Plankton Biodiversity in The Floating Net Cage Area of Lake Batur Kintamani, Bangli

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Abstract. Lake Batur has the potential to be a fishery resource that has not been explored and even very little attention from the community and the government so that this resource can be developed optimally. The current condition of lake Batur waters tends to change either naturally or annually or changes due to community activities around the lake. The purpose of this study is to determine the feasibility of lake Batur waters as a fish farming business field for the freshwater floating net cage system. Water samples to be tested for water quality and plankton were obtained directly at Lake Batur. The results of plankton abundance at each station were received, at station I (2.070 ind/l), station II (1.477 ind/l), station III (6.975 ind/l), station IV (2.617 ind/l), station V (2.902 ind/l). The parameters observed are water quality parameters in the form of brightness, temperature, pH, DO, Nitrates, Nitrites and plankton abundance in Lake Batur Kintamani, Bangli. The results of research on the quality parameters at each station showed different values. The brightness parameters at 5 stations have values in the range of 246-480 cm, temperatures 26-28.3 °C, pH 7.5-8.3, DO 7.1-8.3 mg/L, Nitrates 0.36-0.66 ppm, and Nitrites 0.02-0.04. brightness.

Keywords: floating net cage; lake batur; plankton abundance; water quality

I. INTRODUCTION

Bangli Regency has a variety of public waters such as lakes, rivers, and waterfalls. One of the aquatic resources that exist in Bangli Regency and have the potential to be developed is lake fisheries. Bangli Regency has a lake from four lakes in Bali, namely Lake Batur.

Lake Batur has the potential to be a fishery resource that has not been explored and even very little attention from the community and the government so that this resource can be developed optimally. Activities or businesses that are usually carried out by the surrounding community if managed properly so that they are diverse such as fish farmers in the KJA system [1].

The current condition of lake Batur waters tends to change either naturally or annually or changes due to the activities of the community around the lake [2]. The annual cycle in question is an upwelling phenomenon, which is a phenomenon in which colder and larger-type lake water moves from the bottom of the lake to the surface due to wind movement and also due to bursts of blerangs that occur erratically every year which are expected to occur in

January-Mret and July-August. The burst of blerang occurred because the lake was under the foot of Mount Batur which was still active, as a result of the burst of the blerang the lake water turned dark green and the fish cultivated in KJA became poisoned and died mass.

The development of lake fisheries still faces problems with limited data and accurate information so that it cannot be used as a basis for policy determination, especially data on the potential of lake water resources and the carrying capacity of lakes for fisheries development, in utilizing a potential water with various purposes, a form of proper management is needed so that this potential can be utilized by all communities around the lake [3].

The use of lake batur as one of the locations for cultivation is a very appropriate step to utilize existing natural resources, although there are still many considerations that need to be considered to make the area a cultivation land for the KJA system with freshwater media in terms of water quality and the neurological state of the lake such as physical, chemistry, and biological factors as well as geographical factors that need to be

considered also by cultivators before cultivating in the waters of lake batur [4].

Astusti et al. [5] revealed another problem, namely the importance of the presence of plankton in lake waters, plankton is the main life support component for biotic components that are at a very high tropical level. Plankton is able to convert inorganic substances into organic substances and is also able to take advantage of the presence of light energy in the area around the lake.

The abundance of plankton is a parameter in looking at the level of fertility of the waters in lake Batur which will be used as a cultivation land for the freshwater KJA system. This is closely related to water quality, so this study was conducted to determine the abundance of plankton and analyze water quality as an indicator of the fertility of a water quality, so this study was conducted to determine the abundance of plankton and analyze water quality as an indicator of the fertility of a water.

II. RESEARCH METHOD

Research Location

This research was conducted for 3 months starting in March 2022 – May 2022 at Lake Batur Kintamani, Bangli and at the Posikandu laboratory in Bangli Regency with sampling every 1 month (Figure 1).
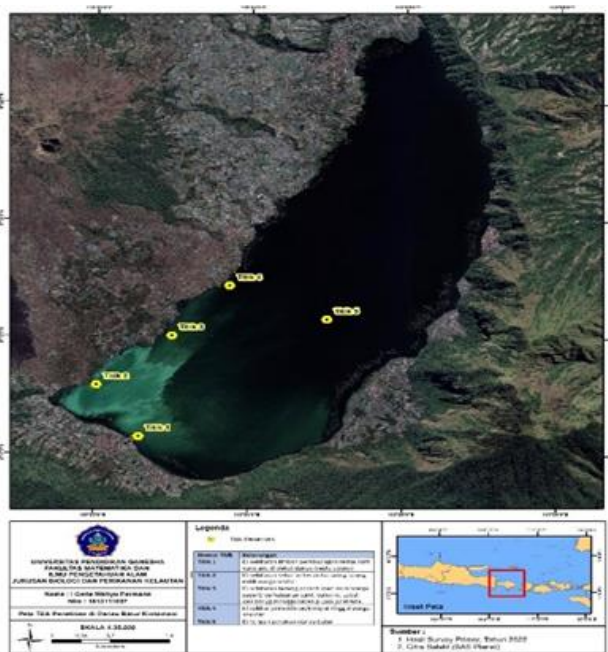

