Original Research Article

STRUCTURE OF MACROZOOBENTHOS (GASTROPODS) COMMUNITY IN MANGROVE FOREST ECOTOURISM PANDANSARI KABUPATEN BREBES, CENTRAL JAVA

ABSTRACT

Aims: This research aim~~s~~ed to analyze the abudance and diversity of macrozoobenthos in the Gastropod Class in the Ecotourism Waters of Pandansari Mangrove Forest, Brebes Regency, Central Java. ~~The research was conducted in the Ecotourism Waters of Pandansari Mangrove Forest, Brebes Regency, Central Java~~

Study design: The research was conducted by survey

Place and Duration of Study: This research was carried out for 3 months between December 2018 until February 2019 in Ecotourism Forest Areas in Bakau Pandansari, Brebes Regency, Central Java

Methodology: The method used in this research ~~is~~ was survey methods using primary data in the form of physical chemistry of aquatic data, gastropod abundance, diversity index, equi~~at~~ability index. Data collection techniques using purposive sampling in determining 3 stations and 3 repetitions. Data analysis in this research use~~s~~d descriptive ~~analysis~~statistics.

Results: Research results found 9 species of Gastropods ~~that settled in~~inhabiting the mangrove ecosystem, namely *Casidulla aurisfelis, Cerithidea* sp, *Cerithidea alata, Cerithidea cingulata, Cerithidea obtusa, Polinices* sp, *Puperita* sp, *Telescopium telescopium*~~,~~ and *Turiculla nellial-suprius.* Gastropod abundance range~~s~~d from 67 - 166 ind / m2. Gastropod diversity index in the medium category 2 <H ’≤ 3. Uniformity values ranged from 0.79 to 0.81 with a high category. The relationship between water quality and gastropods ha~~s~~d an R2 value of 97%, water quality can affect gastropod life and as much as 3% is influenced by other factors.

Conclusion: Based on the results of this research that has been done, it can be concluded that in general environmental parameters in the Pandansari mangroves are still ~~viable~~ favorable in supporting the survival of the gastropods ~~contained in~~inhabiting them.

Keywords: [Gastropods, ~~Abudance~~Abundance, Diversity Index, ~~Equatibility~~Equitability Index]

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1. INTRODUCTION

Brebes is one of the districts in Central Java ~~reside~~ located in the north coast of Java (Pantura). The North Coast region of Brebes has a coastal area that stretches around 54 kilometers with mangrove

forests covering an area of approximately 852 hectares from Brebes, Losari Sub-district. Brebes mangrove forests are used for timber, some land is used for shrimp ponds and recently for salt production. So that ~~on~~ in 2007 it was estimated that the remaining mangrove forest in Brebes was 275 hectares [1]. Mangrove area ~~having~~ has been damaged due to abrasion and excessive logging. Starting from 2000 to 2008, abrasion in Brebes reached 640.45 hectares with a coastline of 27.043 km in the period of 8 years or 29.60 m per year[1]. One of the regions with the highest abrasion level is located in Kaliwlingi Village, Brebes Subdistrict, reaching 385.98 hectares. The activities of mangrove rehabilitation in the coastal area of Brebes Regency were coordinated and carried out by the Department of Agriculture, Forestry and Soil Conservation of the Regency of Brebes which was realized since 2004[2]. Efforts to rehabilitate mangrove forests from 2008 to 2017 from one stakeholder ~~have~~ who has planted as many as 3,500,000 mangrove stems [3]. The most commonly planted species is *Rhizophora* sp because it is relatively resistant to estuary environmental ~~fluctuations~~ fluctuations.

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Mangrove forests are dominated by several species of distinctive trees or shrubs that have the ability to grow in salty waters [4]. Mangrove forest~~,~~ creates~~ing~~ a healthy climate atmosphere for aquatic biota, and has contributed to balance the biological cycle in the waters. Mangrove has a very important function ~~for~~ as ~~feeding~~ breeding ground, as the venue for biological processes such as spawning ground, nursery grounds for some aquatic organisms ~~one~~ such as macrozoobenthos[5]. Macrozoobenthos is a group of invertebrate animals that live in the benthos, sticking to the substrate at the bottom of the body of the water. Macrozobenthos are generally relatively sedentary or can move with slow movements [6]. Macrozoobenthos in mangrove forests mostly live on hard substrates ~~to~~ than in mud. Generally macrozoobenthos in the Indonesian mangrove region are macrozoobenthos from the Gastropod, Bivalvia, Crustacea, and Polychaeta[7].

