# RELATIONSHIP POPULATION DENSITY OF AQUATIC SEDIMENT MACROZOOBENTHOS TO RIVER WATER QUALITY PARAMETERS

## (Case Study: Citarum Upstream, Subdistrict Kertasari, Bandung Regency)

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**Abstract:** The increase in anthropogenic activities that occur along the Citarum river basin upstream segment, District Kertasari, Bandung regency, have a negative impact on water quality of the river with the presence of input waste into the water body which is the remainder of the result of human activity, and also cause disruption to the aquatic biota that live in it. The purpose of this study was to determine the relationship of the changes conditions of water and sediment parameters on macrozoobenthos populations. The results showed that based on the Pearson correlation analysis are known parameters COD, TOC and silt have the highest correlation value of the macrozoobenthos population density of 0.966, 0.865 and 0.576. In addition, with the use of PCA analysis known that water temperature, TSS, turbidity, TOC, COD, BOD and water pH is a major component of water parameters that affect the density of macrozoobenthos. Whereas, for the parameters of sediment obtained that parameter silt substrat, clay substrat, total phosphate sediment and gravel that affect the density of macrozoobenthos. The results also showed that based on biotic index (BMWP-ASPT) water conditions were in polluted condition of mild to severe, and from the pollution index (IP) shows the light polluted conditions.

**Keywords**: Citarum upstream, macrozoobenthos population density, water quality, correlation

## INTRODUCTION

The increase in anthropogenic activities in Citarum has a negative impact on water quality of the river. In the upstream segment CRB has a lot of land use around the river as a residential location, industry, agriculture and livestock. Even in areas close to the Citarum river springs located in Situ Cisanti, has seen the disposal of waste from livestock activities are discharged through the sewers that flow into water bodies subsidiary of Citarum River (Cita Citarum, 2011). As a result of the increase in the load of waste that goes into the water body, besides a decline in water quality, also lead to the disruption of aquatic biota that live in it (Ishaq and Khan, 2013).

One of the biotic components waters often studied the impact of anthropogenic activity in the river is macrozoobenthos. Aquatic biota is an important component in the biological assay (bioassessment) in order to evaluate the overall quality of water resources, ecological functions, as well as the specific influence of anthropogenic activities. Disruption that occurred in the biota due to contamination toxic pollutants may be physiological disorders, such as increased respiration, defect morphology, and there is a larger scale ecological balance disturbance (Sudarso, 2009). Chopra et al. (2012) says that the river has brought the role of industrial waste, urban sewage, fertilizer runoff from agriculture and water carried by the current, and one organism to be affected from such pollution is macrozoobenthos. Research has been done by Muntalif et al. (2008), shows that there has been a decline in water quality in the upper Citarum river flowing along with the flow in the downstream direction that passes through residential areas, dairy farming and agriculture, which contributes to advise the burden of residual waste community activity results in a stream.

This study was conducted to determine the distribution of macrozoobenthos populations that occur along the Citarum River upstream of the conditions that have not been polluted waters up polluted waters, which include population density, species composition and keanekeragaman types of macrozoobenthos. The results of this study are expected to be useful as information for the parties concerned in decision-making according to the conditions existing in the Citarum River management efforts for the welfare of the population and the sustainability of both the living biota in the Citarum River and the people whose lives depend in flow Citarum River.

## METHODOLOGY

The study was conducted in the upper reaches from Mount Wayang Citarum River up to Wangisagara village with 7 specified sampling locations , where the station 1 to 4 with the surrounding natural conditions and station 5 to 7 to ambient conditions there has been human activity. The measurement of physical and chemical parameters of water conducted in situ and in the laboratory. For the measurement of the parameters in the laboratory, water samples taken by the composite sampling method + 2 liters from each sampling location, then water samples are stored in a cool box. Water parameters to be measured is the flow velocity, turbidity, brightness, TDS, TSS, temperature, DO, BOD, COD, pH, total N and total P.