Figure 1. Research Location

This research uses a descriptive method, which is a method that explains a variable that can be explained both by numbers and by words systematically. The sampling technique used is the purposve sampling method where this method is to determine the sampling point of the study.

Tools and Materials

The tools used in this study were photo camera, stationery, plankton net, pH meter, DO meter, Photometer, secchi disk, microscope, bucket, drip pipette, glass bottle, observation data sheet, counting chamber, coverglass, label paper, laptop. The material used is 70% alcohol, formalin, water samples and aquades.

Data Collection

Measurements of water quality carried out in situ (temperature, pH, brightness, and DO) and ex situ (nitrates and nitrites) were carried out in Posikandu, Bangli Regency. Sampling was carried out using a 250 ml plastic bottle on the surface of the water at each sampling point. Water sampling for nitrate and nitrites measurement using plastic bottles of 250 ml volume. sampling of plankton water using plankton net and using plastic bottles with a volume of 250 ml and preserved using formalin and aquades.

Plankton Abundance Data Analysis

Plankton abundance quantitatively based on the abundance expressed in individuals/L calculated using the formula [6]:

$$N = n \text{ x } \frac{Vr}{Vo} \text{ x } \frac{1}{Vs}$$

Information:
N = total number of plankton individuals
N = number of plankton observed
Vr = filtered plankton volume (mL)
Vo = observed plankton volume (mL)
Vs = volume of filtered water (L)

Fertility Rate

The fertility status of the waters can be seen from the abundance of plankton [1], states that each place there is a difference in plankton abundance then the waters can be divided based on plankton abundance, namely:

a. Oligotrophic waters, are waters whose fertility rate is low with plankton abundance ranging from 0-2,000 ind/l.

b. Mesotrophic waters, are waters whose fertility rate is moderate with an abundance of plankton ranging from 2,000-15,000 ind/l.

c. Eutrophic waters, are waters with a high level of fertility with an abundance of plankton ranging from > 15,000 ind / l.

III. RESULTS AND DISCUSSION

Plankton Composition

Based on the results of plankton observations as a whole, phytoplankton found 4, namely Euglenophyta (1 genus), Chlorophyta (4 genera), Chrysophyta (1 genus), Thallophyta (1 genus). While in zooplankton, 2 phylums

were found, namely Rotifera (2 genera), and Copepoda (1 genus) (Table I). The type composition of the 6 plankton phylum found in phytoplankton turns out that the phylum Chlorophyta has the largest number of genera and zooplankton phylumrotifera has a large number of genera. This is thought to be because the phylum is a phylum that can adapt easily in waters [6]. Euglenophyta, Chrysophyta, Thallophyta have the lowest genus composition allegedly because these phytoplankton have adaptations that are prone to changes in environmental factors especially in seasonal changes. Based on the pick-up point, samperl is near the floating net cage that is suspected of providing contamination in the waters of Lake Batur.

Plankton Abundance and Aquatic Fertility

The state of plankton community structure in the waters of Lake Batur Kintamani, Bangli which was analyzed based on its abundance and showed the results that plankton on the surface of the waters of Lake Batur Kintamani, Bangli consisted of 7 phytoplankton genera and 3 zooplankton genera where all of them had a total of about 10 plankton genera. Based on table 1. it shows that the abundance of plankton in Lake Batur Kintamani, Bangli is 16,603 ind / l. The highest abundance of plankton species is Closterium cornu as much as 3,540 ind / l and the lowest species is Lecane bulla as much as 150 ind / l. Zooplankton abundance from the phylum Rotifera and Copepoda is very profitable for the development of Lake Batur waters for the business of system fish farming activities (KJA), because Rotifers and Copepod aini are natural food sources for fish larvae and the mother fish itself [1]. Based on the overall composition of plankton, it can be concluded that Lake Batur in the waters of Kedisan Village belongs to the category of eutrophic waters, and when viewed based on the abundance per station at station I 2,070 ind /l (Mesotrophic waters), station II 1,477 ind / l (Oligotrophic waters), station III 6,975 ind / l (Mesotrophic waters), station IV 2,617 ind / l (Mesotrophic waters), station V 2,902 ind / l (Mesotrophic waters).
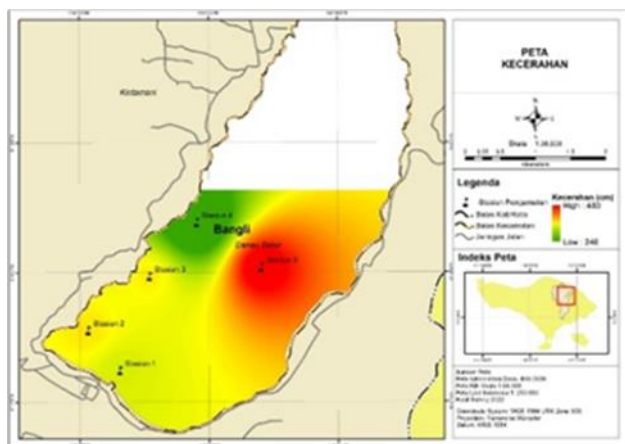

