Biovalentia: Biological Research Journal **E-ISSN: 2477-1392**
Vol 2, No 1 (2016): May 2016

CHARACTERISTICS OF MACROZOOBENTHOS COMMUNITY BASED ON SUBSTRAT TYPE AT WARKUK RIVER DISTRICK of WARKUK RANAU SELATAN, OKU SELATAN REGENCY, SOUTH SUMATERA

Frianti[1], Fauziyah[3], Zazili Hanafiah[2]
[1,2,3]Study Program of Management Environmental, Graduated Program at Sriwijaya University, Palembang
Email: **friantibiology@yahoo.com**

Received on 23th March 2016 and Accepted on 26th June 2016

ABSTRAK

Karakteristik Komunitas Makrozoobentos Berdasarkan Tipe Substrat di Sungai Warkuk Kecamatan Warkuk Ranau Selatan Kabupaten OKU Selatan, Sumatera Selatan telah dilaksanakan dari bulan Mei 2013 sampai Desember 2015. Penelitian ini bertujuan untuk menganalisis karakteristik komunitas dan komposisi makrozoobenthos berdasarkan tipe substratdan menganalisis bagaimana kondisi faktor fisika-kimia air di Sungai Warkuk. Penentuan lokasi pengambilan sampel dilakukan dengan metode *Random Sampling*. Identifikasi sampel makrozoobentos dilakukan di Laboratorium Balai Penelitian Perikanan Perairan Umum (BP3U) Mariana, Palembang. Dari hasil yang didapatkan, dikelompokkan ke dalam 3 kelas makrozoobentos yaitu, Insecta, Gastropoda dan Oligochaeta, yang tergolong ke dalam 9 ordo makrozoobentos, 14 famili dan 16 jenis. Kepadatan berkisar antara 1155,56-1755,56 individu/m^2. Tingkat keanekaragaman tergolong sedang, berkisar antara 1,95-2,41 dan indeks dominansi berkisar antara 0,31-0,40 dan tergolong tidak mendominasi.*Family Biotic Indeks* (FBI) berkisar antara 3,47-3,98 dengan kategori kualitas air *excellent*.

Kata kunci : Sungai Warkuk, Makrozoobenthos, Tipe Substrat

ABSTRACT

The research about Characteristic of Macrozoobenthos Community Based on Substrates Type At Warkuk River Districk of Warkuk Ranau Selatan, OKU Selatann Regency, South Sumatera has been conducted from May 2013 to December 2015.This studyaims to analysis of characteristic and makrozoobenthos composition in substrat type and analysis physic and chemistry condition at Warkuk River. Sampling sites was determined by *Random Sampling*. The Sample of macrozoobenthoswere identifiedat the Laboratory of Research Institute for Inland Fisheries Mariana, Palembang. The results obtained, that there group into 3 classes of macrozoobenthos namely Insecta, Gastropoda and Oligochaeta, which is classified into 9 orders consists of 14 families, 16 spesies. Density ranging from 1155,56 to 1755,56 individuals/m^2. Level of diversity are moderate, ranging from 1,95 to 2,41 and dominance index ranging from 0,31 to 0,40. *Family Biotic Index* (FBI) ranging from3,47 to 3,98 with the water quality category of excellent.

Keywords : Warkuk River, Macrozoobenthos, Substrat Type

INTRODUCTION

The river is a form of aquatic ecosystems with an important role in the hydrological cycle and serves as a water catchment area for the surrounding area, so the condition of the river is very influenced by the characteristics possessed by the surrounding environment.Rivers, have a variety of biotic and abiotic components interact to form a braid functional interplay. Components on the river ecosystem will be integrated with each other to form a stream of energy that will support the stability of the ecosystem (Setiawan 2008).

OKU Selatan Regency consists of 19 districts that flowed around 20 rivers. District of WarkukRanauSelatan is one of the districts in the OKU Selatan Regency with the capital city of Kota Batu and there are 16 villages in the district of WarkukRanau Selatan. One of the river that flow in the district of WarkukRanau Selatan is the Warkuk River (Pemda OKU Selatan).WarkukRanau Selatan has upstream headwaters area, and the more sloping towards downstream, with the type of heavy water flow, it can be found various types of substrates bottom waters. Substrate category waters can be found that is rocky, gravelly, sandy and litter. With this type of microhabitat mentioned above, sufficient support for the increasingly varied types of freshwater invertebrates, particularly macrozoobenthos.

