



**TAXONOMIC COMPOSITION AND ECOLOGICAL SIGNIFICANCE
OF PHYTOPLANKTON IN ERANDOL DAM,
KOLHAPUR, DISTRICT (MS), INDIA**

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Abstract:

This study evaluates the phytoplankton community structure of the Erandol freshwater dam in Ajara Tehsil, Kolhapur, to establish a baseline for aquatic conservation. A taxonomic investigation identified a diverse assemblage of 29 species across five key classes: Chlorophyceae, Cyanophyceae, Euglenophyceae, Dinophyceae, and Bacillariophyceae. As primary producers, these microalgae serve as critical bio-indicators; their presence and relative abundance provide essential data on the dam's trophic status and overall water quality. By documenting these assemblages, the research highlights the relationship between nutrient loading and algal diversity, offering insights into the reservoir's ecological health. The findings suggest that identifying pollution-tolerant or sensitive species serves as a diagnostic tool for monitoring organic enrichment. Ultimately, this documentation provides a vital scientific foundation for local authorities to implement sustainable management practices and protect the biodiversity of this essential freshwater resource in the Kolhapur district.

Keywords: Erandol Dam, Chlorophyceae, Cyanophyceae, Euglenophyceae, Dinophyceae, and Bacillariophyceae.

Introduction

Phytoplankton serve as the primary producers in aquatic ecosystems and are sensitive indicators of water quality changes. Erandol Dam, located in the Western Ghats region of Ajara, serves as a crucial water source for irrigation and domestic use. Monitoring its microscopic flora is essential for understanding the ecological health of the

reservoir. The presence of phytoplankton in water body ecosystems includes its use in estimating potential fish yield (1), productivity (2), energy flow (3), water quality (4), trophic status (5) and management (6). Change in any physico-chemical factor of the water body directly or indirectly causes great variation in phytoplankton species diversity and abundance.

Phytoplankton as the primary producers in aquatic ecosystems, play a crucial role in the food chain by facilitating energy transfer and material cycling (7). Due to their small size and unicellular form, they are highly responsive to environmental changes (8). Factors such as water temperature and nutrient availability have been identified as significant influences on the structure of phytoplankton communities (9). Consequently, the composition of these communities serves as an important indicator of water quality and the extent of eutrophication (10). The high sensitivity of phytoplankton community composition to environmental changes makes it nearly impossible to predict it across various habitats. Therefore, traditional biological methods often fail to accurately reflect the health of aquatic ecosystems (11).

Materials and Methods

Study area

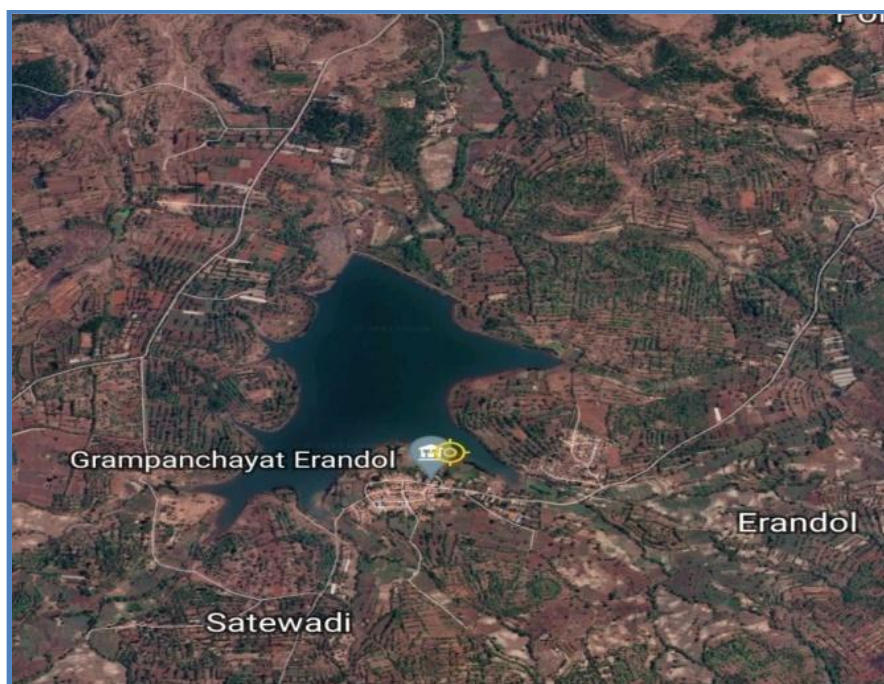


Figure 1: Map of Erandol Dam (source: Google Earth)

The study area designated for this limnological analysis is the Erandol Minor Irrigation Dam, situated in the Ajara Tahasil of the Kolhapur district, Maharashtra. Geographically, the reservoir is located approximately 6 km west of the town of Ajara, positioned at the coordinates of $16^{\circ} 03' 21''$ N latitude and $74^{\circ} 10' 44''$ E longitudes. It is nestled within the Western Ghats, its specific geographic positioning influences the runoff patterns and physico-chemical characteristics that shape the unique phytoplankton assemblages documented in this research.

