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Status Of Algal Flora In Community Mosque Lake Of Ju Campus, Savar, Dhaka, Bangladesh

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Abstract
The focus of the research was to assess the diversity and composition of algae in the community mosque lake of Jahangirnagar University campus. The research was conducted between December 2021 and August 2022. In order to carry out the investigation, 72 different samples of water were analyzed. The level of diversity was evaluated using both the Shannon and Simpson diversity indices. A total of 38 genera belonging to 7 classes (Cyanophyceae, Chlorophyceae, Bacillariophyceae, Euglenophyceae, Cryptophyceae, Dinophyceae, and Xanthophyceae) were found. Chlorophyceae made up 52% of the total generic percentage composition, which was followed by Bacillariophyceae (21%) and Euglenophyceae (11%) (13%). In February, the phytoplankton density was found to be at its peak, while in August, it was at its lowest. Members of the Chlorophyceae, Cyanophyceae, Euglenophyceae, Dinophyceae, and Xanthophyceae classes were found in high concentration in summer, while they appear in lower concentration in winter. The total density of dominant phytoplankton was 398.6×105 ind/l. Oscillatoria, Euglena, Trachlelomonas, Pediastrum, Trachlelomonas, Euglena, Pinnularia, Oscillatoria, and Synedra dominated the surveyed lake. The Shannon Diversity Index for the seasons ranged from 1.51 to 1.55, while the Simpson Diversity Index (D) ranged from 0.26 to 0.28. 80.8% overall variation found among different classes. The both Shannon and Simpson Diversity Indexes indicated that the level of generic diversity was quite low.

Keywords:*Algal diversity, phytoplankton density, dominant phytoplankton, Principal Component Analysis (PCA)*

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I. Introduction

Water is the most important factor in both shaping the landscape and influencing the local climate. One of the most influential substances on living things, it is widely recognized. Few genuine lakes or natural lakes exist in Bangladesh [1]. More than 700 rivers and streams, countless haors, baors, beels, seasonal and permanent floodplain, etc. contribute Bangladesh's wetland ecology, and in recent years, captive or ponds fishery and beel fishery have gained popularity in the country [2]. The principal food source in each aquatic ecosystem is produced by phytoplankton, which are essential and significant creatures. They are the basic biological elements from which higher species in the food chain receive their energy [3]. Toxic compounds (hepatotoxins, neurotoxins, etc.) released into the water by some species of phytoplankton can be detrimental to humans and other vertebrates. Phytoplankton are primary producers and the foundation of the food chain in open water. It is important to keep an eye out for the spread of hazardous organisms like phytoplankton. Group green algae in particular can have a negative impact on the recreational value of surface water due to their ability to produce thick surface scum, which discourages the use of facilities, or huge concentrations, which deoxygenate the water and kill fish [4]. Some of Jahangirnagar University's lakes are suited for pisciculture, making them a great study spot and recreational area [5]. Seasonal changes affect algal flora, and the diversity of freshwater algal flora is one of its key characteristics. The nutrient levels of the aquatic environment are mostly impacted by the algae growth in a habitat, which also directly affects the ecosystem [6]. These organisms float with the currents of water and come in a spectrum of shapes, sizes, and colors. Human activity, urbanization, and industrialization all have direct effects on water quality, as well as the number and variety of phytoplankton and zooplankton. Due to the dynamic nature of their habitats, aquatic ecosystems are prime examples of ecological communities [7]. Algae are useful markers of ecosystem health because of their rapid response to changes in water conditions, both in terms of the species composition and densities of their populations [8]. The bulk of the water bodies in this region are highly turbid due to the presence of silt, sand, and clay, which appears to result in lower levels of primary production. The soil on the campus of Jahangirnagar University has a color that is somewhere between reddish-brown and brown [9]. In order to understand the biological status and water quality of the researched water bodies, the statistical methods are helpful for interpreting complex data matrices. Such assessments are useful in water resources management because they allow for the identification of potential impact sources [10]. The species diversity indices and water pollution levels should be taken into account when evaluating the health of an aquatic ecosystem. Quantitative and qualitative comparisons of phytoplankton abundance and composition across study locations and time periods offer an ecological portrait of the study region [11]. Seasonal phytoplankton and environmental factor data is scarce in the Indian subcontinent, and neither the data quality nor the methods of earlier investigations were well-defined [12]. Community Mosque Lake, which is situated on the Jahangirnagar University campus in Savar, Dhaka, Bangladesh, is the site of the study. The purpose of this study was to investigate whether or not there are variations in the composition of the phytoplankton in this lake on a monthly and seasonal basis.

