International Journal of Research and Review
[Indexed, Peer-Reviewed Journal]
Volume 12; Issue: 2; February 2025
Website: www.ijrrjournal.com
Research Paper *E-ISSN: 2349-9788; P-ISSN: 2454-2237*

Identification of Plankton in the Tabalong Kiwa River, Tabalong Regency, South Kalimantan Indonesia

Nilly Raihani[1], Herliwati[2], Abdi Fitria[3], Abdul Hadi[4]

Master of Natural Resources and Environmental Management, Universitas Lambung Mangkurat, Banjarbaru. Indonesia

Corresponding Author: Nilly Raihani

DOI: https://doi.org/10.52403/ijrr.20250251

ABSTRACT

The Tabalong Kiwa River is located in the northern part of Tabalong Regency, South Kalimantan, with upstream in the Meratus Mountains. The Tabalong Kiwa River has important ecological value, because it supports biodiversity, including aquatic flora and fauna typical of South Kalimantan. Plankton diversity in the Tabalong Kiwa River is still limited. This research aims to identify plankton species in the Tabalong Kiwa River, Tabalong Regency. Sampling will be carried out in the Tabalong Kiwa River, Tabalong Regency. The research parameters are Abundance (cells/L), Diversity Index (H'), Uniformity Index (E), Dominance Index (D). Identification of plankton in the Tabalong Kiwa River, Tabalong Regency, namely phytoplankton in all locations, shows low values between 0.1527 to 0.1626, which indicates that there are no species that dominate in the extreme and the plankton community is relatively stable, as well as a Uniformity Index (E) which is close to 1, indicating an almost even distribution of species.

Keywords: *Plankton, River, Tabalong Kiwa*

INTRODUCTION

Indonesia is an archipelagic country with the highest level of biodiversity after Brazil. Geographically, Indonesia's territory is between two oceans, namely the Indian Ocean and the Pacific Ocean, so it has abundant biodiversity. The diversity of aquatic biota in Indonesia is very high, with 4,000-6,000 types of fish spread throughout Indonesian waters (LIPI, 2010). Kalimantan, as one of the largest islands in Indonesia with a total area of 736,000 km², has a curved geographical condition, so there are many rivers in this area (Nurudin et al., 2013).

Rivers generally have a dual role, namely as a habitat for aquatic biota and as a source of water for humans. As an ecosystem, the interaction between the diversity of aquatic biota and water quality is a unique relationship and influences each other. Various types of plankton live and thrive in river waters with water quality that supports life. Conversely, polluted rivers can poison aquatic biota, which causes a decrease in the level of diversity and productivity of these biota (Priyono, 2012).

The Tabalong Kiwa River is located in the northern part of Tabalong Regency, South Kalimantan, with its headwaters in the

Meratus Mountains. This river is around 49 km long and flows through Burum Village and Usih Village in Bintang Ara District, downstream to Mahe Pasar Village, Haruai District. Various activities such as coal and gold mining are developing around the Tabalong Kiwa River. These activities are often not accompanied by good environmental management, thus potentially poisoning aquatic biota. The Tabalong Kiwa River has important ecological value, because it supports biodiversity, including the typical aquatic flora and fauna of South Kalimantan. This river ecosystem is a habitat for various aquatic biota such as fish, shrimp, plankton, and benthos, which have high ecological and economic value. Management and conservation of the Tabalong Kiwa River are very important to ensure the sustainability of its ecological and economic functions for the local community.

People living around rivers often use rivers for bathing, washing, urinating, defecating, and throwing away rubbish, all of which contribute to the decline in water quality and fish life (Ardiansyah, 2015). Rivers, as a source of surface water, provide important benefits for human life, with the movement of water from springs through various river channels to the downstream which takes place dynamically (Herliwati et al., 2021).

Identification of plankton in is very important to identify specific problems that may be faced by living things in the area. A better understanding of the impact of water pollution on river ecosystems can provide the basis for necessary remediation actions (Kusumastuti et al., 2021). Plankton diversity in the Tabalong Kiwa River is still limited. This research aims to identify plankton species in the Tabalong Kiwa River, Tabalong Regency.

