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Macrozoobenthos Community Structure in the Coastal Waters of Marsegu Island, Maluku, Indonesia

Fitry Yunita, Fredy Leiwakabessy & Dominggus Rumahlatu

Biology Education Departement, Faculty of Teacher Training and Education Science, Pattimura University, Ambon, Maluku, Indonesia

Abstract

The existence of macrozoobenthos in an ecosystem is closely related to the conditions of the surrounding environment. This research aimed to examine the physical chemical condition of aquatic environment and macrozoobenthos community structure in the coastal waters of Marsergu Island. This research was conducted in July and December 2016 in 3 stations. The data were collected by using sampling technique to measure the environmental factors (temperature, salinity, pH, and dissolved oxygen of seawater) and enumeration of gastropod species with in-situ. The results of this research showed that macrozoobenthos in the coastal waters of Marsegu Island consisted of 2 Phylum, namely Molusca and Echinoderms, that is, gastropod with 18 species, bivalvia with 5 species, and echinoderms with 17 species. Echinoderms was the dominant macrozoobentos with a percentage of 45%, followed by gastropods 42%, and bivalvia 13%. This suggests that echinoderms and gastropods are the main components that make up the macrozoobenthos community structure in the coastal waters of Marsegu Island. The results of the calculation of the diversity index of macrozoobenthos in the three research stations showed the highest score was station 1 as much as 3.56, station 2 as much as 3.52 and the lowest was station 3 as much as 2.07.

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Introduction

Along with the growing human needs, the economic activity is also growing. Various industries emerge with the aim of meeting the human needs. This rapid industrialization has had a negative impact on the environment. The residue of the processing becomes a source of pollution for the surrounding environment, both land, air and water. The environmental quality continues to decline significantly, especially the marine waters. Most residues of human activity will be disposed at sea, and this causes environmental problems. Sea water pollution is a paradox, because most of the nutrients needed by humans come from the

CONTACT : DOMINGGUS RUMAHLATU dominggus_amq@yahoo.co.id

ocean. Therefore, continuous water quality monitoring is required by utilizing bioindicators such as macrozoobenthos.

The studies on the role of macrozoobenthos as bioindicator are based on the fact that these organisms have a very important role in nutrient cycling in waters. Răescu *et al*. (2011) explains that macrozoobentos are the main source of nutrients in aquatic ecosystems. Macrozoobenthos plays a fundamental role in transfering the energy through the food chain and helps break down various types of material in the sea bed (Vyas *et al*., 2012). Dauer (1983) explains that macrozoobenthos has a living behaviour which does not change much, accustomed to make contact with contaminants, and shows different levels of tolerance toward contaminants. The distribution of macrozoobenthos in an aquatic environment is determined by a number of factors, such as the physical properties of the substrate and nutrients in the water column. In addition, Trayanova *et al*. (2007) add that benthos invertebrates are used as environmental indicators because their responses can predict various types of anthropogenic stress.

Some researches have proved that the presence of macrozoobenthos in an ecosystem is closely related to the conditions of the surrounding environment. The research conducted by Cai *et al*. (2012) found that the total concentrations of nitrogen, phosphate, ammonium and dissolved oxygen is closely related to the macrozoobenthos community structure in Caochu China river. Taurusman (2010) also found that the structure of macrozoobenthos in eutrophic coastal waters had a significant correlation with the quantity and quality of organic material. The research also proved that macrozoobenthos could respond to eutrophication conditions.

One of the coastal areas which have the potential of macrozoobenthos is Marsegu Island in West Seram District, Maluku, Indonesia, with an area of 240.20 Ha and it has marine areas as much as 10.000 hectares. Marsegu Island is often used as a laboratory for various types of research, namely agriculture research, forestry research, fishery research, conservation research, and as tourism area. Therefore, a continuous analysis is required to assess the quality of the waters by utilizing aquatic organisms as bioindicators, and analyzing the physical-chemical factors in marine environment, as well as analyzing the macrozoobenthos community structure in the coastal waters of Marsegu Island.

