



Zooplankton Diversity of Hanuman Sagar, Akola, MS, India

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Abstract

The present investigation deals with the monthly variations of Zooplankton in Hanuman sagar of Akola MS. The present investigations carried out during October 2007 to March 2008. The population status of Zooplankton at Hanuman sagar consisted of 48 genera, categorized into three major groups, viz, Rotifera > Cladocera > Copepoda. The Zooplankton noted and reported, 20 species of Rotifera, 12 species of Cladocera and 8 species of Ostracoda and 8 species of Copepoda respectively. From the Present investigations Rotifers found to dominant for the Hanuman sagar freshwater ecosystem.

Keywords: Zooplankton, hanuman sagar, density, population.

Introduction

Hydrosphere is the most important factor for the life on earth and its sustainable development. The water in rivers, streams, springs, lakes, ponds and manmade dams are inland depressions is collectively termed as inland water or fresh water. Fresh water bodies include a large number of rivers, ponds, darns, impoundments and lakes. The fresh water system is of two types. The lentic water system includes water from lakes, ponds, reservoirs and dams; while the lotic water system includes flowing water of streams, springs, rivers etc. Living organisms need water for their physiological existence. From the very beginning of the human civilization water has been used for drinking, bathing, washing and also utilized for irrigation, fish culture, generation of power and industries. The water quality assessment is usually done either by monitoring the physicochemical properties of water or by analyzing inhabiting biota including bacteria, diatoms, phytoplankton, zooplankton, macroinvertebrates and aquatic vertebrates.

Water from the Hanuman sagar dam on the river Wan District Akola (MS) is being used for the purpose of drinking, domestic activities and irrigation. Hence, the present investigation aims to work out biotic components of the reservoir the investigated data would further utilize for comparative limnology for maintenance and conservation of water body.

Seasonal variations and diversity of zooplankton is important to keep our ecosystem healthy because each species plays a specific role in the ecosystem and some species may allow natural ecosystem to function in a healthy manner¹. Zooplankton are crucial elements of fresh water lake ecosystems as they occupy the center of the aquatic food web and being as an important food for almost all freshwater fish species at some stage in their life history². They play important role in ecosystem of lake and aquatic food chain. Zooplanktons are valuable food sources for fishes and other aquatic animals.

Zooplankton diversity are being reported from freshwater bodies of North India³⁻⁷.

The rotifers are fresh water zooplanktons, characterized by the presence of an anterior wheel like rotating corona, form large communities in Indian waters indicating the trophic status of the water body⁸⁻¹².

Materials and methods

The Hanuman sagar masonry dam selected for the present investigation is on Wan river, which is the tributary of Purna river in Tapi Basin. Dam is situated near the village Wan (Bhairavgad) in the Taluka Telhara and Distt. Akola (MS). It is situated at about 368m above the sea level. It is at 76°-46-25N longitude and 21-11-8"E latitude. Human Sagar receives the water from river Wan which flows through the hill ranges of Sutpuda. The grazing activities of domestic animals adding their excreta, which get decompose during rainy season, enters along the runoff. The waste from the forest also influx in the dam water along the rain water. The Maximum capacity of the Hanuman sagar to hold water is 83.465 million m during rainy season, it is filled to its maximum capacity and excess water goes through waste weir, located on west shore of the reservoir. However, from last five years this lake has not achieved the high flood level. Water from the lake is being used for drinking, Irrigation and domestic use.

Five different sampling stations were selected for water samplings. The period of investigation was from October 2007 to March 2008. Water sampling carried out during 9am to 10am with the help of Rattner's water samples from a depth of 3 feet for every month, from Oct 2007 to March 2008.

Zooplankton investigations were carried out during October 2007 to March 2008. Zooplankton qualitative analysis carried out¹³. Standard methodology was used^{14,15}.

Results and discussion

The dam water was studied for the quantitative and qualitative analysis of rotifers. The monthly variations in the Rotifers biodiversity at different sampling stations are given in Table-1. Total 20 species of rotifers were recorded from Hanuman Sagar, Wan during the present investigations Rotifers dominated in the dam during the month of Jan and Feb 2008 and their minimum population was seen during Oct and Nov 2007. Among Rotifera, *Vonoela* and *Monostia* species dominated the Hanuman Sagar during Jan and Feb 2008 throughout the period of investigation.

