**IBJ**
*Indonesian Biodiversity Journal*
*http://ejurnal.unima.ac.id/index.php/ibj*

***indonesian.biodivers.j.***
**Vol. 5, No. 2, August 2024**
**ISSN : 2722-2659**

# ANALYSIS OF MANGROVE FOREST VEGETATION ON MOLAS BEACH, BUNAKEN DISTRICT, MANADO CITY

**Fransiska Futwembun*, Helen Lawalata, Iriani Setyawati, Nova Ogi, Nonny Manampiring, Yermia Mokosuli**

Biology Departement, Faculty of Matehematics and Natural Science, Universitas Negeri Manado, Indonesia.

**Corresponding author: Fransiskafutwembun11@gmail.com*

*Received: May 27, 2024* *Accepted: August 14, 2024*

## Abstract

The lack of scientific information about the current condition of the mangrove ecosystem on the Molas beach in the Bunaken District of Manado City is an important reason to conduct a study related to the analysis of mangrove forest vegetation. The purpose of this research is to identify the types of mangroves and to find the Important Value Index (INP) of mangroves on the Molas beach in the Bunaken District of Manado City. Data collection was conducted using the line transect method with plots at only one observation station, which was then analyzed to determine the Importance Value Index (INP). Based on the observations, it was found that four types of mangroves were present at the research location. The dominant mangrove species are *Bruguiera Cylindrica, Bruguiera gymnorrhiza, Aegiceras cosniculatum*, and *Ceriops tagal*. The substrate condition, which is dominated by muddy sand, and the water quality parameters that affect mangrove growth generally still meet the standards for mangrove growth. The species *Ceriops tagal* has the highest values of Relative Density, Relative Frequency, and Relative Dominance, resulting in the highest INP. Meanwhile, the lowest INP was found in the species *Bruguiera gymnorrhiza* in the tree category.

**Keywords:** Mangrove Forest Vegetation, Important Value Index (INP), Molas beach in Bunaken District

## INTRODUCTION

Ecologically, mangrove forests serve as a buffer ecosystem for coastal areas at large. (Syarifuddin dan Zulharman, 2012). The area of mangrove forests in Indonesia has decreased by 30-50% in the last half-century due to coastal area development, the expansion of shrimp farming, sea water erosion, and excessive logging. (Cifor, 2012). From an ecological perspective, mangrove forests serve as a provider of food for marine biota, a barrier against tidal waves and tsunamis, a preventer of seawater intrusion, a barrier against coastal erosion, and a waste absorber. In addition, it also serves as a provider of food needs for the communities around the mangrove area. Meanwhile, in terms of economic function, mangrove forests provide benefits as a source of timber, fish seed production, and serve as a site for

indonesian.biodivers.j.
Vol. 5, No. 2, August 2024
ISSN : 2722-2659

ecotourism, research, and education. (Riwayati, 2014).

Research on the analysis of mangrove vegetation is very necessary considering the importance of the functions and benefits of the mangrove ecosystem. The research conducted includes the structure of vegetation and the zoning of mangroves. This research is expected to serve as a reference for further studies on mangrove vegetation in the Molas beach area and to provide information to the local government in formulating comprehensive policies for the mangrove forest area. This is intended so that efforts to protect and preserve the mangrove ecosystem are further developed, ensuring that its utilization is accompanied by protection and preservation efforts. Based on the above background, a study was conducted on the Analysis of Mangrove Forest Vegetation at Molas Beach, Bunaken District, Manado City.

## RESEARCH METHODS

### Data Collection Procedure

The data collection procedure involves direct field surveys using the Sampling Method. On each route, observation plots were created with sizes of 2 x 2m for the seedling stage, 5 x 5m for the sapling stage, 10 x 10m for the pole stage, and 20 x 20m for the tree stage. (Fachrul, 2007).

### Data Analysis Technique

Identification of species composition and vegetation structure is carried out by analyzing parameters referring to Natividad et al. (2015), namely:

Density (K) = Number of individuals / Area of the measurement plot
Relative Density (KR) = (The density of a species / The density of all species) x 100%
Frequency (F) = Number of discovery plots of a type / Density of all types
Relative Frequency (FR) = (Frequency of a type / frequency of all cells) x 100%
Dominance (D) = The area of the base field of a type / the area of the plots
Relative Dominance (DR) = (Dominance of a type / Dominance of the entire plot) x 100%
Importance Value Index (INP)= KR+FR+DR

