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Taxonomic composition and Ecological Dynamics of Algal communities in Pangadi Reservoir and Khairabhandha Dam Reservoir of Gondia district.Maharashtra, India

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Abstract*— Algal communities play a crucial role in keeping the ecological stability of aquatic ecosystems. Reservoir connectivity furnishes a solution for geographical water shortages. Understanding the water quality of reservoirs and the response of algal communities to water transfer should supply the groundwork for a long-term evolutionary mannequin of reservoirs. This study investigates the taxonomic composition and ecological dynamics of algal communities in Pangadi Reservoir and Khairabhandha Dam Reservoir, positioned in Gondia District, Maharashtra, India. The research employs a comprehensive approach combining area surveys, laboratory analyses, and ecological assessments to symbolize the variety and abundance of algal species, as well as their ecological interactions inside the reservoirs. Algal epiphytes attached to three dominant aquatic macrophytes (Pistia striatotes, Eichhornia crassipes, and Ipomoea aquatic) have been inspected as a phase of preliminary study and analysis of the ecological dynamics of Algal communities in Pangadi Reservoir and Khairabhandha Dam Reservoir of Gondia district. Maharashtra, India. Sampling expeditions have been carried out during [duration] to seize seasonal variants in algal neighborhood shape and environmental parameters. Water samples have been gathered from a couple of websites inside every reservoir and analyzed for physicochemical parameters, inclusive of pH, temperature, dissolved oxygen, nutrients, and turbidity. Additionally, algal samples have been accumulated and subjected to microscopic examination and taxonomic identification to decide species composition. The study aims to elucidate the relationships between algal community dynamics and environmental factors, such as nutrient availability, hydrological conditions, and anthropogenic influences. The findings furnish treasured insights into the ecological health and management of these reservoir ecosystems, contributing to our appreciation of freshwater biodiversity conservation and sustainable resource management practices in the region.

***Index Terms*— Algal communities, Taxonomic composition, Ecological dynamics, Pangadi reservior, Freshwater ecosystem, Water quality, Gondia district.**

Aim- The main aim this research is to investigate Taxonomic composition and Ecological Dynamics of Algal communities in Pangadi Reservoir and Khairabhandha Dam Reservoir of Gondia district. Maharashtra, India.

Objectives-

1. To characterize the taxanomic composition of algal communities in Pangadi Reservoir and Khairabhandha Dam Reservoir.
2. To analyze the physicochemical parameters influencing algal community dynamics.
3. To determine the ecological interactions within algal communities and their implications for water quality and ecosystem health.

I. INTRODUCTION *(HEADING 1)*

Algal communities are crucial factors in aquatic ecosystems, exerting tremendous impact on ecosystem structure and function. In the Gondia district of Maharashtra, India, Pangadi Reservoir and Khairabhandha Dam Reservoir characterize key freshwater habitats supporting a huge array of flora and fauna. The taxonomic composition and ecological dynamics of algal communities in these reservoirs are indicative of the standard health and ecological integrity of these aquatic ecosystems.

Macrophytes have numerous species of microalgae associated with submerged plant components which are a crucial productive issue of the aquatic ecosystem **[1].** Algal epiphytes structure a matrix device of microalgae and cyanobacteria associated with submerged aquatic macrophytes. These algae are considered as most important species in exclusive lotic water structures and are permuted with confining ecological stability among the distinctive groups of macrophytes and aquatic organisms **[2].** It is broadly identified that these organisms furnish meals to invertebrates, fish, and different aquatic fauna in the littoral region and make a contribution of an estimated 0.2% to 41% of the complete primary production in an aquatic ecosystem. Most of the observational and experimental research and analysis on the ecological prominence of bodies of water verified an enlarge in the population and diversity of algal epiphytes in revulsion to

nutrient loading and pollution. This precipitates the deliberation of these organisms as erratic bioindicators of environmental and water quality transformation due to the fact of their sensitivity to exterior sources of pollution **[3].** Most of the reports cautioned that biotic and abiotic components such as physicochemical characteristics of submerged components (stem, leaves, and roots) of macrophytes, availability of substrates, temperature, light intensity, and grazing influence the diversity and phenomenon of epiphytic algal community **[4].** Aquatic macrophytes are once in a while hazardous to algal epiphytes on account that they are victorious in monopolizing light and assimilating nutrients besides the vertical extent of the water column, inhibiting algal epiphytes as nicely as distinct submerged macrophytes from prevailing enough expedient for growth and survivance **[5].**

