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Assortment of macrozoobenthic diversity in lower Lake of Bhopal, Madhya Pradesh, India

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Abstract
This study was carried on to look over the current position of macrozoobenthic diversity of lower Lake of Bhopal. The current analysis on Lower Lake of Bhopal with respect to its macrozoobenthos brought to light a total of 28 species during winter season (Dec 2020 to Feb 2021). The macrozoobenthos species fell into 7 orders and 18 families. Up to 24 of macrozoobenthos have been observed in the vegetated site and at least 4 species have been registered at interrupted site. The macrozoobenthos from the order Odonata had dominion over the Lepidoptera.

Keywords: Macrozoobenthos, lower lake, diversity

Introduction
Wetlands are bassinets of bio-diversity providing water supply and basic production on which innumerable variety of flora and fauna survive (Prakash, 2020) [8]. India's inland wetlands are home to over 500 species of macrozoobenthos mainly defined by Tricoptera (Caddisflies), Ephemeroptera (mayflies) and Odonata (Dragonflies) (Subramanian and Sivaramakrishnan, 2007) [12]. The macrozoobenthos community is an essential component and authentic indicator of the biotic integrity of marine ecosystems. Macrozoobenthos especially reside in water and complete part of their life cycle almost there. We have approximately 751,000 familiar macrozoobenthic species constituting nearly three-quarters of all animals on earth, inhabiting both land and water habitats (Westfall and Tennessen, 1996) [14]. These macrozoobenthic species can resist rigor and harshness of surroundings and are capable of living under all climatic circumstances (Polhemus, 1979) [7]. Being diverse in nature, macrozoobenthos respond often in a predictable and strong way to human impacts on the water ecosystem. For surveillance of aquatic ecosystems, they serve as a workable instrument in biology because they have a large array of sensibilities to changing physiochemical parameters and circumstances of habitat (Thoker *et al*. 2015) [13]. Macrozoobenthos have a great ecological importance and help in maintenance of ecosystem functions for example, in material cycling in sediments and transfer of energy in food webs. The richness of macrozoobenthic diversity specifies the healthy status of lake owing the availability of water and safe habitat. So As the principal biomarkers of freshwater bodies the occurrence or the lack of some of macrozoobenthos can forecast the status of water body whether polluted or healthy as physiochemical and biological properties of water affect them and are used as feed of fish, other invertebrates and pathogen carriers for animals and people (Foil, 1998; Chae *et al*. 2000) [1]. Macrozoobenthos improve biogeochemical cycles; help communities of superior organisms such as frogs, fish and others through their nutrition plan (Kumar, 2014) [4]. Thus the present study has been carried out with the aim to identify and enlist various species of macrozoobenthos residing in the Lower Lake which may provide a baseline for the future management of the Lake.

Study Area
The Lower Lake also called as Chhota Talaab (coordinates; 23016`0``N 77025`0``E) is a Lake at Bhopal, The capital of Madhya Pradesh State of India. The surface area of the Lake is 1.29 km2 (0.50sqmi) with average depth of 6.2m (20ft) and highest depth 10.7m (35ft). At the same time catchment area of the Lake is 9.6 km2 (3.7sqmi).

Together with Bhojtal or Lake Superior, it forms the wetland of Bhoj. The Lake gets the infiltration water from the Upper Lake basement. It flows through the Patra River into the Halali River, a small tributary of the Betwa River.
The Chhota Talaab suffers from pollution caused by draining nalllahs filled with sewage, lack of freshwater source and washing of clothes commercially. The Lake as a whole is nutrient- enriched, with water unsuitable for consumption. Despite all this, the Lake provides a great spot for visitors to sit and immerse themselves in environing charm of the city.

Fig 1: Lower Lake Bhopal (Source: Google earth).

Materials and Methods

The survey was done on monthly basis from December 2020 to February 2021. The macrozoobenthos were collected by using D-net (Cuffney *et al*., 1993) with 0.5mm mesh. After sampling of macrozoobenthos sorting was performed at the site immediately. For sorting the organism's forceps were used and then the soft bodied animals were preserved in 5% formalin and hard bodied or shell type animals were preserved in 70% ethanol. The samples were identified, classified and counted after segregation. The different species of macrozoobenthos were studied in laboratory for detailed examination. Identification of different taxa was done by using standard works of Needham (1957), Edmondson (1989-91), Pennak (1978) and APHA (1989), Engbolm and Lingdell (1999). The macrozoobenthic species were categorized based on their status.

Results and Discussion

A total of 28 species of macrozoobenthos from 18 families and 7 orders were observed in the study zone throughout the observation session from three sampling sites of the Lower Lake of Bhopal. The flowchart of listed macrozoobenthic species and their order, family and scientific name is provided in (Table 1). Periodical changes were seen in macrozoobenthic diversity. Order Odonata was dominant in the study area (Fig-2).Most of the macrozoobenthic species were surveyed from station 2 of the study area and a total of 16 and 14 species were surveyed from station 1 and station 3. The station 1 and station 3 were adversely affected by man-made activities resulting in poor macrozoobenthic diversity at the stations. The general diversity of species has shown that macrozoobenthos of the order Odonata were the most prevalent and Lepidopteran were present leastly. Higher diversity (38 species) of macrozoobenthic species were revealed from the Lower Lake of Bhopal throughout summer season by Mohiuddin *et al*., (2009) [5]. Water chemistry and habitat loss may result in reduction in macrozoobenthic diversity was noted by Hepp *et al*., (2013) [3].

