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Pollution Level of the Downstream Area of Paguyaman River, Gorontalo, Indonesia: A Study Based on the Microalgae Distribution and Saprobic Index

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ABSTRAK

Judul : Level Kualitas Perairan Bagian Hilir Sungai Paguyaman, Gorontalo, Indonesia: Suatu Kajian Berdasarkan Distribusi Mikroalga dan Indeks Saprobik

Latar Belakang: Sungai Paguyaman membentang sepanjang 136,25 km dan merupakan daerah aliran sungai terbesar kedua di Provinsi Gorontalo. Bagian hilir sungai ini bermuara di Teluk Tomini dan berada di perbatasan antara Desa Girisa Kecamatan Paguyaman Kabupaten Boalemo dan Desa Bilato Kecamatan Boliyohuto Kabupaten Gorontalo. Bagian hilir sungai ini menjadi sumber penghidupan bagi masyarakat di sekitarnya, namun kualitas perairannya terancam akibat pencemaran organik yang berasal dari aktivitas domestik dan pertanian. Tujuan dari penelitian ini adalah untuk mengidentifikasi jenis dan distribusi mikroalga, dan menilai kualitas perairan menggunakan indeks saprobik di wilayah hilir Sungai Paguyaman, Gorontalo.

Metode: Pengambilan sampel dilakukan pada empat stasiun dengan masing-masing tiga ulangan, dimulai dari stasiun 1 tepat di bibir muara sungai, kemudian disusul stasiun 2 hingga 4 dengan jarak antar stasiun 3-4 km. Mikroalga yang diamati mencakup mikroalga planktonik (fitoplankton) dan mikroalga yang melekat pada substrat batu (perifiton). Sementara parameter fisik perairan mencakup kedalaman air, suhu, kecepatan arus, kecerahan, dan substrat dasar, serta parameter kimia perairan mencakup pH, oksigen terlarut (DO), dan salinitas.

Hasil: Hasil penelitian menunjukkan bahwa mikroalga yang ditemukan di wilayah hilir Sungai Paguyaman berasal dari 10 kelas yang terdiri dari 101 spesies dan 45 genus. Komposisi terbanyak berasal dari kelas Bacillariophyceae.

Simpulan: Berdasarkan nilai indeks keanekaragaman (H'), indeks dominansi dan indeks keseragaman mikroalga, perairan secara umum berada dalam kategori komunitas stabil dengan keberadaan atau kepadatan biota yang merata. Nilai indeks saprobik (SI) 1,64 dan nilai indeks keadaan trofik (TSI) 0,65 menunjukkan bahwa tingkat saprobitas wilayah hilir Sungai Paguyaman saat ini berada pada tingkat Oligo/β-mesosaprobik yaitu termasuk pada kategori tercemar ringan. Temuan ini mengindikasikan bahwa perairan di hilir sungai mengalami penurunan kualitas yang dapat berdampak pada kesehatan ekosistem dan masyarakat.

Kata kunci: Fitoplankton; Indeks dominansi; Indeks keanekaragaman; Indeks keseragaman; Perifiton

ABSTRACT

Background: *Paguyaman River stretches for 136.25 km and represents the second largest drainage basin in Gorontalo Province. Its downstream area of the river empties into Tomini Bay and is located on the border between Girisa Village, Paguyaman Subdistrict, Boalemo Regency, and Bilato Village, Boliyohuto Subdistrict, Gorontalo Regency. This regions constitutes a vital source of livelihood for the local community. However, organic pollution from domestic and agricultural activities threatens the quality of its waters. The objective of this study is to identify the types and distribution of microalgae and assess water quality using saprobic index in the downstream area of Paguyaman River, Gorontalo.*

Method: *Sampling was conducted at four stations with three replications per station. The sampling began at station 1, located at the river mouth, and continued to stations 2 through 4, with a distance of 3-4 km between stations. Microalgae observed included planktonic microalgae (phytoplankton) and microalgae attached to rock substrates (periphyton). The physical parameters included water depth, temperature, current velocity, brightness, and bottom substrate, while the chemical parameters included pH, dissolved oxygen (DO), and salinity.*

Result: *The findings revealed that microalgae in the downstream area of the Paguyaman River came from 10 classes of 101 species and 45 genera. The most significant composition comes from the Bacillariophyceae class.*

