TRANSPUBLIKA INTERNATIONAL RESEARCH IN EXACT SCIENCES (TIRES)

THE STRUCTURE OF THE COMMUNITY AND THE DIVERSITY OF PLANKTON TYPES FOUND IN THE CURUG GUMAWANG AREA, PADARINCANG DISTRICT, SERANG-BANTEN DISTRICT

Hermawan
Faculty of Science and Technology, UIN Sultan Maulana Hasanuddin Banten
E-mail: hermawanbrow24@gmail.com

Abstract

The research was conducted to determine the community structure and diversity of plankton types in Gumawang Waterfall, Padarincang Village, Padarincang District, Serang-Banten Regency. This research was carried out in February 2024 for 1 month. This research was carried out on 4 plankton samples, with results obtained from 12 types of plankton species. The plankton that dominates or is often found at these 4 points is the Achnanthes sp type with a number of around 170 species. The results of calculations using the Species Diversity Index obtained a result of 2.176744285, this shows that the diversity of plankton species found in Gumawang Waterfall, Padarincang Village, Padarincang District, Serang-Banten Regency is in the "Medium" range in accordance with the results of the species diversity index calculation.

Keywords: *Plankton Community Structure, Diversity, Gumawang Padarincang Waterfall*

1. INTRODUCTION

Rivers in Indonesia are a source of life for the local communities around these rivers. Rivers are also used to obtain their water for daily needs such as cooking, washing, bathing, or in the fields of agriculture, plantations, power plants, raw materials for drinking water. or as a tourist attraction.

Rivers which have good biotic habitat certainly also have habitat with flowing water which has a dynamic and changing ecosystem in its composition from upstream to estuary. The aquatic environment also has a very complex system consisting of parameters that influence the aquatic ecosystem.

The water in Padarincang District is in the form of a waterfall, with a water depth of around 5 meters. This waterfall is in Padarincang Village and Padarincang District, Serang-Banten Regency. Gumawang waterfall is a tourist destination for the Padarincang community in particular and in general Banten residents who want to vacation there, this waterfall is only busy on Saturdays and Sundays, on other days it is not as busy as on weekends. Gumawang Waterfall is a very hidden location and we have to go to the village in Padarincang, because this waterfall is located in a village, not in the middle of the city or in an urban area. Gumawang waterfall has a very fast waterfall with a large water flow too. The aquatic environment also has a very complex system consisting of various parameters that support life and have an influence on the life of the ecosystem within it.

The parameters contained in it include physical, chemical and biological parameters. One of the biological parameters is plankton. Plankton is a pelagic organism that floats on the surface of waters or can float and be carried by water currents. Plankton is also mostly found only a few meters from the surface of the water, and inside it tends to be absent altogether (Ningsih et al 2021).

Plankton is also divided into 2 types, namely phytoplankton and zooplankton. Phytoplankton are a type that is similar to plants, they live in the photic zone, namely in the zone exposed to sunlight and they can carry out the process of photosynthesis. Meanwhile, zooplankton are aquatic organisms that have heterotrophic properties or get their food by eating other organisms as their own food. For example, protozoa, jellyfish, mollusks and other zooplankton in waters.

The photosynthesis process in aquatic ecosystems is carried out by phytoplankton which is a source of nutrition for other aquatic organisms as food in these waters such as zooplankton and is followed by other groups of organisms so that a food chain is formed there. With the abundance of phytoplankton, it will change at various levels in response to changes in environmental conditions both physically, chemically and biologically in these waters (Barus et al 2022).

Community structure is a collection of species in a community that are bound in biotic interactions and function as an integrated unit including diversity index, abundance index, species type, species density. The abundance of phytoplankton in waters can also influence the existence of zooplankton because it is one of their foods.

So, in this case the structure of the plankton community is also an important factor to study, including the plankton in the Gumawan Waterfall in Padarincang Village. Apart from that, the community structure and environmental supporting factors also have a very big influence on the aquatic ecosystem, especially in Curug Gumawang, Padarincang Village, Serang-Banten Regency.

2. LITERATURE REVIEW

2.1. Importance of Rivers to Local Communities

Rivers are integral to the livelihoods of communities in Indonesia, serving as a primary source of water for various uses. They support agricultural activities by providing irrigation, contribute to power generation through hydroelectric plants, and serve as sources of raw materials for drinking water. Additionally, rivers often become tourist attractions, drawing visitors to natural sites such as waterfalls, which contribute to local economies and cultural practices (Idiawati et al 2021).

2.2. Case Study of Gumawang Waterfall

The Gumawang Waterfall in Padarincang District, Serang-Banten Regency, exemplifies the significance of riverine ecosystems. With a depth of around 5 meters and a rapid flow, this waterfall is a key tourist destination for both local residents and visitors from the broader Banten region. Despite its popularity on weekends, it remains relatively quiet during the week, highlighting the role of such natural sites in regional tourism. The waterfall's location in a village, rather than an urban area, underscores its role as a hidden natural gem (Barus et al 2022).

