

Community Structure of Benthos in Gajah Mungkur Reservoir Wonogiri, Central Java

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Abstract

Sunarto. 2013. Index of diversity as a basis in determining the benthos community structure influenced by environmental factors in Gajah Mungkur Reservoir, Wonogiri, Central Java. Gajah Mungkur Water Reservoir is a man made body water that serves as a flood control as well as a place for fishery, tourism, hydroelectric, and irrigation. The quality of the water highly depends on the humans' activities, including their dealing with the waste, tourism activities, and fishery activities making use of cages. Waste can cause hyper-nitrification accompanied by sedimentation, hypoxia, and siltation. The benthos community structure is possibly influenced by environmental factors based on benthos biodiversity index. The purpose of this study was to examine the influence of phisical and chemical invironmental to the community structure of benthos based on the diversity index to figure out the impact of the physical and economical environment factors on the benthos community structure based on diversity index. The sample was collected from six areas at six zones: (i) the inlet (the springhead of Keduang River), (ii)traditional fisheries,(iii) tourism area, (iv) conservation, (v)nerawin area, and (vi) the outlet. The observed environmental factors include temperature, the degree of water's purity, pH, DO, nitrate, phosphate, calcium and magnesium. The results showed that the environmental factors do have impact on the benthos community structure based on diversity index. Therefore Gajah Mungkur water reservoir was considered still feasible for the benthos habitat and for other purposes as required in the government regulations.

Keywords: diversity index, community structure, benthos, Gajah Mungkur Reservoir Wonogiri, environmental factors

1. Introduction

Gajah Mungkur Water Reservoir was one of the largest dam in central Java which was very potential to serve as the flood control, a place for fishery, tourism, hydro-electric and irrigation. Due to the hummans activities including agricultural purposes , natural soilerosion and many humans' activities causing a lot of solid and fluid waste and involving the nature process, the reservoir's function has a bit altered. The waste has caused hyper-nitrification that is accompanied with the increase of sedimentation, siltation, hypoxia and the changes on the productivity, community structure and the benthos diversity index.

Benthos is a group of organism which lives in or on the surface of sediment on the bottom of body water. They have a subtle sensitivity to certain polluting materials. Their characteristics are low mobile, easy to catch and have a long life span. Therefore benthos have their role in determining the balance of water ecosystem , and can also be use as indicator for the recent state of certain ecology in a certain areas.

Ecosystem with more variations of the living organisms or species is belance to see more stable and is less influenced by the external factors compared to the one with fewer variations (Boyd 1999). The diversity of species can be used as a parameter which is often used to figure out the degree of stability and balance of a certain habitat. According to Widodo (1997), the main factors determining the number of benthos, were the diversity of species, domination of the damage on the natural habitat, chemical pollution and climate change.

The importance of knowing the benthos community structure based on the index of diversity is as the indication of the recent condition of an ecosystem in a certain area and also as information about the natural richness contained in certain body water; as studied by Wiryanto and Pitoyo (2002) and Permana (2003). The **benthic zone** is the ecological region at the lowest level of a body of water such as an ocean or a lake, including the sediment surface and some sub-surface layers. Organisms living in this zone are called benthos, e.g. the benthic invertebrate community, including crustaceans and polychaetes.[1] The organisms generally live in close relationship with the substrate bottom and many are permanently attached to the bottom. The superficial layer of the soil lining the given body of water, the benthic boundary layer, is an integral part of the benthic zone, as it greatly influences the biological activity which takes place there. Examples of contact soil layers include sand bottoms, rocky outcrops, coral, and bay mud.

Table 1. Physic and Chemical Paramater Table

Parameter	Station					
	I	II	III	IV	V	VI
Temperature (°C)	25.01	32.15	30.68	28.28	29.28	28.69
Purity (cm)	33.75	43.09	33.8	36.9	41.59	41.9
pH	7.89	7.96	8.5	8.15	7.49	8.08
DO (ppm)	6.58	5.15	5.75	5.90	6.43	7.29
Nittrate(NO3) (ppm)	978.42	441.49	189.80	521.60	1940.89	699.90
Phospate (ppm)	0.06	0.28	0.17	0.06	0.09	0.25
Calcium (ppm)	237.00	155.98	280.00	259.90	169.01	156.01
Magnesium (ppm)	144.01	522.98	107.00	158.00	443.90	473.98

