Plankton Diversity in Aek Rao River Gunung Tua

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Abstract.
The purpose of this study was to determine the index of plankton diversity in the Aek Rao River, Gunung Tua. The research was carried out from April to May 2022 in the Aek Rao River, Gunung Tua. The sampling method used purposive random sampling which consisted of 3 observation stations, namely station 1 upstream, station 2 for residential areas and station 3 for densely populated areas. The results showed that the composition of plankton in the Aek Rao River, Gunung Tua consisted of 3 classes of phytoplankton, namely Bacillariophyceae, Chlorophyceae and Cyanophyceae, while the zooplankton class consisted of 4 classes, namely Mastigophora, Monogononta, Crustacea and Ciliophora. The highest diversity index in phytoplankton was obtained at station 1 of the sand mining area with a value of 1, 39 which indicates that the level of diversity is in the medium category. In zooplankton the highest diversity index was found at station 3 with a value of 0.33 which indicated that the level of diversity was included in the low category. While the highest dominance index for phytoplankton was found at station 3 in densely populated areas with a value of 0.43 while zooplankton was found at station 1 in a sand mining area with a value of 0.00563, both values indicated that there was no dominant plankton genus in that area.

Keywords: *Diversity, Plankton, and Aek Rao River Gunung Tua..*

I. INTRODUCTION

Aek Rao River is located in Nabundong Village, Dolok Sigompulon District, Gunung Tua Regency. These waters have a length of 35 KM and a width of 7 M. Based on survey results and information from the surrounding community, it is known that most of the community activities around the Aek Rao River use river water for activities. These waters are widely used by the community as transportation, fishermen and as a source of daily drinking water. Community activities in the Komering River cause changes in the aquatic environment. Soylu and Gonulol (2003) in Rashidy, et al. (2013) stated that the aquatic environment consists of biotic and abiotic components that interact with each other through the flow of energy and nutrient (nutrient) cycles.

Changes in aquatic ecosystems will affect the presence of plankton. According to Sachlan (1982), plankton are small organisms that live swayed by water currents. The diversity of plankton in a waters can be used as one of the biological indicators in determining changes in the condition of the waters. For this reason, it is necessary to study the diversity of plankton in the Aek Rao River, Nabundong Village, Dolok Sigompulon District, Gunung Tua Regency. The results of the study are expected to be used as initial data for assessment related to the water quality of the Aek Rao River.

II. METHODS

This research method uses a descriptive method of plankton diversity in the Aek Rao River, which is located in Nabundong Village, Dolok Sigompulon District, Gunung Tua Regency. Sampling of plankton using purposive random sampling method.

Materials And Methods

a. Location and Time

This research was carried out from April to May 2022 in the Aek Rao River, which is located in Nabundong Village, Dolok Sigompulon District, Gunung Tua Regency.

b. Tools and materials

The tools used in this research are: Sedgwick rafter / cover glass, film bottles, label paper, microscope, plankton net no 25, plastic bucket, secchi disk, thermometer, DO meter, pH meter, camera, dropper, stationery, measuring cup. While the material used is water samples taken from the Aek Rao River.

c. Plankton Sampling

The sampling steps are to prepare a plankton net, take a water sample using a 5 liter bucket, after that the water sample is entered into the plankton net net, repeated 10 times until the water sample volume reaches 50 liters. The water that is accommodated at the end of the plankton net is transferred to a 200 ml sample bottle, then 2 ml of the sample is dripped with Lugol's solution, shake the sample bottle until it is homogeneous and the sample water looks brownish. Then close the sample bottle tightly, label the station, time and place.

Plankton Identification

The identification and analysis of plankton was carried out at the Labuhanbatu University Biology Laboratory.

I. Data analysis

Diversity Index

Diversity index analysis is used to determine the diversity of aquatic organisms. The equation used to calculate this index refers to the Shanon – Wiener equation (Odum, 1993 in Yusanti, 2018).

