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Research Article

SEASONAL DIVERSITY OF ROTIFERS FROM AGNIYAR ESTUARY, THANJAVUR DISTRICT, TAMIL NADU, INDIA

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ABSTRACT

Seasonal changes in the diversity of rotifers of the Agniyar estuary was studied from August 2013 to February 2014. Qualitative analysis reveals the presence of 24 species belonging to 17 genera. Higher number of species (8) was recorded from family Brachionidae. Diversity was high during postmonsoon season. The density of *Brachionus plicatilis* was high density during premonsoon and postmonsoon seasons. While, *B. rubens* was present in high density only during monsoon season.

Keywords: Rotifers, Agniyar estuary**,** Seasonal changes, Diversity, Density.

INTRODUCTION

Rotifers form an important link in the food chain of most fin-fishes and shell fishes in the aquatic ecosystem. They constitute a considerable portion of the total zooplankton population. In India, studies on rotifers were initiated by Anderson (1889). Available literature indicates that the distribution and ecology of rotifer fauna had been studied considerably in different parts of the world, but in India, the studies are restricted to certain pockets. Much of the information available, are concentrated to north India. Among the limited works carried out in southern part of India, major studies were carried out in freshwater habitats (Nair *et al.*, 1985; Azis and Nair, 1986; Bijoy Nandan, 1991; Bijoy Nandan and Abdul Aziz, 1994). Studies on rotifers of estuarine and brackishwater habitats are concentrated in Kerala (Anuradha Rammohan, 1996; George Thomas, 1996). They reported some information on rotifers, when they dealt with studies on general plankton in different brackish water ecosystems of Kerala.

Gopakumar (1998) studied the brackish water rotifers of Kerala with special reference to *Brachionus plicatilis* as live feed for aquaculture. The community structure and succession of brackishwater rotifers in relation to ecological parameters were studied by Gopakumar and Jayaprakas (2003). Anitha (2003) carried out studies on certain selected live feed organisms used in aquaculture, with special reference to rotifers of the family Brachionidae. But later two studies gave more emphasis on culture aspects than studied seasonal distribution and ecology.

A survey on distribution and ecology of rotifers in Tamilnadu reveals few reports on freshwater rotifers of Thanjavur district (Parthiban, 2013) and mangrove rotifers (Prabhakar *et al.*, 2012). Considering the extend of estuarine and brackishwater habitats available in the state the information available on rotifers in these ecosystems are meager. No report is available on rotifers of Agniyar river till date. Hence, an ecological investigation is carried out on the diversity of rotifers in Agniyar estuary.

MATERIALS AND METHODS

Sampling station

The Agniyar estuary is the part of Cauvery river system in Thanjavur district. The present study was conducted from August 2013 to February 2014. Seasonal collections of rotifers were made from Agniyar estuary near Rajamadam (Figure 1).

Sample collection and analysis

Qualitative and quantitative samples of rotifers were collected in the early morning using nylon plankton net (40µm mesh size). Quantitative samples was collected by filtering 100 liters of water while, Qualitative sample was taken by towing the plankton net for 25 times in knee depth water. The filtered rotifer samples were fixed and preserved in 4% formaldehyde. For analysis samples were made up to 100 ml. An aliquot of 1ml was taken in a Sedgwick-Rafter counting chamber and observed under a binocular microscope. The different species/genera of rotifers were identified following the taxonomic classification adopted by Dhanapati (2000) and density was expressed as individuals/m^3.

