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ZOOPLANKTON DIVERSITY FROM FRESH WATER RESERVOIR OF MALDAD, SANGAMNER, (M.S.) INDIA

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AUTHORS' CONTRIBUTIONS

This work was carried out in collaboration among all authors. Author RVB designed the study. Author DAK performed the experimental work. Author PGD wrote the protocol, managed the analyses of the study and wrote the first draft of the manuscript. Author SSB helped in designing the study, managed the literature searches, final draft of the manuscript and communication with the publisher. All authors read and approved the final manuscript.

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ABSTRACT

The present study reveals the zooplankton diversity of fresh water reservoir from Maldad village of Sangamner Taluka, Ahmednagar district, Maharashtra. The investigations were carried out during the period of August 2019 to March 2020. Water samples were collected on the monthly basis during the morning sessions and brought to the laboratory for further analysis. The analysis of zooplankton diversity was done by using standard zooplankton identification manual. In all, eight zooplankton species from phylum Rotifera (*Branchionus calyciflorus, Keratella tropica, Asplanchna brightwelli*) and phylum Arthropoda; Copepoda (*Mesocyclopus leukarti, Mesocyclop species, Thermocyclops hyalinus* and *Nauplius,* a larval stage copepods), Cladocera (*Cerodaphnia quadrangula)* and Ostracoda (*Cyclocypria kinkaidia*) were recorded. This reveals presence of most of the cosmopolitan species of zooplanktons in the study area. No new species was observed during the study period. The presence of cosmopolitan species hints at low levels of pollution. However, further quantitative analysis of the same may help in analyzing the potential of the water for mankind use.

Keywords: Diversity; fresh water; Maldad; zooplankton.

1. INTRODUCTION

Freshwater zooplankton is generally dominated by major groups such as Rotifera, Cladocera, Copepoda and Ostracoda. Zooplankton diversity is an indicative of variety within community. It also acts as one of the important ecological parameters due to its major role in fresh water food chain and ecosystem, in turn.

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Zooplanktons are heterotrophic planktonic organisms floating in water. They are delicate aquatic organisms and some of these are non-motile or very weak swimmers. Zooplanktons contribute significantly to biological productivity of freshwater ecosystem [1]. Ecosystem comprises of both biotic and abiotic factors which may alter the diversity, density, biomass, and spatio-temporal distribution of zooplankton species. Zooplankton life span may vary from several days to weeks [2]. Certain species of zooplanktons have been deployed as bioindicators for monitoring water and presence of pollutants or eutrophication [3]. In any water body, the survival and growth rate of fishes are directly dependent on the zooplankton diversity as they feed on zooplanktons. In this way, zooplanktons serve as one of the important primary consumers of food chains and food webs in all aquatic ecosystems [4,5]. However, the information on zooplanktons in relation to physical and chemical parameters, and biodiversity studies of water bodies is scanty. Hence the present study was an attempt to carry out the qualitative analysis of zooplanktons from the fresh water reservoir of Maldad over a period.

2. MATERIALS AND METHODS

Surface water from the water reservoir was collected using a graduated plastic bucket during the period August 2019 to March 2020 on monthly basis from 7 am to 9 am in Maldad village, Taluka Sangamner (Latitude: 19° 39.005'N, Longitude: 74° 11.999'E; Fig. 1). The length, breadth and depth of the water reservoir was 480 feet, 110 feet and 42 feet, respectively. Zooplankton samples were collected from four corner sites by filtering a known volume of water (100 L) through zooplankton net made up of bolting silk cloth (mesh size 40 µ). These samples were transferred into plastic bottles containing 4% formalin (50 ml capacity) immediately after the collection on site and brought to the laboratory for further analysis. Zooplanktons were stained with eosin for their detailed observation and identification. The qualitative analysis of different groups of zooplankton was done by using taxonomic keys like [6,7,8,9].

Fig.1 The geographic coordinates of the studied water reservoir from Maldad village are depicted in the figure. The length, breadth and depth of the reservoir was 480 feet, 110 feet and 42 feet, respectively. The sites of collection were the corners of the reservoir as shown in orange circles in the image.

3. RESULTS AND DISCUSSION

About eight zooplankton species were recorded from the different sampling sites of the fresh water reservoir. Out of the eight observed zooplanktons, three species were from phylum Rotifera whereas the rest were from phylum Arthropoda (five species and the larval stage of copepod). In Arthropoda, three species were from subclass Copepoda and family Cyclopidae, one species each from subclass Branchiopoda (order Cladocera) and subclass Ostracoda (refer Table 1). The community structure of zooplanktons observed in the present study showed a mixed composition ranging from mesotrophic to eutrophic species. These results are in concurrence with the earlier reports Bhavan P S et al. [10].