Table 1: List of macrozoobenthic species recorded during winter season at Lower Lake Bhopal

Order S.No.	Family S.No.	Species S.No.	Taxa	Station 1	Station 2	Station 3
1.			**Architaenioglossa**			
	1.		Ampullariidae			
		1.	Pila (Apple snail) sp	+	+	-
		2.	Pila globosa	-	+	-
2.			Venerida			
	2.		Cyrenidae			
		3.	*Corbicula* sp	+	+	+
		4.	Corbicula fluminalis	_	+	+
		5.	Corbicula straita	+	+	_
3.			Odonata			
	3.		Aeshnidae			
		6.	*Anax* sp	-	+	+
		7.	Gynacantha bayadera selys	+	-	-
	4.		Libellulidae			
		8.	*Brachythemis* sp	-	+	-
		9.	Acisoma panorpoides Rambur, 1842	+	+	+
		10.	*Orthetrum* sp	+	+	+

		11.	*Brachydiplax* sp	+	-	+
		12.	*Trithemis* sp	+	-	-
4.			Diptera			
	5.		Syrphidae			
		13.	*Eristalis* sp	-	+	-
	6.		*Tipulidae*			
		14.	*Tipula* sp	+	+	+
	7.		*Ephydridae*			
		15.	*Ephydra* sp	+	-	-
		16.	*Brachydeutera* sp	-	+	-
5.			Hemiptera			
	8.		Corixidae			
		17.	*Sigara* sp	+	+	+
	9.		Vellidae			
		18.	*Microvelia* sp	+	+	+
	10.		Notonectidae			
		19.	*Notonecta* sp	+	+	+
	11.		Hydrometridae			
		20.	*Hydrometra* sp	-	+	-
	12.		Naucoridae			
		21.	*Pelocoris* sp	-	+	-
	13.		*Nepidae*			
		22.	*Nepa* sp	+	+	-
6.			Coleoptra			
	14.		Hydrophilidae			
		23.	*Tropisternus* sp	-	+	+
		24.	*Berosus* sp	-	+	-
	15.		Dytiscinae			
		25.	*Cybister* sp	+	+	+
	16.		Noteridae			
		26.	*Hydrocanthus* sp	-	+	-
	17.		Psephenidae			
		27.	Psephenus sp	-	+	+
7.			Opisthopora			
	18.		Megascolecidae			
		28.	*Pheretima* sp	+	+	+

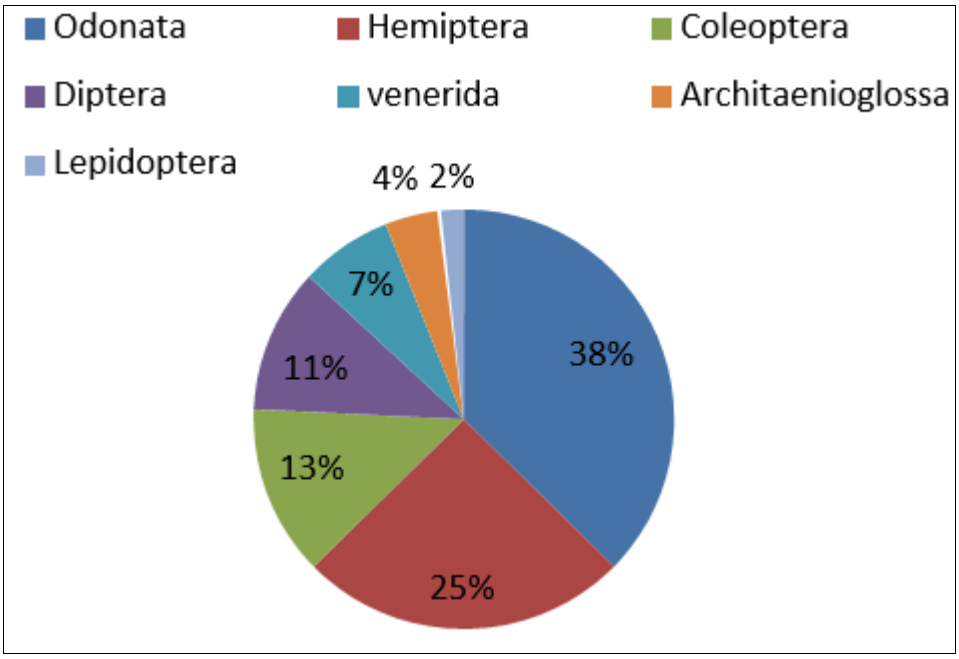

Fig 2: Percentage of macrozoobenthic species in Lower Lake Bhopal

Conclusion

The study reveals that the Lower Lake of Bhopal is a developing ecological community consisting of necessary characteristics for stability of macrozoobenthic species. The diversity of macrozoobenthos is affected by anthropogenic process in and around the Lake. Appropriate education about the importance of macrozoobenthos and their essential function in day-to-day life should be developed.

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