Figure2. Brightness distribution map

Water Quality Parameters

a. Brightness

The brightness of the waters shows the magnitude of the value of *Secchi Disk* which is still visible, and the clearer a water, the deeper the sunlight that can penetrate the water surface [7]. The measurement results in the waters of Lake Batur which showed the lowest yield was 246 cm and the highest was 480 cm (Figure 2).
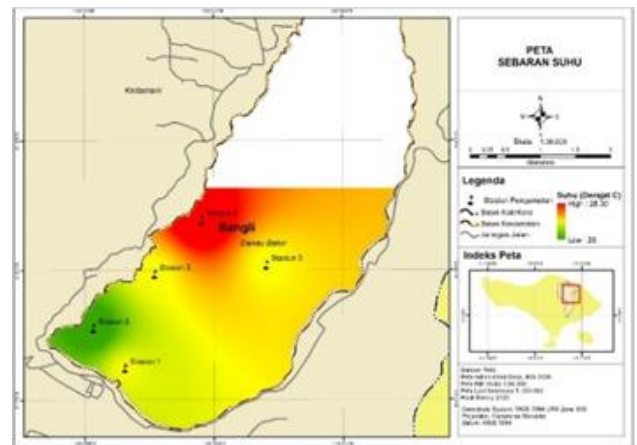

Figure 3. Temperature distribution map

b. Temperature

Temperature values in the waters of Lake Batur Kintamani, Bangli ranged from 22-28.3 °C, the highest temperature at the time of conducting the study was at station IV at the time of the third sampling, and the lowest was found at stations II and III at the time of the first sampling. According to [8], temperature plays a role in the process of photosynthesis and the speed of phytoplankton growth rate (Figure 3).
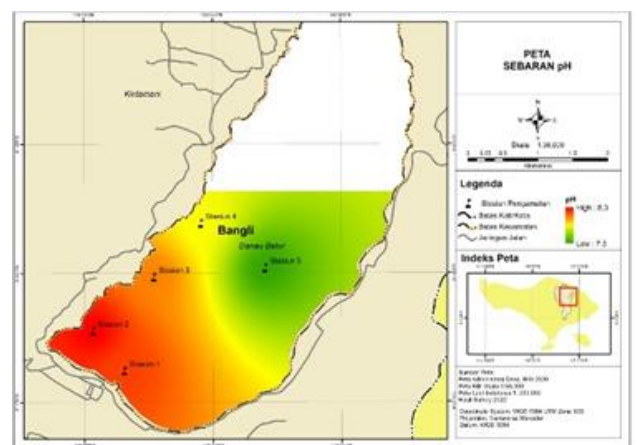

Figure 4. pH distribution map

c. The acidity (pH)

The acidity (pH) value during the study showed a neutral direction and tended to be alkaline, which ranged from 7.5 – 8.3, this happened because the waters of Lake Batur are locations for fish farming in the KJA system, tourist attractions, agricultural areas, and housing (Figure.

4). So that the condition of the waters is greatly influenced by the geological conditions of the land [9].

d. Dissolved Oxygen (DO)

The results of measuring the dissolved oxygen content (DO) in the waters of Lake Batur are quite high, which ranges from 7.1-8.3 mg / L (Figure 5). Oxygen content on the surface of a water is not only produced by diffusion from the air, also caused by the photo process of phytoplankton synthesis [10-11].
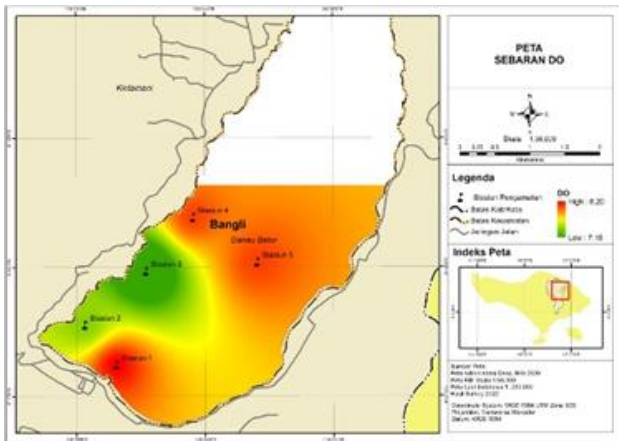