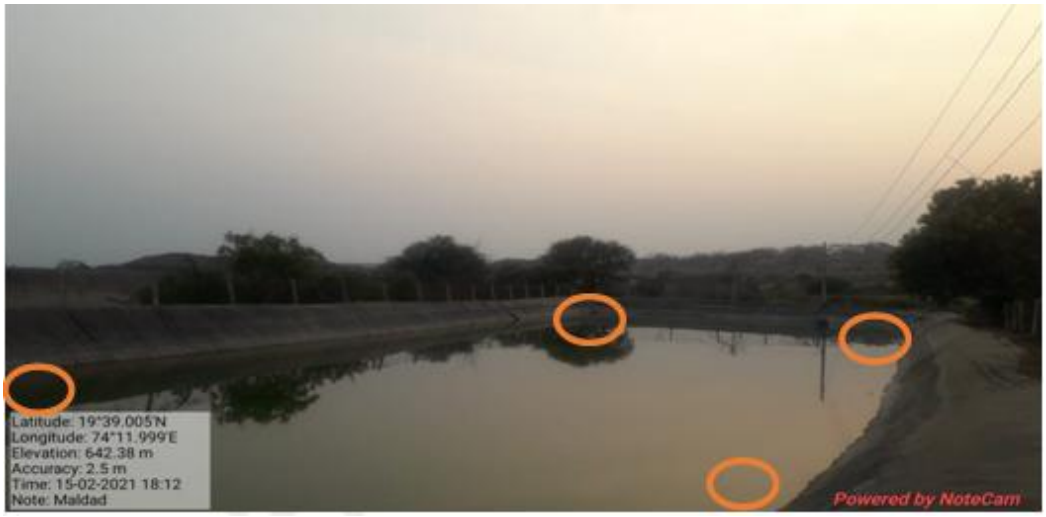

Fig. 1. Location of the water reservoir selected for the study (Add Legend of Figure 1)

Table 1. Zooplankton species diversity from the fresh water reservoir of Maldad

Phylum	Class	Sub-class	Order	Family	Genus and Species
***Rotifera**	Monogononta	_	Ploimida	Brachionidae	1. *Branchionus calyciflorus* (Pallas, 1776 reviewed in Altaff, 2004)
					2. *Keratella tropica* (Asptein, 1907 reviewed in Altaff, 2004)
				Asplanchnidae	3. *Asplanchna brightwelli* (Gosse, 1850 reviewed in Altaff, 2004)
Arthropoda	Crustacea	***Copepoda**	Cyclopoida	Cyclopidae	4. *Mesocyclops leukarti* (Claus, 1853 reviewed in in Pennak, 1978)
					5. *Mesocyclop species*
					6. *Thermocyclop hyalinus* (Rehberg, 1880 reviewed in Pennak, 1978)
		Branchiopoda	***Cladocera**	Sididae	7. *Cerodaphnia quadrangula* (Muller, 1785 reviewed in Edmonson, 1992)
		***Ostracoda**	Podocopopida	Cyprididae	8. *Cyclocypria kinkaidia* (Dobbin, 1941 reviewed in Pennak, 1978)

** indicates major zooplankton groups*

Fig. 2. Diversity of Zooplankton species from the fresh water reservoir of Maldad village: A. *Branchionus calyciflorus*, B. *Keratella tropica*, C. *Asplanchna brightwelli*, D. *Mesocyclops leukarti*, E. *Mesocyclops* species, F. *Thermocyclops hyalinus*, G. *Nauplius* larva; a common larval stage of copepods, H. *Cerodaphnia quadrangula*, *I. Cyclocypria kinkaidia*

Rotifera: Rotifers are the most important soft-bodied invertebrates having a very short life cycle as compared to other zooplanktons [1]. Rotifera, being an important member of fresh water ecosystem, plays an inevitable role in zooplankton diversity. Rotifers are observed widely in nature and some of the rotifers have been considered as bioindicators for water quality monitoring, as model systems for toxicology studies and as fish food in aquaculture practices [11]. A total of three species (*viz. Branchionus calyciflorus, Keratella tropica* and *Asplanchna brightwelli*) belonging to three different genera and two families of rotifers were observed in the examined water reservoir (Figs. 2, A-C). The present study exhibited occurrence of a few of the monogonant species in the water body. Earlier studies highlighted rotifers, especially monogononts, as a relatively diverse constituent of the fauna of stagnant freshwater ecosystems [12]. Present results are in accordance with the work reported by the other researchers Oueda A et al. [13], Pagano M et al. [14], Sako S et al. [15].

Copepoda: Copepods are known to adapt themselves to live in diverse habitats. They dwell well in fresh water bodies ranging from temporary rainwater pools to perennial rivers, lakes etc. About three species (*viz. Mesocyclops leukarti, Mesocyclop species, Thermocyclop hyalinus* and a larval stage of copepod; *Nauplius* larva) belonging to three genera and one family of Copepoda have been reported from the study site (Figs. 2, D-G). *Thermocyclops* species and *Mesocyclops* species are usually found in association with tropical water bodies [16]. The association of these species in most of the reservoirs in Sao Paulo state, Brazil has been reported earlier [17,18]. In the present study, we observed similar association between the *Thermocyclops* and *Mesocyclops* species. Copepods, belonging to order Cyclopoida, are important food items in freshwater habitat; even their nauplii are also treated as food for feeding fry [19,20].

