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Macrozoobentos community structure *in situ* Ciburuy Padalarang West Bandung regency, West Java

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Abstract
This research was conducted to determine the water quality of Situ Ciburuy based on the structure of the macrozoobenthos community as a bioindicator. The research was conducted using a survey method and purposive sampling method. Observational data were analyzed descriptively. The results showed that the level of water quality in the Situ Ciburuy based on macrozoobenthic bioindicators was lightly polluted. This is indicated by the low to moderate diversity of macrozoobenthos, which ranges from 1,3 to 2,1. Macrozoobenthos uniformity *in situ* Ciburuy which is found at each station is categorized as moderate population in unstable conditions because the uniformity index ranges from 0.51 to 0.66 which indicates low uniformity of macrozoobenthos *in situ* Ciburuy. Based on the FBI value, Situ Ciburuy has slightly bad to very good water criteria, station 1 has an FBI value of 6,1 with slightly bad water criteria, the value of FBI station 2 is 4.8 with good water criteria, the value of FBI station 3 is 4.0, station 4 is 3.8 and station 5 is 3.9 with very good water criteria.

Keywords: water quality, situ ciburuy, macrozoobenthos

1. Introduction
Situ Ciburuy is one of the waters in West Bandung Regency about 25 km from the center of Lembang City precisely in Padalarang District, West Java. Situ Ciburuy waters are used by the surrounding community for tourism activities, as irrigation to irrigate rice fields and other anthropogenic activities. Various activities of utilization of water and land around Situ Ciburuy produce waste that increases the amount of nutrient input to the parairan. This has the potential to cause enrichment *in situ* ciburuy water bodies. This condition can result in eutrophication, thus degrading the quality of the aquatic environment. Eutrophication is a condition of water that experiences increased levels of organic matter or increased rate of nutrient input into a body of water [1].
Therefore, it is necessary to monitor the water quality of Situ Ciburuy to know the changes that occur in the quality of the aquatic environment as a form of management efforts there. One of the water quality monitoring activities that can be done is monitoring based on the assessment of biological parameters (biomonitoring). Biomonitoring in aquatic ecosystems can be done by studying the community of aquatic organisms namely water invertebrates, including macrozoobentos [2]. Macrozoobentos play an important role in freshwater ecosystems related to energy flows and nutrient cycles in the waters [3]. This causes macrozoobentos to have properties that are sensitive to changes in the aquatic environment, so its existence is suitable for use as an indicator organism in the efforts of biomonitoring to be carried out however, *in situ* Ciburuy has not been conducted effective biomonitoring [4]. This study aims to determine the water quality of Situ Ciburuy based on the structure of the macrozoobentos community as a bioindicator.

2. Materials and Methods
2.1 Time and Location
The research was conducted from January to March 2021. The research was conducted at Situ Ciburuy, West Bandung Regency. Macrozoobentos identification and analysis of water quality parameters were conducted at the Laboratory of Aquatic Resource Management of the Faculty of Fisheries and Marine Sciences, Universitas Padjadjaran.

2.1 Research Method
The research method conducted in this study is to use the survey method by sampling *in situ* Ciburuy in the form of purposive sampling. Sampling is done at 5 points of the station as many as 4 times the replay. The data needed is primary data in the form of macrozoobentos community structure and water quality which includes physical parameters namely temperature, turbidity while, chemical parameters include pH, DO and BOD.
Materials (macrozoobentos samples, water samples, formaldehyde 4%, substrate samples, MnSO4, H2SO4, Sodium thiosulfat and O2 reagent) and tools (ekman grab, jala surber, sieve, cool box, magnifying glass, plastic container, 500 ml sample bottle, pH meter, DO meter, rowing boat.

2.2 Data Analysis
The parameters measured include the main parameters, namely macrozoobentos and supporting parameters, namely physical parameters in the form of temperature, turbidity, and chemical parameters pH, DO and BOD.
The abundance of macrozoobentos on each station is calculated by using the following formula:

$$K = \frac{a}{b \times n}$$

The calculation of macrozoobentos diversity is done using shanon-wiener diversity index equation as follows (Odum, 1971) [5].

$$H' = - \sum Pi \, Ln \, Pi$$

The uniformity of macrozoobentos can be calculated by the Uniformity Index formula [6].

$$E = \frac{H'}{Hmaks}$$

The Family Biotic Index is an index used to analyze water quality. FBI values can be calculated by the following formula [5]:

$$FBI = \frac{xi.ti}{N}$$

The observation data is analyzed descriptively by explaining water quality data that includes physical and chemical variables. Data on macrozoobentos community structure which includes composition, abundance, diversity, and uniformity are discussed qualitatively. In addition, macrozoobentos data is associated with physical and chemical variables and is used to measure the FBI. The water quality parameters measured include chemical-physical water parameters i.e temperature, pH, dissolved oxygen and turbidity are measured directly (*in situ*). While the analysis substrate, BOD is indirectly (ex-situ).

