

## DIVERSITY OF GASTROPODS IN MANGROVE ECOSYSTEM OF POTON BAKO HAMLET, JEROWARU DISTRICT, EAST LOMBOK REGENCY, NTB

Keanekaragaman Gastropoda Pada Ekosistem Mangrove Di Dusun Poton Bako, Kecamatan Jerowaru, Kabupaten Lombok Timur, NTB

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### ABSTRACT

One of the natural beauties that attracts attention in Poton Bako Hamlet is the mangrove ecosystem. The existence of the mangrove ecosystem in Poton Bako Hamlet is important, because it is a breeding and enlargement place for biota that lives around the area. One of the biota that depends on mangroves is the gastropod species. So it is necessary to know the diversity of gastropod types that exist in the mangrove ecosystem of Poton Bako Hamlet. This research used a survey method, where gastropod samples were collected at 2 different stations using the line transect method. Each transect consists of several subplots measuring 1x1 m<sup>2</sup>. Gastropod samples were collected and identified at the Marine Hydrobiology Laboratory, Faculty of Agriculture, Mataram University. The abundance of gastropod types obtained was 13 families, 21 genera, 32 species. The total number of biota obtained was 606 individuals spread across Station 1 as many as 289 individuals and Station 2 as many as 319 individuals. The type of *Terebralia sulcata* that is most often found at each station. The results of this research describe the ecological conditions at Station 1 with the diversity index ( $H'=2.23$ ) being classified as medium, the uniformity index ( $E= 0.72$ ) being relatively high and the dominance index ( $D= 0.15$ ) being relatively low. Meanwhile, the ecological conditions at Station 2 with the diversity index ( $H'=1.44$ ) are classified as moderate, the uniformity index ( $E= 3.94$ ) is high and the dominance index ( $D= 0.46$ ) is high.

**Keywords:** Gastropods, Species Abundance, Mangroves

### ABSTRAK

Salah satu keindahan alam yang menarik perhatian di Dusun Poton Bako yaitu adanya ekosistem mangrove. Keberadaan ekosistem mangrove di Dusun Poton Bako menjadi penting, karena menjadi tempat perkembangbiakan dan pembesaran bagi biota yang hidup disekitar wilayah tersebut. Salah satu biota yang bergantung pada mangrove yaitu jenis gastropoda. Sehingga perlu diketahui keanekaragaman jenis gastropoda yang ada di ekosistem mangrove Dusun Poton Bako. Penelitian ini menggunakan metode survei, dimana pengumpulan sampel gastropoda dilakukan dengan 2 stasiun yang berbeda dengan metode transek garis. Masing-

masing transek terdiri atas beberapa subplot berukuran 1x1 m<sup>2</sup>. Sampel gastropoda dikumpulkan dan diidentifikasi di Laboratorium Hidrobiologi Laut, Fakultas Pertanian, Universitas Mataram. Kelimpahan jenis gastropoda yang didapatkan sebanyak 13 Famili, 21 Genus, 32 spesies. Total jumlah biota yang didapatkan 606 individu tersebar di Stasiun 1 sebanyak 289 ind dan Stasiun 2 sebanyak 319 ind. Adapun jenis *Terebralia sulcata* yang paling banyak ditemukan pada setiap Stasiun. Hasil dari penelitian ini menggambarkan kondisi ekologis pada Stasiun 1 dengan indeks keanekaragaman ( $H'=2,23$ ) tergolong sedang, indeks keseragaman ( $E= 0,72$ ) tergolong tinggi dan indeks dominansi ( $D= 0,15$ ) tergolong rendah. Sedangkan kondisi ekologis pada Stasiun 2 dengan indeks keanekaragaman ( $H'=1,44$ ) tergolong sedang, indeks keseragaman ( $E= 3,94$ ) tergolong tinggi dan indeks dominansi ( $D= 0,46$ ) tergolong tinggi.

**Kata Kunci:** Gastropoda, Kelimpahan Jenis, Mangrove.

## INTRODUCTION

Poton Bako Hamlet is one of the hamlets in Jerowaru Village, Jerowaru District, East Lombok Regency, West Nusa Tenggara. This hamlet is known as Teluk Poton Bako because of its presence in the bay. This area is used as a tourist village that offers charming natural beauty. One of the natural beauties that attracts attention is the mangrove ecosystem. In this ecosystem there are mangrove forests that grow along the coastline (Safnowandi, 2021).

