

# Plankton Community in The Water of Babura River, Deli Serdang Regency

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**Abstract.** Plankton communities in Babura River Deli Serdang are the title of the research that has been conducted to determine the presence of plankton by a place of life. The research was conducted in November 2016. In order to provide the accuracy of data, then each station there are ten sub-stations for sampling samples. The results from this study illustrated of Plankton community in the river Babura, there are 11 species with the number of 26 individuals consisting of 9 species of zooplankton are *Closterium cornu*, *Zygnemopsis circumcarinatum*, *Synedra acus*, *Bacillaria* spp, *Fragilaria capucina*, *Cyclotella kutzingiana*, *Melosira ambigua*, *Calothrix pariet*, and *Eremosphaera viridis* and two species of phytoplankton are *Euglypha tuberculata* and *Rabdolaimus* spp. The condition with physical and chemical parameters at the time of research still support plankton life. This type of research is a de facto exposit that only revealing of existence data without any treatment. The data obtained will be used as initial data for further research. From indicated of Plankton communities and also connected with the parameters affecting it in each station can be known the ecological description of each species found.

**Keywords:** Community, Ecology, Parameters, Plankton.

## 1 Introduction

Plankton community is a collection of several species of plankton in the water, in this case in the water of the Babura river. Plankton is a food ingredient of organisms that are bigger than them so that the presence of plankton can be an indication of the presence of other organisms in this water. Plankton obtains food from ingredients that enter the river and have a role in nutrient cycles, especially phytoplankton as producers. According to Nybakken (1992), that plankton is invertebrate animals that float in the waters, whose relative movement is affected by currents. According to Melay and Rahalus (2014), found six phyla consisting of 9 genera with ten plankton species in Mangrove Ohoi in Kolser village, Southeast Maluku. According to Sagala (2009), 38 species of plankton were found, consisting of 26 phytoplankton species and 12 zooplankton species in Lebak Jungual, water in Pampang sub-district, Ogan Komering District. According to Purwanti et al. (2011), that more plankton was found at high tide compared to tidal times in the waters of the Demaan river estuary in Jepara Regency. According to Tindaon et al. (2014), found nine phytoplankton classes and eight zooplankton classes.

The plankton community can be used as biomonitoring of pollutants that enter the water. Much research has been done on plankton, but in the water of the Babura river, it is not.

Babura river is one of the rivers that traverse the city of Medan which is located in the village of Keci-keci, Sibolangit sub-district. This research was carried out in the upper reaches of the river in which water is still natural.

Plankton classified as plants or called phytoplankton are producers in the waters because they have chlorophyll to carry out photosynthesis, which produces starch as a food source for organisms bigger than plankton. Plankton are a food source for people, the food we eat is not directly depend on them (Hutabarat and Evan, 1986). Plankton are organisms that float in water which have almost no movement ability, and even if there are very weak and limited/passive movements (Suin, 2002). The swimming ability possessed by plankton is weak so the movement is strongly influenced by the movement of water (Nybakken, 1992); (Barus, 2004).

According to Basmi (2000), the classification of plankton through the needed nutrients consists of phytoplankton, saproplankton, and zooplankton. Phytoplankton is a vegetable plankton (> 90% consists of algae) which contains chlorophyll which is able to synthesize inorganic nutrients to become organic through photosynthesis with energy derived from sunlight. Saproplankton is a group of plants (bacteria and fungi) that has no photosynthetic pigments, and nutrients and energy from the rest of the other styles that have died, while zooplankton is group that depend on living environments, such as phytoplankton or residual organisms, such as detritus and debris.

According to Brotowidjoyo et al, (1995) that herbivorous zooplankton eat phytoplankton, carnivorous zooplankton and predatory fish eat herbivorous zooplankton. According to Putra et al. (2013), found 5 phytoplankton classes and 3 Zooplankton classes in the Upper Citarumriver. Plankton play an important role in influencing primary productivity of river water, especially phytoplankton because of their ability to photosynthesize. Stated that plankton is tolerant and have very different responses to quality. Phytoplankton is a group of plant plankton which size ranges from  $2 \pm 200$  micro meters (1 micro meter = 0.001 mm). Phytoplankton requires supporting factors to help the growth process, including temperature, light intensity and CO<sub>2</sub>. According to Karuwal (2015), that the plankton community is affected by physical factors.

