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Rajesh Mishra

Department of Zoology
Government College, Balodabazar.

V. K. Kanungo

Government Nagarjuna P. G.
College of science,
Raipur, C.G.492010, India.

Swati Shrivastava

Government Nagarjuna P. G.
College of science,
Raipur, C.G.492010, India.

R. K. Agrawal

Government Nagarjuna P. G.
College of science,
Raipur, C.G.492010, India.

Seasonal Abundance of Zooplanktons in Five Ponds of Raipur City in Chhattisgarh

Rajesh Mishra, V. K. Kanungo, Swati Shrivastava and R. K. Agrawal

Abstract

Seasonal abundance of zooplanktons was investigated in five ponds Budha (S1), Maharajbandh (S2), Raja pond (S3), Telibandha pond (S4) and Dumar pond (S5) in Raipur city of Chhattisgarh during the year 2011. A total of 34 species of zooplanktons belonging to five major groups Protozoa, Rotifera, Cladocera, Copepoda and Ostracoda were recorded during the investigation in three seasons during the year. The zooplanktons observed were 6 of Protozoa, 22 of Rotifera, 2 of Cladocera, 3 of Copepoda and one of Ostracoda. Rotifers were the dominant group recorded during the present study composed of 13 genera and 22 species. Rotifers constitute 64.70% of total species recorded during the present study. 1, 2 and 3 genera were recorded of Ostracoda, Cladocera and Copepoda respectively. A total of 4 genera and 6 species of Protozoans were recorded in five ponds of Raipur city. Due to suitability of temperature and other environmental condition the zooplanktons abundance was higher in summer season, intermediate in winter season and lower in rainy season. The presence of maximum number of Rotifers indicated the eutrophication of the investigated ponds. In Rainy season lower diversity of zooplanktons was recorded due to higher turbidity of water in ponds.

Keywords: Pond water, Zooplanktons, Seasonal abundance and Eutrophication.

1. Introduction

Ponds are aquatic systems. It is habitat for large number of aquatic organisms ranging from microscopic planktons to large aquatic animals and macrophytes. All forms of life on the earth depend upon water for their existence. In recent time unplanned urbanization, rapid industrialization and unsystematic use of chemical fertilizers and pesticides in the field is leading to the deterioration of the water quality both qualitative and quantitatively and depleting the aquatic fauna^[1].

In freshwater ecosystem like ponds, zooplanktonic organisms are important food sources for many aquatic animals specially fishes. The main food for major Carps Rui, Catla and their hybrids found to be plankton in origin^[2]. Among all the freshwater aquatic biota zooplankton population is able to reflect the nature and potential of any aquatic system^[3]. Zooplankton plays an important role in indicating the water quality, eutrophication status and productivity of fresh water bodies^[4]. The planktons not only increase fish production but also help in Bioremediation of heavy metals and other toxic materials. Zooplankton can also act as biomarker for water quality assessment for fish production.

Ecologically zooplanktons are one of the most important biotic components influencing all the functional aspects of aquatic ecosystem such as food chains, food webs, energy flow and cycling of matter^{[5], [6], [7], and [8]}. According to Murugan *et al.* (1998)^[5] and Dadhick and Saxena, (1999)^[6] the zooplankton plays an integral role and serves bioindicator and it is a well suited tool for understanding water pollution status^[9,10].

Several studies have been made about zooplankton composition in India, however no such study was made in urban environment like in Raipur city. Hence, an attempt has been made to investigate zooplankton composition and seasonal abundance of Raipur city.

Study Area

Present investigation was done in Raipur city located in the fertile plains of Chhattisgarh Region. It lies between 21° 14'N latitude and 81°38'E Longitude. City is situated 260 m above mean sea level. As per latitudinal point of view city lies on northern tropics, about 250 kms south of the tropic of cancer. The five ponds were selected out of 27 ponds in the Raipur city.

Correspondence:

V. K. Kanungo

Department of Botany
Government Nagarjuna P. G.
College of science,
Raipur, C.G.492010, India.