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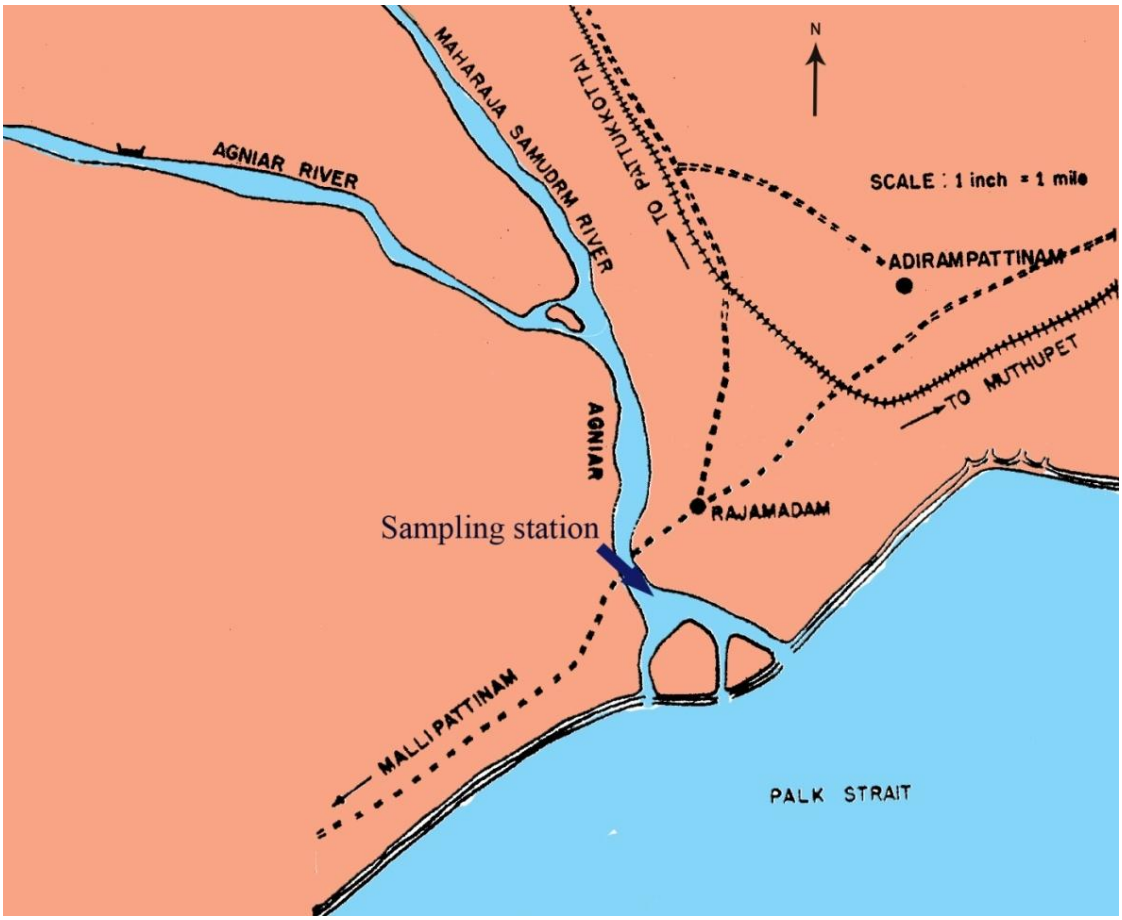

Figure 1. Map showing the sampling station of Agniyar estuary.

For seasonal study August was treated as premonsoon, November as monsoon and February as postmonsoon season. The numbers were grouped into total rotifers and individual species for better understanding. Univariate statistical analyses were performed to calculate Diversity (Shannon-Weiner index *H'*), richness (Margalef's index), evenness (Pielou's J) using the PRIMER 5.

RESULTS

Diversity of rotifers

Seasonal diversity of rotifers recorded from the Agniyar estuary is given in Table 1. Seventeen genera of rotifers were recorded during the present study. They were *Brachionus, Keratella, Platyias, Anuraeopsis, Mytilina, Euchlanis, Dipleuchlanis, Epiphanes, Microcodides, Lepadella, Lecane, Monostyla, Trichocerca, Polyarthra, Encentrum, Filinia* and *Testudinella*. A total of 8 species under the genus *Brachionus* were recorded. Species diversity was high during Postmonsoon.

Seasonal diversity

Seasonally distribution showed the presence of *B. plicatilis, B. rudentiformis, Anuraeopsis* sp., *Lecane* sp., and *Encentrum* sp. in all the seasons. *B. bidenta, Keratella* sp., and *Trichocera* sp. were recorded during premonsoon season. While *N. forficula, B. mirabilis, Dipleuchlanis* sp., and *Polyarthra* sp., were observed only during postmonsoon season. Whereas *B. rubens, Platyias* sp. and *Euchlanis* sp. were found only during monsoon season.

