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Phytoplankton diversity of a seasonal wetland in Ambajogai, Maharashtra

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Abstract
In present investigation 17 species of phytoplankton were identified from seasonal eutrophic wetland in Ambajogai town of Beed district (Maharashtra, India). Among phytoplankton 6 species belonged to Chlorophyceae, 5 to Bacillariophyceae, 4 species to Cyanophyceae and 2 species to Euglenophyce. The phytoplankton consisted of 28.12% of Bacillariophyceae, 25.62% of Cyanophyceae, 35.18% of Chlorophyceae and 11.08% of Eugelnophyceae. Phytoplankton density was maximum in summer and minimum in rainy season.

Keywords: phytoplankton diversity, seasonal wetland, Maharashtra

Introduction
Among biotic communities phytoplankton constitute the first stage in trophic level by virtue of their capacity to transduce environmental radiant energy into the biological energy through photosynthesis. Also referred to as primary productivity, the magnitude of photosynthetic energy fixation depends primarily on diversity and biomass of phytoplankton. The planktonic photosynthesis plays a key role in conditioning the microclimate (zone around an ecosystem) as it helps in regulating the atmospheric level of oxygen and carbon dioxide. Apart from primary production, phytoplanktons also play an important role as food for herbivorous animals. They also are biological indicators of water quality in pollution studies. To summarize, due to their environment in cycling of energy and matter in an ecosystem, evaluation of phytoplankton population in terms of their diversity, density, biomass, spatial and temporal distribution, periodicity and productivity and population turnover, is vital in management of an ecosystem. Fishes consume the phytoplankton, which is found abundantly in ponds, lakes, streams and reservoirs. Phytoplankton also gives green colour to the water. It is due to the presence of chlorophyll. Growth and multiplication of phytoplankton is mainly dependent on temperature, solar illumination and the availability of certain essential nutrients such as nitrates, silicates and phosphates.
The present research paper is intended only to know the phytoplankton diversity from seasonal wetland in Ambajogai of Beed district in Maharashtra (Geographical coordinates: 18°44'0" North, 76°23'0''East). The selected wetland for the present study is situated in the heart of town where idol emersion and continuous domestic effluents are responsible for eutrophication.

Methodology
The planktonic samples were collected on monthly basis for the period of June 2021 to May 2022.Samples were collected by filtering 100 liters of water through plankton net made up of bolting silk. The phytoplanktonic in lugol's solution. The preserved samples were brought to the Zoology Research Laboratory of Yogeshwari Mahavidyalaya, Ambajogai. Identification was done with the help of methods described by Desikachary [1], Prescott [2] and Tripathi and Pandey [3].

Results and Discussion
The study of the phytoplankton sampled from seasonal wetland showed 17 species (Table 1). The phytoplankton assemblage was represented by four classes *viz.* Bacillariophyceae, Cyanophyceae Chlorophyceae and Euglenophyceae.
The class Bacillariophyceae was was reported by 5 species. The class was represented by species such as *Navicula gracilis, Navicula viridula, Nitzschia subtilis, Bacillaria paradoxa* and *Synedra affinis* The class Cyanophyceae was represented by 4 species. It was represented by *Oscillatoria limnosa, Anabaena constricta, Microcystis aerugenose* and *Merismopedia punctate* The class Chlorophyceae was represented by 6 genera i.e; *Zygnema sp., Pediastrum duplex, Pediastrum simplex, Scendesmus armatus, Ankistrodesmus falcatus* and *Chlorella vulgaris.*
The class Euglenophyceae was represented by two species i.e., *Euglena stellata* and *Euglena pisciformis*.

During present study, the phytoplankton consisted of 28.12% of Bacillariophyceae, 25.62% of Cyanophyceae, 35.18% of Chlorophyceae and 11.08% of Eugelnophyceae (Fig.1). Mishra *et al.* [4] also reported chlorophyceae as the dominant group from Dhaura and Baigul reservoirs of Uttarakhand. During present investigation it was revealed that the class Chlorophyceae was dominant with annual average of 105.83 units/liter, followed by Bacillariophyceae (84.58 units/liter), Cyanophyceae (77.08 units/liter) and Euglenophyceae (33.33 units/liter).

