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Composition and Abundance Of Crustacea and Polychaeta In Mangrove Stands At Bulalo Kwandang District North Gorontalo Regency.

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ABSTRACT

The aim of the study to determine the composition and abundance of Crustacea and Polychaeta based Mangrove stands in the village of Bulalo Kwandang District of North Gorontalo regency. The research conducted over four months. The method used is survey method and techniques of data collection was done by using a sample square. The data were analyzed by descriptive quantitative. The results showed that crustacea species which consists of 3 family, that is Portunidae, Sesarmidae, Ocypodidae, while the Polychaeta only one family that is Capitellidae family. At station 1 species which have the highest index of abundance that is *Sesarma sp.* Indv/m2 and 0.189 for species that have the lowest abundance index of 0.023 Indv/m2 *Scylla serata*. While at the station two species that have the highest abundance index *Sesarma sp*. of 0.188 Indv/m2 which has an index of abundance and low of *Scylla serata* the abundance index of 0.020 Indv/m2. The most abundance species found in the *Rhizophora sp* stands. Where species of the least discovered that the stand *Avicenia sp.*

Keyword: Composition, abundance, Crustacea and Polychaeta, mangrove

1. Introduction

Mangrove ecosystems is one of the ecosystems that have natural resources and can be utilized by most living things. The magnitude of the mangrove ecosystem can be seen from the number of organisms that live dependent on mangrove ecosystems. As we know that the mangrove ecosystem is where spawning and place foraging range of aquatic biota.

In the mangrove ecosystem, there is a uniform vegetation including mangrove forest. Mangrove forest has several ecological functions. One of its functions is as a producer of large amounts of detritus, especially those from the litter (leaves, twigs, flowers and fruit that autumn). Most of this detritus utilized as food by fauna makrobenthos eaters of detritus, some bacterial quantitatively into a role in nutrient enrichment waters (Syamsurisal, 2011:1). Makrozoobentos is an animal that lives in the bottom waters and is usually attached to the base of river substrates; Stone, sand, and mud. (Zulkifli, et al, 2009:587). The basic substrate structure will determine the composition and abundance of species makrozoobenthos (Welch, 1952 in Suartini, et al, 2010:120). Makrozoobenthos the dominant community a waters including the Polychaeta and Crustacea (Nybakken, 1988:170). Polychaeta ecologically important role as a basic pet food such as fish and shrimp and also can be used as indicators of water pollution (Junardi, et al, 2007: 213). While Crustaceans role in accelerating the decomposition of mangrove material and also the nutrient cycle is also a big influence in the nutrient

cycle and the physical and chemical environment of mangrove forests (Taqwa, 2010: 22). The existence of benthic animals on a body of water, is strongly influenced by various environmental factors, both biotic and abiotic. Biotic factors that influence them is a manufacturer, which is a food source for benthic animals and species interactions and the pattern of the life cycle of each species in the community. The abiotic factors are physical-chemical water include temperature, dissolved oxygen (DO), salinity and pH (Syamsurisal, 2011: 1).

Mangrove forest, located in the village of the District Bulalo Kwandang terms of geographical adequately protected by small islands located in front of the shoreline. The growth of mangrove species in the village Bulalo based on the soil conditions of the region, so that each species of mangrove grow to dominate a certain area in accordance with suitable habitat and enable it to grow (Bahri, 2010). Based on the research that has been done Bahri, (2010) there are differences in patterns of zonation contained in the mangrove forest area Bulalo village. Each type has a different tolerance ranges to certain environmental factors, so that each zone is dominated by different species. Mangrove zonation patterns in the village Bulalo generally be divided into the following zones:

1. Rhizophoraceae *zone,* this zone is the outermost zone immediately adjacent to the sea and didominsi by *Rhizophora mucronata* who live on the muddy substrate. Although this zone dominated by *Rhizophora mucronata,* still not a pure stands / *pure stand.* Other types are associated in this zone include *Rhizophora apiculata, B. gymnorrhiza* and *Avicennia marina.*
2. Zone Meliaceae / Rhizophoraceae. This zone is located on the second layer after Rhizophoraceae zone. This zone is represented by the type *Xylocarpus granatum* and *Rhizophora apiculata.* Other plant species are present and beraosiasi on this zoning is *Rhizophora mucronata* and *B. gymnorrhiza.*
3. Avicennia zone, a zone in the center of which is dominated by *Avicennia marina.* In this zone associated *Avicennia alba* and *Rhizophora apiculata* also because these species are pioneer plants in silt.

