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Community Structure of Molluscs at Batu Kijuk Village

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Abstract: Batu Kijuk Beach is one of the coastal areas located in West Nusa Tenggara. Its territory used for a tourist attraction and crossing to Gili Nanggu, Gili Gede and Gili Kedis. These coastal have a wealth of marine life, one of them is mollusc. This study aims to analyze the structure of mollusk community using the Systematic Plot Sampling method. This research was conducted in June-September 2019 in Batu Kijuk, Sekotong District, West Lombok, NTB. Identification and data analysis was carried out at the Marine Biology Laboratory, University of Mataram. From the results of research with 10 transects and 70 quadrants, there are 79 species with a total of 927 species of molluscs. The gastropod class consists of 65 species and 14 species of bivalves. The most common types of species found were from the family Columbellidae with 262 species, nassaridae 109 individuals, strombidae 82 species, cypraeidae 58 species and the rest were found 1-15 species. From the results of data analysis calculations, it was obtained that the highest abundance was *Pyrene versicolor* (3.70 Ind/m^2), Nassaridae which was dominated by *Hebra nigra* with 2.91 (Ind/M2) and *Nassarius globosus* had an abundance value of 1.08 (Ind/m^2). The index value of diversity (H') for molluscs in Batu Kijuk coastal is included in the high category, 2.74. The dominance index value (C) is 0.1 which means that no mollusk species dominates. The uniformity index (E) has a value of 0.62 which means moderate uniformity because only a few species dominate so that the community can be said to be quite stable.

Keywords: Batu Kijuk; coastal; Community; Mollusk

Introduction

Lombok, one of the islands in West Nusa Tenggara which is the Wallacea region, has a wealth of abundant aquatic resources, one of which is the mollusk phylum. Mollusk comes from the Latin word molis which means soft. The Mollusks is a group of soft-bodied animals without backbone (Invertebrates) that typically have an anterior head, a ventral foot, and a dorsal visceral mass The visceral mass is covered by a mantle that often secretes a calcareous shell (Matsuura et al, 2000). Based on the shape and number of shell pieces, the mollusk phylum is divided into seven classes, namely aplacophora, monoplacophora, polyplacophora, gastropods, bivalves, scaphopods and cephalopods (Moore, 1960). The phylum of mollusk is the largest member after arthropods. More than 60,000 living species have been found worldwide and there are 1,500 species in fossil form (Irawan, 2008). In Indonesia, there are around 3,400 species of mollusk recorded (Septiana, 2017). Molluscs have a fairly high ability to adapt to various types of habitats (Cappenberg 2017). Molluscs can live in almost all types of habitats ranging from coastal areas, deep sea, mangrove forests, fresh waters and the sea, some are found attached to coral reefs and some drown themselves in sediments and even attach to marine plants (Septiana, 2017). Factor that caused large abundance of mollusk is the specific environmental condition in both stations especially the type and condition of subtrate (Candri et al, 2020)

Molluscs have important ecological and economic functions for ecosystems and humans. For humans, molluscs are used as food and basic industrial materials such as jewelry. As for ecosystems, molluscs play a role as bio-indicators of environmental health and water quality. This is because molluscs (especially gastropods and bivalves) have slow mobility and tend to settle down which causes them to accept any environmental

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changes. The magnitude of the influence of environmental changes on existing fauna can be seen through the community structure and distribution of a fauna. The greater the pollution in a water, the less biota can survive (Septiana, 2017). Several types of molluscs have been found in various areas of the island of Lombok by Mujiono (2016) in West Lombok, found 11 families of the mollusk phylum namely Assiminidae, Ellobidae, Haminoeidae, Littorinidae, Muricidae, Neritidae, Onchidiidae, Pachychilidae, Pachychilidae, Potamididae, Thiaridae, Trochidae.

