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Types and Abundance of Phytoplankton in the Genting River Estuary, Tanjung Medang Village, North Rupat District, Bengkalis Regency, Riau

Jenis dan Kelimpahan Fitoplankton di Muara Sungai Genting Desa Tanjung Medang Kecamatan Rupat Utara, Bengkalis, Riau

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Abstract

The waters of North Rupat are an area with various anthropogenic activities, including tourism, industry, transportation, and activities of local communities who work as farmers, ranchers, traders, and fishermen, which may cause water pollution. The estuaries in this area have mangrove ecosystems, seagrass beds, and open waters that support the life of aquatic organisms. Phytoplankton, as primary producers, play an important role in the food chain and can serve as biological indicators of water quality and fertility. This study aims to determine the types and abundance of phytoplankton in the Genting River Estuary, Tanjung Medang Village. The study was conducted in September 2024 using a survey method to obtain primary data in the form of phytoplankton samples and water quality parameters. Samples were taken three times at weekly intervals, then identified and counted for abundance. The results showed that there were 43 types of phytoplankton consisting of *Bacillariophyceae* (23 types), *Chlorophyceae* (7 types), *Cyanophyceae* (8 types), *Dinophyceae* (1 type), *Euglenophyceae* (1 type), and *Zygnematophyceae* (3 types). The abundance of phytoplankton ranged from 6,280 to 7,560 cells/L, indicating low water fertility. Water quality parameters (temperature, salinity, pH, dissolved oxygen, free carbon dioxide, nitrate, and phosphate) still support phytoplankton survival. Thus, it can be concluded that the waters of the Genting River Estuary exhibit a fairly high phytoplankton diversity but are classified as low in fertility.

Keywords: Abundance, Phytoplankton, Water Quality, Estuaries, North Rupat

Abstrak

Perairan Rupat Utara merupakan wilayah dengan berbagai aktivitas antropogenik, pariwisata, industri, transportasi, serta aktivitas masyarakat setempat yang berprofesi sebagai petani, peternak, pedagang, dan nelayan, sehingga berpotensi menimbulkan pencemaran perairan. Estuaria di kawasan ini memiliki ekosistem mangrove, padang lamun, dan perairan terbuka yang mendukung kehidupan organisme akuatik. Fitoplankton sebagai produsen primer berperan penting dalam rantai makanan serta dapat digunakan sebagai indikator biologis untuk menilai kualitas dan kesuburan perairan. Penelitian ini bertujuan untuk mengetahui jenis dan kelimpahan fitoplankton di Muara Sungai Genting, Desa Tanjung Medang. Penelitian dilaksanakan pada bulan September 2024 dengan metode survei untuk memperoleh data primer berupa sampel fitoplankton dan parameter kualitas air. Pengambilan sampel dilakukan sebanyak tiga kali ulangan dengan interval waktu satu minggu, kemudian diidentifikasi dan dihitung kelimpahannya. Hasil penelitian menunjukkan terdapat 43 jenis fitoplankton yang terdiri atas

Bacillariophyceae (23 jenis), *Chlorophyceae* (7 jenis), *Cyanophyceae* (8 jenis), *Dinophyceae* (1 jenis), *Euglenophyceae* (1 jenis), dan *Zygnematophyceae* (3 jenis). Kelimpahan fitoplankton berkisar 6.280–7.560 sel/L, yang mengindikasikan tingkat kesuburan perairan termasuk kategori rendah. Parameter kualitas air (suhu, salinitas, pH, oksigen terlarut, karbondioksida bebas, nitrat, dan fosfat) masih mendukung keberlangsungan hidup fitoplankton. Dengan demikian, dapat disimpulkan bahwa perairan Muara Sungai Genting memiliki keragaman fitoplankton yang cukup tinggi, namun tingkat kesuburannya tergolong rendah.

Kata kunci: Kelimpahan, Fitoplankton, Kualitas air, Estuaria, Rupat Utara

1. Introduction

Rupat Island is an island located in Bengkalis Regency, consisting of two sub-districts: Rupat Sub-district and North Rupat Sub-district. North Rupat Sub-district consists of five villages, with the sub-district capital located in Tanjung Medang. The area of North Rupat Sub-district is 628.50 km^2 (BPS, 2021). The waters of North Rupat are directly adjacent to the Malacca Strait. The Malacca Strait is an international transport route that plays a role in dense shipping activities. Therefore, in the waters of North Rupat, various anthropogenic activities, such as tourism, industry, and transportation, also make the waters prone to pollution. In addition to industry, communities engage in activities such as farming, animal husbandry, trading, and fishing (Brown et al., 2016).