MATERIALS & METHODS

Sampling was carried out in the Tabalong Kiwa River, Tabalong Regency.

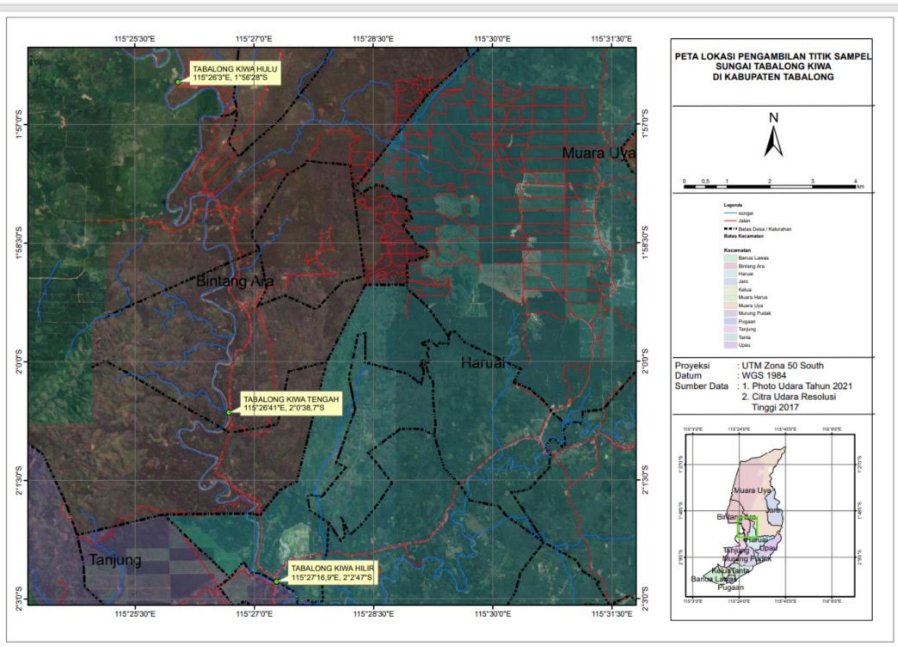

Figure 1. Map of Research Locations

Plankton sampling technique uses the Filtration method with a plankton net. Sampling procedures are:

- Sampling based on research maps covers upstream, middle and downstream areas. Location determination is carried out by considering variations in the physical characteristics of rivers such as current, depth and bottom substrate.

- Use a plankton net with a mesh size of 20-100 µm to catch plankton from the surface or sub-surface of the water. The net must be pulled horizontally to a consistent depth with a constant movement speed during the pull to maintain sample representation.
- After the net is pulled 10-20 meters, rinse the plankton trapped in the net into a sample bottle using sterile river water.
- Place the plankton in a bottle filled with 4% formalin for long-term preservation.
- Label each sample bottle with important information such as location, time, date, and water conditions during sample collection.

Diversity Index

Diversity describes how species abundance is distributed among species (Rahmani, et al., 2022). Shannon – Wiener Diversity Index (H')

$$H' = - \sum_{i-1}^{n} \left(\frac{ni}{N}\right) \log\left(\frac{ni}{N}\right)$$

H ' = Diversity index
ni = Number of type i
N = Total number of individuals of all species
The diversity index benchmark can be seen in Table 1 below:

Table 1. Standard Benchmark Value for Diversity Index Measurement

Shannon-Wiener index value (H')	Description
H'<1,0	Low diversity, very low productivity as an indication of heavy pressure and unstable ecosystem
1,0<H'-<3,322	Medium diversity, fairly balanced productivity, moderate ecological pressure
H'>3,322	High diversity, very good ecosystem stability, high productivity against ecological pressure

Table 2. Diversity index value (H') are associated with water quality

Water Quality	Diversity index value
Heavily Polluted	< 1,0
Moderately Polluted	1,0 – 1,6
Lightly Polluted	1,6 – 2,0
Not Polluted	>2,0

Uniformity Index (Equitability/ E)

Uniformity can be calculated based on a formula (Rahmani, et al., 2022).

$$E = \frac{H'}{Log\ S}$$

E = Uniformity index
H' = Species uniformity index
S = Number of species
According to Krebs (1985) the standard value of the species uniformity index ranges from 0-1 with the following categories:
$0<e \leq 0.4$: Low population uniformity
$0.4 <e \leq 0.6$: Medium population uniformity
$0.6 <e \leq 1.0$: High population uniformity

Uniformity Index Value: uniformity ranges from 0-1. The smaller the E value, the smaller the population uniformity value. This means that the distribution of the number of individuals of each type is not the same and there is a tendency for one species to dominate. Likewise, the greater the E value, the no species dominates. The categories of level of uniformity are: If E = 1: Evenly If E = 0, Not evenly.

