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Composition of mangrove and macro zoobenthos species ar Lhuok Buon Beach, Samatiga District, West Aceh Regency

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Abstract
Lhok Bubon Beach is a unique coastal area because it has complete biota, namely mangrove forests and macrozoobenthos. This research looks at the composition of mangroves and macrozoobenthos on Lhok Bubon Beach. The method used in this research is a survey with three sampling stations. Determination of stations uses purposive sampling with different characteristics and 3 station plots measuring 10x10m. The research results show that the highest macro zoobenthos composition was obtained at station 3 and the lowest at station 1. The diversity index was classified as low, uniformity was medium and high at station 3, and no mangroves dominated at any station. Environmental quality is still relatively good for mangroves and macrozoobenthos.

1. INTRODUCTION

Mangrove forests are one of the essential natural ecosystems that protect land from the effects of wave abrasion/erosion and have a variety of resources (Shinta et al., 2022). Mangroves have high productivity in supporting the surrounding environment. This is because mangroves have optimal conditions and are suitable for the reciprocal processes of biota in the ecosystem. Mangroves provide living space for many invertebrate organisms associated with mangrove forests. This association makes mangrove land fertile because of several types of burrowing organisms (Putriningtias et al., 2019).

Human activities in coastal areas, such as mangrove and macrobenthos ecosystems, affect biota. Benthic biodiversity reflects the slow-growing and sensitive nature of mangrove ecosystems. Macro zoobenthos are indicators of aquatic biology; apart from being sessile organisms, they also have a relatively long life cycle. The Gastropod and Bivalvia classes generally have high abundance and diversity and always respond to the water quality conditions where they live (Nadaa et al., 2021). Macro zoobenthos are associated with the mangrove ecosystem as a habitat for living, shelter, and spawning and a food supply supporting growth. Macro zoobenthos helps speed up the decomposition process of organic matter by destroying aquatic macrophytes and litter that enters the water into small pieces, making it easier for microbes to break down into nutrients for aquatic producers in the food chain (Alwi et al., 2020).

According to Jufia et al. (2020), four types of mangrove trees are scattered along Lhok Bubon Beach: *Rhizopora apiculata*, *R. mucronata*, *R. stylosa,* and *Sonneratia alba*. Residents use the mangrove forest area on Lhok Bubon Beach as a tourist and residential area. Changing mangrove forest areas into areas for other purposes negatively impacts the mangrove ecosystem and the macro zoobenthos itself. This research examines the composition of mangroves and macro zoobenthos taken from locations without settlements, approaching settlements to settlement locations.

2. RESEARCH METHODS

Time and Place

This research was conducted in October 2023 at Lhok Bubon Beach, Samatiga District, West Aceh Regency.

Research method

This research uses a survey method. This research used three sampling stations using the purposive sampling method. Station 1 is a busy residential area, Station 2 has few residential homes, and Station 3 is far from residential areas.

Research procedure

This uses three stations, where a 50 m-long transect line is drawn, and the plot is laid in a zigzag manner. Place three observation plots (substations) of mangrove vegetation along the transect line. Use raffia rope with a predetermined plot size of 10 m x 10 m. Record the number, type, and diameter of tree trunks in the plot. Photos or samples of the mangrove's roots, fruit/seeds, and leaves are taken to identify the type of mangrove. The macrozoobenthos in each plot are taken and then identified. Water quality is also measured, including temperature, pH, and substrate pH, and can be observed from the substrate composition per plot.