One of the areas in Lombok Island which has a diversity of molluscs is the coastal area in West Sekotong Village. West Sekotong Village is located in Sekotong District, West Lombok Regency. Sekotong Barat Village has an area of 46.19 km2 (Nursimah, 2015), one of the hamlets in this village, namely Batu Kijuk, where almost part of its territory has been utilized as a place for human activities such as hotels, restaurants and ports which are used as crossing points, especially for tourists going to the four gili (small islands), namely Gili Nanggu, Gili Sudak, Gili Kedis and Gili Gede. According to Hartoni & Agussalim (2012) the increasing human activity in water areas can disrupt the balance of flora and fauna in an ecosystem. Not much is known about the existence of fauna around Batu Kijuk Hamlet, especially about the diversity of mollusk species. This study aims to determine the community structure and distribution of molluscs in the area around Batu Kijuk Hamlet.

Method

The Kind of this research is descriptive exploratory. Sampling was carried out using the Systematic Plot Sampling method, in a population a number of sample plots that are regularly spaced from each other will be selected. The research was conducted in June-September 2019 in Batu Kijuk Hamlet, Sekotong District, West Lombok Regency, West Nusa Tenggara. Identification and data analysis was carried out at the Marine Biology Laboratory, University of Mataram. Map of research locations is presented in Figure 1.

Figure 1. Map Location of Batu Kijuk Coastal

Determination of Sampling Points

Systematic Plot Sampling, selecting/placing sample plots based on the results of observations that can represent the population whose parameters will be estimated.

Sample Collection

A 50 m long transect line is laid perpendicular to the shoreline in an area of 50 x 2000 m2. Sampling of molluscs using a belt transect. The transect is divided into 6 stations and each station consists of 6 points. The distance between stations is 100 meters, while the distance between points in one station is 10 meters where each point will be plotted with a size of 1 x 1 m2. The use of a 1 x 1 m2 transect is because the vegetation measured is not too large. Collecting mollusks in each plot by hand sorting and digging methods. Molluscs that stick to the substrate (coral and rocks) can use the help

of a knife. The samples that have been collected are put into plastic according to the location obtained then fixed with 4% formalin and then labeled. Sampling was carried out at the lowest tide.

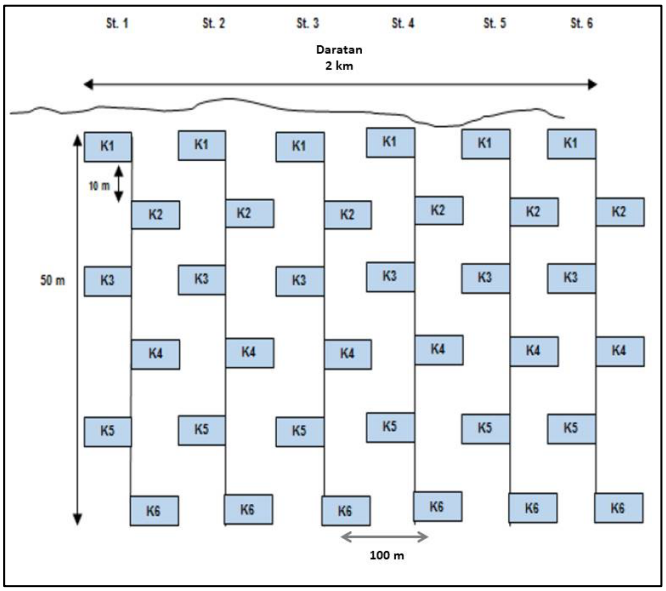

Figure 2. Design of Sample Collection

Sample Identification

The samples that have been collected were identified in the marine laboratory of the Faculty of Mathematics and Natural Sciences, University of Mataram based on Herbert, et al. (2008), Yule & Yong (2012), and Waninger & Wollesen (2015).

Data Analysis

Abundance species

$$K = \frac{Ni}{A} \quad (1)$$

K: abundance species
Ni: Number of individual of species i
A: Sampling area (m^2)

Diversity index

$$H' = \sum_{i=1}^{S} Pi \ln Pi \quad (2)$$

$$H' = - \Sigma (ni/N \ In \ ni/N) \quad (3)$$

H′: Diversity index
ni: Number of individual of species i
N: Total number of individual of species

Uniformity index

$$E = \frac{H'}{H'maks} = \frac{H'}{In\ S} \quad (4)$$

E: Uniformity index
H′: Diversity index
H′ max: Diversity index
ln: natural logarithm
S: Number of species

