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Research Paper

Community structure of Zooplankton in Chandloi River District Kota Rajasthan

Jyoti Sharma
G. S. S., Kota, Rajasthan, India
Email: jyoti19781975@gmail.com

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Abstract: Chandloi River is a small, semi-perennial left bank tributary of Chambal River. Its location is 25.23^{o}N Latitudinal and 75.99^{o}E Longitudinal near Kota City, Rajasthan, India. Zooplankton communities colonize almost all fresh water territories. The zooplankton diversity was studied in a segment of Chandloi River (from its origin up to Kaithun village, district Kota, Rajasthan) for a period of two years from October 2018 to September 2020. In the period of present study, a total of 46 species of zooplankton were recorded - 16 species of Rotifera, 14 species of Cladocera, 5 species of Ostracoda and 4 species of Copapoda. Apart from these 7species of protozoans were also observed during the study period. Among these zooplankton Rotifera was found as the dominant group throughout the study period. The highest diversity was recorded in summer while lowest was observed in winter season. Group Rotifera (34.9%) was dominated over Cladocera (30.5%), Copapoda (8.6%), Ostracoda (10.8%) and Protozoa (15.2%).

Keywords*:* Chadloi River, Cladocera, Copapoda, Ostracoda, Protozoa, Rotifera, Semi-perennial, Zooplankton.

Introduction:

Zooplankton are small floating or weakly swimming organisms that drift with water currents. The zooplankton occupies a vital role in the trophic structure of an aquatic ecosystem and plays a key role in the energy transfer. They are responsible for the eating millions of little algae that may otherwise grow to an out of control state. Zooplankton species have different types of life histories influenced by seasonal variations of biotic factors, feeding ecology and predation pressure. The zooplankton forms a major link in the energy transmit at secondary level in aquatic food webs between autotrophs and heterotrophs. By insuring that the lower parts of the food chain are healthy can protect the higher ordered organisms like fish, whales and even human.

Zooplankton is being influenced strongly by both bottom up and top down processes and is often used as models for ecological paradigms. Zooplankton communities are highly sensitive to environmental

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variation. Hence they are effective tools in environmental biomonitoring of an aquatic system changes in the zooplankton species composition have been used as indication of increased eutrophication of fresh waters (Wanganeo and Wanganeo, 2006). In India, several important contributions on zooplankton and their diversity, density, ecological importance has been made in different part of the country such as Suresh *et al*. (2009), Das and Kar (2009), Dube *et al*. (2010b), Dede and Deshmukh (2015), Meena (2019), Sharma and Dube (2019), Karra (2020), Sharma (2020) and Sarkar and Pal (2021). But information regarding the zooplankton composition has not been thoroughly investigated in Chandloi River, a tributary of Chambal River.

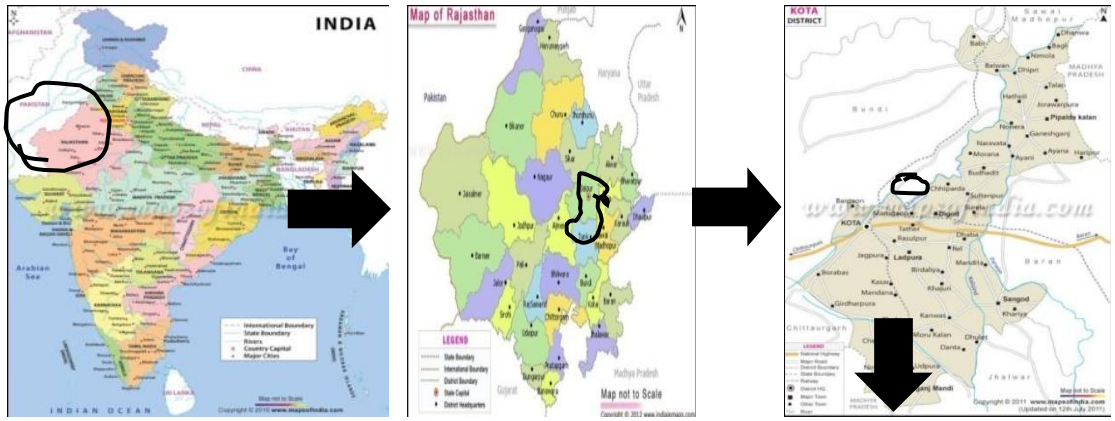
Thus the present work aimed to assess the community structure of zooplankton in the Chandloi River which is mainly used for irrigation purposes, commercial fishing practices and recreation.