Density of rotifers

The density of rotifers recorded in the present was 2564 numbers/m^3, 925 numbers/m^3 and 1071 numbers/m^3 during premonsoon, monsoon and postmonsoon seasons, respectively (Figure 2). Species density showed *B. plicatilis* and *B. rudentiformis* as significant portion. Highest value of 768 numbers/m^3 was recorded by *B. plicatilis* during premonsoon season (Figure 3).

Ecological indices

The results of ecological indices such as diversity index, Richness index and Evenness index were presented in Table - 2. The diversity index was maximum (3.71) during premonsoon season and minimum (2.845) during monsoon season. The richness was maximum (2.437) during postmonsoon season and minimum (1.464) during monsoon season. The Evenness index was the lowest during premonsoon season with 0.8140, while highest value of 0.8896 was recorded during postmonsoon season.

Table 1. Seasonal diversity of Rotifers recorded from Agniyar estuary.

S. No	Species	Premonsoon	Monsoon	Postmonsoon
	Family : Brachionidae			
1	*Brachionus plicatilis*	+	+	+
2	*B. rotundiformis*	+	+	+
3	*B. urceolaris*	–	–	+
4	*B. rubens*	–	+	–
5	*B.caudatus*	+	–	+
6	*B. forficula*	–	–	+
7	*B. bidentata*	+	–	–
8	*B. mirabilis*	–	–	+
9	*Keratella* sp.	+	–	–
10	*Platyias* sp.	–	+	–
11	*Anuraeopsis* sp.	+	+	+
	Family: Mytilinidae			
12	*Mytilina* sp.	+	–	+
	Family : Euchlanidae			
13	*Euchlanis* sp.	–	+	–
14	*Dipleuchlanis* sp.	–	–	+
	Family : Epiphanidae			
15	*Epiphanes* sp.	–	+	+
16	*Microcodides* sp.	+	–	+
	Family: Colurellidae			
17	*Lepadella* sp.	–	+	+
	Family: Lecanidae			
18	*Lecane* sp.	+	+	+
19	*Monostyla* sp.	+	–	+
	Family: Trichocercidae			
20	*Trichocerca* sp.	+	–	–
	Family: Synchaetidae			
21	*Polyarthra* sp.	–	–	+
	Family: Dicranophoridae			
22	*Encentrum* sp.	+	+	+
	Family : Filiniidae			
23	*Filinia* sp.	+	–	+
	Family: Testudinellidae			
24	*Testudinella* sp.	+	–	+

\+ Present – Absent

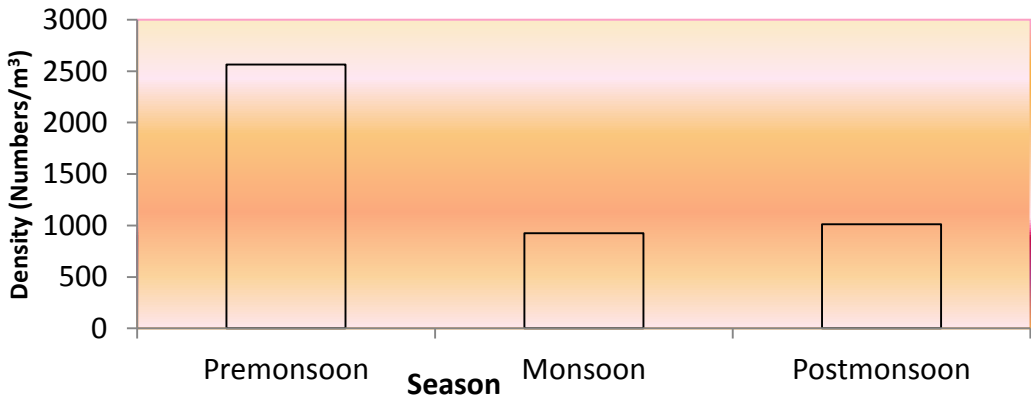

Figure 2. Total density (Numbers/m^3) of Rotifers recorded from Agniyar estuary.

