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Fish diversity of Nandur Madhmeshwar Bird Sanctuary, Nashik, Maharashtra, India

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Abstract
The current study aimed to evaluate the ichthyofaunal diversity of Nandur Madhmeshwar Bird Sanctuary (NMBS), a Ramsar site which is a freshwater wetland located at the confluence of the Godavari and Kadwa rivers. Primary and secondary research were used to evaluate the ichthyofaunal diversity. A total of 16 fish species were found to be distributed across 6 orders and 9 families. The order Cypriniformes dominated the ichthyofaunal diversity with 37.50% of the total species, followed by the order Siluriformes with 25.00% and Anabantiformes with 18.75%. Economically important fish species, such as *Catla catla, Labeo rohita, labeo calbasu* were also found. The study also found invasive species, such as *Oreochromis mossambicus* and *Cyprinus carpio*. Seasonal hydrological changes and habitat diversity played an important role in the distribution of the ichthyofauna.

Keywords: Ichthyofaunal diversity, Nandur Madhmeshwar Bird Sanctuary, freshwater wetland ecosystem, fish species composition, invasive fish species

Introduction

Freshwater ecosystems occupy a very small proportion of the Earth's surface, yet they support disproportionately high levels of biodiversity, including a substantial diversity of fishes. Freshwater fishes are among the most ecologically important vertebrate groups because they contribute to nutrient cycling, trophic interactions, energy flow, and ecological stability. They are also widely used as biological indicators of environmental quality, since their distribution and diversity are closely linked to hydrology, habitat heterogeneity, physicochemical properties of water, and anthropogenic pressures (Nelson, 1994; Talwar & Jhingran, 1991; Jayalekshmy & Sanalkumar, 2012) [5, 9]. Wetlands are among the most productive ecosystems on Earth and serve as breeding, nursery, feeding, and refuge habitats for numerous aquatic organisms. In India, wetlands are ecologically and economically important because they support fisheries, conserve biodiversity, regulate water flow, and sustain local livelihoods. Fish communities in riverine wetlands are strongly influenced by seasonal hydrology. Flood pulses help animals move, spread out, spawn, and recruit new members, while dry-season contraction can break up habitats and make animals more stressed. Godavari and Kadwa rivers play an important role in maintaining fish diversity within the sanctuary. This interpretation is consistent with the flood-pulse concept proposed for river–floodplain systems, which emphasizes the role of hydrological connectivity in maintaining aquatic productivity and biodiversity (Junk *et al*., 1989; Welcomme, 2001) [7, 11]. Wagh *et al*., 2018 [10] studied freshwater fish fauna from Nandur Madhmeshwar bird sanctuary, Nashik.

Although Nandur Madhmeshwar is widely known for its avifaunal richness, its ichthyofauna has received comparatively less focused scientific attention. The draft reports 14 fish species and notes the dominance of Cypriniformes and Cyprinidae in the system. Freshwater biodiversity is facing escalating threats from habitat modification, eutrophication, invasive alien species, pollution, hydrological regulation, and overexploitation. Numerous global and Indian studies have consistently demonstrated that freshwater fishes rank among the most susceptible faunal groups to contemporary environmental changes (Dudgeon *et al*., 2006; Arthington *et al*., 2016) [1, 4]. In this context, the current study seeks to record the ichthyological diversity of Nandur Madhmeshwar Bird Sanctuary, evaluate its taxonomic structure, examine ecological trends, and recommend conservation strategies for the sustainable management of this Ramsar-designated wetland.

Material and methodology

The present study was carried out in Nandur Madhmeshwar Bird Sanctuary, a Ramsar site, located in the Nashik district of Maharashtra State, 19°48′-19°55′ N latitude, and 74°05′-74°12′ E longitude, and covers an area of 10,000 hectares. The sanctuary consists of different habitats such as reservoirs, marshy wetlands, grasslands, mudflats, and riparian wetlands. The study area comes under a tropical monsoon climate, and annual rainfall ranges from 600 to 700 mm. Hydrologically, this study site is under the influence of the Godavari and Kadwa rivers, providing both lentic and lotic conditions for fish habitats. Flooding during the monsoon season helps to fertilize the water and also provides breeding grounds for fishes. The identification of fish species was done based on morphological characteristics such as body shape, fin structure, scale pattern, and meristic features, following the standard ichthyological literature (Jayaram, 2010; Talwar and Jhingran, 1991) [6, 9].

Results and Discussion

The ichthyofaunal study carried out in Nandur Madhmeshwar Bird Sanctuary recorded 16 species, 6 orders, and 9 families, indicating moderate species richness. The order Cypriniformes was found to be dominant, with 6 species (37.50%) followed by Siluriformes with 4 species (25.00%) and Anabantiformes with 3 species (18.75%). The orders Perciformes, Osteoglossiformes, and

Synbranchiformes contributed one species each (6.25%) to the fish fauna, indicating the dominance of Cypriniformes, a freshwater fish order, in the wetland ecosystem. At the family level, Cyprinidae had maximum dominance with 6 species, followed by Channidae with 3 species. The remaining families, such as Clariidae, Bagridae, Siluridae, Cichlidae, Notopteridae, Mastacembelidae, and Schilbeidae, were represented with one species each. This indicates the low diversity of niches and specialization in the ecosystem.

The presence of invasive species such as *Oreochromis mossambicus* and *Cyprinus carpio* indicates ecological disturbance. These species have high reproductive potential and competitive ability, which may affect native species diversity. Bansod *et al*., 2024A [2] and Bansod *et al*., 2024B [3] also recorded Cypriniformes as dominant order in the study. Cyprinidae family dominance is also recoreded in many studies (Mohan *et al*., 2013; Jain *et al*., 2013).

