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Limnological Investigation and Microscopic Characterization of Pre-Monsoon Microfauna in the Lentic Ecosystem of Amolakchand Mahavidyalaya, Yavatmal

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Abstract: *Lentic waterbodies on educational campuses serve as vital ecological refuges, regulating microclimatic stability and providing resources for hands-on biological monitoring. This study presents a qualitative taxonomic assessment of microfauna recorded in the freshwater body situated within the campus of Amolakchand Mahavidyalaya, Yavatmal, Maharashtra, India. Water samples were systematically collected during the pre-monsoon season. Microscopic identification was performed using compound light microscopy in the institution's B.Sc. Zoology Laboratory. The biological findings were cataloged into 26 recorded observations representing distinct taxa, developmental stages, and structural indicators across two major kingdoms: Protista and Animalia. Rotifers represented the most taxonomically diverse group, dominated by the families Brachionidae, Synchaetidae, Lepadellidae, Notommatidae, Hexarthridae, and Trichocercidae. The co-occurrence of bioindicator ciliates (Vorticella sp., Colpoda sp., Balantidium coli), stress-induced cladoceran resting eggs (ephippia), benthic ostracods (Heterocypris incongruens, Cyprideis torosa), and predatory copepods (Cyclops sp. and nauplii) indicates a mesotrophic to early eutrophic water quality state driven by pre-monsoon stagnation.*

Keywords: Microfauna, Bioindicators, Rotifera, Zooplanktons

I. INTRODUCTION

Freshwater ecosystems in the semi-arid Vidarbha region of Maharashtra experience intense hydrologic and atmospheric fluctuations. In Yavatmal district, located within the Godavari-Penganga basin, small lentic waterbodies face severe ecological pressure during the pre-monsoon dry season [4] [5] [8] [9]. Elevated ambient temperatures and high evaporation rates significantly reduce water volume, resulting in increased conductivity, alkalinity, and concentrated organic materials [9].

Within this regional setting, the campus of Amolakchand Mahavidyalaya, Yavatmal (established in 1956), spans 39 acres and includes extensive botanical gardens that contribute organic leaf litter to surface runoff. The campus waterbody functions as a natural catchment and an educational site for undergraduate and research studies in the Department of Zoology.

Microscopic invertebrates, including protozoans, rotifers, micro-crustaceans, and helminth stages, occupy key positions in aquatic food webs [8]. They transfer energy from primary producers and bacteria to higher trophic levels and respond quickly to environmental changes. Qualitative identification of these organisms provides a direct measure of water quality and ecological health [2] [8]. This paper documents the pre-monsoon microfaunal diversity of the campus waterbody to establish a baseline for continuous biomonitoring and institutional water conservation.

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II. MATERIALS AND METHODS

A. Sample Collection and Field Protocols

Sampling was conducted during the peak pre-monsoon phase at the campus waterbody of Amolakchand Mahavidyalaya, Yavatmal. To minimize diurnal migration effects, surface and subsurface water samples were collected during early morning hours. A total of 50 liters of water was filtered through a standard silk bolting cloth plankton net (mesh size 64µm, No. 25) to concentrate the microscopic specimens [3] [8]. The concentrated filtrate was transferred into clean polyethylene bottles and preserved immediately on-site with 4% neutral buffered formalin to prevent cellular degradation [1] [4] [8].

B. Microscopic Identification

Laboratory analysis was carried out in the B.Sc. Zoology Laboratory of Amolakchand Mahavidyalaya. Individual drops of the concentrated samples were placed on cavity slides and examined under compound light microscopes equipped with ocular micrometers. Taxonomic identification down to the level of genus, species, or developmental stage was performed using standard taxonomic keys, monographs, and identification manuals for Indian freshwater microfauna [8].

III. OBSERVATION

Observed Microfauna:

Photoplate: Photographic evidence of observed microfauna


Vorticella sp


Colopoda sp.


Balantidium coli (Trophozite)


Flagellate protozoan


Daphnia/Moina sp (Ephippium/Resting egg)


Cyprieis torosa


Cypris larva


Cyclops sp (Nauplius larva)


Cyclops sp.


Brachionus calyciflorus


Brachionus quadridentatus


Brachionus caudatus


Brachionus plicatilis


Keratella testudo


Keratella quadrata


Keratella cochlearis

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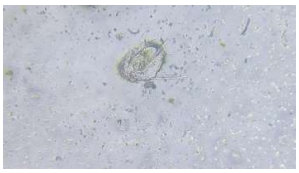
Cephalodella sp


Monommeta longiseta

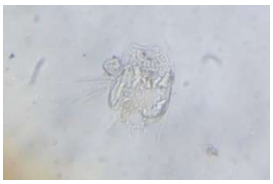

Colurella adriatica

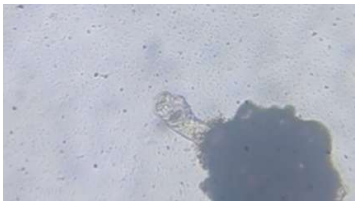

Polyarthra vulgaris


Polyarthra remata


Polyarthra dolichoptera


Trichocerca longiseta


Hexarthra sp


Bdelloidea sp


Trematode egg

IV RESULTS AND DISCUSSION

Microscopic analysis of the pre-monsoon water samples yielded 26 recorded observations. The full taxonomic classification, structured systematically across Kingdom, Phylum, Sub-Group, Class, Order, Family, and Genera/Species, is presented in Table 1.