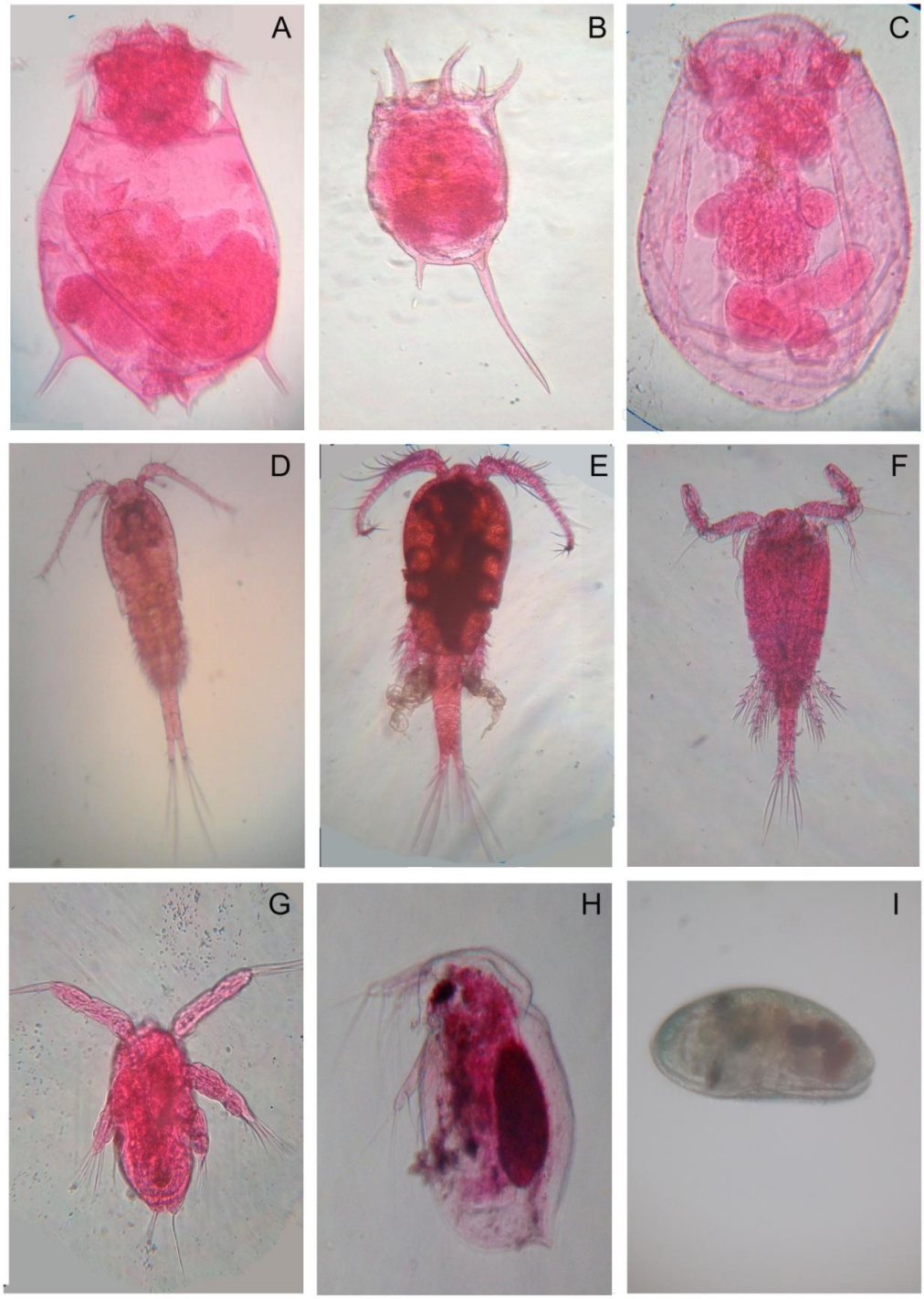

Fig. 2. Zooplanktons observed in the water reservoir during the study period (Add Legend of Figure 2)

Cladocera: Cladocera, commonly known as 'water flees' form an integral link in food web of freshwater ecosystems. One species (*Cerodaphnia quadrangula*) belonging to order Cladocera and family Sididae is reported in this study (Fig. 2, H). Baird initiated the work on Indian freshwater Cladocera and reported

Cladocerans as comparatively low profile animals with no definite pattern of variation throughout the year [21]. Similar findings have been recorded by Pradhan [22]. As per earlier reports, Cladocera prefer to live in clean water [23]. This may be the reason for the occurrence of low numbers of Cladocera species in the studied water reservoir.

Ostracoda: Ostracoda are small bivalve crustaceans which colonize in a wide variety of aquatic habitats. *Cyclocypria kinkaidia* was the only species observed in the present study (Fig. 2, I). Ostracods, in general, exhibit less speciation in comparison to other zooplanktons and morphological stasis over long time span [24].

4. CONCLUSIONS

The species observed in the studied water reservoir are all cosmopolitan. Though presence of *Brachionus* and *Keratella* species indicates the possibility of eutrophication, a quantitative study is essential to confirm this. The present water body was rich in copepods as compared to the other zooplankton groups. The present work thus reports qualitative analysis of the zooplanktons in the water body while further quantitative study of the same is essential to explore its use for mankind.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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