The pond receives water from monsoonic rain and surface runoff. Ponds also receive domestic waste water by surface runoff during rainy season. The pond is largely used for bathing and washing of cattle, clothes and utensils by the local people.

2. Materials and Methods

The water from all the selected five ponds Budha pond (S1), Telibandha pond (S2), Dumar pond (S3), Raja pond (S4) and Maharaj bandh pond (S5) was collected in monthly intervals between 9 to 11 am. Pond water was filtered through plankton net and concentrated samples were preserved with 1 ml Lugol's solution in 10 ml vials. Zooplankton were analysed under light microscope and identification was done by following Edmondson [11], [12], [13]. The seasonal abundance was investigated for the year 2011.

3. Results and Discussion

In present investigation zooplankton recorded were representing protozoa, rotifera, Cladocera, Copepoda and Ostracoda. During present investigation 34 species of zooplankton were recorded. The zooplankton recorded were composed of 6 species of Protozoa, 22 species of Rotifera, 2 species of cladocera, 3 of Copepoda and 1 of Ostracoda. Rotifers were dominant group recorded during the present study composed of 13 genera and 22 species. Rotifer recorded 64.70% of total species, while 1, 2, 3 genera were recorded of Ostracoda, Cladocera and Copepoda respectively. Total of 4 genera and 6 species were recorded of Protozoa in all the 5 ponds (S1-S5) of Raipur city. (Table-1, 2 and 3).

Table 1: Abundance of zooplanktons in five ponds of Raipur city, during summer season of the year 2011

S.N.	Name of Zooplankton	Summer Season				
		S1	S2	S3	S4	S5
	Protozoa					
1	<i>Amoeba</i> sp.	+	+	+	+	+
2	<i>Arcella discoidea</i>		+	+	+	
3	<i>Arcella vulgaris</i>	+	+	+	+	+
4	<i>Paramecium aurelia</i>	+	+	+	+	+
5	<i>Paramecium caudatum</i>	+	+	+	+	+
6	<i>Vorticella companula</i>	+		+	+	
	Rotifera					
7	<i>Anuraeopsis fissa</i> (Gosse 1851)	+	+	+	+	+
8	<i>Asplancha brightwelli</i> (Gosse 1850)		+	+	+	
9	<i>Brachionus angularis</i> (Gosse 1851)		+		+	+
10	<i>Brachionus bidentata</i> (Anderson 1889)					
11	<i>Brachionus calyciflorus</i> (Pallas 1766)		+		+	
12	<i>Brachionus caudatus</i> (Barrois&Daday 1894)		+		+	
13	<i>Brachionus falcatus</i> (Zacharias 1898)	+	+		+	+
14	<i>Brachionus forficula</i> (Wierzejski 1891)				+	
15	<i>Brachionu squadridentatus</i> (Hermann 1783)				+	
16	<i>Brachios urceolaris</i> (Muller 1773)	+	+	+	+	+
17	<i>Filinia longiesta</i>		+			
18	<i>Keratella cochlearis</i> (Gosse 1851)				+	
19	<i>Keratella tropica</i> (Apstein 1907)		+		+	
20	<i>Lecane bulla</i> (Gosse 1951)					
21	<i>Lecane luna</i> (O.F. Muller 1776)				+	
22	<i>Monostyla bulla</i> (Gosse)					
23	<i>Notholca acuminata</i> (Ehrenberg)					
24	<i>Platylas quadricornis</i> (Ehrenberg 1832)			+		
25	<i>Polyarthra vulgaris</i> (Carlin 1943)	+				+
26	<i>Synchaeta pectinata</i> (Ehrenberg)	+	+		+	+
27	<i>Testudinella patina</i> (Hermann 1783)	+	+	+	+	+
28	<i>Trichocera similis</i> (Wierzejski 1893)		+		+	
	Cladocera					
29	<i>Daphnia</i>	+	+	+	+	+
30	<i>Chironormous</i> larvae	+	+	+	+	+
	Copepoda					
31	<i>Cyclops viridis</i>	+	+	+	+	+
32	<i>Eucyclops agilis</i>				+	
33	<i>Nauplius</i> larvae	+				+
	Ostracoda					
34	<i>Cypris</i> sp.	+	+	+	+	+