3. Results and Discussion
The condition of Situ Ciburuy is thought to have decreased in water quality due to the entry of pollutants originating from various human activities. This shows that Situ Ciburuy needs biomonitoring to monitor the water quality of its waters. Biomonitoring in aquatic ecosystems can be done by studying the macrozoobenthos community. Sampling of macrozoobenthos and substrates was carried out at 5 stations, namely station 1 which is where the water enters the Ciburuy Lake, namely from the Cimeta River. It has calm water flow and the texture of the substrate is dusty clay loam. Station 1 was found to have a lot of garbage, is located near residential areas and is the first collection of waste produced by factories and household activities. Station 2 is a transition zone connecting the artificial *in situ* to the center of the lake. There is a change of land function from there to rice fields and other agricultural activities. has a swift and brown water flow. Station 2 is very shallow and the substrate texture is clayey loam. Furthermore, station 3 is an open zone of water flow where water flows from the inlet and the texture of the substrate is clay. There is a lot of waste from restaurants in the middle of the island and boats going back and forth. Station 4 has a lot of fishing activity and a floating net cage, station 4 has a clay substrate texture. Station 5 is near the outlet and there is a lot of garbage along the shores of the lake and close to residential areas. The texture of the substrate at station 5 is dusty clay loam.

3.1 Water Quality Parameters
3.1.1 Temperature
Temperature is a measure of the degree of heat or cold of an object [7], and is one of the limiting factors for the growth of macrozoobentos in a water. Situ Ciburuy water temperature data is shown in Figure 1.

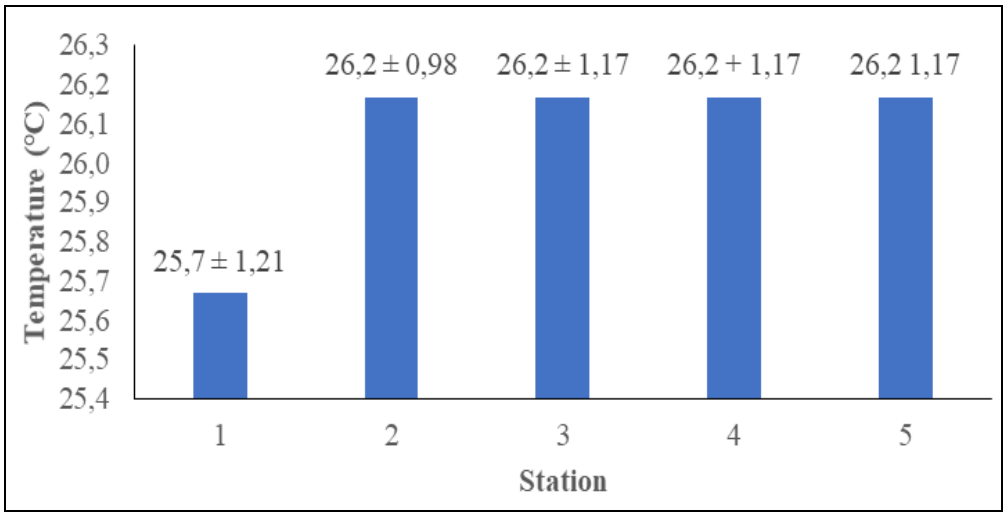

Fig 1: Temperature Value

Based on Figure 1, it is known that the water temperature at each station is from 25.7 °C - 26.2 °C. Station 1 has an average water temperature of 25.7 °C ±1.21 and is the station with the lowest average temperature. This can be caused by the transparency of light that does not reach the bottom of the water due to the high turbidity at station 1. In addition, the low temperature at station 2 is also affected by currents. The statement was supported by Patty (2013) [8] who stated that temperatures in the waters are affected by currents, wind and weather such as sunny, cloudy or rainy. This is due to the implementation of station 1 research between 09.00 – 10.00 WIB. This time difference can cause differences in the entry of sunlight or the amount of sunlight received by the waters. Solar radiation to the waters affects temperature fluctuations in these waters, because the incoming sunlight will turn into heat energy. In addition, the influence of the weather during the study also affects the temperature in the waters. The water temperature at station 1 is relatively lower due to cloudy weather causing less solar radiation to enter the waters. The temperature obtained as a whole can also be said to be not too high because at the time of measurement the weather temperature was unstable due to rain, cloudy weather and sometimes sunny so the water temperature was also unstable.

Situ Ciburuy water temperature (Fig 1) is good enough to support the development of macrozoobentos living in it, because according to Rahman (2009) [9] in Choirudin *et al*. (2014) [10] the optimum temperature for the development of macrozoobentos is between 20-30 °C and the temperature dangerous for macrozoobentos ranges from 35 °C – 40 °C. If the water temperature increases, it can lead to an increase in the metabolic rate and respiration of organisms living in a water, which will then increase the oxygen needs of the organism [11].

3.1.2 Tubidity

Turbidity is caused by the presence of suspended or dissolved organic and inorganic materials such as mud, fine sand, as well as plankton and microorganisms of organic matter and others. Data on the turbidity of Situ Ciburuy waters is shown in Figure 2.

