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Identification of Water Biota in the Mangrove Forest Water Area in Aek Horsik Village, Tapanuli Tengah District

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ABSTRACT

Mangrove forests are a typical ecosystem in coastal areas that accommodate a variety of species, are breeding grounds for marine biota, and have economic value in improving community welfare. Based on the search data results, various aquatic organisms, such as Mollusca, Crustacea, and fish, use mangroves as a nursery, shelter, and breeding habitat. This research aims to identify the diversity of aquatic biota in the mangrove forest waters in Aek Horsik Village, Tapanuli Tengah Regency and was carried out from May to June 2023. This research used a survey method with a purposive sampling technique, analyzed descriptively with abundance formulas and dominance indices. The research station is divided into three stations. Station 1 is located in the upstream mangrove forest waters, station 2 is located in the middle of the mangrove forest waters, and station 3 is located downstream of the mangrove forest waters. Based on the results of research in the waters of the Aek Horsik mangrove forest, it was found that there were ten types of macrozoobenthic biota consisting of the Gastropoda class inhabited by six families, the Bivalvia class inhabited by two families and the Crustacea class inhabited by 2 Portunidae families with an abundance of 10,648 individuals and the fish biota of 8 species consisting of 8 families with abundance numbering 111 ind.

Keywords: Mangrove Forest, Aquatic Biota, Identification

1. INTRODUCTION

Indonesia has a mangrove forest area of around 3,364,080 million ha (Ditjen PDASRH, 2021). One of the areas in Central Tapanuli Regency with a mangrove forest area is Aek Horsik village. Aek Horsik village is on the coast and has a mangrove forest of up to 100 ha. It adjoins the Vaname shrimp farming area. The speciality of mangrove areas is that they can support seafood production by providing nutrients in the coastal area and the surrounding coastal waters. They can be a nursery area for animals, especially crustaceans and fish (Hidayat, 2022).

Mangrove areas are the habitat of various economically valuable organisms such as fish, crabs, shellfish, and shrimp and can be utilized to benefit coastal areas (Siburian & Haba, 2016). Maulud et al. (2017) stated that the development of mangrove ecosystems has excellent potential to improve the welfare of the community because it has its uniqueness and uniqueness such as its distinctive root form and various types of fauna associated with mangrove ecosystems, such as a wide variety of aquatic organisms, such as molluscs, Echinodermata, fish, crustaceans and various other biotas.

Until now, people only utilize mangrove forests for household needs, and there is no information on the diversity of aquatic biota found in mangrove forest waters in Tapanuli Tengah Regency, especially in Aek Horsik Village, so it is necessary to research to study and inventory the types of fishery biota found in mangrove waters in Aek Horsik Village. Biota in mangrove waters are identified to determine the types of biota that live in the ecosystem. Changes in the number and type of biota can indicate environmental changes that can impact human survival and biodiversity. Therefore, this study aims to identify the diversity of aquatic biota in mangrove forest waters to understand the biodiversity in mangrove waters so that coastal communities can participate in maintaining sustainability, which is also a community livelihood.

2. RESEARCH METHOD

Time and Place

This research was conducted from May to June 2023 in the mangrove forest area in Aek Horsik Village, Tapanuli Tengah Regency.