Table 2: Aabundance of zooplanktons in five ponds of Raipur city, during rainy season of the year 2011

S.N.	Name of Zooplankton	Rainy Season				
		S1	S2	S3	S4	S5
	Protozoa					
1	<i>Amoeba</i> sp.				+	
2	<i>Arcella discoidea</i>					
3	<i>Arcella vulgaris</i>			+		
4	<i>Paramecium aurelia</i>				+	
5	<i>Paramecium caudatum</i>	+				+
6	<i>Vorticella companula</i>	+	+	+	+	+
	Rotifera					
7	<i>Anuraeopsis fissa</i> (Gosse 1851)			+		
8	<i>Asplancha brightwelli</i> (Gosse 1850)				+	
9	<i>Brachionus angularis</i> (Gosse 1851)	+	+	+	+	+
10	<i>Brachionus bidentata</i> (Anderson 1889)	+				+
11	<i>Brachionus calyciflorus</i> (Pallas 1766)		+			
12	<i>Brachionus caudatus</i> (Barrois&Daday 1894)				+	
13	<i>Brachionus falcatus</i> (Zacharias 1898)			+		
14	<i>Brachionus forficula</i> (Wierzejski 1891)				+	
15	<i>Brachions quadridentatus</i> (Hermann 1783)					
16	<i>Brachionus urceolaris</i> (Muller 1773)			+		
17	<i>Filinia longiesta</i>	+	+	+	+	+
18	<i>Keratella cochlearis</i> (Gosse 1851)	+	+	+	+	+
19	<i>Keratella tropica</i> (Apstein 1907)				+	
20	<i>Lecane bulla</i> (Gosse 1951)	+				+
21	<i>Lecane luna</i> (O.F. Muller 1776)	+	+	+	+	+
22	<i>Monostyla bulla</i> (Gosse)					
23	<i>Notholca acuminata</i> (Ehrenberg)			+		
24	<i>Platylas quadricornis</i> (Ehrenberg 1832)			+	+	
25	<i>Polyarthra vulgaris</i> (Carlin 1943)				+	
26	<i>Synchaeta pectinata</i> (Ehrenberg)		+			
27	<i>Testudinella patina</i> (Hermann 1783)			+		
28	<i>Trichocera similis</i> (Wierzejski 1893)		+			
	Cladocera					
29	<i>Daphnia</i>	+				+
30	<i>Chironormous</i> larvae	+	+		+	
	Copepoda					
31	<i>Cyclops viridis</i>		+	+	+	
32	<i>Eucyclops agilis</i>				+	
33	<i>Nauplius</i> larvae	+	+	+	+	+
	Ostracoda					
34	<i>Cypris</i> sp.				+	

Table 3: Aabundance of zooplanktons in five ponds of Raipur city, during winter season of the year 2011

S.N.	Name of Zooplankton	Winter Season				
		S1	S2	S3	S4	S5
	Protozoa					
1	<i>Amoeba</i> sp.		+		+	
2	<i>Arcella discoidea</i>					
3	<i>Arcella vulgaris</i>				+	
4	<i>Paramecium aurelia</i>			+	+	
5	<i>Paramecium caudatum</i>		+			
6	<i>Vorticella companula</i>		+	+	+	+
	Rotifera					
7	<i>Anuraeopsis fissa</i> (Gosse 1851)		+		+	
8	<i>Asplancha brightwelli</i> (Gosse 1850)				+	
9	<i>Brachionus angularis</i> (Gosse 1851)		+		+	
10	<i>Brachionus bidentata</i> (Anderson 1889)				+	+