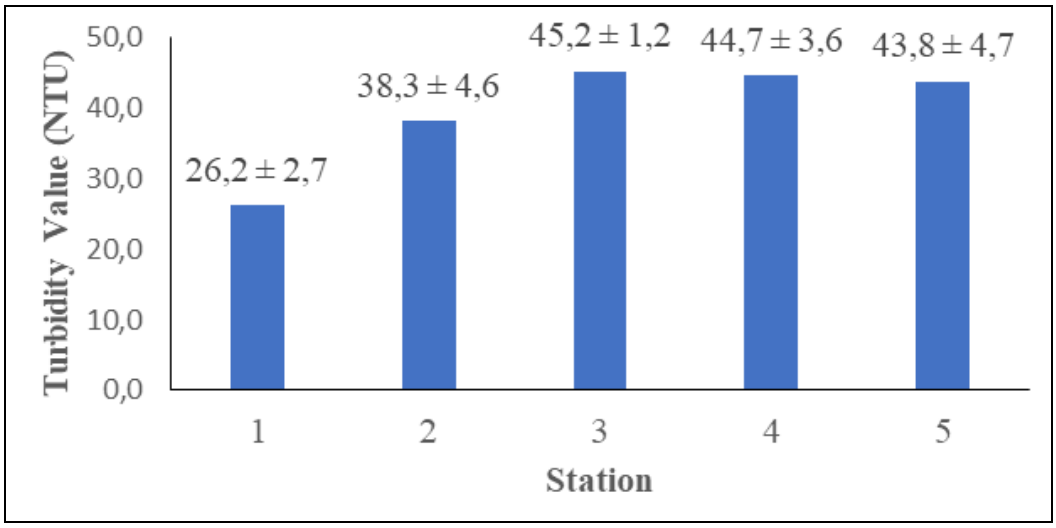

Fig 2: Turbidity Value

The average turbidity of Situ Ciburuy waters obtained during observation is between 26.2 NTU – 45.2 NTU. The highest average turbidity value is found in station 3 with a value of 45.2 NTU ± 1.2. The lowest turbidity value is found in station 1 with a value of 26.2 NTU ± 2.7. Sugiharto (1987) [12] added that turbidity will reflect light, so it can reduce the production of oxygen produced by plants, pollute the landscape and disrupt macrozoobentos life.

Stations 3, 4 and 5 have the highest turbidity or higher than other stations which are about 43.8 NTU – 45.2 NTU. This is due to the rainy weather when sampling water in all three stations, while at station 1 and station 2 because it is done in the morning where the weather is still sunny or cloudy. This is in accordance with Modesta (2015) [13], high water turbidity can be caused by high rainfall factors. Rain can affect turbidity, due to the effects of water flow and the large amount of sediment. Rainwater carries suspended particles into the water resulting in high turbidity.

Physically, the water is polluted when it has murky water, a pungent aroma and sometimes a lot of garbage appears on the surface of the water. The condition of station 3,4 and 5 at that time was a lot of garbage and had a pungent aroma. Turbidity occurs due to the presence of clay and even household and industrial waste. The presence of large amounts of wastewater can also cause a murky effect on the water. High turbidity is disliked by macrozoobentos because it interferes the vision and respiratory system thus inhibiting the growth of bentic organisms in it [14].

3.1.3 Acidity (pH)

The degree of acidity (pH) acidity intensity from the release of hydrogen ion concentration in a liquid and be an indicator of the quality of a water [15].

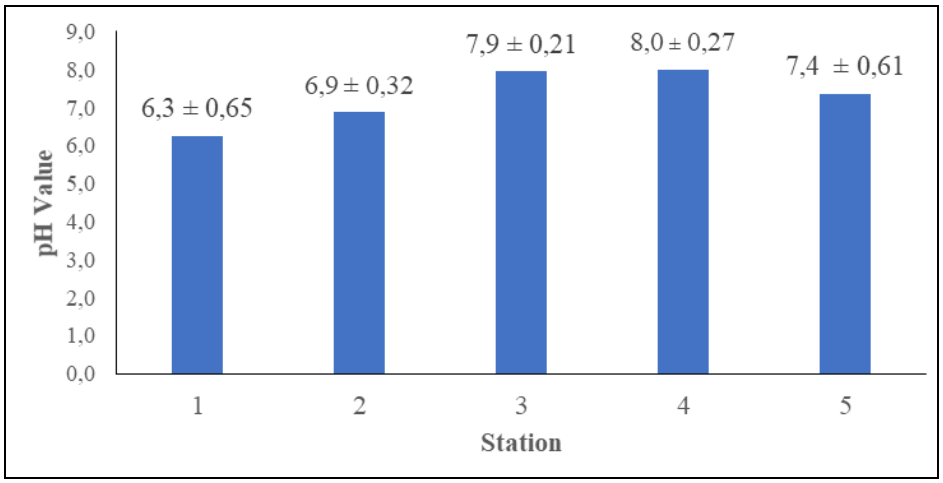

Fig 3: Value of pH

The average pH value at station 1 is 6.3 with a standard deviation of 0.65 and is the lowest average pH value. Meanwhile, the average pH value at station 4 is 8.0 with a standard deviation of 0.27 and is the station with the highest average pH value. High or low of pH is influenced by fluctuations in both O2 and CO2 content (Rukminasari, 2014) [16]. PH values can be affected by temperature, BOD, COD and chemical elements entering the water. Situ Ciburuy's pH value (Fig 3) indicates the most acidic pH is at station 1 and the most alkaline pH is at station 4. A low pH value at station 1 can be caused by a very low DO value and an excessively high BOD. In addition, the value of pH is also influenced by the temperature of the waters, the content of organic matter and the waste of household and industrial waste that enters the body of water [17]. Station 1 has the lowest pH value; this is due to the high amount of waste waste from the population. Generally, the pH value during the day to evening is higher than the night to early morning. This condition is thought to be the result of photosynthesis during the day [18]. The lowest pH of station 1 is due to the measurement time at station 1 which is done in the morning and is different from other stations whose pH is higher because it is done during the day. The optimum pH value for macrozoobentos life ranges from 6.5-8.5. So it can be said that the waters of Situ Ciburuy have an optimum pH for macrozoobentos life.