Table 1: Salient features of Erandol Dam, Ajara (Source: Minor Irrigation Division, Kolhapur)

	Attribute	Value
1	Name of Dam	Erandol (Kolhapur) Dam
2	River	Local Nallah
3	Nearest City	Ajra Mahal
4	District	Kolhapur
5	State	Maharashtra
6	Basin	Krishna
7	Status	Completed
8	Purpose of Dam	Irrigation
9	Year of Completion (YYYY)	2007
10	Operating & Maintenance Agency	WRD, GOM
11	Dam as per Parliamentary Constituency	Kolhapur
12	Type of Dam	Earthen
13	Total Volume Content of Dam (MCFT)	148.51
14	Total Area Under Irrigation (Hectors)	282

Phytoplankton analysis

The present investigation was conducted over a one-year period, spanning from January 2024 to December 2024. To ensure a comprehensive ecological assessment, water samples were collected seasonally, enabling observation of successional changes in the microbial community. This temporal framework provides a robust dataset for understanding how fluctuating environmental conditions throughout the calendar year influence the density and distribution of the dam's primary producers.

For the sampling process, a standardized volume of 100 liters of water was filtered through a specialized plankton net constructed of bolting silk. With a fine pore size of 50 μm , this method ensured the efficient capture of a diverse range of phytoplankton species. The concentrated samples were then transported to the laboratory and preserved with 4% formalin to maintain structural integrity. Subsequent qualitative analysis was performed to identify the taxonomic composition, providing a detailed inventory of the reservoir's microscopic flora.

Identification

The taxonomic identification of the collected phytoplankton was performed using a rigorous comparative analysis based on established classical literature. By employing the specialized keys of Needham and Needham (12) and Tonapi (13), the study ensured high morphological accuracy in distinguishing between various freshwater genera. These foundational texts provided the structural framework necessary to categorize the diverse species found within the Erandol Dam, moving from broad classes down to specific species-level identifiers.

Furthermore, the study utilized comprehensive regional and technical manuals, including Adoni *et al.* (14), Michael (15), and the standard methods prescribed by Trivedy and Goel (16). These references were instrumental in validating the qualitative analysis, particularly for species common to Indian freshwater ecosystems. This multi-source approach provided a robust scientific basis for the identification process, ensuring that the resulting baseline data for the Kolhapur district is both accurate and reproducible for future limnological research.

Results and Discussion

The taxonomic survey of the Erandol freshwater dam revealed a rich biological diversity, organized into five primary groups. The community structure is strongly dominated by Bacillariophyceae (Diatoms) and Chlorophyceae (Green Algae). This dominance indicates a robust primary production base and suggests that the physicochemical environment, particularly silica and nutrient availability, is highly conducive to the growth of these lineages.

Table 2: Checklist of phytoplankton species found in Erandol Dam, Ajara

Sr. No.	Class	Species Identified
1	Chlorophyceae	1. <i>Asterococcus limneticus</i> 2. <i>Closterium acutum</i> 3. <i>Coelastrum microporum</i> 4. <i>Cosmarium botrytis</i> 5. <i>Cosmarium subcrenatum</i> 6. <i>Oocystis gloecystiformis</i> 7. <i>Pediastrum simplex</i> 8. <i>Scenedesmus indicus</i> 9. <i>Staurastrum manfieldi</i> 10. <i>Staurastrum sebaldi</i>
2	Cyanophyceae	1. <i>Chroococcus pallidus</i>
3	Euglenophyceae	1. <i>Phacus alatus</i> 2. <i>Trachelomonas cylindrica</i> 3. <i>Trachelomonas robusta</i> 4. <i>Euglena erandoli</i>
4	Dinophyceae	1. <i>Ceratium hirundinella</i>
5	Chrysophyceae	1. <i>Dinobryon bavaricum</i> 2. <i>Dinobryon sociale</i>
6	Bacillariophyceae	1. <i>Cocconeis placentula</i> 2. <i>Cyclotella comensis</i> 3. <i>Diatoma vulgare</i> 4. <i>Diploneis elliptica</i> 5. <i>Diploneis subovalis</i> 6. <i>Gomphonema intricatum</i> 7. <i>Gyrosigma acuminatum</i> 8. <i>Navicula gregaria</i> 9. <i>Navicula rhynchocephala</i> 10. <i>Nitzschia acula</i> 11. <i>Nitzschia sigmoidea</i>