Results of observation in the village Bulalo Kwandang District of North Gorontalo District mangrove forests are dominated by three types of mangrove namely *Rhizophora* sp., *Avicennia* sp., And *Ceriops tagal.* Type will have different mangrove litter production or different organic materials.
Associated with different patterns of zoning or in this case stands mangroeve can assume the existence of differences in the composition and abundance makrozoobenthos particular class Crustacea and Polychaeta living below the mangrove stands. These conditions make the basis for the author to do research, and also still lack of information about makrozoobenthos class Crustacea and Polychaeta class, then prompted the authors to conduct research with the formulation of the title "Composition and Abundance Class Crustacea and Polychaeta Makrozoobenthos Based Mangrove stands in the village of Bulalo Region District of Kwandang North Gorontalo District ".

2. Methodology

The method used in this research is the method to make a field survey to obtain information and a description of the composition and abundance of Polychaeta and crustacea in the mangrove forest village Kwandang Bulalo District of North Gorontalo District.

Before performing data collection conducted preliminary field observations (observation) and determining the location of sampling done by using GPS *(Global Positioning System).* Results of the determination of the sampling point location coordinates are then transformed into a map using GIS methods *(Geografichal Information System).* Data was collected using sampling techniques squared *(Quadrat sampling)* where the sampling unit quadrangular placed randomly based communities or by stands of mangrove (Fachrul, 2007: 14).

Each stand consists of four plots with each plot size 20x20 m. For class Polychaeta taking the sample using the sacks by means of filtered samples and then put into jars and alcohol 70%, and to label

the jar with a paper label. Samples had been identified in invertebrate zoology laboratory using a microscope and matched with the existing books identification keys. To know the composition of each species counted then analyzed the data to determine the abundance of each species.

The data obtained were analyzed by descriptive quantitative. To determine the composition of makrozoobenthos calculated the number of individuals of each species were found, while the index of abundance to know in advance the diversity index is calculated using the following formula:

Diversity index (diversity)

To calculate the formula used diversity index of Shannon Wiener (Fachrul, 2006: 109).

Description:

Pi = Number of Individuals Each species (i = 1,2,3 ... ..)

s = Number of Species

H = Estimates of Population Diversity

Abundance Index

$$J^{I} = H^{I} / H^{I}_{Max}$$

Description:

J^{I} = The abundance or presence

^{I} = H-winner Shannon diversity index

H^{I}_{Max} = Ln s, where, s = number of species found (Vodopich, 2010)

3. Results And Discussion

Makrozoobenthos composition Class crustacean and Polychaet

Makrozoobenthos composition class Crustacea and Polychaeta were found in the village Bulalo Kwandang District of North Gorontalo District consists of four families that are divided into 8 species. The composition of each kind can be seen in Table 1 and Table 2.

Table 1. Composition of crustacean and Polychaeta station 1.

No.	Klas	Family	Species	Stands			Jmlh
				R	C	A	
1	Crustaceans	Sesarmidae	*Sesarma* sp.	271	248	118	637
		Ocypodidae	*Uca urvillei*	136	86	53	275
			Uca vocans	108	74	80	262
			Uca tetragonan	105	49	48	202
			Uca chlorophtalamus	80	39	22	141
		Portunidae	*Scylla serata*	16	0	0	16
2	**Polychaeta**	Capitellidae	*Capitella capitata*	72	23	17	112
Number							16

Description:

R = *Rhizopora* sp.

C = *Ceriops tagal*

A = *Avicennia* sp.

Table 1 shows that at the station I Sesarmidae family consists of one species that is *Sesarma* sp. the number of 637 individuals, families Ocypodidae which consists of 4 species *Uca urvillei* the number of individuals 275, *Uca vocans* the number of individuals 262, *Uca tetragonan* the number of individuals 202, 141 *chlorophtalamus Uca,* Portunidae family consists of one species that is *Scylla serata* the number of individuals 16 Capitellidae family consists of one species that is *Capitella capitata* with 112. The total number of individuals individuals at station 1 was 1645 individuals.

Table 2. Composition of crustacean and Polychaeta station 2.

