen Hutan Mangrove, IPB Press,Bogor.

Noor, Y. R., Muhammad, K., dan I.N.N, Suryadiputra. (2012). Panduan Pengenalan Mangrove di Indonesia, Cetakan Ketiga. Wetlands International Indonesia Programme. Bogor.

Nurjanah, Asadatun, A., dan Taufuk, H. (2011). Pengetahuan dan Karakteristik Bahan Baku Hasil Perairan. IPB Press. Bogor.

Odum, E.P. (1993). Dasar-Dasar Ekologi. Edisi ketiga. Gajah mada University Press. Jogjakarta. H. 134-162.

Odum, E. P. (1971). Fundamentals of Ecology. Saunders Company. Philadelphia, London, Toronto.

Pinto, Z,. (2015). Kajian Perilaku Masyarakat Pesisir yang Mengakibatkan Kerusakan Lingkungan (Studi Kasus di Pantai Kuwaru, DesaPoncosari, Kecamatan Srandakan, Kabupaten Bantul, Provinsi DIY). Jurnal Wilayah dan Lingkungan. 3 (3): 163-174.