2.3. Aquatic Ecosystems and Their Complexity

The aquatic environment of rivers like Gumawang Waterfall comprises various parameters that influence the ecosystem. These include physical, chemical, and biological factors that together create a complex and dynamic habitat. One crucial biological

component of this environment is plankton, which plays a fundamental role in the aquatic food web (Idiawati et al 2021).

2.4. Plankton and Their Role in Aquatic Ecosystems

Plankton are pelagic organisms that float in the water column and are typically found near the surface of aquatic environments. They are classified into two main groups: phytoplankton and zooplankton. Phytoplankton, similar to plants, reside in the photic zone where they perform photosynthesis, generating oxygen and forming the base of the aquatic food chain. Zooplankton, on the other hand, are heterotrophic and rely on consuming other organisms for nutrition. They include protozoa, jellyfish, and various mollusks (Barus et al 2022).

The abundance of phytoplankton is critical as it influences the availability of food for zooplankton and other aquatic organisms. Changes in the environmental conditions—whether physical, chemical, or biological—affect phytoplankton populations, which in turn impacts the entire aquatic community structure (Idiawati et al 2021).

2.5. Community Structure and Ecological Impact

The community structure of plankton, including both phytoplankton and zooplankton, is a reflection of the interactions among species and their environment. This structure encompasses factors such as diversity, abundance, species composition, and density. In riverine ecosystems like that of Gumawang Waterfall, studying the plankton community provides insights into the health and stability of the aquatic environment. The interplay between community structure and environmental parameters highlights the interconnectedness of aquatic life and the importance of maintaining ecological balance (Barus et al 2022).

3. RESEARCH METHODS

The research was conducted in February 2024, this research took place at Gumawang Waterfall, Padarincang Village, Padarincang District, Serang-Banten Regency. This research was carried out by dividing several places to observe plankton in Gurug Gumawang. Observation, the method used in this research is "purposive sampling", namely by taking samples based on the considerations of the researcher. This plankton sampling is based on differences in habitat. Next, plankton identification and calculations were carried out and data processing was carried out at the UIN Sultan Maulana Hasanuddin Banten Laboratory at the Faculty of Science and Technology. The calculation is by using data analysis using the diversity index from Shannon-Winner with the formula being as follows:

H'= - ∑ni/N log ni/N

With

H' = Diversity Index

H1 = Number of individuals of one type

N = Total number of all individuals

The magnitude of the diversity index is as follows:

H' value > 3 = High species diversity

H' value 1 < H' < 3 = Medium diversity

H' value < 1 = Low diversity

4. RESULTS AND DISCUSSION

The results of observations in several places, namely 4 places for plankton identification and sampling at Gumawang Waterfall, Padarincang Village, were obtained, which can be seen in table 1. What was obtained at 4 places for plankton taking and identification were 12 types of plankton species found in the area. Gumawang Waterfall.

Figure 1. Condition of Gumawang Waterfall

The most abundant plankton is the type of plankton *Achnanthes* sp, *Plangktonini*, numbering 170 at the sampling site. and the second most abundant is the plankton type *Hantzschia amphioxys*. namely 90 species from the 4 sampling locations and the 3rd largest, namely the *Cymbopleura amphicephala* species with a total of 80 species in the 4 sampling locations. The results for all types of species at the 4 sampling sites can be seen in Table 1 below.

Table 1. Results Of Plankton Collection at Gumawang Padarincang Waterfall

No	Latin Name for Plankton	Place for Sampling Plankton				Amount
		1	2	3	4	
1	*Hantzschia amphioxys*	50	20	10	10	90
2	*Achnanthes sp*	80	40	30	10	170
3	*Cymbopleura amphicephala*	30	10	20	10	80
4	*Cocconeis pediculus*	5	7	10	10	32
5	*Cymbella tropicala*	5	21	5	7	38
6	*Achnanthes subhudsonis*	10	20	10	5	45
7	*Mesodon diatoms*	3	2	1	4	10
8	*Denticula sp*	7	8	10	2	27
9	*Discotella pseudostelligera*	3	6	7	10	26
10	*Cyclotella operculata*	2	5	6	8	21
11	*Aulacoseira granulata*	5	5	5	7	22
12	*Fragilaria sp*	7	3	6	8	24
	Number of Plankton					585

Based on the table above, the most dominant species is the *Achnanthes* sp type which is often found in the 4 sampling locations. *Achnanthes* sp is also a diatom that has

characteristics that are tolerant of unstable environmental conditions. Apart from that, this type of plankton is easily found in freshwater waters or is also often found in waters that have good environmental conditions.

