INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH & DEVELOPMENT

ISSN 2278 – 0211 (Online)

Identification of Fitoplankton Density on Litoral Zone Lake Kerinci

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Abstract:
Research about identification of density phytoplankton had been studied in litoral zone Kerinci Lake. Five stations has been choosen by purposive sampling along litoral zone. The samples were colleted by filtering water through plankton net. The samples has been identified and analyzed in Environmental Boards UPTD Laboratory and laboratory Department of Biology IAIN Kerinci. 53 spesies phytoplankton has been identified consist of three class. Average of individu/liter of Bacillariophyceae (36650), Chlorophyceae (3000) and Cyanophyceae (4000). Highest total of density phytoplankton found in station one are 386 individu and the less density phytoplankton found in station five are 4 individu.. The result of physicochemical properties measuring were temperature ranged from 23^0C - 25^0C, pH 5,5-6, BOD 4,8 – 48,96 mg/l, COD 10 – 19 mg/l, nitrit 0,03 – 1,1 mg/l and amoniac 1,9 – 2,7 mg/l. Based on the total density and physicochemical factors of Kerinci Lake refer to oligotrophic condition.

Keyword: *Density, Phytoplankton, Litoral Zone*

1. Introduction

Indonesia has many freshwater bodies, either in the form of lakes, reservoirs, ponds or rivers is a vehicle for a potentially huge resource. The agencies are mainly located in the waters of the island of Sumatra, Kalimantan, Java, Sulawesi and Irian, most of this potential has not been used optimally (Anwar et al, 1994 cit. PSLH, 1984). According Thohir (1985) the origin of a lake can vary, there is volcanic events, fracture surface of the earth, the bend in the river and so forth. Kerinci Lake is a volcanic lake is large, in addition to the lake Lingkat, Kaco Lake and Lake Gunung Tujuh in Kerinci District, Jambi Province. Kerinci Lake surrounded by hills stretching from the southwest to the southeast to West Sumatra. In this hilly area found many rivers, 14 of them flow into the lowlands in the central part of which eventually empties into Lake Kerinci. Lake Kerinci geographically located between 207 'L.S - 2011' L.S and 101 026 'B.T - 101 031' B.T (Soerjani, 1979)

Kerinci Lake is a lake that located in Jambi Province, precisely in Kerinci District. Kerinci Lake has an area of 500 square meters with a height of 783 meters above sea level. The lake is located at the foot of Gunung Raya is the biggest lake in Kerinci district. The breadth is 4,200 hectares. The lake is located about 16 kilometers south of Sungai Penuh City. The lake is located in two districts namely kerinci lake districts and districts around the lake. Kerinci Lake is a volcanic lake has a depth of 110 meters. Lake Kerinci used by the community in meeting the daily needs of good for agriculture, the need for drinking, fishing and tourism (Tempo.com: Pikatan Lake Kerinci, Publication 21 March 2012).

The climateof Lake Kerinci is wet tropical climate. Rain occurs nearly every month with a maximum in January (about 250 mm/month), for the months of June-July rather dry (approximately 100 mm / month). Rainfall in this region showed the bipolar pattern, ie, with two peaks, the primary in January and secondary in April. Overall Lake Kerinci received rainfall of 2000-3000 mm / year (DPU & Yaramaya, 1983). The average air temperature in the region of Lake Kerinci ranged from 19.2 to 20.2 ° C with a mean of 19.6 ° C, while humidity ranging from 81-86% with a mean of 84% (DPU & Yramaya, 1983).

Lake Kerinci already exist various human activities such as agriculture, fisheries, irrigation, sand mining, tourism and MCK. The byproduct of these activities directly or not will go into the water body of the lake, andfinally will definitely bring changes to the physical condition and water quality and aquatic biota. Lake body of the first to receive the waste material is the coastal zone. The Region of Lake Kerinci watershed has undergone various changes in land use. This leads to an increased rate of erosion, sedimentation and eutrophication is causing a lot of trouble in the waters of the lake environment.

The study conducted by Mukhoriyah & Trisakti (2014) for example, has indicated that there has been a change in land cover of the Lake Kerinci Water Catchment from 2000 to 2012, among others the increasing of residential areas, while the area of forest and rice fields decreased. Vegetation cover of hardwoods (forests, plantations, mixed gardens, shrubs / bushes) to be 55.2%, so it has fallen into the threatened category based on Lake Ecosystem Management Guidelines. This land-use change resulted in an increase in the coefficient of surface flow to the lake, from 0.420 (year 2000) to 0.437 (in 2012), where the greatest increase occurred in residential

and paddy fields. Changes in the area of vegetation cover in the Water catchment area resulted in an increasing rate of sedimentation in the lake.

