



Short Communication

Effect of Anthropogenic Activities on Zooplankton Population of Sogal Pond, Belgaum District, Karnataka, India

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Abstract

The present study is aimed at the impact of anthropogenic activities on the richness of zooplankton of Sogal pond. The Sogal pond is located at 15° 51' 35" North latitude and 74° 58' 28" East longitude. The observations reveal presence of 16 different species belonging to 3 groups namely. Rotifera, Cladocera and Copepoda and formed 41, 30 and 29 percent of total zooplankton population in the pond. The overall observation reveals that presence of many of them are pollution indicators due to the lot of interference of human activities. Rotifers are found maximum in summer and least in monsoon, similarly cladocera are maximum in monsoon than in other seasons. Water is not found to be suitable for human consumption.

Keywords: Sogal pond, zooplankton, rotifer, cladocera. Belgaum district.

Introduction

Water is one of the important components of the earth, essential for the existence and continuity of life. It occupies 71% of the total area of the earth's surface but fresh water is relatively small in portions. Quality of aquatic environment has inevitably associated with the problems caused by the anthropogenic activities.

India is bestowed with many large and small water bodies. These water bodies are of immense importance and serve as source of water for various uses. The small water bodies especially ponds, man made ponds and paddles are diverse in their water quality which in turn provide diverse environments for the micro fauna. Although Zooplankton form a minute aquatic group but play a vital role in food chain by linking the producers and consumers. The distribution of aquatic organisms in particular has long been known to be heterogeneous in nature. In all ecosystems functioning is the result of many interesting physical and biological process¹. The study of the fresh water fauna especially zooplankton, is complicated due to environmental variations.

Fresh water zooplankton plays a key role in preservation and maintenance of ecological balance and a study on its basic aspects is absolutely necessary. The seasonal fluctuations of the zooplankton exhibits a bimodal oscillation with a spring and autumn phenomenon in the temperate lakes and reservoirs². This fluctuation is greatly influenced by the variations in the temperature along with many other factors. Among various factors, temperature seems to exhibit the greatest influence on the periodicity of zooplankton^{3,4}.

Sogal pond is located at 15° 51' 35" North latitude and 74° 58' 28" East latitude. Every year thousands of pilgrims visit the temple. Surface water run towards south and forms a fall in front of the temple. Earlier pond water was used for drinking but anthropogenic activities pond is polluted and unfit for drinking. Several researchers worked on the characteristics of natural and man made ponds. Present work is an attempt to know the diversity of zooplankton and impact of anthropogenic activities.

Material and Methods

Water samples were collected monthly by using plankton net made of bolting nylon cloth. (No; 25 and 60 μ in size) by sieving a known volume of water sample. Samples were fixed in 4% formalin and preserved in 50 ml bottles. Numerical estimation of zooplankton was done under microscope using Sedge-Wick Raftar Cell. Average 10 counts were made for each sample and expressed in numbers per liter. All data are statistically analyzed.

Results and Discussion

Zooplankton species survive under a wide range of environmental conditions and their growth and intensity totally depend on physical, chemical and biological factors. Monthly variations of zooplankton is depicted in table 1. Zooplankton consists of by rotifer (41%), cladocera (30%) and copepod (29%) and all the three groups contributed to richness in the pond. Rotifera formed the dominant group over cladocera and copepod. Density of various zooplankton thus, in the order rotifera>cladocera>copepod.

Rotifers represented by 6 genera namely Brachionus, Keratella, Asplanchna, Trichocerca, Lecane and Filinia.

Table-1
Variation of zooplankton in Sogal pond (Number /l)

Zooplankton	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan
Rotifera												
Brachionus angularis	40	41	52	32	-	-	-	10	28	24	20	22
B. caudatus	78	62	-	38	20	32	28	44	-	-	-	-
B.calyciflorus	26	20	100	31	-	-	-	-	-	-	-	28
B.forficula	31	28	28	40	12	22	38	-	20	12	26	28
Keratella tropica	40	30	32	58	12	14	-	-	-	-	-	-
Trichocerca cylindrical	72	18	50	-	-	-	10	18	14	28	24	-
Asplanchna priodonta	32	28	20	-	-	-	-	-	42	28	46	32
Lecane monostyla	-	-	19	-	20	22	32	26	-	-	-	-
Filinia longiseta	22	19	-	30	40	34	-	-	-	-	-	24
Cladocera												
Daphnia carinata	20	20	-	-	100	86	68	104	83	-	-	-
Ceriodaphnia cornuta	18	16	20	-	56	32	24	18	28	-	-	22
Alona rectangular	10	12	-	-	-	42	32	28	14	-	-	-
Moina macrocopa	-	-	12	-	34	42	52	42	10	18	28	-
Macrothrix laticarnis	-	-	-	-	20	16	28	32	12	-	-	-
Chydorus reticulates	16	-	-	22	48	60	98	70	40	-	-	-
Copepoda												
Rhodiaptomus sps	22	32	18	38	10	12	18	48	28	36	42	30
Mesocyclops leukarti	26	18	28	40	-	-	-	-	46	42	28	48
Tropocyclops prasinus	26	28	38	-	-	-	68	58	38	38	62	38
Nauplius larva	35	48	40	28	18	26	42	46	43	40	34	40

Table-2
Month -wise variations among different group of Zooplankton population (Number/l)

Month	Rotifera	Cladocera	Copepodes
February	341	64	109
March	246	48	126
April	327	32	124
May	267	22	106
June	104	268	28
July	124	288	38
August	108	302	128
September	98	294	152
October	102	187	155
November	92	18	156
December	116	28	166
January	134	22	156

Rotifers in general, are cosmopolitan and their distribution is not limited to any continent. It is also suggested that the distribution of rotifer species depends on their relations to environment and other species of the aquatic community. The composition of rotifer population showed higher population in summer, while lower population observed in monsoon. This may be due to availability of food such as bacteria, organic matter of dead and decaying vegetation, perhaps may be due to the influence of copious quantity of rain water and turbidity which gets drained into the reservoir⁵.