In case of Bacillariophyceae, *Navicula viridula* and *Bacillaria paradoxa* were the dominant species which were recorded throughout the year. Their number was high in summer season. *Navicula gracilis* and *Nitzschia subtilis* were seen during ten months with peak in summer. *Synedra affinis* was absent in one month i.e., July 2021.

Among blue-green algae, *Oscillatoria limnosa, Anabaena constricta, Merismopedia punctata* and *Microcystis aerugenose* were recorded. *Anabaena constricta* and *Microcystis aerugenose* were observed throughout the investigation with maximum and minimum density in summer and monsoon season respectively. The variation in the population density of blue-green algae ranged from 25 to 120 units/liter and contributed to 25.62% of the total phytoplankton population. *Merismopedia punctata* was recorded in ten months only. It was absent in two months of monsoon season (Table 1). *Oscillatoria limnosa* was absent in June. The density of *Oscillatoria limnosa* ranged from nil to 30 units/liter. *Anabaena constricta* 5 to 30 units/liter, *Merismopedia punctata* nil to 30 units/liter and *Microcystis aerugenose* 5 to 35 units/liter.

The green algae were represented by *Zygnema sp, Pedistrum duplex, Pediastrum simplex, Scendesmus armatus, Ankistrodesmus falcatus* and *Chlorella vulgaris.* The population density of green algae was between 40 to 155 units/liter and contributed to 35.18 % of the phytoplankton (Fig.1). It was recorded maximum in summer and minimum in monsoon. Among the green algae, *Zygnema sp, Pediastrum duplex* and *Scendesmus armatus* were observed throughout the study period, while *Pediastrum simplex* and *Ankistrodesmus falcatus* were recorded in eleven months and *Chlorella vulgaris* in ten months (Table 1). Higher population density of *Zygnema sp* was recorded in summer and minimum in monsoon season. The population density of this species varied from 15 to 25 units/liter. Similarly, population density of *Pediastrum duplex* and *Pediastrum simplex* was in the range of 5 to 30 units/liter and nil to 35. units/liter respectively. The population density of *Scendesmus armatus, Ankistrodesmus falcatus* and *Chlorella vulgaris* varied from 5 to 35 units/liter, nil to 25 units/liter and nil to 25 units/liter respectively.

In case of Euglenophyceae, *Euglena pisciformis* was dominant. It was recorded throughout the year. Its number was high in the month of March and April (30 units/liter). *Euglena stellata* was seen during ten months with peak in summer. It was absent in two months i.e., June and July.

Summer is the most suitable season for the growth of phytoplankton in freshwater lakes because of long duration of sunshine period, increased alkalinity and pH. Summer peak in total phytoplankton population was due to higher temperature [5]. Decline in phytoplankton population in monsoon was a result of flushing due to incessant rain in regions which also hamper light penetration decreasing photosynthesis [5]. Similar opinion was proposed by different workers who suggested that the heavy rainfall, over flooding, dilution and turbidity were the factors responsible for the reduced population of phytoplankton during monsoon season despite of increased nutrient levels during the period [3, 6, 7].

Maheshwari *et al.,* [8] concluded that the temperature, dissolved oxygen, and nutrients play a crucial role in the phytoplankton dynamics and also observed maximum phytoplankton number in summer. The lowest population in the rainy season corroborated with the reports of Escaravage and Prins [9] who recorded the low density of phytoplankton during rainy season due to high influx of flood water and rain washings. The minimum number of phytoplankton population in rainy season was also reported by Gupta *et al.,* [10] and Panigrahi and Patra [11].