No.	Klas	Family	Species	Stands			Jmlh
				R	C	A	
1	Crustaceans	Sesarmidae	*Sesarma* sp.	254	246	114	614
		Ocypodidae	*Uca urvillei*	122	96	104	322
			Uca vocans	97	29	154	280
			Uca tetragonan	22	15	32	69
			Uca chlorophtalamus	92	78	0	170
		Portunidae	*Scylla serata*	12	0	0	12
2	Polychaeta	Capitellidae	*Capitella capitata*	17	9	15	41
Number							1508

Description:

R = *Rhizopora* sp.

C = *Ceriops tagal*

A = *Avicennia* sp.

Based on Table 2 above shows that the station I Sesarmidae family consists of one species that is *Sesarma* sp. the number of 614 individuals, families Ocypodidae which consists of 4 species *Uca urvillei* the number of individuals 322, *Uca vocans* the number of individuals 280, *Uca tetragonan* the number of individuals 69, *Uca chlorophtalamus* the number of individuals 170, Portunidae family consists of one species that is *Scylla serata* the number of individuals 12 Capitellidae family consists of one species that is *Capitella capitata* 41. Total number of individuals with species at station 2 is 1508 people.

Klas Makrozoobenthos abundance Crustaceans and Polycheata

Table 3. Abundance Crustaceans and Polycheata station 1.

8	Klas	Family	Species	Stands			Jmlh
				R	C	A	
1	Crustaceans	Sesarmidae	*Sesarma* sp.	271	248	118	637
		Ocypodidae	*Uca urvillei*	136	86	53	275
			Uca vocans	108	74	80	262
			Uca tetragonan	105	49	48	202
			Uca chlorophtalamus	80	39	22	141
		Portunidae	*Scylla serata*	16	0	0	16
2	**Polychaeta**	Capitellidae	*Capitella capitata*	72	23	17	112
Number							1645

Abundance indices based on calculations Crustaceans and Polychaeta in Mangrove forest in the village Bulalo Kwandang District of North Gorontalo District at the station I *Sesarma* sp. the abundance index of 0.189 Indv / m ^{2,} *Uca urvillei* with abundance index 0.154 indv / m ^{2,} *Uca vocans* with abundance index of *0,* 151 indv / m ^{2,} *Uca tetragonan* with abundance index 0.133 indv / m ^{2,} *Uca chlorophtalamus* with abundance index 0.108 indv / m ^{2,} *Scylla serata* the abundance index of 0,023 indv / m ^{2} and *Capitella capitata* the abundance index of 0.094 indv / m $^{2.}$

At the second station *Sesarma* sp with abundance index 0.188 indv / m ^{2,} *Uca urvillei* with abundance index 0.170 indv / m ^{2,} *Uca vocans* with abundance index of 161 indv / m ^{2,} *Uca tetragonan*

with abundance indices 0072 indv / m ^{2,} *Uca chlorophtalamus* with abundance index 0.126 indv / m ^{2,} *Scylla serata* the abundance index of 0,020 indv / m ^{2,} *Capitella capitata* the abundance index of 0,050 indv / m $^{2.}$ From the above it can be seen that the station 1 and station 2 has an index of abundance of the same species at the highest and lowest abundance. At the first station the highest abundance index *Sesarma* sp. the abundance index of 0.189 Indv / m ^{2,} the species with the lowest abundance index that is *Scylla serata* the abundance index of 0,023 indv / m $^{2.}$ At the station II species with the highest abundance index *Sesarma* sp. the abundance index of 0.188 indv / m ^{2,} the species with the lowest abundance index that is *Scylla serata* the abundance index of 0,020 indv / m2. For more details can be seen in Figure 1.