Macrozoobenthos Sampling was conducted using random sampling using a Surber net with a mesh size of 500 lm. Then do the preservation of the macrozoobenthos samples with administration of 4% formalin solution. Sediment sampling as much as + 500 grams each sampling location. Sediment samples then will be analyzed to determine the distribution of sediment particles, total organic carbon content (%), total nitrogen (%), and phosphate (mg / kg).

Then proceed with the analysis of data begins, to the calculation the number of population density of macrozoobenthos. Furthermore, the calculation of the value of diversity index (H ') in each station. The use of biotic index (BMWP-ASPT) to determine the quality of the waters (Mandaville, 2002) as well as the pollution index (IP) as a comparison (Decree LH, 2003). Pearson correlation analysis is used to predict the relationship between the parameters of water, sediment and sediment particle distribution of the biological parameters. The test is used to determine the relationship between the parameters of water, sediment and sediment particle distribution (% gravel,% sand,% silt and% clay) on the abundance of macrozoobenthos. Principle Component Analysis or principal component analysis to determine the relationship between the density of macrozoobenthos with water and sediment quality parameters in the upstream Citarum River. The calculation of the statistical analysis performed using SPSS software ver. 20:00

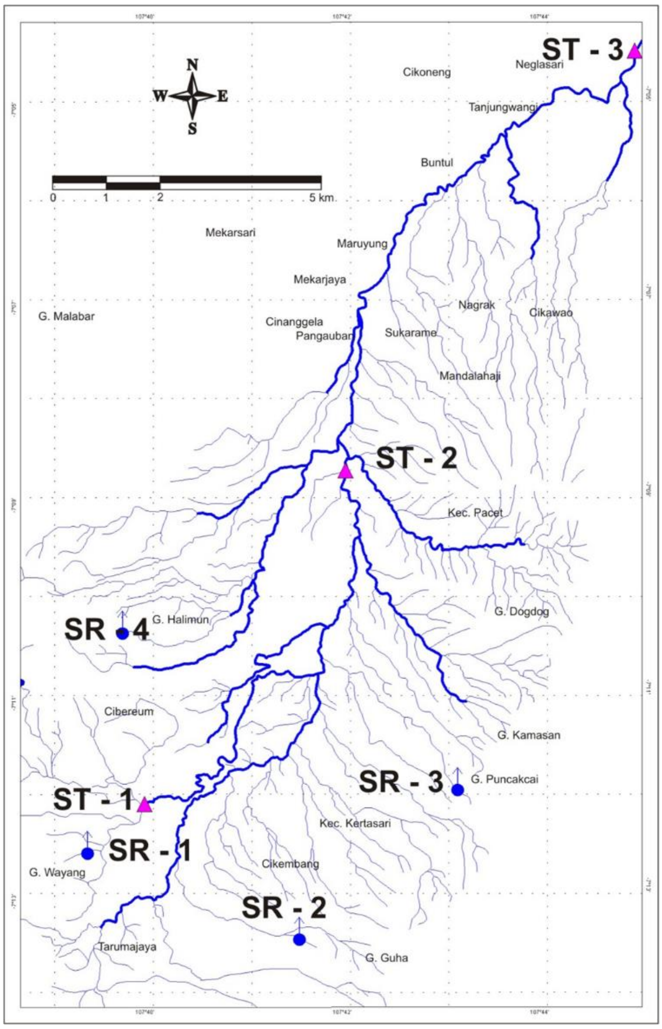


**Figure 1.** Sampling Site Map

## RESULTS AND DISCUSSION

### Overview of Sampling Stations

Sampling stations were determined as refference site with conditions that have not been disturbed by 4 points located in 4 different Citarum river basin located in Gunung Wayang, Gunung Guha, Gunung Puncakcae and Gunung Halimun. Conditions surrounding the sampling station still crowded with riparian vegetation. In addition, those sampling stations have relatively similar physical characteristics, in terms of water depth, substrate type and width of the river water. The water depth of four stations ranges from 3 cm to 5 cm, and the width of the river ranges from 14 cm to 4 meters. Station 4 has the lowest vegetation density of 3 other stations. It can affect the water temperature caused by higher light intensity. Type substrate of bottom river of the four stations is almost similar which is dominated by gravel and sand.