Conclusion: *According to the diversity index (H'), dominance index, and uniformity index of microalgae, the waters are generally classified as stable communities, characterized by the presence or density of biota that are evenly distributed. The Saprobic Index (SI) value of 1.64 and the Trophic Status Index (TSI) value of 0.65 indicate that the saprobity level of the downstream area of the Paguyaman River is currently at the Oligo/β-mesosaprobic level, which is included in the lightly polluted category. This finding indicates that the river downstream is experiencing degrading, potentially affecting the health of the ecosystem and the surround community.*

Keywords: Dominance index; Diversity index; Periphyton; Phytoplankton; Uniformity index

INTRODUCTION

Water quality is a critical factor that impacts the sustainability of aquatic ecosystems as well as human health. Rivers are essential for various human needs, such as drinking water, irrigation, and industrial activities, but they are very vulnerable to pollution. Water pollution caused by human activities, including the disposal of domestic, industrial, and agricultural waste, can damage the balance of the ecosystem and threaten the health of people who depend on rivers as a water source. One effective method to assess water quality is by utilizing aquatic organisms, particularly microalgae, as biological indicators.

Microalgae are aquatic photosynthetic microorganisms that can be planktonic, epiphytic, and benthic[1–4], and can thrive in a wide range of salinity levels, from freshwater and brackish water to marine environments[5]. Microalgae are essential in aquatic ecosystems as primary producers, providing oxygen and being a food source for various aquatic organisms[5–7]. Some of them exhibit sensitivity or tolerance to pollutants that make them valuable bioindicators for assessing the health of aquatic ecosystems[1,8-11]. Ecologically, the presence of microalgae in a water body is strongly influenced by physical and chemical factors, such as temperature, pH, salinity, nutrient concentration, and light intensity, biological parameters (predators and mortality), and the water cycle[6,12].

Downstream areas often serves as the accumulation of various wastes and organic matter that can affect the composition and quantity of microalgae. These areas are particularly vulnerable to significant water pollution due to the accumulative impact of water quality carried over from upstream and midstream areas[13,14]. Conversely, this area holds significant potential for economic utilization. Additionally, it is also directly related to the estuary, which plays a crucial ecological role, by serving as a source of organic matter carried by tidal currents and providing habitat for various species.

Paguyaman Watershed is the second largest watershed in Gorontalo Province, which stretches along 136.25 km from the upstream located at Mount Dapi, the border between Karya Baru Village, Dengilo Subdistrict, Gorontalo Regency and Hulawa Village, Buntulia Subdistrict, Pohuwato Regency. The downstream part of the river empties into Tomini Bay and is located on the border between Girisa Village, Paguyaman Subdistrict, Boalemo Regency, and Bilato Village, Boliyohuto Subdistrict, Gorontalo Regency. The Paguyaman River has significant potential to support biodiversity, including microalgae.

The distribution of microalgae in the downstream area of the Paguyaman River is potentially influenced by organic and inorganic waste entering the river ecosystem. According to Ogbonna[15], the accumulation of organic material can trigger the growth of certain microalgae. However, it can also decrease species diversity due to the dominance of certain types. The surrounding community utilizes the Paguyaman River to meet their needs, irrigate agricultural land, fisheries, industry, and even gold mining activities[16]. This utilization by the community can cause an increase in the amount of discharge and pollutants and damage to the environment[17,18]. Household waste, industrial waste, and waste from gold mining activities that are often still discharged in water bodies further exacerbate the decline in water quality and productivity.

Saprobity refers to the water quality affected by introducing organic matter into an aquatic environment. Saprobity assessment is generally done by observing organisms' numbers and species composition[19]. The level of saprobity can describe the extent of pollution in these waters, which will be reflected in the presence of microorganisms as pollution indicators[4]. Microorganisms, including various types of microalgae, have specific characteristics that allow them to live in certain environmental conditions. The types and abundance of organisms that reflect the saprobic conditions in a water body play a key role in determining its water quality and overall ecological well-being[20].