The mangrove ecosystem in Poton Bako Hamlet has great potential for development (Larasati *et al.*, 2022). The existence of a mangrove ecosystem is important, because it is a breeding and enlargement place for biota that lives around the area (Kariada & Andin, 2014). The high organic content around the mangrove ecosystem results in an abundance of marine organisms such as benthic groups, namely crustaceans and molluscs. The molluscs that are often found around mangrove ecosystems are gastropods which generally live at the bottom of waters with soft substrates such as sand and mud, and stick to the roots and trunks of mangrove trees (Wahyudi & Larasati, 2022).

Gastropods are organisms that belong to the mollusk group, characterized by having spiral shells and moving with abdominal legs, such as snails, snails, snails and others (Apriyanti *et al.*, 2023; Zulheri *et al.*, 2014). Gastropods have 3 habitat groups spread across mangrove forests, such as in mangrove trees (roots, stems and leaves of mangroves), on the surface of mud and in sediment. This type has an important role as a bioindicator for waters, litter decomposition processes and material mineralization. The presence of gastropods is determined by mangrove vegetation. The more mangrove vegetation there is, the more gastropod species will be abundant. The exploitation of mangrove forests will also contribute to the diversity of gastropods. In addition, gastropod diversity can be influenced by aquatic environmental factors, food availability, predation and competition (Apriyanti *et al.*, 2023). Therefore, research is needed to look at the diversity of gastropods in the mangrove ecosystem in Poton Bako Hamlet.

## METHODS

This research was carried out in Poton Bako Hamlet, Jerowaru District, East Lombok Regency, NTB from March to April 2023 (Figure 1). Identification and handling of Gastropod samples was carried out at the Marine Hydrobiology Laboratory, Faculty of Agriculture, Mataram University. The tools and materials used in this research are sieve, GPS, camera, tray, oven, ruler, pH meter, tweezers, hand refractometer, roll meter, scope, thermometer, digital scale, plastic jar, water, alcohol, aluminum foil, distilled water, waterproof paper, ziplock and tissue.

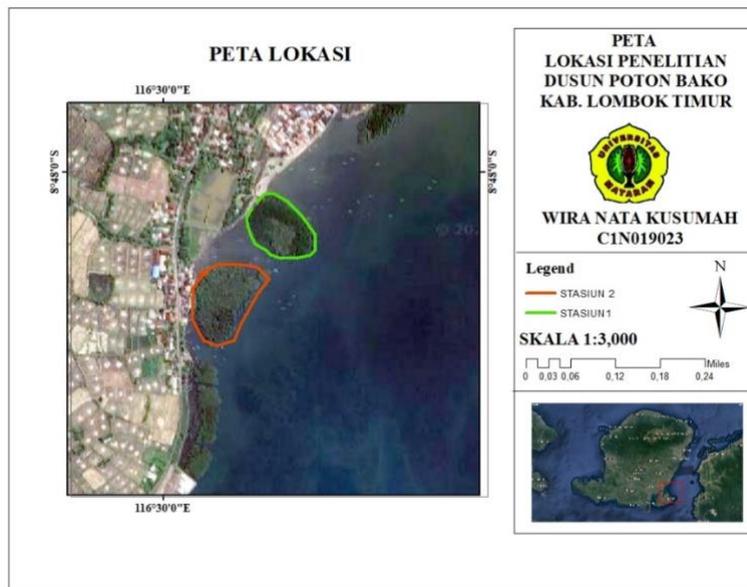


Figure 1. Research Location

### Research design

This research activity includes collecting Gastropod types and other supporting parameter data which is carried out directly. This research uses a survey method. Data collection was carried out at two different stations, which were then explained descriptively. The parameters observed were the abundance of gastropod species, the ecological index and the type of substrate around the mangrove ecosystem.