The other sampling station determined based on the utilization of the different areas around the river, such as livestock and agricultural area (station 5), housing (station 6) and sand mining (station 7). The depth of water from the three stations ranged from 43 cm to 70 cm, with the deepest is located at station 7. The width of the river water ranged from 5.5 m to

17 meters, where the station 7 with the largest width of the river water. The water temperature was measured range between 22,2 °C to 22,7 °C. The narrow temperature range around the river due to similar conditions with lack of riparian vegetation that grows around the river flow. Substrate types were observed in the different stations with two other stations, namely rocky and sandy, while the other station types of substrates such as hard rock and muddy.

**Physical And Chemical Parameters River Water Bodies**

Here is the result of the measurement of physical and chemical parameters of the river waters

**Table 1**. Physical and Chemical Parameter Water

| Parameter | Satuan | Stasiun | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | |
| | | I | II | I | II | I | II | I | II | I | II | I | II | I | II |
| **Temperature** | ºC | 19,8 | 20,3 | 16,4 | 16,4 | 18,1 | 17,6 | 20,7 | 24,5 | 22,3 | 22,4 | 22,2 | 24 | 22,7 | 26,1 |
| **Turbidity** | NTU | 15,4 | 16,7 | 13,7 | 10,2 | 22,7 | 3,3 | 34,3 | 53,2 | 126 | 29,2 | 90,1 | 32,1 | 76,3 | 21,6 |
| **Current Velocity** | m/s | 1,08 | 0,2 | 1,2 | 0,2 | 0,4 | 0,3 | 2,1 | 0,2 | 0,5 | 0,4 | 1,2 | 0,4 | 0,9 | 0,5 |
| **TDS** | mg/L | 167 | 221 | 94 | 32 | 41 | 21 | 81 | 7 | 123 | 183 | 93 | 123 | 112 | 106 |
| **TSS** | mg/L | <1 | 10 | 11 | 16 | <1 | 15 | <1 | 29 | 225 | 38 | 106 | 34 | 93 | 23 |
| **pH** | -- | 7,8 | 7,46 | 7,4 | 6,2 | 7,2 | 7,13 | 8 | 7,76 | 8,1 | 7,6 | 8,45 | 8,16 | 8,3 | 7,8 |
| **DO** | mg/L | 7,88 | 7,30 | 8,09 | 8,12 | 8,01 | 6,97 | 7,87 | 7,58 | 7,5 | 7,84 | 6,8 | 7,97 | 8,12 | 7,87 |
| **COD** | mg/L | 11,2 | 7,57 | 22,3 | 7,57 | 11,2 | 7,57 | 11,2 | 30,4 | 89,3 | 53,2 | 11,2 | 15,2 | 27,9 | 38 |
| **BOD** | mg/L | - | 4,66 | - | 4,58 | - | 4,54 | - | 13,68 | - | 24,67 | - | 7,26 | - | 18,48 |
| **Total P** | mg/L | 0,11 | 0,35 | 0,05 | 0,15 | 0,05 | 0,03 | 0,04 | 0,55 | <0,01 | 0,83 | 0,06 | 0,26 | 0,07 | <0,01 |
| **NTK** | mg/l | 0,87 | 1,63 | 0,87 | 2,71 | 2,36 | 2,17 | 2,95 | 2,71 | 2,66 | 8,66 | 3,55 | 3,79 | 2,36 | 2,17 |
| **TOC** | mg/L | 2,87 | 2,87 | 0,8 | 2,87 | 1,31 | 0,8 | 1,83 | 0,8 | 5,45 | 4,42 | 5,45 | 2,35 | 2,87 | 5,45 |