Several studies have been carried out on the distribution of microalgae in various aquatic ecosystems throughout Indonesia. However, research focusing on the distribution of microalgae in downstream areas and their application as bioindicators of water pollution, particularly in the Gorontalo Province, remains limited. The objective of this study is to (1) determine the types and distribution of microalgae and (2) evaluate water quality using the saprobic index in the downstream area of the Paguyaman River, Gorontalo. The findings of this research are expected to foster the more efficient and sustainable utilization of water resources, ensuring that communities especially those reliant on water resources for daily consumption, agriculture, and fisheries, can maintain both their health and ecosystem balance. By contibuting to improved water quality, this study supports environmental health and strengthens community resilience in addressing environmental changes and water pollution.

MATERIALS AND METHODS

Location and time of research

This study was carried out in the downstream area of the Paguyaman River in Gorontalo from June to July 2024. Four sampling stations start from downstream right at the mouth of the river, such as Station 1 (N 00º31'16.6"; E 122º38'52.00"), followed by station 2 (N 00º33'00.7"; E 122º38'02.50"), stasion 3 (N 00º33'59.1"; E 122º38'20.50"), and stasion 4 (N 00º36'11.0"; E 122º36'52.20"), with a distance of 3-4 km between stations (Figure 1).

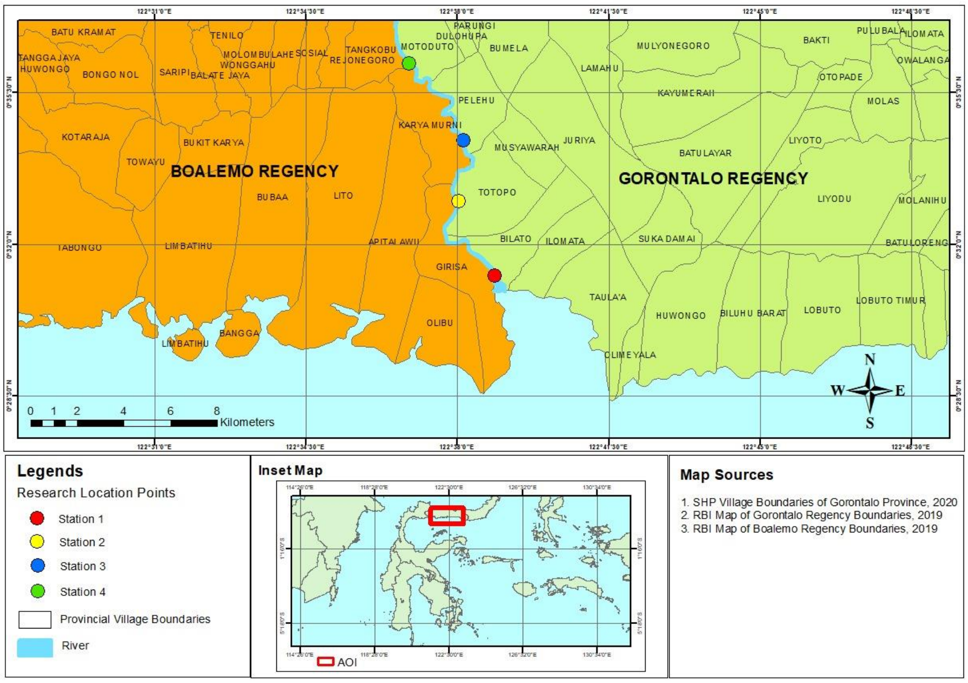

Figure 1. Sampling locations in the Downstream area of Paguyaman River, Gorontalo

Data collection procedures

Microalgae observed in this study included planktonic microalgae (phytoplankton) and microalgae attached to the rock substrate (periphyton). Phytoplankton and periphyton sampling was conducted at each station for three replicates. Plankton samples were obtained by filtering 5 L of water through a 25 µm mesh plankton net. The filtered 8 ml samples were then preserved in a 4% formalin solution. Meanwhile, periphyton samples were taken on rock substrates in river waters by scraping the rock surface using a fine brush with a scraping surface area of 4x4 cm^2 [21]. The scraping results were put into a sample bottle filled with distilled water and then preserved using a 1% Lugol solution. Sample observation was conducted at the Hydrobioecology and Biometrics Laboratory, Faculty of Marine and Fisheries Technology, Universitas Negeri Gorontalo. Plankton enumeration was carried out on 0.04 ml of plankton samples using a glass object. The number of plankton was observed using the whole observation method (census) for three replicates. The identification process was conducted using a Zeiss binocular microscope with 40 times magnification. Plankton and periphyton were identified using a microalgae identification key book from the National Marine Fisheries Service[22,23].