3.1.4 Dissolved Oxygen (DO)

Dissolved oxygen in a water can be used as an indicator of pollution of these waters. According to Effendi (2003) [11], generally polluted waters have a low oxygen concentration. The data from the observation of dissolved oxygen concentration *in situ* Ciburuy is shown in Figure 4.

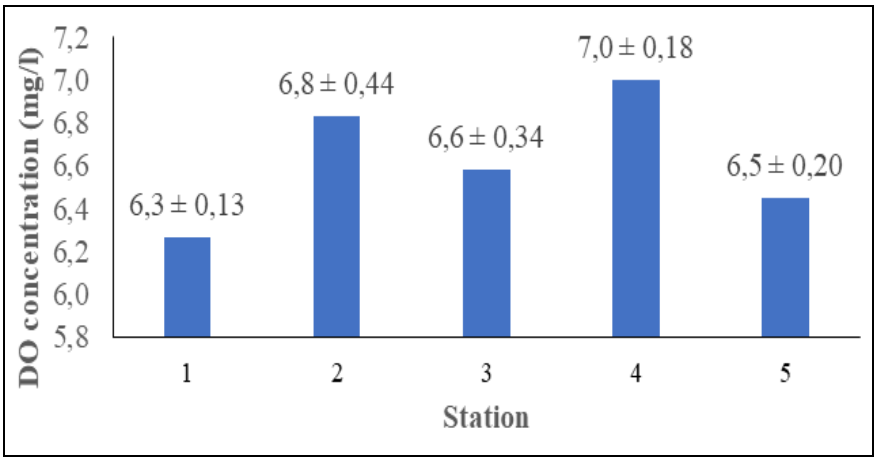

Fig 4: Dissolved Oxygen Concentration

Situ Ciburuy has an average oxygen concentration ranging from 6.3-7.0 mg/l. The lowest value is at station 1 with DO at 6.3 mg/l ±0.13 and the highest value is at station 4 with DO at 7.0 mg/l ±0.18. Each research station has a different average concentration of dissolved oxygen. Station 1 has the lowest average dissolved oxygen concentration compared to other stations, at 6.3 mg/l, and station 4 has the highest average dissolved oxygen concentration of 7.0 mg/l. Dissolved oxygen concentrations are affected by water temperature and BOD values [19]. Station 1 has the lowest concentration of dissolved oxygen, which is related to the bod value of station 1 which is quite high when compared to 4 other stations, which is as much as 3.9 mg/l (Figure 5). According to Gazali (2015) [20], the high value of BOD5 in a water is caused by activity around is higher so that a lot of organic matter enters the body of water. As a result, decomposing microorganisms use O2 to degrade these organic materials so that the O2 of the waters is reduced and vice versa. Station 1 has many human activities around it such as settlements, places to eat, stalls, and also it is a Situ Ciburuy inlet.

Based on the dissolved oxygen data in Figure 4, Situ Ciburuy can be said to have not experienced pollution because the dissolved oxygen concentration still included into the ideal category of supporting the growth of macrozoobentos. This is

supported by the statement of Anggraini *et al* (2015) [21] which states that ideally the dissolved oxygen content in a water to support the growth of aquatic organisms is >5 mg/l.

3.1.5 Biochemical Oxygen Demand (BOD)

BOD value can be used as an indicator of pollution of a water. The data of BOD Situ Ciburuy observations is shown in Figure 5.

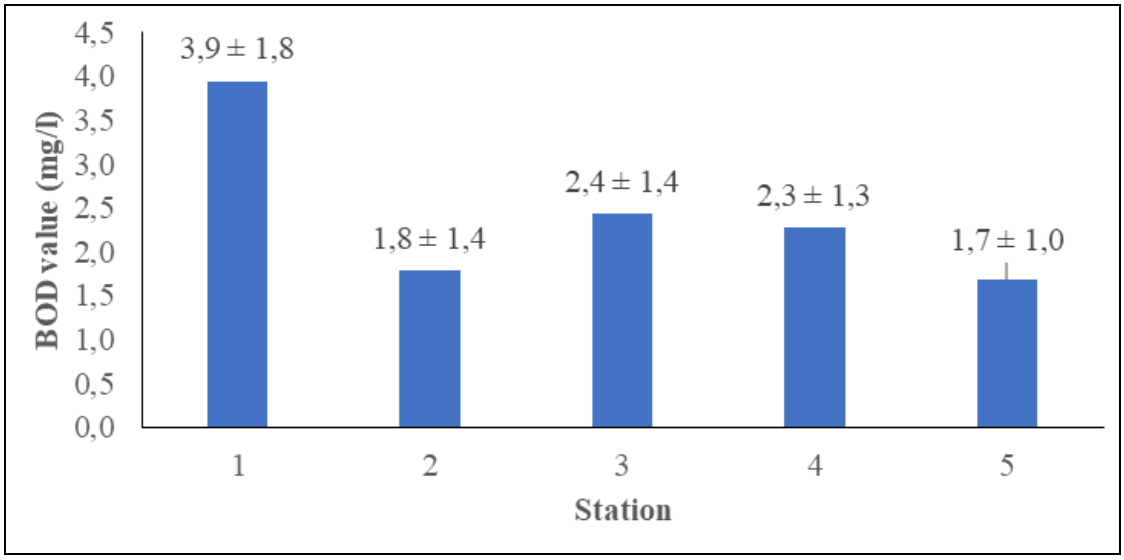

Fig 5: BOD Value

The average BOD value *in situ* Ciburuy is quite diverse with a range between 1.7 mg/l – 3.9 mg/l. The highest BOD average was at station 1 with a score of 3.9 mg/l ±1.8 and the lowest was at station 5 with a score of 1.7 mg/l±1.0. The high value of BOD indicates that the content of organic matter in these waters is high. Because the value of BOD indicates the need for oxygen used by microorganisms to break down organic compounds. The high value of BOD also means that the decomposition process of organic matter is also high. Organic material contained *in situ* is suspected to come from human activities and domestic waste of households.

