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Assessment of water chemistry and phytoplankton: A case study of Keenjhar lake District Thatta, Sindh

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Abstract: The goal of this study was to evaluate the Phytoplankton species diversity with the physicochemical parameters of a freshwater lake. The current research is based on a study of the phytoplankton diversity in a freshwater permanent lake in the Thatta rural region. The current study is beneficial in understanding phytoplankton species, composition, and relationships with physicochemical factors in Keenjhar Lake. Phytoplankton may be utilized to determine the physicochemical state of any body of water. Algal growth is influenced by physicochemical factors.Phytoplankton was divided into five categories throughout the research period: Chlorophyceae, Bacillariophyceae, Dinophyceae, and Euglenophyceae.

Keywords: Phytoplankton, Diversity, Physicochemical parameter, Water

INTRODUCTION

The originator of the aquatic food chain, phytoplankton, symbolizes the tiny algae groups of water bodies. The diversity of phytoplankton has a direct relationship with ecological production (Palh, et al., 2020). In the aquatic environment, phytoplankton is the primary producer, absorbing carbon dioxide and water to make carbohydrates through photosynthesis (Lashari, et al., 2015). The trophic state of an aquatic ecosystem may be determined through phytoplankton (Palh, et al., 2019). The diversity of phytoplankton is by the seasonal variation determined of physicochemical factors. The basis of the productivity pyramid is phytoplankton, which is a major element of the dam biota in general (Palh, et al., 2018). Because phytoplankton species have distinct physiological requirements, they respond differently to Physicochemical variables like light, temperature, pH .This study's goal was to assess the water. chemistry and phytoplankton in the Kenjhar Lake District of Thatta.

2. <u>MATERIALMETHOD</u>

Study area

1.

Keenjhar Lake was formed in 1958 by dynamiting the dividing hills between two natural lakes, Keenjhar and Sunehri ('Green' and 'Golden'), to form one lake, which was formerly known as Kalri Lake. This manmade tropical lake was renamed Keenjhar Lake in 1972. At 24°47 N and 68°2 E, the lake is around 120 kilometers from Hyderabad It stretches over 27.2 kilometers and spans an area of 80 square kilometers The Kalri Baghar Feeder, which starts at the Ghulam Mohammad Barrage, provides water from the Indus River. When it was opened, the lake was about 25 metres deep, but siltation and the deposition of rotting vegetation have reduced the depth to 3–8 metres.

Collection of sample

From February 2019 through January 2020, researchers looked at water parameters modifies as well as return makeup of Lake regular data (summer, rainy, and winter). Several physicochemical parameters were examined using APHA standard procedures, including temperature, pH, clarity, TDS, dissolved oxygen, total alkalinity, total hardness, and chloride (Palh, *et al.*, 2016).

Biological analysis

From February 2019 to January 2020, samples for phytoplankton examination be composed one time a month for a year. Along with water samples, phytoplankton was gathered. A conventional plankton

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net constructed of bolting silk number (25) was used to gather phytoplankton samples for qualitative tests. Lugol's Iodine solution was used to preserve the samples. Prescott, and APHA provided keys that were used to identify phytoplankton.

3. <u>RESULTANDDISSCUSION</u> Physico-chemicalparameters

(Table-1) shows Physico-chemical the characteristics of the lake at Keenjhar. The temperature of the water in this study ranged from 35.4°C to 17°C. Water temperature is crucial because it affects a variety of abiotic and biotic activities in aquatic habitat (Palh, et al., 2017). The lowest water temperature (17°C) and highest (35.3°C) were recorded in January and July, respectively. The observed temperature variations in the water might be linked to the weather. From 7.1 in August to 6.3 in October, the pH level fluctuated. (Korai, et al., 2010) found a similar outcome in their water quality research.Maximum 100.32cm was measured in November during the winter season and a minimum of 32.19cm was measured in June during the rainy season in this research. noted the lowest transparency during the summer and the greatest values. The lake's total dissolved solids were 300.22 mg/l during the rainy season, the highest figure, and 200.46 mg/l during the summer, the lowest. DO is an essential parameter that increases the favorable conditions for algal development throughout the research period, according to (Korai, et al., 2008). limnological investigations of Keenjhar Lake.Do is a vital component of aquatic biological life. During the research period, high dissolved oxygen levels (10.9 mg/l) were observed during the winter season and low dissolved oxygen contents (6.2 mg/l) during the summer. Chloride levels ranged from 16.22 to 26.25 mg/l, with the greatest level during hot season and the small level in coldness, perhaps due to post-monsoon dilution. In limnological research on freshwater ponds in Hyderabad, discovered comparable behavior of chlorides. Alkalinity levels varied from 250.42 to 1370.31 mg/l, with summer being the highest and winter being the lowest.