Measurement Parameters

To calculate the species diversity index, uniformity index, and dominance index are calculated according to Odum (1998) with the following formula:

a) Shannon-Wiener diversity index:

$$H^1 = \sum_{i=1}^{s} \left(\frac{ni}{N}\right) \ln \left(\frac{ni}{N}\right)$$

Diversity can be determined based on the value of the species diversity index (H') with the following criteria:

High if H' > 3

Meanwhile, if 2 < H' < 3, and

Low if 0 < H'< 2

b) Uniformity index:

$$E = H'/Hmax$$

The evenness index value for this type ranges from 0 – 1 with a description of the conditions as follows: E = 0, evenness between species is low, meaning that the individual richness of each species is very different; E = 1, evenness between species is relatively even or the number of individuals of each species is relatively the same.

c) Dominance index:

$$D = \sum_{i=1}^{s} \left[ni/N\right] 2$$

The Simpson-dominance index has a value between 0 – 1 with the following description: D = 0 means that no type dominates other types or the community is stable. D = 1 means there is a species that dominates other species or the community is in an unstable condition due to ecological pressure with:

H' = Shannon-Wiener diversity index
E = uniformity index
D = Simpson dominance index
ni = number of individuals of the i-th genus
N = Total number of individuals in all genus
Hmax = Maximum diversity index

Data Analysis

The data obtained is then processed to calculate the type dominance index (D), diversity index (H'), and evenness index (E) of mangroves. Next, the calculation results are tabulated in tables and graphs and discussed descriptively.

3. RESULTS AND DISCUSSION

Water Quality Parameters

The water quality at Lhok Bubon Beach from the three stations is still good compared to water quality standards (Table 1).

Table 1. Water quality parameters at Lhok Bubon Beach, Samatiga, West Aceh

No	Water quality parameters	Station		
		1	2	3
1	Temperature	27.30	28.30	29.3
2	Water pH	7.73	6.10	7.53
3	Soil pH	7.00	7.10	7.00

Based on the results of observations, the temperature obtained ranged from 27.30 - 29.3^{o}C, the pH value of the water was 6.10 - 7.73, and the pH value of the soil was 7.00 - 7.10. The quality value of environmental parameters is still in the good category, and this is the opinion of Pratiwi & Ernawati (2016) that the temperature value obtained is still below the quality standard and is suitable for living and developing places for aquatic biota, with a temperature of 27.27-30.13^{o}C, maximum water pH of 7.97 (Susiana, 2015) and maximum soil pH of 9.09 for land close to the sea (Tumangger & Fitriani, 2019).

Mangrove Type Composition

The mangrove ecosystem is a unique area that connects land and marine biota. Biologically, mangrove forests maintain the functions and characteristics of coastal ecosystems, including their bio-life, such as spawning, places to find food, nursery areas, nesting places for various types of birds, and habitats for various types of fauna. The observations from 3 stations showed four types of mangroves, including *R. apiculata*, *R. mucronata, R. stylosa*, and *S.alba*. For more clarity, see the following Table 2.

Table 2. Diversity index (H') and uniformity (E) values and dominance index of mangroves.

No	Station	Station		
		H'	D	E
1	1	0.60	0.86	0.59
2	2	0.61	0.88	0.59
3	3	0.56	0.80	0.62

The species evenness index indicates the level of evenness of individuals of each type in a location. Based on the criteria for species evenness from Magurran (1988), the value E < 0.3 indicates low species evenness, 0.3 < E < 0.6 indicates a moderate level of species evenness and E > 0.6 indicates a relatively high level of species evenness, it can be seen that the evenness of mangrove species at this level trees and their regeneration in the Lhok Bubon Beach mangrove forest are classified as medium at stations 1 and 2 and high at station 3. The species dominance index determines the concentration or control of a species in a location. At the research location, the dominance index value is below 1 or =0, indicating no species dominance at all stations.

Composition of Macro zoobenthos Types

The composition of macro zoobenthos types found in the three stations was highest at station 3, where there was no human activity, and the lowest was at station 1, where there was much human activity. For more details, see Figure 1.