Physical and chemical water parameters were measured at each station for three replicates. Physical parameters included temperature, current velocity, brightness, and bottom substrate. Otherwise, chemical parameters include pH, dissolved oxygen (DO), and salinity.

Data analysis

The plankton and periphyton parameters observed include diversity index, uniformity index, dominance index, saprobic index, and trophic saprobic index. The calculation were performed using the following formulas:

Diversity Index

The diversity index is used to assess the variety of plankton or periphyton species in the water and is calculated using the Shanon-Wiener equation Magurran[24] as follows:

$$H' = -\sum_{t=1}^{s} Pi \times Ln_{Pi}$$

Descriptions:
H' = Shanon-Wiener diversity index
s = Number of species
$P_i = n_i / N$
n_i = Number of individuals of the species
N = Total number of plankton or periphyton

Where the criteria for the value of H' according to Odum[25] as follows: 0<H'<2,303 low diversity; 2,303<H'<6,907 moderate diversity; dan H'>6,907 high diversity.

Uniformity Index

The uniformity index is determined using the formula according to Arinardi et al.[26]:

$$e = \frac{H'}{H^{maks}}$$

Descriptions:
e = Uniformity index
H' = Shanon-Wiener diversity index
H^{maks} = Ln of number of species

Dominance Index

Simpson's dominance index is used to assess the dominance of spesific plankton or periphyton in the water and is calculated using the equation Odum[25] as follows:

$$D = -\sum_{t=1}^{s} \left(\frac{n_i}{N}\right)^2$$

Descriptions:
D = Dominance index
S = Number of species
N_i = Number of individuals of the species
N = Total number of plankton

Saprobic Index

The saprobic index is used to determine the level of savings with the equation Dresscher dan Van Der Mark[27]:

$$SI = \frac{1C + 3D - 1B - 3A}{1A + 1B + 1C + 1D}$$

Descriptions:
SI = Saprobic index (-3 s.d. +3)
A = Species count of the polisaprobic group
B = Species count of the α-mesosaprobic group
C = Species count of the β-mesosaprobic group
D = Species count of the oligosaprobic group

According to Siregar et al.[28], saprobic is a water quality condition caused by the addition of organic matter into a body of water. Arsad et al.[4] categorize oligosaprobic as unpolluted water conditions, β-mesosaprobic as mild to moderate pollution conditions, α-mesosaprobic as moderate to severe pollution conditions, and polysaprobic as severe pollution conditions.

Trophic Saprobic Index

$$TSI = \frac{(nC) + 3(nD) - 1(nB) - 3(nA)}{1(nA) + 3(nB) + 1(nC) + 1(nD)} \times \frac{nA + nB - nC - nE}{nA + nB + nC + nD}$$

Descriptions:
TSI = Trophic Saprobic Index
nA = Individuals belonging to the Polysaprobic group
nB = Individuals belonging to the α-mesosaprobic group
nC = Individuasl belonging to the β-mesosaprobic group
nD = Individuals belonging to the Oligosaprobic group
nE = Individuals belonging to organisms outside groups A, B, C, and D

Table 1. Relationship between water pollution level and saprobic index[27]

Index SI and TSI	Saprobic Level	Fertilize	Pollute
(-3,0) s/d (-2,0)	Polysaprobic	Difficult to utilize fertility	Very heavy
(-2,0) s/d (-1,5)	Poly/α-mesosaprobic		
(-1,5) s/d (-1,0)	α-meso/polysaprobic		Heavy
(-1,0) s/d (-0,5)	α-mesosaprobic		
(-0,5) s/d (0,0)	α/β (mesosaprobic)	Fertility is possible to use	Moderate

Index SI and TSI	Saprobic Level	Fertilize	Pollute
(0,0) s/d (+0,5)	β/α (mesosaprobic)		Delicate
(+0,5) s/d (+1,0)	β (mesosaprobic)		
(+1,0) s/d (+1,5)	β (meso/oligosaprobic)		
(+1,5) s/d (+2,0)	Oligo/β (mesosaprobic)	Fertility is possible to use	Very delicate
(+2,0) s/d (+3,0)	Oligo saprobic		