A study on Cladocera's of Hanuman Sagar has been made. The monthly variations in the Cladocera biodiversity at different sampling stations are given in Table-2. In the present investigation 14 species of cladocera are recorded *Steno Daphnia* and *Alona* species were dominant in to water of Hanuman Sagar Cladocera dominated in the dam during the month of Feb & March 2008 and their minimum population was seen during October 2007.

The monthly variations in the ostracod diversity at different sampling spots are given in Table-3. Eleven species of ostracods were recorded from Hanuman Sagar, during the present investigation which includes 3 species of the genus *Cypris*. Further, the ostracods were found to be almost uniformly distributed throughout the reservoir ranging between 1.10x10 to 2.88x10' organisms it at each sampling spot under investigation. The monthly variations in the copepod diversity at different sampling spots are given in Table-3. Copepods ranged between 1.00x10 organisms / lit in October to 2.90x10 organisms / lit in Mar-2008. In all 8 species of copepods were observed. The monthly variation in copepods biodiversity is shown in Table-4. Among copepod, *Eucyclops* is seen to be represented by two species namely *Sparatus* and *Agilis*.

Water is one of the most important resources. All living organisms on the earth are so intimately connected that life on this planet is simply impossible in the absence of water. Water is equally vital for the growth of the plants, animals and human welfare activities such as agriculture and industrial developments. The fresh water bodies of India include a large number of rivers ponds, dams, impoundments and lakes. Once a water body gets established, it forms a definite ecosystem with its own physicochemical characteristics and accordingly various fauna and flora developed into it and get established forming a complicated food chain Hanuman Sagar dam is one such water body which is constructed for the purpose of irrigation, as a source of drinking water and water for domestic use. Presently water from the Hanuman Sagar is being supplied to various villages in the Akot and Telhara taluka. The water from the dam is also supplied to Akola district and Akot and Telhara taluka headquarters. In the present investigations categorized into four groups Rotifers, Cladocera, Ostracoda and Copepoda among these groups Rotifers is dominant group and is represented in the order of dominance was Rotifers, Cladocera > Ostracoda > Copepoda.

In the present investigations the dominant observations recorded during March. Rotifers dominated the Hanuman sagar dam during summer season, showing presence of 20 species throughout the year 2007-08. Similar observations were reported¹⁶⁻¹⁸. It was observed maximum number of rotifers during summer months. The high rotifer densities in summer seasons may be due to reduced water volume and increased concentrations of nutrients. Changes in the physico-chemical factors, inter specific and intra-specific composition, pollution level and the presence or absence of planktivorous and piscivorous fauna are some of the factors influencing rotifers species composition and structure in any ecosystem. Species richness, however, is good indication of dynamic state of the communities. It was noted that when more than one genus of the same group occurs in any water body, the genus is more abundant than others¹⁹. In the present study two species of the genus *Collurella* were recorded^{20,21,11,12} reported abundance of genus *Brachionus* in the various water body.

Cladocera forms are important component of zooplankton and form the most dominant group of fish food organisms²². It was observed that an important link in the aquatic food chain. Twenty different species of cladoceran are recorded during the present investigation with dominance of *Bosmina*, *Daphnia* and *Moina*, Table-2 include details of the cladoceran species recorded from the five different stations of Hanuman Sagar Reservoir. This group is also showed major peak in the month of March and minor peak in October. It is second dominating group of zooplankton in the present study. Cladocera as second dominant form of various fresh water bodies^{23,24}. The annual periodicity of the Cladocera species seems to be highly variable depending on the reproductive cycles of these organisms, physico-chemical characteristics of the reservoir water and the gross climate factors Copepods are the major links in the aquatic ecosystem. In the present study the copepod population ranked third in order of dominance. They are represented by eight species. The genus *Eucyclops* was represented by two species. The group showed major peak in the month of March and minor peak in the month of December and January. Similar observations reported on the study of zooplankton from Yashwant sagar reservoir, Indore (M.P. India)²⁵.