Macrozoobenthos is one of aquatic organisms whose existence can be used as a biological indicator of changes in the quality of the waters of the river which has a relatively slow motion and have a relatively long life cycle.Macrozoobenthos is a type of aquatic biota are easily affected by the presence of contaminants, both chemical contaminants, mud, sand or habitats which are generally the accumulation of contaminated materials.Besides the substrate and the addition of pollutants will also affect the abundance, composition and levels of diversity.With a variety of these reasons, the macrozoobenthos is excellent for use as bio-indicators of a biological water quality (Wilhm 1975).

The formulation of the problem is the increasing activity in the vicinity of the Warkuk River can lead to increased volumes of waste generated in the Warkuk River which can cause disruption and changes in the environment of Warkuk River. Therefore, to determine the condition of the water at this point it is necessary to do research on the characteristics of macrozoobenthos communities based on the type of habitat on the

Warkuk River that is: How do the characteristics of macrozoobenthos communities in Warkuk River, physic-chemical factors condition the water in the River Warkuk, and biodiversity of macrozoobenthos in Warkuk River. The purpose of this research is to analyze the characteristics and composition of macrozoobenthos community based on the type of habitat on the Warkuk River, analyze how factors physic-chemical conditions of the water in the Warkuk River and analyze biodiversity Warkukmacrozoobenthos in Warkuk River.

MATERIALS AND METHODS

This study was conducted in May 2013 to December 2015. Sampling was conducted in Warkuk River, District of WarkukRanauSelatan, OKU Selatan. Observation and identification of macrozoobenthos conducted at the Laboratory ofResearch Institute for Inland Fisheries Mariana, Palembang.Sampling stations substrate and macrozoobenthos determined by *Random Sampling Method*. Sampling was carried out at each station substrate with repetition as much as twice, and then composited. There are three stations with four types of substrates are substrates rocky, gravelly, sandy and litter. Station 1 is the coffee plantation areas and situated in the village of Gunung Raya.Station 2 is annatural area is located in the village of Mekar Sari.Station 3 is a densely populated area and is located in the Kota Batu.The distance between stations 1 and 2 is 3.6 km and the distance between stations 2 and 3 is 7 km. The statistic interpretation of the results, after measuring the abundance (Density Population), the Shannon-Wiener Index /Diversity Index (H), the Simpson Index/ Dominance Index (C). To establish the water quality and level water polution, FBI (*Family Biotic Index*) was used. In order to establish the conclusions, corresponding graphic representations were made using Statistic 8 (Scatterplot of relationship between water quality and macrozoobenthos community). The following are presented in the figure:

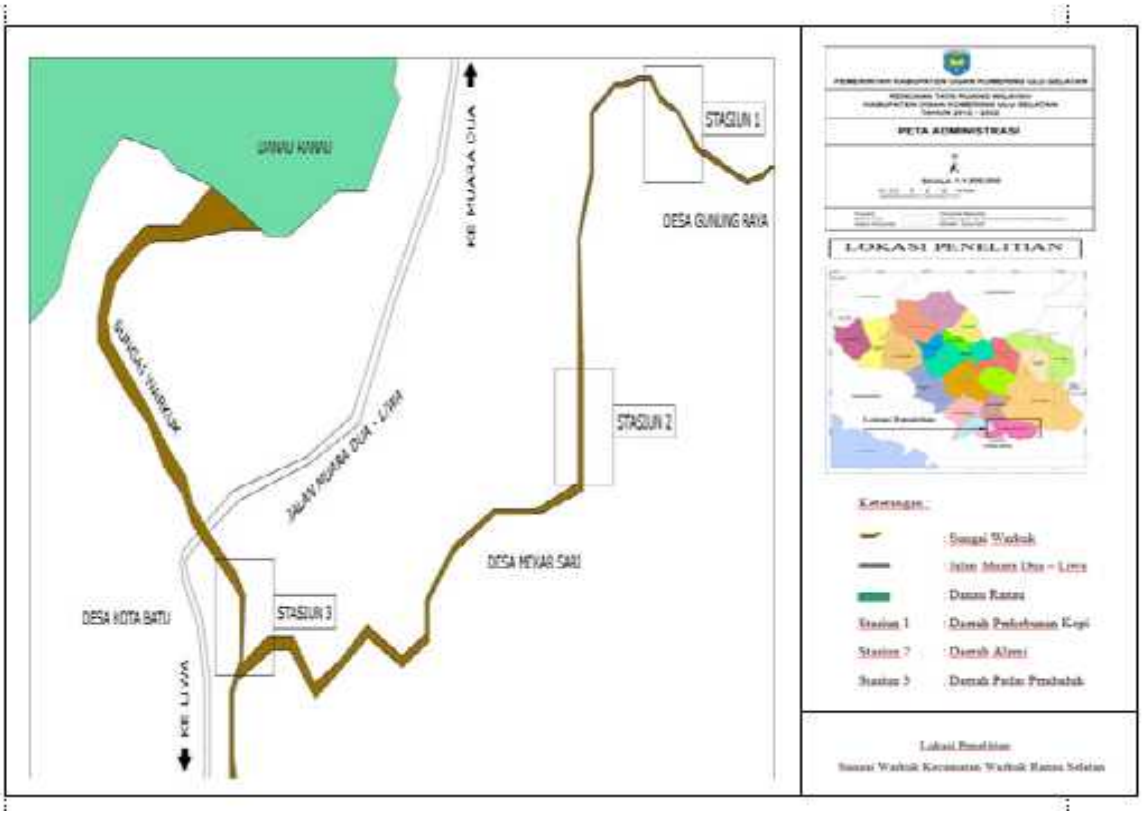


Figure. 1. Map of sampling stations in Warkuk River

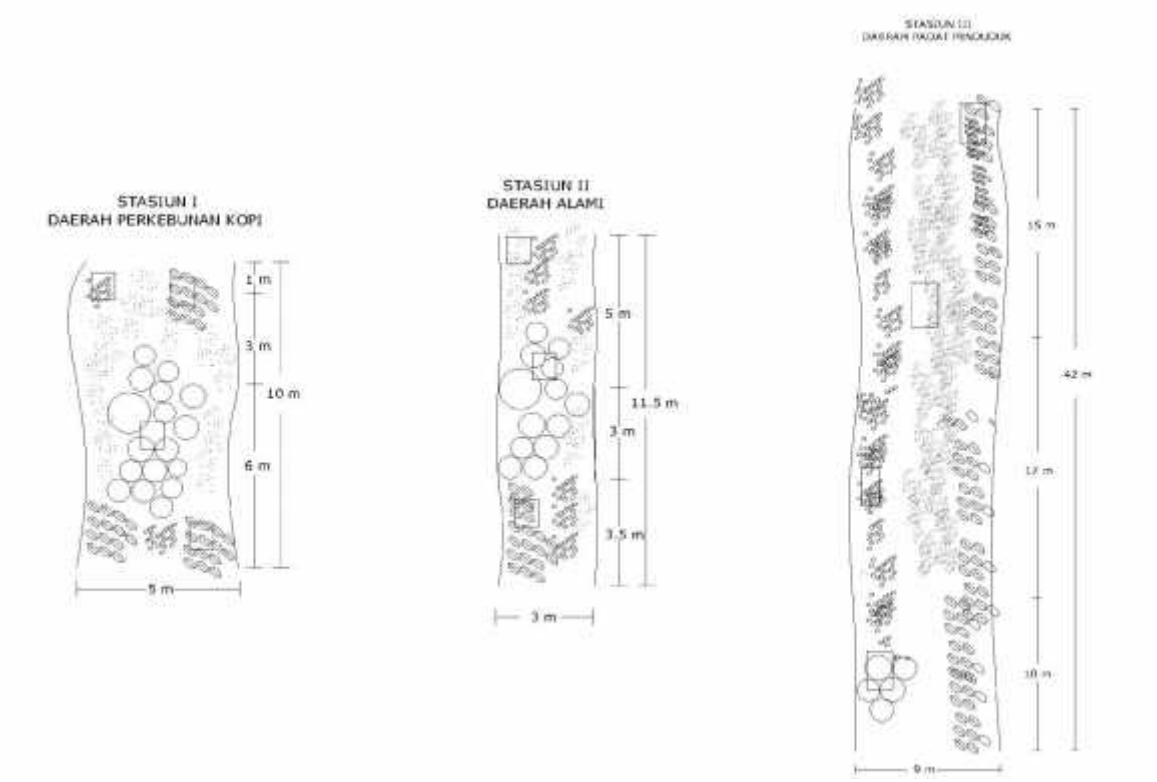