The phytoplankton part of a living plankton member floats in the water where all of its motion activity in the water, both freshwater and sea water is influenced by water currents. Phytoplankton is a photosynthetic plankton both microscopic and macroscopic in size or also called plankton from the plant group (Odum, 1971 and Michael, 1984). All life in the waters directly or not depends on the photosynthesis of phytoplankton and aquatic plants. Both are able to convert the inorganic elements into organic materials with the help of sunlight. The process of photosynthesis occurs only in plants that contain chlorophyll, one of which is phytoplankton. This plant plays an important role as a primary producer, because it is the main component of plants containing chlorophyll in the water in addition to perifiton and other rooted plants (Marklan, 1987).

The abundance and diversity of phytoplankton is influenced by many factors such as dissolved oxygen, light, temperature, food availability and aquatic pH. It is also influenced by both carnivores and herbivores derived from the plankton itself as well as from other groups such as fish that are also affected by the competition in obtaining space, oxygen and food. The high nutrient concentration in the waters will determine the abundance of phytoplankton in these waters (Green et al., 1976).

Limnology research that has been done in lake kerinci is by Soerjani (1979) about water chemical physics factor, and aquatic biota of kerinci lake, then Hamidah (2000) examine about plankton community in waters of kerinci lake. Phytoplankton found 36 genus and consists of 5 classes. Furthermore, Hamidah (2015) also studied about the type and density of mollusks in the jambi provincial kerinci lake and from the identification result, found 8 families and 9 species of mollusks, ie 1 species from Bivalvia class and 12 species from Gastropoda class found 8 types of gastropods and 1 type of bivalves and By Kencanawati Indah (2001) on the composition and structure of the phytoplankton community in the litter zone of the kerinci lake. Increasing human activity and land use change resulted in ecological changes in the waters of the Kerinci lake that will affect the types of phytoplankton present in it.

Taking into account the conditions that occur in the waters of Kerinci lake, it is necessary to conduct further research on the influence of phytoplankton density in litter zone of lake kerinci, so that will be known what factors influence the density of phytoplankton in waters of Kerinci lake.

2. Methodology

The materials used in this study were 40% formalin, 70% Alcohol and Aquades. The tools used are: plankton net, bucket, bottle sample, dropper drops, universal pH paper, sechi kepping, microscope, glass object, glass cover, film bottle, pencil and paper label.

This research was conducted in the waters of Lake Kerinci, Province of jambi. Phytoplankton sampling was conducted in the morning until noon.

Determination of sampling stations is determined based on field survey results. The sampling location is divided into 5 stations. Station 1 is a fishpond area (Central Island), 2 densely populated areas of settlements and rice fields (Supreme Court), 3 stations of inlet (merching rod), station 4 outflow area (out let) Merangin stem and station 5 Sand mining area (koto petai).

Sampling phytoplankton at each station is done by drawing as much as 100 liters of lake water into mesh plankton mesh size 60 um. The filtered water sample was put into a 25 ml sample bottle, 5-10 drop of formaldehyde added, then sealed and labeled subsequently the sample taken to the laboratory for analysis The calculation of individual phytoplankton is done directly (direct count methode). Previously samples were shaken to homogeneous, and taken as much as 1 ml was observed drop by drop. Then the sample water is placed on the glass of the object and covered with a cover glass, observed under a microscope and identify and calculate the number of each species of phytoplankton present. The identification of phytoplankton was performed using reference books: Hustedt (1930), Prescott (1961) and Prescott (1978), Smith (1955), Watanabe (1984) and Watanabe and Usman (1987).

The phytoplankton obtained at the time of the study were analyzed by finding the phytoplankton density determined by the following formula

$$n = \frac{(a \times 1000) \times c}{L}$$

Description:
n = Number of individual phytoplankton in liter
a = average number of phytoplankton in ml sample
c = consolidated samples
L = volume of filtered water (liter) (Michael, 1984)

Analysis The measurement of physical chemistry factor of water and water quality quality is partially carried out such as temperature, pH, brightness, depth, while dissolved oxygen and CO2, BOD, COD, ammonia and nitrite analyzes are done at UPTD Laboratory of Kerinci Regency.

3. Result and Discussion

Based on the observations, obtained 3 classes of Bacillariophyceae, Chlorophyceae and Cyanophyceae. Qualitatively the phytoplankton found in Lake Kerinci littoral zone of 53 species consist of Bacillariophyceae (30 species), Chlorophyceae (18 species) and Cyanophyceae (5 species).