II. Materials and Methods

The experiment was conducted at Jahangirnagar University's CM lake (Community Mosque Lake) from December 2021 to August 2022. A 5 L Schindler's Sampler was utilized to collect water samples at a depth of 50 cm in the lake's coastal region. Before being collected, the sampler was gradually submerged in water. After that, the water was put to a 5-liter carboy made of black plastic for analysis. To determine the quantity and caliber of the phytoplankton, each water sample was treated with Lugol's iodine solution and allowed to settle for 48 hours. Phytoplankton cells were counted using a Hawksley microplankton counting chamber, a modified Neubauer ruling, and a 400 Nikon compound microscope (Hawksley Ltd., Lancing, UK) (Japan). During the research period, phytoplankton dispersion patterns were reported.

Enumeration of phytoplankton:

Enumeration of phytoplankton was done under a compound microscope (Nikon SE) at a magnification of 10 × 40 with the help of the Helber Counting Chamber (HCC). A circular microscopic counting chamber is engraved with grids at the center of the HCC. The total volume of the chamber is 1.005 µl. The counting was carried out by putting one drop of well mixed phytoplankton sample on the counting chamber and a cover slip was put on it. Before counting, HCC was let to stand in rest for at least 2-5 minutes to settle down phytoplankton. Then counting of phytoplankton cells present in the microchamber of the HCC was done. All the cells present were counted, and the dominant group was identified. The counting was done for three times for each sample. Finally, the phytoplankton cell density was calculated per litre of water by using the following formula.

With the aid of the Helber Counting Chamber, phytoplankton was counted using a compound microscope (Nikon SE) at a magnification of 10 × 40. (HCC). At the heart of the HCC is a spherical microscopic counting chamber that is grid-engraved. The chamber has a total volume of 1.005 µl. One drop of thoroughly mixed phytoplankton sample was placed on the counting chamber, and a cover slip was placed over it to conduct the counting. HCC was allowed to rest at at least 2 to 5 minutes prior to counting in order to calm the phytoplankton. Following that, the phytoplankton cells in the HCC's microchamber were counted. The number of cells was counted, and the dominating group was determined. For each sample, the counting was done three times. Finally, the following formula was used to get the phytoplankton cell density per litre of water.

Individual/litre = TPC×SCV/TCV
Where,
TPC= Total plankton counted
SCV = Sediment of plankton concentrate volume in mL
TCV = Total Hawksley's chamber volume (0.001005×3) in µL

Qualitative analysis of phytoplankton:

Prior to counting the individual phytoplankton, a random examination of the sedimented phytoplankton material was conducted under high magnification for species-level identification. Algal literatures, Bangladeshi publications, novels, and other international monographs were all studied for identification. [13]–[24].

Considerations were made for the following seasons [25]: summer (March to May), monsoon (June to early October), autumn (late October to November), and winter (December to February). The following equation was used to determine the Shannon index: H=$\sum[(P_i) \times ln(P_i)]$. Where, H: The Shannon Diversity Index; S: The total number of unique species; P_i= The proportion of the entire community made up of species i. The greater the value of H, the greater the species diversity in a given community. The lower the value of H, the less diverse the population. A value of H = 0 represents a community with a single species. An approach to assess the species variety of a community is the Shannon Equitability Index. The level of comparability between the abundances of various species within a community is referred to as "evenness." [26]. This index, denoted E_H, is calculated as follows: $E_H = H/\ln(S)$. The Simpson's Diversity index was calculated with the following equation: $D = \sum n_i(n_i - 1)/N(N - 1)$. Where, n_i: The number of organisms that belong to species i; N: The total number of organisms. The Simpson's Diversity Index ranges from 0 to 1. The population is less diversified the higher the value. The Simpson's Index of Diversity, often known as a Dominance Index, is calculated as $1 - D$ because this interpretation seems rather paradoxical. The diversity of species increases with the value of this indicator. the calculation of Simpson's reciprocal index, which is $1/D$. This index's minimum value is 1, and its highest value is equal to the number of species. Throughout the research period, the total phytoplankton density classes during the examined months and the seasonal distribution of several phytoplankton groups were depicted. Principal component analysis (PCA) was used to make the observations of phytoplankton cell densities in the surface waters of CM Lake from December 2021 to August 2022. The dominant species of phytoplankton during each month were included in this study. Finally, the analysis of phytoplankton over the study period was calculated and displayed using Excel and the R programming language (version 4.2.2).

III. Results and Discussion

Composition of phytoplankton

In total, this analysis found 38 different genera belonging seven different classes from the chosen location. Among them, 20 genera were from Chlorophyceae, 8 genera from Bacillariophyceae, 1 genus from Cyanophyceae, 5 genera from Euglenophyceae, 2 genera from Cryptophyceae, 1 genus from Dinophyceae, and 1 genus from Xanthophyceae were identified (Fig. 1). The limnological studies of Khondkar et al. (2012) on Ramsagar, Dinajpur, Bangladesh [27]; Nivrutti Dhumal & Baburao Sabale (2014) on estuaries in the Ratnagiri district of Maharashtra (India) [7]; Khatun & Rashidul Alam (2020) on the Turag River of Bangladesh [3]; and Khondker et al., (2010) on lake Bogakain, Bandarban, Bangladesh [28] all discovered nearly identical taxa. In addition, limnological research conducted in Bangladesh's Lake Ashura, which is located on the Ramsagar, Dinajpur, and in a lake located on the campus of Jahangirnagar University, both of which are in Bangladesh, revealed the presence of the same genera [1], [28], [29].