In Maharashtra, taxonomic research of algal epiphytes associated with distinctive macrophytes has been sophisticated merely on those plant species inhabiting Pangadi Reservoir and Khairabhandha Dam Reservoir of the Gondia district. To current date, a total of 82 taxa of algal l epiphytes related with 4 dominant aquatic macrophytes (***Hydrilla verticilata, Nymphaea pubescens, Eichhornia crassipes, and Ipomoea aquatic***) observed in Pangadi Reservoir and Khairabhandha Dam Reservoir of Gondia district have been documented in the Maharashtra **[6].** These taxonomic surveys stated the incidence of 5 uncommon microalgae – namely, ***Cryptoglena skujae Marin and Melkonian, Pseudanabaena minima (G.S. An) Anagnostidis, Synechococcus nidulans (Pringsheim) Komárek, Chroococcus schizodermaticus West and Franceia amphitrite (Lagerheim) Hegewald*** – for the first time in Maharashtra. Also, some of the microalgal genera documented in this taxonomic research (eg. ***Chlorella, Cryptoglena, Chroococcus, Euglena, Nitzschia, Oscillatoria, Phacus, and Tetradesmus***) are frequently correlated with naturally polluted enriched waters **[7].** These algal epiphytes are considered good indicators of environmental changes and water quality due to their sensitivity to exterior sources of fertilization which can be used in the evaluation of the ecological status of the Pangadi Reservoir and Khairabhandha Dam Reservoir of the Gondia district. The taxonomic records reported in this research supplied baseline information concerning the distribution and diversity of Maharashtra epiphytic algae from aquatic macrophytes discovered in local freshwater habitats.

Given the environmental significance of algal communities in Pangadi Reservoir and Khairabhandha Dam Reservoir, understanding their taxonomic composition and ecological dynamics is essential for superb ecosystem management and conservation. This research aims to inspect the diversity, abundance, and seasonal variability of algal species in these reservoirs via comprehensive subject surveys and laboratory analyses.

Fig 1:- Pangadi Reservoir and Khairabhandha Dam Reservoir of Gondia District

II. METHODS

A single preliminary collection of algal epiphytes from submerged aquatic macrophytes has been once carried out from the littoral sector of Pangadi Reservoir and Khairabhandha Dam Reservoir of Gondia district. Maharashtra, India. The plant components have been put into sterile autoclavable plastics stuffed with water for laboratory examination. A total of 20 aquatic macrophyte samples (each for Pistia striatotes, Eichhornia crassipes, and Ipomoea aquatica) have been accumulated and analyzed throughout the study period. Immediately after collection, these samples have been washed in several instances with sterile distilled water.

The algal epiphytes from submerged leaves stems, and roots on the gathered aquatic macrophytes have been set aside from the plant utilizing gently scraping the connected algae on the plant material **[8].** The accumulated scraped algal epiphyte used to be cautiously mixed, and the portion of 50 mL used to be saved for taxonomic enumeration. The blended algal epiphyte samples have been conveyed into a sterile beaker and left overnight to grant the settling of the drag algal samples. An aliquot of 45 mL of the liquid specimen is eliminated from the beaker after the settling period. The residual 5 mL of the congregate scraped material is once conveyed into a sterile drum vial for taxonomic recitation of algal epiphytes and used to be preserved by the use of 2-3 drops of Lugol's iodine from the organized specimens **[9].** A small portion (5 mL) of the targeted scraped epiphytic algal samples is used for the analysis of diatom flora. The scraped samples had been chemically digested following the standard method for diatom cleansing and slide preparation. A mixture of cleaned diatoms used to be dried onto glass coverslips and mounted. Three slides have been organized for every aquatic macrophyte sample for microscopic observation and enumeration of diatoms.

Percentage settlement of algal epiphytes after a specified setting period:

$$\text{Percentage Settlement} = \left(\frac{Volume\ of\ settled\ algal\ sample}{Total\ volume\ of\ algal\ sample}\right) \times 100$$

III. RESULTS

Epiphytic algal flora of three dominant aquatic macrophytes (***P. stratiotes, E. crassipes, and I. aquatica***) found in Pangadi Reservoir and Khairabhandha Dam Reservoir, positioned in Gondia District, Maharashtra, India be composed of 22 taxa. Out of these, 8 accord to the ***Chlorophyta***, 4 accord to the ***Cyanobacteria***, 7 belong to the ***Bacillariophyta***, and 3 belong to the ***Euglenophyta*** divisions. Chlorophyta used to be presiding and consists of 36.36% of all reported taxa. ***Bacillariophyta, Cyanobacteria, and Euglenophyta*** mainly represented 31.81%, 18.18%, and 13.63% of all reported taxa, respectively. All the taxa are systematically enumerated with morpho-taxonomic descriptions alongside easy habitat information about the place where the alga was once observed. analytical photomicrographs of most of the algal species are given in Fig. 2 [**10].**