Based on **Table 1** known that there were some chemical parameters with different concentrations significantly between refference site stations (stations 1-4) to the station with the flow of the river is polluted (stations 5-7), including the temperature, TSS, turbidity, total N, COD and conductivity. Water temperature measured at 5-7 stations ranged between 22.2 to 22.7 C. The high temperature at the station compared with 1-4 stations, because riparian vegetation through which the river flows is minimal so that the penetration of sunlight can be easily into the waters of the river. According to Whitehead *et al.* (2009), an increase in water temperature will affect the chemical reactions and is associated with a reduction in water quality and ecological status of freshwater. The high level of TSS concentration at 5-7 stations caused by particulate inputs from the riparian areas that have changed function into open land, such as agriculture, residential, traditional sand mining and ranching. Similarly, the turbidity values were higher than the station realitf 1-4. The difference in turbidity value is presumably due to differences in flow velocity in each section of the river. The effect of a slower flow causes the accumulation of material suspended solids greater.

In addition, at 5-7 stations there was an increase nitrogen concentration (NTK). Presumably the increase was because the number of inputs of organic matter that comes from agricultural areas due to the use of nitrogen fertilizer around the river carried away by runoff water. Moreover, domestic waste from human settlements and farms also contribute to the increase of the nitrogen concentration. The highest COD concentration is located at station 5 with an average concentration of 89.3 mg / L. High COD value at the station at this location due to the load input of organic material has a large enough from settlement, a dairy farm and agriculture around the river, it is similar with the statement of Al-Shami *et al.* (2011) that the high value of COD in water is caused by a number of contaminants that enter the waters, especially organic pollutants from household waste, industrial, rice fields and aquaculture.

**Distribution of Sediment Particles**

The main factor that determines the spread of macrozoobenthos is aquatic sediments in the form of sand, clay and silt gravel and rocks, the composition determines the type of makrozoobenthos. Here is the result of sediment particle distribution subsrat sample stream.

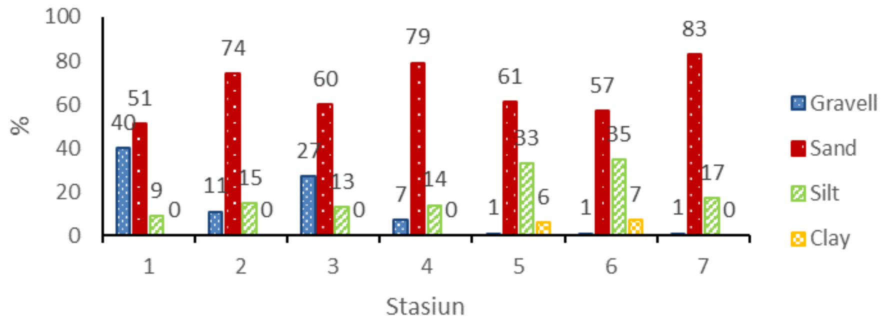


**Figure 2. Distribution of Sediment Particles**

Based on **Figure 2**, it is known that the highest percentage of fractions at each station is sand. The percentage of sand fraction is highest at Station 7 in the amount of 83%, while the lowest was in station 1 is 51%. Sediment type is one factor that determines the spread of the type of benthos. The results of the sediment fraction and texture of sand fraction showed the greatest presentation compared to other sediment particle size. Nybakken (1992) stated that the sand has a nutrient and water holding capacity that is not too good but good infiltration and aeration. The number of benthos that live in the sand substrate showed that sediment type is fairly well correlated to the water circulation that regulates moisture and supplies oxygen and nutrients.