The difference in BOD value in each station is caused by differences in pollutants entering the body of water [22]. According to Effendi (2003) [11], waters that have not experienced pollution have a BOD value that ranges from 0.5-7 mg / l and the waters that have been contaminated have a value of BOD >10 mg / l. Based on these indications, Situ Ciburuy is still declared as having not experienced pollution.

3.2 Physical Parameters of Chemical Substrates

The observation of the chemical physical parameters of Situ Ciburuy substrate was conducted by observing the texture, pH value, C-organic, N-total and C/N ratio of substrates from the five stations. The data of Situ Ciburuy substrate observations are shown in Table 1 as follows

Table 1: Results of Measuringn Substrate Situ Ciburuy

No.	Parameter	Unit	Station				
			1	2	3	4	5
1.	Tekstur	-	Lempung liat berdebu	Lempung berliat	Liat	Liat	Lempung liat berdebu
2.	pH substrat	-	7,44	7,24	7,45	7,36	7,06
3.	C-Organik	%	2,97	0,75	4,55	1,57	3,28
4.	N-total	%	0,17	0,11	0,60	0,11	0,22
5.	C/N *ratio*	-	17	7	8	14	15

Situ Ciburuy has a substrate in the form of dusty clay clay, clay, and clay. Situ Ciburuy has a variety of substrates. This can affect the distribution of macrozoobentos that live *in situ* Ciburuy. According to Palealu *et al*. (2018) [23] the existence of macrozoobentos can be seen from the substrate of its water base. Each station also has a different substrate pH value, but overall the pH of Situ Ciburuy substrate is neutral. For macrozoobentos *in situ* Ciburuy the pH value is a little too alkaline because it ranges from 7.06-7.44. Based on Romimohtarto and Juwana (2001) [24], the best pH values that can support macrozoobentos life range from 6-7. Macrozoobentos death can also be caused by a high pH.

The highest C-organic content *in situ* Ciburuy is at station 3 as much as 4.55%. The lowest C-organic was at station 2 at 0.75%. In research conducted by Sunarto *et al* (2012) [25], it was known that in substrates with high C-organic content there is a high abundance of macrozoobentos. This is in accordance with the results of research that shows the highest organic C is found at stations 3 and 5, which is comparable to the abundance of the highest macrozoobentos.

The next parameter calculated in the observation of this substrate is N-total. Pusat Penelitian dan Pengembangan Tanah dan Agroklimat. (2005) [26] grouped the N-total values in the substrate of 0.1-0.3% categorized as low; 0.3-0.6% categorized as moderate; 0.6-1.0% categorized as high and >1% categorized as very high. Based on these criteria, N-total station 1, station 2, station 4 and station 5 are included in the low criteria, meanwhile station 3 into the moderate criteria. So it can be concluded that N-total Situ Ciburuy has a low to moderate N-total value.

The C/N ratio value of station 2 is the lowest C/N ratio of 7. The highest C/N ratio value is at station 1 with a C/N ratio of

17. According to Pratiwi (2019) [4], a low C/N ratio indicates that the mineralization process of organic matter in a water is going well. Macrozoobentos is an organism that plays an important role in the process of remodeling organic matter as well as the mineralization process [27]. This indicates that the abundance of macrozoobentos as organisms that play an important role in the mineralization process *in situ* Ciburuy is uneven.

3.3 Composition and Abundance of Makrozoobentos

The composition of macrozoobentos found during the study amounted to 11 species from 5 research stations, namely *Pomacea canaliculata, Pila ampullacea, Terebia granifera, Thiara scabra, Thiara granifera, Filopaludina javanicus, Melanoides tuberculate, Melanoides plicaria, Lymnea rubiginosa, Tubifex tubifex and Chironomus* sp. The macrozoobentos species with the most composition were the Pomacean canaliculata species (30%), then *Filopaludina javanicus* (26%), and *Melanoides tuberculata* (14%). While the species with the lowest composition is *Lymnea rubignosa* which is only 1%. According to Ratih *et al* (2015) [28], macrozoobentos species with a high composition are influenced by the tolerant ability or not of the species as it is known that the tolerance level of *Pomacea canaliculata* has a tolerance value of 3 [3], so that the species can quite survive in environments with extreme conditions. In addition, the relative abundance of each species of macrozoobentos can also be caused by the chemical physical factors of the environment in which macrozoobentos live [28]. The average percentage of species found from each station is shown in Figure 6.