2. Review Of Literature

The major oceanographic efforts to study the organism and their environments Initiated As expeditions under the leadership of differentr investigators using various Research vessels from time to time. Italians, Marsigli and Donati were the first to I-ijort, 1965). Study the benthos, using dredge around the year 1750 (Murray and British - anractic expedition In HMS erebun and HMS terror (1839-43) under the leadership of Sir James Clark Ross, used a dredge showing that there was abundant and varied benthic fauna down to 730 m. The great marine expedition by H.M. S. Challenger (1872-76) during its coarse of study, made investigations on benthic invertebrates of the Pacific, Atlantic and Antarctic Oceans. The earlier works were on qualitative aspects and pioneering studies on the quantitative aspects of benthos were by Peterson (1911, 1913, 1914, 1915 & 1918) who developed a concept about of benthos. Nicholls (1935) introduced the term 'interstitial community structure fauna' to denote organisms, which inhabited the space between the sand particles. Remane (1940) coined the term 'mesopsammon' for these organisms and Thorson (1957) proposed 'isocommunity concept', which was the seed of vertical zonation in addition to Peterson's (1918) community concept. Sanders (1958) studied the benthos of Buzzards Bay and its positive correlation to the type of substratum. Sanders (1968, 1969) collected the benthos of the organisms. Gerlach (1972) studied studied the population density and diversity the bottom fauna and sediment characteristics and its influence on the burrowing et al., (1978) studied the temporal resistance and filter feeding conditions. Buchanan variations and observed that seasonal changes in abundance and biomass appeared to be independent of the composition of the assemblage. Gaston (1987) studied the of polychaetes of middle atlantic bight and found that feeding and distribution of carnivorous were greatest in coarse sediments and decreased proportion graf (1992) investigated significantly with water depth across the continental shelf. The benthic - pelagic coupling and developed an energy flow equation for marine sediments. Service and feller (1992) whi le studying the sub-tidal macrobenthos from in the north inlet and noticed significant fluctuations in the sandy and muddy sites faunal abundance and high variability between replicate samples.

Devassy et al., (1987) studied the effect of industrial effluent on biota off mangalore, west coast of india and found that effluent discharge did not cause any noticeable damage to the inshore areas. Varshney et al., (1988) studied the qualitative and quantitative aspects of benthos of versova (bombay), west coast of india and stated that coastal areas were more polluted than off shore and high species diversity indices of foraminifers and polychaetes in pohution stressed area revealed their tolerance to the pollutants. Harkantra and parulekar (1991) using the multivariate analysis showed the of distribution and abundance of sand dwehing fauna on more than one dependence ecologically significant environmental parameters rather than one ecological master factor. Salinity, dissolved oxygen, grain size and availability of food together fonned significant factors ln the distribution and abundance of benthos. Ansari et al., (1994) made a survey of the macro invertebrate fauna in the soft sediment of mormugao harbour and revealed the spatial heterogeneity based on the environmental parameters and benthic assemblage. Harkantra and parulekar (1994) also stressed the monsoon impact, which plays an important role in the density and diversity of soft sediment dwehing macrobenthos of rajapur bay, west coast of india and its replenishment after the monsoon. Ansari et al., (1996) studied the macro and meiobenthos of the eez ofindia and pointed out the relevance ofbenthic data in the assessment of potential fishery resources.

3. Materials and Methods

This research was conducted at Gajah Mungkur Water Reservoir, Wonogiri, Central Java. The sample was collected from several spots that represent the characteristic of different habitats of the body water, namely: Station I at the inlet zone (the Keduang River estuary), Station II at the traditional fishery zone, Station III at the tourism zone, Station IV at the conservation zone, Station V at the free body water area, and Station VI at the outlet zone.

The research was conducted on several stages, namely: The sample of benthos were taken using Eijkman method followed by taking water and sediment samples The sediment samples taken, the observation and identification on the benthos were conducted according to Clesceri *et al.* (1998), Goldman and dan Horne (1983), and Davis (1955), measurement on the physical and chemical parameter of the water (pH, temperature, DO, the water's purity, nitrate, phosphate, calcium and magnesium) using the method of (APHA 1998)

All the data collected were than analysed by using sofl qualitivelly and quantivelly respectively, water quality wason examples of the qualitative analysis while the Anova test was used to calculation the diversity index.