Generic percentage composition revealed that during the study period, Chlorophyceae predominated the studied sites, occupying 52% of the total area. This was followed by Bacillariophyceae (21%), Euglenophyceae (13%), Cryptophyceae (5%), Cyanophyceae (3%), Xanthophyceae (3%), and Dinophyceae (3%) (Fig. 1). A Preliminary Observation on the Water Quality and Plankton of an Earthen Fish Pond in Bangladesh: Recommendations for Future Research also revealed that Chlorophyceae(34.48%) dominated the phytoplankton community [30]. According to Phytoplankton Assemblage in Relation to Water Quality of the Wetland at Bangladesh's National Monument, Chlorophyceae (33.33%) and Bacillariophyceae (32.67%) dominated the wetland's overall phytoplankton flora [31]. The Bacillariophyceae were found to be the most prominent group in the Baldi stream, followed by Chlorophyceae and Cyanophyceae, according to a case study of the impact of physico-chemical factors on phytoplankton distribution in a headwater stream of the Garhwal Mountains. It made up 71% of the Baldi stream's phytoplankton population [32]. However, identical results were reported in water bodies in the Dhaka Export Processing Zone (DEPZ), Savar, Dhaka, Bangladesh. Chlorophyceae dominated the research locations, accounting for 49% and 35.68%, respectively [6]. In many freshwater wetlands and seasonal fluctuations of phytoplankton flora of freshwater wetlands in the greater Dhaka district, the Chlorophyceae family contained the greatest number of taxa [33]. Although a similar distribution was seen in other studies of the Limnology of Lake Ashura, the present study found that Xanthophyceae and Dinophyceae constituted only a minor portion of the overall algal group [1].

