

Monthly Variations of Zooplankton in a Fresh Water Body, Bheemgarh Dam of Seoni District (M.P.)

Paper Submission: 15/11/2020, Date of Acceptance: 27/11/2020, Date of Publication: 28/11/2020



Anil Kumar Dongre

Research Scholar,
Dept. of Biosciences,
Barkatullah University,
Bhopal, M.P., India



Kapil Kumar Soni

Professor,
Dept. of Biosciences,
Barkatullah University,
Bhopal, M.P., India

Abstract

Zooplankton is cosmopolitan in nature and they are found to inhabit all freshwater body. The present study deals with the study of monthly changes of diversity and density of Zooplankton in Sat Bheemgarh dam of Chhapara, Seoni. The work was carried out for a period of one year from January 2015 to December 2015. The population status of Zooplankton at Bheemgarh dam consisted of 52 species, categorized into three major groups, viz,

Rotifers>Crustaceans>Cladocera>Protozoa>Copepoda.

The Zooplankton sample consisted of 32.69% Rotifera, 26.92% Crustaceans, 19.23% Cladocera, and 11.54 % Protozoa and 9.61% Copepoda respectively. The highest qualitative value of total zooplankton recorded in Bheemgarh dam was 938.80 ± 28.27 org/l in the month of August 2015, while the lowest value of total zooplankton was recorded 440.00 ± 15.41 org/l in the month of January 2015. Rotifera were the dominant group of Zooplankton recorded with respect to diversity and species density status. They are also important as an index of productivity, eutrophication and pollution of the aquatic ecosystem.

Keywords: Beemgarh dam, Zooplankton diversity and density.

Introduction

Zooplankton is microscopic animals that act as primary and secondary links in the food webs of all aquatic ecosystems. They feed on phytoplankton which directly provide food source for larval vertebrates and invertebrates as well as related to the growth of juvenile and larger fish. They are also important component in the transfer of energy from primary producers of phytoplankton to higher trophic levels such as fish. Regarding the habitat, zooplankton are cosmopolitan fauna and inhabit all freshwater bodies of the world. These communities are also sensitive to various substances in water such as nutrient enrichment and pollutants. Thus, they have often been used as indicators to assess the condition and change of the freshwater environment. They are endowed with many remarkable features and are often armored with spines, which hamper their predation by higher organisms.

Aims of Study

The aims and objectives of the present study are following:

1. To Conserve the topography of dam.
2. To increase the volume of reservoir.
3. To avoid the siltation in reservoir and human activities.
4. To check the changes in biological parameters and their temporal and spatial fluctuation.
5. To improve the aquaculture and water quality of reservoir.

Study Area

The present investigation has been carried out on Bheemgarh dam Chhapara is located in the Chhapara, Seoni district of the central Indian state of Madhya Pradesh. Bheemgarh dam also known as Sanjay Sarovar Bandh is built Across the Wainganga river in Chhapara tehsil of Seoni district of Indian state of Madhya Pradesh. The Bheemgarh Sanjay Sarovar Dam is located 43 km away from the Seoni. It is known as the biggest Mud / Earthen dam of Asia. It is situated $22^{\circ}20'41''N$ $79^{\circ}36'16''E$. It has an average elevation of 611 meters (2004 feet). The city is 2,043 ft. above sea-level, half-way between Nagpur and Jabalpur. The water of this dam is used for irrigation and fish culture.