Gastropod is a class that has a very wide ~~spread~~distribution, because it has a fairly high adaptability [4]. Gastropods are part of the mangrove ecosystem and have a very complex role because their presence in aquatic ecosystems is unique. Unique because in addition to functioning as a food ingredient for other organisms, it can also be used as an indicator of the quality of ~~a~~ the waters [8]. In the mangrove ecosystem~~.~~, the existence of the macrozoobenthos ~~a~~is very closely related to water quality and the type of sediment that exists because in addition to water quality, sediment is a living medium that is in directly ~~in~~ contact with macrozoobenthos [8]. Therefore the research entitled "Community Structure Macrozoobenthos (Gastropod) ~~On Bodies~~Community in Ecotourism Mangrove Forest Pandansari Brebes, Central Java" need~~s~~ed to be done. This research observe~~s~~d and analyze~~s~~d species diversity and Gastropod abundance which can be used as bioindicators of the environment and is associated with abiotic factors in mangrove ecosystems for the sustainability of mangrove forest conservation.

2. MATERIAL AND METHODS

2.1 Time and Place of Research

This research was carried out ~~o~~during~~n~~ December 2018 to March 2019 at Ecotourism Pandansari Mangrove Forest located in Kaliwlingi Village, Brebes Regency, Central Java.

2.2 Materials and Tools

The tools used in this research are Global Positio~~t~~ning System (GPS), quadrant transect, refaractometer, DO meter, pH meter. poles, shovel, plastic bags. While the material used is, Gastropods and sediment.

2.3 Research Methods

The method used in this research ~~is~~ was survey, ~~determination~~determination of sampling stations using purposive sampling method. Gastropod sampling was carried out using the quadrant transect method. 1m x 1m quadrat size.

Station I is a muddy high density mangrove with a coordinate point S 6°47´8,70″ : E 109°2´16,62″. Station II is a mangrove forest with a medium density of mud and gravel with a coordinate point of S 6°47 ´ 13″ : E 109°2´22 ″. Station III is a low density mangrove forest with muddy substrates with a coordinate point of S 6°47´9″ : E 109°2´20,23″ Figure 1. Sampling was carried out three times with a monthly sampling interval ~~every month according~~due to the fast life cycle of macrozoobenthos.

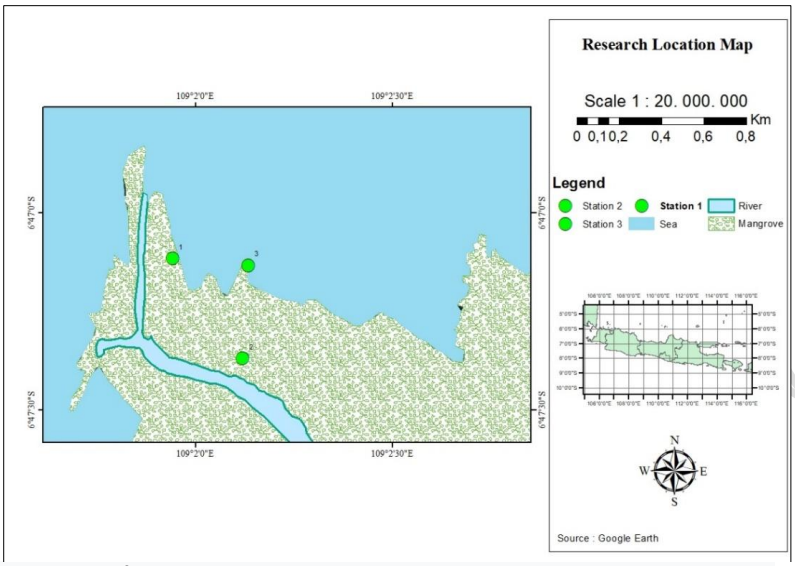

Figure 1. The map of study stations located at Ecotourism Pandansari Mangrove Forest Brebes Central Java

