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# Plankton Diversity in a River Nearby Klotok Landfill, Kediri, East Java

*by Restu Hikmah Ayu Murti*

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## Plankton Diversity in a River Nearby Klotok Landfill, Kediri, East Java

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### ABSTRACT

Landfill management in Indonesia is mostly operated by open dumping as well as the Klotok's Landfill at Klotok Village, Kediri City. This landfill has three lands, and the third landfill is currently actively operating. The pollution is like the occurrence of leaks in leachate storage tanks which is near the Klotok river. That situation can make the leachate enter the river and affect the physicochemical conditions of the water which have an impact on decreasing the diversity and abundance of plankton. The diversity of plankton species in aquatic ecosystems is often used as an indicator to determine the primary productivity of waters and the condition of the aquatic ecosystem, so this research was carried out to determine the diversity of plankton species in the Klotok river, so the quality of the water can be known. This research was conducted in the Klotok River, Kediri City, East Java. Samples were taken upstream of the Klotok River, near the leachate treatment Plant, and downstream of the Klotok River. Samples were taken as much as 21 liters by pouring method. The samples are poured into plankton nets. The result shows that plankton diversity in the water body near Klotok landfill is between 0,49 to 0,67, which indicates that the diversity index according to Shannon-Wiener is 0,49 where the species diversity is low, the number of individual species is low, the ecosystem is unstable, and the waters are degraded.

*Keywords: Corruption Landfill, klotok, water quality, plankton*

### Introduction

Most of the landfill management in Indonesia still uses the open dumping process, as well as the landfill, is located in Klotok Village, Kediri City. This landfill has three lands and is currently actively operating three lands landfill. The Klotok landfill is located close to the Klotok River, which has a vital role in meeting the water resource needs of the surrounding community as a place for bathing and drinking water for livestock. The Klotok landfill produces leachate that has the potential to pollute the environment. Pollution that can occur is the occurrence of leakage in leachate storage tanks not far from the Klotok river flow, which can enter the river and affect the physicochemical conditions of river waters which have an impact on decreasing the diversity and abundance of plankton (Kurniawan et al., 2015).

Leachate treatment is essential to protect the environment from pollution. Leachate is a black liquid with an unpleasant odor that contains high organic and inorganic materials (Yao, 2013). Leachate contains a lot of heavy metals such as Zn, Cu, Mn, Hg, Cd, Pb, Cr, and other heavy metals. Leachate can threaten soil, soil surface, and surface water in water bodies because it contains

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organic materials such as inorganic salts and is chlorinated organically (Manginmbulude, 2012; Yatim & Mukhlis, 2013).

Plankton is a representation of organisms that are in the waters with passive movement. Plankton is an organism that can be used to identify the quality of water in rivers. Poor water quality can affect the plankton community in the waters, especially in abundance and diversity (Jawwad et al., 2021). The diversity of plankton species in aquatic ecosystems is often used as a benchmark to determine the primary productivity of waters and the condition of aquatic ecosystems, so this study was carried out which aims to determine the diversity of plankton species in the waters around the Klotok landfill so that the quality of the water in these waters can be known.

### Material and Methods

This research was conducted in the Klotok River, Kediri City, East Java. Samples were taken upstream of the Klotok River, near the leachate treatment Plant, and downstream of the Klotok River. Sampling locations are shown on the following map.



Figure 1. Map of sampling in Klotok River

Samples were taken as much as 21 liters by pouring method. The samples are poured into plankton nets. The plankton used in this study was 0,2 mm. The sample was filtered by a plankton net, which was obtained as much as 100 ml containing substrate from phytoplankton. 98% alcohol was added to 100 ml of the sample so that the sample could last a long time and the organism not eat each other. The samples were brought to the laboratory of UPN "Veteran" Jawa Timur for research. Before conducting, the samples were filtered into 5 ml. The samples are examined in the laboratory using a microscope. Then, the plankton cells were analyzed in Sedgewick Rafter Counting Chamber for the number per volume, abundance, dominance, and the Shannon-Wiener diversity index.

### Results and Discussion

Klotok landfill is located in the Klotok Village, Kediri City, East Java. This garbage disposal site is the final disposal site for the community of Kediri city. This landfill operates on open dumping and has been operating since 1998. The leachate processing at the Klotok's landfill still needs some

evaluation for its processing. Around the leachate processing located at Klotok's landfill, there is a river. The aquatic environment around Klotok's landfill can be influenced by the activities of the community around the river and the leachate treatment activities of the Klotok landfill.