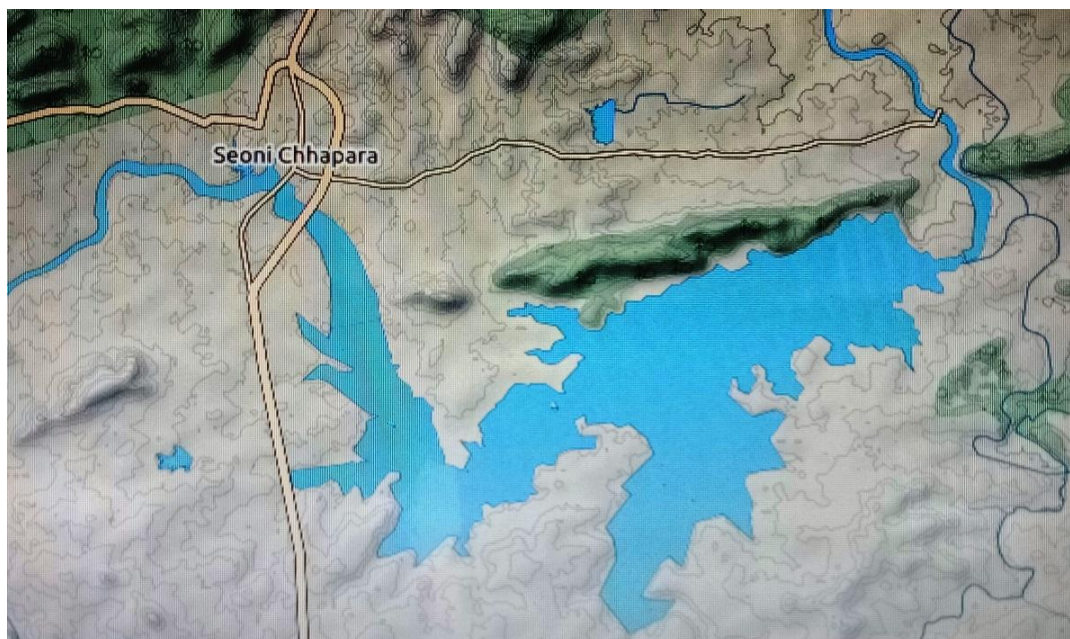


Fig. 1 Map of Bheemgarh Dam Seoni Dist. (M.P.).

Review of Literature

Quantitative study of zooplankton was carried out by many researchers worldwide. Bhat et al (2014), Chatterjee et al (2014), Koli and Muley (2012), Kulkarni and Surwase (2013), Patole (2015), Pradhan (2014), Sehgal et al (2013), Watkar and Barbate (2013) studied zooplanktons quantitatively to a large extent from Indian continent. The importance of the Zooplankton is well recognized as these have vital part in food chain and play a key role in cycling of organic matter in an aquatic ecosystem Sharma et al (2010). Though numerous works on Zooplankton diversity are being reported from different parts of India but there is scarcity of report from freshwater bodies of different parts of Northeast India except some worth mentioning of Sharma and Sharma (2008); Kar and Barbhuiya (2004); Kar (2013).

Material and Methods

Samples were collected monthly from five different sampling stations namely A, B, C, D, and E for one year (January 2015 to December 2015). Then the sample were filtered and placed in Tarson (100 ml) container, subsequently fixed in Lugol's solution and stored in cool and dark place. For studying the diversity of Zooplankton, sample were taken in a Sedgwick-Rafter counting chamber and observed under a light microscope under required magnification (X 10 initially, followed X 40) and the specimens were identified following standard literature of Battish (1992); Edmondson (1959); Michael and Sharma (1998); Sharma (1998); Sharma and Sharma (2008).