Figure.2. Horizontal Profile of Sampling Area in Warkuk River

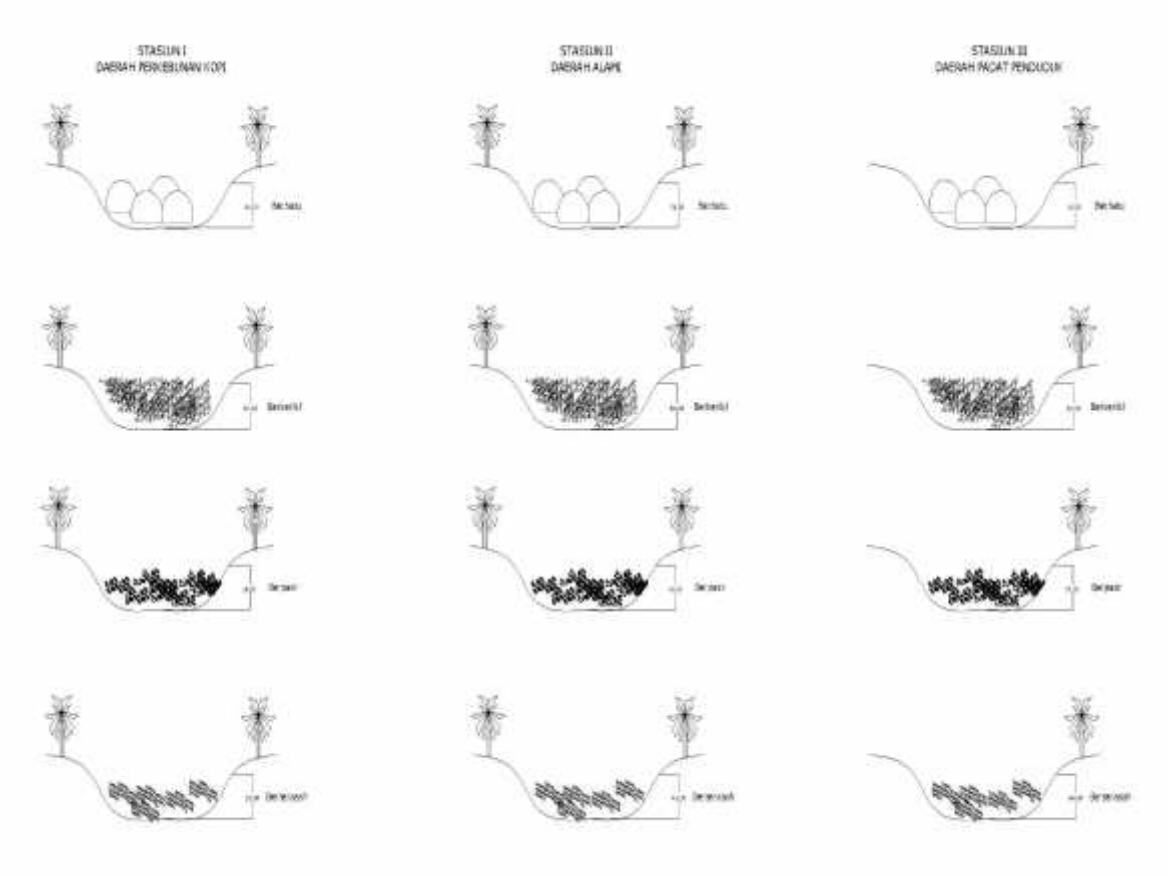
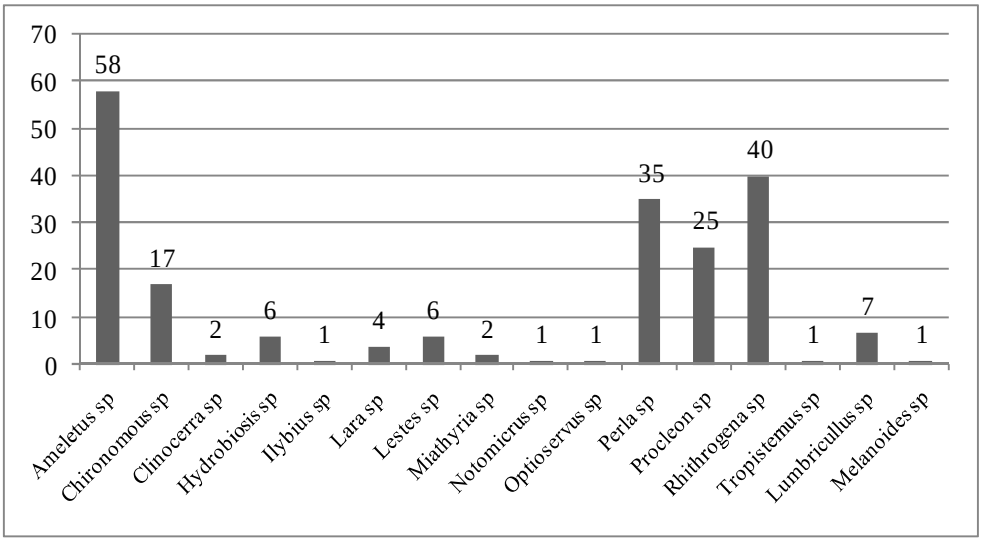