Table 1. Taxanomic Classification of Microfauna identified in the Campus Waterbody

Kingdom	Phylum	Sub-Group	Class	Order	Family	Genera and species
Protista	Ciliophora	Ciliata	Oligohymenophorea	Peritrichida	Vorticellidae	*Vorticella* sp.
			Colpodea	Colpodida	Colpodidae	*Colpoda* sp.
			Litostomatea	Trichostomatida	Balantidiidae	*Balantidium coli* (Trophozoite)
	Sarcomastigophora	Mastigophora	Unspecified	Unspecified	Unspecified	Flagellate protozoan (Trophozoite)
Animalia	Arthropoda	Crustacea	Branchiopoda	Anomopoda	Daphniidae	*Daphnia* / *Moina* sp. (Ephippium / Resting Egg)
			Ostracoda	Podocopida	Cytherideidae	*Cyprideis torosa*
			Thecostraca	Sessilia	Unspecified	Cypris larva
			Hexanauplia	Cyclopoida	Cyclopidae	*Cyclops* sp. (Nauplius larva)
						Cyclops sp.
	Rotifera	Eurotatoria	Monogononta	Ploima	Brachionidae	*Brachionus calyciflorus*
						Brachionus quadridentatus

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Kingdom	Phylum	Sub-Group	Class	Order	Family	Genera and species
						Brachionus caudatus
						Brachionus plicatilis
						Keratella testudo
						Keratella quadrata
						Keratella cochlearis
					Notommatidae	*Cephalodella sp.*
						Monommata longiseta
					Lepadellidae	*Colurella adriatica*
					Synchaetidae	*Polyarthra vulgaris*
						Polyarthra remata
						Polyarthra dolichoptera
					Trichocercidae	*Trichocerca longiseta*
				Floscullariacea	Hexarthridae	*Hexarthra* sp.
			Bdelloidea	Bdelloida	Unspecified	*Bdelloidea* sp.
	Platyhelminthes	Neodermata	Trematoda	Unspecified	Unspecified	Trematode egg

Ecological Dynamics and Bioindicator Analysis

A. Protozoan Assemblages

The protozoan fauna identified includes sessile and free-swimming ciliated species alongside motile flagellates. *Vorticella* sp., a stalked ciliate, feeds on free-swimming bacteria in organically enriched waters. Its presence suggests active bacterial decomposition of organic leaf litter originating from the campus gardens. *Colpoda* sp. is a common soil and freshwater ciliate adapted to temporary or shrinking waterbodies, while the parasitic ciliate *Balantidium coli* (trophozoite stage) indicates organic inputs of animal origin or surface runoff into the pond. Unspecified motile flagellate trophozoites further confirm the presence of dissolved organic nutrients supporting micro-heterotrophic activity.

B. Rotifera Dominance and Water Quality Trends

Rotifers formed the most taxonomically diverse phylum in the pre-monsoon samples. This pattern aligns with limnological studies in the Yavatmal region, where rotifers dominate during periods of high temperature and low water volume.

The family Brachionidae was represented by *Brachionus calyciflorus*, *Brachionus quadridentatus*, *Brachionus caudatus*, and *Brachionus plicatilis*, as well as *Keratella testudo*, *Keratella quadrata*, and *Keratella cochlearis*. Species like *Brachionus calyciflorus* and *Brachionus caudatus* are established bioindicators of eutrophic water conditions and high organic enrichment. *Keratella cochlearis* is similarly adapted to warm, nutrient-rich conditions typical of pre-monsoon stagnation.

Littoral and soft-bodied rotifers, including *Cephalodella* sp., *Monommata longiseta*, *Colurella adriatica*, *Trichocerca longiseta*, and *Polyarthra* species (*P. vulgaris*, *P. dolichoptera*, *P. remata*), indicate the presence of submerged organic detritus and littoral microhabitats. The semi-planktonic *Hexarthra* sp. and members of the class Bdelloidea exhibit high physiological tolerance to elevated water temperatures and dry-season desiccation.

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C. Micro-Crustaceans and Parasitic Inclusions

Micro-crustaceans were represented by Cladocera, Ostracoda, and Copepoda:

- **Cladocera:** Identified primarily through ephippia (resting eggs of *Daphnia* or *Moina*). The transition from parthenogenetic live-bearing to ephippial egg production is an adaptation to environmental stress, triggered by rising water temperatures, crowding, and evaporation during late pre-monsoon conditions.
- **Ostracoda:** Represented by *Heterocypris incongruens*, *Cyprideis torosa*, and an unattached Cypris larval stage. These benthic organisms scavenge on organic detritus and recycled organic mud at the pond bottom.
- **Copepoda:** Represented by adult *Cyclops* sp. and abundant *Cyclops* nauplius larvae. Adult cyclopoids act as predators on smaller rotifers, while the high density of nauplii demonstrates active reproduction during warm pre-monsoon conditions.

Finally, the presence of a flatworm egg (Trematode egg) points to host-parasite interactions involving local avian or terrestrial vertebrates that frequent the campus waterbody, illustrating an ecological linkage between the aquatic habitat and surrounding terrestrial fauna.

V. CONCLUSION

The qualitative microscopic study of the pre-monsoon waterbody at Amolakchand Mahavidyalaya, Yavatmal, reveals a diverse microfaunal community adapted to seasonal environmental stress. The co-occurrence of bioindicator rotifers (*Brachionus* spp., *Keratella* spp.), ciliates (*Vorticella* sp., *Colpoda* sp.), cladoceran ephippia, and benthic ostracods indicates a mesotrophic to early eutrophic water quality profile driven by nutrient concentration and organic inputs during summer stagnation

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