4. Result and Discussion

4.1 The water's quality

Benthos are the organisms which live in the benthic zone, and are different from those elsewhere in the water column. Many are adapted to live on the substrate (bottom). In their habitats they can be considered as dominant creatures. Many organisms adapted to deep-water pressure cannot survive in the upper parts of the water column. The pressure difference can be very significant (approximately one atmosphere for each 10 meters of water depth). Because light does not penetrate very deep into ocean-water, the energy source for the benthic ecosystem is often organic matter from higher up in the water column which drifts down to the depths. This dead and decaying matter sustains the benthic food chain; most organisms in the benthic zone are scavengers or detritivores. Some microorganisms use chemosynthesis to produce biomass.

Benthic organisms can be divided into two categories based on whether they make their home on the ocean floor or an inch or two into the ocean floor. Those living on the surface of the ocean floor are known as epifauna. Those who live burrowed into the ocean floor are known as infauna.

The benthic region of the ocean begins at the shore line (intertidal or eulittoral zone) and extends downward along the surface of the continental shelf out to sea. The continental shelf is a gently sloping benthic region that extends away from the land mass. At the continental shelf edge, usually about 200 meters deep, the gradient greatly increases and is known as the continental slope. The continental slope drops down to the deep sea floor. The deep-sea floor is called the abyssal plain and is usually about 4,000 meters deep. The ocean floor is not all flat but has submarine ridges and deep ocean trenches known as the hadal zone.

For comparison, the pelagic zone is the descriptive term for the ecological region above the benthos, including the water-column up to the surface. Depending on the water-body, the benthic zone may include areas which are only a few inches below water, such as a stream or shallow pond; at the other end of the spectrum, benthos of the deep ocean includes the bottom levels of the oceanic abyssal zone. For information on animals that live in the deeper areas of the oceans see aphotic zone. Generally, these include life forms that tolerate cool temperatures and low oxygen levels, but this depends on the depth of the water.

The water's quality is determined by the humans' activities and the nature's process. Humans' activities include industry, agriculture, and fishery which in the one hand produce beneficial things but in the other hand also leave out waste that in turn influences the living organism in the water including benthos. The water's purity can be measured through the physical and chemical environment factors that include: pH, temperature, DO, the water's purity, nitrate, phosphate, calcium and magnesium (Table 1)

Temperature. The parameter of the temperature can be a determining and controlling factor of the life of the aquatic organisms. The research was conducted in a composite manner. The result of the measurement conducted on the temperature on the day time varies from 25.01°C to 32.15°C, which is higher than the threshold point required by the government rule of PPRI No. 82/2001 on *the maintenance of the water's quality and the control of pollution of the water class II*. Based on the result, Gajah Mungkur Water Reservoir has the quality of the water class II which hence can be functioned as a place for fishery, tourism, and irrigation.

Purity. The water's purity was aimed to look at the ability of the sun heat to penetrate into the water. The amount of the sun heat that penetrates into the water determines the temperature of the water. The explanation of the water's purity is not included in the government regulation of PPR PPRI No. 82/2001 I no. 82 Th. 2001, since it is trivia as to be used as the indicator of the water's quality.

pH. The chemical parameter of water pH is usually used to determine the pollution index. The amount of pH of the water of Gajah Mungkur Water Reservoir varies from 7.49 to 8.5; which if compared to the standardized quality as required by the government regulations PPRI No. 82/2001, then the amount of the pH is still safe for fishery and agriculture which is in the range of 6-9. Based on the result it can be said that Gajah Mungkur Water Reservoir has a good enough quality of water.

DO. In order to measure the DO which were influenced the method of Odum (1993) was wed. The oxygen dissolved in the water is generally not more than 10 ppm. The DO measurement of Gajah Mungkur Water Reservoir shows the range of 5.15-7.29 ppm. Compared to the required amount by the government regulation of PPRI No. 82/2001, which is 4-9ppm, it can be concluded that Gajah Mungkur Water Reservoir has a good enough quality of water.

Nitrate. The measurement of the nitrate substance in the water of Gajah Mungkur Water Reservoir varies from 189.80-1940.89 ppm, which if compared to the required amount by the government regulations of PPRI No. 82/2001, it has out gone the threshold point which is 10 mg/L. It means that in this sense the water reservoir has less qualified water.