RESULTS AND DISCUSSION

Microalgae Community Structure in the Downstream Area of the Paguyaman River

The observed biological parameters were represented by the diversity, uniformity, and dominance value of microalgae, including both phytoplankton and periphyton. Plankton is a crucial element of the trophic structure, contributing to the formation of food webs that are vital for maintaining the balance of aquatic ecosystems[29]. Phytoplankton serves as a primary source of organic production, forming the foundation of the food chain and playing a key role in determining the health of aquatic ecosystems[30], while periphyton is an animal or plant that lives attached to rocks, twigs, or other substrates whose existence is relatively sedentary or attached[31]. Physico-chemical factors of the water strongly influence the growth of plankton and periphyton. Baek et al.[32] explained that environmental parameters strongly influence phytoplankton's survival and replication success. In response to changes in environmental parameters, the relative abundance of each type of microalgal community constituent will also vary[33]. Thus, its existence can describe the basic information of water quality status.

Microalgae in the downstream area of the Paguyaman River were identified from 10 classes, consisting of 101 species and 45 genera. The 10 classes identified were Bacillariophyceae, Chlorophyceae, Coleochaetophyceae, Cyanophyceae, Dothideomycota, Sordariomycota, Trebouxiophyceae, Ulvophyceae, Zygnematophyceae, and Zygnemophyceae. Dothideomycota and Trebouxiophyceae were only found as plankton constituent classes, while Coleochaetophyceae and Ulvophyceae were only found in the periphyton. Microalgae composition in the downstream area of Paguyaman River, Gorontalo, is shown in Figure 2.

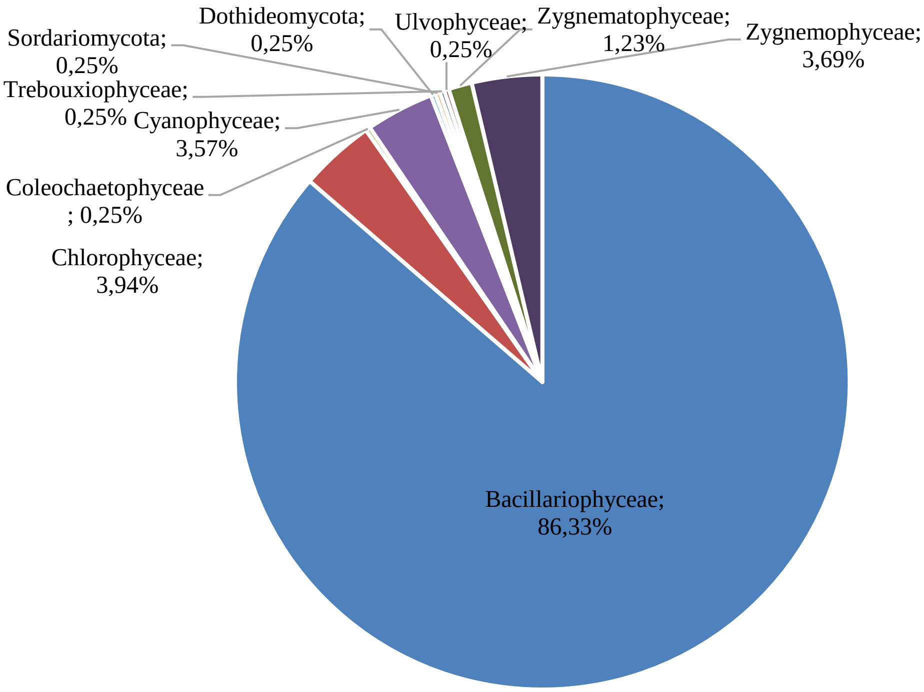

Figure 2. Composition of microalgae in the downstream area of Paguyaman River Gorontalo

The results of the microalgae sample identification revealed that the most abundant genus found in this study was *Navicula*, followed by *Nitzschia* from the Bacillariophyceae class. Both genera can live and adjust well to environmental changes, even in poor conditions. Zakiyah and Mulyanto[34] reported that the genus *Nevicula* is adaptable to mildly to moderately polluted environmental conditions. Christiani et al.[35] stated that *Navicula* has a slimy stalk used as a solid attachment to the substrate to live in turbulent waters. This is also described by Harmoko et al.[36], who states that this genus can attach to the substrate. Likewise, *Nitzschia* has high survival and adaptation to various water conditions, including extreme conditions[37].

