Composition and Biodiversity of Rotifer Population in Godavari River

KEYWORDS

rotifer population, Godavari river, Brachionus, population density

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ABSTRACT

In the present investigation variation in rotifer population of Godavari river from Nashik, (M.S.) India from four different study stations were analyzed from May 2009 to April 2010. During the study period total 24 rotifer species belonging to 17 genera were found. The most quantitatively genera Brachionus were the main and significantly abundant genera, represented by 6 species. Monthly population density of rotifera showed its peak during December while least in August at study station IV.

INTRODUCTION

Amongst the zooplanktons rotifers ought to be well-known. Rotifera also known as the “Wheel Animal” (rota=wheel, -fera=those that bear). Rotifers are microscopic aquatic animals of the phylum Rotifera. They play an important role in the ecosystem, and considered as a bioindicators of the habitats (Segers 2008). A few rotifers are cosmopolitan, while majority of these animals are highly adapted to a wide range of freshwater conditions (Brummet 2000). As a result, the ecological investigations on rotifers also gained importance. Hence, qualitative and quantitative studies of rotifers are of great importance.

Bhat et al, (2012) studied composition and dynamics of rotifera fauna from upper basin (Bhoj Wetland) as parameter of water quality. Sitre and Zade (2012) studied biodiversity of rotifers in a freshwater lake of Nagpur city (M.S.) during different seasons of the year. Shah et al, (2013) studied rotifers of aquatic ecosystems of Kashmir Himalaya for documentation and authentication.

At present there has been lack of studies regarding the biodiversity of rotifers from Godavari river. As a consequence, the aim of the present study was to collect, identify as well as to determine monthly variation of density and diversity of rotifers from surface water of Godavari river from four study stations.

Materials and Methods

(A) Study area

Four sampling stations were selected to study the monthly composition and diversity of the rotifer population in Godavari river, Nashik, Maharashtra.

Station I: At downstream of Gangapur dam, the point before the discharge of industrial effluents. The water is used for agriculture purpose only.

Station II: Near Someshwar Temple, the point before the discharge of agro-industrial effluents. The water is used for agriculture, bathing and washing purposes and agriculture runoff is also released.

Station III: Ramkund also known as Ganga ghat is a holy place. Various rites and rituals are performed here. Water is used for bathing and washing. The domestic waste water is mostly released before and subsequent to this point.

(B) Collection of samples

Rotifers samples were collected for qualitative and quantitative analysis in between 7 a.m. to 10 a.m. by standard methods (APHA, 1985) from four sampling sites over a period of one year (May 2009 to April 2010). The collected samples were fixed in 4% formalin and brought to the laboratory for zooplankton analysis; counting and identification were done as per Battish (1992). For quantitative estimation Sedgwick – Rafter cell method was used.

RESULTS AND DISCUSSION

Table 1 represents list of rotifer species recorded in Godavari river. The pattern of rotifer analysis and monthly variation at four studied sites of Godavari river are given in table 2 and figure 1. Figure 2 represents annual mean percentage composition of rotifers at four studied stations.

During the present study, 24 species of rotifers belonging to 17 genera were recorded from four studied stations. Diversity population as studies in the present investigation indicates that rotifers dominate at all considered stations of Godavari river. The Brachionus was represented by different species while Filina and Keratella by 2 species. The other genera of rotifer such as, Conochilus unicornis, Hexarthra mira, Polyarthra indica, Trichotria trichatris, Mytilina ventralis contributed low densities and were restricted to certain season only. The annual rotifers population was 16%, 20%, 29%, and 35% at stations I, II, III, and IV respectively.

Station IV: Ramkund Downstream just before the Tapovan area. At this point, sewage from Nashik City and some industrial waste are also released in to water.
TABLE - 1
LIST OF ROTIFER SPECIES RECORDED FROM GODAVARI RIVER.

