

## **PHYTOPLANKTON IDENTIFICATION IN JATIGEDE RESERVOIR, SUMEDANG REGENCY, WEST JAVA PROVINCE**

Identifikasi Fitoplankton Di Waduk Jatigede, Kabupaten Sumedang, Provinsi Jawa Barat

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(Received April 21<sup>th</sup> 2026; Accepted June 3<sup>rd</sup> 2026)

### **ABSTRACT**

Plankton serves as a study to assess the fertility quality of a water body, which is essential to support aquatic productivity. Plankton consists of phytoplankton and zooplankton. This research aims to identify and quantify the abundance of phytoplankton as a reference for the fertility of Jatigede Reservoir, located in Sumedang Regency, West Java Province. Sampling was conducted from February 6-27, 2024, at Jatigede Reservoir, Sumedang Regency, West Java. The research method used was a survey method with purposive sampling. The results of the study identified phytoplankton from 6 classes comprising 33 genera, namely Bacillariophyceae (8 genera), Chlorophyceae (10 genera), Zygnematophyceae (5 genera), Cyanophyceae (5 genera), Euglenophyceae (3 genera), and Dinophyceae (2 genera). The total abundance of phytoplankton was 21,887 ind/l, indicating eutrophic fertility, and the total biomass of phytoplankton was 469,418.99 µg/l.

**Keywords:** Biomass, Phytoplankton, Abundance, Jatigede

### **ABSTRAK**

Plankton merupakan salah satu biota air yang dapat dianalisis untuk mengetahui kualitas kesuburan suatu perairan yang sangat diperlukan untuk mendukung produktivitas perairan. Plankton terdiri dari fitoplankton dan zooplankton. Penelitian ini bertujuan untuk mengidentifikasi dan menghitung kelimpahan fitoplankton sebagai acuan kesuburan perairan Waduk Jatigede, Kabupaten Sumedang, Provinsi Jawa Barat. Pengambilan sampel dilaksanakan pada tanggal 6-27 Februari 2024 di Waduk Jatigede Kabupaten Sumedang, Jawa Barat. Metode penelitian yang digunakan adalah metode survei dengan melakukan pengambilan sampel (purposive sampling). Hasil penelitian menunjukkan fitoplankton yang teridentifikasi sebanyak 6 kelas terdiri dari 33 genus, yaitu kelas Bacillariophyceae (8 genus), kelas Chlorophyceae (10 genus), Zygnematophyceae (5 genus), Cyanophyceae (5 genus), Euglenophyceae (3 genus), dan Dinophyceae (2 genus). Kelimpahan total fitoplankton sebesar 21.887 ind/l yang berarti memiliki kesuburan eutrofik, dan biomassa total fitoplankton sebesar 469.418,99 µg/l.

**Kata Kunci:** Biomassa, Fitoplankton, Kelimpahan, Jatigede

## INTRODUCTION

According to Government Regulation of the Republic of Indonesia Number 37 (2010), a reservoir is an artificial reservoir formed by the construction of a dam. One such reservoir in West Java is the Jatigede Reservoir, located in Jatigede District, Sumedang Regency, with an area of 3,035.34 hectares. This reservoir functions as a hydroelectric power plant (PLTA), irrigation system, flood control, recreation (ecotourism), and fisheries sector, both capture fisheries and freshwater aquaculture (Sisemar, 2023).

Water activities in the Jatigede Reservoir will impact water quality. One biotic component that can serve as an indicator of water quality is plankton. Plankton is studied to determine the quality of water fertility, which is essential for supporting aquatic productivity (Nurruhwati *et al.*, 2017). According to Utojo (2015), the presence of plankton can be used as a bioindicator of water quality and environmental stability. High plankton abundance indicates a large number of individuals of each species, indicating that the water quality is within a suitable range for the growth of horticultural organisms.

