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Macrozoobenthos Diversity in Sunyanyuri Lake, Sumedang Regency as an Indicator of Water Quality

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KeyWords
Sunyanyuri Lake, Water Quality, Makrozoobenthos

ABSTRACT
Sunyanyuri Lake is a small artificial lake located in Cimarias Village, Pamulihan District, Sumedang Regency which is currently used for various activities of local residents such as *camping ground*, agriculture, and fishing. Macrozoobenthos was chosen as a biological indicator of lake waters because of its relatively sedentary life, limited movement, easy analysis, and living in and on the bottom of the waters which are very good for biological indicators of water. The purpose of this study was to determine and analyze water quality based on the diversity of macrozoobenthos in Sunyanyuri Lake, Sumedang Regency. The research method used is a survey method by making direct observations at stations that have been determined based on a simple random sampling technique. The study was conducted at 4 stations based on the cardinal directions of Lake Sunyanyuri from June 20, 2021 to October 20, 2021. The results of the study at Lake Sunyanyuri found 3 families (Dytiscidae, Hydrophilidae, and Hirudinea) from 2 classes (Clitellata and Insecta). The diversity index ranges from 0 to 0.36. The uniformity index ranges from 0 – 0.33. The range of water quality and BOD showed variations and dynamics that were still within the tolerance limits of macrozoobenthos life.

INTRODUCTION

Sunyanyuri Lake is a small artificial lake located in Cimarias Village, Pamulihan District, Sumedang Regency. Sunyanyuri Lake serves as a water reservoir. The water from the lake was originally used to irrigate citrus and lychee plantations in 1992. Currently, it is used for various activities of local residents such as *camping ground*, agriculture, and fishing. Human activities around the lake can have an impact on the ecosystem (Asdak 2002). These human activities will provide organic input to the lake. These organic inputs come from agricultural activities, plantations, and soil erosion. The influence of human activity can be seen in its existence in benthos, due to the relatively sedentary nature of benthos (Siegel 2003). The abundance and diversity of macrozoobenthos are influenced by changes in water quality. Abundance and diversity are highly dependent on tolerance and sensitivity to changes in the surrounding environment (Marsaulina 1994). The high diversity of macrozoobenthos in water indicates that the waters are in good condition. On the other hand, if the diversity of macrozoobenthos is low and the dominance of a species occurs, then the waters are in a bad condition (Sastrawijaya 1991). The importance of the role of macrozoobenthos in the waters and the absence of data and information about macrozoobenthos in Sunyanyuri Lake, therefore research was carried out on the diversity of macrozoobenthos and its effect on water conditions in Sunyanyuri Lake, Pamulihan District, Sumedang Regency.

MATERIALS AND METHODS

TOOLS AND MATERIALS

The tools and materials used in the research are as follows: Ekman grab, 1 mm sieve, dark bottle, pH meter with an accuracy of 0.01, a digital thermometer with an accuracy of 0.1 ^{o} C, a digital DO meter with an accuracy of 0.01 mg/l, *Secchi disk,* Winkler bottle, dropper, mohr pipette, Erlenmeyer, stick, camera, plastic zip-lock, petri dish, digital scale, oven, sieve shaker, stationery, coolbox, label paper, equates, identification book Pennak (1978) and Thorp and Covich (1991), 70% alcohol, 50% MnSO4 solution, Reagent 02 solution, H_2SO_4 solution, na-thiosulfate solution, sodium oxalate and sodium carbonate, $K_2Cr_2O_7$ 1 N and H_2SO_4 concentrated indicator Ferroin, Acid sulfate concentrated H_3BO_3 1% Conway's indicator, 40% NaOH, H_2SO_4 0.05 N, Sodium oxalate and Sodium carbonate.

METHODS

The research method used is a survey method by making direct observations at stations that have been determined based on simple random sampling technique. The selection of stations is distinguished based on the representation of the lake area with the cardinal directions. Sampling was carried out on the northern, southern, eastern, and western shores of the lake.

OBSERVATION PARAMETERS AND DATA ANALYSIS

ANALYSIS OF WATER PHYSICAL-CHEMICAL PARAMETERS

The measurement of the parameters of the physical and chemical aspects along with the tools and methods used in the study are as follows.