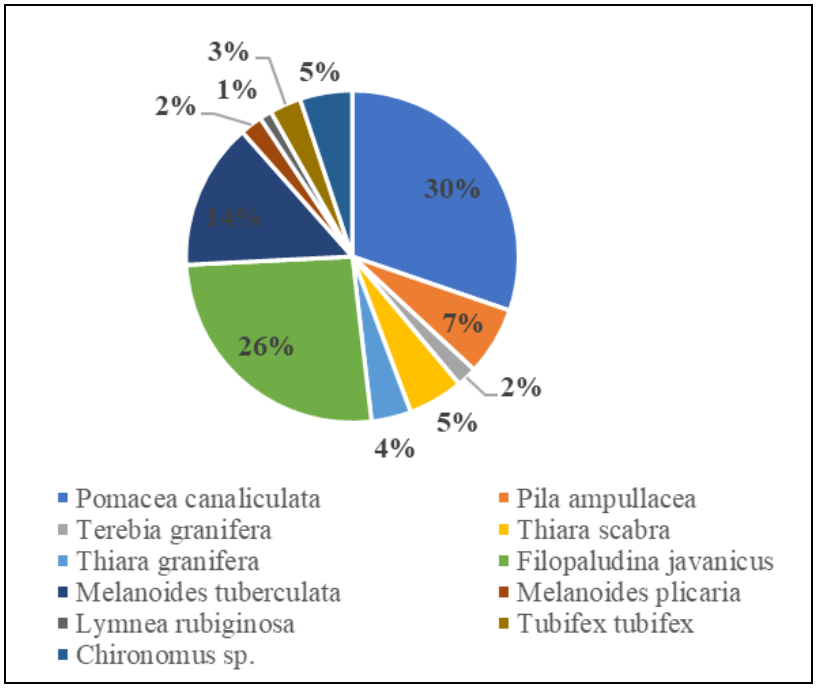

Fig 6: Percentage of average macrozoobentos species

The abundance of macrozoobentos is defined as the number of individual macrozoobentos per unit area (m^2). Data from the observation of abundance and types of macrozoobentos found *in situ* Ciburuy are shown in Table 2.

Table 2: Abundance and type of macrozoobentos found *in situ* Ciburuy

Class	Data Sampling	Abundance of Each Station (ind/m^2)				
		1	2	3	4	5
Gastropods	*Pomacea canaliculata*	7	17	25	29	20
	Pila ampullacea	1	8	11	5	4
	Terebia granifera	1	6	0	0	1
	Thiara scabra	0	18	0	2	4
	Thiara granifera	0	13	1	0	0
	Filopaludina javanicus	4	8	33	16	43
	Melanoides tuberculata	0	21	10	8	12
	Melanoides plicaria	0	7	0	7	0
	Lymnea rubiginosa	0	0	1	3	0
Oligochaeta	*Tubifex tubifex*	9	6	0	0	0
Insecta	*Chironomus* sp.	2	0	0	0	0
Total Makrozoobentos		26	44	80	69	83

Macrozoobentos found *in situ* Ciburuy are of the gastropod class. In general, gastropod classes are factional, can grow and develop on fine sediments because they have special physiological organs to be able to adapt to aquatic environments with muddy or dusty substrate types. According to Chusna *et al* (2017) [29], gastropods love habitats that have a high organic content and habitats that have sandy substrates. The data in Table 1 shows that station 5 has the

highest C-organic content of the substrate, making it the preferred habitat of macrozoobentos.

The abundance of macrozoobentos in the waters also depends on its tolerance to environmental changes [23]. Macrozoobentos tolerance values describe whether macrozoobentos are intolerant or tolerant, macrozoobentos tolerance values to environmental changes range from 0-10 [3]. Based on the data in Table 2, the macrozoobentos species with the highest abundance is the pomacea canaliculata species which has a fairly high tolerance value of 3 [3]. At station 1, Tubifex can live well due to the high organic matter of substrates in these waters, which can be seen from the lowest pH state and the highest BOD at station 1. Oligochaeta types such as *Tubifex tubifex* get food by digesting the surface of sediment which is the result of decomposition of organic matter (algae and bacterial detritus). The existence of the dominating family Tubificidae also indicates that the waters are polluted with organic materials. According to Hartini *et al* (2012) [3], *Tubifex tubifex* has a very high tolerance value of 10, which means the water in station 1 is polutted. Tubifex and *Chironomus* sp. are species of the oligochaete class and insects which be perched and become indicator organisms in the polluted waters of organic waste although their existence does not necessarily indicate that the waters have become polluted.

Situ Ciburuy has the lowest macrozoobentos abundance in station 1 with 26 ind/m^2, this is due to the type of base substrate of station 1 in the form of mud that is dominated by fine substrates of clay and dust. The highest abundance is found in station 5 with 83 ind/ m^2, because the substrate of station 5 contains high C-organic (Table 1), and according to Sunarto *et al* (2012) [25] in substrates with high C-organic content, there is also a high abundance of macrozoobentos. The abundance of each species of macrozoobentos can also be caused by the chemical physical factors of the environment in which macrozoobentos live [28]. Station 1 has the highest BOD value when compared to other stations, which is as much as 3.9 mg /l (Figure 5), this causes the low abundance of macrozoobenthos at station 1. Since the value of BOD is the amount of oxygen needed by bacteria to decompose organic matter in the waters, if the BOD value is high, it will result in a decrease in dissolved oxygen available in the waters, so many types of macrozoobentos are found that have a high tolerance to the concentration of low dissolved oxygen that can live in those waters, such as *Tubifex tubifex* and *Chironomus* sp.

