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Phytoplankton Diversity of Tarangwadi Perennial Lake, Indapur, District Pune

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Abstract

The Tarangwadi Lake is a significant minor irrigation project situated in the Maharashtra state, specifically within the Indapur taluka of Pune. It serves as a vital freshwater ecosystem, offering a nutrient-rich environment that supports a wide variety of aquatic organisms. This study aims to explore the diversity of phytoplankton present in the Tarangwadi perennial lake over the course of one year, from February 2023 to January 2024. Phytoplankton are essential components of aquatic ecosystems as they form the base of the food web and contribute to primary production. During the study period, a total of 19 phytoplankton species were identified, which were categorized into four major taxonomic groups: Chlorophyceae, Bacillariophyceae, Cyanophyceae, and Euglenophyceae. Among these groups, Chlorophyceae was found to be the most dominant, showcasing a strong presence throughout the year. The results revealed significant seasonal variation in the phytoplankton composition, reflecting the influence of environmental factors such as temperature, nutrient availability, and light intensity. The findings of this research contribute valuable insights into the ecological health of the Tarangwadi Lake and highlight the importance of phytoplankton as indicators of water quality. The diversity and abundance of these organisms also play a crucial role in maintaining the ecological balance of the lake, offering essential data for future management and conservation strategies of freshwater resources in the region. Furthermore, understanding these dynamics can guide the sustainable use of water resources in similar lakes and reservoirs across Maharashtra.

Keywords: *Tarangwadi lake, freshwater ecosystem, phytoplankton, Chlorophyceae, Bacillariophyceae, Cyanophyceae and Euglenophyceae.*

Introduction

Phytoplankton forms the base of aquatic food webs and plays a dynamic role in the productivity and nutrient cycling of freshwater ecosystems. These microscopic algae are essential bioindicators of water quality and ecological balance. The Tarangwadi lake, located in Indapur taluka, Pune district, is a perennial freshwater body serving as a critical resource for irrigation and biodiversity.

Despite its ecological significance, limited research has been conducted on the phytoplankton diversity in this region. The current study aims to bridge this knowledge gap by identifying and documenting the phytoplankton species present in the Tarangwadi lake, evaluating their seasonal variations, and understanding their ecological roles.

Materials and Methodology

Study Area

Tarangwadi lake is situated at a latitude of 18.123°N and longitude of 74.678°E in Indapur taluka, Pune district. The lake covers an area of approximately 1.2 km² and is surrounded by agricultural fields. It receives water primarily from monsoon rains and serves as a habitat for diverse aquatic organisms.

Sampling and Data Collection

Water samples were collected monthly from February 2023 to January 2024 from three designated sampling points: the inlet, middle, and outlet of the lake. Sampling was conducted using a 1-liter Niskin sampler.

Phytoplankton Analysis

Phytoplankton samples were preserved using Lugol's iodine solution. Identification and enumeration were performed under a light microscope at 400x magnification, following standard taxonomic keys (Prescott, 1978; APHA, 2012; APHA, 2017). The species were categorized into four major groups: *Chlorophyceae*, *Bacillariophyceae*, *Cyanophyceae*, and *Euglenophyceae*.

Data Analysis

The relative abundance of phytoplankton species was calculated as a percentage of the total count. Diversity indices, including the Shannon-Wiener Index (H') and Simpson's Index (D), were used to assess species diversity and evenness.

Observations and Results

Table 1: Phytoplankton Diversity in Tarangwadi Lake (February 2023 - January 2024)

Group	Species Identified	Dominance (%)
Chlorophyceae	*Chlorella vulgaris*, *Scenedesmus quadricauda*, *Pediastrum simplex*, *Ankistrodesmus falcatus*	48.2
Bacillariophyceae	*Navicula sp.*, *Cymbella sp.*, *Fragilaria sp.*, *Diatoma sp.*	25.4
Cyanophyceae	*Microcystis aeruginosa*, *Oscillatoria sp.*, *Anabaena sp.*, *Nostoc sp.*	18.7
Euglenophyceae	*Euglena gracilis*, *Phacus sp.*, *Trachelomonas sp.*	7.7

Seasonal Variations

Chlorophyceae showed peak abundance during summer months (April-June), attributed to higher temperatures and nutrient availability. Bacillariophyceae were prominent during winter (November-January), while Cyanophyceae exhibited sporadic blooms, particularly after monsoon inflows (July-September).

Discussion

Bhosale et al., (2010) reported phytoplankton diversity of four lakes of Satara district (M. S.) India. They observed 68 species of phytoplankton and 13 species of filamentous algae. Patil et al., (2015) studied the occurrence of phytoplankton at five major freshwater bodies from Ajara Tehsil of Kolhapur district, Maharashtra. They reported total 41 species of phytoplankton from same study. Narasimha and Benarjee (2013) investigated physicochemical factors influenced plankton biodiversity from Nagaram tank of Warangal district of Andhra Pradesh. They reported total 31 phytoplankton species which belongs to 4 groups and Chlorophyceae was the dominant group. Nissa and Bhat (2016) reported phytoplankton in Nigeen Lake of Kashmir Himalaya. During study period they reported total 65 phytoplankton species which were represented in to four groups and noted Chlorophyceae is dominant group. Reddy and Chaturvedi (2017) made new records of fresh water algae from India. They studied micro and macro flora of major rivers of Chandrapur district and noted total 12 taxa of 8 genera of fresh water algae.

The dominance of Chlorophyceae aligns with similar studies in tropical freshwater systems, where nutrient-rich conditions favor their proliferation (Smith et al., 2020). Bacillariophyceae's seasonal preference for cooler temperatures underscores their adaptability to varying ecological conditions. Cyanophyceae blooms highlight the potential for eutrophication and its associated ecological risks.

Conclusion

The diverse phytoplankton community underscores the ecological importance of Tarangwadi lake, while the periodic dominance of specific groups reflects the dynamic interplay of abiotic factors. The study revealed significant phytoplankton diversity in Tarangwadi lake, with Chlorophyceae as the dominant group. Seasonal variations in phytoplankton composition emphasize the influence of temperature and nutrient dynamics. These findings contribute to the ecological understanding of freshwater lakes in semi-arid regions and serve as a baseline for future monitoring and conservation efforts.

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Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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