Table 1. Physical and Chemical Parameters studied.

Parameter	Unit	Method Analysis	Location Observation
		Physical Parameters	
Temperature	^{o}C	Potentiometric	*in situ*
Transparency	cm	Visual	*in situ*
Depth	m	Visual Stick	*in situ*
Texture Substrate	-	Gravimetry	Laboratory
		Chemical Parameter	
pH	-	Potentiometric	*in situ*
DO	mg/l	Potentiometric	*in situ*
BOD	mg/l	Audiometry (Winkler)	Laboratory
C- Organic Substrate	-	Walkey and Black	Laboratory

Parameter	Unit	Method Analysis	Location Observation
N- Organic Substrate	-	Kjeldahl, Titrimetry	Laboratory
Substrate pH	-	Potentiometric	Laboratory

ANALYSIS OF PHYSICAL CHEMICAL PARAMETERS OF SUBSTRATE

a. PHYSICAL SUBSTRATE

Analysis of the texture of the substrate using the gravimetric method.

Calculation:

Soil weight (W) = dry soil weight x$100/(100\ /(+\mathrm{ka}))$

Weight of Clay-Dust (DL) = 1000/(ml pipetting I) x weight of pipetting I

Weight of Clay (L) = 1000/(ml pipetting I) x weight of pipetting I

B close Dust (D) = Weight Clay-Dust (DL) – Heavy Clay (L)

Percentage Clay Dust (%DL) = DL/W x 100%

Percentage Clay (%L) = L/W x 100%

Percentage Dust (%D) = %DL-%L

Percentage Sand (%P) = 100-%DL

b. CHEMICAL SUBSTRATE

Analysis of chemical substrate in the form of C- Organic analysis use method Walkey and Black, N-Total using method Kjeldahl, Titrimetry, and Substrate pH use method Potentiometry.

ANALYSIS OF BIOLOGICAL PARAMETERS

a. ABUNDANCE OF MACROZOOBENTHOS

Macrozoobenthos abundance was defined as the number of individuals taken per unit area (m2). The samples that have been identified are then calculated for their abundance using the Odum formula (1993).

Di=ni/A

Information :

In : Macrozoobenthos Abundance (eng/ m2)

Ni: Number of Individuals of Macrozoobenthos (Ind)

A : Ekman's mouth opening area (m2)

b. MACROZOOBENTHOS DIVERSITY

Species diversity is a characteristic of community structures, the purpose of which is to measure the level of order in a system. Diversity is calculated using the Shannon – Winner diversity formula in (Krebs, 1978), as follows:

H^'= -∑ (ni/N) Log2 (ni/N)

Information :

H' : Species diversity index

Ni : Number of individuals of macrozoobenthos species (i = 1,2,3 ...)

N : Total number of macrozoobenthos individual individuals

The criteria for the Shannon – Wiener (H') diversity index value are as follows:

H' < 1 : low diversity

1 < H' 3: Medium Diversity

H' > 3 : High Diversity

c. UNIFORMITY OF MACROZOOBENTHOS

Uniformity can be said to be balanced, namely the individual components of each species contained in a community, calculated by the uniformity index formula (Brower and Zar 1989)

E=H'/(H Max)

Description :

E : Macrozoobenthos species uniformity index

H' : Macrozoobenthos species diversity index

H max : Log2S = 3.3219 Log S

S : Number of Species

d. MACROZOOBENTHOS AS WATER QUALITY INDICATORS

Macrozoobenthos as an indicator of water quality was calculated using the family biotic index (FBI) index. FBI is a method of calculating the level of pollution of water by using an indicator in the form of the presence of macroinvertebrates based on their families. The formula used in the calculation is as follows:

FBI=(ni x T)/N

Information :

ni : Number of individuals of the i-th species.

T : Tolerance value of each family.

N : The total number of individuals found.

Table 2. Water Quality Criteria Based on Family Biotic Index (FBI) Value (Hilsenhoff, 1988).