Plankton are organisms that float in water and cannot move or whose movement is very limited, so their movement is influenced by water currents (Sachlan, 1982). Plankton consists of two types: phytoplankton and zooplankton. According to Hutabarat & Evans (1984), phytoplankton are very small aquatic plants that float in water. Their role is so crucial that they are considered as important as plants in terrestrial ecosystems. Phytoplankton are autotrophic, meaning they can produce their own food. Phytoplankton also serve as primary producers in water.

This study aims to identify and quantify the abundance and biomass of phytoplankton as a reference for the fertility of the waters of the Jatigede Reservoir, Sumedang Regency, West Java Province.

## RESEARCH METHODS

### Place and Time

The research method used was a survey with purposive sampling. Sampling was conducted from February 6-27, 2024, at the Jatigede Reservoir in Sumedang Regency, West Java. The sampling locations were divided into four stations, as shown in Table 1 and Figure 1.

Table 1. Research Stations

Location	Coordinate	Information
Station 1	6°55'44.17"S; 108° 5'53.90"E	Reservoir inlet section
Station 2	6°54'49.49" S; 108°5'56.10" E	The middle of the reservoir
Station 3	6°53'35.24" S; 108°5'11.62" E	The middle of the reservoir
Station 4	6°52'49.84" S; 108°5'21.43" E	Reservoir outlet section

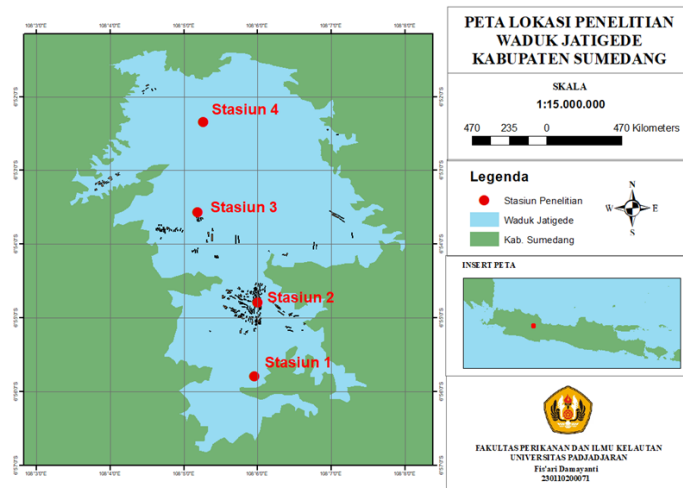


Figure 1. Research Location Map

Station 1 is located in Sukamenak Village, which is the reservoir's inlet. This station is used by the community as a fishing and fishing spot, while the surrounding areas are used for plantations and rice fields. Stations 2 and 3 are located in Jemah Village, which is the center of the reservoir. These stations are used by the community for fish farming using floating net cages (KJA). Finally, station 4 is located in Jemah Village, specifically at Gunung Surian, which is the reservoir's outlet. There is no activity at this station due to the dam gates.

#### Data Analysis Procedure

Water sampling was conducted at each station using a plankton net. Twelve liters of water were filtered, and 50 ml of the filtered water was placed in a sample bottle. Phytoplankton identification was then conducted in the Aquatic Resources Management (MSP) laboratory of the Faculty of Fisheries and Marine Sciences (FPIK), Padjadjaran University. The abundance of identified phytoplankton was calculated using Sachlan's (1982) formula, as shown in Equation 1.

$$N = n \times \frac{Vt}{Vs} \times \frac{1}{Vd} \dots \dots \dots (1)$$

Information:

- N = Abundance of plankton (Ind/l)
- n =  $\Sigma$  identified plankton
- Vt = Volume of filtered water (ml)
- Vs = Observed water volume (ml)
- Vd = Volume of filtered water (l)

Plankton biomass is calculated based on the Wetzel (1983) formula in Amanta, et al., (2012), which can be seen in Equation 2.

$$B = BJ \times V \dots \dots \dots (2)$$

Information:

- B = Plankton biomass ( $\mu\text{g/l}$ )
- BJ= Plankton specific gravity ( $1 \times 10^{-6} / \mu\text{g}^3$ )
- V = Volume plankton

## RESULT

### Phytoplankton Composition and Abundance

The results of phytoplankton identification can be seen in Figure 2. In the Jatigede Reservoir, 6 classes consisting of 33 genera were found in Table 2.