Figure 5. DO distribution map

e. Nitrate

The nitrate content value in the waters of Lake Batur, which reached the highest value, was found at station III, which was 0.66 and the lowest was at station I, which was 0.36 (Figure 6). This nitrate content value is included in the optimum value for phytoplankton growth and the fertility rate is categorized as moderate [12]. According to Purnawati et al [13], the concentration of nitrates that are feasible for phytoplankton growth is 0.3-13 mg / l and the water fertility rate is said to be at a value of 0.227-1.129 mg / l.
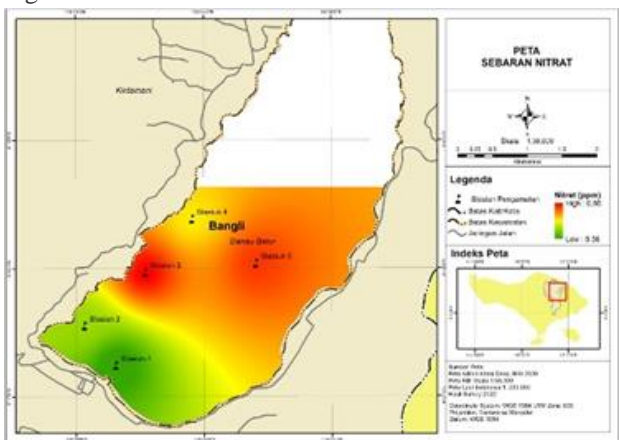

Figure 6. Nitrate distribution map

f. Nitrite

The results of measuring the nitrite content in the waters of Lake Batur at each sampling point there is the highest value found at station point 5 (in the middle) which is 0.04

ppm, while the smallest nitrite content value is found at station points 2 and 4 (around KJA and around residential areas) which is 0.02 ppm (Figure 7). In general, the value of nitrites in the waters of Lake Batur is still below the threshold of water quality standards, where the content of aquatic nitrites must reach 0.06 [14-15].
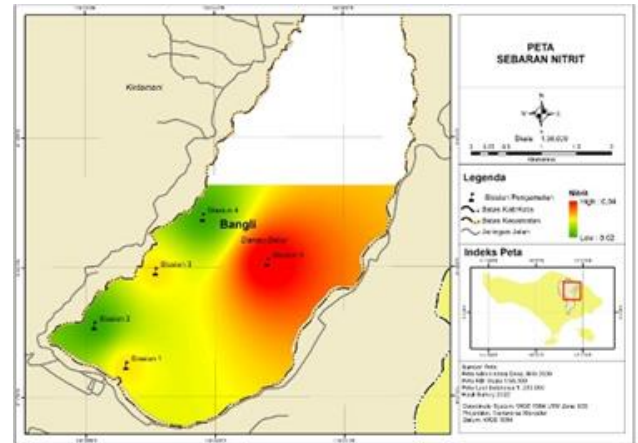

Figure 7. Nitrite distribution map

IV. CONCLUSION

Based on the results of research and discussions that have been carried out in depth, conclusions can be drawn, namely as follows:

1. The results of the plankton abundance study calculated based on the number of species in Lake Batur Kintamani, Bangli have an abundance value of 16,603 ind / l. the number of species that have the most abundance is Closterium cornu which is 3,540 ind / l, and the species that has the lowest abundance value is found in the Lecane bulla species , which is 150 ind / l.

2. There were differences in results in water quality measurements that were influenced by sampling at different points as well as differences in weather quality during the study.

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TABLE I
PLANKTON ABUNDANCE ANALYSIS

No	Species	Group	Sum	Abundance (ind/l)
1	*Euglena*	Fitoplankton	372	2.790
2	*Closterium cornu*	Fitoplankton	472	3.540
3	*Microspora*	Fitoplankton	234	1.755
4	*Schizogonium*	Fitoplankton	76	570
5	*Nitzchia*	Fitoplankton	295	2.212
6	*Mougeotia*	Fitoplankton	51	382
7	*Nauplius*	Zooplankton	260	1.950
8	*Lecane Bulla*	Zooplankton	20	150
9	*Karatella tropica*	Zooplankton	187	1.402
10	*Karatella cochlearis*	Zooplankton	247	1.852
	Total		2,214	16,603