

DIVERSITY OF MOLLUSCS (BIVALVES AND GASTROPODS) IN KABUNG ISLAND, WEST KALIMANTAN, INDONESIA

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ABSTRACT

Kabung Island is an island located in Bengkayang Regency, West Kalimantan, Indonesia. The characteristics of these waters are sandy, muddy and muddy sand. This type of water is compatible with the life of Gastropods and Bivalves. Both of them play an important role in an ecosystem because of their ability as a filter feeder that filters dissolved substances in the water, for a source of food for their survival. The abundance and diversity of molluscs are highly dependent on the conditions of the aquatic environment, such as substrate type, pH, turbidity, temperature, salinity and dissolved oxygen, availability of food, pollutants, predators and competitors. This study aims to assess the diversity and abundance of molluscs on the Kabung island. The results on this research show that the highest diversity index is 1.94 which means that it is in moderate condition. The evenness index and dominance index values found to show a value of 0.88 which means high evenness so that a dominance value of 0.45 means that there are no molluscs that dominate on the Kabung island.

Keywords: Abundance, Bivalves, Diversity, Gastropods, Mollusca.

INTRODUCTION

The diversity and abundance of marine biological resources is proportional to the conditions of the aquatic environment. Changes in the aquatic environment can damage the ecosystem and ultimately have an impact on the existence of marine life in it. A disturbed aquatic environment can be the main cause of reduced biodiversity in an ecosystem. The decline in the quality of the aquatic environment due to the pressure of biotic and abiotic elements around the coast can be described by the diversity and abundance of a biota in the environment. Gastropod and bivalves class animals are one of the marine biota groups that can be directly affected by the decline in the quality of the aquatic environment. The molluscs are the constituents of marine ecosystems from coastal areas to depths, because of its ability to survive on various types of substrates, including sandy, rocky, and muddy substrates (Cappenberg, 2006).

These gastropods and bivalves have the ability to survive according to physical and chemical conditions. They are often found in intertidal areas. According to Susiana (2011), its abundance influenced strongly by several factors such as environmental conditions, food availability, predation and competition. In addition, environmental pressures and changes can also affect the number of species and differences in the structure of these organisms. Ecologically, bivalves are categorized as important biota that make up an ecosystem because they are filter feeders that are able to filter organic materials in the waters.

Kabung Island is one of a group of small islands in the Karimunting archipelago, Bengkayang Regency, West Kalimantan. The coastal areas have a complex substrate type, where some of the sand is muddy, rocky, and also some parts of mangrove forest so that the substrate

tends to be sandy. Most of the people of Kabung Island is fishermen, relying on the anchovy FAD system which is placed about 200-300 m from the shoreline. Shellfish and snails are caught by these fishermen for family consumption and not for commercial purposes.

The lack of information regarding the abundance and diversity of gastropods and epifauna bivalves in Kabung waters is the background for this research activity. Data on the abundance and diversity of gastropods and molluscs in the southern Kabung waters can be used as basic information for future research developments related to changes in environmental conditions that occur around these waters.

MATERIALS AND METHODS

The study was conducted from 26 to 28 April 2019 on Kabung Island in the south region, Bengkayang Regency, West Kalimantan Province (Fig. 1). The determination of the location of the stations carried out systematically. Sampling at each station coincided with the measurement of physical and chemical parameters, i.e., 7 to 10 am.

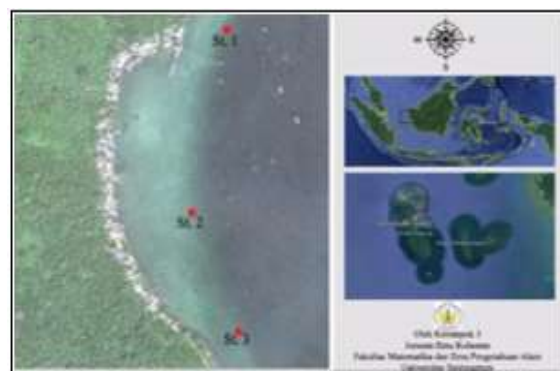


Figure 1. Map showing study sites in Kabung island in the south region, West Kalimantan

Tools and materials

The tools used include pH meters, refractometers, thermometers, roll meters, glass equipment such as Winkler and Erlenmeyer bottles, ropes and knives, and the materials used include formalin 4%, ethanol 70%, MnSO₄ (Merck), KOH (Merck), KI (Merck), H₂SO₄ (Merck) and Na₂S₂O₃ (Merck) 0.025 N.