### Data collection technique

This research used 2 different stations with purposive sampling data collection techniques. Determining observations of gastropod samples using a 1x1 m<sup>2</sup> subplot transect within a 10x10 m<sup>2</sup> transect from the beach where the mangrove was found to the sea which can be seen in Figure 2 (Ernawati, 2019; Wahyudi & Larasati, 2022). The distance between one point and another is 50 m and the line transect is drawn 100 m based on the representativeness of the location so that 9 points are determined for each station.

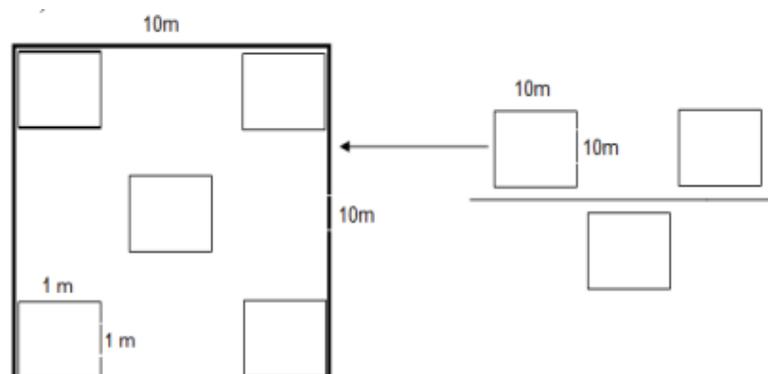


Figure 2. Modification of the Sampling Technique with the Quadrant Method (Wahyudi & Larasati, 2022)

At each quadrant point, water quality parameters, namely temperature, salinity and pH of the water, were taken using tools in the form of a refractometer, pH meter and thermometer. Sediment samples were taken once at each quadrant point using a scope, then the samples were

put into a ziplock plastic and to determine the type/type of substrate by analyzing the sediment fraction in the hydrobiology laboratory. Gastropod sampling was carried out at each quadrant transect point at each station. The Gastropod samples obtained were then taken directly using hands, both on the surface of the substrate and on the stems and leaves. The Gastropod samples that have been obtained are then placed in ziplock plastic which has been marked and preserved with 70% alcohol and identified in the laboratory with reference to the FAO (1998) and Peter & Sivasothi (1999) books.

### Data analysis

The data that has been collected is then analyzed according to needs, such as abundance of Gastropod species, ecological index and basic substrate type. Next, the data is presented in descriptive table or graphic form. The abundance or density of gastropod species refers to Sandewi *et al.*, (2019), where species abundance (ind/m<sup>2</sup>) is obtained from dividing the number of individuals of type *i* and the area of the sampling plot (m<sup>2</sup>). The ecological index is divided into a diversity index which refers to Sandewi *et al.*, (2019), uniformity refers to Sandewi *et al.*, (2019) and dominance based on Odum (1996).

## RESULTS

The research results showed that the composition of gastropod species was found to be 13 families, 21 genera and 32 species spread across the two research stations in the mangrove ecosystem of Poton Bako Hamlet. The species found at both stations totaled 606 individuals consisting of several families and genera. The species most commonly found at both stations is *Terebralia sulcata* (Figure 3).



Figure 3. *Terebralia sulcata* species

*Terebralia sulcata* had the highest presence at Station 1 and Station 2, presumably because in each transect, this type was found in greater numbers compared to other types. According to Hawari (2014), the *Terebralia sulcata* species prefers muddy substrates and is able to adapt to environmental factors such as tides, temperature and salinity. Laily *et al.*, (2022) explained that the high species composition of gastropods in an area can be used as a marker of whether marine biota is their habitat. Apart from that, sediment transport factors, currents and waves carry several types of gastropods into the mangrove area (Rangan, 2010). The abundance of gastropod types can be seen in Table 1.

