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Study of fish diversity and water quality assessment from Gorewada Lake, Nagpur, Maharashtra

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Abstract
Water is essential for life and has numerous benefits, including providing aquatic and human life minerals. Lakes are the most significant freshwater resource, providing critical water for various uses such as drinking water, domestic use, and pisciculture infrastructure. However, eutrophication is a recognised water quality issue due to their limited self-purification ability and rapid contamination. The study aims to examine the variety of fish species and assess Gorewada Lake's water quality, focusing on its cleanliness and scenic beauty. In the study conducted in Gorewada Lake Nagpur, India, ten distinct fish species belonging to three different orders were found (Cypriniformes, Perciformes, Clupeiformes). Various physical and chemical parameters (pH, Dissolved oxygen, CO_2 and Chlordes) revealed that anthropogenic activities are the primary cause of the lake's aquatic variety, with neutral pH and safe drinking water.

Keywords: Fish diversity, lakes, water quality, Gorewada Lake, Nagpur

Introduction
Life requires water to survive. In terms of nutrition, it has minerals that are beneficial to both aquatic and human life. Water is becoming more and more in demand in several ways as a result of its many uses. The most significant freshwater resource is lakes, which provide several advantages. Lake water is vital to aquatic life and is utilized for industrial, agricultural, and residential uses. Discharges of waste from cities, industries, and agriculture increase the amount of chemicals in water resources, changing their physicochemical properties and hastening eutrophication because of nutrient-rich materials like nitrogen and phosphorus (Rao and Valsaraj, 1984) [13]. Lentic water bodies are crucial for drinking water, domestic use, and pisciculture infrastructure, but eutrophication is a recognized water quality issue. (Kim *et al*., 2006; Koorosh *et al*., 2008) [9]. Because lakes have a limited ability for self-purification and quickly become contaminated, their ecology is more delicate (Marganwar *et al*., 2012) [11]. The lakes sustain both terrestrial and aquatic vegetation and animals. Lakes preserve and promote a high level of regional biodiversity by providing significant fresh habitats for the local flora and wildlife. A vast array of animals depends on the biodiversity of freshwater lakes, which are home to fish, zooplankton, phytoplankton, and water insects which are food of fish (Jadhav *et al*.,2022) [10]. Lakes are vital to the preservation of a high level of regional biodiversity because they provide watery habitats for aquatic plants and animals. Contamination of water bodies can alter trophic status, making them unsuitable for aquaculture. Regular monitoring of water quality parameters is crucial for determining lake status for fish culture (Iwama *et al*., 2000; Basavaraja *et al*., 2014) [6]. Many antibiotic resistance bacteria may be found on fish bodies (Deshmukh *et al*.,2024) [4].
Water quality significantly influences aquatic plant and animal growth in streams, lakes, and lakes, influenced by physical, chemical, and organic characteristics. The goal of the current study is to examine the variety of fish species and assess Gorewada Lake's water quality.

Materials and methodology
Study area
Nagpur city second capital of the state of Maharashtra is located geographically centre of India. It has dry subtropical monsoon climate conditions and receives an annual rainfall of 1,205 mm (47,44 in) in monsoon (Geo, Inf. Nat Inf. Centre, 2006). The city has various water bodies and its limit which harbours a variety of huge and diverse avifauna. Gorewada Lake situated on the north-western end of Nagpur city is a water body that attracts people to its serene locale. The freshwater lake used primarily as a source of drinking water supply belongs to the waterworks department that maintains the site and is responsible for its upkeep. Considered one of the best sources of drinking water, research suggests it to be the cleanest of the lakes in Nagpur. Established as a water works department's project in 1911, the lake was rich with thick vegetation around it. It was an important habitat for migratory ducks. Gorewada is about 15 km from Nagpur and is looked upon as an excellent excursion spot. It extends over 1912 hectares of reserved forest on the outskirts of Nagpur city. The land is well drained and forms catchments of Gorewada Lake. The annual average rainfall of the area is 900mm. and the annual mean temperature varies from 10°C minimum to 45°C maximum. The land under consideration has scenic beauty.

Methodology
Collection of water samples
Water samples were collected from the floor of Gorewada for Physical and chemical parameters of water.

Collection of fish identification of fish
Fishes were collected from the fishermen who were allowed to fish from the Gorewada lake. Fishes were collected using Tangadi Jaal (Fishing net), net trapping or by hand picking method. Collected fishes were photographed and identified using the fin formula and its morphological characters such as pattern of mouth, body shapes and scales, number of barbles and the kind of tail (such as homocercal or

heterocercal tail). Collection and identification were done every week. After identification and photographing, the fish were returned to the fishermen from whom the fishes were procured.

