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DISTRIBUTION AND ABUNDANCE MACROZOOBENTHOS IN SEAGRASS VEGETATION, SANGIANG ISLAND

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ABSTRACT

Macrozoobenthos plays an important role in the transfer of energy in the form of a food chain. This study aims to see the abundance and distribution of macrozoobenthos in the waters of Sangiang Island. The method used is purposive sampling using a transect squared along 100 m with three repetitions of each station. Macrozoobenthos found in 42 species, namely 77% class gastropods, 15% class bivalves and 8% grade holothuridea. The highest abundance of macrozoobenthos was at station 2. The most species of the gastropod class were 37 individuals, *Cerithiumsalebrosum*, from the bivalvia class were 8 individuals *Vasticardium flavum*, and from Holothuridae class were 16 individuals *Holothuriaatra*. The results of the Canonical Correspondence Analysis show that the distribution of macrozoobenthos at stations 1 and 3 is influenced by pH, current velocity, and Dissolve Oxygen. Distribution at station 2 is influenced by Total Organic Material, temperature, and salinity.

Introductions

Seagrasses are flowering plants adapted to life in the oceans. They are the only angiosperms able to withstand a saline existence[1]. Seagrass ecosystems are important in supporting marine biodiversity. Seagrass has been known as one of the most important marine resources, because they provide a great ecological and economic important marine ecosystem services, including their capacity in sediment stabilization, water quality improvement, and their role in carbon and nutrient cycling. Seagrass serve as nursery, shelter and feeding area for many species, including macrozoobenthos [2]. Macrozoobentos contributes greatly to the functioning of aquatic ecosystems, plays an important role such as mineralization processes in sediments, organic material cycles, and an important role in the transfer of energy in the form of a food chain [3].

Sangiang Island has a relatively high potential of marine resources and is rich in various types of marine biota both economically and ecologically valuable, one of which is macrozoobenthos. Unfortunately, information regarding the composition and distribution of this biota has not been revealed. To be able to find out how much ecological potential is found on Sangiang Island, data collection is needed in the form of abundance and distribution on Sangiang Island.

The waters of Sangiang Island are directly affected by the waters of the Sunda Strait. The physical and chemical factors of the waters that are highly related to the characteristics of the Sunda Strait. This phenomenon certainly greatly influences the distribution of macrozoobenthos that are on the coast of Sangiang Island. The purpose of this study is to examine the abundance and distribution of macrozoobenthos and their relation to environmental characteristics that exist on the coast of Sangiang Island. Some environmental parameters are thought to influence the abundance and distribution of macrozoobenthos in these waters.

Materials and Methods

The research was conducted in May - June 2018 on the Sangiang Island waters of Serang Regency, Banten. The materials used in the study included macrozoobenthos samples, sediment samples, 4% formalin and ice gell. The method used is a survey method with data collection in situ including sediment sampling, macrozoobenthos, and water chemical physical parameters such as temperature, salinity, pH, DO, brightness, and current speed. Sediment samples that have been taken are taken to the Laboratory of Soil Chemistry and Plant Nutrition, Faculty of Agriculture, Padjadjaran University.

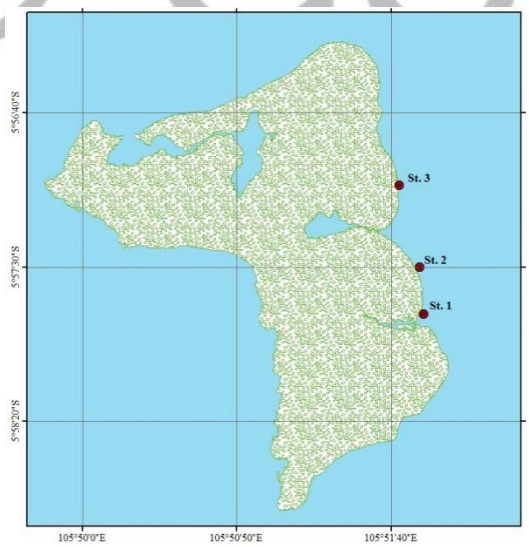


Figure1. ResearchSite in Sangiang Island

Determination of observation stations using purposive sampling method. The research was conducted at three stations based on the existence of seagrass ecosystems as a consideration representing the whole in the field.