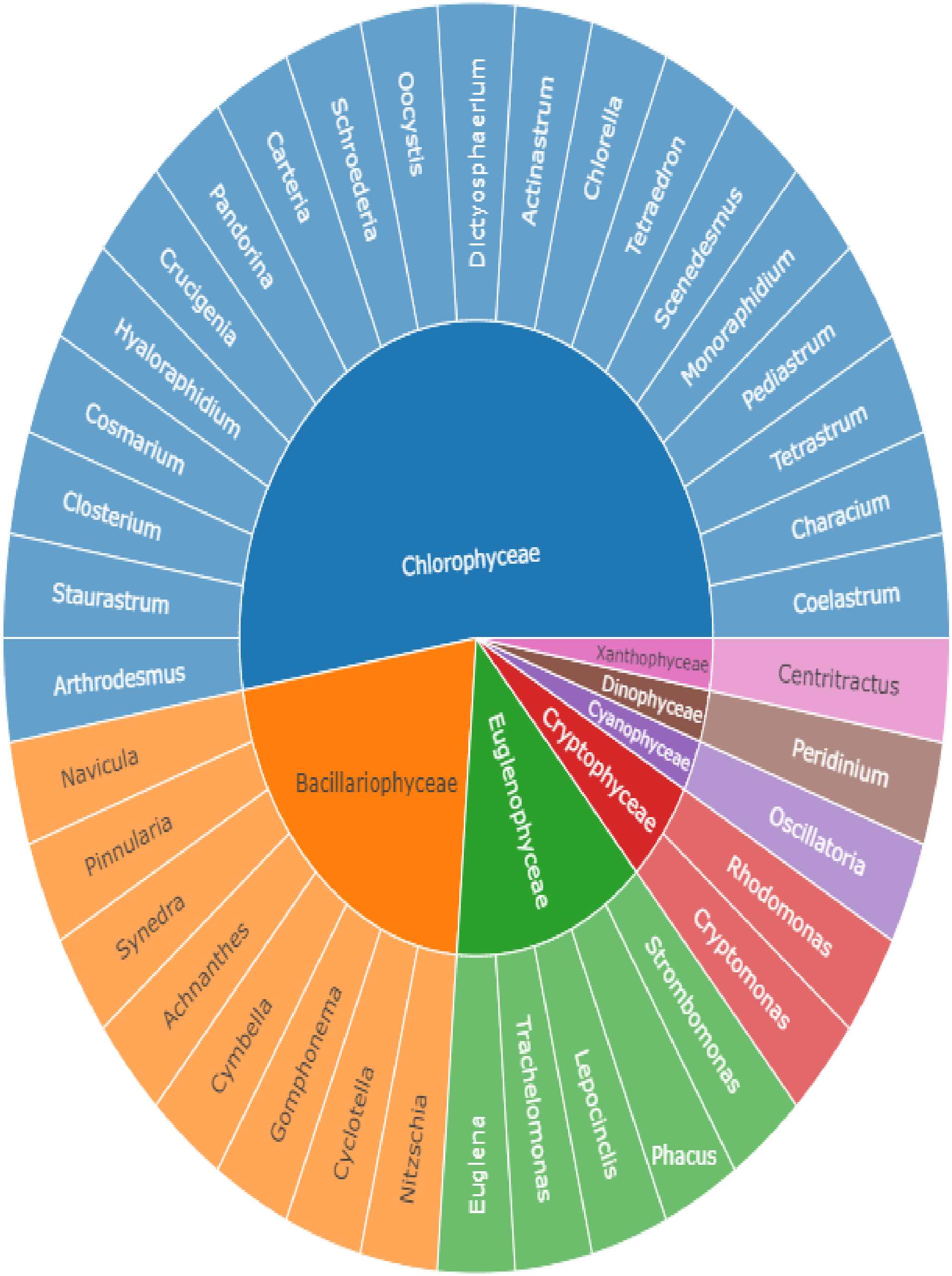

Fig. 1: Total phytoplankton genera found in the studied lake.

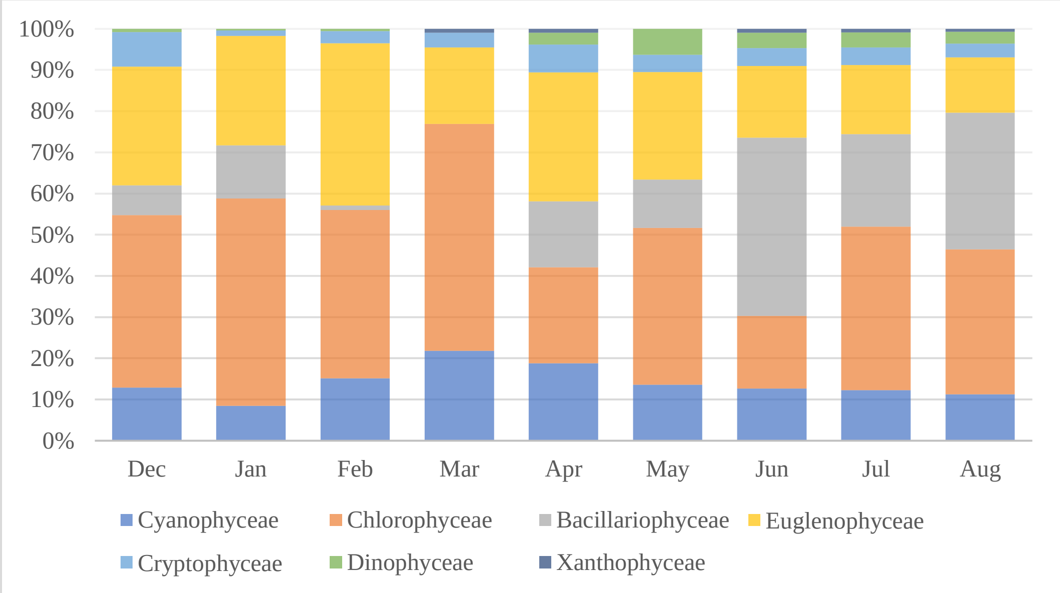

Fig. 2: The total phytoplankton density classes during studied months.