Materials and Methods

This research was conducted in the coastal waters of Marsegu Island in July 2016, at coordinate 02˚59'- 03˚01' latitude and 128˚02' - 128˚03' longitude (Figure 1). The data were collected by using sampling technique to measure the physical chemical factors of the environment (temperature, salinity, pH and dissolved oxygen) and enumeration of gastropods with in-situ at 3 stations of data collection. The data collection was carried out during the lowest tide, beginning with determining the sampling area, and then making the vertical transect line as many as 10 transect lines from the highest tide limit toward the sea with the distance between the transect line with each other 50 m. In each transect were made 10 plots of 1×1 m with the distance between the plots 10 m, to obtain 100 plots for each data collection station.

The measurement of the environmental factors (temperature, salinity, pH, and DO) was carried out on each plot for 10 transect lines in the morning, afternoon, and late afternoon. The equipments used for the measurement of temperature, salinity, pH, and dissolved oxygen of sea water were thermometer, refragtometer, pH meter, and DO meter.

The data about the types of macrozoobenthos were collected by enumeration, and it was done by taking pictures of each macrozoobenthos in the research sites.

Figure 1. Location of Research Stations

The calculation of the diversity index of Macrozoobenthos was done descriptively by using Shannon-Wiener formula, as follows.

$H' = -\sum Pi \ln Pi$ (Brower *et al*. 1990)

where:

$P_i = n_i / N$

H' = Shannon–Wiener diversity, n_i = total individuals of species i, N = total number of individuals of all species, ln= logarithm nature, Σ = number of individual species, with the criteria of diversity, namely low (H <2) moderate (2 <H <4), and high (H> 4). In addition, it was also calculated the evenness value, richness value, density, frequency of attendance, and importance values.

Results and discussion

The physical chemical Environmental Factors

The results of the measurement of the physical chemical factors of the aquatic environment in each plot at the three observation stations (Table 1) show that there were fluctuations of the physical chemical environmental factors in the coastal waters of Marsegu island measured in the morning, afternoon and late afternoon.

The results of this research (Table 1) show that the average temperature of the sea water experienced fluctuation in morning, afternoon and late afternoon. The sea water temperature seemed to be lower in the morning, but it increased in the afternoon, and it decreased again in the late afternoon. The average temperature in the morning ranged from 27.80 - 8.00^{o}C, in the afternoon ranged from 29.90 - 30.16^{o}C and in the late afternoon was 26.00^{o}C. The fluctuation of the sea water temperature was influenced by the characteristics of the intertidal zone which had a very extreme temperature fluctuation. This temperature fluctuation was caused by the solar radiation and the CO_2 content in the water. These fluctuations are among the factors that determine the level of adaptation of organisms in the intertidal zone. Temperature is known to play an important role in the various physiological responses of aquatic organisms (Szathmary *et al*., 2009; Fly *et al*., 2012). This is due to climate change which results in increasing the frequency and severity of heat waves (Adamo & Lovett, 2011). In addition, temperature affects the rate of biochemical and physiological processes and the stability of biomolecules (Sanford, 2002). High temperatures in the body of the organism can affect the rate of digestion, respiration, metabolic activity, growth, reproduction and gametogenesis in poikilotherm organisms (Christophersen & Strand, 2003).

Table 1. The results of the measurement of the physical chemical environmental factors in the coastal waters of Marsergu Island

Variables	Station	Morning	Afternoon	Late Afternoon
Temperature (°C)	1	27.80	29.90	26.00
	2	28.00	30.16	26.00
	3	27.80	29. 90	26.00
pH	1	7.00	7.00	7.00
	2	7.00	7.00	7.00
	3	7.00	7.00	7.00
DO (mg/L)	1	4. 16	3.02	2.38
	2	4. 06	3.19	2.07
	3	3. 79	3.06	2.67
Salinity (‰)	1	31.00	31.00	31.00
	2	31.00	31.00	31.00
	3	31.00	31.00	31.00

pH factor (Table 1) in the coastal waters of Marsegu Island was relatively stable. There was not any significant pH fluctuation during the measurement in the morning, afternoon and late afternoon. Rumahlatu & Leiwakabessy (2017) explains that the pH of a waterway affects the distribution of gastropods. Based on the results of the measurement, the pH of the sea water was 7. The acidity factor of aquatic environment is strongly influenced by the concentration of CO_2 in the atmosphere. If the concentration of CO_2 in the atmosphere is very high, then it will be absorbed into the water, so that the pH becomes reduced, and the saturation of carbonate ions in water will occur. The condition of the seawater that is too acidic will affect the physiological activity of the organisms which live in it (Paganini *et al*., 2014). Physiologically, ocean acidification will lead to a change in the structure of organisms in the habitat, food web, and the loss of marine resources that are useful for human being (Newell, 2004).