During the study, the measurement of the body parts and scale counts were made according to Hodges (2012) [5]. By convention, the measurement was done on the left side of the fish when possible. The different lengths that were taken into consideration like Counts and measurements (Scale counts, Lateral-line scale counts, Scales above and below the lateral line, Caudal peduncle scale rows, Fin element count, Dorsal and anal fin count, Caudal fin rays count, Paired fin rays count, Gill raker counts, Pharyngeal tooth count, Head pore counts, Body measurements, Standard length, Total length, Head length, Head depth, Head width). Identification of fish species by referring Day (1978) [3] and Jayaram (1999) [7]; Talwar and Jhingran (1991) [14]; Datta Munshi and Srivastava (1988) [2].

Physical and chemical parameters of water

For the present study, different physical and chemical parameters were taken into consideration. The temperature of the water was measured using a thermometer from all the different spots during the time of collection of the water sample. The pH of the water sample was measured using pH meter. Dissolved Oxygen was measured using Wrinkler's method (APHA, 1989) [1]. Carbon dioxide was measured by the tri-iodometric method. The Mohr Method was used to measure chloride in a water sample.

Result and discussion

Fish diversity

Total 10 fish species were identified from Gorewada Lake, Nagpur from different three orders (Cypriniformes, Perciformes, Clupeiformes), identified species were *Catla catla, Labeo rohita, Labeo dussumieri Cirrhinus mrigala, Mystus seenghala, Mystus cavasius, Oreochromis mossambicus, Abbassis nama, Glossogobius giuris.*

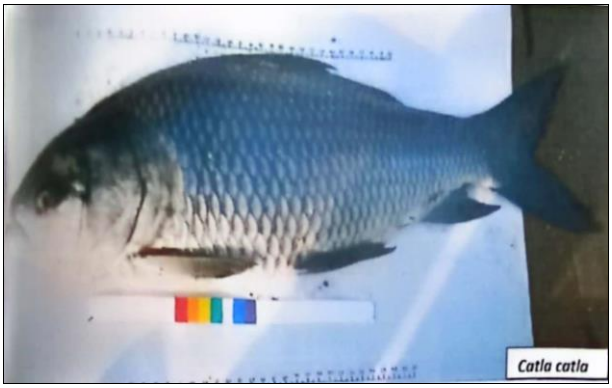
Table 1: Fish diversity from Gorewada Lake, Nagpur

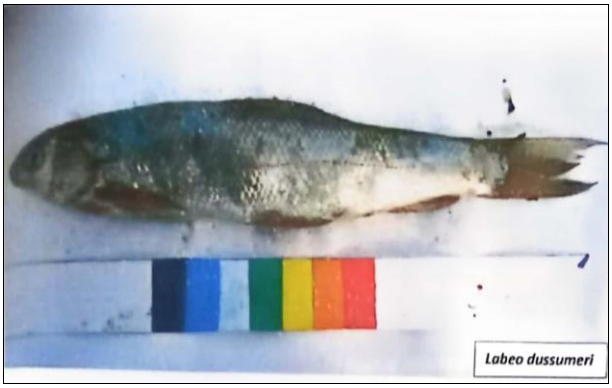
Sr. No	Common Name	Order	Suborder	Scientific Name
1.	Katla	Cypriniformes	Cyprinoidei	*Catla catla*
2.	Rohu			*Labeo rohita*
3.	-			*Labeo dussumieri*
4.	Mrigala			*Cirrhinus mrigala*
5.	Tengra		Siluroidei	*Mystus seenghala*
6.	Tengra			*Mystus cavasius*
7.	Tilapia	Perciformes	-	*Oreochromis mossambicus*
8.	-			*Abbassis nama*
9.	-			*Glossogobius giuris*
10.	-	Clupeiformes	-	*Notopetrus kapirat*

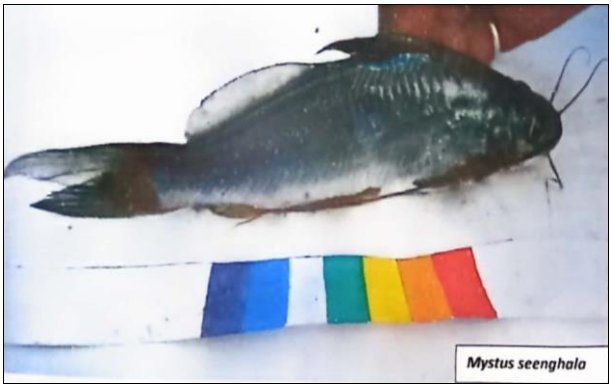
Table 2: Physical and chemical parameters of water