The North Rupat Estuarine area encompasses a variety of habitats, including mangroves, seagrass beds, and open waters, that support a range of aquatic organisms. The presence of phytoplankton greatly influences the potential for natural food in this estuary. Phytoplankton are photosynthetic microorganisms that function as primary producers in aquatic ecosystems. The presence of phytoplankton as primary producers can provide information about the condition of surrounding waters, making them a biological parameter that can be used as an indicator of a body of water's quality and fertility (Syafriani & Apriadi, 2017).

Phytoplankton abundance varies greatly temporally and spatially (Cahyani et al., 2023), influenced by factors such as nutrient availability, light intensity, water temperature, and interactions with other organisms. Changes in phytoplankton abundance significantly impact fisheries productivity and the balance of aquatic ecosystems. Thus, the presence and abundance of phytoplankton greatly affect the sustainability of aquatic ecosystems, including natural fish stocks. Considering the importance of phytoplankton as the basis of the food chain and an ecosystem indicator, it is necessary to research the types and abundance of phytoplankton in the Genting River Estuary, Tanjung Medang Village, North Rupat District, Bengkalis Regency. This study aims to determine the types and abundances of phytoplankton in the Genting River, Tanjung Medang Village. It is expected to provide basic information for the management of sustainable fisheries resources and to serve as a scientific reference in efforts to conserve and optimise the utilisation of aquatic resources in the region.

2. Material and Method

2.1. Time and Place

This study was conducted in September 2024 at the mouth of the Genting River in Tanjung Medang Village, North Rupat District, Bengkalis Regency, Riau Province (Figure 1). Identification and analysis of phytoplankton abundance were carried out at the Fisheries Biology Laboratory, Faculty of Fisheries and Marine, Universitas Riau.

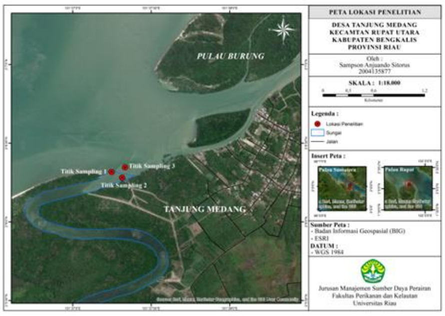

Figure 1. Research Location

2.2. Methods

The method used in this study was a survey method, with the waters of the Genting River Estuary in Tanjung Medang Village, North Rupat District, as the research location. The data collected included both primary and secondary sources. Primary data were collected directly at the research site by sampling phytoplankton and measuring water quality parameters.

2.3. Procedures

2.3.1. Phytoplankton Sampling

Phytoplankton sampling and water quality sampling were conducted simultaneously three times at one-week intervals. Sampling was carried out at three stations in the morning (08:00-10:00). Samples were collected using a plankton net. A total of 100 L of water was collected using a 10 L bucket and then filtered using a plankton net (mesh size 20 µm). The sample collected in the bucket was transferred to a 100 ml sample bottle. Then, 4-5 drops of Lugol's solution were added and labelled for identification. The bottles containing the samples were placed in a cool box to protect the samples from heat and sunlight.

2.3.2 Observation of Phytoplankton Samples

The phytoplankton samples obtained from the water were then observed in the Aquatic Biology Laboratory. Identification was necessary to determine the genus. Phytoplankton identification and counting were carried out by taking 1-1.5 ml of phytoplankton samples from the sample bottles, which were then dropped onto cover slips and observed under a microscope. Phytoplankton samples were identified using the books Marsh (1900) and Bold & Wynne (1985).

2.3.3. Calculation of Phytoplankton Abundance

Phytoplankton abundance is calculated using the following equation according to APHA (2012):

$$N = n \times \frac{A}{B} \times \frac{C}{D} \times \frac{1}{E}$$

Description:

N	= Plankton abundance (cell/L)	n	= Number of individuals found
C	= Volume of water filtered (ml)	B	= Observation area (mm^2)
A	= Area of the cover glass (mm^2)	E	= Volume of filtered water (100 L)
D	= Volume of one drop of sample (mL)		

Goldman & Horne in Pohan (2011), classify water fertility levels based on phytoplankton abundance, namely if phytoplankton abundance is $< 10^4$ cells/L, water fertility is low; phytoplankton abundance $10^4 < x < 10^7$ cells/L or more indicates moderate water fertility, and if phytoplankton abundance is $\geq 10^7$ cells/L, water fertility is very high. In this case, the phytoplankton present in the water is said to be blooming

2.3.4. Measurement of Water Quality Parameters

Measurement of several physical and chemical parameters in situ at the research site. The water quality parameters to be measured include physical and chemical parameters. The physical parameters used in this study are temperature and salinity. The chemical parameters used in this study are pH, dissolved oxygen (DO), free carbon dioxide (CO_2), nitrate, and phosphate.