Ostracoda are also form the major links in the aquatic ecosystem during present study Ostracoda population ranked fourth in order of dominance. Eight species of ostracoda were recorded during the present investigation (Table-3). They showed almost constant population during winter and summer months le from October to March. The abundance of this group provides very good food for the fishes. They are the intermediate hosts for tapeworms of water fowl. Their abundance in the present reservoir could be because of their reproduction habits, less abundance of predators like fishes and favorable physico-chemical conditions. These forms reproduce by sexual as well as parthenogenetically and also by syngamy²⁶. Because of favorable conditions and abundant food they might have multiplied parthenogenetically in large number.

Table-1: Rotifer biodiversity of Hanuman Sagar during Oct 2007 to March 2008.

Species	Oct. 2007	Nov. 2007	Dec. 2007	Jan. 2008	Feb 2008	March 2008	Average
<i>Colurella sps</i>	0.1	0.3	1.6	1.00	1.50	1.31	0.7
<i>Colurella obtuse</i>	0.76	0.81	1.00	1.80	1.20	1.70	1.21
<i>Cephalodlallagibba</i>	0.30	1.20	0.76	1.20	1.50	1.80	1.17
<i>Tripleuchlanisplicata</i>	1.20	0.90	1.32	1.29	1.50	1.60	1.30
<i>Lecane luna</i>	0.80	0.65	1.10	1.60	1.30	1.90	1.22
<i>Lecane depressa</i>	0.67	0.78	0.59	1.20	1.60	1.20	1.00
<i>Monoyella globosa</i>	0.70	0.60	0.90	1.30	1.60	1.40	1.08
<i>Monostyla lunaris</i>	0.60	1.20	1.30	1.80	2.10	1.30	1.28
<i>Monostyla closterocerca</i>	0.60	1.20	1.10	1.29	1.30	1.80	1.21
<i>Keratella tropica</i>	0.69	0.29	1.20	1.30	1.70	1.50	1.11
<i>Anuraeopsis fissa</i>	1.20	1.60	1.10	1.80	1.50	1.98	1.53
<i>Brachionus hananaensis</i>	0.69	0.49	1.30	1.20	1.30	1.70	1.11
<i>Harringiarousseleti</i>	0.69	0.39	1.20	0.50	1.60	1.30	0.94
<i>Vonoyella globosa</i>	0.60	0.86	0.76	0.80	1.10	2.50	1.10
<i>Notholca acuminata</i>	0.65	1.30	0.69	0.78	1.3	1.2	0.98
<i>Ascomorpha sps</i>	1.30	1.20	1.19	1.49	0.90	0.98	1.17
<i>Lecane raculata</i>	1.10	1.60	1.39	1.20	1.80	1.10	1.36
<i>Lepadella ovalis</i>	1.10	0.80	0.89	0.79	1.10	1.26	0.99
<i>Elosaworalli</i>	1.40	1.80	1.98	1.78	1.67	1.86	1.74
<i>Bdelloid sps</i>	0.89	0.78	0.37	0.89	1.59	0.76	0.71

Each value in the Table X 10³.

Table-2: Cladocerans biodiversity of Hanuman Sagar during Oct 2007 to March 2008

Species	Oct. 2007	Nov. 2007	Dec. 2007	Jan. 2008	Feb 2008	March 2008	Average
<i>Stenodaphnia sps</i>	0.61	1.47	1.43	1.31	1.86	1.92	1.60
<i>Alona rectangula</i>	0.91	0.37	1.58	1.21	1.27	1.75	1.16
<i>Simocephalus exspinosus</i>	0.50	0.76	1.45	1.80	1.12	1.45	1.18
<i>Bipertura sps</i>	0.73	1.07	1.12	1.30	1.38	1.46	1.28
<i>Chydorus sphaericus</i>	0.57	0.58	1.27	1.11	1.45	1.33	1.05
<i>Chydorus ovalis</i>	0.96	1.30	1.02	0.95	1.08	1.50	1.34
<i>Daphnia pulex (female)</i>	0.66	0.92	1.43	1.06	1.90	1.65	1.36
<i>Macrothrixsps</i>	0.57	1.02	1.00	1.21	1.10	1.68	1.09
<i>Scapho lebersiskingi</i>	0.70	1.31	0.96	1.13	1.13	1.38	1.10
<i>Complocercus Oklanomensis</i>	0.60	0.81	1.33	0.93	0.95	1.48	1.01
<i>Moina Daphnia macleay li</i>	0.96	0.58	0.80	1.16	1.40	1.60	0.98
<i>Moina daphnia sps</i>	0.78	0.72	0.96	0.62	0.14	0.90	0.69
<i>Ilyocryptus spinifer</i>	0.75	0.85	1.05	0.95	0.21	0.32	0.32

Each value in the Table X 10³.