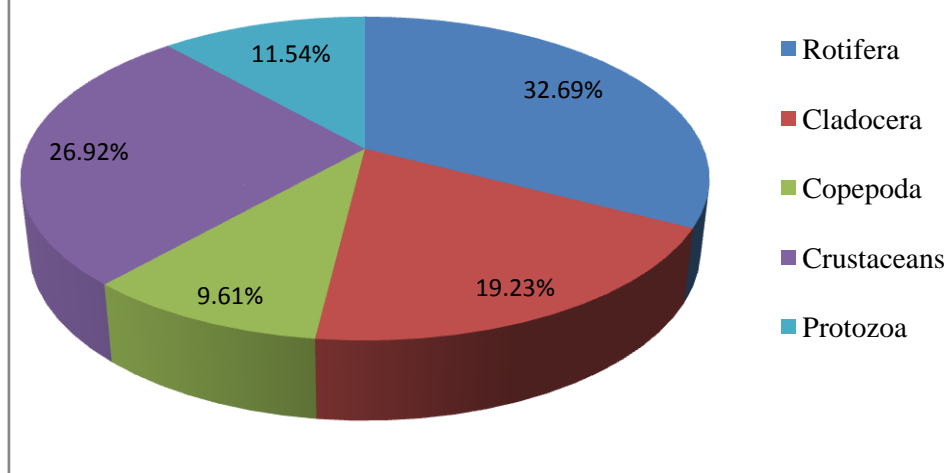
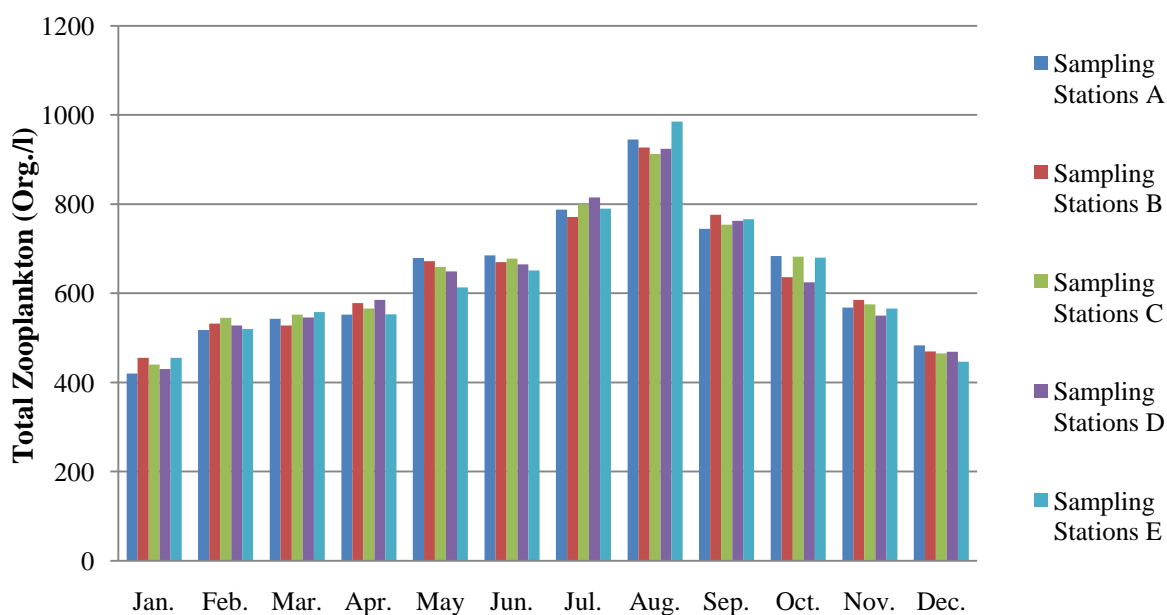
Result and Discussion

A total of 52 genera of zooplanktons have been identified during the research period and are listed in table no. 1. (Fig. no. 2). The values of total

number of zooplankton have been noted to varied with an increasing trend from January up to August and becoming maximum in the month of August due to rain brings more zooplankton from the water bodies of upper reaches to the sites under investigation.

Zooplanktons are considered to be the ecological indicators of water bodies (Gajbhiye and Desai 1981). Factors such as light intensity, food availability, dissolved oxygen and predation effect the population dynamics of zooplankton. Low pH or higher salinity can reduce their diversity and density (Horn and Goldman, 1994). The samples from five sampling sites have been analyzed for spatial and temporal distribution. It shows the presence of 52 species, out of which 20 species belong to rotifera, 11 species are of crustaceans, 07 species are of protozoa and Mollusca 04 species. Rotifera (32.69%), Cladocera (19.23%), Copepoda (9.61%), Crustaceans (26.92%) and Protozoa (11.54%) The zooplankton assemblage of this dam consists primarily of rotifer followed by crustaceans and protozoa. Seasonal variation of the zooplankton populations of Bheemgarh dam correlate to changes in environmental factors.