Table 1: Ichthyofaunal diversity from Nandur Madhmeshwar bird sanctuary

Sr. No.	Common Name	Scientific Name (with Author)	Order	Family
1	Tilapia Mozambique	*Oreochromis mossambicus* (Peters, 1852)	Perciformes	Cichlidae
2	Bronze Featherback	*Notopterus notopterus* (Pallas, 1769)	Osteoglossiformes	Notopteridae
3	Spotted Snakehead	*Channa punctata* (Bloch, 1793)	Anabantiformes	Channidae
4	Striped Snakehead	*Channa striata* (Bloch, 1793)	Anabantiformes	Channidae
5	Dwarf Snakehead	*Channa gachua* (Hamilton, 1822)	Anabantiformes	Channidae
6	Common Carp	*Cyprinus carpio* Linnaeus, 1758	Cypriniformes	Cyprinidae
7	Rohu	*Labeo rohita* (Hamilton, 1822)	Cypriniformes	Cyprinidae
8	Catla	*Catla catla* (Hamilton, 1822)	Cypriniformes	Cyprinidae
9	Olive Barb	*Puntius sarana* (Hamilton, 1822)	Cypriniformes	Cyprinidae
10	Calbasu	*Labeo calbasu* (Hamilton, 1822)	Cypriniformes	Cyprinidae
11	Mola Carplet	*Amblypharyngodon mola* (Hamilton, 1822)	Cypriniformes	Cyprinidae
12	Walking Catfish	*Clarias batrachus* (Linnaeus, 1758)	Siluriformes	Clariidae
13	Gangetic Mystus	*Mystus cavasius* (Hamilton, 1822)	Siluriformes	Bagridae
14	Freshwater Shark	*Wallago attu* (Bloch & Schneider, 1801)	Siluriformes	Siluridae
15	Zig-zag Eel / Spiny Eel	*Mastacembelus armatus* (Lacepède, 1800)	Synbranchiformes	Mastacembelidae
16	Two-spot Catfish	*Callichrous bimaculatus* (Bloch, 1794)	Siluriformes	Schilbeidae

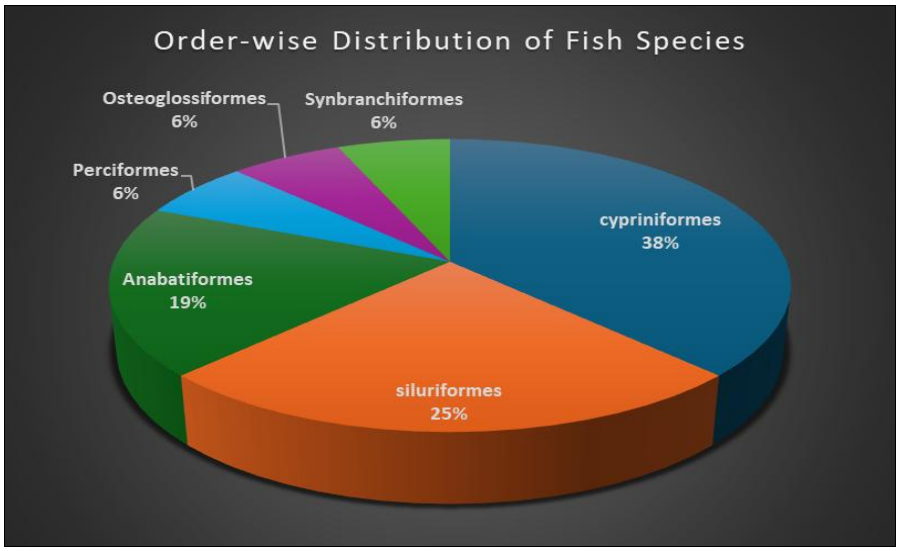

Fig 1: Order-wise Distribution of Fish Species at Nandur Madhmeshwar bird sanctuary

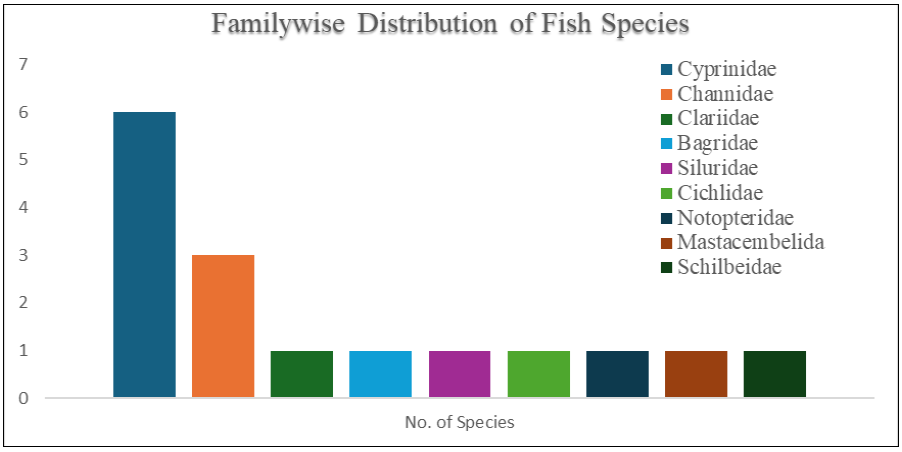

Fig 1: Family-wise Distribution of Fish Species at Nandur Madhmeshwar bird sanctuary

Based on the findings, it is recommended that effective conservation measures, including regulation of fishing activities, control of invasive species, habitat protection, and regular monitoring of water quality, should be implemented. Community awareness and participation should also be encouraged to ensure sustainable utilization and long-term conservation of this Ramsar wetland ecosystem.

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