Material and Methods

Water samples collected at every month during October 2018 to September 2020 from the selected sampling stations of Chandloi River (Figure 1) were used for water quality analysis and zooplankton study. 100 litre of surface water were filtered with bolting silk (No. 25) during the morning hours and filtrate was preserved in 4% formalin at the experimental site. The preserved samples were transferred to the laboratory of Government College, Kota for further analysis. The concentrated samples were examined under the inverted microscope and identification of zooplankton was done following the taxonomic references of Needham and Needham (1978), Pennak (1989), Michel and Sharma (1998), Edmondson (1992) and APHA (2005).

Study area

Chandloi River is a small, semi perineal left bank tributary of Chambal River. It originates from Aalania Dam near Aalania village and meets the River Chambal near village Kashoroipatan. Its location is 25.23 Latitudnal and 75.99 Longitudnal in Kota city, Rajasthan. The river flows nearly 100 Km. before entering River Chambal and its average width is 50 to 80 meter (Sharma 2021). Present work has been conducted on four sampling sites of Chandloi River. Site 1 has two ghats located in towards East at Kaithoon village. Site 2 is another side of site 1 situated in the Western side of the river. Site 3 is near origin of river situated near Aalania village. Site 4 is before entering into Chambal River near Kashoroipatan.



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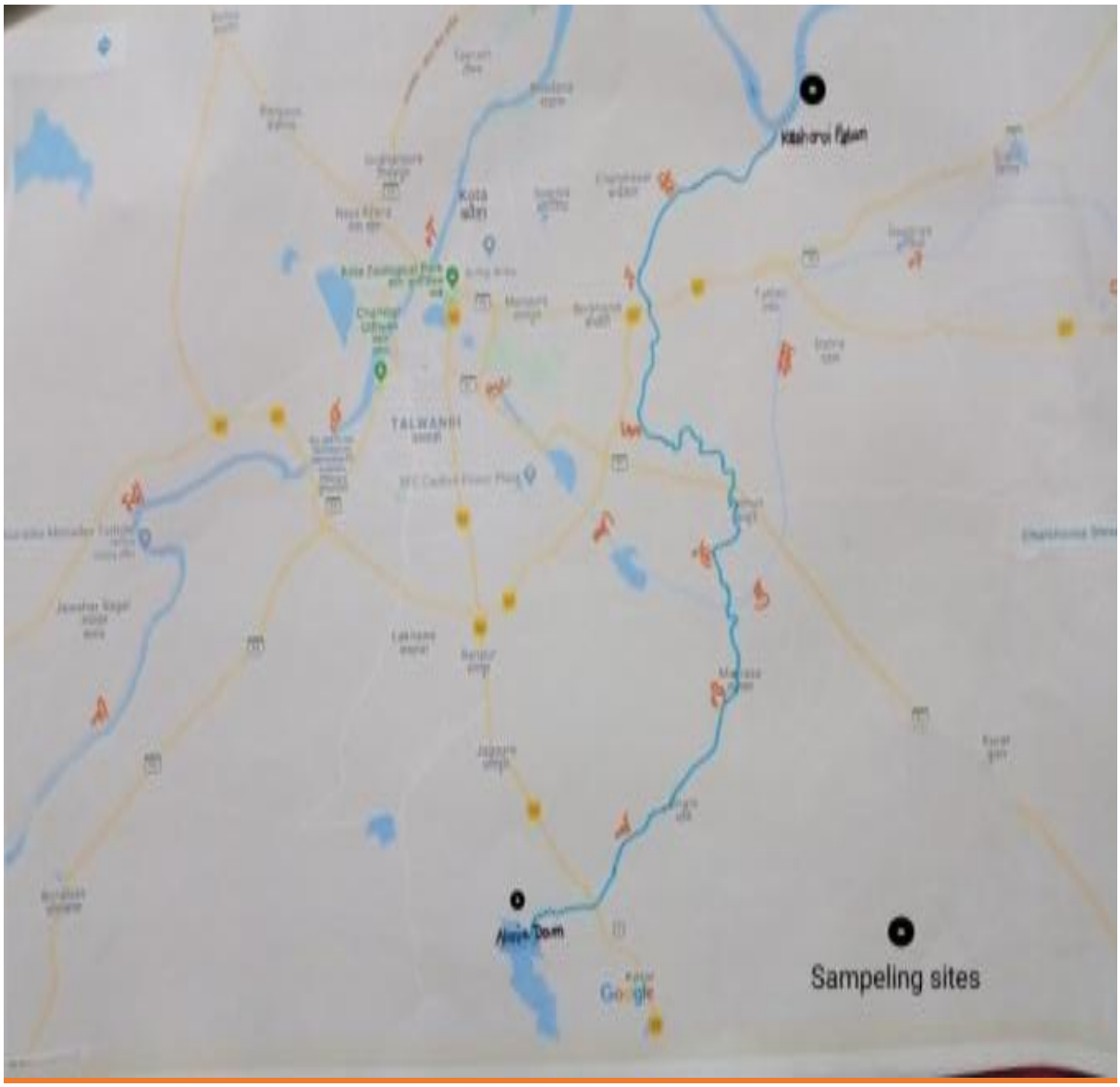