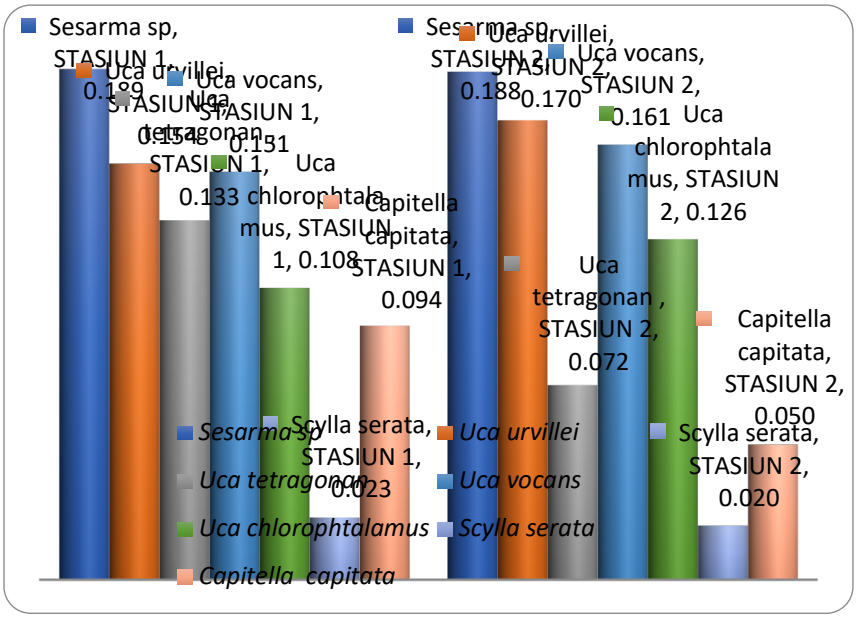

Figure 1. Calculation abundance index

Environmental Factors in Mangrove Forest Area

Environmental factors are measured in Mangrove Forest Area in the Village District of Kwandang Bulalo good at station I have the 33°C temperature, salinity 15 ‰ (ppt), pH 6 pH, DO 5.7 mg / 1 while the station II have the temperature 31°C, salinity 14.1 ‰ (ppt), pH 6.5 pH, DO of 5.3 mg / 1 and the substrate consists of mud and silt sand. For more details can be seen in Table 4 and diagram 4.

Table 4. Environmental Factors Affecting Life Crustaceans And Polycheata At Station 1 and 2

	Temperature (ºC)	Salinity (‰)	pH	DO (Mg / 1)
Station 1	33	15	6	5.7
Station 2	31	14.1	6.5	5.3

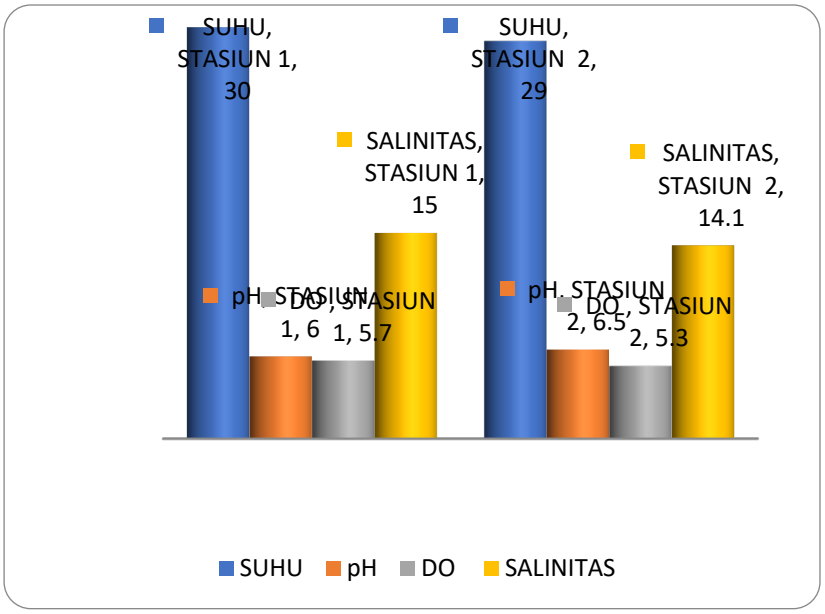

Figure 4. Diagram Calculation Results Environmental Factors

Based penelitiann overall result that is found four families makrozoobenthos; 3 family of crustacean and first class family of class Polychaeta. The composition of each species can be seen in Table 1 and Table 2. The table shows that the total individual at station 1 that is 1645 people, while total individual at station 2 1508. The difference in the number of individuals that were allegedly due to the physical condition of the mangrove ecosystem on station 1 deployment mangrove more than the 2 stations are mostly mangrove has experienced loss or are already degraded.

Makrozoobenthos the most abundant in stands of *Rhizophora* sp. because this type of stand is thought to have a substrate with organic matter content higher than the amount of litter production generated by stands of *Rhizophora* sp. As stated by Nybakken, (1988: 261) that muddy substrates tend to accumulate organic matter, which means that there is quite a lot of potential food for the inhabitants of the mangrove organisms, particles that settle in the area of mangrove areas are mostly organic. As a result, the substrate is very rich in organic matter.