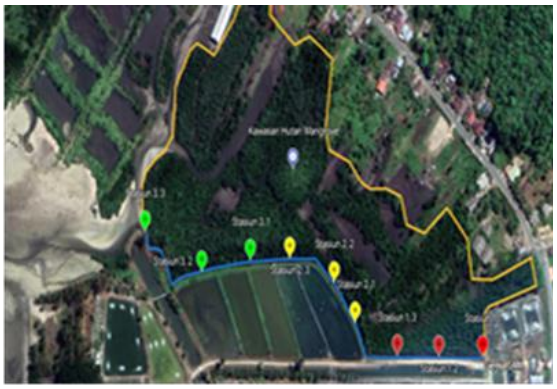

Figure 1. Map of Research Location

Procedures

The research procedures were as follows: 1) Select the mangrove water area to be identified. 2) Prepare identification tools and guides. 3) Finding the location of mangrove waters. Determination of station points by dividing the mangrove ecosystem waters into three parts: upstream, middle, and downstream. 4) Examine and identify the physical characteristics of water, such as pH, temperature, salinity, and water brightness. 5) Macrozoobenthos sampling was conducted using a sieve tool and a sieve to separate the sample from the substrate. 6) Observe the physical characteristics of sediments, such as particle size and color. 7) Fish sampling using bubu and fishing gear. 8) The samples obtained were stored and identified based on reference sources and identification books.

Parameters Observed

Biota Abundance

The abundance of organisms in a body of water can be expressed as the number of individuals per unit area. The formula can calculate abundance (Odum in Maulud et al., 2017).

$$Xi = \frac{Ni}{A}$$

Description:

Xi = abundance of biota species
ni = number of individuals of the i-th species
A = Quadrant area of the i-th species found (m^2)

Dominance Index

The dominance index is an index that describes and explains a species of biotic organism that dominates or is the most numerous in an ecological community. Species dominance is analyzed using the dominance index (Odum in Maulud et al., 2017), with the equation:

$$D = \Sigma - \left(\frac{Ni}{N}\right)^2$$

Description:

D = Dominance index
Ni = Number of individuals of the i-th species
N = Total number of individuals

The dominance index can be grouped into three groups as follows: $0.00 < C \leq 0.50$ = Low; $0.50 < C \leq 0.75$ = Medium; $0.75 < C \leq 1.00$ = High.

Water Quality

Water quality parameters measured during the study were temperature, pH, brightness, and salinity. Water quality parameters were measured in situ, and the measurement time was carried out every day for one week with three measurements per day.

Data Analysis

The data obtained were analyzed descriptively by centering on explaining the causal relationship based on literature studies comparing reference sources of optimum biological parameters with research. The method of solving existing problems based on data. This method also analyzes data using Microsoft Office Excel software and interprets the data to get conclusions and research results.

3. RESULT AND DISCUSSION

Abundance of Macrozoobenthos Biota

Based on the study results, ten species from 3 classes with a total abundance of 10,648 ind (Table 1). The macrozoobenthos community had three classes, totalling ten species. The Gastropoda class is inhabited by three families and six species, including *Faunus ater*, *Cerithidea cingulata*, *Telescopium telescopium*, *Terebralia sulcata*, *Terebralia palustris*, and *Neritina turrita*. Two families and species inhabit the Bivalve class: *Anadara granosa* and *Polymesoda expansa*. The Portunidae family and two species inhabit the Crustacean class: *Scylla* sp and *S.serrata*. Overall, the Gastropoda class has the highest abundance value and is inhabited by the *F.ater* species. This is thought to be due to the abundance of organic matter derived from the remains of plant and animal debris, which then accumulates and becomes a

food supply. This follows the statement of Gultom et al. (2018) that the spread of macrozoobenthos is closely related to organic matter, a food source for macrozoobenthos.

Table 1. Macrozoobenthos Abundance

No.	Types of Macrozoobenthos		Biota abundance (ind/m²)			Total
	Class	Species	1	2	3	
1	Gastropods	*Faunus ater*	167,9	104,1	0,0	7.342
2		*Cerithidea cingulata*	0,0	0,0	102,7	2.774
3		*Telescopium telescopium*	4,3	1,0	0,0	142
4		*Terebralia sulcata*	0,6	6,0	0,0	107
5		*Terebralia palustris*	0,3	0,7	0,0	27
6		*Neritina turrita*	0,4	0,0	0,0	11
7	Bivalves	*Polymesoda expansa*	4,9	0,9	0,0	156
8		*Anadara granosa*	0,0	0,0	0,9	24
9	Crustaceans	*Scylla serrata*	0,0	0,1	1,3	37
10		*Scylla* sp	0,7	0,3	0,0	28
	Total		179,1	110,1	104,9	10.648