H' = -

Information :

H' = Diversity Index

S= Number of Species

Pi = ni/N

Ni = total number of individual species to i

N = total number of individualsin the community

The criteria for the diversity index are divided into 3 categories, namely:

H' < 1 = low diversity H' < 3 = moderate diversity H' > 3 = high diversity

Dominance Index

The dominance index is used to determine the dominance of certain species in the waters using the Simpson's formula (Odum 1993).

D = (pi)2 = ( )2 Description :

D = dominance index $\frac{ni}{N}$

Ni = total number of individuals of the ith species (ind/l)

N = total number of plankton at each sampling point (ind/l)

Pi = ni/N

III. RESULTS AND DISCUSSION

The results of the identification of plankton samples in the Aek Rao River, located in Nabundong Village, Dolok Sigompulon District, Gunung Tua Regency, obtained the composition of the plankton genus consisting of 4 classes of phytoplankton namely Bacillariophyceae as many as 14 (fourteen) genera, namely Achnanthes, Coconeis, Coscinodiscus, Cymbella, Diatoma , Epithemia, Fragilaria, Melosira, Navicula, Nitszthia, Pinularia, Surirella and Synendra. Class Chlorophyceae as many as 15 (fifteen) genera, namely Ankistrodesmus, Ankistrodesmus, Closterium, Cosmarium, Cyclotella, Gleocystis, Gonatozygon, Mougeotia, Oedogonium, Pediastrum, Pleurotaenium,Scenedesmus, Staurastrum, Stigeoclonium farctum and Tetraedron. For the Cyanophyceae class there are 7 (seven) genera, namely Aphanizomenon, Gomphospaheria, Hydrodiction, Merismopedia, Oscilllatoria, Phormidium and Stigeonema.

Meanwhile, zooplankton consists of 4 classes, namely Mastigophora with 5 (five) genera, namely Arcella, Difflugia, Euglena, Phacus and Trachelomonas. Class Monogononta as many as 7 (seven) genera, namely Anureopsis, Asplanchna, Keratella, Lecane, Monostyla, Notholca,Trichocerca. Class Crustacea as

much as 1 (one) genus, namely Nauplius and Ciliophora as much as 1 (one) genus, namely Stentor.The value of the plankton diversity index consisting of phytoplankton and zooplankton at each sampling station in the Aek Rao River, located in Nabundong Village, Dolok Sigompulon District, Gunung Tua Ilir Regency can be seen in full in Table 1.

Plankton Diversity

From Table 1, it is found that the highest average value of the phytoplankton diversity index obtained at station 1 for the sand mining area is 1.39, followed by station 2 for the floating net cage fish cultivation area with a value of 1.29. Based on the Shannon-Wienner index, this value indicates that the diversity of phytoplankton is included in the moderate category, where the diversity value of 1 < H' < 3 indicates that the diversity is moderate, the distribution is moderate, the productivity is sufficient, the ecosystem condition is quite balanced, and the ecological pressure is moderate. At station 1, the sand mining area and station 2, the floating net cage fish culture area, the average diversity value is at a moderate level, so it can be interpreted that the phytoplankton in these 2 (two) stations are in good condition.

Table 1. The Average Index of Plankton Diversity (H') in the Aek Rao River is the waters located in Nabundong Village, Dolok Sigompulon District, Gunung Tua Regency.

Station	Diversity Phytoplankton (H')	Diversity Zooplankton (H)
Station 1		
Sand Mining Area		
1 point	0.5	0.37
Point 2	1.67	0.39
3 point	1.17	0.17
Average	1.11 (Medium)	0.31 (Low)
Station 2		
Floating Net Cage Fish Cultivation Area		
1 point	1.24	0.30
Point 2	1.72	0.28
3 point	1.42	0.09
Average	1.46 (Currently)	0.22 (Low)
Station 3		
Densely Populated Area		
1 point	1.66	0.34
Point 2	0.86	0.79
3 point	0.69	0.39
Average	1.07 (Low)	0.50 (Low)

At station 3 densely populated areas, the average value of the diversity index is 0.98. Based on the Shannon-Wienner index, this value indicates that the diversity of phytoplankton is categorized as low. Score diversity H'< 1 indicates that diversity is low, unstable, poor, very low productivity as an indication of heavy pressure and unstable ecosystem. The low value of phytoplankton diversity at station 3 is a densely populated area, presumably because phytoplankton cannot adapt well, this is because at that station, based on observations in the field, it is a densely populated area which causes high population activity. Sinaga (2009) in Luthfia (2013) said that the addition of organic and inorganic materials in the form of waste in the waters in addition to changing the chemical composition of the water, can also affect the biological properties of the waters. Luthfia (2013) in Yusanti (2017) also added that pollution can cause species diversity to decrease.