In addition, the results of measurements of organic matter content in the sediment in the waters of the Upper Citarum River showed that organic C content ranged from 33.85% - 47.63%, with the lowest percentage found in station 6 and the highest at station 2. For the total content N (NTK) ranged from 1.03% - 1.22%, the lowest percentage found in station 4 and highest at station 2. For the phosphate content ranged from 316.42 mg / Kg - 1002.19 mg / kg, with the lowest content found on three stations and highest at station 5.

**Macrozoobenthos**

Based on observations of macrozoobenthos in the upstream flow Citarum River Kertasari District, Bandung Regency in 2 times of sampling, was found 87 genera, which is 68 genera of the class Insecta, 3 genera of the class Hirudinae, 3 genera of the class Oligochaeta, 5 genera of the class Gastropoda, 5 genera of the class Malacostraca, one genus of the class Bivalvia, 1 genus of Adenophorea class and one genus of Diplopoda class. In **Figure 3** are known that from twice sampling, the most species of macrozoobenthos were found in station 1 with 32 genera, meanwhile in station 6 only found the least about 12 genera. The lack genera found in Station 6 is affected by the condition of the river waters are dominated by rocky substrate, so that only certain types of macrozoobenthos are able to live on the substrate.

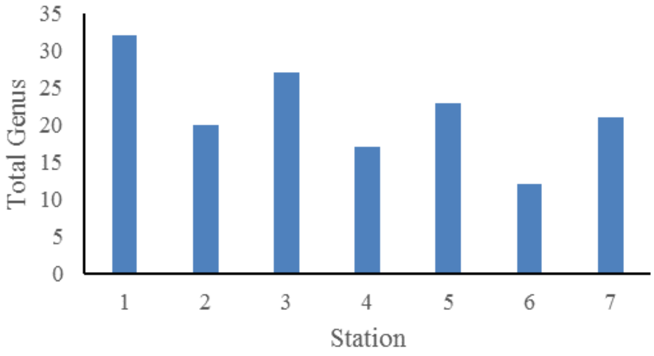


**Figure 3**. Number of Species Macrozoobenthos

The most species of macrozoobenthos were found at station 1 indicates that water conditions at the station can be said to be in good condition, so it can support the life of the various species of aquatic biota. Meanwhile, the least were found at station 6, describing the condition of the water is bad, because it is only able to support life in some kind of macrozoobenthos were tolerant to the water conditions.

Based on **Figure 4**, shows that the highest population is macrozoobenthos at station 5 and station 7. A large number of species found at station 1 does not show the number of higher population density. Another case with the five stations that have the highest population density among the six other stations. That is because there are two species of macrozoobenthos that dominates at the station, that *Chironomus* and *Polypedilum*. Both species are known to go into the family Chironomidae, which the family is known to have the ability to adapt to the condition of waters with high pollution levels. In addition, it is also supported by the ability to form colonies, increase the chances of reproducing are higher than with other species of family (Zaha and Mazumdar, 2013).