3.4 Makrozoobentos Diversity

Macrozoobentos Diversity Macrozoobentos diversity can indicate the condition of a water. A water with a high level of diversity indicates that the condition of the water has not undergone changes in environmental conditions and vice versa, a water with an uneven spread of abundance indicates that the waters have undergone changes in environmental conditions [30]. Data from the observation of macrozoobentos diversity index *in situ* Ciburuy calculated using shannon-wiener diversity index is shown in Figure 7.

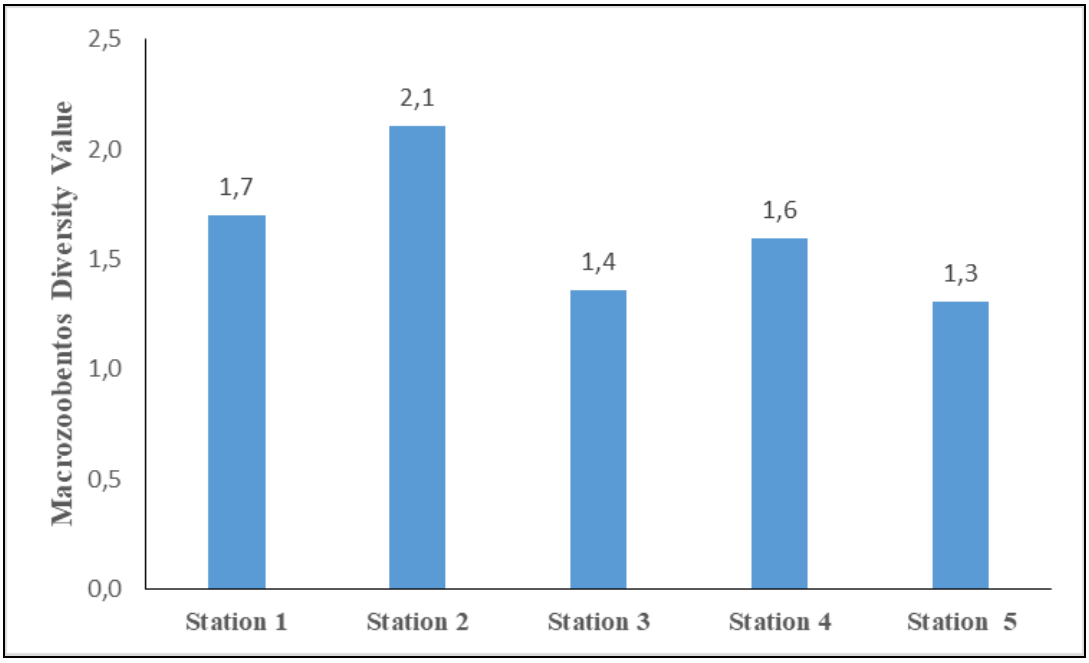

Fig 7: Macrozoobentos Diversity Data

The diversity index value at the species level from each station during the observation was between 1.3 – 2.1. Station 5 is the station with the lowest level of macrozoobenthos diversity, which is 1.3. Station 2 is the station with the highest level of macrozoobenthos diversity, which is 2.1. Station 1 has a macrozoobenthos diversity level of 1.7 and station 3 has a macrozoobenthos diversity level of 1.4. Station 4 has a macrozoobenthos diversity level of 1.6.

The Shannon-Wiener diversity index has certain criteria, namely H' < 1 indicates low diversity, 1 <H' <3 indicates moderate diversity and H' > 3 indicates high diversity. Based on the diversity index values from the five stations, the macrozoobenthos diversity value *in situ* Ciburuy indicates moderate diversity, which means the spread of each species and moderate community stability. Handayani *et al*. (2000) stated that the level of diversity in a waters can be used as an indicator of water pollution. A waters with a high level of diversity indicates that the condition of the waters has not changed environmental conditions and vice versa, a waters with an uneven distribution of species abundance indicates that the waters have experienced changes in environmental conditions [30]. This diversity index value indicates that the

state of Situ Ciburuy is starting to experience ecological pressure and the stability of the ecosystem *in situ* Ciburuy is starting to decline, so that the macrozoobenthos community that lives there begins to experience a decline in its distribution. The ecological pressure that occurs *in situ* Ciburuy is strongly suspected to come from the daily activities of the residents. This has been proven at the time of sampling conducted in the morning in the condition of Situ Ciburuy there was a lot of stagnant garbage and a lot of foam that came from the disposal of household waste that flowed from residents' homes. If this wastewater enters the waters in large quantities, it will disrupt the productivity of the macrozoobenthos community. This is comparable to the research of Rachman *et al* (2016) [31], the diversity index value (H') *in situ* Bungur and Situ Gintung is moderate, namely 2.29 and 1.74, indicating that the area is moderately polluted.

3.5 Makrozoobentos Uniformity

The uniformity of macrozoobentos can be said to be the balance, i.e. the individual composition of each species contained in one community, calculated by the formula of the Uniformity Index [6]. The data of observation of macrozoobentos uniformity index *in situ* Ciburuy which is calculated is shown in Figure 8.