Another environmental factor which did not experience a significant fluctuation was the salinity of sea water. The average salinity measured in the coastal waters of Marsegu Island was 31‰ and did not show any difference among the measurement carried out in the morning, afternoon and late afternoon. Although it did not show any significant fluctuation, Montory *et al*. (2014) explain that the organisms that live in the intertidal zone are often faced with the fluctuation of salinity of sea water that causes pressure to physiological conditions. Too high salinity and if followed by increased temperature will reduce the availability of oxygen in the tissues and reduce the resistance of organisms (Pörtner & Farrell, 2008).

The fluctuation in the environmental factor appeared in the dissolved oxygen where fluctuation occured in the morning, afternoon and late afternoon. The dissolved oxygen level was high in the morning and decreased in the afternoon and late afternoon. The average dissolved oxygen in the morning ranged from 3.79-4.16 mg/L, and in the afternoon it decreased to 3.02-3.09 mg/L. The dissolved oxygen continued to decline in the late afternoon to 2.07-2.67 mg/L. Oxygen is a factor for the respiration of all living things. If the oxygen concentration in the water is too low, it can cause hypoxia. At the individual level, this condition can cause physiological changes and interfere with the ability of individuals to survive, reduce reproductive system work, and be highly vulnerable to various types of diseases (Ekau *et al*., 2010). Hipoksia juga dapat menyebabkan perubahan kepadatan dan distribusi, serta dapat mengganggu komposisi kumunitas dengan cara menghilangkan spesies sensitif serta memberi kesempatan pada spesies toleran untuk berkembang biak (Weisberg *et al*., 2008).

Types of macrozoobenthos in the coastal waters of Marsegu Island

The Individuals of macrozoobenthos were collected and subsequently identified based on the taxon order (Table 2). Based on the results of identification, macrozoobenthos in the coastal waters of Marsegu Island consisted of 2 Phylum, namely Mollusk and Echinodermata, with 18 species of gastropods, 5 species of bivalves, and 17 species of echinoderms.

Table 2. Macrozoobenthos species in the coastal waters of Marsegu Island

Phylum	Class	Order	Family	Genus	Species
Molluscs	Gastropods	Littorinimorpha	Strombidae	Canarium	*Canarium urceus* (Linne, 1758)
				Lambis	*Lambis-lambis* (Linne, 1758)
				Lentigo	*Lentigo lentiginosus* (Linne, 1758)
			Cypraeidae	Cypraea	*Cypraea annulus* (Linne, 1758)
					Cypraea evrones (Linne, 1758)
					Cypraea tigris (Linne, 1758)
					Cypraea ovum (Gmelin, 1791)
					Cypraea vitellus (Linne, 1758)
		Caenogastropoda	Cerithiidae	Clypeomorus	*Clypeomorus concisus* (Hombron & Jacquinot, 1848)
		Neogastropoda	Volutidae	Cymbiola	*Cymbiola vespertilio* (Linne, 1758)
			Conidae	Conus	*Conus eburneus* (Hwass in Bruguière, 1792)
					Conus muriculatus (Sowerby, 1833)
			Buccinidae	Chantarus	*Chantarus undosus* (Linne, 1758)
				Engina	*Engina medicaria* (Linne, 1758)
			Nassariidae	Nassarius	*Nassarius albescens* (Dunker, 1846)
					Nassarius livescens (Philippi, 1849)
		Cycloneritimorpha	Neritidae	Nerita	*Nerita* sp (Linnaeus, 1758)
	Bivalves	Venerida	Veneridae	Gafrarium	*Gafrarium tumidum* (Röding, 1798)
		Ostreida	Pinnidae	Pinna	*Pinna bicolor* (Gmelin, 1791)
					Pinna muricata (Linne, 1758)
		Veneroida	Tellinidae	Tellina	*Tellina radiate* (Linne, 1758)