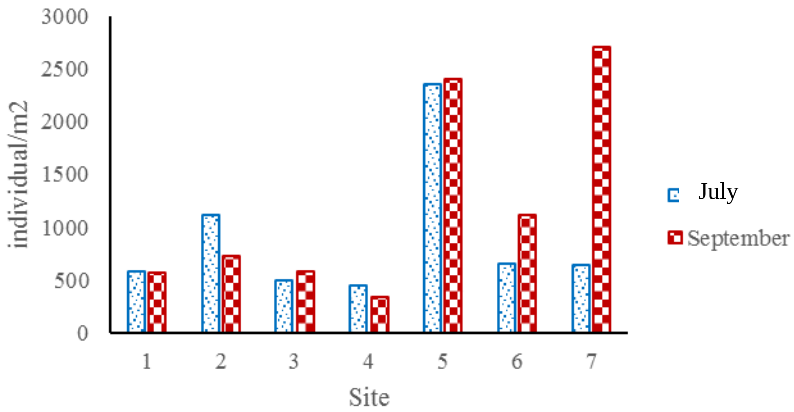


**Figure 4**. Population Density of Macrozoobenthos

The highest diversity index (H ') value, was found at station 1, that is equal to 2.48. This value is influenced by many different species was found and the population density of each species. Known in advance that station 1 is the station with the largest genus that found of 32 genus. In addition, there were no genus dominating the population density, which is population density of each genus is almost evenly. As with the stations 6 and 7, which has a diversity index value of 0.49 and 0.4. There was a genus of the family Chironomidae who have abundant population density compared to other genus, and also the amount of genus are found relatively few, which is only 12 genera.

**River Water Quality Assessment**

Biotic indices used in the assessment of water quality status Citarum River upstream, District Kertasari, Bandung Regency is an index Biological Monitoring Working Party-Average Score Per Taxon. Based on the value of ASPT, Citarum River upstream have ASPT values range between 2.91 to 5.86. It shows that the condition of river water into the level of light pollution to heavy pollution. Lowest index value was obtained at station 5 by 2.91. The low value of the biotic index because there is genus with a low scoring rate, which comes from the family Chironomidae, Hirudinae, Oligochaeta and Gastropoda. The family belongs to the group of macrozoobenthos that kind of cosmopolitan or can adapt to various environmental conditions (Zeybek et al. 2014).

Pollution Index (IP) obtained from the seven stations ranged from 1.62 to 4.13. The highest IP value obtained at station 5 and the lowest at station 3. The high value of IP at station 5 is because there is some water parameters that exceed water quality standards, such as BOD and COD. Sewage that comes from around the waters had a major contribution to the concentration of these two parameters, especially the waste that comes from a dairy farm. However, the value of IP is still included in the group lightly polluted.

**Relationship Between Biological Parameters to Water and Sediment Parameters**

Based on Pearson correlation analysis between the diversity of macrozoobenthos to water and sediment parameters within two sampling times (Table 2 and Table 3) was obtained parameters with the highest positive correlation value was the total phosphate (+0.33), TDS (+0.78) and substrate gravel (+0.91), while the parameters with the highest negative correlation value is pH (-0.75), DO (-0.5) and the sand substrate (-0.69).

At the first sampling, it is known that the total phosphate is the parameter with the highest positive correlation value. However, when viewed from the significance value which is more than 0.05 can be said that these parameters haven't significant relationship to diversity of macrozoobenthos. Another case in the second sampling, TDS is known as the parameter with the highest correlation value, has a significance which is less than 0.05, so it can be said that these parameters have a significant and strong relationship to diversity of macrozoobenthos. Correlation value of gravel whether on the first and second sampling is the highest, and the significance value of 0.05 so that it can be said that the relationship between the diversity of macrozoobenthos to gravel parameters are very strong and significant.

**Table 2.** Results of Pearson Correlation Analysis Betweem Diversity of Macrozoobenthos to Water Parameters

| | Flow | Temperature | TDS | TSS | pH | DO | Turbidity | NTK | P | COD | TOC | BOD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Diversity (1) | -0,14 | -0,57 | 0,02 | -0,42 | -0,75 | 0,31 | -0,54 | -0,54 | 0,33 | -0,17 | -0,34 | |
| sig. (1) | 0,77 | 0,18 | 0,96 | 0,36 | 0,05 | 0,50 | 0,22 | 0,21 | 0,47 | 0,72 | 0,45 | |
| Diversity (2) | -0,06 | -0,08 | 0,78 | -0,38 | 0,17 | -0,50 | -0,19 | -0,05 | 0,23 | -0,14 | 0,10 | -0,12 |
| sig. (2) | 0,89 | 0,86 | 0,04 | 0,41 | 0,71 | 0,25 | 0,68 | 0,92 | 0,63 | 0,77 | 0,83 | 0,80 |