Phosphate. The result of the measurement on the phosphate substance is still under the threshold point as required by the government regulation which is 0.2 mg/L. In this sense, the water in Gajah Mungkur Water Reservoir is considered good enough.

Calcium. Based on the measurement result it was recorded that concentration of Ca ranging from 156.01 ppm to 280.000 ppm. This condition can be considered good enough and still under the limited amount of chemical and poisonous substances that is allowed in Michael (1994), which is in the range of 75-200 ppm. In this sense, the water's quality is considered good enough.

Magnesium.The result on the magnesium substance measuremets was in the range of 107.00-522.98 ppm, which is beyond the threshold amount as suggested in Michael (1994), which is in the range of 50-150 ppm. In this concideration, the water in Gajah Mungkur Water Reservoir was not good enough for drinking.

Sediment is a common place on which benthos can be found. It is benthos' natural habitat; hence its structure has to be known. The observation result during the research also includes the type of clay. The difference among several textures (sand, clay and dust) is strongly correlated with the dynamic of erosion and sediments. The soil's texture is also correlated with the growth of natural food including benthos which lives on the sediment.

Gajah Mungkur Water Reservoir receives water from several sub-watersheds among which are the watersheds of Wuryantoro, Alang Unggahan, Solo hulu, Temon, Wiroko and Keduang. The water that carry pollutant substances from the waste of agriculture, industry, people's houses and fishery influences the water's quality.

The water's quality shows the degree of pollution and also shapes the habitat characteristic which in turn determines the number and distribution of the living organism in the water including the biodiversity of benthos, that influences its community structure.

4.2 Benthos community structure

The results of observation of the sample taken from the six station showed that eleven species of benthos belonging to the five phyla were documented (see table 3)

There is the difference in the matter of individual number of benthos in each station. The least number is in station II which is 27 and the most plenty of benthos was found in is in station I which is 401. A great deal number of meso and meiobenthos is probably caused by a significant amount of litter and a kind of substrates particle on the bottom of the water. In accordance to the significant number of meiobenthos, then the environment is highly possible to experience decomposition in order to be able to control the amount of accumulated waste on the sediments. The macro type of benthos is rarely found. This is probably caused by the presence of physical and chemical factors including the substrate substance which contains muddy clay. Besides macrobenthos, the type of microbenthos was also rarely found. This is possibly because of the size of microbenthos which is extremely small and has no strong stability to adapt itself to live in the stream water.

The variation index of benthos was in the range of 0.88 and 1.78. This showed / indicated that the difference in the habitat characteristic, the water's condition, the management system can lead the index of diversity to variations (Table 2)

Station I is the inlet zone or the mouth of the river which is from Keduang river. The diversity index of benthos at station I is 1.43. Based on the parameter of diversity by Fitriana (2006), the score of benthos diversity index above is just moderate. As stated by Wetzel (2001), a habitat which is in a good condition tend to have organisms living in it able to adapt better, in reverse if the condition is bad, the condition can be the limiting factor for the organisms.

Station II is the traditional fishery zone. The diversity index of benthos at station II is 0.99. According to the parameter diversity by Fitriana (2006), station II has a low benthos diversity index. This is caused by the waste of fish feeding and agriculture that get into the water and influence the growth of benthos.

Station III is a tourism zone. The diversity index of benthos at this station is 1-27. Based on to the parameter diversity by Fitriana (2006), station II has an moderate index. This is caused by the littering done by tourists and the significantly low number of trash can that can be used. The number of tourists is relatively small so the damage is not that acute.

Station IV is a conservation zone. The diversity index of benthos at station IV is 1.54. Comparing this result to the parameter diversity by Fitriana (2006), the diversity index of benthos at station IV is moderate. This is because the sediment in this phase is moderate. According to Ponk-Masak (2006), the moderate condition of a benthos community is exposed a change even due to relatively insignificant environmental factors.

Station V is a free zone whose diversity index is 1.76. It was the highest index. Wulandari (2006) said that benthos which is the *bottom feeder* usually experiences lost when sedimentation occurs. Sedimentation at this zone is still low, since humans' activities are very rarely,this condition would be a good life of the benthos.

Station IV is the outlet zone, whose index is the lowest, 0.87. This very low index of diversity is probably caused by the water's condition that has been severely polluted and highly sediment that disturb the benthos' ecosystem.