Table 1: Monthly analysis of phytoplankton diversity in seasonal wetland of Ambajogai, Maharashtra (Year 2021-22)

Species/Month	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Chlorophyceae												
Zygnema sp	15	15	20	25	20	25	20	20	25	25	20	25
Pediastrum duplex	05	10	10	15	20	20	15	15	20	20	25	30
Pediastrum simplex	10	05	00	15	20	25	25	25	30	35	30	30
Scendesmus armatus	05	05	10	15	15	25	20	25	25	25	35	25
Ankistrodesmus falcatus	10	05	10	00	15	15	20	20	20	25	25	25
Chlorella vulgaris	00	00	10	10	05	10	10	15	15	25	20	20
Total	45	40	60	80	95	120	110	120	135	155	155	155
Cyanophyceae												
Oscillatoria limnosoa	00	15	20	20	25	20	25	25	30	25	30	30
Anabaena constricta	10	05	15	15	10	15	20	15	25	30	25	20
Merismopedia punctate	10	00	15	00	20	20	20	25	20	25	30	25
Microcystis aerugenose	05	15	20	15	15	20	25	20	25	25	35	25
Total	25	35	70	50	70	75	90	85	100	105	120	100
Bacillariophyceae												
Navicula gracilis	00	00	10	10	10	05	15	15	25	25	20	20
Navicula viridula	05	10	15	10	15	20	20	25	25	35	30	35

Nitzschia subtilis	10	05	00	00	15	15	15	20	25	30	35	30
Bacillaria paradoxa	15	10	10	05	10	15	20	10	20	25	20	25
Synedra affinis	15	00	15	10	15	15	25	20	25	30	25	35
Total	45	25	50	35	65	70	95	90	120	145	130	145
Euglenophyceae												
Euglena stellata	00	00	05	10	15	15	10	20	20	20	25	25
Euglena pisciformis	05	15	10	10	20	20	25	20	25	30	30	25
Total	05	15	15	20	35	35	35	40	45	50	55	50

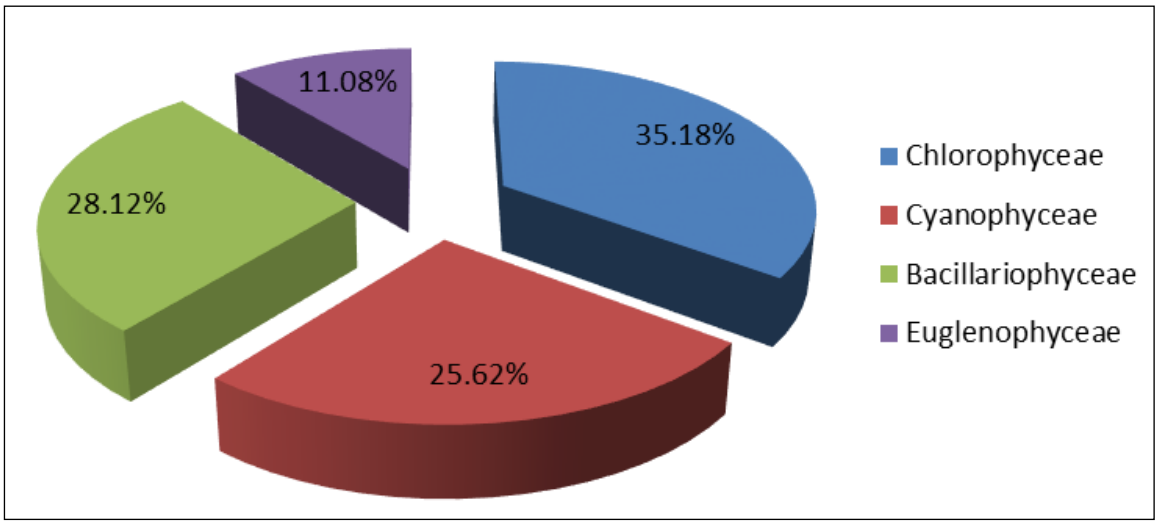

Fig 1: Quantitative occurance of phytoplankton in seasonal wetland at Ambajogai (Year 2021-22)

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