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ANALYSIS OF THE COMPOSITION AND ABUNDANCE OF ZOOPLANKTON IN THE WATERS OF LAKE RANAU WARKUK RANAU SELATAN DISTRICT SUMATERA SELATAN PROVINCE

Analisis Komposisi Jenis Dan Kelimpahan Zooplankton Di Perairan Danau Ranau Kecamatan Warkuk Ranau Selatan Provinsi Sumatera Selatan

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ABSTRACT

Lake Ranau as a water resource for the community, especially Warkuk Ranau Selatan District, has a fairly high biodiversity. Zooplankton is one of the biological components that is an indicator of water quality based on the composition and abundance of zooplankton. This study aimed to analyze the composition and abundance of the genus and abundance of zooplankton in Lake Ranau, focusing on upstream, midstream, and downstream regions to identify potential differences in zooplankton diversity and density across these areas, potentially influenced by environmental factors such as water quality variation. The data collection method was carried out by sampling surface water and filtered using a plankton net tool. The results showed that the highest genus composition was observed at the upstream lake, namely 8 genera, and the highest abundance of zooplankton was found at the midstream lake, namely 945 ind/L. The results of this study can be concluded that the distribution of zooplankton is not only influenced by biological factors but also by environmental conditions in each location so that the composition and abundance of zooplankton in Lake Ranau varies significantly between the upstream, midstream, and downstream areas.

Key words: Lake Ranau, Genus Composition, Zooplankton Abundance

ABSTRAK

Danau Ranau sebagai sumber daya air bagi masyarakat khususnya Kecamatan Warkuk Ranau Selatan memiliki keanekaragaman hayati yang cukup tinggi. Zooplankton merupakan salah satu komponen hayati yang berfungsi sebagai indikator kualitas air berdasarkan komposisi dan kelimpahan zooplankton. Penelitian ini bertujuan untuk menganalisis komposisi jenis dan kelimpahan zooplankton di Danau Ranau, terutama pada area hulu, tengah, dan hilir untuk memahami ada tidaknya perbedaan dalam komposisi dan jumlah zooplankton pada masing-

masing area, yang dapat dipengaruhi oleh faktor lingkungan seperti perbedaan kualitas air. Metode pengumpulan data dilakukan dengan pengambilan sampel air permukaan dan disaring menggunakan alat plankton net. Hasil penelitian menunjukkan komposisi genus paling banyak ditemukan di bagian hulu danau sebanyak 8 genus dan kelimpahan zooplankton paling tinggi ditemukan di bagian tengah danau sebesar 945 Ind/L . Hasil penelitian ini dapat disimpulkan bahwa distribusi zooplankton tidak hanya dipengaruhi oleh faktor biologis tetapi juga oleh kondisi lingkungan di setiap lokasi sehingga komposisi dan kelimpahan zooplankton di Danau Ranau bervariasi secara signifikan di antara area hulu, tengah dan hilir.

Kata Kunci: Danau Ranau, Kelimpahan Zooplankton, Komposisi Genus

INTRODUCTION

One of the largest lakes in South Sumatra is Lake Ranau, precisely in Ogan Komering Ulu Selatan Regency and has an area of around 12,623.52 Ha (Prasetya and Ansar, 2017). Lake Ranau plays an important role in supporting the life of the local ecosystem and providing water resources for the community. However, increasing human activities around the lake, such as fisheries, settlements, and agriculture, can affect the quality of its waters (Gozdziejewska, 2024). One indicator of the quality of a freshwater ecosystem is zooplankton, whose composition and abundance can reflect the condition of the aquatic environment. This study will analyze how activities around Lake Ranau can cause changes in the distribution and abundance of zooplankton in the waters of Lake Ranau.

Zooplankton have long been recognized as effective bioindicators in monitoring water quality. According to research by Wang *et al*. (2022), differences in the composition and abundance of zooplankton in lakes are often influenced by changes in environmental parameters such as temperature, acidity level (pH) and nutrient availability due to anthropogenic activities. Previous studies have shown that spatial variation in zooplankton composition can indicate differences in water quality between locations in a freshwater body of water (Qiu *et al.*, 2022).

