

CONSERVATION, MANAGEMENT AND REHABILITATION ASPECTS ON THE FISH DIVERSITY OF UPPER LAKE, BHOPAL, INDIA

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Abstract:

Conservation and biodiversity is regarded as one of the major issues of enabling sustainable use of natural resources. This work focuses on the conservation of the fish population in this freshwater Lake. The anthropogenic pressure and sewage coming from the catchment area have affected its fishery potential and water quality as well. The study revealed the occurrence of 27 fish species belonging to 4 orders namely Cypriniformes (21), Ophiocephaliformes (3), Perciformes (2) and Mestacembeliformes (1) and nine families namely Cyprinidae (17 species), Ophiocephalidae (3 species), Cobitidae, Heteropneustidae, Siluridae, Bagridae, Mestacembelidae, Gobidae, Ambassidae (1 species) and 16 genera.

Key words:- Upper Lake, fish population, Diversity, Conservation, Sewage and catchment area.

Introduction:-

Water is a life-giving elixir. Water is the "mother of all living planets" since it oversees the evolution and activities of the universe on Earth. The majority of water on the planet is saltwater, and just a little amount of pure water occurs in nature. Freshwater fishes are one of the most endangered taxonomic groups (Darwall and Vie, 2005) due to their great sensitivity to changes in aquatic behaviours, both quantitatively and qualitatively (Laffaile et al., 2005; Sarkar et al; 2008; Kang et al., 2009). India is one of the world's mega biodiversity countries, and it ranks ninth in terms of freshwater mega biodiversity (Mittermeir et al., 1997). Fish are susceptible to water chemistry changes caused by various human activities in their watershed. In comparison to simpler species, fish reactions to environmental disturbances such as hydro-morphological variables differ in time and space because they are integrated over long periods of time.

Because of its ease of identification and economic worth, fish has been selected as a good candidate for biological evaluation (Silas 1951; Smith et al., 1999, Siligato and Bohmer 2001., and Vibhute 2016). Conservation efforts to ameliorate the effects of the pressures have been delayed and ineffective, and as a result, many species are fast decreasing (Venkateshwarlu 2014). Not only because of their iconic value, but also because of their sensitivity to subtle environmental changes, fish have been regarded as an effective biological indicator of environmental quality and anthropogenic stress in aquatic ecosystems (Simon and Lyons, 1995; Bhat, 2003; Jayalekshmy and Sanalkumar, 2012). They demonstrate a diverse variety of community tolerance.

Material and Methods:- During the years 2010-2012, the current research was done with the goal of recording the fish variety of Upper Lake. The Upper Lake Bhopal was built by Raja Bhoj in the 11th century by erecting an earthen dam over the Kolans River. It is India's oldest artificial lake. It is the city of Bhopal's primary supply of portable water. Between 23° 12, 0" N latitude and 77° 18, 0" E longitude is

the Upper Lake. During the current investigation, fish samples were gathered early in the morning from local fisherman living along the Upper Lake's shores.

Result and Discussion:- A total of 27 fish species were identified during the examination of Upper Lake's fish diversity, which were categorised into four orders, nine families, and sixteen genera. There are twenty-one species of Cypriniformes, three species of Ophiocephaliformes, two species of Perciformes, and one species of Mastacembeliformes. The Ophiocephalidae family is subdominant, while the Cyprinidae family is dominant. Ophiocephalidae has three species (11.11 percent), followed by Cobitidae, Heteropneustidae, Siluridae, Bagridae, Mastacembelidae, Gobiidae, and Ambassidae, each with one species. Meena et al., (2013) swkt papr looked into the ichthyofaunal diversity of the Bhopal district and found 45 species belonging to 18 families, 7 orders, and 32 genera, which is nearly equivalent to the findings of this study. According to Napit et al., (2013), Cypriniformes (29 species) dominated the Ichthyofauna of Upper Lake Bhopal, followed by Ophiocephaliformes (5 species), Perciformes (4 species), and other order.