Tabel 1. Abundance of Gastropoda

No	Species	Abundance			
		Station 1		Station 2	
		ind/m <sup>2</sup>	%	ind/m <sup>2</sup>	%
1	<i>Littorina scabra</i>	37	0,37	9	0,09
2	<i>L. carinifera</i>	5	0,05	1	0,01
3	<i>L. punctata</i>	2	0,02	0	0
4	<i>L. obtusata</i>	1	0,01	0	0
5	<i>Nerita undata</i>	37	0,37	9	0,09
6	<i>Terebralia sulcate</i>	78	0,78	215	2,15
7	<i>T. palustris</i>	5	0,05	17	0,17
8	<i>Cerithideopsilla alata</i>	5	0,05	7	0,07
9	<i>Telescopium Telescopium</i>	3	0,03	1	0,01
10	<i>Canarium mutabile</i>	8	0,08	3	0,03
11	<i>Notocochlis gualteriana</i>	1	0,01	0	0
12	<i>Monondata labio</i>	20	0,2	24	0,24
13	<i>Cerithium atromarginatum</i>	2	0,02	0	0
14	<i>C. scabridum</i>	31	0,31	0	0
15	<i>C. atratum</i>	1	0,01	0	0
16	<i>C. vulgatum</i>	45	0,45	0	0
17	<i>Pseudovertagus aluco</i>	0	0	1	0,01
18	<i>Clypeomorus moniliforus</i>	0	0	3	0,03
19	<i>C. inflata</i>	0	0	1	0,01
20	<i>Claremontiella nodulosa</i>	2	0,02	0	0
21	<i>Unosalpinx cinerea</i>	2	0,02	2	0,02
22	<i>Schicoreus torrefactus</i>	0	0	2	0,02
23	<i>Semiricinula muricoides</i>	0	0	1	0,01
24	<i>Nassarius mutabilis</i>	1	0,01	1	0,01
25	<i>N. reveanus</i>	1	0,01	2	0,02
26	<i>N. siquijorensis</i>	1	0,01	0	0
27	<i>Ilyanassa obsoleta</i>	0	0	8	0,08
28	<i>Batillaria attremantaria</i>	1	0,01	0	0
29	<i>Cymatium grandimaculatum</i>	0	0	1	0,01
30	<i>C. gutturnium</i>	0	0	9	0,09
31	<i>Marginella rosea</i>	0	0	1	0,01
32	<i>Engina aveolata</i>	0	0	1	0,01

Abundance of gastropod species found in the waters of Poton Bako Hamlet, Jerowaru District, East Lombok Regency. In Table 1, the total number of biota obtained was 606 individuals, spread across 289 individuals at Station 1 and 319 individuals at Station 2. The identification results show that there are 13 families that have quite high abundance, namely Cerithiidae 7 Ind/m<sup>2</sup>, Nassaridae 4 Ind/m<sup>2</sup>, Littorinidae 4 Ind/m<sup>2</sup>, Muricidae 4 Ind/m<sup>2</sup> and Potamididae 4 Ind/m<sup>2</sup>. These five families are abundant, supported by the characteristics of the

substrate, which is clayey mud which is very popular with Gastropod species. According to Rella *et al.*, (2014) in the basic substrate texture of muddy sand and clayey mud has a higher organic material content than the sand substrate, so that many types of Gastropods and Bivalves are high in abundance on the muddy sand and clayey mud substrates. This is because the finer the texture of the base substrate, the greater its ability to capture organic material.

The type of Gastropod that was most often found at Station 1 was *Terebralia sulcata* with a total of 78 individuals, and the types that were found the least were *Notocochlis gualteriana*, *Batillaria attremantaria*, *Littorina obtusata*, *Cerithium atratum*, *Nassarius reveanus* and *N. mutabilis* with 1 individual each. The type of Gastropod that was most often found at Station 2 was *Terebralia sulcata* with a total of 215 individuals, and the types that were found the least were *Clypeomorus inflata*, *Cymatium grandimaculatum*, *Engina aveolata*, *Semiricinula muricoides*, *Pseudovertagus aluco*, *Marginella rosea*, *Telescopium telescopium*, *Nassarius mutabilis* and *Littorina carinifera* with 1 individual each.