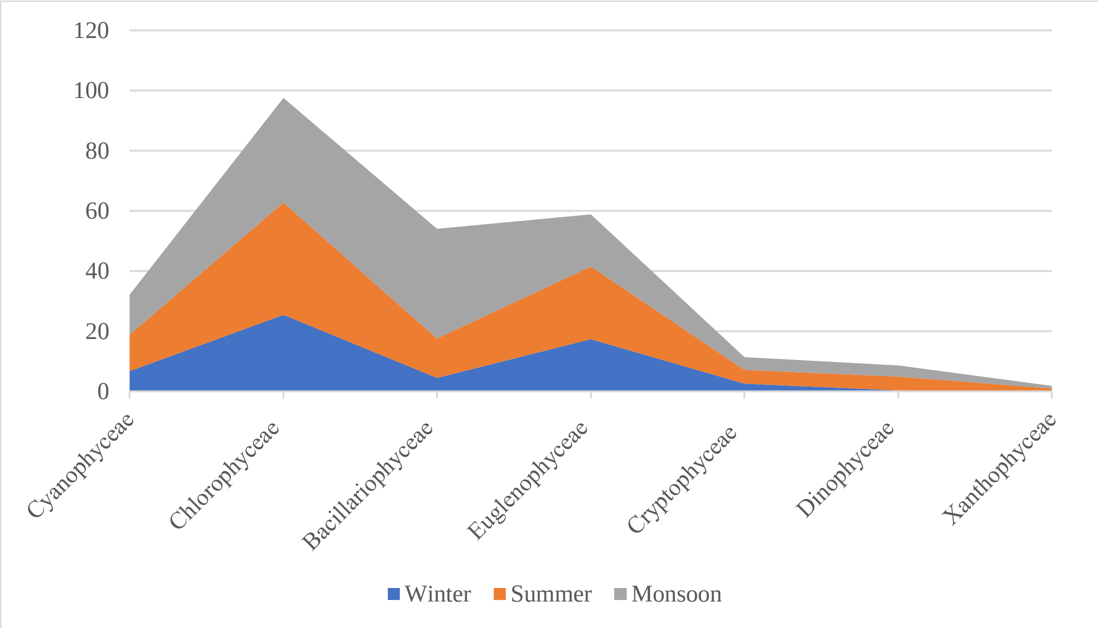

Fig. 3: Distribution of different phytoplankton groups during the studied seasons.

In the present research, the highest phytoplankton density was found in February (130.03×10^5 ind/l), and the lowest was in August (41.64×10^5 ind/l). And, the total phytoplankton density was found 789.503×10^5 ind/l.

In contrast, in a number of analyzed regions, the highest phytoplankton densities were seen in May and June, while the lowest concentrations were observed in November and September in the water bodies surrounding the Dhaka export processing zone (DEPZ), Savar, Dhaka, Bangladesh [6]. In a headwater stream in the Garhwal Himalayas, S1 also had the highest phytoplankton density (984 individuals L^{-1}), while S2 had the lowest, in a case study of the impact of physico-chemical factors on phytoplankton distribution (553 individuals L^{-1}). In Baldi stream, the highest concentration of phytoplankton was found in the winter (January and February). It began falling in March and reached its lowest level in July and August (monsoon months) [32]. The overall phytoplankton density was determined to be 163.53×10^4 ind/l, based on limnological observations made in Ramsagar, Dinajpur, Bangladesh [27]. The limnological investigation of the River Buriganga revealed that the phytoplankton density was highest in March (100 ×10^5 ind/l) and lowest in December (4.2×10^5 ind/l) [34].

The maximum concentrations of Cyanophyceae (20.78×10^5 ind/l), Chlorophyceae (52.47×10^5 ind/l), and Xanthophyceae (0.94×10^5 ind/l) occurred in March, during the summer. In April, during the summer, the density of phytoplankton was greatest for both Euglenophyceae (27.79×10^5 ind/l)) and Cryptophyceae (5.99×10^5 ind/l). The maximum phytoplankton density of Bacillariophyceae was recorded in August during the monsoon season (43.21×10^5 ind/l). The highest value for Dinophyceae was recorded in May during the summer season (6.47×10^5 ind/l) (Fig. 2 and Fig. 3). Cyanophyceae (5.31×10^5 ind/l) and Cryptophyceae (0.791×10^5 ind/l) phytoplankton densities were also at their lowest in January, corresponding to the winter season of the year. The winter month of February showed the lowest concentrations of Chlorophyceae (17.03×10^5 ind/l), Bacillariophyceae (0.456×10^5 ind/l), Euglenophyceae (16.4×10^5 ind/l), and Dinophyceae (0.23×10^5 ind/l). Nevertheless, Xanthophyceae were not present during the winter season (Fig. 2 and Fig. 3).

Cyanophyceae, Chlorophyceae, Bacillariophyceae, Euglenophyceae exhibited similar seasonal trends in the water bodies surrounding the Dhaka export processing zone (DEPZ), Savar, Dhaka, Bangladesh, except for Cryptophyceae and Dinophyceae, whose density was highest in winter. Phytoplankton density was also found to change with the seasons and between different study locations [6]. In the investigation of the headwater stream of the Garhwal Himalayas, however, a high density of Chlorophyceae was observed during the winter months (January and February) and a low density during the monsoon months (July and August) at all three sites [32]. On the other hand, the physio-chemical conditions and the plankton population of two fishponds in Khulna revealed that Cyanophyceae and Euglenophyceae were present in high numbers throughout the months of April and May. And the months of September and October showed the highest levels of Bacillariophyceae.[35]. The yearly change of the water quality in Dharma Sagar in Comilla showed that the maximum density of Cyanophyceae was recorded in July at 52.85×10^6 ind/l [36]. Cyanophyta species were frequently found throughout the spring and summer in the Karkamis Dam lake in Sanliurfa, Turkey, but were rarely observed during the fall and winter. The bulk of Chlorophyta were also observed during the summer. The spring and summer months showed the greatest variety of Bacillariophyta species, while the winter and fall months recorded the least. Euglenophyta was also present in the summertime geographical and temporal distribution of phytoplankton [37]. Quantity and variety of Euglenophyceae were discovered in comparable proportions in April and May [35]. The winter communities that were observed throughout the arctic night and the early spring were constituted of several different species, the majority of which belonged to the Dinophyceae and Cryptophyceae families (17 January - 16 April and 15 November - 13 December, respectively) [38].