Similar observation was made by many researchers throughout the country Kar and Kar (2013) reported 26 species of Zooplankton from an oxbow lake of Cachar, Assam; Tyor et al. (2014) studied Zooplankton diversity in a shallow lake of Gurgaon, Haryana revealing Rotifera with highest diversity followed by Cladocera and then Copepoda showing least diversity; Pawar (2014) reported 66 species of Zooplankton in some freshwater bodies around Satara district of Maharashtra, India.

Graph No. 1. The number of genera belonging to different Groups and their percentage**Graph No. 2. Monthly variation in Total Zooplankton (Org./l) of various sampling stations in Bheemgarh Dam in January to December 2015****Zooplankton density (Org. /l)**

The zooplankton population of Bheemgarh dam was studied for a period of 12 months from January 2015 to December 2015. Zooplankton was composed of Rotifera (32.69%), Cladocera (19.23%), Copepoda (9.61%), Crustaceans (26.92%) and Protozoa (11.54%). A Total number of 52 genera

were observed during the present study. The highest qualitative value of total zooplankton recorded in Bheemgarh dam was 938.80 ± 28.27 org/l in the month of August 2015, while the lowest value of total zooplankton was recorded 440.00 ± 15.41 org/l in the month of January 2015.

Table No. 1 Showing the composition of zooplanktons species in Bheemgarh Dam.

S.No.	ZOOPLANKTON GENERA	Sampling Stations				
		A	B	C	D	E
ROTIFERA						
1.	<i>Asplanchnabrightwelli</i>	+	-	+	+	+
2.	<i>Asplanchnopusmulticeps</i>	+	+	+	+	+
3.	<i>Brachionueangularis</i>	+	+	+	-	+
4.	<i>Branchinectaferox</i>	+	+	-	+	+
5.	<i>Chromogasterovalis</i>	-	+	+	+	+
6.	<i>Cvclops bicuspidatus</i>	+	+	+	+	+
7.	<i>Filinia longiseta</i>	+	+	+	+	+
8.	<i>Keratellacochlearis</i>	+	-	+	+	+
9.	<i>K. tropica</i>	+	+	-	+	+
10.	<i>Monostyla bulla</i>	+	-	+	+	+
11.	<i>Mytilinamucronate</i>	+	+	-	+	+
12.	<i>Notholcaacuminata</i>	+	+	+	-	+
13.	<i>Platylabusquadricornis</i>	+	-	+	+	+
14.	<i>Polvarthra vulgaris</i>	+	+	+	-	+
15.	<i>Synchaetapectinata</i>	+	-	+	+	+
16.	<i>Scardiumlongicaudum</i>	-	+	+	+	+
17.	<i>Trichocerca similes</i>	+	-	+	+	+
CLADOCERA						
18.	<i>Alonaspis</i>	-	+	+	+	+
19.	<i>Ceriodaphniaspis</i>	+	+	-	+	+
20.	<i>Daphnia lumholtzi</i>	+	+	+	+	+
21.	<i>Daphnia carinata</i>	+	+	+	-	+
22.	<i>Diaphanosomaspis.</i>	+	+	+	+	+
23.	<i>Levinsiaspis</i>	+	+	-	+	+
24.	<i>Moniaspis</i>	+	+	+	+	+
25.	<i>Nauplii larva</i>	+	-	+	+	+
26.	<i>Paracyclopsaffinis</i>	+	+	+	+	+
27.	<i>Simocephalus</i>	+	+	-	+	+
COPEPODA						
28.	<i>Cyclops scutifer</i>	+	-	+	+	+
29.	<i>Mesocyclopsspis.</i>	+	+	+	-	+
30.	<i>Macrocylopsspis.</i>	+	+	-	+	+
31.	<i>Microcylopsspis.</i>	+	+	+	-	+
32.	<i>Neodiaptomusspis</i>	-	+	+	+	+
CRUSTACEANS						
33.	<i>Bosmiacornuta</i>	+	+	+	+	+
34.	<i>Bosmiacoregoni</i>	+	+	-	+	+
35.	<i>Ceriodaphnia reticulate</i>	+	+	+	-	+
36.	<i>Cypris sp.</i>	+	-	+	+	+
37.	<i>Cyclops viridis</i>	+	+	+	+	+
38.	<i>Eubranchipus</i>	-	-	+	+	+
39.	<i>Gammaruspulex</i>	+	+	+	+	+
40.	<i>Lathonura sp.</i>	+	+	-	+	+
41.	<i>Macrobrachium</i>	+	+	+	+	+
42.	<i>Micrithrix sp.</i>	+	-	+	+	+
43.	<i>Moinodaphnia sp.</i>	-	+	+	+	+
44.	<i>Neodiaptomus</i>	+	+	+	+	-
45.	<i>Pseudosidabidantata</i>	+	-	+	+	+
46.	<i>Senecellacalanoides</i>	+	+	-	+	-
PROTOZOA						
47.	<i>Arcellavulagris</i>	+	+	+	-	+
48.	<i>Amoeba proteus</i>	+	-	+	+	+
49.	<i>Ceraciumspis.</i>	+	+	-	+	+
50.	<i>Diffusiaspis</i>	+	+	-	+	+
51.	<i>Eudena viridis</i>	-	+	+	+	+
52.	<i>Praemaciumcardatum</i>	+	-	+	+	+
Total		45	38	40	44	50