2.4. Data Analysis

The data obtained in the form of phytoplankton abundance and water quality will be tabulated. The data will be analysed descriptively and correlated with the measured water quality parameters, and the results will be discussed in accordance with the supporting literature to conclude.

3. Result and Discussion

3.1. Types of Phytoplankton

The presence of phytoplankton greatly affects life in the water because it plays an important role as food for various aquatic organisms, especially in the estuary of the Genting River in Tanjung Medang Village. A total of 43 phytoplankton taxa were identified during the study, belonging to seven classes: Bacillariophyceae, Chlorophyceae, Chroococcophyceae, Cyanophyceae, Dinophyceae, Euglenophyceae, and Zygnematophyceae. The types of phytoplankton, grouped by class, are shown in Table 1.

The most abundant type of phytoplankton found in the Genting River Estuary in Tanjung Medang Village belongs to the *Bacillariophyceae* class (23 species), with *Cyclotella operculata* being the most abundant. In comparison, the least abundant belongs to the Euglenophyceae class (1 species), namely *Euglena intermedia*. The large number of species in Bacillariophyceae is due to this group's common occurrence in estuarine waters, high tolerance to salinity changes, and ability to adapt to waters with high nutrient levels, especially silicate and phosphate (Perdana et al., 2020).

Diatoms from the *Bacillariophyceae* class are known to be primary producers and the main food source for zooplankton, indicating high primary productivity potential and supporting the availability of natural food for fish.

In a study by Ghiffary et al. (2018), the Belanak (*Mugilidae*) species *Chelon subviridis* was found to utilise Bacillariophyceae class phytoplankton as its main food source. Meanwhile, the Belanak species *Moolgarda engeli* also uses Bacillariophyceae as its main food source, but with a different dominant species, *Nitzschia*.