The highest abundance of macrozoobenthos community was found at station 1, 179.1 ind/m², and the lowest abundance was found at station 3, 104.9. One indicator of macrozoobenthos abundance is the difference in substrate at each station. At station 1 and station 2, there is a mud substrate. According to Gultom et al. (2018), there is a positive relationship between sediment particles and macrozoobenthos abundance. The more mud, the more the number of benthic macrofauna organisms, and vice versa. Mud substrates contain more nutrients than sand or clay substrates, so the organisms that live in them must be able to adapt to the environment with mud substrates. This follows the statement of Putri et al. (2016) that there is a close relationship between silt and organic matter content. The higher the mud content in the substrate, the higher the organic matter content.

Macrozoobenthos Dominance Index

There is a dominating species based on the dominance index value of macrozoobenthos biota in the mangrove waters of Aek Horsik. The dominance index of biota is presented in Table 2.

Table 2. Macrozoobenthos Dominance Index

No.	Species	Station		
		1	2	3
1	*F.ater*	0,88	0,89	0,00
2	*T.Telescopium*	0,00	0,00	0,00
3	*T.palustris*	0,00	0,00	0,00
4	*N.turrita*	0,00	0,00	0,00
5	*T.sulcata*	0,00	0,00	0,00
6	*C.cingulate*	0,00	0,00	0,96
7	*P.expansa*	0,00	0,00	0,00
8	*A.granosa*	0,00	0,00	0,00
9	*S.serrata*	0,00	0,00	0,00
10	*Scylla* sp	0,00	0,00	0,00
	Total	0,88	0,89	0,96

Based on Table 2, the dominance index value ranges from 0.00 - 0.96. The highest dominance index value is found at station 3, dominated by *C.cingulata* species, with a value of 0.96. The lowest dominance index value is found at station 1, dominated by the *F.ater* species, and has a value of 0.88. The dominance index value in the waters of the Aek Horsik mangrove ecosystem is included in the high category based on Odum in Maulud et al. (2017), stating that if the dominance index ranges from $0.00 < D \leq 0.50$ means low if $0.50 < D \leq 0.75$

means medium and $0.75 < D \leq 1.00$ means high.

The highest dominance is found at station 3, inhabited by *C.cingulata*. The high value of the dominance index at station 3 is due to the relatively low number of species found (3 species) to get the highest dominance value. Then, due to the uneven distribution of the number of individuals and supported by physical factors of water in the form of depth and high water brightness, only certain species can survive at station 3. Then, station 1 and station 2 are dominated by *F.ater* species, with each dominance index value of 0.88 - 0.89. *F.ater* species are straightforward to find, and it is thought that this species can adapt and regenerate quickly and in suitable environmental conditions.

Fish Abundance

Based on the study results, eight species from 8 classes with a total abundance of 111 ind. The types of fish biota obtained are presented in Table 3.

Table 3. Fish Abundance

No.	Class	Species	Station			Total
			1	2	3	
1	Lutjanidae	*Lutjanus russellii*	0	0	29	29
2	Gerreidae	*Gerres erythrourus*	0	0	28	28
3	Teranppotidae	*Pelates quadrilineatus*	0	0	21	21
4	Stromateidae	*Peprilus alepidotus*	0	0	18	18
5	Gobiidae	*Glossogobius circumspect*	7	3	0	10
6	Siganidae	*Siganus javus*	0	0	3	3
7	Leiognathidae	*Leiognathus equulus*	0	0	2	2
8	Serranidae	*Epinephelus sexfasciatus*	0	0	2	2
	Total		7	3	101	111

Based on Table 2 above, the fish community had eight classes totalling eight species of 111 ind. The highest abundance is at station 3, which comes from the class Lutjanidae, Gerreidae, Teranppotidae, Stromateidae, Siganidae, Leiognathidae, and Serranidae. The lowest abundance is at station 2, which comes from the Gobiidae class.