Zooplankton was composed of Rotifera (32.69%), Cladocera (19.23%), Copepoda (9.61%), Crustaceans (26.92%) and Protozoa (11.54%). A

Total number of 52 genera were observed during the present study. A Total number of 52 genera were observed during the present study (Table no. & Graph No.1 & 2).

Table No. 1 The number of genera belonging to different Groups and their percentage.

S.No.	Group	No. of Genera	Percentage
1.	Rotifera	17	32.69%
2.	Cladocera	10	19.23%
3.	Copepoda	05	09.61%
4.	Crustaceans	14	26.92 %
5.	Protozoa	06	11.54 %
Total		52	100 %

Pahwa and Mehrotra (1966) reported rotifer population from Ganga river, where they constituted 61.5 to 94.4% of population. Govind (1969) reported a rotifer peak in February (24.7%) out of the total zooplankton from shallow zone of Tungbhadra reservoir. Gupta (1989) reported a major rotifer peak in August and in February from two ponds near Jodhpur. Sheeba et. al. (2004) Qualitative and quantitative study of zooplankton in Ithikkara river, Kerala. These exhibited a bimodal pattern with a major peak in December and a minor peak in August. The second group of zooplankton, Copepoda, also exhibited two maxima (April & August) and two minima (February, March and September).

Conclusion

The qualitative analysis of zooplankton from Bheemgarh dam aquatic ecosystems revealed the presence of three taxonomic groups: Rotifera, Crustaceans, and Cladocera. The dominance of zooplankton species is highly variable in different types of water body according to nutrient levels, predator and other environmental factors which then affects the other biotic components of the ecosystems. The rapid increase of human activities and assemblage of livestock are creating pollution in the dam water and needs immediate measure. At this critical juncture the local representatives, Government and Non-Government bodies, the educated bodies, the village heads and the reputed figures of the society should come forward and formulate conservational model for the sustainability of this beautiful water body.