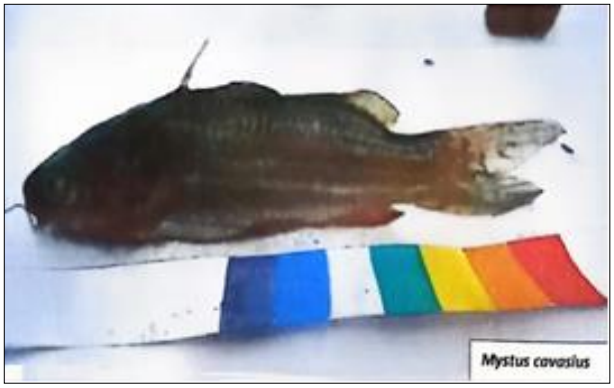
Sr. No		Location 1			Location 2			Location 3			Location 4			Location 5			Location 6		
	Season Parameters	S	W	M	S	W	M	S	W	M	S	W	M	S	W	M	S	W	M
1	Temperature (°C)	34	21	27	36	22	28	33	21	28	34	23	31	33	22	30	35	21	28
2	pH	7.9	7.6	7.5	8.1	7.4	7.4	7.9	7.3	7.1	8.0	7.4	7.0	8.2	7.9	7.4	8.4	8.1	8.0
3	Dissolved Oxygen (mg/l)	5.6	6.9	7.0	5.4	6.8	7.6	5.4	8.2	8.0	5.2	8.1	7.9	5.0	7.8	8.0	5.1	8.0	7.8
4	Carbon dioxide (in ppm)	32.0	29.9	28	32.1	31.1	26	33.2	29.9	25.5	30.1	39.9	32.3	33.3	32.8	25.0	28.3	31.8	29.2
5	Chloride (mg/lit)	25.4	17.2	16.2	32.1	21.1	19.9	29.8	17.3	16.3	28.0	18.1	18.9	30.3	21.0	21.1	32.0	18.5	18.1

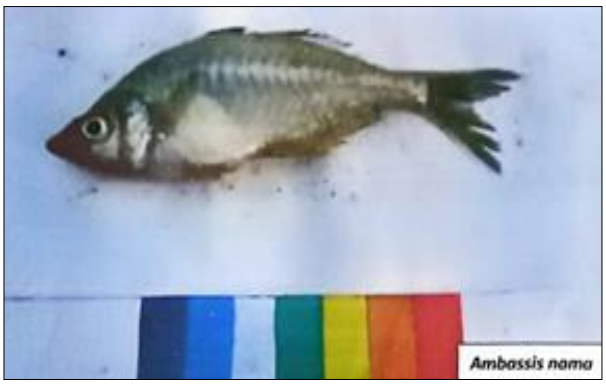
Anthropogenic activities were shown to be the primary cause of the lake's aquatic variety, with only a minor impact. A physico-chemical water analysis revealed that Gorewada Lake's pH is neutral. In addition to being safe to drink, water may be utilised in industry and agriculture. Fish can no longer thrive in the lake's water quality due to an overabundance of zooplankton and altered microbial flora. The low dissolved oxygen value suggests an imbalance in the aquatic vegetation and fauna as well as a high rate of organic waste breakdown. The Department of Forests only proposes to prohibit fishing and artificial breeding in the lake to preserve biodiversity for the proposed Gorewada International Zoo. here is only a restriction on fishing and artificial breeding in the lake from the Department of Forest.

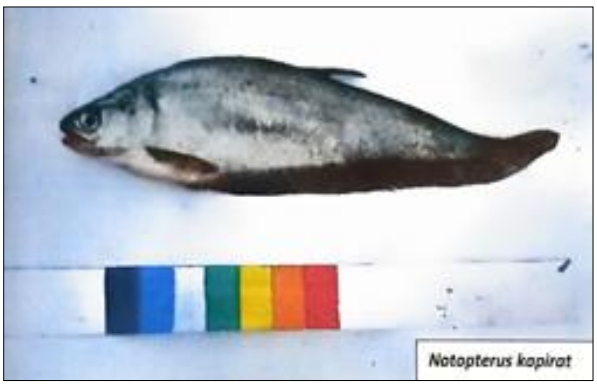












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