Figure 1: Location map of the study area with two study sites.

Results and Discussion:

A total of 46 zooplankton species were identified in Chandloi River. Out of these 16 species (34.9%) were recorded from Rotifera, 14 species (30.5%) from Cladocera, 7 species (15.2%) from Protozoa, 5 species (10.8%) from Ostracoda and 4 species (8.6%) from Copepoda (Table 1 and Figure 2). The class wise sequence of dominance of zooplankton in Chandloi River was as: Rotifera> Cladocera> Protozoa> Ostracoda> Copepoda.

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Table 1: Qualitative estimation of zooplankton in Chandloi River during October 2018 to September 2020.

Phylum	Class	Family	Genus & Species
Rotifera	Monogonta	Brachionidae	*Anuraeopsis fissa*
	Monogonta	Brachionidae	*Brachionus calyciflorus*
	Monogonta	Brachionidae	*Brachionus forficula*
	Monogonta	Brachionidae	*Keratella tropica*
	Monogonta	Brachionidae	*Keratella procurva*
	Monogonta	Brachionidae	*Notholca spp.*
	Monogonta	Brachionidae	*Notholca acuminate*
	Monogonta	Filiniidae	*Filinia longiseta*
	Monogonta	Filiniidae	*Filinia opoliensis*
	Monogonta	Lecanidae	*Lecane spp.*
	Monogonta	Lecanidae	*Lecane bulla*
	Monogonta	Lecanidae	*Lecane luna*
	Monogonta	Lecanidae	*Monostyla punctate*
	Monogonta	Lecanidae	*Monostyla bulla*
	Monogonta	Notommatidae	*Cephalodella spp.*
	Monogonta	Notommatidae	*Scaridium longicaudum*
Arthropoda	Cladocera	Bosminidae	*Bosmina longirostris*
	Cladocera	Chydoridae	*Chydorus sphaericus*
	Cladocera	Chydoridae	*Alonella spp.*
	Cladocera	Chydoridae	*Alona rectangular*
	Cladocera	Daphniidae	*Daphnia carinata*
	Cladocera	Daphniidae	*Daphnia lumholtzi*
	Cladocera	Daphniidae	*Daphnia pulex*
	Cladocera	Daphniidae	*Daphnia reticulate*
	Cladocera	Daphniidae	*Daphnia similis*
	Cladocera	Daphniidae	*Ceriodaphnia spp.*
	Cladocera	Daphniidae	*Simocephalus spp.*
	Cladocera	Moinidae	*Moina brachiata*
	Cladocera	Moinidae	*Moina micrura*
	Cladocera	Moinidae	*Moina dubia*
	Ostracoda	Cyprididae	*Cypris spp.*
	Ostracoda	Cyprididae	*Heterocypris spp.*
	Ostracoda	Cyprididae	*Stenocypris spp.*
	Ostracoda	Cyprididae	*Stenocypris malcolmsoni*
	Ostracoda	Cyprididae	*Eucypris spp.*
	Copepoda	Diaptomidae	*Phyllodiaptomus annae*
	Copepoda	Diaptomidae	*Diaptomus affinis*
	Copepoda	Cyclopidae	*Mesocyclops leuckart*
	Copepoda	Cyclopidae	*Mesocyclops hyalinus*
Protozoa	Ciliata	Parameciidae	*Paramecium caudatum*
	Ciliata	Vorticellidae	*Vorticella campanula*
	Ciliata	Oxytrichidae	*Oxytricha ovalis*
	Ciliata	Euplotidae	*Euplotes spp.*
	Ciliata	Tracheliidae	*Trachelius ovum*
	Ciliata	Lacrymariidae	*Lacrymaria olor*
	Ciliata	Ophryoglenidae	*Ophryoglena flava*