Molluscs Sampling

Sampling was carried out near the jetty by placing three stations systematically, based on the firsttime finding gastropods or bivalves, and the distance between stations was 100 m parallel to the shoreline and 25 m perpendicular to the sea. Each station has 3 plots with a distance of 5 m from each plot. One observation plot was sampled once with a transect 1x1 m². Samples were collected and cleaned. Then, they were fixed using 4% formalin and taken to the laboratory (identification). Sampling was carried out at the lowest low tide conditions (Atnasari, 2020).

Identification

Samples of gastropods and bivalves were washed then preserved using 70% ethanol, then sorted. Identification carried out at the species level, namely based on the morphology, color and pattern of the shell, as well as the special characteristics possessed by the Taxonomy Book (Oemarjati and Wardana, 1990).

Measurement of Physical-Chemical Parameters

The measurement of physico-chemical parameters was temperature, salinity, depth, pH, and dissolved oxygen (DO).

Determination of the Shannon Weiner Diversity Index (H')

The diversity index is as follows:

$$H = \sum_{i=1}^S (Pi \log_2 Pi) \text{ or } H = \sum_{i=1}^S (Pi \ln Pi)$$

Where:

Pi = number of individuals of each type (i = 1, 2, 3,...)

S = number of types

H = population diversity estimator

In addition, diversity also calculated using the Margalef index. The value of the Margalef Index will increase along with the wider the sample plot used, and the higher the diversity, which is also indicated by the

greater the value of species richness (Boontawee et al. 1995).

Evenness Index (E)

$$E = \frac{H'}{H'_{Maks}} = \frac{H'}{\ln(a)}$$

Information:

E = total number of species

H' max = maximum diversity

The evenness index value ranges from 0-1. If the value is 0 it indicates the level of evenness of species in the community is very uneven, whereas if the value is close to 1 then almost all existing species have the same abundance (Magurran 1988).

Dominance Index (D)

Dominance index (D), using Simpson's Index

$$H = \sum_{i=1}^S \frac{ni(ni-1)}{N(N-1)}$$

Where:

ni = number of individuals of the -i . species

N = total number of individuals (Boontawee et al. 1995).

RESULTS AND DISCUSSION

Identification of Gastropod and Bivalve Species

Based on the results of the study, it can be concluded that there are 9 species of molluscs (Gastropods and Bivalves) found on Kabung Island, Bengkayang Regency, West Kalimantan. They were *Cerithideopsisilla alata*, *Neothais marginatra*, *Euplica scripta*, *Cerithium coralium*, *Stramonita gradate*, *Euplica loisae*, *Neothais nesiototes*, *Engina alveolata*, *Neothais marginatra* and *Tridacna gigas* (Table 1).

Table 1. Identification of gastropods and bivalves on Kabung Island

Code	Species	Station		
		1	2	3
A	<i>Cerithideopsisilla alata</i>	√	√	√
B	<i>Neothais marginatra</i>	√	√	√
C	<i>Neothais nesiototes</i>	√	√	√
D	<i>Euplica sripta</i>	√	-	-
E	<i>Euplica loisae</i>	√	√	√
F	<i>Cerithium coralium</i>	√	√	√
G	<i>Stramonita gradate</i>	√	√	√
H	<i>Engina alveolata</i>	√	√	√
I	<i>Tridacna gigas</i>	√	-	-

Table 2. Physical chemical parameters of Kabung island waters

Station	Parameter					
	pH	DO (mg/mL)	Temperature (°C)	Salinity (‰)	Sediment	Depth (cm)
1	7.97	2	30	31	Sandy mud	58.6
2	8.17	2.4	30	30	Sandy mud	33.8
3	8.05	2.2	30	31	Sandy mud	45.7

Biodiversity divided into three levels, namely genetic diversity, species, and communities (ecosystems). This diversity determines the adaptability of the population that will be part of the species interaction. Diversity consists of two distinct components, namely species richness and evenness. Species richness is the total number of species, while evenness is the distribution of abundance (e.g number of individuals, biomass, etc.) in each species (Ludwig and Reynolds 1988)