Dominance index

$$(C) = \Sigma (ni/N)^2 \quad (5)$$

C: Dominance index
ni: Number of individual of species i
N: Total number of individual of species

Distribution of Species

There are three types of individual distribution patterns, namely uniform, random, and clustered. This pattern is known by using Morisita Distribution Index (Id).

$$id = N \frac{\sum x^2 - \sum x}{(\sum x)^2 - \sum x} \quad (6)$$

Id: Morista index
N: total of quadran
Σx: total number of organism individual in quadran
Σx^2: total number of individuals of organism in quadran

Result and Discussion

Batu Kijuk Beach is one of the coastal in West Sekotong Village whose area is used as a tourist spot and crossing route to Gili Nanggu, Gili Gede and Gili Kedis. Based on research results from 10 transects and 70 quadrants with a transect length of 150 m leading to the beach, 79 species of molluscs were found with a total of 927 individuals. Environmental parameters such as vegetation, sediment type, temperature and salinity as well as habitat characteristics are important factors in the distribution and composition of gastropods (Pribadi et al, 2009). The existence of gastropods and bivalves is strongly influenced by the composition and type and depth of the substrate of coastal (Candri et al, 2022). Food availability factors such as in mangrove and seagrass ecosystems as well as the physical and chemical conditions of the environment affect the availability of food for molluscs (Candri et. al, 2020). The gastropod class consists of 65 species and 14 species of bivalves. The most common types of species found were from the columbellidae family with 262 individuals, 109 individuals nassaridae, 82 individual strombidae, 58 individual cypraeidae and the remaining 1-15 species were found. Biodiversity in detail can be seen in table 1.

Table 1. Biodiversity species of Mollusc in Batu Kijuk coastal

Class	Family	Species	Abundance
Gastropoda	Strombidae	*Strombus urceus*	0.94
		Strombus iuhanus	0.01
		Strombus bulla	0.02
		Strombidae spp. 1	0.10
		Strombus spp. 2	0.11
		Strombus spp. 3	0.04
	Nassaridae	*Nassarius Pullus*	0.08
		Nassarius globosus	1.08
		Nassarius graphiterus	0.17
		Nassarius albescens	0.01
		Nassarius coronatus	0.17
		Nassarius dorsatus	0.01
		Hebra nigra	2.91
	Ceritiidae	*Rhinoclavis vertagus*	0.04
		Cerithium columna	0.04
		Cerithium coralium	0.10
		Cerithium citrinum	0.01
		Cerithium punctatum	0.02
		Clypeomorus petrosa	0.05
		Clypeomorus batillariaeformis	0.21
		Bittium sp.	0.04
	Naticidae	*Polinices mammilla*	0.02
		Polinices melanostoma	0.02
		Natica lineatus	0.07
		Natica vitellus	0.02
		Neverita peselephanti	0.07
	Costellaridae	*Vexillum dennisoni*	0.01
		Vexillum virgo	0.01
		Vexillum plicarium	0.01
		Vexillum subdivisum	0.05
	Pyramidellidae	*Otopleura auricasti*	0.15
		Pyramidella maculosa	0.01
	Columbelidae	*Pyrene scripta*	3.70
		Pyrene obscura	0.04
	Cypraeidae	*Cypraea moneta*	0.18
		Cypraea annulus	0.61
		Cypraea tigris	0.02
	Conidae	*Conus taeniatus*	0.05
		Conus kinoshitai	0.01
		Conus planorbis	0.02
		Conus chapitanius	0.01
	Muricidae	*Drupella margariticola*	0.15
		Chicoreus sp	0.02
		Chicoreus ramosus	0.01
		Chicoreus brunneus	0.01
	Mitridae	*Domiforta filaris*	0.01
	Turbinidae	*Astralium calcar*	0.10
	Buccinidae	*Engina alveolate*	0.01
	Trochidae	*Tectus fenestratus*	0.17
		Trochus maculatus	0.04
	Fasciolariidae	*Latirus iris*	0.05
	Plaxidae	*Planaxis sulcatus*	0.01
	Ranellidae	*Ranularia sarcostoma*	0.01
		Cymatium pilearis	0.01
		Cymatium muricinum	0.02
	Chilodontidae	*Herpetoma atrata*	0.01
	Volutidae	*Cymbiola vesvertilo*	0.02
	Neritidae	*Nerita chameleon*	0.01
		Neritiidae spp. 1	0.02
		Neritiidae spp. 2	0.02