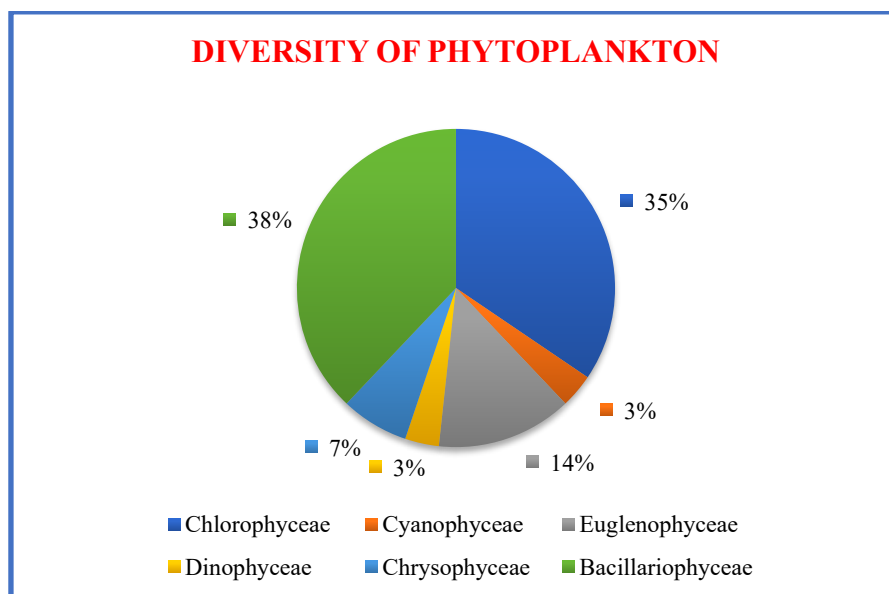


Figure 1: Diversity of phytoplankton species found in Erandol Dam, Ajara

The prevalence of diatoms often indicates well-oxygenated conditions and specific alkaline ranges, while the variety of green algae reflects the reservoir's fundamental productivity. The presence of these groups, alongside Cyanophyceae, Euglenophyceae, and Dinophyceae, creates a complex ecological mosaic. Together, these assemblages serve as sensitive indicators of the dam's health, reflecting seasonal nutrient dynamics and the overall stability of the aquatic habitat in the Western Ghats region.

Researchers in related disciplines are increasingly employing functional groups as an effective means to analyze phytoplankton communities, thereby gaining significant insights into aquatic ecosystems (17, 18, 19). Functional groups classify phytoplankton species based on shared morphological, physiological, and ecological traits. This classification enables researchers to predict community responses to environmental changes and anthropogenic pressures. Consequently, functional groups analysis has become a valuable tool for monitoring water quality and ecosystem health in diverse aquatic environments.

Observations

The taxonomic composition of the Erandol Dam provides a nuanced map of its chemical and organic profile. The frequent occurrence of Desmids such as *Cosmarium* and *Staurastrum* serves as a biological signature of the region's geography; these species typically thrive in soft to slightly acidic waters, which is characteristic of the runoff from the hilly, lateritic terrains of the Ajara Western Ghats. This suggests that the dam retains much of its natural, pristine water quality influenced by the local lithology.

However, the presence of other specific genera indicates localized environmental shifts. While *Nitzschia* and *Navicula* are ubiquitous in freshwater, their proliferation or dominance can be a precursor to organic enrichment, signaling a transition toward higher nutrient levels. This is further corroborated by the detection of *Euglena* and *Phacus*. These euglenoids are classic indicators of decomposing organic matter, suggesting that while the dam is generally healthy, specific pockets may be experiencing high organic loading, likely due to stagnant areas or localized anthropogenic runoff.

Conclusion

The Erandol Dam supports a vibrant and taxonomically rich phytoplanktonic community, underscoring its role as a vital ecological hub in the Ajara region. The clear dominance of Chlorophyceae and Bacillariophyceae suggests a fundamentally healthy and productive ecosystem, capable of supporting diverse higher-order life forms, including local fish populations. This biological profile reflects a well-functioning freshwater habitat where nutrient cycling and primary production are currently in a state of relative equilibrium.

Despite this overall stability, the presence of specific stress-tolerant genera such as *Nitzschia* serves as a critical ecological warning. These indicators suggest that while the dam is currently productive, it is susceptible to nutrient influxes that could trigger a shift in its trophic state. To prevent the reservoir from progressing toward eutrophication, which could lead to oxygen depletion and algal blooms, periodic biological monitoring and physico-chemical assessments are highly recommended. Maintaining this surveillance will be key to preserving the water quality for both domestic use and local biodiversity conservation.

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