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Rotifers play a vital role in the trophic tiers of freshwater impoundments and serve as living capsule of nutrition (Kumar, 2002). The Rotifera species exhibit marked differences in their tolerance and adaptability to changes in physio-chemical and biological parameters of freshwater ecosystem. In the present study they dominated with 16 species as compared to other groups of zooplankton. 16 species belonging to 9 genera and 4 families namely Brachionidae, Filiniidae, Lecanidae and Notommatidae. Family Brachionidae exhibit maximum diversity with 7 species. Among Rotifera species the species of *Brachionus calcyflorus* are the pollution tolerant species and indicate accumulation of organic matter. Rotifera were found in maximum diversity of species in summer season. In summer, the absence of inflow of water brings stability to the water body. The availability of food is more due to production of organic matter and decomposition. These factors contribute for high species density. Arora and Mehra (2003) studied seasonal dynamics of rotifers in relation to physical and chemical conditions of River Yamuna and made similar observations in increased densities in summer and reduced densities in Winter. Segers (2003) highlighted the dominance of Rotifer population which was due to its preference for warm waters. Sharma and Dube (2019) studied population dynamics and seasonal variation of Rotifers in Chandloi River, Kota, Rajasthan. It listed 16 genera and 31 species of fresh water Rotifers found in the river in different seasons. Population dynamics and distribution of Rotifers maximum number were found in during summer, followed by winter and minimum during monsoon.

Cladocerons are the most useful and nutritive group of crustaceans for higher members of fishes in the food chain and commonly called by “water fleas”. They are highly responsive against pollutants and hence serve as good biological indicators of water pollution. In the present study Cladocera represented 14 species belonging to 8 genera and 4 families Bosminidae, Chydoridae, Daphniidae and Moinidae. Family Daphniidae exhibit maximum diversity with 7 species. Sharma *et al.* (2012) reported 54 species of freshwater cladocerans of South Rajasthan, India. The population diversity of Cladocera was higher in summer season and lower in winter season might be attributed to favourable temperature and availability of food. Similar observation was earlier made by Jose and Sanalkumar (2012) in the River Achencovil, Kerala.

Ostracods are a diverse calcite microfossil group that exist in all aquatic and semi terrestrial habitats. They are mainly bottom dwellers of fresh water bodies and live on detritus and dead phytoplankton. In the present study Ostracoda represented by 5 species belonging to 4 genera and single family Cyprididae. The population diversity was higher in summer season and less in monsoon. Sukand and Patil (2004) recorded maximum Ostracoda population in summer at Fort Lake in Belgaum, Karnataka. Similar results were reported by Mahor (2011).

Copepods have been known to the most abundant zooplankton in the river system. They are high in stable environmental conditions and disappear as pollution level increases (Sivakumar and Altaff 2004). They serve as food to several fishes and play a major role in ecological pyramids. In the present study. Copepods represented by 4 species belonging to 3 genera and 2 families Diaptomidae and Cyclopidae. Copepoda showed higher population diversity in summer season and lower in winter. This pattern of seasonal fluctuations of Copepods has been also observed by Mahor (2011) in Trigha Reservoir of Gwalior. Similar observations are made by Somani and Pejavar (2004) in Masonda Lake, Maharashtra.