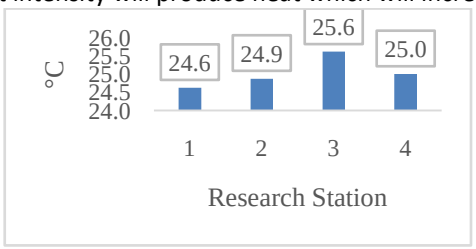
Index Value	Water Quality Criteria
>7.26	Very bad
6.51 – 7.25	Bad
5.76 – 6.50	Bad enough
5.01 – 5.75	Currently
4.26 – 5.00	Well
3.76 – 4.25	Very good
0.00 – 3.75	Excellent

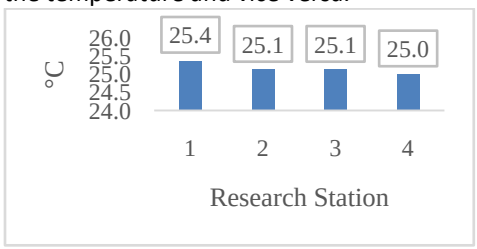
CONCLUSION

PHYSICAL PARAMETERS OF SUNYANYURI LAKE WATERS

TEMPERATURE

Temperature is the easiest environmental factor to measure and is often used as a limiting factor in water. temperature variation in the aquatic environment is relatively narrow compared to the terrestrial environment (Kramadibrata 1996). The first week of temperature observation had a difference of 24.6°C to 25.6°C. The low temperature at station 1 is due to the fact that when measurements were made in the morning at 08.00 WIB and the intensity of light entering the waters was small. Meanwhile, measurements at stations 2,3, and 4 were carried out during the day at 11.00 – 14.00 WIB and the intensity of the incoming light began to increase. In the second week of observation, the temperature range was quite homogeneous at a temperature range of 25°C. This happened because at the time of observation the weather was sunny and the light entering the waters was sufficient. The difference in temperature values at each station occurs due to differences in sampling time carried out in the field. Zahidah (2017) states that high light intensity will produce heat which will increase the temperature and vice versa.





Picture 1. The results of observations of temperature parameters in weeks 1 and 2

The temperature range in the first and second weeks at Sunyanyuri Lake, when compared with the water quality standard for fisheries, namely PP No.22 of 2021, can be stated that in this temperature range it is still within the normal range for aquatic biota life and macrozoobenthos life due to temperature fluctuations during research at each station does not exceed 3°C. Overall,

during the observation of the temperature in the waters of Lake Sunyanyuri, it was still within the tolerance value for the life of aquatic organisms, especially macrozoobenthos. Unfavorable temperatures can even cause the death of macrozoobenthos in the range of 35-40°C (Rijaluddin 2017).

DEPTH AND TRANSPARENCY

The depth of water is one of the barriers that affect the brightness of the waters. In shallow water conditions, the intensity of the sunlight can penetrate the entire body of water so that it reaches the bottom of the water (Simanjuntak 2018). The depth of the water edge of Sunyanyuri Lake as a whole can be said to be shallow because it has a depth of less than 1 meter. In the 2nd week there is a decrease in water discharge or receding because in the observation period from week 1 to 2 there is no rainwater and has entered the dry season. Depth also affects the type and number of macrozoobenthos. Sulistiyarto (2011) states that the depth of water is related to the abundance of macrozoobenthos, where an increase in water depth is followed by a decrease in the abundance of macrozoobenthos and vice versa. The depth measurement at the time of the research in Sunyanyuri Lake can be seen in Figure 2.