Figure.3. Vertical Profile of Sampling Area in Warkuk River

RESULT AND DISCUSSION

In habitat rocky, gravelly, sandy and litter there are some species that are found in all subsrates type that *Ameletus* sp. were found in the area of coffee plantation (Station 1) and *Rhithrogena* sp. were found in the natural area (Station 2). This is in accordance with the opinion of Hafele (1997)that *Ameletus* sp. found in many natural habitats, example in watersheds near the mountains, cool and clean the area and under the roots of trees.The following are presented in the table.

Table.1. Composition kind of macrozoobenthos in Warkuk River.



Based on the results of composition and density of macrozoobenthos were carried out in coffee plantation areas, natural areas and densely populated areas in the WarkukRiver District of WarkukRanauSelatan Regency of OKU Selatan,obtained 16 genera are classified into three classes, Insecta, Oligochaeta and Gastropoda.Here is presented the composition and density of macrozoobenthos.

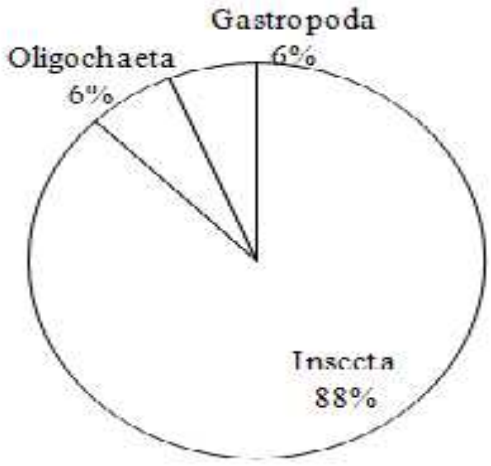


Figure. 2. Percentage Composition Class Macrozoobenthos in Warkuk River

Index value of diversity in the coffee plantation areas, natural and high density ranges from 1.95 to 2.41.The level of diversity of macrozoobenthos in Warkuk River classified as moderate due to river conditions WarkukRiver still good with many types of habitat is rocky, gravelly, sandy and litter. This is in accordance with the opinion of Zulkifli (2009)the type of substrate affects the community structure of macrozoobenthos,

good density, composition and diversity of benthic animals.Dominance index value of diversity in the coffee plantation areas, natural and high density ranges from 1.23 to 1.61.So macrozoobenthos contained in these three stations belonging to dominate because of> 0.5. The following table of Diversity index and Dominance index:

Table.2. Diversity and Dominance of Macrozoobenthos in Warkuk River

Sampling Area	Substrat	Diversity Index (H) (Shannon-Wiener index)	Dominance Index (C) (Simpson index)
Coffee plantation	Rocky	0,52	0,36
	Gravelly	0,73	0,22
	Sandy	0,41	0,44
	Litter	0,56	0,33
Total		**2,22**	**0,34**
Natural	Rocky	0,63	0,26
	Gravelly	0,40	0,50
	Sandy	0,65	0,25
	Litter	0,74	0,22
Total		**2,41**	**0,31**
Densely Populated	Rocky	0,45	0,45
	Gravelly	0,52	0,35
	Sandy	0,38	0,50
	Litter	0,60	0,31
Total		**1,95**	**0,40**

Family Biotic Index (FBI) is indices used to determine the level of pollution of waters by aquatic biota. Based on the composition of macrozoobenthos were found in the River Warkuk, the FBI value can be seen in the following table:

Table. 3. FBI value at observation stations on the Warkuk River

Sampling Area	**FBI Value**	**Category**
Coffee plantation	3,58	Excellent
Natural	3,47	Excellent
Densely Populated	3,98	Excellent

FBI value of the three observation stations included into the category of water quality with excellent and very good condition with a tolerance range around 3.47 to 3.98,this indicates that the water quality is excellent.At the third station is a common group of EPT (Ephemeroptera, Plecoptera, and Trichoptera).This is in accordance with the

opinion ofRidwan (2004) that the EPT group is a type that can not thrive when there is a decrease in water quality and are intolerant.

The relationship between the diversity index. Dominance Index and the FBI (Family Biotic Index) with some parameters can be seen in the following table:

Table.4. R^2 of diversity index, dominance index and the FBI

	Diversity Index	Dominance Index	FBI
R-Square	0.409	0.354	0.708

The coefficient ofdetermination (R^2) diversity index, dominance index and the FBI respectively 0.409; 0.354; and 0.708 means that 40.9%, 35.6% and 70.8% physic-chemical factors affecting the diversity of macrozoobenthos rest influenced by other factors. The equation of multiple linear regression and scatterplot of each index that shows the relationship between water quality and macrozoobenthos community can be seen in Table and Figure below:

Tabel.5. The equation of multiple linear regression

Index	The equation
Macrozoobenthos Community	$Y = 29{,}0019 + 5{,}7211\ x_1 - 0{,}5200\ x_2 + 0{,}0215\ x_3 + 0{,}0080\ x_4 + 0{,}0789\ x_5 - 0{,}0249\ x_6 - 2{,}1745\ x_7$ or $Y = -29{,}0019 + 32{,}112x$

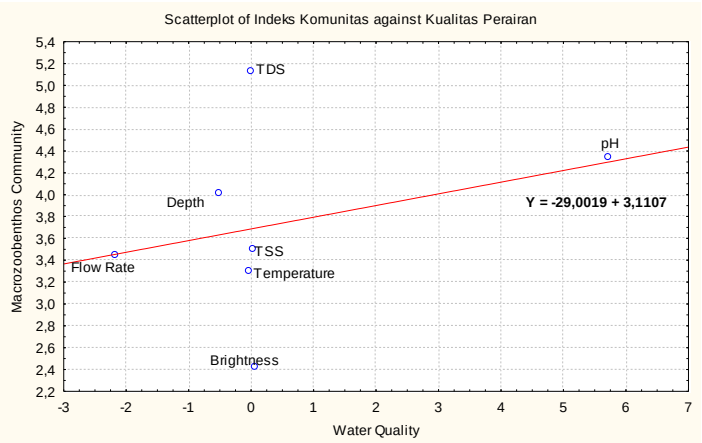


Figure. 3. Scatterplot of relationship between water quality and macrozoobenthos community

From the multiple linear regression equation and a scatterplot of the relationship between water quality with macrozoobenthos community it was concluded that the TSS and TDS on all three indices are positive, which means the higher the value TSS and TDS then the effect on the lives of the higher macrozoobenthos.This is in accordance with the

opinion of Muntalif (2015) that the TSS and TDS is a parameter that has a significant relationship and affects the lives of macrozoobenthos on waters.