This study utilized the role of zooplankton as a biological indicator in evaluating water quality through analysis of its composition and density at various sampling points. Zooplankton, as organisms that are easily affected by environmental changes, allow for an accurate evaluation of the impact of human activities on the lake ecosystem (Manca & Comoli, 2000). Based on this, the purpose of this study was to determine the variation in genus composition and abundance of zooplankton in the upstream, middle and downstream areas of Lake Ranau.

RESEARCH METHODS

Time and Place

This research was conducted in February 2020 in the waters of Lake Ranau, located in Warkuk District, South Ranau, South Sumatra Province. Sampling locations included the upstream, middle, and downstream areas of the lake to observe variations in zooplankton distribution. Zooplankton analysis was carried out in the biology laboratory of the General Aquatic Fisheries Research and Fisheries Extension Center.

Tools

In this study, tools such as 100 micron plankton nets, sample bottles, microscopes (Olympus), GPS, label paper, cool boxes, object glasses, petri dishes and micropipettes were used.

Materials

The materials used in this study were preservative solutions (4% formalin concentration) to maintain sample conditions before analysis in the laboratory.

Research Implementation

In this study, the random sampling method was used in the waters of Lake Ranau which consisted of 3 (three) station points, namely in the upstream, middle and downstream parts. Plankton nets were used to take samples vertically. Zooplankton samples were collected by filtering water using a 100 micron plankton net to capture zooplankton organisms. The samples taken were put into a 100 ml sample bottle and preserved using 3-6 drops of 4% formalin. Furthermore, the sample bottle that already contained the sample water was closed and labeled. Zooplankton observations used SR volume 1 ml which was identified in the Laboratory of the General Water Fisheries Research and Fisheries Extension Center.

Data Analysis

The data obtained were analyzed using quantitative descriptive methods to calculate the abundance of zooplankton per unit volume of water. Meanwhile, the calculation uses Microsoft Excel to facilitate the analysis. The abundance of zooplankton was calculated using the APHA equation (2012) as follows:

$$N = \frac{O_i}{O_p} \times \frac{V_r}{V_o} \times \frac{1}{V_r} \times \frac{n}{p}$$

Information:

N = Abundance of zooplankton
Oi = Area of glass from the slide cover
Op = Area of one field of view
Vr = Volume of filtered water
Vo = Volume of water observed
n = Number of plankton in the entire field of view
p = Number of fields of view observed

RESULT

Types of Zooplankton

Based on the results of the identification of zooplankton found in the waters of Lake Ranau, Warkuk District, South Ranau consists of 2 (two) classes, namely Mastigophora (7 genera) and Monogonanta (5 genera) zooplankton. At station 1, the zooplankton genus obtained was dominated by Clamydomonas totaling 270, at station 2 the dominant genus was Clamydomonas totaling 625 and at station 3 it was dominated by the Trachelomonas genus totaling 160. The following are the results of zooplankton identification at each station presented in the following table.

Table 1. Number of Zooplankton Genuses Found at Each Station

No	Class	Genus	Number of Genus Per Station (Individual/Liter)		
			Station-1	Station -2	Station -3
1	Mastigophora	Clamydomonas	270	625	0
2		Coleps	40		
3		Difflugia	160		115
4		Euglena			20
6		Peridinium	160	15	105
7		Tintinnidium	170		
8		Trachelomonas		105	160

9	Monogononta	Hexartha	25	15	
10		Mytillina			15
11		Polyarthra	25	125	
12		Trichocerca		60	30
13		Keratella	15		

Abundance of Zooplankton

Based on the results of the calculation of zooplankton abundance in the waters of Lake Ranau, Warkuk District, South Ranau, the value of zooplankton abundance at station 2 has the highest value while at station 3 it has the lowest value. The following table shows the value of zooplankton abundance.

Table 1. Abundance of Zooplankton

No	Genus	Number of Genus Per Station (Individual/Liter)			Total (Ind/L)	Abundance Value (Ind/L)
		Station-1	Station -2	Station -3		
1	Clamydomonas	270	625	0	895	8950
2	Coleps	40	0	0	40	400
3	Difflugia	160	0	115	275	2750
4	Euglena	0	0	20	20	200
6	Peridinium	160	15	105	280	2800
7	Tintinnidium	170	0	0	170	1700
8	Trachelomonas	0	105	160	265	2650
9	Hexartha	25	15	0	40	400
10	Mytillina	0	0	15	15	150
11	Polyarthra	25	125	0	150	1500
12	Trichocerca	0	60	30	90	900
13	Keratella	15	0	0	15	150
	Total	**865**	**945**	**445**	**2255**	**22550**