4.3 The correlation between benthos diversity index and the abiotic environmental factors

Benthos diversity index and the abiotic environmental factors usually tend to form a certain regressive correlation.

The small deviation of the amount of the temperature can actually influence the diversity index of benthos (Figure 1A). The more the temperature is, the less the diversity and the number of the living organism will be, as can be seen in the station, when the temperature of the water a bove or at the level of 30^0C, a significant decrease on the benthos diversity index occurs.

The purer the water, the less the diversity will be. It is because the purer the water, the more sun heat will be able to penetrate into the water and somehow damage the sediment (Figure 1B).

The water's pH can generally influence the life of benthos. The pH's amount which is more than 7 and going up until close to 9 can actually decrease the diversity index of benthos (Figure 1C).

The correlation between DO and the index of diversity have formed a pattern similar in the shaped to a parabola (Figure 1D). Where station V is the peak with the DO score 6.43 ppm and benthos diversity index, 1.78. This is probably due to the fact that the optimum DO for the best index of diversity is 6 ppm. The amount of nitrate tends to increase the diversity of benthos. This can be seen at (Figure 1E).

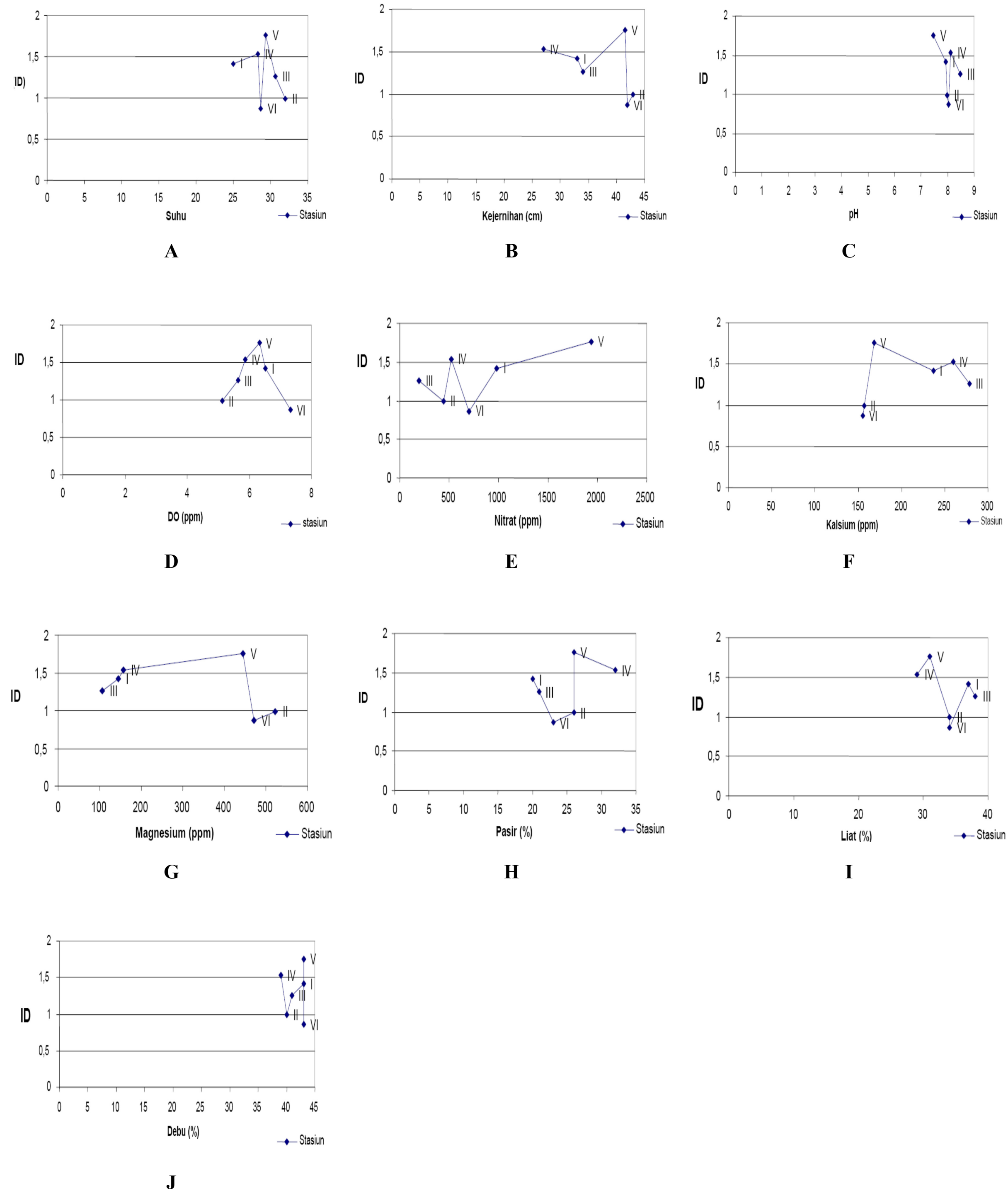

Figure 1. The correlation between benthos diversity index and abiotic factors: A. temperature, B. water's purity, C. pH, D. DO, E. nitrate, F. kalsium, G. magnesium, H. sand, I. clay, J. loam

The significant increase to the diversity index is clearly seen at the station VI and II compored to the station V. The amount of calcium at station VI and II is 150 ppm more or less and the diversity index of benthos is 1.78. A significantly high amount of calcium has been found at station III (280.00 ppm) and this codition can actually make the water heavier and increase the water's pH, This can be seen at Figure 1F.

The amount of Magnesium in the water can increase the diversity index of benthos but too much amount can actually decrease the diversity index. Station VI, although having the magnesium content which is less than 500 ppm, has a low diversity index of benthos (Figure 1G). This is because the diversity index of benthos is not only

influenced by the amount of Magnesium but also the habitat condition and other correlated environmental factors.
The sand's content can actually indicate the growth of the natural food which is abundant (Figure 1H). This is in accordance to what Ponk-Masak (2006) that abundant natural food in the water has a pretty high organic substance in it (>16%). Therefore it can actually increase the diversity index of benthos in that area.