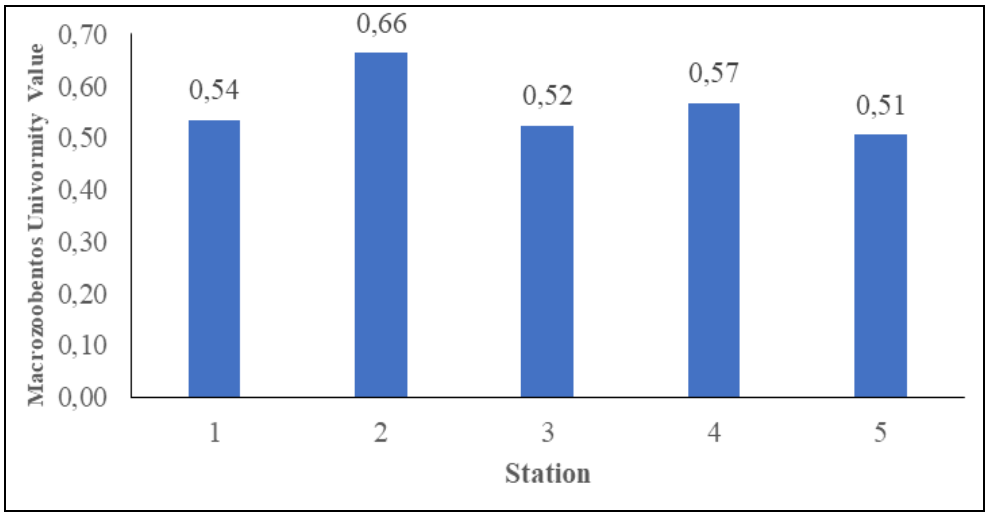

Fig 8: Macrozoobentos Uniformity Data

The uniformity of Macrozoobenthos *in situ* Ciburuy which is found at each station is categorized as low. The uniformity index ranged from 0.51 to 0.66. This means that the community is in an unstable or unstable condition because the uniformity index is at 0.50 < E 0.75. Macrozoobenthos in the waters of Situ Ciburuy is evenly distributed, this refers to Krebs 1972 [32] where if it can be stated 0.4 < E < 0.6 indicates moderate population uniformity. If the uniformity index is close to 1.00, it means that all samples of macrozoobenthos at the station have the same number of types of organisms. Thus, the population of macrozoobenthos at all stations studied was not evenly distributed with uniformity values at each station. A stable community indicates that the ecosystem has high diversity, and there is no dominant species and the distribution of the number of individuals is evenly distributed, that the distribution of the number of individuals for each species is the same, and there is no tendency to be dominated by certain species [5].

The low uniformity index value *in situ* Ciburuy indicates that the biota in the area are less tolerant of pollutants that enter the water. If a biota community is not sufficiently tolerant of pollutants that enter the waters, it can cause this community to move to areas that have less pollutant materials or to areas that have pollutants, but can still be tolerated by the biota community.

3.6 Famili Biotic Index (FBI)

The Family Biotic Index (FBI) is an index used to analyze water quality by paying attention to the tolerance of an organism based on its family. According to Rachman *et al* (2016) [33], organisms with a high level of sensitivity to dissolved oxygen content have a low tolerance value. Meanwhile, organisms with a low level of sensitivity to dissolved oxygen content have a high tolerance value. FBI data from macrozoobentos found *in situ* Ciburuy is shown in Table 3.

Table 3: Value of The Macrozoobentos FBI *in situ* Ciburuy

NO.	FBI	Criterion
Station 1	6,3	A Little Poor
Station 2	4,8	Good
Station 3	4,0	Very Good
Station 4	3,8	Very Good
Station 5	3,9	Very Good

Situ Ciburuy has an FBI score that ranges from 3.8 to 6.3. The FBI value shows that Situ Ciburuy is indicated to have a very good to a little poor water criterion, which means slightly polluted to polluted with organic matter. These organic materials include waste from domestic, agricultural, livestock, fisheries and industrial activities [34].

The station with the highest FBI value is station 1 with a value of 6.3 and based on the criteria for the FBI value, it can be seen that station 1 has sufficient water criteria because it is polluted with a lot of organic matter. This is in accordance with the results of observations of C-organic substrate, which shows that the substrate at station 1 contains quite high C-organic (Table 1). In addition, station 1 also has the lowest DO average.

Station 2 has an FBI score of 4.8 and is included in the criteria for good waters. Station 3 has an FBI score of 4.0 with very good water criteria. Furthermore, station 4 has an FBI value of 3.8 which is included in the criteria for very good waters,

which is slightly polluted with organic matter, and is the station with the lowest FBI value. Station 5 has an FBI value of 3.9 which is included in the criteria for waters that are very good and slightly polluted with organic matter. The FBI value is of course related to the macrozoobenthos tolerance level contained in each station. The macrozoobenthos tolerance value describes whether the macrozoobenthos is intolerant or tolerant, the macrozoobenthos tolerance value to environmental changes ranges from 0-10 [3]. All stations were dominated by *Pomacea canaliculata* from the family Ampullariidae which had a tolerance value of 3. However, at station 1 there were other types that were also found, namely *Tubifex tubifex* and *Chironomus* sp. which have high tolerance values, which are 10 and 8.

4. Conclusions

The level of water pollution *in situ* Ciburuy based on macrozoobenthos bioindicators is moderately polluted with indications of diversity, the uniformity of macrozoobenthos *in situ* Ciburuy is categorized as moderate or in unstable conditions, and the FBI value indicates the criteria for the waters are slightly bad to very good with values ranging from 3.8 -6.3.

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