Environmental and ecological parameters of recent Ostracods in Cauvery River Estuary, Poombuhar, Tamil Nadu, India

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ABSTRACT

The present study deals with the study of some recent benthic ostracoda in the sediments collected from the Cauvery river estuary of Poombuhar. The sediment samples have been collected from 9 stations from the Cauvery river estuary of the study area. In the present study, 17 ostracod species belongs to 12 genera, 10 families, 3 super families and 2 sub orders. Spatial distribution of ostracoda of the study area reveals that the higher population is found only in the samples collected from the mouth of the estuary. Of the 17 ostracoda identified, the six species cytherelloidea leroyi, Paijenborchella sp, stigmatocythere indica, Keijella reticulata, Loxoconcha sp., and Phlyctenophora orientalis are considered to be widespread and abundantly occurring species in the present study. Higher diversity and population of ostracod species are noticed in stations 8 and 9 because of their favourable niche. The substrate of present study area is seen to consist of silty-clay sand and clay sand. The most accommodative substrate for higher population is clay sand.

Keywords: Ostracoda, Cauvery river estuary, environmental and ecological parameters.

1. Introduction

Ostracoda have been used widely to typify water depths of modern marine environments and to derive paleodepths which are useful in understanding eustatic sea-level changes, plaeobiogeography, and other geologic problems. Numerous studies have shown that the distribution of ostracod assemblages can be related to several environmental and sedimentological conditions (Annapurna and Ramama Sarma 1987, Brady, 1886, Bhatia, S.B and Kumar, S. 1979, Guha, D.K, 1980). The response of ostracoda to the changed environmental conditions is reflected in the variation in abundance and morphology of the carapace. The ostracod carapace has high preservation potential thus making these microorganisms one of the most useful proxies for the long as well as short-term temporal variation in the amount and type of toxins in all kinds of marine environments, especially the near-shore coastal areas. This research provides basic data for the monitoring of coastal environmental conditions.

2. Materials and Method

2.1 Study area

The area of study forms a part of toposheet numbered 58M, (between longitude E 79°45’ to 79°50’ and latitude N 11°8’) of the survey of India. The study area is traversed by the kumbakonam shale ridge and the triangular tranquebar depression with the Cauvery, tracing the Cauvery river major lineament into the sea with a cross cutting relationship with the Point
Calimere – mouth of Coleroon fault. The area has recent to sub-recent sediments of mostly alluvium. The area has a gentle slope to very gentle slope towards the sea from the continental surface.

2.2 Field work

The sediment samples were collected from 9 stations from the Cauvery river estuary of study area. A unit volume of 50ml. wet sediment was taken from the top 10cm layer of sediment in all the sample locations.

2.3 Sedimentological analysis

The sedimentological analysis such as, organic matter was determined by titration method, while calcium carbonate by volumetric method, sand-silt-clay ration by pipette method.

2.4 Faunal studies

For the faunal study, the sediment samples were subjected to laboratory treatment. A portion of the collected samples was washed over an ASTM 230 mesh sieve (0.063mm) to remove the silt and clay. The ostracod carapaces were the separated from the residue by floatation method using carbon tetrachloride (Cushman, 1959). After flotation species identification and counting were done under stereo binocular microscope, and scanning electron micrographs were taken to help in some problematic identification. The Shannon-weaver diversity index was calculated to identify changes in assemblages of benthic foraminifera (Shannon-weaver, 1999):

\[ H = - \sum Pi \ln Pi \]  \hspace{1cm} (1)

Where, \( H \) = Shannon – weaver diversity index

\( Pi \) = the relative abundance of each species

3. Result and discussion

3.1 Substrate

The relative percentage of sand-silt-clay is determined and of the 12 possible sediment types (Trefethen’s 1950), the sediment types of the present area of study are silty clay sand and clay sand. The sample collected from Cauvery river estuary i.e. stations 1 to 5 are silty sand and stations 6 to 9 are clay sand (Figure 1). The distribution of ostracod fauna is positively correlated with fine sediments. As the percentage of fine sediments increases, the number of ostracod specimens also increases. Diversity of the fauna is also more in samples with relative higher sediment fines.

3.2 Calcium carbonate

To study the influence of calcium carbonate on the distribution of ostracoda, the calcium carbonate content of various sediment samples were determined and ranges between 1.1% and 6.2%. The mean value of calcium carbonate is 3.71%. In the present area, the calcium carbonate content gradually decreases from stations, 1 to 9, i.e. towards mouth of the estuary. The calcium carbonate content found to be closely related with substrate of the study area. As the percentage of calcium carbonate is less and spatial variation is meager in the present study (Figure 2), a comparison is not possible between its percentage and ostracod population.
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Figure 1: Sediment nomenclature based on Sand-Silt-Clay ratios (after Trefethen, 1950)

Figure 2: Showing percentage of calcium carbonate of the study area

3.3 Organic matter

Organic matter content of the study area was determined for all the samples collected. It has been found that organic matter content ranges between 0.17% and 1.20%. The mean value of organic matter is 0.95%. The organic matter content is gradually decreasing towards the mouth of estuary i.e. station no 9. In the study area, organic matter content shows a positive relation with fines of the substrate and in turn related with ostracod fauna.
3.4 Distribution and ecology of Ostracoda

In the present area totally 17 ostracod species were identified. Among the 17 species (Hartmann and Puri, 1974), Cytherelloidea leroyi, Paijenborchella sp., Stigmatocythere indica, Keijella reticulata, Loxoconcha sp. and Phlyctenophora orientalis are observed abundantly, in all the samples collected and these five species are considered to be widespread and abundantly occurring, in the area of study. And the following 7 species are present rarely in the all samples collected and studied.

They are Bairdia sp., Actinocythereis sp., Camphlocythere sp., Quadricythere sp., Caudites sp., Propentocypris crocata and Xestolebris sp. The abundance of ostracoda is positively correlated with greater depth, higher fine sediments and organic matter content. They provide congenial environment for higher species diversity and abundance of ostracoda in this part of estuary. Comparison between the sediment characteristics and ostracod fauna reveals that the higher sediment fines are associated with higher organic matter content of the study area provide the congenial environment for higher population of ostracoda and higher species diversity.

3.5 Species diversity

The species diversity values of ostracod vary from sample to sample, but an overall gradual increase is observed towards the mouth of the estuary. The diversity is relatively high in samples 8 and 9. From the stations 1 to 7 the Shannon-weaver values are low. The Shannon-weaver index ranges between 22.9 and 23.8 with highest total population between 544 and 600 (ostracod species/g) in the stations 8 and 9 (Figure 4).
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Figure 4: Variation of the ostracod population and Shannon–Weaver index values in the study area.

4. Conclusion

In the present study, 17 ostracod species were identified and their spatial distribution reveals that the higher population is found only in the samples collected from the mouth of the estuary. Of the 17 ostracoda identified, the six species cytherelloidea leroyi, Paijenborchella sp, stigmatocythere indica, Keijella reticulata, Loxoconcha sp., and Phlyctenophora orientalis are considered to be wide spread and abundantly occurring species in the present study. Higher diversity and population of ostracod species are noticed in stations 8 and 9 because of their favourable niche. The substrate of present study area is seen to consist of silty-clay sand and clay sand. The most accommodative substrate for higher population is clay sand. The main ecological parameters, which govern the distribution of ostracod species of the present area, are organic matter content and nature of the substrate.

5. References