Dominance Index (C)

Dominance Index is a measure of the greater or lesser diversity of a type of plankton using Simpson's formula (Rahmani, et al., 2022).

$C = \sum (ni/N)^2$

C = Dominance index

ni = Number of i individuals

N = Total number of individuals

The standard dominance index (C) is used to determine the extent to which a group of biota dominates other groups (Odum, 1993).

$0 < C < 0.5$ = No species dominates

$0.5 < C < 1$ = there is a species that dominates

The Dominance Index value varies between 0-1. The Dominance Index value is close to 1 if the community is dominated by a certain type or species, and if the Dominance Index is close to zero (0), then there is no dominant type or species (Odum, 1971).

RESULT

The results of the analysis of the diversity of plankton species in the Tabalong Kiwa River are presented in the following table:

Table 3. Diversity of Plankton Species

No	*Phytoplankton Phylum*	*Genus*	Upstream	Middle	Downstream
Phytoplankton					
1	*Chlorophyta*	*Closterium*	70	55	75
2		*Roya sp*	10	0	0
3		*Microspora*	30	10	50
4		*Gonatogyron*	10	55	40
5	*Chrysophyta*	*Hormidium*	5	0	0
6		*Synedra*	45	35	10
7		*Diatom*	40	15	55
8		*Fragillaria*	10	50	0
9		*Coconeis*	0	0	30
10		*Navicula*	0	45	40
11		*Nitzschia*	80	20	50
12		*Clyotell*	20	0	0
13		*Surirella*	60	0	5
Zooplankton					
1.	*Euglenozoan*	*trachelomonas planctonica*	0	0	20

Tabel 4. Results of Species Diversity *Phytoplankton*

No	Location	Abundance (cells/L)	(H')	(E)	(D)	Total Taxa
1	Upstream	133.33	1.9497	0.9629	0.1531	7.67
2	Middle	110	1.9031	0.9612	0.1626	6.67
3	Downstream	118.33	1.9291	0.9597	0.1527	7.33

Tabel 5. Results of Species Diversity *Zooplankton*

No	Location	Abundance (cells/L)	(H')	(E)	(D)	Total Taxa
1	Upstream	0	0	0	0	0
2	Middle	0	0	0	0	0
3	Downstream	20	0	0	1	2

Description:

- Abundance (cells/L): Is the average of plankton abundance at each location for three dates.
- Diversity Index (H'): The average of diversity index at each location.
- Uniformity Index (E): The average of uniformity index at each location.
- Dominance Index (D): The average of dominance index at each location.
- Number of Taxa: The average number of plankton taxa found at each location.

The research results showed that the upper reaches of the Tabalong Kiwa River had a level of phytoplankton abundance, namely 110 cells/L to 133.33 cells/L. Magguran (1987) stated that waters with phytoplankton abundance <1,000 cells/liter are classified as waters with low fertility levels. The abundance of phytoplankton is influenced by the physical and chemical properties of water. Physical properties that affect such as light penetration and water turbidity. Chemical properties that affect the abundance of Phytoplankton such as nutrients in the water, especially nitrate and phosphate. All of these physical and chemical properties are needed in the photosynthesis process of phytoplankton. The Nitzschia genus from the Chrysophyta phylum dominates with a number of 80 cells/L, indicating water conditions that support the growth of certain phytoplankton.