## DISCUSSION

The diversity index (H') value shows that the highest value is at Station 1 with a value of 2.23 which is included in the medium category, compared to the value obtained at Station 2 in the medium category, namely 1.14. The high diversity index at the two stations is based on the high organic content of the ecosystem. This is confirmed by Febrita *et al.*, (2015) The high organic content of the substrate at station two is due to the mangroves being natural and dense, and also supported by the sediment texture in the form of mud. Therefore, sediment that contains a lot of mud is one of the factors that influences gastropods because the availability of nutrients in sediment that is in the form of mud and has a high organic material content is a suitable habitat for gastropods. The diversity index is related to the way of life of biota in the environment. Apart from that, the moderate diversity index is also influenced by unspoiled mangrove forests and the content of soil quality parameters (Susiana, 2011).

The uniformity index (E) value in the mangrove ecosystem in Poton Bako Hamlet ranges from 0.72 – 3.94. The highest uniformity index is at station 2 with a value of 3.94 which is included in the high category, indicating that the number of individuals for each type is evenly distributed or no one dominates. The lowest uniformity index was found at station 1 with a value of 0.72 with the high category referring to the occurrence of species that dominate at that station. The uniformity index which ranges between 0.4 - 0.6 can indicate that the ecosystem is in poor condition due to the low diversity of organisms in the ecosystem (Rizkya *et al.*, 2012). If the uniformity index is >0.6, then the ecosystem is in fairly good condition. This is thought to be due to the abundance of gastropod species. Gastropod uniformity is also influenced by healthy and unhealthy mangrove conditions. Gastropods need nutrients from mangrove litter or sufficient organic material as food (Susiana, 2011).

The dominance index values obtained in Poton Bako Hamlet ranged from 0.15 – 0.46. The lowest dominance was at Station 1 at 0.15 in the low category. The highest dominance index is at Station 2 with the low category. And the lowest dominance index is at Station 1 in the low category. According to Rachmawaty (2011), if the dominance index value obtained is close to one, then the community is dominated by a certain species, whereas if the index value obtained is close to zero then no species dominates.

According to Putra *et al.*, (2015), the higher the dominance index value, the greater one species dominates the population in an area. Based on the Gastropod calculation results obtained, *Terebralia sulcata* had the highest density at both stations because this species is a native biota that inhabits mangrove forest areas and has a high tolerance for environmental changes (Romdhani *et al.*, 2016). The gastropod type *T. sulcata* breeds well because there are many food sources in the mangrove ecosystem which makes it easy to find this species. This

is confirmed by Rangan (2010), this ability allows *T. sulcata* to survive and develop well in mangrove forests. In addition, *T. sulcata* actively uses mangrove litter as food (Tue *et al.*, 2012).

Environmental supporting parameters are one indicator to determine the environmental conditions of a Gastropod habitat such as temperature, pH, salinity and substrate. The temperature obtained has an average range of 31.1°C which is very good for gastropod life. Temperature is one of the growth factors that influences Gastropods. As a general rule for Gastropods, the optimal temperature range for daily growth and reproduction of Gastropods is 25-32°C. As a result, the temperature range currently used can be said to be a typical range for the daily life of Gastropods. A temperature that is suitable for biota life will provide good growth because it creates a suitable environment for the survival of gastropods. If the temperature is too high, chemical processes in the biota's body will be disrupted, when the temperature is low, chemical processes such as metabolism in the body of Gastropods will slow down so that the digestive process decreases and can result in death. This is confirmed by Suwondo *et al.*, (2006) that Gastropods can carry out metabolic processes optimally at a temperature range of 25-35°C.

The average pH obtained at the research location was 6.6 which is quite good because Gastropods can live in the pH range of 5.8 - 8.3 to maintain their life activities. Gastropods with a pH value that is more acidic or alkaline will have a negative impact on the way these Gastropods live in that ecosystem. Gastropods that

### CONCLUSION

The composition of Gastropod species found in the Poton Bako Hamlet mangrove ecosystem is 13 families, consisting of 21 genera and 32 species with a total of 606 Gastropod individuals. The type of gastropod most commonly found at both stations is *Terebrallia sulcata*. The abundance of *Terebrallia sulcata* at Station 1 was 72 individuals and at station 2 was 215 individuals with a total of 293 individuals. Station 1 is characterized by a medium level of diversity (2.23), high uniformity (0.72) and low dominance (0.15). Meanwhile, at Station 2 the level of diversity was medium (1.44), high uniformity (3.94), and low dominance (0.46).

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