Seagrass and macrozoobenthos data retrieval techniques are carried out using the line transect method which is mounted perpendicular to the 100 m coast towards the sea. In each station a line is made of three lines with a distance between lines 50 m. Taking macrozoobenthos samples was carried out at several points with shovel and a 1x1 mm filters to obtain macrozoobenthos in sediments. Each individual obtained was taken then fixed with a standard solution of 4% formalin fixation then put into a plastic bag

and stored in the ice box containing the ice gell. Samples were taken to the Water Quality Laboratory of the Research Center for Natural Resources and Environment, LPPM Unpad. Macrozoobenthos samples are identified to species level if this is possible with reference to Dharma (2005)[4].

Data analysis included the abundance of macrozoobenthos [5], pattern of macrozoobenthos distribution (Khouw, 2016). To see the relationship between macrozoobenthos and environmental parameters used a multivariate CCA statistical analysis approach using past 3 software.

Result and Discussion

The coastal habitats of Sangiang Island have characteristics that are not much different, both from the type of substrate, the type of vegetation and the physical chemical parameters that exist. The beach profile in the east which is used as a research station is more sloping than the other parts of the island in the form of cliffs. The substrate in all stations is dominated by sand which is usually located in areas that have dynamic current conditions such as areas that lead to the high seas.

From the results of measurements, the chemical physical parameters in the waters of Sangiang Island show that they are susceptible to tolerance for marine biota. The water temperature obtained from the three locations on Sangiang Island ranged from 29 ° C - 31 ° C. The temperature of station 2 is higher, which is 30.93 ° C because the measurement of station 2 is done during the day at 11:30 a.m. where the intensity of the sun is stronger. Patty (2013) suggested that the intensity of the sun can affect water temperature. The salinity value obtained at station 2 is higher at 34.47 ppt. Yuslan (2013) states that the salinity tolerated by macrozoobenthos in life and life ranges from 30-35 ppt.

Table1. List of Environmental Parameters

Name of Parameters	*Quality Standard Value	Site 1	Site 2	Site 3
Temperature (°C)	28 – 30	29,8	30,93	30
Clarity(%)	-	100	100	100
Current Speed (m/s)	-	0,25	0,16	0,08
Dissolved Oxygen (mg/l)	>5	5,29	5,48	5,6
Salinity (ppt)	33 – 34	33,97	34,47	34
pH	7,0 – 8,5	8,06	7,56	7,55
Total organic content (%)	-	1,30	1,86	1,03
Substrate	-	Pasir	Pasir	Pasir

*Indonesian Minister of Environment Decree no. 51 of 2004, seawater quality standards for marine organims

Abundance OfMacrozoobenthos

The abundance of macrozoobenthos is defined as the number of individuals taken in a broad union (m^2). The highest value of macrozoobenthos abundance was found at site 2 of 12.33 ind / m^2. The lowest macrozoobenthos abundance value is site 3 as much as 6.56 ind / m^2. The obvious difference from the research station is the high value of organic matter contained in the substrate where macrozoobenthos live at site 2. This is in accordance with the statement of Nybakken (1992)[7] which states that the higher the organic matter, the more abundant biota that lives in it.

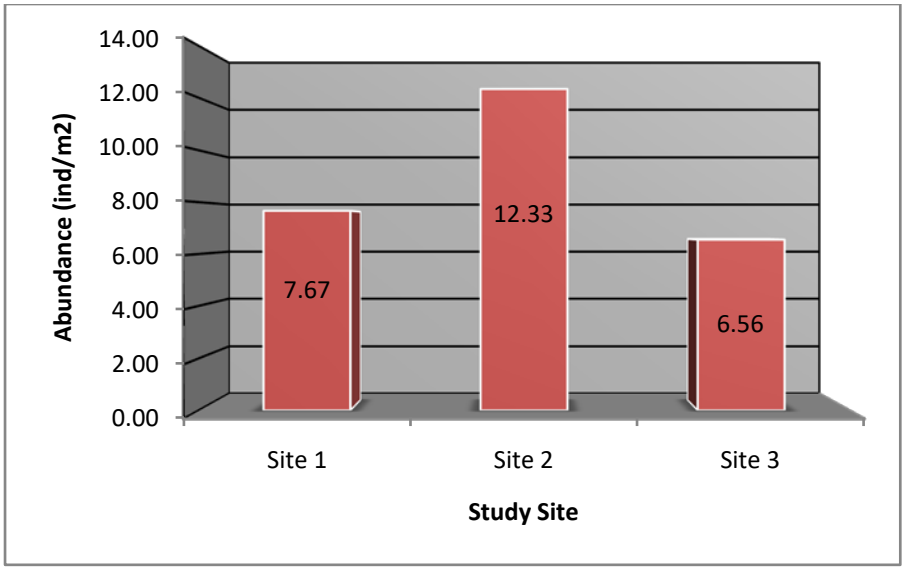


Figure2. The value of macrozoobenthos abundance each site

The macrozoobenthos community that lives in the substrate will overhaul organic matter into food ingredients used to maintain survival rates and growth. Site 3 with the lowest value of organic matter in sediments makes macrozoobentos that live at site 3 less than other site. Besides site 2 is a location that is quite far away and has no influence from human activities so that there are no hazardous materials resulting from human activities.