**Table 3.** Results of Pearson Correlation Analysis Betweem Diversity of Macrozoobenthos to Sediment Parameters

| | C-Organic | NTK | Phosfat | pH | Gravel | Sand | Silt | Clay |
|---|---|---|---|---|---|---|---|---|
| Diversity (1) | 0,34 | 0,01 | -0,56 | 0,12 | 0,91 | -0,64 | -0,50 | -0,34 |
| sig. (1) | 0,45 | 0,98 | 0,19 | 0,80 | 0,01 | 0,12 | 0,25 | 0,45 |
| Diversity (2) | 0,67 | -0,63 | 0,70 | -0,32 | 0,73 | -0,69 | -0,25 | -0,06 |
| sig. (2) | 0,10 | 0,13 | 0,08 | 0,48 | 0,06 | 0,09 | 0,59 | 0,90 |

Pearson correlation analysis between population density of macrozoobenthos to water and sediment parameters was obtained parameters with the highest positive correlation values, which is COD (+0.96), TOC (+0.89) and mud substrates (+0.58), while the parameters with values The highest negative correlation is the total phosphate (-0.69), pH (-0.85) and gravel substrate (-0.59).

Correlation value, either COD or TOC, to population density of macrozoobenthos showed a very strong relationship, and the significance of each value of less than 0.05 can be considered as a significant relationship. In addition, the negative correlation value of pH sediment have a very strong relationship to population density of macrozoobenthos and the significance value of 0.05 resulted in a significant relationship.

**Table 4.** Results of Pearson Correlation Analysis Betweem Density of Macrozoobenthos to Water Parameters

| | Flow | Temperature | TDS | TSS | pH | DO | Turbidity | NTK | P | COD | TOC | BOD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Density (1) | -0,43 | 0,21 | 0,27 | 0,81 | 0,12 | -0,19 | 0,66 | 0,02 | -0,69 | 0,97 | 0,50 | - |
| sig. (1) | 0,34 | 0,66 | 0,56 | 0,03 | 0,79 | 0,69 | 0,11 | 0,98 | 0,09 | 0,00 | 0,25 | - |
| Density (2) | 0,62 | 0,52 | 0,40 | 0,47 | 0,30 | 0,43 | 0,01 | 0,52 | 0,11 | 0,77 | 0,90 | 0,80 |
| sig. (2) | 0,14 | 0,24 | 0,37 | 0,28 | 0,51 | 0,33 | 0,99 | 0,23 | 0,82 | 0,04 | 0,01 | 0,03 |

**Table 5.** Results of Pearson Correlation Analysis Betweem Density of Macrozoobenthos to Sediment Parameters

| | C-Organic | NTK | Phosfat | pH | Gravel | Sand | Silt | Clay |
|---|---|---|---|---|---|---|---|---|
| Density (1) | 0,18 | 0,25 | 0,48 | -0,85 | -0,38 | -0,13 | 0,58 | 0,54 |
| sig. (1) | 0,70 | 0,59 | 0,27 | 0,02 | 0,40 | 0,78 | 0,18 | 0,21 |
| Density (2) | -0,03 | -0,54 | -0,36 | 0,32 | -0,59 | 0,27 | 0,49 | 0,36 |
| sig. (2) | 0,95 | 0,22 | 0,43 | 0,49 | 0,17 | 0,56 | 0,26 | 0,43 |

To determine the most influential environment parameters between population density of macrozoobenthos to the water and sediment parameters used statistical analysis such as Principle Component Analysis (PCA) to reduce the variables into several factors. The percentage of the form factor representing each independent variable can be seen from the value of communality.

The results of PCA analysis of water parameters in July showed that only one factor was formed fromfour water parameters. Based on **Table 6** shows that the turbidity and TOC is a variable that has the highest communality value of 4 parameters. For variable turbiditya, was obtained a value of 0.962. It shows about 96.2% turbidity variable can be explained by factor formed. For variable TOC, was obtained a value of 0.883. It shows about 88.3% TOC variable can be explained by formed factor.