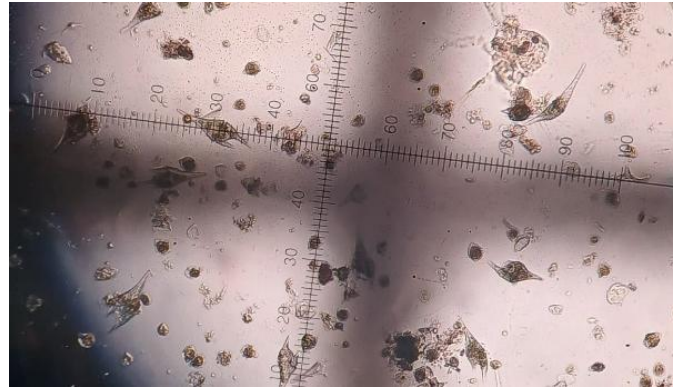


Figure 2. Documentation of Phytoplankton under a Microscope

Table 2. Phytoplankton Composition

No	Class	Genus
1	Bacillariophyceae	Nitzchia
		Coscinodiscus
		Synedra
		Mastogloia
		Melosira
		Navicula
		Pinnularia
		Diatoma
2	Chloropyceae	Eudorina
		Sphaerocystis
		Arthrodesmus
		Cosmarium
		Staurastrum
		Tetraedron
		Coelastrum
		Monactinus
		Pediastrum
		Scenedesmus
3	Zygnematophyceae	Hyalotheca
		Micrasterias
		Penium
		Spirogyra
		Spirotaenia
4	Cyanophyceae	Chroococcus
		Coelosphaerium
		Mycrocystis
		Oscillatoria

		Merismopedia
5	Euglenophyceae	Euglena Phacus Trachelomonas
6	Dinophyceae	Ceratium Peridinium

The abundance of phytoplankton in the Jatigede Reservoir is 21,887 individuals/l, dominated by the Dinophyceae class at 16,432 individuals/l. The abundance of phytoplankton can be seen in Figure 3.

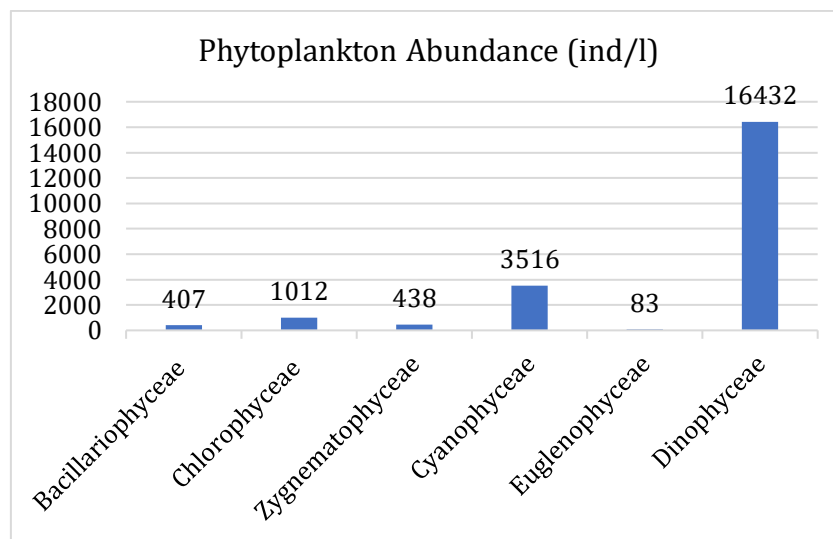


Figure 3. Phytoplankton Abundance (ind/l)

The greatest abundance comes from the Dinophyceae class which consists of the Genus Peridinium and Ceratium which can be seen in Figure 4.