Furthermore, the Bacillariophyceae class with the most significant composition in phytoplankton and periphyton is in the composition of 70.06% and 50.10%, respectively. According to Aryani et al.[38], Bacillariophyceae area abundant in many waters due to their adaptability, resilience to extreme conditions, are cosmopolite, and have high reproductive capacity. A high composition of Bacillariophyceae class in Gorontalo waters has also been reported in epilithic microalgae in Bulango River, Gorontalo[39], in Gorontalo Bay[40], and Bone River, Gorontalo[41]. Moreover, Chrysophyta, as a phylum member of the Bacillariophyceae class, also dominates phytoplankton in Gorontalo Bay, Indonesia[42].

The diversity index (H'), dominance index (D), and uniformity index (e) of microalgae found in the downstream area of the Paguyaman River have varying values at each station. Microalgae diversity index (H') ranged from 3.079-4.932, the dominance index (D) ranged from 0.053-0.325, and the uniformity index (e) ranged from 0.772-1.261, as shown in Table 2.

Table 2. Diversity index, dominance index, and uniformity index of microalgae in the downstream area of Paguyaman River

Stations	Diversity Index (H')	Dominance Index (D)	Uniformity Index (e)
S1	4.932	0.053	1.261
S2	4.433	0.071	1.194
S3	3.079	0.325	0.772
S4	4.550	0.073	1.125

Diversity is a mathematical description that can facilitate the analysis of information about the types and numbers of organisms. A value of H' > 3 indicates the stability of the community is in prime condition (stable). As Iswanto et al.[43] also stated, the value of H' > 3 indicates high community stability. Based on the microalgal diversity index (H') value, the waters in the downstream area of the Paguyaman River are a good place for microalgae to live. Microalgal diversity functions in the balance of aquatic ecosystems as well as natural food for aquatic ichthyofauna.

Furthermore, dominance index reflects competition or competition in resource utilization that leads to unbalanced or stressed environmental conditions[30]. The dominance index value of microalgae obtained at the research site is relatively low, which implies that no species are found with a density that is too high in the waters of the downstream area of the Paguyaman River. According to Odum[25], Pirzan and Pong-Masak[44], and Akmal et al.[45], a dominance value close to 0 suggests that no single species heavily dominates others within the community structure.

Based on the value of the uniformity index (e) of microalgae (Table 2), the waters in the downstream area of the Paguyaman River show an even presence or density of biota. These value indicate that the waters are stable and capable of sustaining productive and long-term fisheries. The analysis results from all stations show that the microalgae Diversity Index falls within the high species uniformity category. A higher uniformity index value indicates a balanced distribution of individuals across each genus, with no genus dominating[46].

Water Quality

The results of measurements of the physical and chemical water parameters are presented in Table 3.

Table 3. Water quality data in the downstream area of Paguyaman River, Gorontalo

No	Parameters	Stations			
		S1	S2	S3	S4
A. PHYSICS					
1	Temperature (°C)	29.73	29.53	29.13	29.27
2	Current velocity (m/s)	0.09	0.60	0.56	0.59
3	Brightness (cm)	17.67	17.67	15.67	16.33
4	Bottom Substrate	Muddy sand	Rocks	Sandy mud	Muddy sand
B. CHEMISTRY					
1	pH	7.12	7.50	7.53	7.60
2	DO (mg/L)	7.52	7.67	8.22	8.80
3	Salinity (ppt)	0.08	0.00	0.00	0.00

Various factors influence the presence of microalgae in waters, the main one being water quality. Generally, the water quality parameters in the downstream area of the Paguyaman River are in good condition and comply with class II water quality standards according to Government Regulation No. 22 of 2021 concerning the Implementation of Environmental Protection and Management. This is by the primary designation of the downstream area of the Paguyaman River, which has been used for irrigating agricultural and fishery land.

Temperature is a water quality parameter that plays a vital role in microalgae composition, abundance, and distribution[47]. The results of water temperature measurements were in the range of 29,13-29,73 °C and did not show significant differences between observation stations. This value is included in the standard and optimum water temperature category to support microalgae growth. Nybakken[48] explains that average sea surface temperatures generally range from 20-30 °C. Hartanto[49] explains that the optimum temperature range that supports microalgae growth in waters ranges from 20-30 °C.