## RESULTS AND DISCUSSION

The results of the mangrove vegetation on the Molas beach in Bunaken District, Manado City, for the types of mangroves and the number of individuals in each plot can be seen in Table 1. The mangrove species *Brugueira cylindrica* has the highest number of individuals, 227, mostly at the seedling stage or in a 2 x 2 meter plot. Meanwhile, the species with the fewest individuals is *Bruguiera gymnorrhiza*, with only 2 individuals. Table 1 shows that the types of mangroves and the number of individuals are not the same because each category of mangrove has different diameter or height specifications. Mangroves with a diameter of less than 2 cm fall into the seedling category, and those with a diameter of more than 2 cm fall into the sapling category. The pole category has a diameter of 19.9 cm, and the tree category has a diameter of 20 cm. Mangroves with a diameter of less than 2 cm fall into the seedling category, and those

indonesian.biodivers.j.
Vol. 5, No. 2, August 2024
ISSN : 2722-2659

with a diameter of more than 2 cm fall into the sapling category. The pole category has a diameter of 19.9 cm, and the tree category has a diameter of 20 cm.

**Table 1.** Types of mangroves, plot area, category, and number of individuals

| Type of Mangrove | Plot Area Size (m) | Category | Number of Individuals |
|---|---|---|---|
| *Bruguiera cylindrica* | 2 x 2 | Seedlings | 227 |
| *Bruguiera gymnorrhiza* | 5 x 5 | Stakes | 2 |
| *Aegiceras corniculatum* | 10 x 10 | Poles | 4 |
| *Ceriops tagal* | 20 x 20 | Trees | 6 |

Determination of Relative Density (KR), Relative Frequency (FR), Relative Dominance (DR), up to the Important Value Index (INP) can be done using vegetation parameters. (Setyawan, 2008). Here are the quantitative value results in Table 2.

**Table 2**. Relative density, relative frequency, relative dominance, and important value index of four mangrove species.

| Mangrove Species | KR (%) | FR (%) | DR (%) | INP (%) |
|---|---|---|---|---|
| *Bruguiera cylindrica* | 98,9106 | 0,8436 | 6,1737 | 105,9279 |
| *Bruguiera gymnorrhiza* | 0,3485 | 13,2231 | 0,1648 | 13,7664 |
| *Aegiceras corniculatum* | 0,3485 | 27,2727 | 0,2577 | 27,8789 |
| *Ceriops tagal* | 0,2643 | 54,5454 | 51,5609 | 106,3706 |

Note: KR = Relative Density, FR = Relative Frequency, DR = Relative Dominance, and INP = Important Value Index.

Table 2 shows that the highest Important Value Index is found in the mangrove species *Ceriops tagal* with an INP value of 106.3706%, while the lowest Important Value Index is in the mangrove species *Brugueira gymnorrhiza* with an INP value of 13.7664%. Based on the research conducted, the dominant mangrove species on the Molas beach in the Bunaken District of Manado City are *Ceriops tagal* at 106.37% and *Bruguiera cylindrica* at 105.93% due to their high Important Value Index. Based on temperature measurements, the waters at Molas Beach have a temperature range of 29-36ºC with an average temperature of 32.5ºC, which is considered a high temperature that facilitates mangrove growth in the waters.

Research conducted by Cecep and Haikal (2023) on Rambut Island in the Thousand Islands states that an average temperature of 30.67ºC affects the productivity and growth rate of mangroves. This is supported by Supriharyono's (2000) opinion, which states that the optimal temperature for mangrove life is no less than 20ºC. The mangrove species with the lowest Important Value Index (INP) are *Brugueira gymnorrhiza* at 13.77% and *Aegiceras cornitulatum* at 27.88%. (Table 2). These types of mangroves are

*indonesian.biodivers.j.*
Vol. 5, No. 2, August 2024
ISSN : 2722-2659

found very rarely in the mangrove forest ecosystem at Pantai Molas due to the sandy soil substrate, which prevents the mangroves from growing well. The condition of the substrate in the mangrove forest at Pantai Molas can be seen in Figure 1.

**Figure 1.** Substrate conditions in the mangrove forest at Molas Beach

Dahuri (2008) states that there are several factors that determine the survival and growth of mangroves, namely temperature, nutrient supply, substrate stability, freshwater supply, and salinity. According to Bengen and Dutton (2004), the mangrove species *Brugueira gymnorrhiza* and *Aegiceras corniculatum* will thrive at river estuaries due to the relatively thick and fine muddy substrate found in these areas. Research conducted on Molas Beach shows that the dominant mangrove species are *Ceriops tagal* and *Brugueira cylindrica* due to the substrate on Molas Beach being suitable for both types of mangroves. According to Darmadi et al. (2012), substrate characteristics are a limiting factor for mangrove life. The type of substrate greatly influences the composition and density of the mangrove vegetation living above it. The more suitable the substrate is for a certain type of mangrove vegetation, the more densely the vegetation covers its living area.