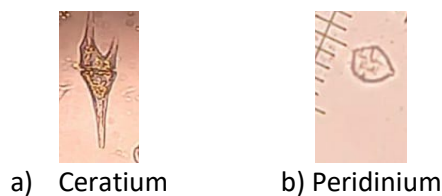


Figure 4. Documentation of the Dinophyceae Class

### Phytoplankton Biomass

The total phytoplankton biomass was 469,418.99 µg/L. The results of the phytoplankton biomass calculation can be seen in Table 3 below.

Table 3. Phytoplankton Biomass

Class	Genus	Individual Biomass (µg)	Average Abundance (Ind/l)	Total Biomass (µg/l)	Total Biomass Per Class (µg/l)
Bacillariophyceae	Nitzschia	4,71	313,63	1478,53	7376,52
	Coscinodiscus	33,52	7,61	255,11	
	Synedra	3,67	1,74	6,37	

	Mastogloia	12,57	8,42	105,85	
	Melosira	3,93	11,41	44,83	
	Navicula	3,14	0,42	1,33	
	Pinnularia	3,93	1,02	4,02	
	Diatoma	88,00	62,28	5480,48	
	Eudorina	65,48	12,96	848,77	
	Sphaerocystis	268,19	16,01	4293,94	
	Arthrodesmus	16,76	668,43	11204,19	
	Cosmarium	4,19	5,94	24,90	
Chlorophyceae	Staurastrum	25,14	197,80	4973,28	26869,57
	Tetraedron	108,00	14,58	1575,00	
	Coelastrum	14,14	41,25	583,42	
	Monactinus	65,48	2,32	152,20	
	Pediastrum	113,14	11,27	1274,60	
	Scenedesmus	47,14	41,14	1939,28	
	Hyalotheca	100,57	374,19	37632,80	
	Micrasterias	21,21	0,06	1,23	
Zygnematophyceae	Penium	12,57	5,98	75,18	38432,55
	Spirogyra	14,93	0,29	4,32	
	Spirotaenia	12,57	57,20	719,03	
	Chrococcus	4,19	0,39	1,62	
	Coelosphaerium	14,14	90,51	1280,06	
Cyanophyceae	Mycrocystis	0,52	76,12	39,87	4895,77
	Oscillatoria	10,21	24,46	249,84	
	Merismopedia	1,00	3324,38	3324,38	
	Euglena	25,14	17,63	443,30	
Euglenophyceae	Phacus	22,00	9,74	214,31	3772,45
	Trachelomonas	55,87	55,75	3114,83	
	Ceratium	87,21	3629,45	316539,57	388072,12
Dinophyceae	Peridinium	5,59	12802,70	71532,55	
	<b>Jumlah</b>	<b>1268,89</b>	<b>21887,08</b>	<b>469418,99</b>	<b>469418,99</b>

## DISCUSSION

### Phytoplankton Composition and Abundance

Phytoplankton identification results in the Jatigede Reservoir revealed six classes comprising 33 genera: Bacillariophyceae (8 genera), Chlorophyceae (10 genera), Zygnematophyceae (5 genera), Cyanophyceae (5 genera), Euglenophyceae (3 genera), and Dinophyceae (2 genera).

The abundance of phytoplankton in the Jatigede Reservoir was 21,887 individuals/L. This abundance was attributed to the Dinophyceae class (16,432 individuals/L), Cyanophyceae class (3,516 individuals/L), Chlorophyceae class (1,012 individuals/L), Zygnematophyceae class (438 individuals/L), Bacillariophyceae class (407 individuals/L), and Euglenophyceae class (83 individuals/L). The highest abundance came from the Dinophyceae class, consisting of the genera *Peridinium* and *Ceratium*. These genera were found at all observation stations. These results align with previous research in the Jatigede Reservoir, according to Herawati *et al.* (2020), which found that the highest abundance was found in the species *Peridinium sp.* and *Ceratium sp.* This is because *Peridinium* and *Ceratium* have high tolerance in water. According

to Sulawesty (2019), *Peridinium* and *Ceratium* can adapt to nutrient-poor waters. Another opinion, according to Canon, A. K. & Ochs, C. (2005), is that Pyrrophyta, which live in freshwater, are generally more abundant than other phyla during low nutrient levels. Furthermore, according to Rengefors & Legrand (2001), *Peridinium* has an algicidal effect, also known as allelopathy, which is the ability to produce toxins that are lethal to other plankton and prevent phytoplankton from growing to high biomass.