The clay substance in the sediment is discussed not only in one separate research (Figure 1I). The existence of the clay substance as a substrate is a possibility for organisms especially for mesobenthos to actually burry themselves. This is done as a method to defend and protect themselves from higher creatures in the fo.od chain such as fish. This can lead to an increase on the diversity of benthos and other water organisms.
The correlation between the percentage of the sand and the diversity of benthos form a straight line among station I, V, and VI (Figure 1J). The amount of sand in those stations was caused by several possibilities among which are from the people's houses in the middle of which the Keduang River flows, from the roads around the water reservoir, and also the natural sand substance which is already on the bottom of the water reservoir. The diversity index of benthos is not influenced by the amount of the sand in the water.

4.4 Correlation and regression

The perception of community structure is strongly related to the spatial resolution of data collection. To quantify variation in community structure at several spatial scales, the benthos was examined on the limestone substratum in a nearshore coastal lagoon. Community structure was described using a form of pattern analysis called correspondence analysis.
Odum (1993) stated that if the coefficient of the correlation is more than or the same as 0.5, then there is a correlation between the two compared variables. If the coefficient of the correlation is less than or the same as 0.5, it means that the linier correlation is not strong.

Table 5. The analysis result of the correlations between the variables of benthos diversity index and the variables of abiotic environmental factors

	The diversity index of benthos	
	Pearson's correlation index	**Status of relationship**
The diversity index	1	-
Temperature (°C)	-0.343	Weak
Purity (cm)	-0.427	Weak
pH	-0.457	Weak
DO (ppm)	-0.083	Very Weak
Nitrate (NO_3) (ppm)	0.637	Moderate
Phosphate (ppm)	-0.815	Strong
Calcium (ppm)	0 .354	Weak
Magnesium (ppm)	-0.378	Weak
Sand (%)	0.299	Very Weak
Clay (%)	-0.405	Weak
Dust (%)	0.046	Very Weak

The strongest and the most significant correlation in this research are shown in Table 5. The correlation between the diversity index and phosphate in which amount was 0.815 is negative (-). This means that the phosphate in the sediment has an inverse correlation with the diversity index of benthos in Gajah Mungkur Water Reservoir. The increase in the phosphate's amount will actually decrease the diversity of benthos and vice versa.
The correlation between the nitrate's substance and the diversity index of benthos is positive (+).This explains that the total amount of nitrate does have influence towards the diversity index of benthos in Gajah Mungkur Water Reservoir.