Correlation between different classes according to PCA cells

There are three dimensions to this scree plot. The eigenvalues for each of the three dimensions were 5.655460e+00, 1.344540e+00, and 1.020171e-30. The three dimensions were 8.079229e+01, 1.920771e+01, and 1.457387e-29 in terms of variance. The cumulative percentages of variance for each dimension were 80.79229, 100.00000, and 100.00000 (Fig. 4; Table 1).

Table 1: Importance of components.

Principle components	Standard deviation
PC1	2.3781
PC2	1.1595
PC3	1.01e-15

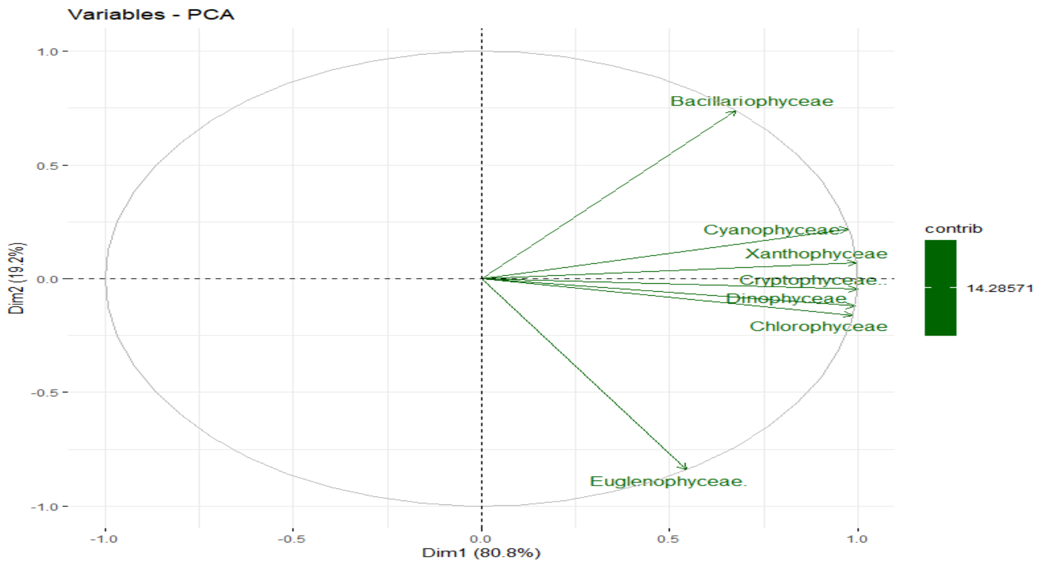

Fig. 4: Principal component analysis (PCA) of phytoplankton cell densities observed monthly in the surface water of studied lake from December 2021 to August 2022.

The first two pcs of the dataset represent the most variation in standard deviation. Additionally, from cumulative proportion, the first axis express 80.8% of the total variation in the sample. Similar to this, the first axis of the PCA, which accounts for 81.5% and 16.33% of the variance for the metals in sediment and phytoplankton, respectively, in the manner that large environmental gradients affect Alpine lakes as shown through planktonic, benthic, and sedimentary assemblages [39]. Furthermore, the PCA explained 73.18 %, 77.61 %, and 65.39 % of the total variance in the evaluation of surface water quality in the Fuji river basin, Japan [40]. In comparison, the first axis explained 30.5 % of the variance in a big tropical lake [41]. Additionally, a phytoplankton risk matrix in drinking water supplies was evaluated, and the principal component analysis was able to account for 84.7 % of the variability [42].

Table 2: Calculation of each component's data.

Class	PC1	PC2	PC3
Cyanophyceae	0.41	0.19	0.54
Chlorophyceae	0.42	-0.14	-0.74
Bacillariophyceae	0.28	0.64	-0.25
Euglenophyceae	0.23	-0.72	0.01
Cryptophyceae	0.42	-0.04	0.2
Dinophyceae	0.42	-0.10	0.24
Xanthophyceae	0.42	0.06	-0.06

Cyanophyceae, Chlorophyceae, Bacillariophyceae, Euglenophyceae, Cryptophyceae, Dinophyceae, and Xanthophyceae showed positive contribution to PC1, while Chlorophyceae, Euglenophyceae, Cryptophyceae and Dinophyceae showed negative contribution to PC2 (Table 2). According to the graph (Fig. 4), the items are shown as either row names or points. A series of arrows represent the variables. The scores are expressed as data points or sample identifiers. Each variable's score is expressed as a deviation from its average. The variable vectors are shown as arrows (Fig. 4).