References

- Battish, S.K. (1992). *Freshwater zooplankton of India*. Oxford and IBH publishing Co., New Delhi.
- Bhat N., A. Wanganeo A. and R. Raina (2014): *The composition and diversity of net zooplankton species in a tropical water body (Bhoj wetland) of Bhopal, India: International journal of biodiversity and conservation*, Vol.6(5): 373-381.
- Edmondson, W.T. (1959). *Rotifera*, in W.T. Edmondson (ed.). *Fresh-water Biology*, 2nd edn. New York: John Wiley.
- Gajbhiy, S.N. and B.N. Desai. 1981. *Zooplankton variability in polluted and unpolluted waters of Bombay*. *Mahasagar.Bull. Nat. InstOceangr.*, 4: 173-182.
- Govind, B. V. 1969. *Bottom fauna and macrovegetation in the Tugabhadra reservoir and their role in the food chain of fish communities*. *Proc. Sem Ecol. Fish.*, pp 27-29
- Gupta, S 1989. *Pollution Ecology of some ponds in urban vicinity of Jodhpur*. Ph. D. Thesis University of Jodhpur, p. 234.
- Kar, D. and Barbhuiya, M.H. (2004). *Abundance and diversity of zooplankton in ChatlaHaor, a floodplain wetland in Cachar district of Assam*. *Environment and Ecology*, 22 (1):247-248.
- Kar, D. (2007). *Fundamentals of Limnology and Aquaculture Biotechnology*. Daya Publishing House, xiv+609.
- Kar, S. and Kar, D. (2013). *Studies on zooplankton diversity of an oxbow lake of South Assam, India*. *International Journal of Current Research*, 5(12):3652-3655.
- Koli K.B. and D.V. Muley (2012): *studied on zooplankton diversity and seasonal variation with special reference to physicochemical parameters in Tulshi reservoir of Kolhapur district (M.S.): India: ElInternational scientific research journal*, Vol.4 (1): 38-46.
- Kulkarni D.A. and S.S. Surwase (2013): *Studies on Occurance, Richness and Composition of Zooplankton in Seena river water at, Mohal, Dist-Solapur, MS, India: International Research Journal of Biological Sciences*, Vol.2(2):25-28.
- Michael, R.G. and Sharma, B.K. (1998). *Indian Cladocera (Crustacea: Branchiopoda: Cladocera)*. *Fauna of India and adjacent countries Series – Zool. Surv. India*, Calcutta.
- Pahwa, D.V. and S.N. Mehrotra 1966. *Observations on fluctuations conditions of river Ganga*. *Proc. Nat. Acad. Sci. India*, 36 (2): 157-189.
- Patole P.D (2015): *study of zooplankton population in a freshwater Nakane dam in Dhule (MS): Indian Streams Research Journal*, Vol.4 (12).
- Pawar, S.M. (2014). *Zooplankton Diversity and Density in Some Freshwater Bodies around Satara (M.S) India*. *Journal of Environments*, 1(2): 64-67.
- Pradhan V.P (2014): *Zooplankton diversity in fresh water Wunnalake: Int. J. of Life Sciences*, Vol.2 (3): 268-272.
- Sehgal K., Phadke G.G., Chakraborty S.K. and S. V. Reddy (2013): *Studies on Zooplankton Diversity in Dimbhe Reservoir, Maharashtra, India: Advances in Applied Science Research*, Vol.4 (1):417-420.
- Sharma, B.K. and Sharma, S. (2008). *Zooplankton diversity in floodplain lakes of Assam*. *Records of Zoological Survey of India. Occasional paper no 290*: 1-307.
- Sharma S., Siddique A., Singh K., Chouhan M., Vyas A., Solnki C., Sharma D., Nair S. and T. Sengupta (2010): *Population Dynamics and Seasonal Abundance of Zooplankton Community in Narmada River (India):3741 researcher0209*, Vol.2 (9): 1-9.
- Sheeba, S., Ramanujan, N. and Santosh, S. 2004. *Qualitative and quantitative study of zooplankton in Ithikkara river, Kerala Ecology, Environment and Conservation* 10(3): 249-292.

Tyor, A.K., Chopra, G. and Kumari, S. (2014). Zooplankton diversity in shallow lake of Sultanpur National Park, Gurgaon (Haryana). International Journal of Applied Biology and Pharmaceutical technology, 5(1): 35- 40.

Watkars A.M and M.P.Barbate(2013): Studies on Zooplankton Diversity of River Kolar, Saoner, Dist. Nagpur, Maharashtra:Journal of Life Sciences and Technologies, Vol.1(1) : 26-28