Phylum	Class	Order	Family	Genus	Species
			Mactridae	Spisula	*Spisula subtruncata* (Costa, 1778)
Echinodermata	Asteroidea	Valvatida	Ophidiasteridae	Linckia	*Linckia laevagata* (Linne, 1758) *Linckia multifora* (Lamarck, 1816)
			Archasteridae	Arachaster	*Arachaster typicus* (Müller & Troschel, 1840)
			Oriasteridae	Culcita Protoreaster	*Culcita novaeguinea* (Müller & Troschel, 1842) *Protoreaster lincki* (Blainville, 1830) *Protoreaster nodusus* (Linne, 1758)
		Forcipulatida	Asteriidae	Asterias	*Asterias vulgaris* (Verrill, 1866)
	Ophiuroidea	Ophiurida	Ophiuridaea	Ophiura	*Ophiura Ophiura* (Linne, 1758)
			Ophiactidae	Ophiopholis	*Ophiopholis aculeafa* (Linne, 1767)
	Echinoidea	Diadematoida	Diadematidae	Diadema Echinothrix Astropyga	*Diadema setosum* (Leske, 1778) *Echinothrix calamari* (Pallas, 1774) *Astropyga radiata* (Leske, 1778)
		Echinoida	Strongylocentrotidae	Strongylocentrotus	*Strongylocentrotus purpuratus* (Stimpson, 1857)
	Holothuriodea	Apodida	Chiridotidae	Chiridota	*Chiridota violacea* (Müller, 1849)
		Holothuriida	Holothuriidae	Holothuria	*Holothuria atra* (Jaeger, 1833) *Holothuria nobilis* (Selenka, 1867)
				Bohadschia	*Bohadschia marmorata* (Jaeger, 1833)

The researc results (Table 2) showed that echinoderms were very dominant in the coastal waters of Marsegu Island with a percentage of 45%, followed by the gastropod class by 42% and bivalves by 13%. This means that echinoderms and gastropods were the main components that made up the macrozoobenthos community structure in the coastal waters of Marsegu Island. The results of this research were in line with Williams and García-Sais (2010) who explained that echinoderms are very important marine animals, and most of its species are known to become the key species that govern the structure and balance of community that affects the life of other organisms on various types of ecosystems. Supono *et al*. (2014) assert that echinoderms are the major part of marine biodiversity, especially in the context of biomass and macroinvertebrates that play an important role in the functions of ecosystem. Echinoderm species are members of the seabed community which are distributed in the polar regions and the tropics regions. Echinoderm phylum contains several trophic groups, namely detrivor, filter-feeder, grazer, scavenger and an active predator, and plays an important role in the structure of benthic communities (Petovic & Cetkovic, 2016). Described by Bellwood *et al*. (2004) that echinoderms are an important component in coral reef ecosystems.

In aquatic environment, some species of gastropods are basically animals which feed on detritus *(*detritus feeder*)* and on the litter of falling leaves and circulate substances that are suspended in water in order to get food. In marine waters, gatropods are more widespread in the littoral region. This is an area affected by tidal activity. This is because the littoral zone area also has a variety of supporting ecosystems and other biodiversity, especially for the typical coastal area in tropical waters and for biota life. In the marine environment, gastropods are also found in various habitats, such as mangrove forests, coral reefs, rocky beaches, sandy beaches, seagrass and deep sea (Khade & Khade, 2016).

Diversity Index, Dominance Index, and Evenness Index of macrozoobenthos species in the coastal Waters of Marsegu Island

The results of enumeration of the macrozoobenthos species were then analyzed to determine the diversity index, evenness index and abundance index of macrozoobenthos in the coastal waters of Marsegu Island (Table 3).

Table 3. Diversity index, evenness index and abundance index of macrozoobenthos species

Station	Diversity Index	Evenness Index	Abundance Index
1	3.56	0.97	0.03
2	3.52	0.95	0.03
3	2.07	0.56	0.24

The results of the analysis of community structure (Table 3) showed that the diversity index of macrozoobenthos on the three research stations from the highest to the lowest was station 1 as much as 3.56, Station 2 as much as 3.52 and the station 3 as much as 2.07. Morris *et al*. (2014) explain that biodiversity represents the diversity and heterogeneity of organisms or characteristics at all levels of the hierarchy of life, from molecules to ecosystems. Heterogeneity of organisms also indicates that the ecosystem is more stable. The results of the calculation of evenness index showed that the evenness index at station 1 was as much as 0.965, station 2 as much as 0.954, and station 3 as much as 0.561. Heip *et al*. (1998) explains that the evenness expresses how individuals of different species are evenly distributed within a community. Evenness indicates whether or not there is a dominance of particular individuals in the community. The results of the calculation of the abundance index showed that the abundance index at station 1 was as much as 0.03, station 2 as much as 0.03 and station 3 as much as 0.24. Aslam (2009) explains that the abundance shows the number of species in a region or at the sampling location. The diversity index, evenness index and abundance index are important ecological indicators to measure the stability of a community. Gotelli & Chao (2013) explained that Information on species diversity is one of efforts to conserve biodiversity along with increasing pressure and climate change environment due to human activities.