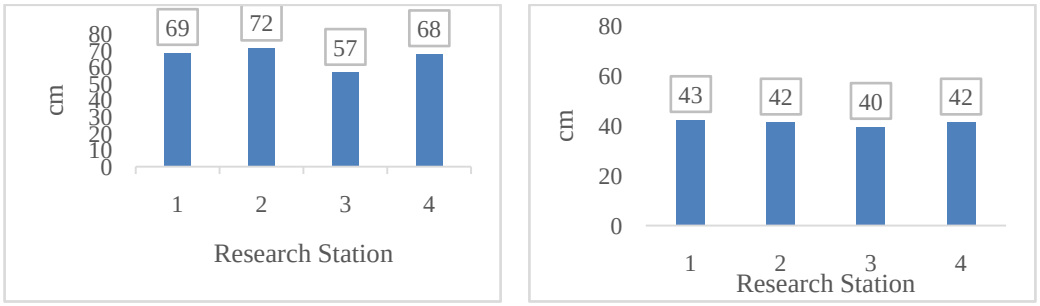


Figure 2. Observations of depth parameters in weeks 1 and 2

Transparency is a measure of water that is determined by visual measurement using a *Secchi disk.* Based on measurements during field observations, the water of Lake Sunyanyuri has clear water so that observations using the Secchi disk can still be seen to the bottom. Good transparency values for macrozoobenthos that live on the bottom of the water range from 25-40 cm (Ghina 2012). Mulyanto (1992) explained that if the distance between the visual boundaries of the Secchi disk is less than 20cm, it will be unfavorable for macrozoobenthos because it can cause problems with low dissolved oxygen content. Thus, the results of transparency measurements during field observations are still in normal condition.

CHEMICAL PARAMETERS OF SUNYANYURI LAKE WATERS

DEGREE OF ACIDITY (pH)

The pH value of the waters is one of the environmental parameters that affect the processes of life and the composition of species in the community of organisms. The pH value is the intensity of the acidity or alkalinity of a sample of water and represents the concentration of hydrogen ions (Danurahman 2019). The results of measuring the pH of the waters in Lake Sunyanyuri at each station in week 1 varied, ranging from 7.5 to 8.2. Meanwhile, in the 2nd week, there was an increase in numbers at each station, namely 8.6 – 8.8. Measurement of pH during the study at Lake Sunyanyuri can be seen at 3.

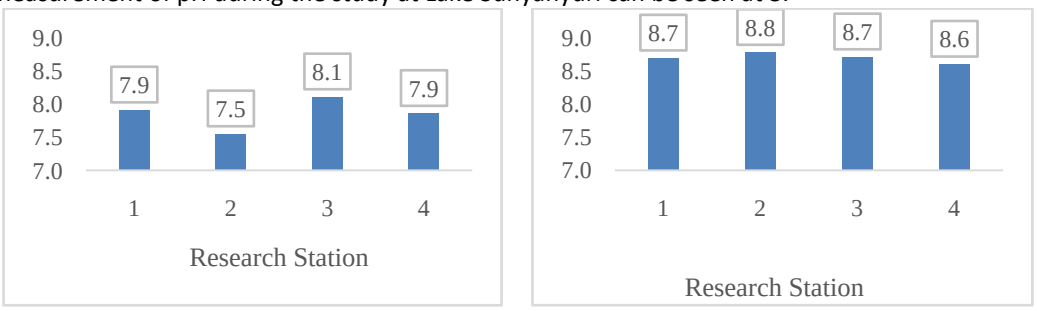


Figure 3. Observations of pH parameters in weeks 1 and 2

Based on PP no. 22 in 2021 the average pH obtained in the 1st and 2nd weeks is still neutral so that it meets the class II water quality standard which requires the pH to be between 6-9 and for benthic organisms, it is still in the tolerance range. Life in water can still survive if the waters have a pH range of 5-9 (Sinambela 1994).

DISOLVED OXYGEN (DO)

Dissolved oxygen is needed by all living organisms for respiration, metabolic processes, or the exchange of substances which then produce energy for growth and reproduction. Oxygen is also needed for the oxidation of organic and inorganic materials

in aerobic processes. The main source of oxygen in waters comes from the process of diffusion from free air and the results of photosynthesis of organisms in these waters (Salmin 2000). The results of measurements of DO waters in Lake Sunyanyuri at week 1 at each station varied, ranging from 6.9 mg/l – 7.2 mg/l. Meanwhile, in the 2nd week, there was a decrease in the DO value at each station, which had the same value of 6.3 mg/l. DO measurement during the research in Sunyanyuri Lake can be seen in Figure 4.

