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Studies on Wetlands of Kolhapur District, Maharashtra, India: Physicochemical Characteristics, Biodiversity and Conservation Aspects

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Abstract: *Wetlands are highly productive ecosystems that provide essential ecological services such as water purification, nutrient cycling, flood control, and biodiversity support. Kolhapur district of Maharashtra contains several natural and man-made wetlands that play an important role in maintaining regional ecological balance. The present study evaluates physicochemical parameters, biological diversity, and anthropogenic impacts on selected wetlands of Kolhapur district. Seasonal sampling was carried out from 2022 to 2024. Water quality parameters including temperature, pH, dissolved oxygen (DO), biological oxygen demand (BOD), nitrate, phosphate, and turbidity were analyzed using standard methods. Aquatic macrophytes, macroinvertebrates, and avifauna were also recorded. Results indicate moderate nutrient enrichment and high biological diversity in perennial wetlands, while seasonal wetlands exhibited ecological stress. The study emphasizes the need for sustainable wetland management and conservation strategies.*

Keywords: Wetlands, Kolhapur, water quality, biodiversity, conservation

I. INTRODUCTION

Wetlands are transitional ecosystems between terrestrial and aquatic environments and are among the most productive ecosystems on Earth (Mitsch & Gosselink, 2015). They perform vital ecological functions such as flood regulation, groundwater recharge, nutrient cycling, carbon sequestration, and habitat provision for diverse flora and fauna (MEA, 2005; Ramsar Convention Secretariat, 2016). Globally, nearly one-third of wetlands have been lost due to land conversion, pollution, and hydrological alterations (Davidson, 2014). India harbors approximately 15.3 million hectares of wetlands, supporting significant biodiversity and livelihood resources (ISRO, 2011). Wetlands of Maharashtra are ecologically important as they form part of the Deccan plateau and Western Ghats eco-region (Prasad *et al*., 2017). Previous studies have reported water quality and biodiversity of wetlands in Maharashtra (Kadam & Patil, 2019; Kulkarni *et al*., 2020). However, systematic ecological investigations of wetlands in Kolhapur district are limited. Rapid urbanization, agricultural runoff, and unregulated resource use are posing serious threats to these ecosystems. Therefore, the present study aims to provide baseline ecological information on selected wetlands of Kolhapur district.

II. STUDY AREA

Kolhapur district is located between 16°40′–17°22′ N latitude and 73°40′–74°30′ E longitude in southern Maharashtra. The region receives an average annual rainfall of 1000–2500 mm and lies within the Krishna river basin. Five representative wetlands were selected for the study namely Warana River floodplain wetland, Dhol Tank (Ichalkaranji), Bhuinj Tank, Kumbhi Tank and Seasonal marshes of Panhala

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III. MATERIALS AND METHODS

Sampling Design

Seasonal sampling (post-monsoon, winter, and pre-monsoon) was carried out from 2022 to 2024. Triplicate samples were collected from each site.

Physicochemical Analysis

Water samples were analyzed following APHA (2017) methods for Temperature, pH, Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), Nitrate (NO_3^-), Phosphate (PO_4^{3-}), Turbidity

Biological Assessment

It is conducted through aquatic macrophytes: Quadrat method (1 m^2), macroinvertebrates: D-frame net sampling and birds: Line transect and point count methods.

Data Analysis

Shannon–Wiener diversity index (H′), species richness (S), and descriptive statistics were calculated.

IV. RESULTS

Physicochemical Characteristics

Table 1. Mean seasonal water quality parameters of selected wetlands

Parameter	Warana	Dhol	Bhuinj	Kumbhi	Marsh
Temperature (°C)	26.5	27.8	26.9	27.2	28.6
pH	7.4	8.1	7.2	7.6	6.9
DO (mg/L)	6.8	5.6	6.1	6.4	3.9
BOD (mg/L)	2.1	3.4	2.6	2.4	4.2
Nitrate (mg/L)	1.7	2.6	2.1	2.3	3.4
Phosphate (mg/L)	0.11	0.19	0.15	0.16	0.26
Turbidity (NTU)	22	35	28	26	42

Macrophyte Diversity

Table 2. Major aquatic macrophytes recorded

Growth form	Dominant species
Emergent	*Typha angustifolia*, *Phragmites karka*
Submerged	*Hydrilla verticillata*, *Vallisneria spiralis*
Floating	*Nymphaea nouchali*, *Lemna minor*
Amphibious	*Ipomoea aquatica*, *Polygonum glabrum*

Total macrophyte species recorded = **117**

Macroinvertebrates

Table 3. Major macroinvertebrate groups recorded

Order	Representative families
Odonata	Libellulidae, Coenagrionidae
Diptera	Chironomidae, Culicidae
Coleoptera	Dytiscidae, Hydrophilidae
Ephemeroptera	Baetidae

Total families recorded = **32**

Avifaunal Diversity

Table 4. Major bird groups observed

Group	Common species
Herons & Egrets	*Egretta garzetta*, *Ardeola grayii*

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Ducks	*Anas crecca*, *Anas poecilorhyncha*
Waders	*Tringa glareola*, *Charadrius dubius*
Cormorants	*Phalacrocorax niger*

Total bird species recorded = **89**

V. DISCUSSION

The water quality of Kolhapur wetlands indicates near-neutral pH and moderate dissolved oxygen levels, suggesting productive freshwater ecosystems. Elevated nitrate and phosphate concentrations during post-monsoon reflect agricultural runoff and organic enrichment, which may lead to eutrophication (Carpenter *et al*., 1998). Similar trends were reported from wetlands of Maharashtra (Kulkarni *et al*., 2020). Macrophytes play a crucial role in nutrient uptake and habitat structuring (Wetzel, 2001). Higher macrophyte diversity was observed in perennial wetlands due to stable hydrological regimes. Macroinvertebrate diversity reflects good ecological status and serves as a reliable indicator of water quality (Rosenberg & Resh, 1993). Avifaunal richness demonstrates the importance of Kolhapur wetlands as feeding and breeding habitats.

However, anthropogenic pressures such as encroachment, waste disposal, excessive fishing, and invasive species are degrading wetland health. Conservation measures are essential to sustain these ecosystems.

VI. CONCLUSION

Wetlands of Kolhapur district exhibit rich biodiversity but show signs of nutrient enrichment and human-induced stress. Integrated management strategies are urgently required for their sustainable conservation.

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