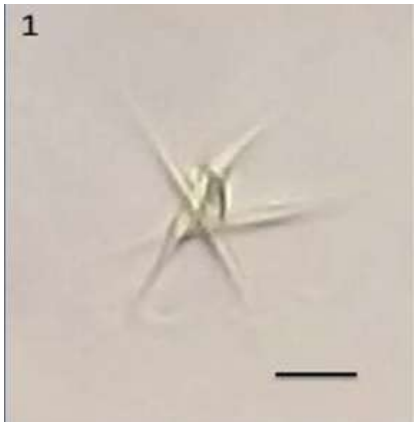
IV. TAXANOMIC DIVERSITY:

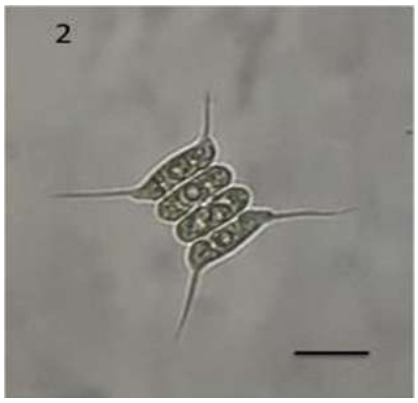
$$H' = - \sum_{i=1}^{S} (pi \times ln\ (pi))$$

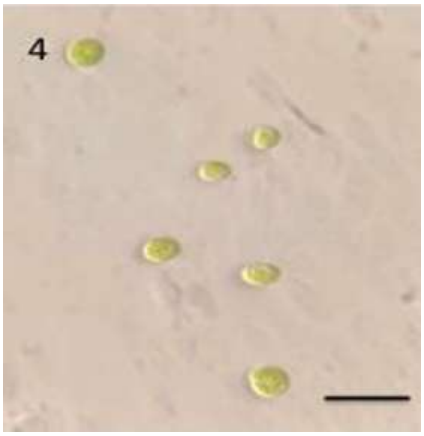
Where, S is the number of algal taxa
Pi is the proportional abundance of the ith taxon.

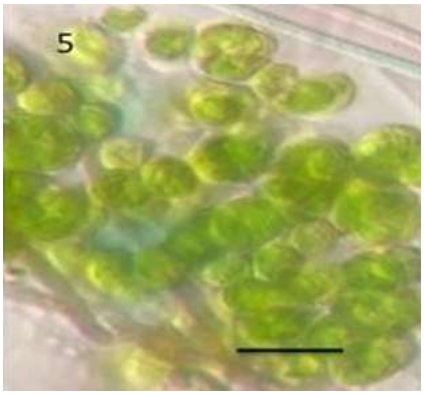
A. ***Relative abundance of each algal division of taxon:***

$$\text{Relative Abundance} = \frac{Number\ of\ individuals\ of\ a\ \ taxon}{Total\ number\ of\ individuals\ in\ the\ sam} \times 100$$









$$\text{Relative Abundance} = \frac{\textit{Number of individuals of a taxon}}{\textit{Total number of individuals in the sample}} \times 100$$

Fig 2 - photomicrographs of some of the algal species

V. CONCLUSION

The findings about the taxonomic composition and ecological dynamics of algal communities in Pangadi Reservoir and Khairabhandha Dam Reservoir of Gondia district, Maharashtra, India give treasured insights into the functioning and health of these aquatic ecosystems. Through complete field surveys, laboratory analyses, and ecological assessments, we have characterized the diversity and abundance of algal species and their interactions inside the reservoirs. Our findings expose a complete of 22 taxa of epiphytic algae related to 3dominant aquatic macrophytes, with Chlorophyta being the dominant division. This diversity underscores the significance of algal communities in these reservoirs. The taxonomic enumeration and morpho-taxonomic descriptions furnished in this study provide baseline statistics for future research and monitoring efforts aimed at assessing adjustments in algal community composition over time. All algal taxa are distributed in the range of 36.36% of Chlorophyta. Similarly, Bacillariophyta, Cyanobacteria, and Euglenophyta distributed as 31.81%, 18.18%, and 13.63% of all recorded taxa, respectively.

Furthermore, the analysis of physicochemical parameters influencing algal community dynamics highlights the interconnectedness between environmental factors and algal abundance and distribution. Understanding these relationships is integral for high-quality management and conservation techniques to preserve the ecological integrity of the reservoir ecosystems. Overall, this research contributes to our understanding of freshwater biodiversity conservation and sustainable useful resource management practices in the region. By elucidating the taxonomic composition and ecological dynamics of algal communities, we provide treasured records for knowledgeable decision-making and ecosystem management efforts aimed at retaining these necessary aquatic habitats for future generations.

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