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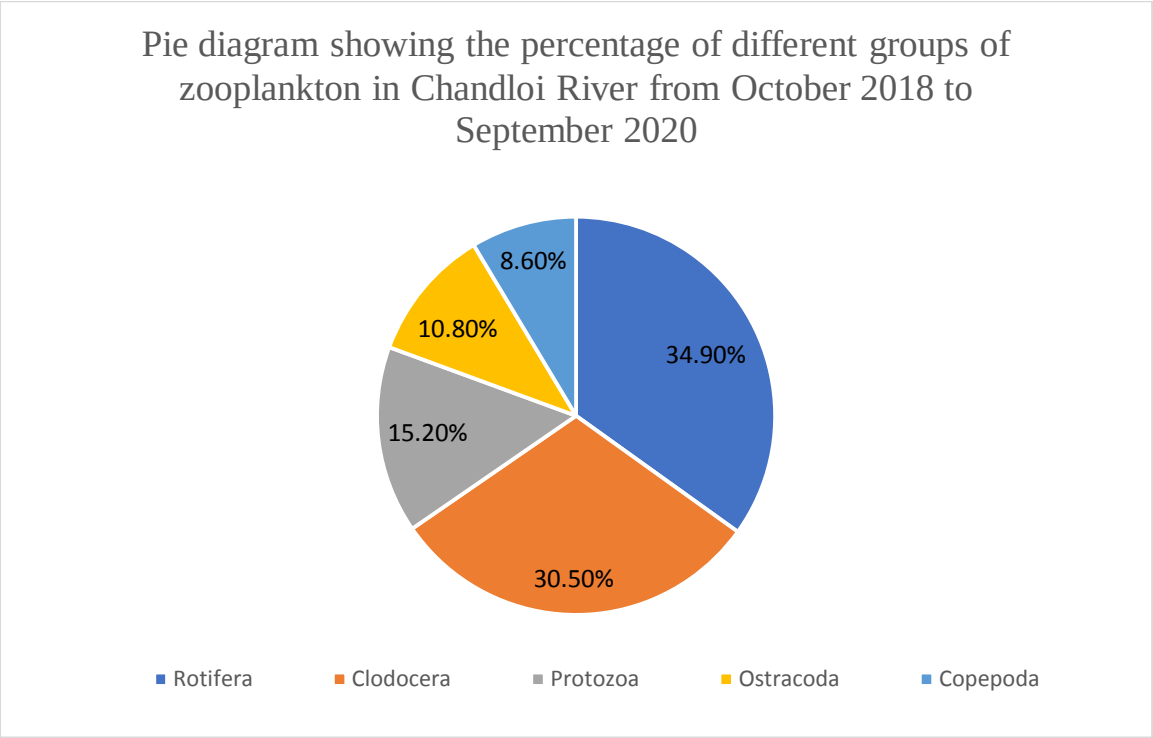
Protozoans are microscopic, unicellular, Eukaryotic organisms and they live in a wide variety of moist habitats including freshwater, marine environments and the soil. In the present study Protozoans represented by 7 species belonging to 7 genera and 7 families: Parameciidae, Vorticellidae, Oxytrichidae, Euplotidae, Tracheliidae, Lacrymariidae, and Ophryoglenidae. All families exhibited only a single species. The population diversity was higher in summer season and less in monsoon. Similar observations were made by Shukla and Solanki (2016) in River Narmada at Jabalpur region (M.P.) and Sharma and Dube (2018).



Conclusion:

The present study reveals community structure of zooplankton in Chandloi River. All 5 groups (Rotifera, Cladocera, Ostracoda, Copepoda and Protozoa) of zooplankton were recorded throughout the study period. Rotifera is predominant group of zooplankton found in the majority of the river constituting more than 34% of the total zooplankton present followed by Cladocera, Protozoa, Ostracoda, Copepoda. The species diversity of zooplankton was highest during summer and lowest during winter. The study indicates that temperature has important role in the distribution of zooplankton in a freshwater habitat. Therefore, the present study on qualitative changes occurring in the riverine ecosystem is necessary in order to understand and preserve the biodiversity of Chandloi River.

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