Tabel 6. The regressive analysis result on the correlation between the variables of diversity index and the variables of abiotic environmental parameter

Model	Variabel entered	R	R square	df	Sig.
1	Phosphate (ppm)	0.815	0,664	5	0.048

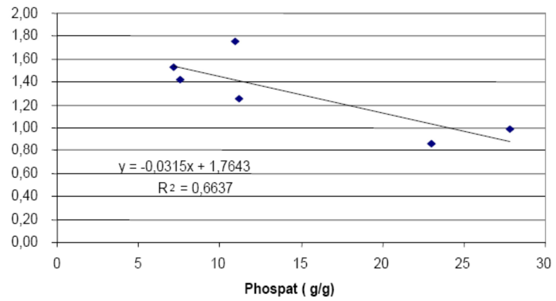

Figure 2. The correlation between phosphate and the diversity index of benthos

Based on the regressive analysis and the research data, it is gained a pattern equation of the correlation between the diversity index of benthos and the amount of phosphate in the water as follows: y =-0.0315 x + 1.7643 with R^2 = 0.6637, and the level of significance = 0.048. This value was less than 0.5 and forming a linear regression pattern (Figure 2). According to the correlation equation, when the amount of phosphate gets increased by one, the diversity index of benthos will get decreased by 0.0315. The coefficient of 1.7643 as the initial point when there is no phosphate meaning that the diversity index is 1.7643. In other words, the more the amount of phosphate is, the less the diversity index of benthos will be.

With thevalue $R^{2=}$ 0.6637, it can be said that the 0.6637 of the total diversity index is influenced by the amount of phosphate and there is still 0.3363 of the total whose correlation is not explained by the used model. The rest 0.3363 may be caused by other factors which cannot be measured by the equation model.

In every habitat the benthos community had quite hight diversity with basic structure ofcommunity differ each other. Every individual benthos had ability to adapt the environments. According to Kennish (1990) that the diversity of habitat can cause different distribution of individual benthos. These benthos community will be the key role in their environment.This community had a role in mofying organic detritus the invertebrate biomass in which the biomassa would eventually take a part in the cycle of food and energy (Mann, 1982)

The increasing activities of human being in the environments of Gajah Mungkur water dam would influence the environmental factor which eventually effect the individual as well as benthos community. Environmental factor within ecosystem will ifluence the total and the kind of organisme which occupay the environment. The above statement was in according with the opinion of Nybakken (1992), that organism within water ecosystem including benthos will be enfluenced by the environmental quality. In this experiment the biotic and abiotic components enfluenced the diversity and uniformity of biota which occupied the Gajah Mungkur reservoir. In the foodwebs, benthos has beeb considered one of the very important component in the environmental water, And the impact of good quality of benthos would give an illustration of tropic level.

Conlusion

The research results show that the enviromental factors such as the water's quality and the sediment influence bentos community structure based on the diversity index. As far as the biology of benthic animals is concerned, the most important feature of these oozes are their physical charasterticts and the amount of digestible organic material they contain. The major potential controls of the variation in benthic community structure were different at each of the spatial scales examined. The strong relationships between extrinsic factors and components of the communities suggested that the major potential controls were: (a) exposure to swell at the large scale, (b) availability of food at the medium scale and (c) biological interactions or responses to microtopography and light climate at the small scale. However the ecosystem in Gajah Mungkur Water Reservoir was still considered would be possible for the hábitat of bentos and for other purposes as required by the goverment regulations of Indonesion Republic on the water's quality class II PPRI No. 82/2001). The variation index of benthos was in the range of 0.88 and 1.78. The significant increase to the diversity index is clearly seen at the station VI and II compored to the station V. The amount of calcium at station VI and II is 150 ppm more or less and the diversity index of benthos is 1.78. A significantly high amount of calcium has been found at station III (280.00 ppm) and this codition can actually make the water heavier and increase the water's pH. The increase in the phosphate's amount will actually decrease the diversity of benthos and vice versa. This showed / indicated that the difference in the habitat characteristic, the water's condition, the management system can lead the index of diversity to variations The researcher recommends a periodic monitoring on the water's quality of Gajah Mungkur Water Reservoir, so the water can stay usable for its purposes and also an education to the people living surrounding the water reservoir so they can take part in maintaining the reservoir and therefore it can stay good for a habitat of aquatic organisms.

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