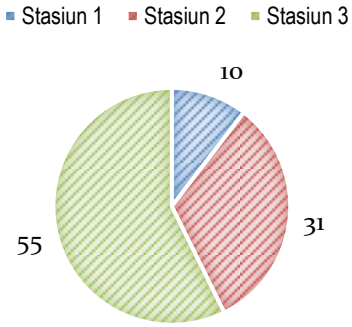

Figure 1. composition of macrozoobenthos at the research station

Figure 1 shows that station 3 has the highest macro zoobenthos composition, namely 57%, and the lowest at station 1, namely 11%. The high composition of macro zoobenthos at station 3 is thought to be due to minimal human activity, so the macro zoobenthos environment is still natural. According to Ledheng & Naisumu (2018), conditions that have a muddy substrate are ideal places for macrozoobenthos, while habitats that tend to be sandy are less suitable for living. This follows the research location: station 3 has a muddy substrate, station 2 has a sandy mud substrate, and station 1 has a sand substrate.

4. CONCLUSIONS

Based on the research results, it is known that the highest macro zoobenthos composition was obtained at station 3 at 57% and the lowest at station 1 at 11%. The diversity and dominance index was highest at station 2 and the lowest at station 3, while the uniformity index was highest at station 3. The quality of the mangrove and macrozoobenthos environment was still relatively good.

REFERENCES

Alwi, D., Muhammad, S.H., Herat, H. (2020). Keanekaragaman dan Kelimpahan Makrozoobenthos pada Ekosistem Mangrove Desa Daruba Pantai Kabupaten Pulau Morotai. *Jurnal Enggano*, *5*(1): 64-77.

Jufia, T.O., Gazali, M., Marlian, N. (2020). Struktur Komunitas Mangrove di Pesisir Lhok Bubon, Aceh Barat. *Jurnal Laot Ilmu Kelautan*, 3(2): 99-115.

Ledheng, L., Naisumu, Y.G. (2018). Studi Komunitas Makrozoobentos di Hutan Mangrove Kecamatan Insana Utara Kabupaten Timor Tengah Utara. *Partner*, 23(2): 682 - 695.

Magurran, A.E. (1988). *Ecological Diversity and Its Measurements.* Princeton University Press, Princeton, NJ.

Nadaa, M.S., Taufiq-Spj, N., Redjeki, S. (2021). Kondisi Makrozoobentos (Gastropoda dan Bivalvia) pada Ekosistem Mangrove, Pulau Pari, Kepulauan Seribu, Jakarta. *Buletin Oseanografi Marina*, 10(1): 33-41.

Odum, E.P. (1998). *Dasar – Dasar Ekologi.* Diterjemahkan oleh Tjahjono Samingan. Edisi Ketiga. Gadjah Mada University Press. Yogyakarta.

Pratiwi, M.A., Ernawati, N.M. (2016). Analisis Kualitas Air dan Kepadatan Moluska pada Kawasan Ekosistem Mangrove, Nusa Lembongan. *Journal of Marine and Aquatic Sciences*, 2(2): 67-72.

Putriningtias, A., Faisal, T.M., Komariyah, S., Bahri, S., Akbar, H. (2019). Keanekaragaman Jenis Kepiting di Ekosistem Hutan Mangrove Kuala Langsa, Kota Langsa, Aceh. *Jurnal Biologi Tropis*, 19(1): 101–107.

Shinta, M.L., Syamsudin, Y., Andriani, A., Subiyanto. (2022). Identifikasi Jenis Mangrove pada Kawasan Ekosistem Mangrove di Kabupaten Pangandaran. *Jurnal Akuatek,* 3(1): 9-18.

Susiana. (2015). Analisis Kualitas Air Ekosistem Mangrove di Estuari Perancak, Bali. *Jurnal Ilmiah agribisnis dan Perikanan,* 8(1): 42-49.

Tumangger, B.S., Fitriani, F. (2019). Identifikasi dan Karateristik Jenis Akar Mangrove Berdasarkan Kondisi Tanah dan Salinitas Air Laut di Kuala Langsa. *Jurnal Biologica Samudra*, 1(1): 009-016.