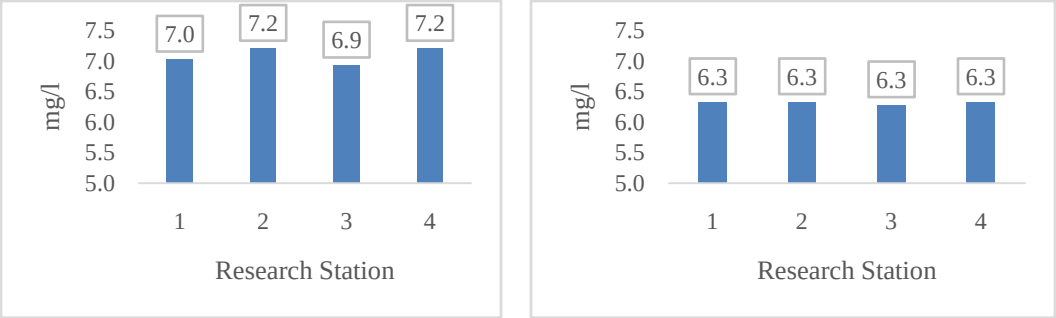


Figure 4. Observations of DO parameters for weeks 1 and 2

The decrease in DO value from the first week to the second week is thought to be due to the input of organic matter into the waters, namely food debris. The entry of organic matter such as food scraps causes an increase in decomposing microorganisms in the water and the consumption of dissolved O2 $_{in}$ the water for respiration, resulting in a decrease in O2 levels $_{(}$ Mulia 2005). Then based on PP no. 22 in 2021 the average DO obtain in the 1st and 2nd weeks is still neutral so that it meets the class II water quality standard which has a minimum limit of 4 mg/l.

BIOCHEMICAL OXYGEN DEMAND (BOD)

Determination of BOD is a *bioassay procedure* that involves measuring the amount of oxygen used by organisms as long as these organisms break down organic matter in waters under conditions that are almost the same as those in nature. BOD5 is an indicator parameter of organic matter pollution, where the higher the BOD5 value in water, the higher the level of organic matter pollution. The value of BOD5 is determined by the activity of decomposing organisms such as bacteria in decomposing organic matter (Barus 2004). The results of BOD $_{5\ measurements}$ in Sunyanyuri Lake at week 1 showed BOD $_{5\ concentrations}$ with a value of 0.096 mg/l to 0.875 mg/l. While in the 2nd week there was an increase in the concentration of BOD $_5$ at each station namely the concentration of BOD $_5$ with a value of 0.0669 mg/l to 1.35 mg/l. Measurement of BOD $_5$ during the study in Sunyanyuri Lake can be seen in Figure 5.

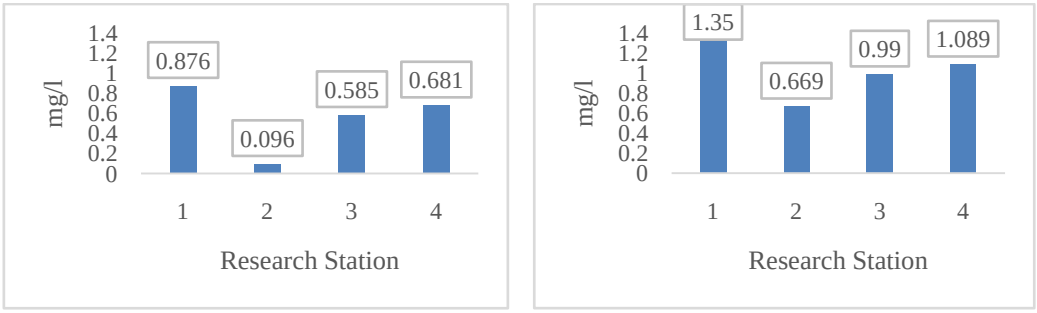


Figure 5. Observations of BOD parameters for weeks 1 and 2

Based on PP no.22 of 2021, the BOD value in Sunyanyuri Lake has a value that is included in class II. The BOD class II value is 3 mg/l, while the BOD_5 in Sunyanyuri Lake has a value below 3 mg/l so the waters of Sunyanyuri Lake are categorized as good.

SUBSTRATE

Substrate base or texture soil is very component important for living organisms. The substrate on the bottom waters will determine the abundance and composition type of benthos (Odum 1994). The results of substrate characteristics such as texture, PH, C-Organic, and N-Organic in the waters of Lake Sunyanyuri can be seen in table 3.