Table 1. Types of Phytoplankton

No	Ordo	Family	Genus	Species
	Bacillariophyceae			
1.	Coscinodiscales	Heliopeltaceae	Actinoptychus	*Actinoptychus annulatus*
2.	Fragilariales	Fragilariaceae	Asterionella	*Asterionella formosa*
3.	Centrales	Chaetocerotaceae	Bacteriastrum	*Bacteriastrum varians*
4.	Biddulphiales	Biddulphiaceae	Biddulphia	*Biddulphia heteroceros*
5.	Biddulphiales	Biddulphiaceae	Biddulphia	*Biddulphia mobiliensis*
6.	Hemiaulales	Hemiaulaceae	Climacodium	*Climacodium* sp.
7.	Achnanyhales	Cocconeidaceae	Cocconeis	*Cocconeis pediculus*
8.	Thalassiosirales	Stephanodiscaceae	Cyclotella	*Cyclotella operculata*
9.	Surirellales	Surirellaceae	Cymatopleura	*Cymatopleura elliptica*
10.	Bacillariales	Bacillariaceae	Denticula	*Denticula tenuis*
11.	Fragilariales	Fragilariaceae	Diatoma	*Diatoma vulgare*
12.	Lithodesmiales	Lithodesmiaceae	Ditylum	*Ditylum sol*
13.	Rhopalodiales	Rhopalodiaceae	Epithemia	*Epithemia argus*
14.	Eunotiales	Eunotiaceae	Eunotia	*Eunotia tetraodon*
15.	Hemiaulales	Hemiaulaceae	Hemiaulus	*Hemiaulus indicus*
16.	Melosirales	Melosiraceae	Melosira	*Melosira salina*
17.	Bacillariales	Bacillariaceae	Nitzschia	*Nitzschia closterium*
18.	Bacillariales	Bacillariaceae	Nitzschia	*Nitzschia curvula*
19.	Bacillariales	Bacillariaceae	Nitzschia	*Nitzschia seriata*
20.	Thalassiosirales	Thalassiosiraceae	Planktoniella	*Planktoniella sol*
21.	Naviculales	Pleurosigmataceae	Pleurosigma	*Pleurosigma delicatum*
22.	Surirellales	Surirellaceae	Surirella	*Surirella ovalis*
23.	Thalassionematales	Thalassionemataceae	Thalassiothrix	*Thalassiothrix* sp.
	Chlorophyceae			
24.	Chlamydomonadales	Sphaerocystidaceae	Sphaerocystis	*Sphaerocystis schroeteri*
25.	Chlamydomonadales	Chlamydomonadaceae	Chlamydomonas	*Chlamydomonas glococystiformis*
26.	Chlorococcales	Oocystaceae	Chlorella	*Chlorella* sp.
27.	Desmidiales	Closteriaceae	Closterium	*Closterium kuetzinggii*
28.	Sphaeropleales	Scenedesmaceae	Coelastrum	*Coelastrum cubicum*
29.	Chlorellales	Oocystaceae	Lagerheimia	*Lagerheimia chodati*
30.	Chlorellales	Oocystaceae	Oocystis	*Oocystis naegelii*
	Chroococcophyceae			
31.	Chroococcales	Synechoccaceae	Dactylococcopsis	*Dactylococcopsis raphidiodea*
	Cyanophyceae			
32.	Nostocales	Nostocaceae	Anabaena	*Anabaena circularis*
33.	Nostocales	Nostocaceae	Anabaena	*Anabaena hallensi*
34.	Nostocales	Nostocaceae	Anabaena	*Anabaena spiroides*
35.	Nostocales	Aphanizomenonaeceae	Anabaenopsis	*Anabaenopsis raciborskii*
36.	Nostocales	Rivulariaceae	Calothrix	*Calothrix* sp
37.	Chroococcales	Chroococcaceae	Chroococcus	*Chroococcus limneticus*
38.	Oscillatoriales	Oscillatoriaceae	Lyngbya	*Lyngbya spirulinoides*
	Dinophyceae			
39.	Gymnodiniales	Polykrikaceae	Polykrikos	*Polykrikos schwartzii*
	Euglenophyceae			
40.	Euglenales	Euglenaceae	Euglena	*Euglena intermedia*
	Zygnematophyceae			
41.	Desmidiales	Gonatozygaceae	Gonatozygon	*Gonatozygon monotaenium*
42.	Zygnematales	Zygnemataceae	Zygnema	*Zygnema insigne*
43.	Desmidiales	Desmidiaceae	Cosmarium	*Cosmarium* sp.

3.2. Phytoplankton Abundance

The average phytoplankton abundance at the mouth of the Genting River in Tanjung Medang Village ranged from 6,280 to 7,560 cells/L. The highest abundance was found at Station 3 (7,560 cells/L) and the lowest phytoplankton abundance at Station 1 (6,280 cells/L), as shown in Table 2. The highest phytoplankton abundance was found at Station 3, namely 7,560 cells/L. The high abundance at this station is due to several factors, including higher concentrations of nitrate, phosphate, and free CO_2 at Station 3 compared to other stations (Table 3). Free CO_2 acts as the main source of carbon in the photosynthesis process, so that if it is sufficiently available, phytoplankton growth and abundance will increase. According to Rahmawati et al. (2021), during photosynthesis, phytoplankton actively absorb carbon from their environment to form carbohydrate compounds as an energy source. If free CO_2 is available in sufficient or optimal amounts, photosynthesis can proceed more efficiently, increasing primary productivity and phytoplankton abundance. However, high phytoplankton abundance is not solely determined by free CO_2 but is also influenced by other supporting factors, such as nutrients (nitrate and phosphate). This is in accordance with the opinion of Mujiyanto et al. (2011), who stated that the availability of nutrients, carbon dioxide, and sunlight are important factors that influence overall phytoplankton growth.