According to Umiatun et al.[50], current velocity can be categorized into very slow (<0.10 ms^{-1}), slow (0.10-0.25 ms^{-1}), medium (0.25-0.50 ms^{-1}), fast (0.50-1 ms^{-1}), and very fast (more than 1 ms^{-1}). Current velocity plays an essential role in the spread of microalgae. Based on the current velocity category, the current velocity value at station 1 (0.09 ms^{-1}) is included in the very slow current category. This is due to the location of station 1, which is right at the mouth of the river. Stations 2-4 have a current velocity of 0.60; 0.56; dan 0.59 ms^{-1}, respectively, in the fast category. The conditions also support this during sampling, which coincides with the rain.

Brightness is the level of water transparency that can indicate whether or not there are many suspended particles in the water. Romimohtarto and Juwana[51] stated that brightness is the penetrating power of sunlight into a body of water. The results showed that the average brightness value of the downstream area of the Paguyaman River was in the optimal range for the growth of microalgae and river ichthyofauna. The lowest brightness value was found at station 3 because sampling at this station coincided with rainfall.

The degree of acidity (pH) is also an important water quality parameter for the growth and distribution of microalgae. The pH value is the negative logarithm of the concentration of hydrogen ions released in a body of water. Based on the measurement results, the average pH value obtained at each observation station (7.12-7.60) remains in the ideal range for microalgae life. Agustin et al.[52] suggested that the pH range of 6-8.1 is the optimum temperature for microalgae life.

Dissolved oxygen (DO) is the amount of oxygen dissolved in water and plays a vital role in the metabolic process, growth, and development of microalgae and ichthyofauna in river waters. In addition, oxygen is also needed in the aerobic process of oxidizing organic and inorganic materials. Arsad et al.[4] explained that microalgae abundance is positively correlated with DO. While salinity influences growth rate, food intake, food conversion efficiency, and survival.

Saprobic Index

Based on the microalgal community found at the research site, 50 species were recorded as saprobic groups, while 51 species were classified as non-saprobic groups. Saprobic constituent groups in the downstream area of the Paguyaman River are presented in Table 4.

Table 4. Saprobic constituent groups in the downstream area of the Paguyaman River

Saprobic Groups	Number of Species	Number of Individuals
Polysaprobic (A)	0	0
α-Mesosaprobic (B)	32	486
β-Mesosaprobic (C)	2	4
Oligosaprobic (D)	16	57
Non-Saprobic	51	265

The saprobity index used to determine the level of water pollution consists of the Saprobic Index (SI) and the Trophic Saprobic Index (TSI). Based on the calculation results, the SI value is 1.64, and the TSI value is 0.65. These values indicate that the water conditions in the downstream area of the Paguyaman River is in the lightly polluted category with the level of water fertility (saprobic) showing Oligo/β-mesosaprobic conditions. According to Al marwazi et al.[53], waters that have reached the mesosaprobic level indicate that the waters have experienced an increase in nutrient levels due to input of domestic waste and other human activities around the waters. In addition, Awaludin et al.[19] explained that the saprobic index, which shows the condition of lightly polluted waters, indicates the occurrence of organic matter pollution in these waters. It is estimated that organic matter entering the downstream waters of the Paguyaman River comes from land use activities that occur in the middle or even upstream of the river and then drift downstream. For comparison, similar conditions were also found in the downstream part of the Bone River, Gorontalo, as reported by Kadim et al.[54].

This decline in water quality has the potential to impact the health of communities that depend on river water for their daily needs. Implementing stricter policies related to domestic and agricultural waste management and regular monitoring of river water quality is essential to maintain the sustainability of aquatic ecosystems and support the health of communities that depend on water from the Paguyaman River. In addition, the need for environmental education and awareness among the community is also crucial to preventing further pollution.

CONCLUSION

The findings revealed that microalgae in the downstream area of the Paguyaman River were represented by 10 classes, consisting of 101 species and 45 genera. The diversity index (H') value of microalgae is generally in the category of stable communities or has a high diversity value. The dominance index value is relatively low, which implies that no species are found with a density that is too high in the downstream area of Paguyaman River. Meanwhile, the uniformity index indicates the presence or density of evenly distributed biota. The saprobity level of the downstream area of the Paguyaman River is currently at the Oligo/β-mesosaprobic level, which is included in the lightly polluted category.

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