Phytoplankton

The Physico-chemical characteristics of a water body have a significant impact on the plankton population. The quantity of phytoplankton fluctuated throughout the year. (**Table 2**) shows phytoplankton communities, while Graph 1 shows total phytoplankton diversity over different seasons in 2019-2020. The lake's phytoplankton diversity were lowest throughout the heavy rain season as well as highest throughout hot season and winter seasons, according to current study. Summer is the best season for phytoplankton development in freshwater lakes, according to current research, according to (Lashari, et al., 2014). This is due to the lengthy duration of the sunlight period, which has risen. In this study, five algae families were identified: Chlorophyceae, Cyanophyceae, Bacillariophyceae, Dinophyceae, and Euglenophyceae. (laghari 2014) made a similar discovery. (Table 3) shows the percentage contribution of phytoplankton types. Chlorophyceae had the highest percentage (40%) while Euglenophyceae and Dinophyceae had the lowest (5%). The Chlorophyceae family of phytoplankton was the most major and dominating, accounting for 40% of all phytoplankton found. The current study found that temperature influences algal development, with low temperatures favouring the growth of Euglenophyceae and high temperatures favouring the growth of Chlorophyceae. The variety of Chlorophyceae in lake water was found to be highest during the summer in this study. The distribution of Chlorophycean members in freshwater zones is influenced by dissolved oxygen, pH, and alkalinity. The study was conducted on two perennial ponds in a high-status region in Tamilnadu. The Bacillariophyceae family accounted for 35% of the total phytoplankton population. Cymbella sp., Navicula microspore, were the most common species in the group. Tabellaria sp., Cocconies sp., and Melosira sp. According to (Palh, et al., 2020), alkaline pH promotes diatomic population abundance. In the current study, alkaline pH was measured at the lake's Khedi Kalan station In two lakes in Tumkur, Karnataka State, India, Bacillariophyceae was found to be the dominant group with 31.12 percent. The Cyanophyceae family accounted for 28% of the total phytoplankton population. Microcystis aruginosa, Anabaena sp., Chrococcus sp.were the most common members of the group. The variety of cyanophyceace in the lake was found to be highest during the summer seasons in the current study. It may be due to the hotter water. High temperatures, , encourage the lush development of bluegreen algae. just one Dinonophyceae species, Ceratium hirudinella, was found in the lake during the current research. Dinophyceae were found in the summer season but not in the rainy season. Euglenophyceae has only one species, Euglena sp. were discovered in the lake. The high temperature, chloride, and TDS may have all had a part in Euglenophyceae's growth and development. Temperatures over 25°C were beneficial to the development of Euglenophyceae, according to Seeneyya18. The occurrence of Euglenophyceae was highest during the summer months when temperatures were greater. The growth of euglenoids is favored by greater temperatures in freshwater environments, according to previous research. The high temperature, chloride, and total dissolved solids (TDS) may have aided Euglenophyceae growth and development.

Season	Month	WaterTemp °c	TDS Mg/l	Trans- parencyCm	рН	Totalalkalinity Mg/l	DO Mg/l	Chloride Mg/l
	Mar	30	225.16	76.00	7.3	120.43	6.2	25.00
	Apr	32.0	223.30	72.81	7.0	122.17	6.3	26.25
Summer	May	32.3	220.46	69.61	68	250.42	6.3	25.37
	Jun	35.4	240.14	63.00	7.0	125.29	6.4	25.16
	July	28.0	290.46	31.44	6.5	128.52	6.5	24.74
	Aug	24.0	260.22	29.19	7.2	129.20	7.0	23.91
Monsoon	Sep	21.2	276.30	25.43	7.2	117.00	6.9	23.18
	Oct	21.6	264.36	58.31	7.3	117.34	7.1	19.00
	Nov	20.9	258.21	84.24	7.5	119.68	8.8	18.14
	Dec	17.0	240.42	112.32	7.5	116.00	10.9	16.22
Winter	Jan	17.8	238.36	70.22	7.7	1370.31	9.2	18.39
	Feb	22.6	221.20	98.16	7.9	116.25	7.1	20.27

Table1: Seasonalvariationinphysicochemicalconditionsofthe Keenjhar lake

Table2: Listof IdentifiedPlanktonfrom Keenjhar lake

Phytoplankton				
Cynophyceae				
1	Anabenasp.			
2	Chroococcussp.			
3	Oscillatoriasp.			
4	Nostocsp.			
5	Spirulinasp.			
6	Microcystisaruginosa			
7	Phormidiumsp.			
Chlorophyceae				
1	Chlorella sp.			
2	Pediastrumsimplex			
3	Scenedesmussp.			
4	Volvoxsp.			
5	Eudorinasp.			
6	Zygenemasp.			
7	Spirogyrasp.			
8	Straurastrumsp.			

Table-3: Percentageofthe groupofphytoplanktonat Keenjhar lake

S. No.	Group	No.ofspecies	%	
1	Chlorophyceae	11	40%	
2	Bacillariophyceae	10	33%	
3	Cynophyceae	7	24%	
4	Dinophyceae	5	3%	
5	Euglenophyceae	1	3%	
	Total	30	100%	

9	Ulothrixsp.			
10	Hydrodictchyonsp			
11	Closteriumsp.			
Bacillariophyceae				
1	Cymbellasp.			
2	Naviculamicrospora			
3	Amphorasp.			
4	Nitzschiasp.			
5	Synendrasp.			
6	Pinnulariasp.			
7	Gyrosigmasp.			
8	Cocconiessp.			
9	Melosirasp.			
10	Tabellariasp.			
Dinophyceae				
1	Ceratiumhirudinella			
Euglenophyceae				
1	Euglenasp.			
4. CONCLUSION				

CONCLUSION

Phytoplankton diversity changed during the research period, especially during the rainy, winter, and summer seasons. Phytoplankton growth was lower in the wet season than in the winter and summer. The lake's algae growth peaks in the summer and winter over the research period. Algal development is statically linked with physicochemical factors like as pH, transparency, and light. The findings demonstrate that phytoplankton species diversity in freshwater lakes is varied. This variation is due to a combination of factors. Temperature, sunshine exposure time, sunlight penetration, water pH, wind, and transparency, on the other hand, may be linked to varied variations in phytoplankton distribution and variety in the lake.

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