Table 2. Abundance of Phytoplankton

No.	Spesies	Station		
		1	2	3
	Bacillariophyceae			
1.	*Actinoptychus annulatus*	280	213,3	386,6
2.	*Asterionella Formosa*	-	-	373,3
3.	*Bacteriastrum varians*	-	213,3	-
4.	*Biddulphia heteroceros*	226,6	66,6	-
5.	*Biddulphia mobiliensis*	-	333,3	-
6.	*Climacodium*	-	-	400
7.	*Cocconeis pediculus*	333,3	186,6	386,6
8.	*Cyclotella operculate*	1160	973,3	786,6
9.	*Cymatopleura elliptica*	-	146,6	-
10.	*Denticula tenuis*	-	373,3	-
11.	*Diatoma vulgare*	480	346,6	-
12.	*Ditylum sol*	386,6	400	386,6
13.	*Epithemia argus*	106,6	-	146,6
14.	*Eunotia Tetraodon*	-	400	-
15.	*Hemiaulus indicus*	-	-	400
16.	*Melosira salina*	306,6	506,6	-
17.	*Nitzschia Closterium*	-	333,3	-
18.	*Nitzschia curvula*	400	533,3	333,3
19.	*Nitzschia seriata*	-	-	413,3
20.	*Planktoniella sol*	266,6	-	400
21.	*Pleurosigma delicatum*	-	266,6	-
22.	*Surirella ovalis*	440	-	506,6
23.	*Thalassiothrix* sp	-	-	493,3
	Chlorophyceae			
24.	*Chlamydomonas glococystiformis*	186,6	-	66,6
25.	*Chlorella* sp	413,3	-	-
26.	*Closterium kuetzinggii*	213,3	40	-
27.	*Coelastrum cubicum*	-	106,6	-
28.	*Lagerheimia chodati*	-	106,6	-
29.	*Oocystis naegelii*	-	-	200
30.	*Sphaerocystis schroeteri*	106,6	-	106,6
	Chroococcophyceae			
31.	*Dactylococcopsis raphidiodea*	120	-	-
	Cyanophyceae			
32.	*Anabaena circularis*	-	-	93,3
33.	*Anabaena hallensi*	-	613,3	-
34.	*Anabaena spiroides*	-	-	373,3
35.	*Anabaenopsis raciborskii*	-	53,3	-
36.	*Calothrix*	373,3	480	173,3
37.	*Chroococcus limneticus*	-	120	-
38.	*Lyngbya spirulinoides*	-	-	186,6
	Dinophyceae			
39.	*Polykrikos schwartzii*	-	-	413,3
	Euglenophyceae			
40.	*Euglena intermedia*	-	40	-
	Zygnematophyceae			
41.	*Gonatozygon monotaenium*	-	306,6	-
42.	*Zygnema insigne*	173,3	-	120
43.	*Cosmarium* sp	306,6	-	413,3
Total		6.280	7.160	7.560

The lowest phytoplankton abundance was observed at Station 1, with 6,280 cells/L. The low abundance at this station may be due to low nutrient levels, which are important nutrients for supporting phytoplankton growth in the water. According to research by Nazar et al. (2024), phytoplankton abundance is strongly influenced by nutrient availability, particularly nitrate and phosphate. The concentration of free CO_2 was also lower at Station 1 than at other stations, resulting in a lack of the main carbon source for phytoplankton to carry out photosynthesis.

In addition, physical factors such as water temperature can affect phytoplankton abundance. Zainuri et al. (2023) stated that temperatures that are too low or too high can inhibit photosynthetic activity in phytoplankton, resulting in lower numbers.

Abundant phytoplankton supports the availability of food for zooplankton, and subsequently for small fish that are the main source in the aquatic food chain. The presence of phytoplankton is also a positive signal for the potential development of sustainable fisheries, especially for local economic fish species such as white snapper, sembilang, and gulamah.

3.3. Water Quality

Water quality is one of the most important aspects of water management. Water quality consists of physical and chemical parameters. The results of the water quality measurements conducted at the mouth of the Genting River in Tanjung Medang Village are shown in Table 3.

Tabel 3. Water Quality

No.	Water Quality Parameters	Station 1	Station 2	Station 3
1.	Temperature (°C)	30	29	30
2.	pH (Unit)	6	7	7
3.	Salinity (ppt)	28	26	27
4.	Dissolved oxygen (mg/L)	4,90	4,96	5,05
5.	Free CO2 (mg/L)	12,66	15,71	17,29
6.	Nitrate (mg/L)	0,0760	0,0798	0,0867
7.	Phosphate (mg/L)	0,130	0,166	0,188

Differences in temperature values among station were due to differences in timing and environmental conditions at the time of measurement. At Station 1, the temperature was measured at 09:00 WIB, and fishing activities were underway. At Station 2, the temperature was measured at 10:00 WIB, and a bridge allowed boats and canoes to cross. At Station 3, the temperature was measured at 11:00 a.m. and was located in the middle of the estuary. Based on the quality standards of KEPMENLH No. 51 of 2004, the water temperature of the Genting River in Tanjung Medang Village remains normal, within 2°C of the natural water temperature. The water temperature in tropical areas, such as the mouth of the Genting River, generally supports optimal phytoplankton growth, especially in the Bacillariophyceae and Chlorophyceae groups, which are known to grow well at 25–30°C (Fachrul, 2007). Therefore, the temperatures recorded during the study were within the range that supports primary productivity at all stations.