11	<i>Brachionus calyciflorus</i> (Pallas 1766)					
12	<i>Brachionus caudatus</i> (Barrois&Daday 1894)			+	+	
13	<i>Brachionus falcatus</i> (Zacharias 1898)			+	+	
14	<i>Brachionus forficula</i> (Wierzejski 1891)	+			+	+
15	<i>Brachionus quadridentatus</i> (Hermann 1783)	+	+	+	+	+
16	<i>Brachionus urceolaris</i> (Muller 1773)	+	+	+	+	+
17	<i>Filinia longiata</i>	+			+	+
18	<i>Keratella cochlearis</i> (Gosse 1851)			+		
19	<i>Keratella tropica</i> (Apstein 1907)				+	
20	<i>Lecane bulla</i> (Gosse 1951)	+	+		+	+
21	<i>Lecane luna</i> (O.F. Muller 1776)				+	+
22	<i>Monostyla bulla</i> (Gosse)		+	+	+	
23	<i>Notholca acuminata</i> (Ehrenberg)				+	
24	<i>Platyias quadricornis</i> (Ehrenberg 1832)				+	
25	<i>Polyarthra vulgaris</i> (Carlin 1943)					
26	<i>Synchaeta pectinata</i> (Ehrenberg)			+		
27	<i>Testudinella patina</i> (Hermann 1783)			+	+	
28	<i>Trichocera similis</i> (Wierzejski 1893)	+	+		+	+
	Cladocera					
29	<i>Daphnia</i>		+	+	+	
30	<i>Chironormous</i> larvae	+	+	+	+	+
	Copepoda					
31	<i>Cyclops viridis</i>		+		+	
32	<i>Eucyclops agilis</i>	+	+	+	+	+
33	<i>Nauplius</i> larvae			+		
	Ostracoda					
34	<i>Cypris</i> sp.	+				+

Seasonal abundance of zooplankton was investigated in all the five ponds of Raipur city, during the year 2011. During summer season zooplankton species of Protozoa recorded maximum 6 species in pond S-3 and S-4 .5 species in S-1 and S-2 and 4 species in S-5. Number of Rotifera species in Summer season was maximum 15 in pond S-4, minimum 5 in pond S-3, while other ponds recorded 6 in pond S-1, 7 in pond S-5. 2 Cladocera species was recorded in all the ponds S1-S5 during Summer season. Similarly 1 Ostracod species each was recorded in the entire pond. The number of Copepod recorded 1 species in pond S-2, S-3 and 2 species in S-1, S-4 and S-5.

In rainy season 2 species each of Protozoa was recorded in pond S-1, S-3 and S-5, while 3 species was recorded in pond S-4 and 1 in S-2. 10 species each of Rotifer was recorded in pond S-3 and S-4, while 6 species in pond S-1 and S-5. 7 species of Rotifer was recorded for pond S-2. 2 species of Cladocera was recorded in pond S-1 and 1 each in pond S-2, S-4 and S-5. No cladocera species was noted in pond S-3. Nauplius larvae were seen in all the ponds S1-S-5. Cyclopes was noted in pond S-2, S-3 and S-4. *Eucyclopes agilis* was observed only in pond S-4. Similarly Cypris species of Ostracoda was observed only in pond S-4.

In winter season no Protozoan species was observed in pond S-1, while in pond S-5, S-3, S-2 and S-4 number of protozoan species recorded was 1, 2, 3, and 4 respectively. The maximum number of Rotifers 18 was observed in pond S-4, while 8 each in S-3 and S-5. The number of Rotifers in pond S-1 and S-2 was noted 6 and 7 respectively. Cladocera species was noted 2 each in pond S-2, S-3 and S-4, while 1 each in pond S-1 and S-5. Similar number of species of Copepods were noted in ponds, however, Cypris species was noted only in pond S-1 and S-5.

The present study reveals that the higher number of

zooplanktons species found in summer season and lower in rainy season. According to [14] increase in temperature and high evaporation during summer enhances the rate of decomposition due to which water becomes nutrient rich resulting in increase in number of zooplankton. The lower number of zooplanktons in rainy season may be attributed to the dilution factor by rain and high water level [15], [16].

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