Table 3. Substrate parameter observations

No.	Parameter	Unit	Results	Criteria
1	pH : H2O	-	6.79	Neutral
2	C-Organic	(%)	1.05	Low

3	N-Organic	(%)	0.31	Currently
4	C/N	-	3.3	Very low
5	Texture :			
	Sand	(%)	10	dusty clay
	Dust	(%)	56	
	clay	(%)	34	

From the results of measuring the pH of the substrate in the lake during the study, the pH value was 6.79. The pH value in Sunyanyuri Lake is considered safe for macrozoobenthos life. The pH value that is safe to support the life of macrozoobenthos is in the range of 5-9 because the effect of the toxicity of toxic materials will be relatively small, and if the pH value is below the number 5 or above the number 9 it will interfere with the life of the macrozoobenthos (Hynes 1978). The chemical concentration of the C-Organic substrate based on the observations was 1.05%. The concentration of N-Organic based on the observations is 0.31. The value of the C/N ratio in Sunyanyuri Lake is 3.3. According to the Center for Soil Research (1983), the C-Organic content in Sunyanyuri Lake is in a low category, the N-Organic content is in the medium category and the C/N ratio is very low. The results of the observation of the texture of the substrate showed that the content of the dust fraction had the highest percentage, namely 56%, clay fraction 34%, and sand fraction 10%. Overall, the type of substrate in Lake Sunyanyuri is dusty clay. This happens because Lake Sunyanyuri is calm waters without any currents. The slow current makes these small fine particles such as mud easy to settle to the bottom of the water (Magfirah *et al.* 2014).

ABUNDANCE OF MACROZOOBENTHOS

The abundance value of aquatic organisms, including macrozoobenthos according to Odum (1993) was obtained by comparing the number of individuals found to the unit area ($m2^{)}$. Data on the total abundance of macrozoobenthos identified in the first and second weeks in Sunyanyuri Lake can be seen in Tables 4 and 5.

Table 4. Data abundance at week 1

class	Family	Abundance of Macrozoobenthos			
		Station 1	Station 2	Station 3	Station 4
Clitellata	*Hirudinea****	125	25	-	-
Insecta	*Dytiscidae **	75	225	25	75
	*Hydrophylidae**	-	-	25	75

Table 5. Data abundance at week 2

class	Family	Abundance of Macrozoobenthos			
		Station 1	Station 2	Station 3	Station 4
Clitellata	*Hirudinea****	150	25	-	-
Insecta	*Dytiscidae **	0	150	200	75
	*Hydrophylidae**	-	-	-	-

Information :
** : facultative group macrozoobenthos (medium pollution indicator).
*** : macrozoobenthos tolerant group (an indicator of heavy pollutant).
(Hillsenhoff 1988 *in* Helen 2013).

The highest average abundance in the first week by the family *Dytiscidae* was 225 ind/m^{2}. the highest abundance in the second week was also by the family *Dytiscidae* at 200 ind/m^{2}. The abundance of macrozoobenthos is influenced by physical and chemical factors as well as aquatic biological factors, such as temperature, pH, substrate type, dissolved gases, and interactions with other organisms (Odum 1993). The Dytiscidae group is mostly found in the waters of Lake Sunyanyuri, in accordance with Hawkes' (1979) statement that this insect group is found in the pH range of 4.5 – 8.5 which corresponds to the pH value of the waters of Lake Sunyanyuri.

In the first week, there were 3 families identified, namely the Hirudinea, Dytiscidae, and Hydrophylidae families. Meanwhile, in the second week of observation, only two families were identified, namely the Hirudinea and Dytiscidae families. The identified macrozoobenthos are facultative and tolerant macrozoobenthos. Setiawan (2008) explains that facultative organisms are organisms that can live within a wide tolerance range. These organisms can live in waters rich in organic matter and in waters that are light to moderately polluted.

MACROZOOBENTHOS DIVERSITY

Species diversity is the number of species among the total number of individuals of all existing species (Arifin 2010). The diversity of macrozoobenthos species in Lake Sunyanyuri is as follows:

a. Dytiscidae


Dytiscidae top view


Dytiscidae bottom view

Dytiscidae has an elongated oval body shape with long antennae. Dytiscidae also has flat hind legs and tufted hairs, have a scutellum. This insect has black, brown, and yellowish colors. Has a body length of 1.4 - 3.5 mm. These insects can be found in ponds or still streams of water. Dytiscidae often takes air from the surface of the water and stores it in air bubbles under the elytra.
The waters of Lake Sunyanyuri are calm waters because this lake does not have a water inlet or outlet. Borror et al (1992) stated that this Dytiscidae group prefers calm waters. Family Dytiscidae belongs to the type of macrozoobenthos that has a tolerance to moderate or facultative waters (Hillsen Hoff 1998).