Table 1. Systematic Position of fish species of Upper lake in the present study

Order	Family	Species Name	Individuals	%age	
Cypriniformes	Cobitidae	Nemacheilus botia	1	0.32	
		Cyprinidae	Chela labuca	10	3.24
			Rasbora daniconius	6	1.94
			Garra gotyla	12	3.88
			Puntius sophore	108	34.95
			Puntius conchonus	21	6.80
			Puntius sarana	15	4.85
			Puntius filamentosus	8	2.59
			Puntius chola	1	0.32
			Puntius chrysopterus	1	0.32
			Puntius ticto	15	4.85
			Amblypharyngodon mola	4	1.29
			Amblypharyngodon microlepis	1	0.32
			Danio devario	10	3.24
			Labeo bata	25	8.09
			Labeo boga	15	4.85
			Labeo calbasu	17	5.50
			Aspidoparia jaya	5	1.62
		Heteropneustidae	Heteropneustes fassilis	6	1.94
		Siluridae	Ompok bimaculatus	2	0.65
		Bagridae	Mystus cavasius	1	0.32
Mastacembeliformes	Mastacembelidae	Mastacembelus armatus	1	0.32	
Perciformes	Gobiidae	Glossogobius giurus	3	0.97	

	Ambassidae	Chanda ranga	6	1.94
Ophiocephaliformes	Ophiocephalidae	Channa punctatus	8	2.59
		Channa gachua	4	1.29
		Channa striatus	3	0.97
Total			309	100

Sharma and Borana (2014) investigated the biodiversity and composition of ornamental fish fauna in the lake and detected 56 fish species, 36 of which were decorative. The order Cypriniformes was the most abundant, with 15 species, followed by Perciformes (12 species), Siliuriformes (5 species), and Beloniformes (1 species). Sharma and Borana (2014) studied the biodiversity and composition of ornamental fish fauna and discovered a total of 56 fish species in the lake, 36 of which had ornamental value. The order Cypriniformes was the most abundant, with 15 species, followed by Perciformes (12 species), Siliuriformes (5 species), and Beloniformes (1 species).

Increased development of algae and plants occurs when phosphates are put into water systems at greater concentrations. Algae tends to develop swiftly when nutrients are abundant. Each algae has a limited life cycle, after which it begins to decompose dead organic materials. Low oxygen conditions occur from this procedure. If the quantity of dissolved oxygen in the water drops too low, a large number of plants and animals will perish. Excessive nutrient loading has become a key cause of freshwater ecosystem change.

Because of nutrient enrichment from its catchment area, Upper Lake waters have a high trophic status. As a result of human stress in the watershed region, Upper Lake has become eutrophic. Pollution, eutrophication, alien species invasion, overexploitation, and flow alteration are also serious threats to fish diversity, according to Leveque et al., (2008). The Shannon-Weaver index is a sensitive pollution measure. Because of pollution and other unfavourable environmental circumstances, it was extremely low, suggesting that fish diversity in Upper Lake is quite low.

Conclusion:-

CONSERVATIONAL MANAGEMENT AND REHABILITATION SUGGESTIONS:-

Human activities in the globe are putting freshwater ecosystems and biodiversity under significant peril. The development of effective control and management strategies that permit life cycle success, dispersion, and population maintenance within the systems must be the major goal for sustainable conservation of freshwater Ichthyofaunal variety in nature reserves. Human activity has the potential to impact biological, physical, and chemical processes, as well as the ecosystem of lakes. The current study supports the assertion that suitable bench-mark sites and a long-term monitoring procedure are required for long-term management and conservation of the fish fauna of nature reserves and other protected areas in Jiangxi Province (Jang et al., 2003) thesis. Illegal fishing, catchment runoff, and direct discharge of untreated sewage from densely inhabited communities and agricultural operations, as well as tourism demand, are all having an influence on the Upper Lake's biodiversity and ecosystem. As Hynes (1960) said in his study, the combination of these danger variables has an impact on biodiversity and puts freshwater biodiversity in particular jeopardy.

SUGGESTIONS:

To avoid soil erosion and biodiversity loss, deforestation and overgrazing should be effectively regulated.

Construction and human occupancy should be forbidden along the Upper Lake catchment region, according to a watershed management plan. The encroachment of large parts of the lake into paddy fields and vegetable gardens should be halted. As a result, management efforts must be focused on ensuring that only treated effluents are discharged into the lake. Activities that produce inorganic effluents that end up in the Lake should be avoided. To avoid overexploitation, effective enforcement of mesh size and fishing gear standards is critical.

To maintain the fish biodiversity of this Lake, strict management techniques and widespread public awareness are required. Conduct environmental impact assessments on a regular basis to guarantee lake conservation and long-term resource utilization.

CONCLUSION: The documentation of biodiversity has become an increasingly crucial part of understanding diverse ecosystems and their impacts. The results of this study suggest that Upper Lake has a diverse and rich fish fauna, despite the fact that it has a record dispersion, with the Cyprinidae accounting for 88.67 percent of the entire population. The Lake's fish variety is dwindling as a result of human activity. A long-term management plan should be implemented to preserve this natural asset.

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