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Species diversity indices of zooplankton from Sadatpur reservoir, Ahmednagar, Maharashtra

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ABSTRACT

The study of diversity indices of zooplankton and physio-chemical characteristics were studied during 2009-10. A total of 25 species of zooplankton belonging to different taxonomic groups were identified. Among these 6 species belonging to protozoa, 10 species to rotifer, 5 species of cladocera, 3 species to copepoda and 1 species from decapoda. The numerical superiority of zooplankton revealed that 81.8% frequency occurrence of some protozoa and rotifer. The maximum value of relative density (4.36) was recorded in *Sinantherina* species (rotifer). The maximum value of relative frequency (15.35) was recorded in *Rotaria* species (rotifer). The maximum value of relative abundance (7.6) was recorded in *Rotaria* and *Asplanchna* species (rotifer). These are pollution indicator species used for monitoring the aquatic body.

Key words: Diversity, Indices, Zooplankton, Sadatpur reservoir.

INTRODUCTION

The study of zooplankton diversity indices contributes to an understanding of the environmental status of a water body. The zooplankton in the surface water consist mainly protozoan, rotifers, cladocerans, copepods and a great variety of larval forms. The zooplankton inhabiting a freshwater responds quickly to environmental changes and hence their species indices fluctuate [1]. However, work has been carried on zooplanktons of fresh water habitat with rapid temporal changes in the structure and abundance which is important in food web and nutrition of zooplanktivorous organisms [2, 3,4].

The aquatic productivity is depending on the bottom or surface organisms directly or indirectly. The aquatic fauna are the natural indicators of the water quality [5]. But now-a-day the quality and purity of water has deteriorated due to pollution. It is adversely affects on the water quality and its biota including zooplankton. The microzoobenthos study has not received much attention in India. Hence, there is need to evaluate the species diversity indices with water parameter, which is lacking. However, present investigation is made an attempt to evaluate the species diversity indices in zooplankton species, inhabiting in the given reservoir.

STUDY AREA

The present study was conducted in ruler area. It was conducted during 2009-10. Sadatpur reservoir was the study area and located between 19⁰35' N latitude and 74⁰27' E longitude at 572 m MSL. The area is about 30320 m² and lies in Godhavari (Tributary Pravara) basin at Loni Dist. Ahmednagar and experience an average rain fall 58 cm. The reservoir is artificially constricted in 1962 but contain natural water and capacity is about 840847 m³. The

physiographic of basin is semi agricultural and semi-arid with cultivated top soil bank.

MATERIALS AND METHODS

The zooplankton was collected from the surface water column (< 1 M depth) from Sadatpur reservoir monthly. The net zooplankton (NZP) was randomly collected in a glass tube (50 ml) by filtering 50L water by a nylon monofilament 75µm mesh from ten different locations. Zooplankton on each location was separately collected. The NZP were segregated and transferred to another glass tube (100 ml) immediately and concentrated and preserved in 70% ethyl alcohol. Two drops of the mild detergent solution (1:4 detergent concentrate and water) were added to prevent any clumping of the NZP, and stored in the dark. A day after preservation, samples were regularly examined and enumerated in the laboratory.

For enumeration of NZP, the drop method was followed according to [6, 7]. The enumeration of small NZP was made in a 2 ml clear acrylic plastic counting cell and placed under a compound microscope (100X). To reduce any moment the organisms, one drop of detergent was placed. The NZP were recorded in a one drop and considered as a quadrat and 10 quadrats were recorded. The NZP collected from the water were identified [8]. The data for a species recorded were evaluated for species diversity indices [9].

The water sample was collected in a plastic container at the same time of zooplankton collection early in the morning (9.00 am) physiochemical properties were carrying out on filtered water sample. The parameter like pH and temperature were recorded on site. The water samples were chemically analyzed for dissolve oxygen (DO), carbon dioxide (CO₂), alkalinity (HCO₃ and CO₃), calcium (Ca), magnesium (Mg), potassium (K), hardness (HA), chloride (Cl) and phosphate (PO₄) according to the standard method recommended [10]. The average data of one year is present in table 1.

RESULTS AND DISCUSSION

In the present investigation frequency accuracy, relative density, relative frequency, relative abundance and important value are evaluated. These values are evaluated in zooplankton including protozoa, rotifer, cladocera, copepoda and decapod (Table-2). Also physico-chemical properties are recorded at the same time (Table-1).

The main value of surface water temperature was 25.6 °C. The pond temperature appears to regulate plankton development. The value of DO (6.5 mg/l), CO₂ (0.6 mg/l) alkalinity (HCO₃) (39.67 mg/l), alkalinity (CO₃) (9.83 mg/l), calcium (25.53 mg/l), magnesium (22.16 mg/l), potassium (19.13 mg/l), hardness (52.67 mg/l), chloride (13.53 mg/l) and phosphate (0.80 mg/L) were recorded during study period.

A total of 25 species of zooplankton were identified during the study period. Out of 25 species recorded, 6 species belong to protozoa, 10 species to rotifer, 5 species to cladocera, 3 species to copepoda and single species to decapoda. Analysis of numerical superiority of zooplankton reveals that rotifer is a dominant species. Dominant species are reported to be the most important ecological indicators as they received the full impact of the habitat for the over longer period and manifest different level of sensitivity [11]. Ecological indicators are the effective tools in environmental monitoring which is required to assess the changes cause by anthropogenic activities [5].

The individual species indices with their groups are presented in table 2. The zooplankton species frequency occurrence varied between 54.5 % and 81.8 % during the study period. The maximum value (81.8 %) of frequency occurrence was found in rotifer (*Monostyella* and *Rotreria sp.*) and protozoa (*Arella* and *Stentor sp.*). However it depends on the sample size and the time spend on searching [4].

