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DISTRIBUTION OF ROTIFER BIOMASS IN THE ESTUARINE REGION OF RIVER ADYAR WITH REFERENCE TO SUSPENDED PARTICULATE MATTER

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ABSTRACT

Importance of rotifers in aquaculture practices and its acceptability as a live food item for cultured organism has been recognised. In the Adyar Estuary, rotifers of the species *Brachionus rubens* and *B. plicatilis* were found in abundance. The biomass of rotifer in each of three stations together with data on salinity and suspended particulate matter were collected. A correlation between the biomass of rotifer and the total suspended particulate matter was drawn.

At Station 1, the suspended particle matter and salinity was high which ranged from 245 to 1086 mg/l and from 8.8‰ S to 29.8‰ S respectively. The salinity range and the amount of suspended particles were less in Stations 2 and 3. In general, very high and very low suspended particulate matter brought about a reduction in the biomass of rotifer.

INTRODUCTION

ROTIFER, constitutes one of the important groups of secondary trophic level. It plays an important role in controlling various ecological models (Stemberger, 1981) as it forms an important link in pelagic food web. It serves as a prey for crustacean predators (McQueen, 1969 ; Gilbert and Williamson, 1978) and helps in recycling the nutrients (Hirata and Nagata, 1982). Rotifers are presently involved in intensive larval rearing experiments (Sulkin, 1975 ; Howell, 1979 ; Yamasaki *et al.*, 1981).

Number of studies (Arora, 1963 ; Dhanapathi, 1974 ; Sharma, 1979) carried out in Indian waters on the geographical distribution of rotifers suggest that rotifer is one of the major components of freshwater zooplankton. Studies carried out in estuarine region show that rotifer also occurs in estuaries in large numbers (Dutta *et al.*, 1954 ; Shanthanam *et al.*, 1975). However, fewer field observations have been devoted to study its food and feeding habits (Halbach and Halbach Keup, 1974 ; Starkweather, 1981).

In reviewing the literature it is recalled that, there exists a very good demand for the biomass of cultured rotifer for use as live feed organisms in aquaculture practices. The maintenance of such cultures require optimisation of culture conditions like salinity, temperature, suspended particulate matter and quality and quantity of food (Ito, 1960 ; Edmondson, 1964 ; Groeneweg and Schlter, 1981). Therefore, field studies on the occurrence of rotifer together with data on the fluctuating ecological conditions like salinity and suspened particulate matter were found essential. Hence, in the present investigation, observations were made to assess the occurrence of rotifer population in addition to the fluctuating salinity and suspended particulate matter originating

from two different (tidal and stagnant) regimes of the estuarine region.

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Material and Methods

Three stations (Fig. 1) were selected at the vicinity of Adyar: Station 1 — near River mouth region, Station 2 — near Thiru Vi Ka Bridge, Adyar and Station No. 3 — near Michael's Academy, Gandhi Nagar. Zooplankton

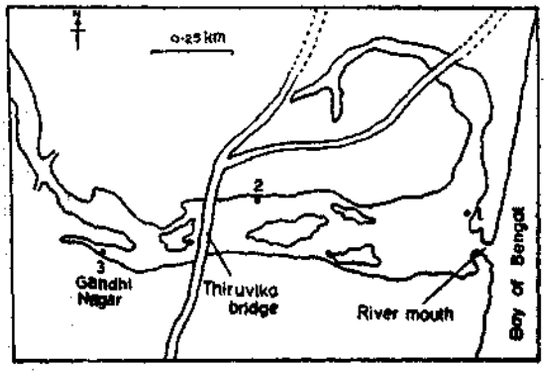

Fig. 1. Station positions in Adyar Estuary.

samples were collected fortnightly during March through November 1983, with the help of 68 μ plankton net (Nansen type). Surface hauls were made only during high tide period. Salinity and suspended particulate matter were estimated. Thirty millilitre polyethene bottles were used for this purpose to store the water samples. Laboratory analyses of the rotifer and water sample were done according to the method of Groeneweg and Schulter (1981).

Results

The data on the monthly variation in the percentage rotifer biomass, salinity and total suspended particulate matter are summarized in Table 1. The data on fluctuations in monthly average of rotifer individuals together with the monthly variations of salinity and suspended particulate matter are illustrated in Fig. 2.