The research conducted by Ahkrianti, et al. (2019) shows different results, where the mangroves on Mendanau Island, Belitung Regency, are predominantly different species of mangroves, namely *Ceriops tagal, Brugueira cylindrica,* and *Avecenia marina*. This is due to the coastal conditions with muddy substrates, allowing mangrove plants to grow abundantly. Another supporting factor is the presence of the Mapam River and the Rawai River on Mendanau Island, Belitung Regency, which enhances the growth of mangroves.

The results of this study at Pantai Molas are in line with Soeroyo's (1992) research, which showed that the mangrove forest areas along the coastline from the mouth of the Pemangkat River, the mouth of the Sambas River, the mouth of the Selakau River, Panibung, Semudun, to Mempawah in West Kalimantan are dominated by the species *Brugueira gymnorrhiza* and *Aegiceras corniculatum*. The substrate type at Pantai Molas is sandy, which means that certain mangrove species, such as *Brugueira*

***indonesian.biodivers.j.***
**Vol. 5, No. 2, August 2024**
**ISSN : 2722-2659**

*gymnorrhiza* and *Aegiceras corniculatum*, cannot grow well. According to Noor et al. (1999), *Brugueira gymnorrhiza* and *Aegiceras corniculatum* can thrive in habitats where the substrate contains mud and is rich in organic matter.

## CONCLUSION

Mangrove vegetation at the research site in Pantai Molas, Bunaken District, Manado, was found to consist of 239 individuals from four species: *Brugueira cylindrica*, *Brugueira gymnorrhiza*, *Aegiceras corniculatum*, and *Ceriops tagal*. The highest Important Value Index (INP) of mangroves at Molas beach, Bunaken District, Manado, was the species *Ceriops tagal* at 106.37%, and the lowest was Brugueira gymnorrhiza at 13.77%.

## REFERENCE

Syarifuddin, A dan Zulharman. 2012. Analisa Vegetasi Hutan Mangrove Pelabuhan Lembar Kabupaten Lombok Barat Nusa Tenggara Barat. Jurnal Gamma, 7(2): 01-13.

Riwayati. (2014). Manfaat dan Fungsi Hutan Mangrove Bagi Kehidupan. Jurnal keluarga Sehat Sejahtera, 12(24): 17-23.

Natividad, E.M.C., V.S. Hingabay, B. Harold, H.B. Lipae, A. Elani, E.A. Requieron, A.J. Abalunan, P.M. Tagaloguin, R.S. Flamiano, J.H. Jumawan, C. Joycelyn, and J.C. Jumawan. 2015. Vegetation analysis and community structure of mangroves in alabel and Maasim Sarangani Provinces, Philippines. ARPN J. of Agricultural and Biological Science, 10 (3):97-102

Cecep, K. Haikal, Z., R. 2023. Evaluasi Pertumbuhan Anakan Mangrove Hasil Restorasi Di Suaka Margasatwa Pulau Rambut Kepulaun Seribu. *Jurnal of Tropical Silviculrture.* 14(2): 119-125

Fachrul MF. 2007. Metode Sampling Bioekologi. Jakarta: Bumi Aksara.

Dahuri, R., J. Rais, S. Putra Ginting dan M.J. Sitepu. 2008. Pengelolaan Sumberdaya Wilayah Pesisir dan Lautan Secara Terpadu. P.T.Pradnya Paramita: Jakarta. 305 hal.

Darmadi, Lewaru, M. W., & Khan, A. M. A. (2012). Struktur komunitas vegetasi mangrove berdasarkan karakteristik substrat di muara harmin desa cangkring kecamatan cantigi kabupaten Indramayu. Jurnal Perikanan dan Kelautan Unpad, 3(3), 347-358.

Soeroyo, 1992, ‘Reboisasi Mangrove Merupakan salah satu cara Penghambat Erosi Pantai di Kalimantan Barat (Prosiding Seminar Hasil Penelitian Abrasi Pantai Kalimantan Barat), LIPI, Jakarta.

Bengen, D.G. dan Duton, I.M. 2004. Interaction Mangrove Fisheries and Forestry Management in Indonesia. 7(2): 63-67.