

## VARIATIONS IN ZOOPLANKTON DENSITY IN THE COCHIN BACKWATER CONSEQUENT TO ENVIRONMENTAL CHANGES

Rosamma Stephen

National Institute of Oceanography, Regional Centre, Kochi - 682 018

**Abstract:** Zooplankton biomass was studied from 4 stations in the Cochin backwater during 1980-81. Though the general zooplankton composition remained the same, a decrease in biomass and density was obvious. Zooplankton was observed to be high in the Barmouth (Station 1) with an average biomass of  $0.102 \text{ ml/m}^3$  and density  $372 \text{ organisms/m}^3$ . Lowest values namely  $0.021 \text{ ml/m}^3$  and  $51 \text{ organisms/m}^3$  were recorded at Mulavukadu (Station 4) on the northern side where the maximum impact of industrial effluents exists. Vertical and horizontal shrinking of the backwater and the increase in industrial effluent discharge are presumed to be the main reasons for the decrease in zooplankton population.

### 1. Introduction

Estuaries are 'multiple use' environments. The Cochin backwater has been a highly exploited ecosystem. During the past few decades the environment has undergone various manmade alterations due to dredging, land reclamation, agriculture and aquaculture practices. The upper reaches of the backwater system forms an outlet for the effluents from the industrial complexes. These irrational use of the backwater resulted in the deterioration of the ecological conditions in the estuary which once formed a suitable habitat for a rich estuarine biota. This alarming situation was highlighted by the studies of Qasim and Madhupratap (1979) and Gopalan *et al.* (1983). This paper is intended to show the changes that are taking place in zooplankton population over the years.

### 2. Materials and Methods

Zooplankton samples were taken from 4 stations (Fig.1) in the Cochin backwater during February 1980 to January 1981. These stations represent 4 sectors of the backwater namely Barmouth (Station 1) in the opening of the estuary, Oil Tanker Berth (Station 2) in Ernakulam Channel, Near Aroor (Station 3) in southern side and Mulavukadu (Station 4) in northern side where the river Periyar bringing industrial effluents joins the estuarine system. Monthly collections were made with an HT net of mouth area  $0.25 \text{ m}^2$  and mesh size  $0.33 \text{ mm}$ . The results are expressed as biomass  $\text{ml/m}^3$ .

### 3. Results and Discussion

The changes in zooplankton biomass observed during the present study are given in Table 1. Station 1 sustained high zooplankton throughout the year with an average of  $0.101 \text{ ml/m}^3$  and a density of  $372 \text{ organisms/m}^3$ . Minimum values were observed in Station 4 namely  $0.021 \text{ ml/m}^3$  with  $51 \text{ organisms/m}^3$ . The mean biomass calculated for the whole area was  $0.066$  with the mean population  $181 \text{ organisms/m}^3$ . In general zooplankton density was high during the premonsoon months of February to April. Copepods were the most dominant group. But zoea larvae outnumbered copepods in February and March. Gastropod larvae were also abundant during this period in stations 1 and 3. Maximum fish eggs and fish larvae were obtained from Station 2. Cladocera became dominant in the postmonsoon months mainly in station 3 and 4.

Biomass of zooplankton obtained in the present study is compared with earlier investigations (Menon *et al.* 1971; Haridas