The first sampling was conducted in the upstream Klotok's river and identified as many as nine plankton species. The diversity index, according to Shannon-Wiener is 0,49, where the species diversity is low, the number of individual species is low, the ecosystem is unstable, and the waters are heavily polluted (Wahyuningsih et al., 2020). In the first sample, the E Coli population was found to be the most numerous among others. This E Coli bacteria can cause diarrheal disease (Zikra et al., 2018). The second largest population is microcystis sp, where this algae can cause health problems and can reduce dissolved oxygen content. These algae can also secrete toxins that cause hepatotoxicity in fish, other aquatic animals, and even humans (Masithah, 2014).

Table 1. Plankton diversity in first sampling point

No	Organism Name	Counted cell (n)	Abundance (n/21 liters)	Diversity $\frac{\sum(n/\sum n) \times \ln(n/\sum n)}$	Dominance $\sum(n/\sum n)^2$
1	<i>Spirulina</i> Sp.	5	0,24		
2	<i>Acella discoides</i>	15	0,71		
3	<i>Chaetophora</i> Sp.	10	0,48		
4	<i>Nitzchia</i> Sp.	5	0,05		
5	<i>Ceratium</i> Sp.	10	0,10	0,67	0,24
6	<i>Selenastrum gracile</i>	5	0,05		
7	<i>Aphanocapsa</i> Sp.	35	0,33		
8	<i>Cyclotella kuantzingiana</i>	55	0,52		
	Total	140	248		

In the second sampling conducted near the leachate treatment plant, it was found that eight species of plankton live in these waters. The diversity index, according to Shannon-Wiener is 0,67. This is the same as the first sampling, where the diversity of species in the water near the leachate treatment plant is low, several individual species are low, the ecosystem is unstable, and the water is polluted. *Cyclotella kuantzingiana* was the most abundant plankton species at this sampling point, followed by *Aphanocapsa* sp. and *Arcella discoides* as the second and third highest.

Table 2. Plankton diversity in second sampling point

No	Organism Name	Counted cell (n)	Abundance (n/21 liters)	Diversity $\frac{\sum(n/\sum n) \times \ln(n/\sum n)}$	Dominance $\sum(n/\sum n)^2$
1	<i>Synedra splendens</i>	35	1,67		
2	<i>Nitzchia</i> Sp.	15	0,71		
3	<i>E-coli</i>	520	24,76		
4	<i>Chaetophora</i> Sp.	5	0,24		
5	<i>Ankistrodemus</i>	25	1,19	0,49	0,47
6	<i>Microcystis</i> Sp.	180	8,57		
7	<i>Closterium</i> Sp.	10	0,48		
8	<i>Straurastrum</i> Sp.	15	0,71		
9	<i>Tribonema</i> Sp.	5	0,24		
	Total	810	38,57		

The third sampling location is in the upstream waters of Klotok's landfill. In this sampling, five plankton species were identified. The diversity index in this third sampling is 0,49. Similar to

the previous sampling, the number of individual species is low, the ecosystem is unstable, the species diversity is low, and the water is polluted. One of the species in this upstream is *Tricocerca similis*.

Table 3. Plankton diversity in third sampling point

No	Organism Name	Counted cell (n)	Abundance (n/21 liters)	Diversity $\frac{\sum(n/\sum n) \times \sum(n/\sum n)^2}{\ln(n/\sum n)}$	Dominance
1	<i>Peridinium Sp.</i>	5	0,05	0,49	0,2
2	<i>Rivilaria</i>	5	0,05		
3	<i>Tricocerca similis</i>	5	0,05		
4	<i>Spirulina Sp.</i>	5	0,05		
5	<i>Cypridopsis vidua</i>	5	0,05		
	Total	810	0,24		

The results shown in three sampling points indicates that the river is unhealthy with an unstable ecosystem. The population number is small and gets smaller when it gets closer to the landfill area. Especially in the second sampling point, there are several pathogens like *E. Coli* and *Clostridium*, as the sampling point is close to the outlet of the landfill's wastewater treatment plant, with a low rate of water quantity. The effect of this wastewater treatment plant is getting worse in the third sampling point, as the population number is getting smaller. To evaluate these results, it is necessary to manage the inputs to the river, especially from the landfill better. The regulation needs to be forced to make sure every waste disposal in the river has met the standard.

### Conclusion

The analysis result shows that plankton diversity in the water body near Klotok landfill is between 0,49 to 0,67, which indicates that the diversity index according to Shannon-Wiener is 0,49 where the species diversity is low, the number of individual species is low, the ecosystem is unstable and the waters are heavily polluted. To evaluate these results, it is necessary to manage the inputs to the river, especially from the landfill, better. The regulation needs to be forced to make sure every waste disposal in the river has met the standard.

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