Water currents are movements of water masses caused by differences in water level, water molecular density, or due to wind. Water movement can occur vertically or horizontally. Vertical currents play a very important role in the distribution of dissolved gases, minerals, turbidity, and planktonic organisms. Current velocity in lotic waters is relatively high, it can even reach 6 m/sec, in general the range is 3 m/sec (Barus, 2004).

Temperatures fluctuate every day, following the pattern of environmental air temperature, sunlight intensity, geographical location, shade, and internal conditions of the water such as turbidity, depth, current velocity, and organic material deposits at the bottom of the waters. The role of temperature is very important to the life of aquatic biota, if the temperature increases by 10°C, the rate of metabolism increases by 2-3 times. Temperatures for the development of aquatic organisms and do not cause dangerous stresses range 240C-270C.

Turbidity is the large number of suspended particles in the water. Turbidity in aquatic ecosystems is also closely related to depth, current velocity, type of substrate base, and water temperature. Ecological influences of turbidity are decreasing the penetration power of sunlight into the waters and will also affect the respiratory mechanism of aquatic organisms. The depth of water has an important role in the life of biota, the deeper of water there are zones which each have certain characteristics, such as temperature, solubility of gases in water, current velocity, penetration of sunlight and hydrostatic pressure. Changes in physical and chemical factors of water due to changes in depth will cause different response to biota in it.

The pH value states the concentration of hydrogen ions (H<sup>+</sup>) in solution, the ability of water to bind or release hydrogen ions will show the nature of an acid or base solution. Clean water, the concentration of H<sup>+</sup> and OH<sup>-</sup> is in balance or known as pH = 7. Aquatic organisms can live ideally

in the pH range between weak acid and weak base. According to Situmorang (2007), unpolluted water is on a pH scale of 6.0 to 8.0.

Dissolved Oxygen (DO) is the amount of O<sub>2</sub> gas that is bound by water molecules. The solubility of O<sub>2</sub> is strongly influenced by temperature and minerals dissolved in water. The maximum solubility of oxygen in water is at a temperature of 0 ° C, which is equal to 14.16 mg/l. DO comes from the process of photosynthesis of plants and direct binding of free air. DO is an indicator of water quality because the level of oxygen contained in water is needed by aquatic organisms in its survival (Situmorang, 2007).

Biological Oxygen Demand (BOD) shows the amount of oxygen needed by aerobic organisms for their life activities. BOD measurements were carried out for 5 days at 20°C, where within five days the activity of aerobic microorganisms was almost unchanged, therefore it was known as BOD<sub>5</sub>. BOD values indicate the content of organic matter in the waters, the higher the BOD value, it indicates that the waters contain a lot of organic material, (Barus, 2004). BOD is the amount of oxygen needed by aerobic microorganisms to degrade organic compounds in water (Situmorang, 2007). Phosphate content will affect eutrophication so that it can cause algae bloom. The color of the water becomes greenish, smells bad, and the water is cloudy.

Based on the description above, hence the title of the research carried out "Plankton Community in the Babura River, Deli Serdang Regency". The formulation of the problem in this study is "How is the community of plankton found from the water of the Babura River at Deli Serdang Regency". Research objective: to determine the plankton community in the waters of the Babura River, Deli Serdang Regency.

## **2 Methods**

The study was conducted in the Babura river, Deli Serdang Regency, which is located on two stations, namely: (1) in Keci-Keci Village, Sibolangit Subdistrict, which is an upstream area, the source of the water comes from the seepage of cliffs on the riverbanks, shaded by trees, and is an area natural and (2) in Durin Pitu village, Pancurbatu subdistrict, it is also covered with trees and crossed by natural plantations that are still in existence, there are wild plants that are cultivated, such as acid scale, mangosteen, areca nut, etc., each station has 10 substations as replications.

When the research or sampling took place on November 26, 2016, at the station one of the Keci-keci villages in Sibolangit starting at 10.00 and at station two in Durin Pitu Pancurbatu village starting at 14:00 am. At the time of sampling the weather at the research station in bright conditions. This research is *expose the facto*, meaning that only reveals the data obtained and as it is in the field (field research). The results of the study were then identified with the book Hutabarat and Evans, (1986).