2.4 Research Parameters

Data analysis was conducted using the Benthos density equation as shown below:

$$Di = ni/A$$

Whereas:
Di = Ma~~k~~crozoobenthos abundance (ind/m^2)
ni = Number of ma~~k~~crozoobenthos that ~~had been~~were found
A = Quadrat area (m^2)

The next stage was to analyze the community structure as shown below :
Diversity (H')

$$H' = pi \text{ Log } 2 \text{ } pi$$
$$pi = ni/N$$

Whereas :
H' = Indeks Diversity Shannon Wienner
Pi = Proportion of species i (ni) to total number (N)

Equ~~a~~i~~t~~i~~a~~bility (E')

$$E = H'/(H \text{ max})$$

2.5 Data Analysis

Statistical data was analyzed for relationships between water quality and ~~between~~ gastropods abundance using multiple regression and correlation.

3. RESULTS AND DISCUSSION

Water quality is one of the main environmental factors in the fish farming system. Water quality is a physical and chemical factor that can affect the maintenance media environment and indirectly affect

the metabolic processes of test fish. Poor water quality can cause fish to become susceptible to disease [14,3].

3.1 Temperature

This research found 9 species of Gastropods which were divided into 6 Genusera. We found that total abundance of Gastropods in station 1 abudance ofto be 166 ind/m2, station 2 abudance 144 ind/m2, and stastion 3 abudance 67 ind/m2 as shown in (Table 1).

Table 1. Abundance of Gastropods in three study stations (ind/m^2)

Species	Station 1	Station 2	Station 3
Casidulla aurisfelis	63	55	26
Cerithidea sp	34	32	12
Cerithidea alata	3	7	4
Cerithidea cingulata	9	8	6
Cerithidea obtusa	18	15	0
Polinices sp	22	15	10
Puperita sp	9	6	5
Telescopium telescopium	6	5	2
Turiculla nellial-suprius	2	1	2
Total	166	144	67

The higher abundance of Gastropods was obtained in study station 1(166 ind/m^2) which was dominated by *Cerithidea* sp . These results are in agreement with Supratman [9] who reported that mangrove forest is the most preferred habitat for *Cerithidea* sp. Moreover, this species are thought to have a wide habitat range and are able to live in various types of habitats both in the mangrove ecosystem, muddy to sandy beaches, and the species are able to live in unstable conditions such as in mining areas. Overall Station 1 haved a high abundance of mangroves, so that the production of mangrove waste organic matter at Station 1 is more than in other stations. According to Nybakken [4] mangrove leaf decay will become an important organic material for organisms. In addition, the type of substrate in station1 is mud and, this type is the most suitable for gastropods life. The abundance of Gastropods at station 3 is lower than in all the other stations because the location of the station is closer to the sea, the location of the substrate being deeper makes the sampling technique difficult, besides that the substrate at the station is dominated by mud and waterlogged soil so that distribution of gastropods are expanded.

3.2 Struckture Community

Diversity is identical to the stability of an ecosystem, if the diversity of an ecosystem is high then the condition of that ecosystem tends to be stable. Ecosystem environments that have diversity disorders tend to be moderate, and ecosystem environments that are polluted with their diversity tend to be low. Deversity index of Gastropods in the mangrove ecosystem of Pandansari Brebes can be seen in Figure 2. Gastropod diversity index from observations in each station included in the medium category 2 <H ’≤ 3. This condition shows that the distribution of the number of individuals of each species is moderate. This productivity is quite high, the condition of the ecosystem is balanced, and the ecological pressure is moderate. The highest diversity index was found at station 2, with a diversity index value of 2.555. The high diversity value of station 2 is because the stability of the community and the distribution of the number of gastropods at station 2 was relatively evenly distributed. The lowest gastropods diversity index are was at station 3 with a value of 2.506. The low diversity index value is due to the small number of gastropod species found here compared to the other observation stations. High and low levels of diversity are also influenced by sediment conditions and the quality of waters in the mangrove environment.