The indices indicate whether all species in a sample are equally dominant or not. In present study zooplankton species the relative density values varied from 2.75 to 4.36 during the study period. The minimum value of relative density was revealed from cladocera and protozoa species and maximum from rotifer species.

The indices are also sensitive to species abundance. In the study relative abundance varied between 0.3 and 7.6 during the study period. The minimum value of abundance (0.3) was recorded from *Euglina* (protozoa) and maximum (7.6) from *Asplanchna* (rotifer). The relative frequency varied from 9.96 to 15.35. The minimum value revealed (9.96) from *Coleps* (protozoa) and maximum (15.35) from *Rataria* (rotifer) and important values ranging

from 8.75 to 27.13. The minimum value (8.75) recorded from *Sinantherina* (rotifer) and maximum (27.13) from *Rataria* (rotifer).

Table 1:- Physico-chemical properties of Sadatpur reservoir during 2009-10

Sr. No	Parameters	
1.	Water temperature	25.66
2.	pH	7.9
3.	DO	6.5
4.	CO ₂	0.6
5.	HCO ₃ Alkalinity	39.67
6.	CO ₃ Alkalinity	9.83
7.	Calcium	25.53
8.	Magnesium	22.16
9.	Potassium	19.13
10.	Hardness	52.67
11.	Chloride	13.53
12.	Phosphates	0.80

All parameters in mg/l, except pH and temperature (^oC).

Table 2 :-Showing species diversity indices of zooplankton from Sadatpur reservoir

Zooplankton species	Frequency occurrence	Relative Density	Relative Frequency	Relative abundance	Important Value
Protozoa (6 sp.)					
1. Arcella sp.	81.8	3.18	11.62	1.6	16.4
2. Balantidium sp.	72.7	2.90	11.20	0.95	15.05
3. Coleps sp.	63.6	2.54	9.96	2.2	14.7
4. Amoeba sp.	72.7	3.00	10.78	0.6	22.38
5. Stentor sp.	81.8	3.69	12.86	0.81	17.36
6. Euglina sp.	72.7	2.45	10.37	0.3	13.12
Rotifer (10 sp.)					
1. Brancionous sp.	63.6	3.63	13.63	5.4	22.72
2. Cristaluta sp.	72.7	3.63	13.69	5.4	22.43
3. Monostyella sp.	81.8	3.90	14.93	0.9	19.23
4. Rotaria sp.	81.8	4.18	15.35	7.6	27.13
5. Testiudinella sp.	72.7	4.27	13.27	1.3	18.84
6. Keratella sp.	72.7	4.18	13.63	4.1	21.97
7. Asplanchna sp.	63.6	4.18	14.52	7.6	26.30
8. Tophrocauna sp.	63.6	3.90	12.95	6.2	23.05
9. Trichoreca sp.	63.6	3.81	12.86	3.2	19.87
10. Sinantherina sp.	72.7	4.36	13.69	0.7	8.75
Cladocera (5 sp.)					
1. Alona sp.	72.7	2.72	12.03	6.3	21.02
2. Bosmia sp.	63.6	2.27	11.61	5.3	19.18
3. Daphnia sp.	54.5	2.18	13.03	3.8	18.01
4. Monia sp.	54.5	2.36	10.37	1.2	13.93
5 Monoclaupnia sp.	63.6	2.36	10.37	1.2	13.93
Copepoda (3 sp.)					
1. Eucyclope sp.	63.6	3.27	12.45	3.6	16.32
2. Mesoylopes sp.	63.6	3.54	12.03	3.8	19.37
3. Naupilus sp.	72.7	3.18	11.20	4.1	18.48
Decapoda (1 sp.)					
1 Zoaea Larva	72.7	3.09	10.37	2.7	16.16

The protozoa, rotifer, copepod, cladocera, decapoda, branchiopoda and ostracoda mainly constituted the net zooplankton (NZZ) groups of the fresh water. The NZZ species increased their abundance during summer probably corresponding to the water quality, decaying vegetation, increased levels of organic matter in the sediment and higher abundance of bacteria in the water during this time [4, 12]. The abundance of NZZ species decreased in winter, probably corresponding to low water temperature and high alkalinity of water [13]. The composition of the NZZ species, however, demonstrated some similarity with those recorded for other tropical freshwater lakes [12, 14]. But the relative abundance and frequency of occurrence of the net zooplankton species in the present investigation differed markedly. Which may due to shallowness and muddy nature of water [13]. As this water passed through years with little drying-up, some species were more abundant than others, and consequently there,

frequency of occurrence reached the maximum. In the present study relationship between seasonal variation in species and physico-chemical properties are not evaluated.

The protozoan populations were fewer in the surface water. The rotifer populations however, were more abundant than other NZP groups in this water, and this was probably due to their ability to withstand and survive in varying immunological conditions prevailing at different seasons. Some of the rotifers were reported as primary consumers that fed on various phytoplanktons, while others were reported as raptorial predators that fed on bacteria and detritus matters [15, 16, 17]. The larger proportions of the rotifer- protozoa- cladocera assemblage in this water may be corresponded to the persistent alkalinity of water [1]. In the present study alkalinity HCO_3 was 39.67 mg/l and CO_3 was 9.83 mg/l. It might be because of higher population of the species.

In the present study the NZP population revealed rotifer > protozoa > cladocera > copepoda > decapoda respectively. The greater species diversity means larger food chain and more cases of inter- specific interactions and greater possibilities for negative feedback control which reduces oscillations and hence increases.

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