From Table 1 above, it is also obtained that the index value of zooplankton diversity at each sampling station in the Aek Rao River is the waters located in Nabundong Village, Dolok Sigompulon District, Gunung Tua Regency. At station 1 the sand mining area obtained an average value of 0.16, at station 2 the floating net cage fish cultivation area obtained an average value of 0.18 and at station 3 the densely populated area had an average value of 0.33.Based on the Shannon-Wiener diversity index, this value indicates that the diversity of zooplankton H' < 1 which indicates the level of diversity is included in the category of low, unstable, poor, very low productivity as an indication of heavy pressure and unstable ecosystem. The low value of zooplankton diversity is thought to be due to zooplankton not being able to

adapt to environmental conditions. In addition, in the food chain system in the waters, zooplankton is a source of food for other organisms, such as fish. Another assumption is that there is a possibility of cannibalism among zooplankton due to the lack of availability of phytoplankton as a food source. The existence of cannibalism in zooplankton is reinforced by the statement of Ningrum (2015),

Dominance Index

Based on the results of the identification of plankton in the Aek Rao River, which is located in Nabundong Village, Dolok Sigompulon District, Gunung Tua Regency, the plankton dominance index value is presented in Table 2 below.

Table 2. The Plankton Dominance Index (D) in the Aek Rao River is the waters located in Nabundong Village, Dolok Sigompulon District, Gunung Tua Regency

Station	Dominance (D) Phytoplankton	Dominance (D) Zooplankton
Station 1		
Sand Mining Area		
• 1 point	0.19	0.089
• Point 2	0.29	0.0009
• 3 point	0.98	0.0007
Average	0.16	0.0604
Station 2		
Fish Cultivation Area		
1 point	0.45	0.9
Point 2	0.56	0.013
3 point	0.63	0.015
Average	0.54	0.61
Station 3		
Densely Populated Area		
1 point	0.36	0.021
Point 2	0.57	0.53
3 point	0.76	0.19
Average	0.56	0.246

Based on Table 2 above and the net cage fish culture area, it can be seen that the highest phytoplankton dominance index was found at station 3 densely populated areas with an average dominance index value of 0.246, while the lowest dominance index average value was obtained at stations 1 and 2, namely the quicksand mining area of 0.98. For the zooplankton dominance index, the highest value was found in station 1 in the sand mining area of 0.00563, while the lowest was at station 2 in the floating net cage fish culture area and in 3 densely populated areas, namely 0.015 and 0.021. This value indicates that at the 3 (three) stations there is no dominant genus. This statement is in accordance with the opinion of Magurran (1998) in Dewiyanti, According to Odum (1993), the loss of a dominant species will cause important changes not only in its own biotic community but also in its physical environment. The dominance of a type of plankton can indicate that the waters are polluted or unfavorable, so that only certain species can adapt to these water conditions.

IV. CONCLUSION

The composition of plankton in the Aek Rao River is that the waters located in Nabundong Village, Dolok Sigompulon District, Gunung Tua Regency consist of 3 classes of phytoplankton, namely Bacillariophyceae, Chlorophyceae and Cyanophyceae, while the zooplankton class consists of 4 classes, namely Mastigophora, Monogononta, Crustacea and Ciliophora. The highest diversity index of phytoplankton was obtained at station 1 of the sand mining area with a value of 1.39 which indicates that the level of diversity is in the medium category. In zooplankton the highest diversity index was found at station 3 with a value of 0.33 which indicated that the level of diversity was included in the low category. While the highest dominance index on phytolactons was found at station 3 densely populated areas with a value of 0,

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