Density, Occurrence Frequency and Importance Value Index

The data from the results of observations at each research station were then used to calculate the density value, abundance value, occurrence frequency and the improtance value index of each species. The summary of the analysis results is presented in Table 4 below.

Table 4. Density (D), Occurrence Frequency (OF) and the Importance Value Index (IVI)

No	Species	Station 1			Station 2			Station 2		
		D	OF	IVI	D	OF	IVI	D	OF	IVI
1	*Nerita sp*	1.01	0.51	15.51	0.97	0.50	14.00	18.38	0.89	81.41
2	*Tellina radiate*	0.92	0.47	14.20	0.92	0.47	13.23	9.67	9.67	78.17
3	*Strongylecentrotus purpuratus*	0.88	0.43	13.76	0.88	0.45	12.99	1.29	0.61	8.71
4	*Spisula subtruncata*	0.88	0.44	13.47	0.89	0.44	12.97	1.18	0.55	7.92
5	*Gafrarium tumidum*	0.82	0.41	12.55	0.88	0.43	12.76	0.49	0.49	5.32
6	*Conus eburneus*	0.76	0.38	12.45	0.82	0.41	12.69	0.66	0.29	4.85
7	*Deadema setosum*	0.82	0.40	12.43	0.83	0.41	12.09	0.68	0.30	4.78
8	*Echinothrix calamari*	0.71	0.36	10.92	0.82	0.40	11.89	0.64	0.28	4.70
9	*Conus muriculatus*	0.62	0.28	10.61	0.72	0.34	10.66	0.62	0.27	4.54
10	*Canarium urceus*	0.69	0.32	10.59	0.71	0.33	10.45	0.61	0.26	4.44
11	*Nassarius livescens*	0.67	0.30	10.15	0.71	0.33	10.45	0.61	0.26	4.44
12	*Cymbiola vespertilio*	0.62	0.29	9.92	0.61	0.27	8.82	0.60	0.26	4.39
13	*Cypraea evrones*	0.55	0.22	8.77	0.56	0.22	8.13	0.35	0.35	4.33

14	*Protoreaster nodusus*	0.59	0.24	8.37	0.55	0.21	7.91	0.62	0.23	4.32
15	*Cypraea tigris*	0.54	0.21	8.13	0.55	0.21	7.91	0.59	0.24	4.23
16	*Cypraea vitellus*	0.50	0.19	7.86	0.52	0.20	7.49	0.32	0.32	3.96
17	*Pinna bicolor*	0.55	0.22	7.76	0.50	0.20	7.29	0.28	0.28	3.89
18	*Cypraea annulus*	0.48	0.17	7.39	0.48	0.18	7.26	0.49	0.17	3.57
19	*Nassarius albescens*	0.49	0.18	6.95	0.47	0.17	7.04	0.49	0.17	3.57
20	*Clypeomorus concisus*	0.39	0.13	6.31	0.46	0.15	6.70	0.68	0.31	3.36
21	*Pinna muricata*	0.45	0.14	6.08	0.45	0.14	6.48	0.41	0.15	3.28
22	*Arachaster typicus*	0.46	0.15	6.08	0.45	0.14	6.48	0.42	0.15	3.08
23	*Lambis-lambis*	0.42	0.15	5.71	0.42	0.12	5.92	0.24	0.24	2.97
24	*Cypraea ovum*	0.37	0.12	5.57	0.37	0.11	5.70	0.17	0.17	2.88
25	*Protoreaster lincki*	0.41	0.14	5.49	0.36	0.11	5.58	0.20	0.20	2.78
26	*Linckia laevagata*	0.40	0.14	5.40	0.34	0.10	5.22	0.31	0.10	2.69
27	*Engina medicaria*	0.34	0.11	5.11	0.33	0.10	5.10	0.34	0.11	2.64
28	*Ophiura Ophiura*	0.38	0.12	4.98	0.32	0.10	4.98	0.17	0.17	2.36
29	*Ophiopholis aculeafa*	0.37	0.12	4.88	0.31	0.09	4.75	0.17	0.17	2.36
30	*Asterias vulgaris*	0.35	0.12	4.70	0.30	0.09	4.63	0.27	0.09	2.36
31	*Chantarus undosus*	0.30	0.10	4.54	0.28	0.09	4.39	0.26	0.09	2.29
32	*Holothuria atra*	0.34	0.11	4.48	0.28	0.09	4.39	0.22	0.07	2.24
33	*Holothuria vagabunda*	0.27	0.09	4.37	0.27	0.09	4.27	0.16	0.16	2.22
34	*Chiridota violacea*	0.32	0.11	4.30	0.27	0.08	4.15	0.06	0.04	0.91
35	*Linckia multifora*	0.29	0.10	4.04	0.26	0.08	4.03	0.05	0.04	0.79
36	*Holothuria nobilis*	0.28	0.10	3.94	0.24	0.07	3.68	0.04	0.04	0.68
37	*Lentigo lentiginosus*	0.24	0.08	3.88	0.23	0.07	3.56	0.02	0.02	0.52
38	*Bohadschia marmorata*	0.23	0.08	3.76	0.21	0.06	3.20	0.02	0.02	0.52
39	*Astropyga radiata*	0.21	0.07	3.40	0.20	0.06	3.08	0.02	0.02	0.52
40	*Culcita novaeguinea*	0.10	0.05	1.91	0.13	0.05	1.32	0.03	0.03	0.51