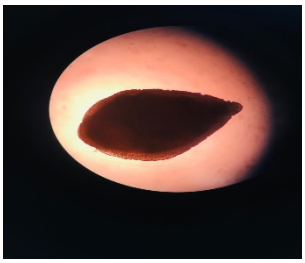
b. Hydrophilidae


Hydropilidae top view


Hydropilidae bottom view

Hydrophilidae has an oval or elliptical body shape and has a body size of 1 – 40 mm. The long maxillary palps resemble antennae, usually longer than the antennae. It has flat hind legs and resembles tufts of hair. This hydrophilic is found in ponds or calm waters. When swimming, these hydrophilic will move their legs alternately. Adult hydrophilic are scavengers but larval hydrophilic eat all aquatic animals. Hydrophilidae is included in organisms with light to moderately polluted water quality indicators or is included in facultative animals (Handika 2012).

c. Hirudinea



Hirudinea has a flat and segmented body shape. The outer body is divided into annulus which means rings. Hirudinea are hermaphrodites. These animals usually live in freshwater, seawater, and in moist soil. The respiratory system of this animal passes through the surface of the body. This Hirudinea food is in the form of worms, insect larvae, other invertebrates, and blood. Hirudinea is an organism with indicators of water quality being heavily polluted or tolerant (Teguh Santoso 2017).
The value of diversity is one of the indexes used to assess the stability of aquatic biota, which is mainly related to the condition of the waters. The value of macrozoobenthos diversity identified in the first and second weeks in Sunyanyuri Lake can be seen in Figure 6.

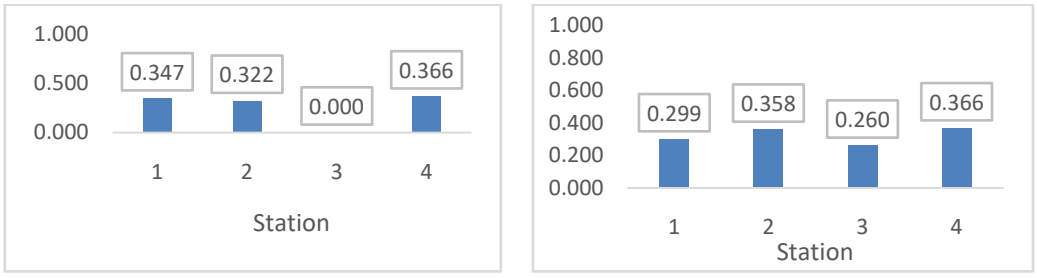


Figure 6. Macrozoobenthos diversity index data for weeks 1 and 2

Based on the data obtained from the results of research in the field in week 1 and week 2, it was found that the calculation of the Shannon-Wiener macrozoobenthos diversity index (H') showed that the diversity index in Sunyanyuri Lake was included in waters with low diversity (H' < 1) and indicates low community stability (the ecosystem is in an unbalanced state). The low diversity of macrozoobenthos in the waters of Lake Sunyanyuri is thought to be due to the lack of activities carried out around the lake. The lack of human activities around the lake causes water conditions to tend to remain constant and cannot invite other macrozoobenthos to be present in these waters (Achmad *et al.* 2011).

UNIFORMITY OF MACROZOOBENTHOS

The uniformity index shows the balance of the individual components of each macrozoobenthos species contained in one community. The uniformity index value in Sunyanyuri Lake can be seen in Figure 7.