DISCUSSION

Based on data collected from several station points (upstream, middle, and downstream) in Lake Ranau, Warkuk District, South Ranau, various zooplankton genera were found to be unevenly distributed in each location. Station 1 showed the most diverse zooplankton genus composition compared to other observation points. Genuses such as Clamydomonas and Tintinnidium were most commonly found in this area, which may be due to the cooler water quality and higher oxygen content in the upstream area. This study is in line with a study by Qiu *et al*. (2022), which found that the composition of zooplankton genera in freshwater lakes is greatly influenced by temperature and oxygen levels. In that study, the upstream area with lower temperatures supported higher zooplankton diversity than the warmer downstream area.

Mytillina and Keratella are zooplankton genera that are rarely found with a number of 15 individuals each. This can be caused by human activities in the form of settlements around the waters of Lake Ranau, Warkuk District, South Ranau, which have the potential to increase organic material pollution so that it can disrupt plankton diversity along with increasing human activities around the waters.

The zooplankton abundance value at Station 2 has a higher value compared to Station 1 and Station 3. The location of Station 2 which is near the pond area is thought to affect the high abundance of zooplankton because the area has abundant nutrients. This is also in line with the research of Mariyati *et al*. (2020) which states that calm currents around pond areas contain

high nutrients that are beneficial for phytoplankton to support zooplankton growth. Mulyadi and Radjab (2015) stated that supportive environmental conditions, nutrient availability, competition between species, and predation pressure play an important role in determining the movement and changes in zooplankton composition.

The high abundance of *Nauplius* sp. in Nafri Waters is thought to be influenced by the physical-chemical conditions at the location, which support the growth and development of these Copepoda larvae. *Nauplius* sp. can generally survive in tropical and subtropical environments, so their abundance is quite high in this area. The temperature of Nafri waters, which ranges from 30.1 to 30.2°C, is an ideal condition for the development of zooplankton. Plankton abundance is closely related to changes in environmental conditions, so this organism is often used as an indicator of water quality biomonitoring (Damayanti *et al*., 2018; Dimenta *et al*., 2020). The physical, chemical, and biotic factors of a water body also have a major influence on the existence, abundance, and diversity of zooplankton in it (Mulah, 2017).

The low abundance of zooplankton at Station 3 may be due to the location of Station 3 being close to residential areas, so that high residential activities result in increased sedimentation and water turbidity. Human activities such as domestic waste disposal have the potential to increase organic matter in the waters, which in turn affects the composition and abundance of zooplankton. High turbidity can also inhibit the penetration of sunlight, thereby disrupting the photosynthesis process of phytoplankton as food for zooplankton. Mariyati *et al*. (2020) stated that high sedimentation and reduced water clarity are often problems around mangrove ecosystems, which also affect the penetration of sunlight entering the waters. This can have an impact on the photosynthesis process of phytoplankton, which is a food source for zooplankton.

The genus composition and abundance of zooplankton show significant variations between the upstream, middle, and downstream areas of Lake Ranau. The upstream area shows a different genus composition and genus abundance compared to the downstream area, indicating that zooplankton can adapt to specific conditions of factors such as water current, nutrient content, and flow speed. These results are in line with the research of Thoha & Rachman (2013), which states that environmental conditions affect the distribution and abundance of zooplankton in freshwater ecosystems. Areas with stable environmental variations and better water quality tend to support higher zooplankton diversity.

CONCLUSION

The composition of zooplankton species and abundance in Lake Ranau waters showed significant variations among the upstream, middle, and downstream areas. The upstream area had the most diverse zooplankton genus composition, dominated by genera such as Clamydomonas and Tintinnidium. The middle area showed the highest zooplankton abundance, reaching 945 individuals per liter, which was likely due to the abundance of nutrients from pond activities around the location. In contrast, the downstream area had the lowest zooplankton abundance, thought to be due to increased human activities, such as settlements and domestic waste disposal, which caused sedimentation, turbidity, and decreased water quality. The distribution and abundance of zooplankton in Lake Ranau are influenced by environmental conditions, including nutrient content, water quality, temperature, and anthropogenic activities. This confirms that zooplankton can be used as bioindicators to evaluate the quality of aquatic ecosystems and the impact of human activities on the environment.

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