Rotifer were recorded maximum in Feb (341 org/l) and minimum in Sept (80org/l). Seasonally they are abundant in summer and indicate the influence of temperature (table 3). Similar observations have been recorded⁶⁻⁸.

Table-3
Seasonal variations in zooplankton (Numbers/l)

	Summer	Monsoon	Winter	Total
Rotifers	1181	434	444	2059
Cladocera	166	1152	255	1573
Copepods	465	346	633	1444

Brachionus species recorded dominated the pond in summer (649 org/l) followed by winter (208 org/l) and 206 org/l in Monsoon indicating temperature dependent factor. Brachionus angularis (10 org/l) has been observed throughout the study period except June, July and August. While B. caudatus found in summer, monsoon and not in winter. B calyciflorus ranged 28 org/l to 10 org/l. B.forficula observed throughout the study period except September. Numerically they were 40 org/l to 12 org/l. Keratella tropica appeared in summer and early monsoon seasons. They were recorded maximum in Feb (40 org/l) and minimum in June (12 org/l).Trichocerca sps were also abundantly observed in summer and winter seasons. Asplanchna sps were observed from April to September. They were maximum in August (32 org/l) and minimum in April (19 org/l). Lecane sps were observed in summer⁸. Filinia longiseta were observed only in April. Keratella sps, Lecane sps and Filinia sps are abundantly found in the pond indicating the eutrophic status.

Asplanchna sps observed in monsoon are usually found in oligotrophic nature of water body.

Cladocerans in general, heavily depend on the supply of food. During summer low density could be due to more dense growth of the rotifers. In monsoon the density is high due to the availability of food in the water. Cladocera represented by Daphnia sps, Ceriodaphnia sps, Alona sps, Moina sps Macrothrix and Chydorus sps. They together forms 31% of the zooplankton. Daphnia carinata abundantly found in monsoon. They recorded maximum in June (110 org/l) and minimum in Feb and March (20 org/l). Ceriodaphnia cornuta ranged 16org/l to 56 org/l. They appeared maximum in monsoon season. Alona rectangular are recorded from 12 org/l to 42 org/l, seasonally they are abundant in monsoon followed by winter. Moina macrocopa are recorded from 10 org/l to 52 org/l. Macrothrix laticornis fluctuated between 12 org/l (Oct) and 32 org/l (Sept). Seasonally they were plenty in monsoon followed by winter. These are restricted to clean waters, indicated that during July and August anthropogenic activities have been considerably reduced, but as anthropogenic activities increased water body leads to eutropic condition. Chydorus sps were recorded minimum in Feb (16 org/l) and maximum in August (98 org/l). They were abundantly observed in monsoon season.

Copepods were represented by Rhinodiptomus indicus, Mesocyclops leuckartii, Tropocyclops prasinus and Nauplius larvae. Copepods contributing 29% of the total net zooplankton. Similar trends are also observed in Fort lake of Belgaum⁸. They are moderately good numbers throughout the study period. Density of R.indicus fluctuated between 10 org/l and 48 org/l. Mesocyclops sps ranged from 18 org/l (April) to 48 org/l (Jan). Tropocyclops prasinus fluctuated between 28 org/l (March) to 68 org/l (August). Seasonally they were abundantly observed in winter season. Nauplius larvae were observed throughout the study period. Copepods are found in clean as well as polluted waters, this is in conformity with the observations made by Patalas⁹.

Sladeczek's $Q_{B/T}$ quotient is useful to know the trophic status of individual water bodies. According to the Sladeczek's quotient values less than 1.0 is oligotrophy, between 1-2 is mesotrophy and above 2.0 is eutrophy and above 4 is hypereutrophy. The values obtained in the lake shows the lake is eutrophic to hypereutrophic in nature (table -4).

Conclusion

Present study indicated that the plankton population of pond is highly influenced by contamination of discharge of domestic waste, floral offerings, washing clothes, cleaning vehicles, bathing and other anthropogenic activities. The shift in the zooplankton community dominance of pollution tolerance forms indicated deterioration of the water quality in the Sogal pond. Public awareness is required to know about the water quality and biodiversity. Still a comprehensive study is essential.

Table-4
Value of $Q_{B/T}$ quotient

Month	No.of Brachionus sps /litre	No.of Tricocerca sps/litre	$Q_{B/T}$ ratio	Tropic status
February	175	72	2.43	Eutropic
March	151	18	8.38	Hypereutropic
April	180	50	0.2	Oligotrophic
August	66	10	6.6	Hypereutropic
Sept	54	18	3.0	Eutropic
October	48	14	3.42	Eutropic
November	36	24	1.5	Mesotrophic
December	46	24	1.9	Mesotrophic

Table-5
Simple Correlation Co-efficient test for various zooplankton

	Rotifer	Cladocera	Copepoda
Rotifer	1.00	-0.522	-0.086
Cladocera	-0.522	1.00	-0.456
Copepoda	-0.086	-0.456	1.00

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