Phytoplankton abundance results can be used as a benchmark for determining water fertility. According to Landner (1978) in Suryanto and Umi (2009) water fertility based on phytoplankton abundance is divided into 3, namely Oligotrophic with an abundance of 0-2000 ind/l, mesotrophic with an abundance of 2,000-15,000 ind/l, and eutrophic with an abundance of more than 15,000 ind/l. The total abundance of phytoplankton in the Jatigede Reservoir was found to be 21,887 ind/l, which means that the waters of the Jatigede Reservoir are included in eutrophic fertility because they are more than 15,000 ind/l. Supported by the statement of Sulastrri (2018) the trophic status of waters with mesotrophic or eutrophic is dominated by several types of the Pyrrophyta phylum such as the genus *Peridinium* and *Ceratium* which come from the class Dinophyceae.

### **Phytoplankton Biomass**

Phytoplankton biomass is calculated based on cell biovolume, which is the volume of an individual cell or phytoplankton population expressed as the volume of one individual or population per unit volume of water (Sulastrri, 2018). Phytoplankton biomass does not follow a fixed annual pattern, as it can be influenced by climate, human disturbance, irregular weather, and the strong trophic relationships between phytoplankton and zooplankton (Winder & Cloern, 2010). Biovolume is determined by plankton abundance and size (Saleh *et al.*, 2022).

The total phytoplankton biomass was 469,418.99 µg/L. The phytoplankton class with the highest biomass contribution came from the Dinophyceae class, with 388,072.12 µg/L. This class, in addition to its large size, also has the highest abundance. According to (Sulastrri, 2018) microplankton have larger sizes, for example the type of Pyrrophyta, class Dinophyceae namely *Ceratium* and *Peridinium*. The size of the identified *ceratium* was 87.21 µg and *Peridinium* 5.59 µg which is in accordance with the statement of Kenish (1990) in Masithah (2023) generally the size of Pyrrophyta ranges from 5-200 µg. *Ceratium* and *peridinium* typically prefer eutrophic lakes, but can also survive in mesotrophic conditions (Hutchinson, 1967; and (Yazici & Gönülol, 1994). Other phytoplankton classes in the Jatigede Reservoir, such as the Bacillariophyceae class, contributed biomass of 7,376.52 µg/l, the Chlorophyceae class 26,869.57 µg/l, the Zygnematophyceae class 38,432.55 µg/l, the Cyanophyceae class 4,895.77 µg/l, and the Euglenophyceae class 3,772.45 µg/l.

Their population growth and decline can vary annually, both in terms of timing and intensity. This occurs because phytoplankton can reproduce very rapidly when environmental conditions are favorable, but can also decline drastically due to pressure from predators such as Zooplankton. The shift in dominance between species makes the dynamics of phytoplankton biomass complex, so that population explosions (blooms) can occur suddenly with unpredictable intensity and timing (Winder & Cloern, 2010).

### **CONCLUSSION**

Phytoplankton identified in the Jatigede Reservoir comprise six classes comprising 33 genera: Bacillariophyceae (8 genera), Chlorophyceae (10 genera), Zygnematophyceae (5 genera), Cyanophyceae (5 genera), Euglenophyceae (3 genera), and Dinophyceae (2 genera). The total abundance of phytoplankton was 21,887 individuals/l, indicating eutrophic fertility, and the total biomass of phytoplankton was 469,418.99 µg/l.

### **ACKNOWLEDGEMENT**

Thank you to all parties who have provided support and contributions to the writing of this journal, especially to the supervisor, reviewers, and research team.

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