The numbers from several places in which Plankton samples were taken can be seen in Table 2 below:

Table 2. Number of Plankton from Each Sampling Site

No	Latin Name for Plankton	Place for Sampling Plankton			
		1	2	3	4
1	*Hantzschia Amphioxys*	50	20	10	10
2	*Achnanthes sp*	80	40	30	10
3	*Cymbopleura amphicephala*	30	10	20	10
4	*Cocconeis pediculus*	5	7	10	10
5	*Cymbella tropicala*	5	21	5	7
6	*Achnanthes subhudsonis*	10	20	10	5
7	*Mesodon diatoms*	3	2	1	4
8	*Denticula sp*	7	8	10	2
9	*Discotella pseudostelligera*	3	6	7	10
10	*Cyclotella operculata*	2	5	6	8
11	*Aulacoseira granulata*	5	5	5	7
12	*Fragilaria sp*	7	3	6	8
	Number of Plankton	207	144	120	91

In Table 2, it is found that the highest number of plankton is found in place number 1, this is because in these waters humans rarely approach these waters, so the number of plankton in them can grow in large numbers. Apart from that, the quality of water that is not visited by humans or tourists is still good, so that lots of plankton grow and develop in this place.

Meanwhile, place 4 is a place very close to the area where tourists always come to bathe, just wash their faces, or take photos in the area, so the amount of plankton around it tends to be less. The calculation results of the number of plankton can be seen in Table 3 below.

Table 3. Calculation of Plankton using the Species Diversity Formula

No	Latin Name for Plankton	Place for Sampling Plankton				H'
		1	2	3	4	
1	*Hantzschia Amphioxys*	50	20	10	10	-0.287969566
2	*Achnanthes sp*	80	40	30	10	-0.359125264
3	*Cymbopleura Amphicephala*	30	10	20	10	-0.272080029
4	*Cocconeis Pediculus*	5	7	10	10	-0.158953898
5	*Cymbella Tropicala*	5	21	5	7	-0.177594831
6	*Achnanthes Subhudsonis*	10	20	10	5	-0.197303797
7	*Diatoma Mesodon*	3	2	1	4	-0.069556013
8	*Denticula sp*	7	8	10	2	-0.141958845
9	*Discotella Pseudostelligera*	3	6	7	10	-0.138378458
10	*Cyclotella Operculata*	2	5	6	8	-0.119433979
11	*Aulacoseira Granulata*	5	5	5	7	-0.12337184
12	*Fragilaria sp*	7	3	6	8	-0.131017765
	Number of Plankton					**2.176744285**

From the calculation data above, the results obtained are that for H', the overall value is -2.176744285. These results show that the Plankton Diversity Index found in Gumawang Waterfall is at the "Medium" index. The types of plankton diversity in Curug Gumawang show varying diversity and the numbers of each species tend to be stable so that when calculated using the Diversity Index formula it shows a "medium" value. The water parameters measured are as follows

Table 4. Measurement of Gumawang Waterfall Water Parameters

N0	Water parameters	Fish Sampling Place			
		1	2	3	4
1	Water Temperature (°C)	21	21	21	21
2	Depth of Water Flow	1	1.5	1	2
3	Water pH	7.8	7.9	7.8	7.8
4	Current speed (m/s)	0.20	0.30	0.30	0.25

The parameters above show that the temperature in the waters of Curug Gumawan is 21oC, Nilia is also in accordance with quality standards. The optimal temperature for plankton growth according to Lampert and Sommer, 2007 is 20-30°C. Meanwhile, the photosynthesis process ranges from a temperature of 25-40°C.

Apart from that, the pH in the waters of Curug Gumawang is around 7.8-79. This also shows that the degree of acidity at the location is neutral. This is in accordance with PP Number 82 of 2001 which states that these waters are still in the class 1 water quality category, and can be used for raw drinking water. A good pH for live plankton is between 6.6-8.5 according to, Prihadi et al (2017). The water depth at Gumawang Waterfall, Padarincang Village, Serang-Banten Regency is between 1 and 1.5 meters or an adult's waist, and the water flow is in the range of 0.20 – 0.30 m/s.

5. CONCLUSION

The types of plankton obtained were 12 species found in Gumawang Waterfall, Padarincang Village, Padarincang District, Serang-Banten Regency. The most numerous species are Achnanthes sp. The diversity index value for plankton species is 2.176744285. This result shows that the diversity criteria for plankton species found in Gumawang Waterfall, Padarincang Village is in "Medium" condition. The water quality in the waters of Curug Gumawang from physical and chemical factors, both in terms of temperature, current, pH and depth, is at optimal quality for the life of plankton and other organisms in the waters of Curug Gumawang.

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