### **2.1 Procedure**

Plankton samples were taken using a net plankton no. 25 tool, which was done by sampling water 10 times using a bucket of 5 liters filtered with net plankton. Water with plankton collected is put into a film bottle and dripped with 4% formalin up to 4 drops. Then plankton was calculated with the aid of a microscope, identified using Hutabarat and Evans (1986), Edmonson (1959), and Hynes (1976).

Water samples were taken with a dark sample bottle and 1 liter in size. The sample bottle is inserted into the body of the water, with the sloping position, the mouth of the bottle leads to the coming of the current after it is fully upheld and closed in water, then analyzed to BTKL. Measurement of parameters and units can be seen in Table 1. Sample of Plankton on the Babura River were taken on the same day at two research stations, the weather was very bright at the time of research in the waters of the Babura river but the previous night it was estimated that it was raining, marked by slippery and humid roads leading to the research location. Sampling was conducted on 26 November 2016, at the station one of Keci-keci village, Sibolangit sub-district starting at 10:00 am and at station two in Durin Pitu village, Pancurbatu sub-district, starting at 14:00 am. At the time of sampling the weather at the research station in bright conditions. Plankton samples were taken using 10 times net plankton at each research station. The plankton found in the Babura river at the time of the study are as shown in Table 2.

**Table 1.** Parameters measured by units

No	Parameter	Measuring Tool	units	Measured
1	Plankton (Community )	Plankton net Identification book	Ind/ltr Ind	In situ and in laboratory Biology Laboratory
<b>Physics Factor</b>				
2	Strong Current	Stop Watch	m/sec	In situ
3	Temperature	Thermometer	<sup>0</sup> C	In situ
4	Turbidity	Turbidimeter	JTU	BTK3L
5	Light transparency	Secchi-disk	M	In situ
<b>Chemical Factors</b>				
4	pH	pH meter	-	In situ
5	DO	DO meter	mg/ltr	In situ
6	BOD	Spectrophotometer	mg/ltr	BTK3L
7	Nitrate	spectrophotometer	mg/ltr	BTK3L
8	Phosphat	spectrophotometer	mg/ltr	BTK3L

**Table 2.** Results of Plankton Observation at two stations

No	Spesies	Station I	Station II	Jumlah
1	<i>Closteriumcornu</i>	1	1	2
2	<i>Zygnemopsis circumcarinatum</i>	2	2	4
3	<i>Synedraacus</i>	1	2	3
4	<i>Bacillariaspp</i>	1	1	2
5	<i>Fragilariacapucina</i>	1	1	2
6	<i>Cyclotellakutziana</i>	1	1	2
7	<i>Melosiraambigua</i>	1	2	3
8	<i>Calothrixpariet</i>	1	2	3
9	<i>Eremosphaeraviridis</i>	1	0	2
10	<i>Euglyphatuberculata</i>	1	1	2
11	<i>Rabdolaimusspp</i>	1	1	2
Jumlah				26

### 3 Result and discussion

The results of this study describe the plankton community in the Babura river there are 11 species with a total of 26 individuals consisting of 9 phytoplankton species namely *Closterium cornu*, *Zygnemopsis circumcarinatum*, *Synedraacus*, *Bacillariaspp*, *Fragilariacapucina*, *Cyclotellakutzingiana*, *Melosiraambigua*, *Calothrixpariet*, dan *Eremosphaeraviridis* and 2 zooplankton species namely *Euglyphatuberculata* dan *Rabdolaimus spp*.

Frequency of presence for *Closterium cornu*, *Zygnemopsis circumcarinatum*, *Synedraacus*, *Bacillariaspp*, *Euglyphatuberculata*, *Fragilariacapucina*, *Cyclotellakutzingiana*, *Rabdolaimus spp*, *Melosiraambigua*, *Calothrixpariet* 100% in each and *Eremosphaeraviridis* 50 % because it is found only at station one. Measurement of physical parameters in the Babura river such as temperature, current strength, depth, and light transparency is done insitu, turbidity and chemical parameters are anaasis to the BTKL Sei Wampu Medan road. The results of measurements of physical parameters and chemical parameters in both research stations still support the life of organisms in the waters of the Babura river such as plankton, can be seen in Table 3.