The high abundance at station 3 is thought to be caused by station 3 being located with the open sea so that fish visit mangrove waters at high tide to find food. This is reinforced by (Jabarsyah et al., 2021), stating that fish will look for food around mangrove waters at high tide.

Fish Dominance Index

Based on the dominance index value of fish biota in Aek Horsik mangrove waters, it is found that there is a dominating species. The dominance index of biota is presented in Table 4.

Table 4. Fish Dominance Index

No.	Class	Species	Station		
			1	2	3
1	Siganidae	*Siganus javus*	0,00	0,00	0,00
2	Leiognathidae	*Leiognathus equulus*	0,00	0,00	0,00
3	Serranidae	*Epinephelus sexfasciatus*	0,00	0,00	0,00
4	Stromateidae	*Peprilus alepidotus*	0,00	0,00	0,03
5	Teranpotidae	*Pelates quadrilineatus*	0,00	0,00	0,04
6	Gereidae	*Gerres erythrourus*	0,00	0,00	0,07
7	Lutjanidae	*Lutjanus russellii*	0,00	0,00	0,08
8	Gobiidae	*Glossogobius circumspectus*	1,00	1,00	0,00
	Total		1.00	1.00	0.23

Based on Table 4, the dominance index value ranges from 0.23-1. The highest dominance index value is found at stations 1 and 2, with a value of 1, which is dominated by the Gobiidae class. The lowest dominance index value is found at station 3, which is 0.23,

dominated by the Lutjanidae class. The dominance index value close to 1 indicates species dominate at each station (Odum in Maulud et al., 2017)

The highest dominance index in Aek Horsik mangrove waters is found at stations 1 and 2, inhabited by *G.circumspectus* species from the Gobiidae family with an index value of 1. This follows the statement of Setiawan et al. (2019), stating that the Gobiidae class is a group of common fish species that inhabit mangroves, which are very dominant in diversity and abundance in mangrove areas with high adaptability. The high value of the dominance index at stations 1 and 2 is due to environmental conditions that are suitable for certain species, so only one fish species is found compared to station 3, where as many as seven species are found. The low value of the dominance index at station 3 is due to the high diversity and abundance compared to other stations where only one species of biota was found.

Water Quality

The results of observations and measurements of the quality of mangrove water parameters in Aek Horsik Village, Tapanuli Tengah Regency, are presented in Table 5.

Table 5. Water Quality

Water Parameters	Station				Quality standard
	1	2	3	Average	(Kepmen LH No. 51 Year 2004)
Temperature (°C)	31	31	31	31	28 - 32°C
pH	7,6	7,5	7,6	7,58	7 - 8,5
Brightness (m)	0,61	0,98	0,76	0,78	-
Salinity (ppt)	12	17	22	17	<34

Based on Table 5, the measurement results of water quality parameters, including temperature, pH, brightness, and salinity parameters during the study period are categorized as feasible for aquaculture, and water quality is still optimal for the growth of macrozoobenthos and fish biota based on Kepmen LH No. 51 of 2004.

4. CONCLUSION

Based on the research results, it can be concluded that the types of biota found in mangrove forest waters in Aek Horsik Village, Tapanuli Tengah Regency, consist of macrozoobenthos and biota. Macrozoobenthos biota found as many as ten species consisting of the Gastropoda class inhabited by six families, the bivalve class inhabited by two families, and the Crustacea class inhabited by the Portunidae family. Fish biota was found in as many as eight species. Water quality parameters in mangrove forest waters include temperature ranging from 29-33°C, pH value 7.2-7.8, brightness value 0.61-0.98, and salinity value 12-22 ppt, including feasibility for aquaculture business for brackish water biota.

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