Class	Family	Species	Abundance
	Tonnidae	*Tonna canaliculate*	0.04
	Olividae	*Olive reticulata*	0.01
	Turbinidae		0.01
	Bursidae	*Tutfa rubeta*	0.01
Bivalvia	Lucinidae	*Anodontia edentula*	0.01
		Codakia tigerina	0.01
	Veneridae	*Pitar citrinus*	0.01
		Lioconcha castrensis	0.05
	Pinnidae	*Pinna muricata*	0.04
		Pinna bicolor	0.02
	Cardiidae	*Trachicardium rugosum*	0.14
		Fragum unedo	0.01
	Donacidae	*Donax cuneaus*	0.01
		Donax sp.	0.12
	Pectinidae	*Decatopecten radula*	0.02
	Mactridae	*Mactra achatina*	0.01
	Malleidae	*Malleus anatinus*	0.04
	Arcidae	*Anadara antiquata*	0.04

Based on table 1, types of gastropods dominate compared to bivalves. This is because gastropods have a higher adaptability than other classes on both hard and soft substrates (Triwiyanto et al., 2015). On the other hand, the small number of bivalves found could be due to the arrests made almost every day by the people of Batu Kijuk Hamlet which are not comparable to the slow growth and reproduction of bivalvia and not accompanied by cultivation, so that over time the bivalves or gastropods that can be consumed are decreasing even out.

Community Structure of Molluscs

Based on the calculation of the data analysis that has been done, the highest abundance value is *Pyrene versicolor* with 3.70 Ind/m^2. P versicolor from the columbellidae family is a mollusk species that can quite adapt its life to various types of environments, this is also in accordance with what was found by Arbi & Mudjiono (2012), P. versicolor which is always present in every research location. Assaridae which is dominated by *Hebra nigra* with a value of 2.91Ind/m^2 and *Nassarius globosus* 1.08 Ind/M^2. Pyrene was found in almost all quadrants and was most commonly found on transect 4.1 with 31 individuals, transect 4.4 with 51 individuals, transect 5.1 with 21 individuals, and transect 3.2 with 20 individuals. The transect location has a substrate with fine sand and silt, while the 5th-7th quadrant is slightly rocky. The columbellidae species is one of the most well-adapted molluscs, able to live on rocky, sandy, muddy beaches, coral reefs and seagrass beds, even in unfavorable environmental conditions (Tunnel et al., 2010).

Figure 3. *Hebra nigra*

Hebra nigra has a rounded shell shape, spire is very short and blunt, formed axial ribs are smooth, there are concentric lines on the surface of the body whorl. There is a thickening of the ventral callus, the ventral part is `flat`, the outer lip is without columellar folds, the outer lip has fine teeth that form a groove to the inside of the aperture. The aperture is narrow and elliptical in shape.

Figure 4. *Nassarius globosus*

Nassarius globosus has a rounded shell shape, spire is very short and blunt, formed axial ribs are smooth, there are concentric lines on the surface of the body whorl. There is a thickening of the ventral callus, the ventral part is flat, the outer lip is without columellar folds, the outer lip has fine teeth that form a groove to the inside of the aperture. The aperture is narrow and elliptical in shape. The species of Nassarius are carnivorous scavengers which can move surprisingly fast over the bottom (Colin and Arneson, 1995).

Types of *H. nigra* were more commonly found in transects 4.2 (45 individuals), 7.1 (103) and 1.2 (30 individuals), as well as *Nassarius globosus* which were more commonly found in quadrants 1 and 2, quadrants 1-3 have smooth and muddy substrates, this is in accordance with the theory of Tunnel et all. (2010) that the habitat of the Nassaridae family is muddy, fine sand and beaches with calm waves. This is because several types of nassaridae have a habit of eating more than their body weight, thus requiring habitats that have lots of nutrients such as muddy substrates and seagrass beds (Meirelles & Cascon, 2012). Nassariidae are a group of scavenging, predominantly marine, snails that are diversifies on soft bottoms as well as on rocky shores (Galindo et al, 2016).