In accordance with the quality standards of KEPMENLH No. 51 of 2004, the pH measurements at the research location are within normal limits. The optimal pH for phytoplankton growth is generally in the range of 6.5–8.0. The pH value of 6 obtained at Station 1 could be one of the causes of the low phytoplankton abundance at that location. Lower pH can interfere with nutrient absorption by phytoplankton cells and affect the ion balance in the water (Wetzel, 2001). Based on previous studies, the relationship between phytoplankton abundance and salinity has been extensively researched. For example, a study by Rahmah et al. (2022) showed that phytoplankton in estuarine waters exhibit higher abundance at moderate salinity, because at extreme salinity, some phytoplankton species tend to be unable to survive or reproduce well. Cahyani et al. (2023) also stated that significant changes in salinity can cause a decrease in phytoplankton abundance, especially in species with narrow salinity tolerance. This is in line with research results showing that slightly higher salinity at Station 3 supports higher phytoplankton abundance.

The results of dissolved oxygen (DO) measurements at the mouth of the Genting River in Tanjung Medang Village ranged from 4.90 to 5.05 mg/L. The highest average concentration was found at Station 3 (5.05 mg/L) and the lowest at Station 1 (4.90 mg/L). Based on the quality standards of KEPMENLH No. 51 of 2004, the dissolved oxygen level in the waters of the Genting River estuary in Tanjung Medang Village remains within the normal range (≥ 5 mg/L). This DO value indicates that photosynthesis is actively taking place and that the water conditions are not experiencing eutrophication or heavy pollution that could reduce oxygen levels.

Based on the measurements, the concentration of free carbon dioxide increased with the abundance of phytoplankton at each station. At Station 1, which had the lowest phytoplankton abundance (6,280 cells/L), the concentration of free carbon dioxide was recorded at 12.66 mg/L. Meanwhile, at Station 2 (7,160 cells/L) and Station 3 (7,560 cells/L), the free carbon dioxide concentrations were recorded at 15.71 mg/L and 17.29 mg/L, respectively. This increase in free CO_2 concentration indicates that the processes of respiration and decomposition of organic matter are more active at stations with higher phytoplankton abundance. Nazar et al. (2024) stated that in waters rich in organic matter or with high phytoplankton abundance, respiration by phytoplankton and other microorganisms tends to produce an increase in free CO_2, which is released into the water.

Based on the quality standards of KEPMENLH No. 51 of 2004, the nitrate concentration in the waters of the Genting River Estuary in Tanjung Medang Village is classified as high (≥ 0.008 mg/L). This is in line with the results described by Mustofa (2020), who stated that although nitrate supports phytoplankton growth, excessive concentrations can have a negative impact on water quality, such as a decrease in dissolved oxygen levels, which are essential for other aquatic organisms.

Based on the quality standards of KEPMENLH No. 51 of 2004, the phosphate concentration at the research site was classified as high (≥ 0.0015 mg/L). This occurred due to the increase in phytoplankton abundance, which caused the phosphate level to increase. At Station 1, the phosphate level was recorded at 0.130 mg/L; at Station 2, it was recorded at 0.166 mg/L; and at Station 3, it was recorded at 0.188 mg/L. The higher phosphate concentrations at Station 2 and Station 3 may indicate that these two stations have more nutrients available to support photosynthesis and phytoplankton growth. Phosphate is an important element in the formation of ATP (adenosine triphosphate) and nucleic acids, which are needed for cell division and phytoplankton growth (Wijaya et al., 2022).

4. Conclusions

Based on research conducted at the mouth of the Genting River in Tanjung Medang Village, 43 types of phytoplankton were found, consisting of the classes Bacillariophyceae (23 types), Chlorophyceae (7 types), Cyanophyceae (8 types), Dinophyceae (1 type), Euglenophyceae (1 type), and Zygnematophyceae (3 types). The phytoplankton abundance ranged from 6,280 to 7,560 cells/L, indicating that the water fertility at the mouth of the Genting River in Tanjung Medang Village is classified as low. Water quality data measured for physical parameters (temperature and salinity) and chemical parameters (pH, dissolved oxygen, free carbon dioxide, nitrate, and phosphate) still support the survival of aquatic organisms, especially phytoplankton.

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