CONCLUSION

Based on the research that has been done, then obtained some conclusions as follows:

1. Physical-chemical conditions in general Warkuk river when viewed from the Criterion Class III is still in good condition with temperature values ranged from 21.39 to 26.54 ° C, pH 7.1 to 7.7, the brightness of 40-50 cm, a depth of 35- 90 cm, flow rate from 32.27 to 97.20 cm / sec, TSS 38-66 mg / l, TDS 40-110 mg / L.
2. The composition of macrozoobenthos in Warkuk River consists of three classInsecta, Oligochaeta and Gastropoda. Macrozoobenthos characteristics seen from the relative density of the level of orders that dominate in order Ephemeropthera Warkuk River. *Ameletus* sp., and *Rhitrogena* sp., *Perla*sp., and *Procloeon* sp. a dominant species at each station and the fourth substrate.Diversity index values ranged from 1.95 to 2.41 with a level of diversity of macrozoobenthos moderate. Dominance index values ranged from 0.31 to 0.40 and classified as not dominate because of <0.5. FBI Values ranged 3,47.3,98 with excellent water quality categories..
3. The results of the calculation of the linear regression analysis showed that pH, TSS, TDS and brightness have a relationship that can affect the life of macrozoobenthos.

ACKNOWLEDGMENTS

I wish to express my heartfelt gratitude and sincere appreciation to my advice Dr. Fauziyah, S.Pi and Dr. Zazili Hanafiah, M.Scfor helping me to carry on inthesis.Thanks so much and i would like to express my deep gratitude to my big family and every one involved infinishing this thesis.

REFERENCES

Hafele, R. 1997. *Aquatic Entomologist and Freshwater Biologist*.Published by Oregon Trout as The First Title in The Aquatic Biology Series.21-23 hlm.

Hilsenhoff, W. L. 1988. *Rapid field assessment of organic pollution with a family-level biotic index.* J. N. Am. Bentol. Soc. 7: 65-68.

Muntalif, B. 2015. *Relationship Population Density of Aquatiq Sediment Macrozoobenthos to River Water Quality Parameters*. The Third Joint Seminar of Japan and Indonesia Environmental Sustainability and Disaster Prevention (3_{rd} ESDP-2015). ITB. Bandung.

PemerintahKabupaten OKU Selatan.2012. *Kabupaten OKU Selatan*. http://indonesia.travel/id/destination/156. Diaksespadatanggal 18 Maret 2013.

Ridwan, D. 2004. *Komunitas Makrozoobenthos Sebagai Indikator Perairan Sungai Ciliwung.*IPB. 71 hlm.

Setiawan, D. 2008. Penentuan Status Terkini Tingkat Degradasi Kualitas Lingkungan Perairan Hilir Sungai Musi Berdasarkan Pola Pengelompokan Sebaran Biota Terpadu Benthos. Hibah Penelitian. Universitas Sriwijaya. Inderalaya.

Sinaga, T. 2009. *Keanekaragaman Makrozoobenthos Sebagai Indikator Kualitas Perairan Danau Toba Balige Kabupaten Toba Samosir*. Tesis Magister Sains. Fakultas Pasca Sarjana. Universitas Sumatera Utara. Medan.

Wilhm, J. L. 1975. *Biological Indicator of Pollution Dalam Whitton, B. A. 1975.* River Ecology Blackwell Scientific Publication, London. 375-402.

Zulkifili, H. 2009. *Struktur dan Fungsi Komunitas Makrozoobenthos di Perairan Sungai Musi Kota Palembang: Telaah Indikator Pencemaran Air*. ProsidingSeminarNasionalBiologi. FMIPA Biologi Universitas Sriwijaya .Inderalaya.