The results of calculations, the number of macrozoobenthos from the molluscum phylum dominates in the waters. This is because all stations have sand bottom substrates which are suitable as macrozoobenthos habitat. According to Nybakken (1992)[7], the type of sandy substrate makes it easy for mollusks to get the supply of nutrients and water needed for their survival. This type of sandy substrate is very suitable for molluscs especially for gastropods and bivalves. Furthermore Nybakken&Bertness (2005)[8] states that Gastropoda is the most successful mollusk and has a very wide spread, starting from land to deep sea.

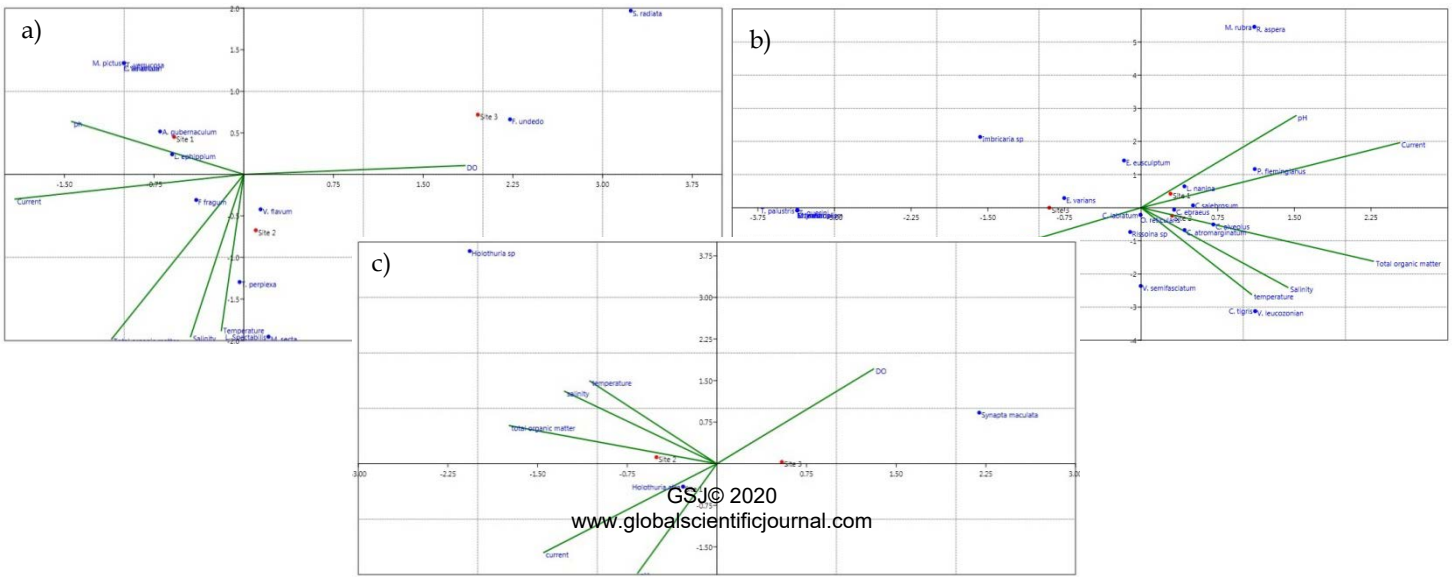
Vasticardium flavum is a type of bivalve commonly found in seagrass areas. Like other types of bivalves, this species has a bysus as a tool for attaching itself to the roots of seagrasses as a form of adaptation to currents and waves [9]. The most common class of gastopods is *Cerithiumsalebrosum* from the family Cerithidae. According to Houbrick (1985)[10]the type of gastropod in the Cerithidae family is the most common type with the most widespread spread in aquatic ecosystems. This type is the original group of inhabitants of marine waters and has good adaptation so that it can live on various types of substrate types that support this type to breed from sand to mud substrate and have a high abundance. The type of sea cucumber Holothuria is found in sandy seagrass areas. Wolkenhauer*et al.* (2010)[11] suggests that sea cucumbers, in this case in the holothuroidea class, are feeder deposits where food behavior sweeps the bottom of the waters in the form of sand and coral fragments. In addition the Holothuroidea group also likes sloping space and is protected from currents, such as seagrass beds.