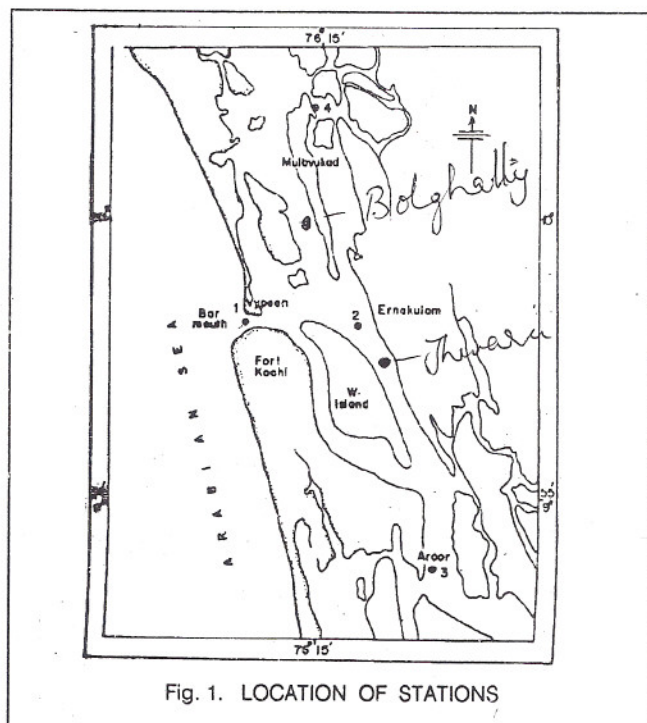


Fig. 1. LOCATION OF STATIONS

*et al.* 1973). The results are shown in Table 1, which clearly indicate the declining trend in planktonic population. Copepods once reported to be high equalling the highest densities recorded anywhere in the world oceans (Transfer and Abraham, 1971), reaching  $4574 \text{ m}^{-3}$  in 1968 has decreased to  $2348 \text{ m}^{-3}$  in 1971 and 742 during the present study. Zooplankton density was lowest in the station where maximum influence of industrial effluent discharge is experienced (Station 4).

The foregoing results suggest that human interaction has adversely affected the zooplankton population. Siltation in this area is reported to be at the rate of  $180 \text{ cm/year}$  (Kurup, 1971). The rate of inflow of industrial effluents is rapidly increasing (about 260 million litres/day; Anon, 1982). The quantity of sewage discharge is also increasing day by day. Moreover, the mixing of sea water with fresh water has also reduced due to reduction in the river flow on account of the construction of dams, barrages and bunds across the rivers and the vertical and horizontal shrinkage of the backwaters. Consequently the concentration of nitrates and phosphates has increased from the minimum value



Table 1. Biomass (ml/m<sup>3</sup>) of zooplankton at the 4 Stations during 1980-81.

| Months           | Barmouth | Oil Tanker Jetty | Aroor | Mulavukadu   |
|------------------|----------|------------------|-------|--------------|
| Feb              | 1980     | 0.080            | 0.080 | 0.100 0.013  |
| Mar              | "        | 0.108            | 0.070 | 0.100 0.012  |
| Apr              | "        | 0.274            | 0.140 | 0.240 0.022  |
| May              | "        | 0.228            | 0.200 | 0.175 0.120  |
| Jun <sup>r</sup> | 0.022    | 0.014            | 0.002 | 0.031        |
| Jul <sup>r</sup> | 0.028    | 0.033            | 0.003 | 0.005        |
| Aug              | "        | 0.054            | 0.049 | 0.050 *      |
| Sept             | "        | 0.050            | 0.024 | 0.022 *      |
| Oct <sup>r</sup> | 0.175    | 0.048            | 0.039 | *            |
| Nov              | "        | 0.037            | 0.029 | 0.052 *      |
| Dec              | "        | 0.121            | 0.040 | 0.035 0.022  |
| Jan 1981         | 0.037    | 0.032            | 0.090 | 0.033        |
| Mean             |          | 0.101            | 0.063 | 0.076 0.0215 |

\* Negligible

Biomass (ml/m<sup>3</sup>) at different locations recorded in earlier studies.

|           | 1972              | 1968   |       |
|-----------|-------------------|--------|-------|
|           | Ernakulam Channel | Aroor  | Aroor |
| January   | 0.0709            | 0.1320 | 1.570 |
| February  | 0.2347            | 0.2975 | 0.197 |
| March     | 0.0302            | 0.3520 | 0.350 |
| April     | 0.3106            | 0.4108 | 0.210 |
| May       | 0.0220            | 0.0560 | 0.610 |
| June      | 2.3580            | 0.0058 | 0.990 |
| July      | 0.0299            | 0.0069 | 0.028 |
| August    | 0.0735            | 0.0140 | 0.153 |
| September | 0.0054            | 0.0030 | 0.338 |
| October   | 0.0012            | 0.0140 | 0.079 |
| November  | 0.0500            | 0.0640 | 0.122 |
| December  | 0.0384            | 0.0369 | 0.192 |

Values in mg/m<sup>3</sup> was converted to ml/m<sup>3</sup> according to Stephen and Saraladevi, 1972.

of 0.31 µg/l and 0.36 µg/l to 4.0 µg/l and 2.0 µg/l respectively in 1978-79 (Sankaranarayanan & Qasim, 1969 and Sankaranarayanan *et al.*, 1983). All these environmental alterations are reflected in the population of the estuary. Considering zooplankton as a measure of richness of the environment, the present study indicates that anthropogenic disturbances of the estuary both directly and indirectly have resulted in the decline in zooplankton density.

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