The principal component analysis (PCA) uses elongated vectors that point in the direction and have a specified amplitude to describe the differentiation between phytoplankton phyla [42]. Principal component analysis is used to determine which subsets of independent variables best describe the patterns present in a particular matrix [10]. This statistical method known as principal components transforms linear combinations of the original variables into new, independent indicators [40], [43]. Eigenvalues greater than 1 indicate statistical significance [40], [44].

In this study, Bacillariophyceae exhibited a slightly negative correlation to Euglenophyceae. The positive association between the remaining classes ranged from modest to strong. On the composition and quantity of phytoplankton in Ajiwa reservoir, Katsina State, North Western Nigeria, euglenophyta had the highest values along the axis, whereas bacillariophyta had the lowest association with the axis [45]. The biplot of Principle Component Analysis (PCA) demonstrated ordination pattern of 5 phytoplankton groups in 6 study sites . The relative separation of site S5 in positive ordinate of both components with fewer points overlapping in the middle which was well correlated with 3 groups of phytoplankton (Euglenoids, Green algae, and Diatoms) [46]. The research of phytoplankton distribution features and its interaction with bacterioplankton in Dianchi Lake found that Bacillariophyta and Cyanophyta had a highly positive correlation with axis 1, whereas Chrysophyta, Chlorophyta, and Cryptophyta had a negative correlation with axis 1 [47]. The importance of phytoplankton composition in the investigation of primary production in a sizable tropical lake, however, demonstrated an inverse relationship between phytoplankton composition and primary production [41]. In several studies, the Cyanophyceae, the most prevalent group of phytoplankton, seemed to have the most resemblances [36], [48], [49].

Dominant phytoplankton and their densities in different months

During the month of December, *Oscillatoria* (8.5×10^5 ind/l), *Euglena* (7.6×10^5 ind/l), *Cosmarium* (6.7×10^5 ind/l), and *Trachlelomonas* (6.2×10^5 ind/l) were the most abundant phytoplankton in this lake. In the month of January, the most common blooms were *Euglena* (8.27×10^5 ind/l), *Cosmarium* (7.75×10^5 ind/l), *Carteria* (6.57×10^5 ind/l), and *Trachlelomonas* (5.41×10^5 ind/l). Species such as *Trachlelomonas* (7.81×10^5 ind/l), *Oscillatoria* (6.3×10^5 ind/l), *Euglena* (5.19×10^5 ind/l), and *Chlorella* (4.29×10^5 ind/l) dominated the environment in February. March was dominated by *Pediastrum* (21.89×10^5 ind/l), *Oscillatoria* (20.78×10^5 ind/l), *Monoraphidium* (9.67×10^5 ind/l), and *Euglena* (8.81×10^5 ind/l). In April, the most common species were *Trachlelomonas* (17.86×10^5 ind/l), *Euglena* (9.93×10^5 ind/l), *Actinastrum* (9.71×10^5 ind/l), and *Pinnularia* (6.8×10^5 ind/l). May saw an abundance of *Euglena* (14.99×10^5 ind/l), *Oscillatoria* (13.9×10^5 ind/l), *Scenedesmus* (11.8×10^5 ind/l), and *Monoraphidium* (10.61×10^5 ind/l). During the month of June, *Pinnularia* (25.39×10^5 ind/l), *Oscillatoria* (12.67×10^5 ind/l), *Trachlelomonas* (11.62×10^5 ind/l), and *Staurastrum* (9.46×10^5 ind/l) were the most common. In July, the most common species were *Oscillatoria* (12.68×10^5 ind/l), *Trachelomonas* (11.61×10^5 ind/l), *Staurastrum* (9.52×10^5 ind/l), and *Monoraphidium* (8.69×10^5 ind/l). The months of August saw a dominance of *Synedra* (23.66×10^5 ind/l), *Oscillatoria* (14.61×10^5 ind/l), *Trachlelomonas* (11.61×10^5 ind/l), and *Pediatrum* (9.72×10^5 ind/l).