These results are in agreement with Suwodo [10] who reported that diversity index will decrease with decreasing water conditions or quality. Species diversity is declared high if the community is composed by many species and with the same or nearly the same species abundance, conversely if the community is composed of a few species and if only a few species are dominant then the diversity of species is low [11].

The equaitiability index is used to determine the evenness of the type of organisms in a community, the equitabilityequability index can also be used as an indicator of the presence of symptoms of species dominance in a community [12]. Uniformity values from the three stations ranged from 0.79 to 0.81 with a high category. Based on the criteria of uniformity index values it can be said that all species found at each station are were almost evenly distributed. At each station the species were found to be almost the same, allegedly the equitable availability of food sources for Gastropods and in the area enabled Gastropods to defend themselves and reproduce well. Base of substrate is also an influencing factor because of the type of substrate that has mud texture and the content of organic material which is spread evenly in the mangrove ecosystem [5].

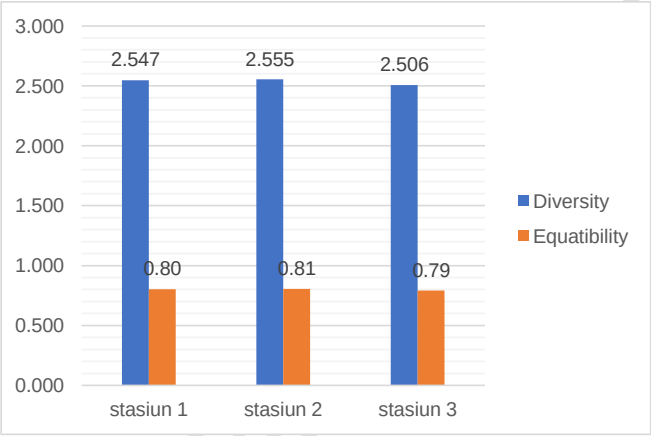

Figure 2. Graphic of Diversity Index and Equitability Index for Gastropods

3.3 Relation of Water Quality with Gastropods abundance

Result of regression test between abundance and water quality in Pandansari Mangrove Ecotourism in Brebes Regency, Central Java obtained y = 14.04 + 2.31 pH - 0.22 DO + 0.44 Salinity + 0.09 temperature -14.6^{0}C + c-organic + 0.80 clay with an R2 value of 0.97, which means as much as 97% of water quality can affect gastropod life and as much as 3% is influenced by other factors.

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Tabel 2. Correlation Test

	Gastropods
pH	-0,3215973
DO	0,20078189
Salinity	-0,0641675
Temperature	-0,368975
c-organic	-0,9752935
Clay	-0,4009145

The correlation coefficient is divided into several groups such as 0.00 - 0.199 very low relation, 0.20 - 0.399 low relation, 0.40 - 0.599 moderate, 0.60 - 0.799 strong relation, and 0,80 - 1,000 very strong relation [13]. Gastropods correlation test results on water quality namely pH 0.32 has a low relation, DO 0.20 has a very low relation, salinity 0.06 has a very low relation, temperature 0.36 has a low relation, c-organic 0.97 has very strongthe relation is very strong, and 0.40 clay has a moderate relation as seen in Tabelle 2. The c-organic correlation test has a very strong relation to influence the life of the gastropods, this is in accordance with the existing criteria.

From these results, it was found that gastropod abundance was influenced by the conditions of the surrounding waters. Based on the correlation values, it was found that the abundance correlated most with organic carbon. The higher the c-organic content, the gastropod abundance will tend to increase, this is in accordance with the statement of Denisenko [14] that high macrozoobenthos abundance is influenced by the high c-organic value at each station. The high c-organic in a waters generally will result in an increase in populations [15]. In general, the results of environmental parameters in the Pandansari mangrove waters are still feasible in supporting the survival of the gastropods in them. Intensive community activities in the surrounding area will have an impact on the survival of gastropods in these waters.

4. CONCLUSION

Based on the results of this research that has been done, it can be concluded that in general environmental parameters in the Pandansari mangroves are still viable favorable in supporting the survival of the gastropods contained ininhabiting them.

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