In accordance with the previously described that kind makrozoobenthos which has the highest abundance *Sesarma* sp. the abundance index of 0.189 Indv / m ^{2} at station 1 and the station 2 0.188 abundance index Indv / m ^{2} this is because the species *Sesarma* sp. found in all stands of mangrove. This is consistent with the stated Kochl and Wolff, (2002) in Murniarti (2010: 262) that members of a species that lives Sesarmidae on the trunk and roots of mangrove trees, this crab utilize mangrove leaves as food and play an important role as detritus in the chain food and energy transfer groove in the mangrove ecosystem. It is said that if in an ecosystem one of the animals that become ecosystem components decreased in number then indirectly will have an impact on the food chain, so as to interfere with the stability of the ecosystem in these ecosystems.

According to the results of research conducted by Taqwa, (2010: 51) that the highest abundance of crab *Sesarma* sp. is in stand Rhizopora. This abundance differences may be caused by differences in choice of habitat preferred by each species of fauna. Differences in habitat selection can be influenced by the intensity of light, litter production and composition of the substrate. As expressed Fitriana, (2006: 70) in his research that the crustacean is a mangrove fauna with wide deployment. This leads to wide deployment crustacean species composition greater than other makrozoobenthos.

Furthermore, the species with the highest abundance after *Sesarma* sp. namely *Uca urvillei* with abundance index 0.154 Indv / m ^{2} at station 1 and at station 2 0.170 abundance index Indv / m $^{2.}$ Supriharyono, (2007) in Katili, (2009: 79) says that the genus *Uca* sp. has a fondness and high greed to consume and utilize mangrove litter Rhizophoraceae types. Rhizophoraceae family mangrove stands a good place for crab *Uca* sp kind. This breed. Tahunalia, (2010: 2) in the study stated that the presence of

species of crab *Uca* sp. This is determined by the presence of mangrove vegetation, whereas the abundance and distribution of crab *Uca* sp. influenced by the local environment (soil texture, tidal, organic matter, and pH). As Lim (2005) in Murniati (2010: 262) shows that the composition of the sediments are important factors that affect the abundance and distribution of crab *Uca* sp. This is reinforced by Murniati (2010: 263) that crabs from the family Ocypodidae can be found in a dry environment and away from the influence of the tide. This suggests that these crabs have a greater ability to store water in Abik gills so it can adapt well to the conditions lingkunagn dry.

Based on the results obtained that the crab *Scylla serata* types showed the lowest abundance index which is the index of abundance 0,023 Indv / m ^{2} at station 1 and the station 2 abundance index 0,020 Indv / m ^{2} it is based on the observation that these crabs prefers muddy substrates compared sandy besides many *Scylla serata* in the stands Rhizopora allegedly because of the litter production owned. This Rhizopora stands grow close together in large numbers sehingganya production produced too much litter, which then can support their litter makrozoobenthos. As described by Taqwa, (2010: 45) in his research that the average litter production increases with increasing density of mangrove. The detritus litter used as food by some makrobenthos fauna species that live in the mangrove forest floor. At the time of high tide flooded the area, litter will be carried out of the area along the water at low tide.

Species *Capitella capitata* from Capitellidae family is the type commonly found in mangrove because this type is found in virtually all stands, this proves that this type can be adapted to all kinds of stands and a wide range of environmental conditions. As expressed Day, (1972) in Indarjo, et al, (2005: 27) that the family Capitellidae has a better adaptability of the families of other Polychaeta. It is supported by a statement Junardi, (2001: 9) that Polychaeta can live in a variety of habitat types; substrate muddy, sandy and rocky at depths less than one meter to hundreds of meters.

Environment with the base substrate in the form of very fine silt generally very supportive for Capitallidae life, this can be seen in Table composition above that Capitellidae most commonly found on the stand *Rhizopora* sp. it is in line with the said Indarjo, et al, (2005: 27) that the relative abundance of Polychaeta Capitellidae allegedly because the area has a softer sedimentary substrate and appropriate for this type tend to like the kind of soft sediments. The high content of organic matter derived from the decomposition of leaf litter, twigs and wood of mangrove suspected to be the cause of high abundance in tegkan *Rhizopora* sp. *Avecenia* stands sp. and *Ceriops tagal* dominated by sand sediment organic matter content is lower when compared to the softer sediments so that the number of families and the number of species in both stations will be lower.