In a study on phytoplankton quantity and structure as an indicator of water quality in the drainage system of the Burullus Lagoon, southern Mediterranean coast, Egypt, the genera *Navicula*, *Nitzschia*, *Euglena*, *Scenedesmus*, and *Oscillatoria* were discovered to be abundant [8]. *Oscillatoria* and *Nitzschia* were identified in previous examinations of two perennial ponds in the Sattur district of Tamil Nadu as indicators of sewage, organic, and toxic contamination [50]. Oscillatoria, Chlamydomonas, Scenedesmus, Carteria, Cyclotella, Synedra, Nitzschia, and Euglena were the species of algae that were most frequently found in the DEPZ. Euglena and Synedra, however, were more generally observed than the others [6]. The study of phytoplankton abundance and structure as a marker of water quality in the drainage system of the Burullus Lagoon, southern Mediterranean coast, Egypt, found that Ankistrodesmus, Cyclotella, Euglena, and Secnedesmus were predominant at all study sites among the reported algal indicator genera [8]. In lake Bogakain, which is located in Bandarban, Bangladesh, the species *Peridinium* and *Scenedesmus* were observed to be the most prevalent [28]. However , lake Ashura in Dinajpur, Bangladesh, showed lower values of *Actinastrum* and *Scenedesmus* (2.97×10^3 ind/l) than Ramsagar (1.48×10^4 ind/l) [1], [27]. Limnological studies of lake Ashura, Dinajpur, Bangladesh, found similar numbers of the phytoplankton genera *Oscillatoria*, *Actinastrum*, *Scenedesmus*, *Trachelomonas*, *Euglena*, *Phacus*, *Pinnularia*, and *Synedra* [1]. The total density of dominant phytoplankton in this present study was 398.6×10^5 ind/l, which is much lower than the density of dominant phytoplankton in lake Ashura, Dinajpur, Bangladesh (552.84×10^5 ind/l) (Alfasane *et al*., 2012). In comparison, in Ramsagar, Dinajpur, Bangladesh, the density of dominant phytoplankton was reported to be 163.53×10^4 ind/l [27].

Diversity Index

For winter, Shannon Diversity Index (H): 1.51, Shannon Equitability Index (E_H): 0.84, Simpson's Diversity Index (D): 0.26, Dominance Index $(1-D)$: 0.74, and Simpson's Reciprocal Index $(1/D)$: 3.84 are the values for genus numbers (Fig. 9). The Shannon diversity value was 1.51 on a scale from 1 to 4. Simpson diversity index was 0.26 when the data were observed and calculated, with a range of 0 to 1. The Shannon and Simpson equations showed that winter vegetation diversity and abundance were low. For summer, Shannon Diversity Index (H): 1.53, Shannon Equitability Index (E_H): 0.79, Simpson's Diversity Index (D): 0.28, Dominance Index $(1-D)$: 0.72, and Simpson's Reciprocal Index $(1/D)$: 3.58 are the values for genus numbers (Fig. 9). The Shannon diversity value was 1.53 on a scale from 1 to 4. Simpson diversity index was 0.28 when the data were observed and calculated, with a range of 0 to 1. The Shannon and Simpson equations showed that summer vegetation diversity and abundance were low. For monsoon, Shannon Diversity Index (H): 1.55, Shannon Equitability Index (E_H): 0.79, Simpson's Diversity Index (D): 0.27, Dominance Index $(1-D)$: 0.73, and

Simpson's Reciprocal Index $(1/D)$: 3.75 are the values for genus numbers (Fig. 9). The Shannon diversity value was 1.55 on a scale from 1 to 4. Simpson diversity index was 0.27 when the monsoon data were observed and calculated, with a range of 0 to 1. The Shannon and Simpson equations showed that monsoon vegetation diversity and abundance were low.

Additionally, other research revealed no obvious connection between the diversity index and species richness. In general, low species richness or during the bloom seasons of the dominating species are correlated with low diversity index values [51]. Algal flora of the water bodies in Dhaka Export Processing Zone (DEPZ), Savar, Dhaka, Bangladesh, showed similar indices variability ranges [6]. Nearly similar variations in phytoplankton quantity and structure as a measure of water quality were found in the Teera Drain of the Burullus Lagoon, on the southern Mediterranean coast of Egypt [8]. A relative range of (1.279-1.681) was discovered through the investigation of a few estuaries in the Ratnagiri area of Maharashtra, India. The Shannon diversity index, which measures variety by combining species richness and evenness, was linked to the number of species and their abundance [7]. According to Simpson's diversity index, (D) (0.93) in the investigation of phytoplankton assemblage regarding water quality in Bangladesh's Turag river, the high diversity of the phytoplankton assemblage could be the outcome of good ecological conditions for its growth [11]. Studying the impact of physical and chemical conditions on the make-up and abundance of phytoplankton in Ajiwa Reservoir, Katsina State, northwestern Nigeria, researchers found that the reservoir's Shannon-Weiner diversity index fell in a comparable 1.46 to 1.53 range [45].

IV. Conclusion

The current study provided in-depth information on the variety of algal flora in the community mosque lake located at the campus of Jahangirnagar University. The composition of the algal flora showed seasonal and monthly variations. The majority of genera were found throughout the summer, whilst there were less in the winter. It was discovered that the Chlorophyceae dominated the studied lake. The study's findings support the conclusion that the selected lake had a low diversity of algae.

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