Water physicochemical parameters greatly affect the diversity of gastropods and bivalves that live in it. Measurement of the condition of the aquatic environment carried out for each sampling. Substrate is one of the factors that affect the existence of this species. According to Kawuri (2012). The water parameters observed were sediment, temperature, depth, pH, salinity and dissolved oxygen (DO). The results of the measurement of environmental physical and chemical parameters during sampling in the waters of the Kabung Island obtained values as shown in Table 2. The pH value of ideal waters for gastropod and bivalve life is 6-8. It showed an ideal balance between oxygen and carbon dioxide and various pathogenic microorganisms are difficult to develop (Gundo, 2010)

The abundance of gastropods on Kabung Island influenced by the conditions of sandy mud waters and contains various kinds of organic matter. According to Zahidin (2008), sandy mud substrate is a factor that influences the composition and distribution of gastropods. According to Riniatsih and Kusharto (2009), such a substrate is an excellent environment for the survival of gastropod organisms. At a low pH (acidic) will reduce the dissolved oxygen content so that it can cause the respiratory activity of organisms increased. The opposite occurs at high pH (alkaline) conditions. The average pH value of the water on the three stations ranged from 7-8. It indicated that three stations were ideal for the diversity of gastropods and bivalves that live in these waters.

The salinity of the three stations showed that the salinity levels classified as salty (30-31 ppt). Gastropods and bivalves in salty and brackish waters have different variations of life. The ideal salinity for the growth of brackish gastropods is between 16-19 ppt. According to Zahidin (2008), the salinity conditions showed that the three transects were not ideal for the growth of gastropods and bivalves. The average water temperature at stations 1, 2 and 3 is 30°C. Temperature taking at station 1 was taken close to Kabung Island. Then, temperature taken at station 1 was taken at a distance from station 2 along 100 m parallel to the coast as well as station 3 was placed 100 m from station 3. Depth measurements were carried out on each plot with 1 replication. Depth measured using wood that has been rated for depth. In this study, the measurement results for Station 1 were 58.6 cm, station 2 was 33.8 cm, while station 3 was 45.7 cm.

The DO measurement results on station 1, 2 and 3 were 2 mg/mL, 2.4 mg/mL and 2.2 mg/mL, respectively. This condition indicates that the station in the ideal category for the growth of gastropods and bivalves. The minimum dissolved oxygen (DO) for the life of gastropods and bivalves is 2 ppm in normal conditions and not polluted by toxic compounds (toxic) (Zahidin, 2008).

Diversity Index (H'), Evenness (E) and Dominance (D).

Data on the index of diversity (H'), evenness (E) and dominance (D) of the calculation results of gastropods and bivalves obtained on each transect in the southern part of Kabung Island are listed in the Table 3.

Table 3. Index of Diversity (H') Evenness (E) and Dominance (D)

Station	H'	E	D
1	1.94 (moderate)	0.88 (high evenness)	0.18 (no one dominate)
2	1.09 (moderate)	0.66 (high evenness)	0.33 (no one dominate)
3	1.41 (moderate)	0.67 (high evenness)	0.45 (no one dominate)

The diversity index on gastropods and bivalves were found moderate diversity. It influenced by physical and chemical factors of the waters (Fajri and Kasry, 2013). Diversity varies due to the number of individuals of each species is different. The evenness index of three station showed high evenness because there are no dominant gastropods or bivalves. The evenness index value was used to measure the degree of evenness of the abundance of individual species in the community. According to Magurran (1988) an evenness value close to one indicates that each species not dominate in the population.

The dominance index of three stations showed that there is no dominant species at the observation station. Gastropod diversity will affect the dominance of Gastropods. High dominance index value indicates a high dominant of one species, whereas a low dominance index indicates there were no one is dominant (Syamsurisal, 2011). Uniform gastropods indicate the unequal distribution of the number of individuals of each species. High diversity and uniformity will result in the absence of dominance in the observation station.

CONCLUSION

Gastropods and bivalves epifauna in the aquatic environment of Kabung Island, Bengkayang Regency on three stations, namely *Cerithideopsis alata* (8), *Stramonita gradate* (1), *Cerithium coralium* (1), *Neothais marginatra* (4), *Euplica loisae* (1), *Neothais nesiotis* (2) and *Engina alveolata* (2). The value of the diversity index, evenness index and dominance index on gastropods and bivalve are moderate, high evenness and no one dominant, respectively. The high evenness

value is high, so with a dominance value of 0.45203, it means that there are no dominant gastropods and molluscs on Kabung Island. Water physicochemical parameters are closely related so that it affects the diversity of gastropods and bivalves that live on Kabung Island.

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