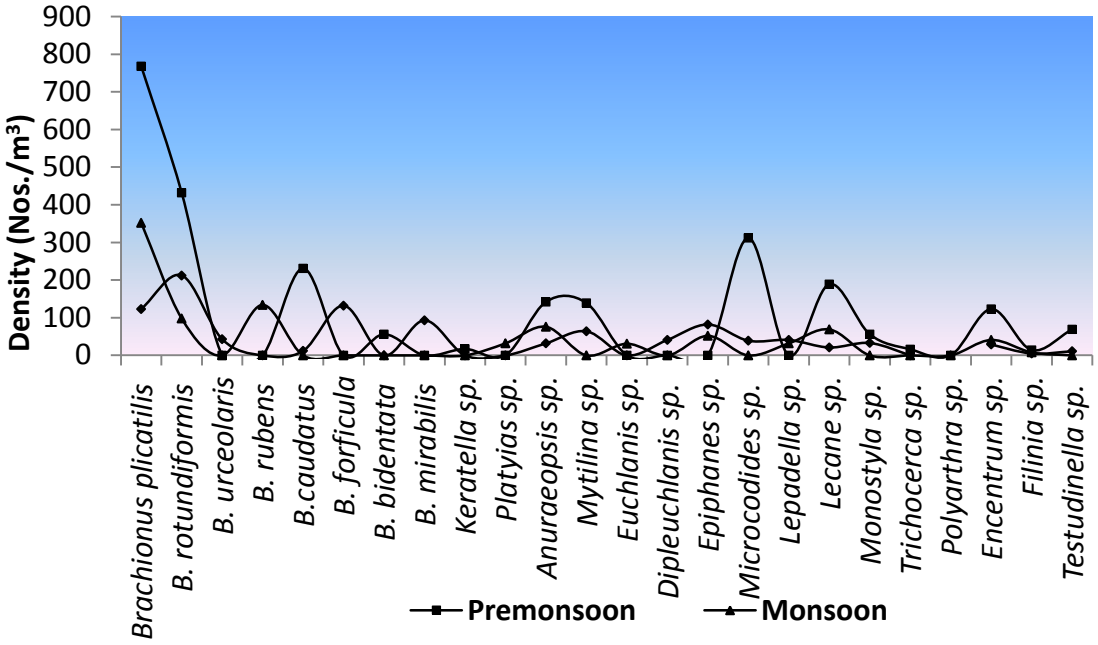

Figure 3. Species density (Numbers/m^3) of Rotifers recorded during different seasons at Agniyar estuary.

Table 2. Univariate ecological indices of rotifers during different seasons at Agniyar estuary.

Sample	Diversity (Shannon and Wiener's H')	Richness (Margalef's d)	Evenness (Pielou's J')
Premonsoon	3.099	1.656	0.8140
Monsoon	2.845	1.464	0.8224
Postmonsoon	3.710	2.437	0.8896

DISCUSSION

Rotifers are important components of planktonic communities because of their rapid heterogonetic reproduction. While many studies have dealt with rotifers in lentic systems, considerably fewer have provided data about estuarine rotifers, which are subjected to large water volume and physicochemical variations.

The results indicated the availability of 17 genera of rotifers in three major seasons on Agniyar river. These16 genera belonged to 11 families, whereas Sharma (1991) in an extensive work on rotifers has recorded 60 genera belonging to 24 families from Northern India. As early as in 1971, Nair and Nayar reported 18 species of rotifers from freshwater habitats in Irijalakuda, Kerala. Later, Gopakumar (1998) reported 30 species of rotifers under 16 genera, belonging to 13 families from three brackishwater habitats of southern part of Kerala with varying salinity regimes. In a similar study, Anitha (2003) recorded 44 species of rotifers belonging to 16genera under 12 families from two estuaries located in southern part of Kerala. Recently Prabahar et. al. (2012) reported 17 species in the nearby Adirampattinam mangrove area. Among the brackish water habitats of Tamilnadu maximum numbers of genera was recorded during the present study.