The results of this research (Table 4) show that the *Nerita* sp species was the main constituent component of the macrozoobenthos community in the coastal waters of Marsegu Island. This can be seen from the density value, occurrence frequency, and the importance value index of *Nerita* sp which were high on the three research stations. At station 1, the density value was 1.01 and the occurrence frequency was 0.51 and the importance value index was 15.51. Furthermore, at station 2, the density value of *Nerita* sp was 0.97, the occurrence frequency was 0.50 and the importance value index was 14.00. At station 3, the density value was 18.38, the occurrence frequency was 0.89 and the importence value index was 81.41.

The research results (Table 4) also show that the *Culcita novagaeguinea* species had the smallest contribution in the structure of macrozoobenthos community in the coastal waters of Marsegu Island. It can be seen from the density value, the occurrence frequency, and importance value index of *Culcita novagaeguinea* in the three research stations. At station 1, the density value was 0.10, the occurrence frequency was 0.05 and the importance value index was 1.91. Furthermore, at Station 2, the density value was 0.13, the occurrence frequency was 0.05, and the importance value index was 1.32. At station 3, the density value was 0.03, the occurrence frequency was 0.03, and the importance value index was 0.05. Makrobentos invertebrates are important parts of marine ecosystems (McDonald *et al.*, 2012). More than 95% of species in marine ecosystems are benthic organisms. These organisms include epifauna which lives on the surface of the substrate (Tagliapietra & Sigovini, 2010). These organisms have the capability to attach to the surface of the substrate or can move freely on the surface of the sediment. The organisms are known to have high sensitivity and can provide a fast response to environmental degradation. Therefore, these organisms are often used as biological indicators (Medrano, 2015).

Conclusions

The Based on results and discussion of this research, it can be concluded that the physical chemical environmental factors (temperature, salinity, and dissolved oxygen) in the coastal waters of Marsegu Island experienced fluctuations, while the pH of seawater did not experience a fluctuation in the measurement which was carried out in the morning, afternoon and evening. The physical chemical environmental factors had an effect on the structure of macrozoobenthos community in waters. The macrozoobenthos found in the coastal waters of Marsegu Island consisted of 2 Phylum, namely Mollusk and Echinodermata, that is, gastropods with 17 species, bivalves with 5 species, and echinoderms with 18 species. Based on the number of the Macrozoobenthos found, the results of the diversity index calculation of macrozoobenthos in the three research stations showed that the highest value was at station 1 with 3.56, followed by Station 2 with 3.52 and the lowest was station 3 with 2.07. In addition, *Nerita* sp species was the main constituent component of the macrozoobenthos community in the coastal waters of Marsegu Island. This can be seen from the density value, occurrence frequency, and importance value index of *Nerita* sp which was high on the three research stations, while *Culcita novagaeguinea* species had the smallest contribution on the structure of macrozoobenthos community in the coastal waters of Marsegu Island.

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