Station 1

A bimodal type of rotifer biomass production can be recognised. A peak in the incidence of rotifer production may be noticed between March and June and the other peak occurred between September and November. The percentage of rotifer biomas during June to September was poor (Average 0.71%).

Data indicate that highest percentage (100% growth) of rotifer biomass occurred in March. The rotifer standing crop from April til November fluctuated from 0% to 42.9% (Table 1).

Brachionus plicatilis, *B. rubens*, *B. caycciflorus* and *B. fulcatus* were identified from the zooplankton collection. Of these, *B. plicatilis* and *B. rubens* occurred throughout in predominant numbers.

The highest salinity value (29.8‰) was recorded during June and the Lowest (8.8‰) in October. Salinity level was consistent during March to May with the value ranging from 25.6‰ to 28.5‰.

There was a wide fluctuation (245.8 mg/l during November to 1086.3 mg/l during September) in total suspended particulate matter.

Station 2

As in station 1, there was a bimodal pattern of distribution in biomass occurrence of rotifer. Highest percentage of rotifer biomass was

recorded in March (88.07%) and October (92.46%). The percentage rotifer biomass for the remaining months fluctuated from 0.4% to 32.6%.

B. plicatilis, *B. rubens*, *B. calyciflorus*, *B. fulcatus*, *Keratella tropica*, *Euchlanis* sp. and *Polyarthra* sp. were recorded. *B. plicatilis* and *B. rubens* were in predominant numbers in March, April, September and October and low values were recorded during June, July and August (Table 1). Maximum (412.6 mg/l) and minimum (31.8 mg/l) values were recorded during October and July respectively.

Station 3

The biomass of rotifer was poorer (Av. 38 no/ml.) than the previous two stations.

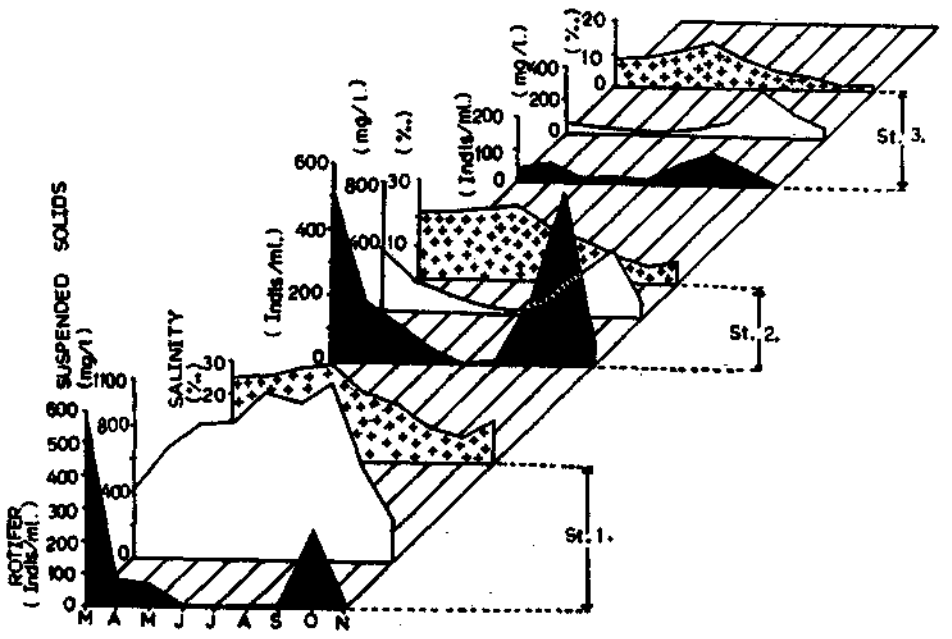

Fig. 2. Fluctuations in monthly average of rotifer individuals, salinity and suspended particulate matter in three estuarine stations in Adyar Estuary.

and also occurred almost throughout the period. *Euchlanis* sp. and *Polyarthra* sp. occurred in addition to the species noted at Station 1. The other rotifer members belonging to species *B. calciflorus*, *K. tropica*, *Euchlanis* sp. and *Polyarthra* sp. were recorded less frequently.

The salinity ranged from 6.3‰ to 22.6‰. The highest salinity (22.6‰) value was recorded during June and the lowest (6.3‰) was recorded in October.

