Aquatic Avifauna in Agroecosystems of the Vidarbha Region, Maharashtra: A Systematic Literature Review

Seema V. Gorkhe
Department of Zoology, G. S. Gawande Mahavidyalaya Umarkhed, Dist. Yavatmal
seemagorkhe17@gmail.com

Sandeep M. Chede
Department of Zoology, G. S. Gawande Mahavidyalaya Umarkhed, Dist. Yavatmal

Abstract
Aquatic avifauna play a crucial role as bioindicators of ecosystem health, nutrient cycling and ecological stability. Agroecosystems integrated with semi natural wetlands, farm ponds, irrigation channels and reservoirs provide vital foraging, breeding and migratory habitats. While bird populations in protected forests and major lakes across Maharashtra have been documented, systematic reviews focusing on agricultural landscapes specifically within the Umarkhed region of Yavatmal District remain limited. This paper synthesizes literature on wetland bird diversity, seasonal distribution, habitat preferences and ecological impacts across Vidarbha. Standard survey methodologies, including line transects and point counts, are reviewed. This review establishes baseline data, identifies research gaps and highlights the need for systematic avifaunal monitoring in agroecosystems.
Keywords: *Aquatic avifauna, Agroecosystems, Wetland ecology, Avian diversity, Umarkhed, Vidarbha, Habitat utilization*

1. Introduction

Birds are vital components of biodiversity, maintaining ecological balance through seed dispersal, pollination, nutrient cycling and biological control of agricultural pests. Aquatic avifauna are particularly effective bioindicators of wetland health because their distribution, abundance and diversity reflect hydrologic and environmental quality. Aquatic habitats such as natural lakes, reservoirs, village tanks, seasonal ponds and irrigation canals provide essential feeding, breeding, nesting and migratory grounds for resident and migratory species.

Agroecosystems function as human-modified landscapes where agricultural fields interlock with natural and artificial water bodies. These systems support rich bird diversity by offering heterogeneous food resources and varied habitat structures outside protected reserves.

The Umarkhed region of Yavatmal District, Maharashtra, features an agriculturally dominated landscape interspersed with seasonal wetlands, irrigation systems, village tanks and small reservoirs. Despite its ecological potential, comprehensive information regarding aquatic bird diversity and community dynamics in this agroecosystem remains scarce. Most previous research in Maharashtra has concentrated on protected national parks, urban lakes or forest ecosystems. This review synthesizes literature across Vidarbha to establish a framework for future empirical studies in Umarkhed.

2. Review of Literature

Recent research across Maharashtra underscores the critical connection between wetland habitats and agricultural surroundings.

Preliminary surveys by Joshi (2011) at Rajura Lake documented rich avifaunal species composition, highlighting the ecological role of freshwater wetlands for resident and migratory birds. In an annotated checklist, Joshi (2012) evaluated Rajura, Godada, and Dhanora lakes, demonstrating that freshwater impoundments serve as key feeding, breeding, and nesting habitats.

Puri and Virani (2016) investigated Khairbandha Lake, reporting high avian diversity and emphasizing the need for wetland conservation. Samrit (2017) examined bird diversity in Chopa Village, revealing that rural ponds and small wetlands maintain localized avifaunal stability.

Ali et al. (2024) documented wetland bird diversity and density variations at Malkhed Lake. Studies by Dahegaonkar (2023) at Ambazari Lake, Nagpur, and Dorlikar & Charde (2019) at Raj Bhavan, Nagpur, confirmed that water bodies support diverse resident and migratory populations. Hinchkhede and Kedar (2013) assessed habitat niche partitioning in Navegaon National Park, illustrating how distinct microhabitats govern avian distribution.

Kasambe et al. (2014) surveyed bird biodiversity in agricultural landscapes across Vidarbha, showing that human-modified farmlands interlinked with irrigation networks serve as functional wildlife corridors.

3. Geographical and Conceptual Research Gaps

Despite growing literature on wetland avifauna in Central India, a critical synthesis reveals noticeable research gaps:

1. **Geographical Imbalance in Yavatmal District:** While Buldhana, Gondia, Amravati, and Nagpur districts have received attention in biological literature, the Umarkhed region of Yavatmal District remains under represented. Detailed, multi season documentation of aquatic bird diversity in agroecosystems of Umarkhed is lacking.
2. **Underestimation of Agroecosystems vs. Protected Areas:** Existing literature focuses heavily on protected reserves (e.g., Navegaon National Park) or major urban lakes (e.g., Ambazari). Semi-natural farm ponds, village tanks and agricultural canal systems are often overlooked, despite their importance for waterbird conservation.
3. **Lack of Long-term Seasonal & Functional Dynamics:** Many existing studies offer short-term checklists without evaluating how seasonal water level changes, crop rotation and agricultural calendar cycles dictate bird foraging and nesting behaviours.

4. Methodological Framework for Avifaunal Assessment:

Synthesizing methodologies from standard ornithological literature (Ali & Ripley, 1987; Ali, 2002; Grimmett et al., 2011; Kazmierczak, 2000) provides a structured approach for field surveys in agroecosystems:

Survey Parameter	Standard Method / Tool	Application in Agroecosystems
Field Sampling	Point Count & Line Transects	Used to record bird abundance along canal banks, lake margins, and agricultural fields.
Visual Identification	Field Binoculars & Photography	Facilitates field identification and plumage verification.
Taxonomic Reference	Field Guides (Ali, 2002; Grimmett et al., 2011)	Used for species identification and status classification.
Statistical Analysis	PAST Software (Hammer et al., 2001)	Evaluates diversity indices and seasonal richness.

Seasonal Dynamics and Habitat Utilization

Avifaunal monitoring in tropical agricultural landscapes requires accounting for three distinct seasons:

1. **Monsoon Season:** Characterized by elevated water levels and increased breeding activity among resident species.
2. **Winter Season:** Characterized by an influx of migratory waterbirds utilizing reservoirs, ponds, and harvested agricultural fields.
3. **Summer Season:** Characterized by drying water bodies, concentrating birds around perennial village tanks and reservoirs.

5. Anthropogenic Threats in Agricultural Landscapes

Aquatic birds in rural agroecosystems face distinct anthropogenic pressures:

Chemical Runoff: Intensive fertilizer and pesticide application in surrounding fields leads to bioaccumulation, reducing aquatic invertebrate populations and impacting bird health.

Habitat Transformation: Encroachment on natural wetland edges for crop cultivation reduces natural nesting cover and mudflats required by shallow water waders.

Hydrological Disruption: Siltation, excessive water extraction for irrigation and seasonal drying of farm ponds disrupt waterbird foraging routines.

6. Conclusion

Agroecosystems and surrounding water bodies serve as vital habitats for resident and migratory waterbirds across Maharashtra. While existing literature underscores the biological importance of agricultural wetlands in the Vidarbha region, there is a clear lack of research in the Umarkhed area of Yavatmal District. Conducting systematic, year-round avifaunal surveys in Umarkhed will help fill this geographical research gap, establish baseline ecological data and support local bird conservation and sustainable land management.

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