Sampling at station one starts at 10.00 with very hot weather conditions, the water is clear and discharge is a little because it comes from the surrounding seepage. Sampling at station two starts at 14.00 with very hot weather conditions, the water is slightly cloudy due to erosion from the cliffs that it passes through, many leaves and twigs in the water body. The plankton community in the Babura river consists of *Closterium cornu*, *Zygnemopsis circumcarinatum*, *Synedraacus*, *Bacillariapaxilife*, *Fragilariacapucina*, *Cyclotellakutzingiana*, *Melosiraambigua*, *Calothrixpariet*, *Eremosphaeraviridis*, *Euglyphatuberculata*, dan *Rabdolaimus spp*. *Euglyphatuberculata* dan *Rabdolaimus spp* are phytoplankton as food sources for zooplankton. Phytolankton as a little food source is found because light cannot go directly to the body of water for photosynthesis

**Table 3.** Results of measurements of physical and chemical parameters

No	Parameter	Station/research site	
		I	II
<b>Physics Factor</b>			
1	Strong current	1.85	3.15
2	Temperature	20	23.5
3	Turbidity	0.80	2,30
4	Depth	30 cm	36 cm
5	Light transparency	get to the bottom of the water	get to the bottom of the water
<b>Chemical Factors</b>			
6	pH	7	7
7	DO	8.0	7.28
8	BOD	0.5	4.5
9	Nitrate	0.8	0.3
10	Phosphat	0.27	0.28

The current strength at station one is 1.85 which is relatively slow because the water discharge is small, the water body is narrow with much rock, so the water that flows only slightly from the side of the large rock. This also happens because the waters are still very shallow and the bottom is almost flat. At station two the current strength is 3.15 the river body is slightly widened, the bottom of the river is slightly tilted. Water currents in the Babura river waters are still in the general range by Barus's opinion, (2004) that the current velocity in lotic waters is relatively high, even up to 6 m / sec, in general, the range is 3 m/sec.

The results of measurements of the pH of the Babura river waters are very supportive of the life of aquatic organisms, but the reality is not so because other parameters are more influential as a

limiting factor for the presence of plankton in the waters of the Babura river. The results of DO measurements of Babura river waters still support the life of aquatic organisms, but in fact, little plankton is found because other parameters are less supportive. The results of BOD measurements of Babura river waters still support the life of aquatic organisms, but in reality, plankton is found to be small because other parameters are less supportive. Light transparency that reaches the bottom of the water, still strongly supports the life of plankton, especially phytoplankton will be able to photosynthesize, but because it is very shallow causing plankton that can live only a little, even though the current is not very heavy but because the movement of plankton is affected by the current, so the flow of water can wash away plankton in the waters.

The research station is covered with a canopy of trees so that sunlight cannot penetrate directly into the waters. This affects the life of phytoplankton that is in dire need of sunlight for photosynthesis. So that there is no direct light to the waters affecting the presence of plankton. So it can be said that the environmental hue is the limiting factor for the presence of plankton.

## 4 Conclusion

Plankton community in the waters of the Babura river Deli Serdang Regency was found as many as 11 species with a total of 26 individuals consisting of 9 types of phytoplankton namely: *Closterium cornu*, *Zygnemopsis circumcarinatum*, *Synedraacus*, *Bacillariapaxilife*, *Fragilariacapucina*, *Cyclotellakutziana*, *Melosiraambigua*, *Calothrixpariet*, and *Eremosphaeraviridis* and 2 types of zooplankton, namely: *Euglyphatuberculata* and *Rabdolaimus spp.* *Euglyphatuberculata* dan *Rabdolaimus spp.* phytoplankton as food sources for zooplankton. Physical parameters in the waters of the Babura River, Deli Serdang Regency, are still supportive except for temperatures that are less than 24°C, but because the sunlight does not reach the water body, it affects the amount of plankton. Chemical parameters in the water of the Babura River in Deli Serdang Regency are all within the supporting limits.

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