In the middle part of the river, the abundance of phytoplankton decreased to 110 cells/L, which was probably caused by environmental factors such as reduced nutrients or physical and chemical conditions of the water. The diversity index (H') of 1.9031 indicates that diversity is still balanced, although lower than the upstream. The genus Gonatogyron had the highest abundance (55 cells/L), indicating specific adaptation to conditions in the middle of the river. The evenness index (E) of 0.9612 reflects a fairly even distribution of taxa. The lower reaches of the Tabalong Kiwa River recorded a phytoplankton abundance of 118.33 cells/L. Although higher than the middle section, the downstream has a diversity value (H') of 1.9291, slightly lower than the upstream. The genera Closterium and Diatom dominate this area with an abundance of 75 and 55 cells/L, respectively. The uniformity index (E) of 0.9597 indicates a distribution pattern of taxa that is relatively similar to other parts of the river. The evenness index can describe the distribution of individuals between species in a community, the evenness index approaching 1 means that the distribution between types is relatively the same, conversely, the closer it is to zero, the distribution between types is relatively unequal and there is a group of abundant individuals of the same type (Krebs, 1989).

The abundance of zooplankton is greatly influenced by the abundance of phytoplankton, where in the food chain in the waters, zooplankton as first-level consumers, their abundance is highly dependent on phytoplankton which is their main food. Lubis (2021) As a result, the distribution and abundance of plankton becomes uneven, with only certain genera able to survive in disturbed environmental conditions, while zooplankton diversity tends to be very low or even non-existent in some locations.

The diversity index (H') in the upstream reaches 1.9497, indicating moderate diversity with a uniformity index (E) of 0.9629, which is close to perfect uniformity. This indicates that phytoplankton species are relatively evenly distributed without any strong dominance by one particular taxa.

There are significant differences in the number of taxa at each location. The upper reaches have the highest average number of taxa (7.67), while the middle section has the lowest average (6.67). This reflects differences in nutrient availability or water quality that affect the presence and sustainability of plankton populations. Closterium, Nitzschia, and Gonatogyron were found throughout the site, indicating the tolerance of these taxa to a wide range of environmental conditions.

Zooplankton table, only the genus Trachelomonas planctonica from the phylum Euglenozoa was found, and that was limited downstream with an abundance of 20 cells/L. No zooplankton were found in the upstream and middle of the river. This indicates that environmental conditions in the downstream are more supportive of the presence of zooplankton, although the diversity, evenness, and dominance indices are all zero, reflecting low zooplankton variation.

Differences in plankton diversity and abundance at each location are likely influenced by environmental factors such as water flow, light availability, nutrient levels, and water quality (pH, DO, and temperature). Upstream parts which tend to be more natural and less contaminated have higher diversity and abundance than middle parts which may be exposed to more human activity.

The low diversity of plankton and zooplankton in the Tabalong Kiwa River, especially in the middle and downstream parts, is likely influenced by mining activities around the area. These activities have the potential to increase sediment and heavy metal contamination in the waters, which can disrupt water quality and inhibit the growth of plankton as primary producers. In addition, increasing water turbidity due to mining waste can reduce the penetration of sunlight needed for the photosynthesis process of phytoplankton. This condition can also affect the food chain in the waters, considering that zooplankton, such as Daphnia magna, depend on the presence of phytoplankton as their main food source.

The dominance index (D) at all locations shows low values, namely between 0.1527 to 0.1626 for phytoplankton. This value shows that there are no species that dominate in the extreme, so the plankton community is relatively stable. The uniformity index (E) across all locations is close to 1, indicating almost even distribution between species.

The diversity of plankton in the Tabalong Kiwa River reflects the ecological conditions of the river. Plankton as primary producers have an important role in supporting the aquatic food chain. The absence of zooplankton in the upstream and middle indicates a lack of organisms that can utilize phytoplankton as a food source, which can affect the stability of the aquatic ecosystem. Regular monitoring of plankton diversity is very important to keep this river ecosystem balanced (Nurruhwati, et al., 2017).

Stable waters with high phytoplankton diversity allow for the presence of more biota, with higher trophic levels so that aquatic productivity will also increase. Environmental sustainability, especially around waters, must be maintained so that the ecosystem within it, including plankton, remains in balance with the life of creatures in the waters (Febriani & Harahap, 2021). The balance of water conditions, both physical, chemical and biological, is very important for the survival of aquatic biota, especially plankton because they are interrelated.