Other species have abundance values of 0.94-0.00 Ind/m^2. This is possibly caused by several factors such as the presence of predators, disturbances to the environment such as the large number of fishing boats and tourism boats that anchor their boats around the intertidal area, long exposure to sunlight at the lowest ebb or anthropogenic activities of the community such as searching for shellfish and taking them excessively. Another factor is about ecological habitat, molluks are all ectothermic with their body temprature controlled by the external environment, salinity, oxygen in environment, energy source also there are indivual interaction factors in the population (Candri et all, 2022; Ponder et al, 2020).

The index value of diversity (H') for molluscs in Batu Kijuk Waters is 2.74, the value indicates high diversity. The diversity index is closely related to the dominance and evenness index. Brower et al. (1998) explained that a community is said to have high species diversity if the community consists of many species and the number of individuals per species is evenly distributed, while dominance (C) is used to determine which species dominate a habitat. The results showed that the dominance index (C) was 0.1, meaning that no species dominated. If the dominance index has a value close to 0 then the evenness index is included in the high category, conversely if the value is close to 1 then there are species that dominate so that it has low evenness which causes an unbalanced community (Magurran, 1988). If you look at the uniformity value (E) it has a value of 0.62 which means moderate uniformity because only a few species dominate so that the community can be said to be quite stable.

Mollusk data from the clam hunting community

The extremely vast biodiversity represented by marine mollusks alongside their widespread utility as a source of food and their high nutritional value has aroused great interest from the scientific community. Furthermore, they can be caught with ease, and their commercial breeding and farming is rampant (Liu & Khan, 2019). The people of Sekotong Barat have used molluscs as a food source for a long time. The activity of looking for clams or in the local language known as "madak" is carried out at low tide and is mostly carried out in the Batu Kijuk coastal area because it is supported by its intertidal area which has higher land so that at low tide it can reach 0.80 m (lowest ebb). This causes people from all walks of life, such as children, adolescents and adults, to search for clams. This activity can lead to scarcity of this type of mollusk because it is not taken selectively (regardless of age/size) and there is no cultivation. The Ministry of Agriculture (1990) explains that excessive exploitation of biological resources in any form will have an impact on the existence of organisms. Based on the research results, the mollusks consumed by the public can be seen in Table 2.

Table 2. Mollusk data from the clam hunting community

Class	Family	Genus	Species
Gastropoda	Turbinidae	Vasum	*Vasum turbenellus*
	Muricidae	Chicoreus	*Chicoreus brunneus*
	Strombidae	Lambis	*Lambis-lambis*
		Strombus	*Strombus canarium*
			Strombus urceus
	Haliotidae	Haliotis	*Haliotis glabra*
	Tonnidae	Tonna	*Tonna canaliculate*
	Cypraeidae	Cypraea	*Cypraea tigris*
Bivalvia	Cardiidae	*Trachicardium*	*Trachicardium rugosum*
	Malleidae	*Malleus*	*Malleus anatinus*
	Arcidae	*Anadara*	*Anadara antiquata*
	Pinnidae	*Pinna*	*Pinna muricata*
			Pinna bicolor
	Volutidae	*Cymbiola*	*Cymbiola vesvertilo*

Conclusion

Based on research conducted at Batu Kijuk Beach, West Sekotong Village, there are 79 species of molluscs were found consisting of 972 species, consisting of 65 species of gastropods and 14 species of bivalves. All of these species are dominated by the Gastropod Class of the Columbellidae family types of gastropods dominate compared to bivalves. This is because gastropods have a higher adaptability than other classes on both hard and soft substrates. the highest abundance value was *Pyrene versicolor* with 3.70 Ind/M². nassaridae which was dominated by *Hebra nigra* with a value of 2.91 (Ind/M²) and *Nassarius globosus* had an abundance value of 1.08 (Ind/M²). The index value of diversity (H') for molluscs in Batu Kijuk coastal is included in the high category, namely 2.74. The dominance index value (C) is 0.1 which means that no mollusk species dominates. The uniformity index (E) has a value of 0.62 which means moderate uniformity because only a few species dominate so that the community can be said to be quite stable.

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