CLASS	ORDO	FAMILY	SPECIES
A. Bacillariophyceae	**Sub Ordo Araphidineae**	**Fragilariaceae**	*1. Fragilaria arcus*
			2. Fragilaria arcus
			3. Fragilaria arcus
			4. Fragilaria arcus
			5. Fragilaria arcus
			6. Fragilaria arcus
	Sub Ordo Biraphidineae	**Cymbellaceae**	*7. Cymbella affinis*
			8. Cymbella cymbiformis
			9. Cymbella turgidula
			10. Cymbella ventricosa
		Gamphonemataceae	*11. Gomphonema clevei*
			12. Gomphonema minutum
			13. Gomphonema parvulum
			14. Gomphonema sumatorense
		Naviculaceae	*15. Navicula odiosa*
			16. Navicula yuraensis
	sub ordo Monoraphidineae	**Achnantaceae**	*17. Achnanthes crenulata*
			18. Achnanthes minuttisima
			19. Cocconeis placentula
	Sub Ordo Surirelineae	**Surirellaceae**	*20. Denticula eximia*
			21. Denticula tenuis
			22. Denticula ocellata
			23. Denticula vanhaureii
			24. Nitzschia dissipata
			25. Nitzschia frustulum
			26. Nitzschia lanceolata
			27. Nitzschia polaris
			28. Nitzscia vermicularis
			29. Suriella linearis
			30. Suriella dorsivantelis
B. Chlorophyceae	**Chlorocchales**	**Oocystaceae**	*31. Tetraedron limnoticum*
			32. Tetraedron minimum
			33. Tetraedron trigonum
			34. Tetraedron regulare
		Scenedesmaceae	*35. Scenedesmus acuminatus*
			36. Scenedesmus bernardii
			37. Scenedesmus denticulatus
			38. Scenedesmus perforatus
			39. Scenedesmus quadricauda
	Oedogoniales	**Oedogoniaceae**	*40. Oedogonium microganium*
	Zygnematales	**Desmiaceae**	*41. Cosmarium contractum*
			42.Cosmarium pseudoconatum
			43. staurastrum cerastes
			44. Staurastrum crenulatum
			45. Straurastrum javanicum
			46. Staurastrum megachantum
			47. staurastrum tetracrum
			48. Staurastrum hexops
C. Cyanophyceae	**Hormogonales**	**Oscillatoriaceae**	*49. Lyngbya mayor*
	Sub Ordo Heterocystineae		*50. Lyngbya spirullinoides*
			51. Oscillatoria tenuis
			52. Spirulina mayor
			53. Spirulina subsalsa

Table 1: Types of phytoplankton obtained in the lethal zone of Lake Kerinci according to their classification

No	Class	Statiion					Total
		1	2	3	4	5	
1	Bacillariophyceae	358	221	143	10	1	733
2	Chlorophyceae	25	8	24	1	2	60
3	Cyanophyceae	3	1	2	1	1	8
	Total	386	230	169	12	4	801

Table 2: Number of Species and average number of phytoplankton individuals based on their class contained in the litter zone of Lake Kerinci

Descriiption :

1. Pulau Tengah
2. Sanggaran Agung (Keluru)
3. Sanggaran Agung (Batang Merao)
4. Sanggaran Agung (Batang Merangin)
5. Koto Petai

No	Class	Station					TOTAL	Average
		1	2	3	4	5		
1	Bacillariophyceae	89500	55250	35750	2500	250	183250	36650
2	Chlorophyceae	6250	2000	6000	250	500	15000	3000
3	Cyanophyceae	750	250	500	250	250	20000	4000
TOTAL		96500	57500	42250	3000	1000	218250	

Table 3: The mean number of densities (ind / l) of phytoplankton found in the litter zone of Lake Kerinci

Description :

1. Pulau Tengah
2. Sanggaran Agung (Keluru)
3. Sanggaran Agung (Batang Merao)
4. Sanggaran Agung (Batang Merangin)
5. Koto Petai

The number of densities of phytoplankton is influenced by many factors, both in terms of environmental ecological conditions and the conditions of the waters that are very happening at the time of research affect the presence and number of plankton in the body of water. Ecological factor itself is defined as a study of science related to field and laboratory experiments and perform mathematical and statistical data analysis, test the hypothesis and formulate conclusions (Chiras, 1991). While the term ecology was first proposed by the German zoologist Ernest Haeckel (1969) who also agreed that the notion of ecology is nothing other than science that studies the relationship between organisms with their environment. More specifically, the ecological understanding for some people is the science of trying to understand and study the relationship between animals, plants, people and the environment, how they live, where they live, why they are in that environment.