Haisyam et al (2022) The fertility level of waters in mine voids based on calculations of plankton abundance is in the less fertile to medium fertility category, the uniformity index is in the high to medium category and there is no type of plankton that dominates. The pollution level of coal mine voids based on the diversity index is in the heavily polluted to lightly polluted category and the saprobity index is in the moderately polluted to not polluted category.

CONCLUSION

Identification of plankton in the Tabalong Kiwa River, Tabalong Regency, namely phytoplankton in all locations, shows low values between 0.1527 to 0.1626, which indicates that there are no species that dominate in the extreme and the plankton community is relatively stable, as well as a Uniformity Index (E) which is close to 1, indicating an almost even distribution of species.

Declaration by Authors
Acknowledgement: None
Source of Funding: None
Conflict of Interest: No conflicts of interest declared.

REFERENCES

1. Ardiansyah, 2015. Mapping of Fish Resources Caught in the Martapura River Basin, Banjar Regency, South Kalimantan Province. Thesis. Lambung Mangkurat University, Faculty of Fisheries and Marine Sciences. Banjarbaru
2. Fardiaz S. (1992). Water & Air Pollution. Yogyakarta (ID): Kanisius
3. Febriani, L., & Harahap, A. (2021). Study of Macrozoobenthic Diversity in the New River Flow of Pinang City, South Labuhan Batu. Budapest International Research and Critics Institute-Journal (BIRCI-Journal) Humanities and Social Sciences, 4(1), 1254–1261. https://doi.org/10.33258/birci.v4i1.1750
4. Haisyam, H., Rahman, M., & Yasmi, Z. (2022). Coal Mine Void Quality Status Based on Plankton Organisms (Case Study) in Tapin Regency, South Kalimantan Province. Aquatica, Vol. 5 No. 2.
5. Herliwati, Mijani R, A. Rahman. 2021. "Analysis of Pollution Index and Pollution Load Carrying Capacity of Jaing River, Tabalong Regency, South Kalimantan Province." Fish Scientiae, 11 (1):70-82.
6. Krebs, C.J. 1989. Experimental Analysis of Distribution and Abundanc. Third. Edition. New York.
7. Kusumastuti SW., Bisri BM., Solichin C., Budi DT. 2021. Water quality monitoring and evaluation in Bengawan Solo River region. IOP Conf. Series: Earth and Environmental Science 641. IOP Publishing
8. Lubis, A. R. (2021). Analysis of Plankton Abundance in Linggahara River, North Sumatra. Pioneer Journal of LPPM Asahan University, 7(1), 287-293
9. Nurruhwati, Isni; Zahidah; Sahidin, A. (2017). Plankton Abundance at Cirata Reservoir, West Java Province Plankton Abundance at Cirata Reservoir, West Java Province Introduction Reservoir is a lake or body of water Research Method This research was conducted in the Reservoir area. 2(2), 102–108.
10. Nurudin, F. A., Martuti, N. K. T., & Irsadi, A., 2013. Fish Species Diversity in Sekonyer River, Tanjung Puting National Park, Central Kalimantan. Unnes Journal of Life Science. 2 (2)
11. Odum, E.P. (1986). Basics of Ecology. (translation). Edition 3. Gadjah Mada Univ. Press. Yogyakarta
12. Priyono, Gitarama, A.M., K. Majariana, R. Dewi, A. 2016. Macrobenthic community and chromium accumulation in the Cimanuk Lama River, West Java. Indonesian Journal of Agricultural Sciences, 21(1): 48-55.
13. Rahmani .R,M., Yulia.F., Sarianto.D., Harisjon, Aisyah.S.2022. Study of Water Quality on Fish Species Diversity in Batang Naras Waters, Padang Pariaman Regency. Bioconservation.18 (2): 88-105

How to cite this article: Nilly Raihani, Herliwati, Abdi Fitria, Abdul Hadi. Identification of plankton in the Tabalong Kiwa River, Tabalong Regency, South Kalimantan Indonesia. *International Journal of Research and Review*. 2025; 12(2): 413-419. DOI: *https://doi.org/10.52403/ijrr.20250251*

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