**Table 6**. Communality Value of Water Parameters (July) on Formed Factor

**Communalities**

| | Initial | Extraction |
|---|---|---|
| Suhu | 1,000 | ,764 |
| TSS | 1,000 | ,877 |
| Kekeruhan | 1,000 | ,962 |
| TOC | 1,000 | ,883 |

Extraction Method: Principal Component Analysis.

The results of PCA analysis of water parameters in September showed that the water of 5 variable parameters only formed one factor. Based on **Table 7** is known that the BOD and COD variable is the variable with the highest commonality value with the formed factor. For BOD variables, was obtained a value of 0.789. It shows about 78.9% BOD variable can be explained by formed factor. For COD variables, was obtained a value of 0.818. It shows about 81.8% COD variable can be explained by formed factor.

**Table 7**. Communality Value of Water Parameters (September) on Formed Factor

**Communalities**

| | Initial | Extraction |
|---|---|---|
| Suhu | 1,000 | ,762 |
| COD | 1,000 | ,818 |
| BOD | 1,000 | ,789 |
| pH | 1,000 | ,567 |
| TSS | 1,000 | ,726 |

Extraction Method: Principal Component Analysis.

The results of PCA analysis of sediment parameters in July indicates that from 5 variable of sediment parameters were only formed one factor. Based on **Table 8** is known that variable silt and clay is the variable with the highest commonality value to the formed factor. For variable silt, was obtained a value of 0.966. It shows about 96.6% mud variable can be explained by factors that are formed. For variable clay, was obtained a value of 0.968. It shows about 96.8% TOC variable can be explained by factors that are formed.

**Tabel 8**. Communality Value of Sediment Parameters (July) on Formed Factor

**Communalities**

| | Initial | Extraction |
|---|---|---|
| COrganik | 1,000 | ,541 |
| pHsedimen | 1,000 | ,416 |
| Lumpur | 1,000 | ,966 |
| Liat | 1,000 | ,968 |

Extraction Method: Principal Component Analysis.

The results of PCA analysis of sediment parameters in September showed that from 4 variable of sedimen parameters were only formed one factor. Based on **Table 9** it is known that the total phosphate and gravel variable is the variable with the highest commonality value do the formed factor. For variable total phosphate, bas obtained a value of 0.897. It shows about 89.7% of total variable phosphate can be explained by factors that are formed. For variable gravel, was obtained a value of 0.829. It shows about 82.9% gravel variable can be explained by factors that are formed.

**Tabel 9**. Communality Value of Sediment Parameters (September) on Formed Factor

**Communalities**

| | Initial | Extraction |
|---|---|---|
| COrganik | 1,000 | ,632 |
| Psedimen | 1,000 | ,897 |
| Kerikil | 1,000 | ,829 |
| Lumpur | 1,000 | ,592 |

Extraction Method: Principal Component Analysis.

## CONCLUSION

Based on Pearson correlation analysis known that COD and TOC has the highest positive correlation values to a population density of +0.966 and +0.895 macrozoobenthos, whereas for sediment sludge parameters have the highest correlation value of +0.576. In addition, total phosphate and TDS parameters have positive correlation value to diversity of macrozoobenthos of 0.33 and 0.78, while for the gravel and sediment parameters phosphate has the highest correlation value of +0.91 and +0.696. Environmental parameters that most influence on the population density of macrozoobenthos, based on the analysis of PCA are water temperature, TSS, turbidity, TOC, COD, BOD and water pH. Whereas, for the parameters of sediment obtained that parameter silt substrat, clay substrat, total phosphate sediment and gravel that affect the density of macrozoobenthos.Conditions waters assessed from biotic index BMWP-ASPT in 6 stations were in lightly to moderate polluted, except in station 5 with heavily polluted conditions, whereas if assessed from pollution index (IP) those 7 station were in lightly polluted state.

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