The quantitative abundance of rotifers, family Brachionidae and genus *Brachionus* varied between seasons significantly. It is worthwhile to mention that maximum density of 2564 numbers / m^3 was noticed during premonsoon season. Postmonsoon season stood second in rotifer abundance with a density of 1071 numbers/m^3. The higher density of rotifers in these ecosystems is associated with highly productive waters, which support fish and shrimp capture in this area. Unni and Fole (1997) observed a maximum rotifer count of 14, 89, 000 numbers/m^3 in summer, from Kanhargaov Reservoir, Madhya Pradesh, which is the maximum count ever reported from Indian reservoirs. But, during the present study the rotifer density comparative less this may be due to brackishwater nature of the habitat.

The variability in the distribution of rotifers in different seasons can also be explained in terms of diversity indices. The indices of richness, evenness and diversity are found to follow a similar pattern, even though the magnitude is different (Aoyagui and Bonecker, 2004; Schmid-Araya, 1993).

According to Koste (1978) the family Brachionidae is composed of seven genera, namely, *Brachionus, Keratella, Platyias, Anuraeopsis, Notholca, Kellicottia* and

Paranuraeopsis. Sharma and Michael (1980) opined that the first five out of the seven mentioned by Koste(1978), are represented in India. It is worthwhile to mention that the first four genera out of the five are reported during the present study, which was carried out from such a small area, showing the high magnitude of their distribution. The fifth genus, *Notholca* is not observed, which is a characteristic feature of many tropical waters Chengalath *et al*. (1974).

The genus *Brachionus* dominated in all three seasons and it formed the major portion of the family Brachionidae. This is in agreement with the findings of Green (1972), Chengalath *et al.* (1974), Pejler (1977), Fernando (1980), Sharma and Michael (1980) and Sharma (1983). Sharma (1987) pointed out that various species of the genus *Brachionus* dominate plankton samples in warmer parts of peninsular India. Apart from the genus *Brachionus,* other genera - *Anuraeopsis*, *Lecane* and *Encentrum* were also recorded from all the seasons studied. In *Brachionus*, the population density is widely attributed as a stimulus for mictic female production (Snell and Boyer, 1988; Canona *et al.,* 1994), which is proved true in the present investigation. Several resting eggs of *Brachionus* were noticed in the samples collected in the course of this study and this also coincides with the maximum density of rotifers especially *Brachionus* in this site. However, the actual counts of these cysts were not taken during the study period.

The seasonal abundance of rotifers in the present work showed maximum during the premonsoon season. A very similar observation has been noticed by Ramesh and Azariah (1987) while studying the rotifers in Adayar estuarine area. They recorded a peak in rotifers between March and June. Also, Unni and Fole (1997) observed a peak of rotifers in summer season, while studying the distribution and diversity of rotifers in Kanhargaov Reservoir, Madhya Pradesh. In the present study maximum rotifer abundance recorded was during the premonsoon season and the least during the monsoon season. A similar trend was observed by Gopakumar (1998) from Kadinamkulam lake located in southern part of Kerala. Also, a leading worker in rotifer research, Sharma (1983, 1987) also stated that, in tropical regions, *Brachionus* spp. dominate in total rotifers. This statement is in agreement with the present study also. Thus, the higher temperature and associated environmental characteristics in the study area might have favoured the abundance of rotifers during the premonsoon season. While high inflow of freshwater and associated flood may be the reason for less density during monsoon.

Presence of *B. plicatilis* and *B. rotundiformis* during all seasons indicates their ability to tolerate varying ecological conditions. It is interesting to note that 4 species of *Brachionus* viz. *B. bidentata, B. caudatus, B. forficula,* and *B. rubens,* which are recorded during the present study in Agniyar estuary are also available from freshwater tanks/ponds in and around Sambalpur, Orissa in Eastern India (Sharma, 1980). This indicates high salinity tolerance of these species as well as their wide distribution.

CONCLUSION

The study reveals the existence of diverse group of rotifers in the Agniyar estuary. Since it is a short time study the data can be used as base line for future long term investigations.

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