| Sr. No. | Rotifer species          | Station I | Station II | Station III | Station IV |
|---------|-------------------------|-----------|------------|-------------|------------|
| 1       | Asplanchna brightwelli  | -         | +          | +           | +          |
| 2       | Brachionus calyciflorus | +         | +          | +           | +          |
| 3       | B. caudatus             | +         | +          | +           | +          |
| 4       | B. forficula            | +         | +          | +           | +          |
| 5       | B. fulcatus             | +         | +          | +           | +          |
| 6       | B. quadridentatus       | +         | +          | +           | +          |
| 7       | B. urceaoaliris         | +         | +          | +           | +          |
| 8       | Conochilus unicornis    | +         | -          | -           | -          |
| 9       | Euchilnis dialatata     | +         | -          | +           | +          |
| 10      | Filina logesita         | +         | +          | +           | +          |
| 11      | Filina pegleri          | +         | +          | +           | +          |
| 12      | Hexarthra mira          | -         | +          | -           | -          |
| 13      | Keratella procura       | +         | +          | +           | +          |
| 14      | Keratella tropica       | +         | +          | +           | +          |
| 15      | Lacane luna             | +         | +          | +           | +          |
| 16      | Trichotria trichatris   | -         | -          | +           | -          |
| 17      | Mytilina ventralis      | +         | -          | -           | -          |
| 18      | P. quadricornis         | +         | -          | +           | +          |
| 19      | Philodina flaviceps     | -         | +          | +           | -          |
| 20      | Platias patulus         | +         | +          | +           | +          |
| 21      | Polyathra indica        | -         | -          | -           | +          |
| 22      | Rotaria neptunia        | +         | +          | +           | +          |
| 23      | Testudinella sp.        | +         | +          | +           | +          |
| 24      | Trichocera cylindrical  | -         | +          | +           | +          |

(+) = Present and (-) = Absent

At station I, the maximum population density recorded in June month 192 units/L and minimum 48 units/L in September. At station II, the maximum population density recorded in January month 289 units/L and minimum 44 units/L in June. Station III, showed maximum density of rotifers 508 units/L was observed in December and less number of population density was recorded 37 units/L in August. At station IV, population density of rotifer 661 units/L was highest in third week of December month and lower 34 units/L in August.

During the present study (2009-2010) the population density of Rotifers, at station I, II, III, and IV ranged between 48 to 192 units/L, 44 to 289 units/L, 37 to 508 units/L and 34 to 661 units/L respectively. At all studied stations the variation recorded, the maximum population density of Rotifers 661 units/L in December 2009 while minimum 34 units/L in August 2009 was observed at station IV.

TABLE - 2
POPULATION COMPOSITION AND MONTHLY VARIATION OF ROTIFERS AT STATION I, II, III AND IV UNITS/L FROM MAY 2009 TO APRIL 2010

| Month    | Station I | Station II | Station III | Station IV |
|----------|-----------|------------|-------------|------------|
| May      | 163       | 117        | 112         | 82         |
| June     | 192       | 44         | 243         | 136        |
| July     | 112       | 108        | 120         | 121        |
| August   | 128       | 96         | 37          | 34         |
| September| 48        | 62         | 157         | 131        |
| October  | 52        | 97         | 128         | 190        |
| November | 116       | 202        | 186         | 192        |
| December | 87        | 200        | 508         | 661        |
| January  | 82        | 289        | 173         | 267        |
| February | 81        | 124        | 276         | 387        |
| March    | 190       | 181        | 324         | 468        |
| April    | 99        | 120        | 124         | 159        |
| Average  | 112.5     | 136.7      | 199         | 235.7      |

Figure 1: Population composition and monthly variation of rotifers at station I, II, III and IV (units/L) from May 2009 to April 2010.

Figure 2: Annual mean percentage composition of Rotifers at Station I, II, III and IV during May 2009 to April 2010.
In the present study highest rotifer density was observed in the month of December i.e. in winter season. This was in accordance with observations of Mukhopadhyay et al, (1981), Jayadevi (1994), Shayestehfar and Abdovis (2011) and Bhat et al, (2012) have reported higher rotifer densities in winter. According to Shayestehfar and Abdovis (2011) the temperature always an optimum range of environmental conditions for each group of Rotifera in which they survive and multiply particularly in December. Lower values of rotifer population density and diversity were observed during monsoon which could be due to dilution of water resulting in fewer nutrients or could be due to depletion of important factors such as transparency, dissolved oxygen or pH (Kumar 2001).

Brachionus species are very common in temperate and tropical waters (Hutchinson 1967), indicates alkaline nature of water. According to Dirican et al, (2009) permanent dominance of rotifer species such as Brachionus and Keratella are indicative of eutrophic condition and their abundance was due to the presence of high levels of organic matter in the river. Station III and IV are downstream sites showing abundance in rotifer species which is due to the discharge of different wastes into the river such as agriculture, domestic sewage, industrial effluents, etc. (Kolhe et al, 2013).

CONCLUSIONS
From the present study it is concluded that, the diversity and density of the rotifers increased in the winter and decreased during the monsoon period. The rotifer population in Godavari river is highly influenced at station III and IV as compare to station I and II. Abundance of rotifer species such as, Brachionus at Station III and IV indicates nutrient rich water body which may undergo the state of eutrophication, if not managed appropriately. Hence there is an urgent need to control the discharge of industrial and domestic sewage.

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