The data on the total suspended particles indicated that high values were found to occur A maximum rotifer biomass of 94 no/ml. was recorded during September (Fig. 2).

The rotifer population consisted of *B. plicatilis*, *B. rubens*, *B. calyciflorus*, *B. quadridentatus*, *B. urceolaris*, *K. tropica*, *Euchlanis* sp. and *Polyarthra* sp. Among the members of different species of rotifers, *B. rubens* occurred predominantly and were represented almost in all the months except during June and July.

Salinity ranged from 1.2‰ (October) to 13.6‰ (June). The salinity was consistent during March (8.2‰) till May (12.0‰).

Data on total suspended particulate matter revealed that its concentration was high (94.1 to 285.5 mg/l) during August till October. The peak value of maximal suspended particulate matter of 285.5 mg/l was recorded in September. The total suspended particles was low during rest of the year and it varied from 7.8 mg/l to 57.0 mg/l.

Discussion

The observation of Boyd (1981) in CEPEX enclosers suggests that zooplankton populations often increased in poorly mixed waters. Dutta *et al.* (1954) reported an inverse relationship of rotifer population with turbidity values. Present study on rotifer population and suspended particulate matter indicate that there is a correlation between the occurrence of rotifer and the amount of suspended particulate matter. The correlation was seen during the period when the intensity of the tide was weak and the amount of particulate matter was optimum.

In the present study, at Station 2 maximum percentage of rotifer biomass (Av. 184 no/ml) was recorded during March till November. The average value of suspended particulate matter during these months was 179.64 mg/l. In this Station, the occurrence of two peaks of rotifer biomass was recorded. One peak (92.46%) of rotifer biomass occurred during October, which coincided with the corresponding load of 412.6 mg/l suspended particulate matter. The second peak (88%) of rotifer biomass occurred in the month of March coinciding with a load of 388.5 mg/l of the suspended particulate load. It is likely that rotifers prefer suspended particulate matter concentration of 388-412 mg/l.

At Station 1, the average standing crop of rotifer was 112 no/ml when the corresponding level of suspended solids, on an average, amounted to 711.73 mg/l/m. Results indicate that there is no significant increase in the population of rotifers in the months of June, July, August and September (per ml 3 no., nil, 7 no. respectively). The corresponding values of suspended particulate matter were 83.1 mg/l (June), 1024.2 mg/l (July), 960.5 mg/l (August) and 1086.3 mg/l (September) respectively.

At Station 3, due to its static nature of the environment, the water was characterised with a very poor load of suspended particulate matter (Av. 84.74 mg/l). It is interesting to note that, as a result of low suspended particulate matter, the occurrence of rotifer biomas was poor (Av. 38 no/ml).

Suspended particle load ranging from 200 to 450 mg/l may support the growth of rotifer population. In cases where the particulate matter amounted less than 200 mg/l and above 450 mg/l, there was a suppression of rotifer population. Groeneweg and Schluter (1981) indicated that the optimum level of suspended particulate matter may be in the range of 300-500 mg/l for the species of *Brachionus rubens* inhabiting the fresh waters. Their result showed that the biomass of rotifer was less when the suspended particulate matter level exceeded 300-500 mg/l range.

It is likely that, since rotifer is a selective feeder (Pourriot, 1977; Starkweather, 1980), the higher the density of particle suspension, the lower may be the feeding efficiency of this group.

The pattern of fluctuations in salinity and rotifer biomass (when all the rotifer species are considered as one group) did not show any distinct relationship. Salinity preference of these two rotifer species suggests that *B. plicatilis* reproduced better in a salinity gradient of 25.5‰ to 28.5‰ and the species *B. rubens* grew better in a salinity gradient of 5.5‰ to 20.0‰.

Ito (1960), Theilacker and McMaster (1971) and Koste (1980) have carried out observations on the salinity preference of *B. plicatilis* and have suggested the existence of a salt affinity in the case of this species. Theilacker and McMaster (1971) suggested an optimum range of 25 to 33‰ for the production of *B. plicatilis*. In a pilot study carried out by Konnur and Azariah (1983), using a culture of *B. rubens* in different concentrations of seawater, it is found that culturability of this species is better between the salinity range from 2.5‰ to 14.5‰.

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