Table-3: Ostracod's biodiversity of Hanuman Sagar during Oct 2007 to March 2008

Species	Oct. 2007	Nov. 2007	Dec. 2007	Jan. 2008	Feb 2008	March 2008	Average
<i>Centrocypris sps</i>	1.10	1.75	2.01	2.88	1.13	1.10	2.88
<i>Stenocypris malcomsoni</i>	2.33	2.46	1.44	2.10	1.65	1.10	2.46
<i>Heterocypris sps</i>	1.21	1.31	2.11	2.33	1.99	1.27	2.33
<i>Cypris shell</i>	1.63	1.73	1.69	1.89	1.55	1.62	1.89
<i>Cypris sps</i>	2.33	2.65	2.10	2.35	2.10	1.30	2.65
<i>Candocypriaosborni</i>	1.55	1.30	1.26	1.46	1.35	1.21	1.55
<i>Cyclocypris sps</i>	1.12	1.31	1.26	1.24	1.36	1.18	1.36
<i>Cypris subglobosa</i>	1.10	2.10	1.23	1.40	2.20	2.35	2.35

Each value in the Table X 10³.

Table-4: Copepod’s biodiversity of Hanuman Sagar during Oct 2007 to March 2008.

Species	Oct. 2007	Nov. 2007	Dec. 2007	Jan. 2008	Feb 2008	March 2008	Average
<i>Thermocyclops crussus</i>	2.00	2.53	2.74	2.64	2.23	2.48	2.27
<i>Eucyclops sparatus</i>	1.00	2.00	2.37	2.32	2.15	2.90	2.45
<i>Phyllodiaptomus sps (Female)</i>	2.92	2.00	2.73	2.43	2.55	2.50	2.02
<i>Mesocyclops leukarti</i>	2.10	1.67	2.40	2.20	2.20	2.13	2.61
<i>Macrocyclus varicans</i>	1.98	1.10	1.20	1.30	1.42	1.03	1.83
<i>Diaptomus minutus</i>	1.80	1.53	1.30	1.02	1.20	1.35	1.03
<i>Cyclops strenuous</i>	1.10	1.39	1.64	2.42	2.25	2.38	2.03
<i>Diaptomus minutus</i>	1.28	1.10	1.10	1.30	1.15	1.48	1.23

Each value in the table X 10².

Conclusion

Water samples from five different sampling stations of Hanuman Sagar were investigated for various physicochemical characteristics and zoo plankton diversity for the period of October 2007 to March 2008.

The water temperature ranged between 20 and 26, it followed more or less the similar trend as that of atmospheric temperature. However, any definite relationship between temperature and zooplankton could not be established.

Among zooplankton, 20 species of Rotifera, 12 species of Cladocera and species of Ostracoda and 8 species of Copepoda were identified from the lake throughout the period of investigation. The order of dominance was Rotifers > Cladocera > Ostracoda > Copepoda.

From the study of zooplankton abundance, the Hanumansagar can be categorized as mesotrophic water body. On the basis of above findings, it may be inferred that the water from Hanuman Sagar is not only suitable for irrigation fish culture but also suitable as a source of potable water for the Akola, Akot, Telhara region of the Maharashtra state.

The present study significant in diversity of Zooplankton which is dominated by Rotifers throughout the investigations for fishery activities Lake are important as Zooplankton particularly rotifers are known to be the best food for the fish larvae for fisheries activities. Present study beneficial for the science and particular to fishery, contribution to reveal the diversity of Zooplankton in freshwater ecosystem in general which on the other hand is significant for Fishery sciences. Thus, it is concluded that, steps should be taken for the conservation and maintenance of the freshwater ecosystem.

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