Nybakken (1988: 264) states that macrozoobenthos type of *deposit feeders* tend to be abundant in the sediment mud or other soft sediments which are the areas with high organic matter content, while for macrozoobenthos type of *suspension feeders* are more abundant in the substrate in the form of sand with organic material more a little. Waters with mud substrates tend to have a very fine particle size characteristics, low availability of oxygen in the sediment although only a few centimeters below the surface, and tend to accumulate organic matter so much available food potential for aquatic biota. Macrozoobenthos is dominated waters mud substrate similar to the waters of sand substrate, namely Polychaeta, bivalves and crustacean, only with a different genus. Organic materials are abundant and very little influence causing waves macrozoobenthos type of *deposit feeders* dominate these waters, such as Polychaeta (Arenicolidae, Spionidae and Capitellidae), crustaceans *(Corophium)* and bivalves *(Macoma* and *Scrobicularia).*

Based on the results of measurements of environmental factors can influence the composition and abundance makrozoobenthos tehadap Crustaceans and Polychaeta class at the study site in the form of temperature, pH, salinity, and DO. Having measured the environmental factors turned out to be in the range of tolerance (ambient temperature range between 31-33 ° C, with a salinity of 14.1 to 15 ‰ (ppt), pH 6-6.5 pH, DO 5.3 -5.7 mg / 1, and the substrate consists of mud and silt sand). Based on observations in the field, the value of the temperature range in the area of mangrove forests Bualalo Rural District of North Gorontalo District Kwandang range between 31ºC-33 ºC. Water temperature

suitable for living organisms in the sea which is between 27ºC - 37ºC, so the temperature in the mangrove forest is still within the range of tolerance for makrozoobenthos to survive (Aji Esti, 2006, in David, 2012: 34).

PH value measurement results show the intensity of the acidity or wetness of a water and is an important factor to control activities as well as the distribution of living organisms in a body of water. According Asikin (1982) in David, (2012: 34) each have a water biota tolerance limits of the water with a pH level of tolerance is different. For marine life ideal pH value range is 6.5 to 8.5 (EPA, 1986 in Junardi, 2001: 15). The optimum pH for the life of marine organisms is between 6-8. The observation in the study site in Mangrove Forest Area Rural District of Kwandang berkisan Bulalo between 6-6.5 which means it is still within the limits of tolerance for the life makrozoobenthos particular class of crustacean and Polychaeta.

Based on the results of measurements indicate salinity in mangrove forests Bulalo Village District of Kwandang ranged between 14.1 ‰ -15 ‰. According Asikin, (1982) in David, (2012: 34) that the optimum salinity for the life of marine organisms that is between 26 ‰ -34 ‰. Based on this it can be presumed that the salinity values measured at study sites affected by the fluctuations in rainfall. (Odum, 1993 in Taqwa, 2010: 15) suggests that salinity can affect the spread of benthic organisms either horizontally, or vertically. Indirectly result in any change in the composition of organisms in an ecosystem.

The range of dissolved oxygen at study sites in Mangrove Forest Area Rural District of Kwandang Bulalo is 5.7 to 5.3 mg / 1. Connell and Miller (1995) in Taqwa, (2010: 17) suggests that ecologically, dissolved oxygen concentration was also decreased with the addition of organic matter, because organic materials will be broken down by microorganisms that consume the available oxygen. At the level of types, each organism has a different response to the decline in dissolved oxygen. Nybakken, (1988: 261) explains that the substrate is one of the main ecological factors that affect community structure makrobenthos. Makrobenthos deployment can be clearly correlated with the type of substrate. Makrobenthos which has the properties diggers eaters tend to be abundant in sedimentary deposits of mud and soft sediments which is an area that contains a high organic matter. Odum, (1993) in Taqwa, (2010: 16) states that the base substrate or the texture of the soil is a very important component for the life of the organism. Substrate in the bottom waters will determine the abundance and composition of benthic animals.

4. Conclusion

1. Makrozoobenthos composition consisting of 4 families and 8 species of crustacean which consists of three families that Portunidae, Sesarmidae, Ocypodidae whereas Polychaeta only one family that Capitellidae family.

2. The species that has the highest abundance index *Sesarma* sp. The families Sesarmidae whereas species that has the lowest abundance index *Scylla serata* of family Portunidae. The species most commonly found in the stands *Rhizopora* sp. This is allegedly due to the high content of organic matter derived from the decomposition of leaf litter, twigs and wood on the stand *Rhizopora* sp.

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