The definition of ecology is indeed diverse, but if observed, we can draw the conclusion that the core of this science is abiotic and also biotic. Abiotok is anything that is not living while biotics refers to organisms of living things (Putrawan, 2014). Furthermore, in detail it is mentioned that ecology is actually a learning area where the subject of the study is the structure as well as the function of the ecosystem or nature including humans in it. While the ability of the carrying capacity of the environment so that growth can continue is called the ability or carrying capacity or "carrying capacity". Carrying capacity can be said as "The maximum number of individuals that can be supported in a given habitat" (Odum, 2005).

The density of the amount of phytoplankton is also influenced by environmental ecological factors found in station 1 of 96500 individuals / l precisely in the area of Central Island which is a region dominated by fish ponds in the waters of Lake Kerinci. This area is becoming increasingly irregular because some areas of fish ponds are not well maintained. Supplementary feeding of fish in the form of pellets makes the existing waters around the pond is blackish brown that causes the accumulation of phytoplankon species, especially in Achnantes crenulata, Cymbella affinis and Synedra acus.

Subsequent density was found in station 2 of 57500 individuals / l in the area of the keluru which is an agricultural area and a small part also found fish ponds. The intake of material entering the water is suspected to cause the growth of the number of phytoplankton, the nutrients that enter the water body also causes the waters dark brown color and tend to dark. Incoming ingredients are a source of nutrients for phytoplankton. Besides that, there are many rivers of Lake Kerinci, so in addition to nutrient input from the agricultural area is also added with other inputs from the activities of the surrounding population who still use the river as a place to bathe and wash, of course all these activities can affect water quality, temperature and water pH .

While the lowest number of phytoplankton densities encountered in station 5 were 3000 individuals / l in the area of koto petai. This area is dominated by sand mining areas used by residents for building materials. The area of koto petai has started to progress in terms of construction of residential areas because it has reached the littoral zone zone of Lake Kerinci waters. The activity of the population that occurred around the waters is also suspected to be a factor that causes a decrease in the number of phytoplankton. Flow water at the time of research rather swift because of high rainfall and caused the waters also blackish brown.

At the time of sampling, lake water conditions are generally not clear, but dark brown color. Cloudy water causes the inhibition of phytoplankton photosynthesis because of the lack of penetration of sunlight obstructed by the cloudy water. Goldman and Horne (1983) mentions that one of the main factors controlling the rate of growth of phytoplankton is its ability to absorb sunlight into the body of water.

Based on the density of phytoplankton and the physical-chemical factors of Lake Kerinci water belonging to the Oligotrophic Lake, where oligotrophic lakes are usually characterized by species dominance of the Bacillariophyceae group. The dominance of these species depends on the environmental and species conditions of the existing Bacillariophyceae. At Kerinci Lake found some species of dominant Bacillariophyceae are: Synedra acus, Achnanthes crenulata, Cymbella affinis, Gamphonema Sp and Denticula Vanhaureii. In addition, Chlorophyceae groups are also found, namely: Cosmarium Sp, Staurastrum Sp and from Cyanophyceae found only Spirulina sp.

The physicochemical measurements of water chemistry at the time of the study were as follows: temperatures ranging from 230C - 250C, pH 5.5-6, BOD 4,8 - 48.96 mg / l, COD 10 - 19 mg / l, nitrites 0, 03 - 1.1 mg / l and amoniac 1.9 - 2.7 mg / l. Nitrogen and measured quantities can be derived from fishery, agricultural, livestock and human waste. When the normal phosphate content for aquatic plants there will be a rapid development of certain algae and aquatic plants, as a result of contaminated environmental conditions due to the many toxins such as H2S that are formed and harmful to the life of fish and other organisms. Conversely, if the waters of phosphate deficiency, the population of water plants is not very developed or the population is reduced (Falconer, 1993). From the measurements of water chemical physics parameters that have been done, it is known that the condition of Lake Kerinci is still balanced for the life of phytoplankton because generally plankton can live at temperature 250C or more (Goldman and Horne, 1983). As for the degree of acidity (pH) optimum for plankton growth ranged from 7 - 8.5. The dissolved o2 concentration is between 4 - 8.2 ppm. Free co2 content 0.9988-2,9964. High levels of o2 will accelerate the growth of phytoplankton, while high CO2 content can cause Chlorophyceae to develop better (Whitton and Sinclair, 1975).

4. Conclusion

Based on the research that has been done then it can be concluded that:

1. Phytoplankton found in Lake Kerinci littoral zone of 53 species consisting of Bacillariophyceae 30 species, Chlorophyceae 18 species and Cyanophyceae 5 species.
2. The density of fitolankton ranged from 3000 to 36.650 individuals / l. The highest total density of phytoplankton was encountered in the Bacillariophyceae class at station 1 of 386 individuals / l and the least was found in station 5 of 4 individuals / l.
3. Seen from the density of phytoplankton and chemical physics factors of water at this time Lake Kerinci belong to oligotrophic lake.

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