Table2. MacrozoobenthosDiversity

Macrozoobenthos Species	Site 1	Site 2	Site 3	Total
Bilvalvia				
Anadara gubernaculum	3	1	0	**4**
Cardiumasiaticum	1	0	0	**1**
Fimbria fimbriata	3	0	0	**3**
Fragumfragum	1	1	0	**2**
Fragumundedo	0	1	2	**3**
Leporimetis ephippium	2	1	0	**3**
Leporimetisspectabilis	0	1	0	**1**
Macomasecta	0	1	0	**1**
Mytilus pictus	1	0	0	**1**
Siliqua radiata	0	0	1	**1**
Tellinaperplexa	1	4	0	**5**
Tellinaverrucosa	1	0	0	**1**
Vasticardium flavum	2	5	1	**8**
Total	**15**	**15**	**4**	**34**
Gastropod				
Oliva reticularis	1	2	1	**4**
Canariumlabiatum	1	2	1	**4**
Cerithium alveolus	6	14	2	**22**
Cerithiumatromarginatum	3	8	2	**13**
Cerithiumsalebrosum	12	20	5	**37**
Conus ebraeus	5	9	3	**17**
Cypraeatigris	0	1	0	**1**
Epitoniumeusculptum	3	2	2	**7**
Epitoniumlyrum	0	0	2	**2**

Macrozoobenthos Species	Site 1	Site 2	Site 3	Total
Euplicavarians	3	4	5	**12**
Imbricariasp	2	0	3	**5**
Leptothyra candida	0	1	1	**2**
Leptothyrananina	10	12	4	**26**
Mastonia rubra	1	0	0	**1**
Miliariconus miliaris	0	0	1	**1**
Mitra cardinalis	0	0	1	**1**
Polinices flemingianus	1	1	0	**2**
Polinices melanostoma	0	1	2	**3**
Rhinoclavis aspera	1	0	0	**1**
Rissoinasp	2	6	3	**11**
Synaptocochleaconcinna	0	1	1	**2**
Telescopium telescopium	0	0	4	**4**
Terebraliapalustris	0	0	1	**1**
Truncatellaguerini	0	0	1	**1**
Vexillum leucozonian	0	1	0	**1**
Vexillum semifasciatum	0	3	1	**4**
Total	**51**	**88**	**46**	**185**
Holothuroudea				
Holothuriaatra	3	7	6	**16**
Holothuriasp	0	1	0	**1**
Synaptamaculata	0	0	3	**3**
Total	**3**	**8**	**9**	**20**

Relationship between Macrozoobenthos and Environmental Variables



Environmental variables such as temperature, current velocity, salinity, DO and pH, and total organic matter can influence the distribution of macrozoobenthos. The results of macrozoobenthos correlation analysis with the quality of the waters of Sangiang Islandshowed a different relationship with the six environmental variables. In the triplot graph CCA shows sites 1 and 3 influenced by pH value, current velocity and dissolved oxygen. *Polinices flemingianus* species can live at site 1 with the appropriate current velocity, pH, and dissolved oxygen. Site 3 has the highest dissolved oxygen value where in this station *Fragum unedo* species whose distribution is influenced by dissolved oxygen values, current velocity and pH.

The distribution of macrozoobenthos at station 2 is influenced by the values of temperature, salinity, and total organic matter. *Cypraeatigris, Vasticardiumsemifasciatum*, and *LeucozonianVasticardium* are found in site 2 with the appropriate temperature and salinity values.

The results of gastropod correlation analysis (Figure 3.b) in the waters of Sangiang Island are seen in many species that tend to center in the center of the ordination axis. Species such as *Leptothyrannanina, Conus ebraeus, Cerithium alveolus, Cerithiumatromarginatum, Canariumlabiatum, Oliva reticularis, Euplicavarians, Epitoniumeusculptum*and*Rissoinasp*are common species that can be found in most observation station locations, indicating that these species have adaptations which is good and can live in various habitats.

Conclusion

The abundance and distribution of macrozoobenthos can be influenced by physical chemical parameters of water. The content of organic matter in sediments is a major factor in the abundance of macrozoobenthos.

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