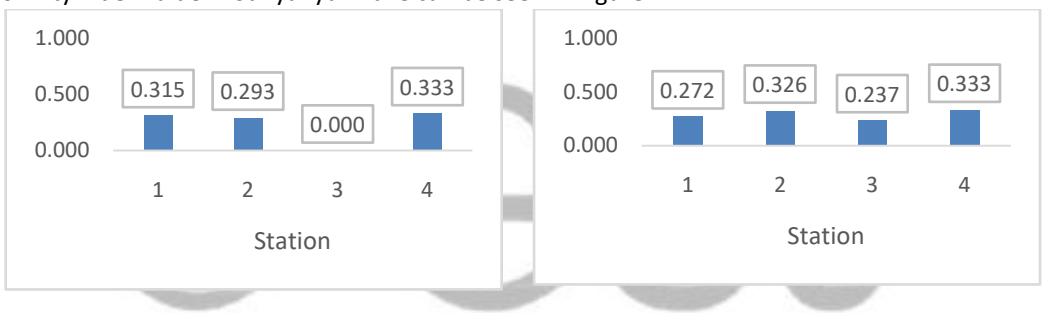


Figure 7. Macrozoobenthos uniformity data for weeks 1 and 2

Based on the uniformity index criteria, the uniformity of the macrozoobenthos population in Sunyanyuri Lake is classified as low because the E value is < 0.5 (Krebs 1985). This shows that the distribution of macrozoobenthos species is uneven and the number is not diverse and there is a dominance of one species. This can happen because the species found are only from three families. Biological conditions in Lake Sunyanyuri are said to be not good because the presence of macrozoobenthos is not balanced and there is a dominance of one species. Hidayat and Muktar (2001) explain that balanced conditions are characterized by high diversity and the absence of dominance because uniformity is directly proportional to the value of diversity, the higher the diversity, the better the biological condition.

SUNYANYURI LAKE WATER QUALITY

From the list of macrozoobenthos classes obtained, it can be grouped into the presence of each class to estimate indicators of aquatic environmental pollution by referring to macrozoobenthos bioindicators according to Hilsenhoff (1988) with the *family biotic index* (FBI) method. The value of the *family biotic index* in Sunyanyuri Lake can be seen in Table 6.

Table 6.Value *family biotic index* in Sunyanyuri Lake, Kab. Sumedang

No	Family Makrozoobenthos	Toleranc e value	M 1 S 1	M2 S 1	M 1 S 2	M2 S 2	M 1 S 3	M2 S 3	M 1 S 4	M2 S 4
1	Hirudinea	10	5	6	1	1	0	0	0	0
2	Dytiscidae	5	3	0	9	6	1	8	3	3
3	Hydrophylidae	5	0	0	0	0	1	0	3	0
Total			8	6	10	7	2	8	6	3
∑ [ni. T]			65	60	55	40	10	40	30	15
Family Biotic Index (FBI)			8,125	10	5.5	5.7	5	5	5	5

FBI Average Score	9.1	5.6	5.0	5.0

Based on the results of the calculation of the biota family index in Sunyanyuri Lake, the value ranges from 5 to 9.1. The value obtained states that Lake Sunyanyuri is included in the lake with moderate to heavy pollution. This happens because the conditions in Lake Sunyanyuri are poor in nutrients. The absence of a food source for the life of the biota will affect the life of the biota in the waters. The presence and abundance of macrozoobenthos species are influenced by habitat conditions, namely bottom sediment and water quality. The basic sediments, apart from being a habitat for macrozoobenthos, also provide food (Aris et al. 2016).

CONCLUSION AND SUGGESTION

CONCLUSION

Based on the research results, the water quality in Sunyanyuri Lake based on the diversity of macrozoobenthos is categorized as moderate to heavily polluted. The macrozoobenthos found consisted of 3 families, namely *Dytiscidae*, *Hydrophilidae,* and *Hirudinea* with a low value of macrozoobenthos diversity (H' < 0,5) indicating a low macrozoobenthos community and low food availability. Based on the uniformity index criteria, the uniformity of the macrozoobenthos population in Sunyanyuri Lake is classified as low because the E value is < 0.5. This shows that the distribution of macrozoobenthos species is not evenly distributed and the number is not diverse. Based on the physical and chemical parameters, the waters of Lake Sunyanyuri fall into the good category of water group II.

SUGGESTION

Based on the results of the study, it is recommended that there be further research on plankton biotic objects so that the waters can be known how their primary productivity is, as well as regular and sustainable management of the waters of Lake Sunyanyuri from all policymakers so that there is no pollution from inputs around the lake so that the quality water is maintained properly and can provide benefits to the surrounding community according to their needs.

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