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Original Research Paper

Assemblages of Marine Polychaete Genus *Glycera* (Phyllodocida: Glyceridae) Along the Kerala Coast as an Indicator of Organic Enrichment

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ABSTRACT

The seasonal distribution of the polychaete genus *Glycera* was studied, especially in relation to the textural characteristics of sediments along the south-west Kerala coast of India. Statistical analysis pointed towards the preference of *Glycera* sp. in sediments rich in silt, clay, sand and organic carbon relating to their role as an indicator of organic enrichment.

INTRODUCTION

Marine pollution management is based on monitoring various physico-chemical and biological parameters to detect changes in the environment. Recent studies carried out in the coastal waters of India reveal that the coastal belt including the water and sediment is continuously being threatened by various pollutants discharged directly from the industrial and effluent activities (Govindasamy & Azariah 1999). Compared with the east coast, the Bay of Bengal, the west coast of India, the Arabian Sea, is highly productive due to the seasonal upwelling processes in association with the south-west monsoon and river inflow (Madhupratap et al. 2001, Venkataraman & Wafar 2005). Some of the recent studies carried out in the south-west coast of India inferred the main source of pollution inflow from anthropogenic activities and industrial origin, threatening the coastal biodiversity to a risk (Ouseph et al. 2009, Udayakumar et al. 2009).

The importance of zoobenthic communities in pollution studies is well established. It is believed that the sea-bed acts as a sink for most of the pollutants entering the marine ecosystem, and the more stable sediments along with their inhabitant fauna give a clear picture of the severity of contaminants and act as an indicator species of that particular area (Gray 1981). According to Gesteira & Dauvin (2005) marine benthic organisms exhibit moderately fast response to stress, and being predominantly sessile or slow moving organisms, are vulnerable to the effects of sediment contamination, assimilating the effects of pollutants over time. In the south-west coast of India very little is known of polychaetes as indicator species of coastal pollution. The available information, however, deals mainly with their abundance in mangrove swamps, as a demersal fishery indicator, their species succession in soft bottom sediments, their community structure in offshore water sand as an anthropogenic indicator (Sunil Kumar & Antony 1994, Sunil Kumar 2000, Harkantra & Rodrigues 2003, Thomas et al. 2006, Joydas et al. 2009, Soniya Sukumaran & Sarala Devi 2009). The objective of the present work was to study the seasonal abundance of meio, micro and macro level polychaete genus *Glycera* in relation to textural characteristics of the sediments, and to confirm its role as an organic enrichment indicator along the south-west coast of India.

MATERIALS AND METHODS

Study sites: The sampling locations (Fig. 1) taken for the present study were Neendakara (8°57′29″N and 76°26′20″E), Alleppey (9°29′28″N and 76°13′33″E), Cochin (9°56′18″N and 76°09′13″E), Ponnani (10°47′06″N and 75°49′49″E) and Kasargod (12°28′56″N and 74°53′19″E). All the sampling points have a distance of 10 km from shore. These stations are all biologically productive and considered as the major fishing zones of Kerala. The coastal waters of these stations were subjected to discharge from industrial and anthropogenic activities, and pollutants arising from fish landing and seafood processing centres.

Sampling and laboratory procedures: The sampling was

carried out seasonally during the year 2008. Four replicate samples for each sediment samples from the five stations were collected using Van-Veen grab of 0.04 m^2 operated onboard Coastal Research Vessels (CRV) Sagar Purvi and Sagar Paschimi. The collected sediment samples were sorted into two sets. Those for chemical analysis, especially for texture and organic matter content, were sealed in plastic bags and frozen. For zoo benthos collection, the sediments were separated through three sieves (mesh size of the upper, middle and lower layer sieves 0.5 mm, 0.1 mm and 60 µ respectively) of diameter 20.5 cm placed layer by layer in a plastic tray using continuous flow of seawater by means of the facility provided in the deck of the research vessel. The collections were preserved in 1.0 % formalin containing Rose Bengal stain. The zoobenthic organisms entangled in the upper, middle and lower sieves were grouped based on their length as micro (100 to 500 µ), macro (> 500 µ) and meio category (50 to 100µ). The sorting of meio and micro polychaetes from fine sediments was carried out using decantation techniques as described by Mcintyre & Warwick (1975). Polychaete counts were expressed in numbers/m^2. The genus level identification of polychaetes was made according to Fauvel (1953) and Fauchald (1977). The sediment texture (sand, silt and clay) analysis was determined by pipette analysis (Krumbein & Pettijohn 1938) and organic carbon of the composite samples using wet digestion (chromic acid) followed by back titration with ferrous ammonium sulphate (EL Walkeel & Riley 1957).

A dendrogram for hierarchical classification was used to assess the potential relationship between the polychaete genera, sediment texture and organic carbon content. Cluster analysis was performed using Ward's hierarchical agglomerative method and Euclidean distance measure. Statistical analysis was carried out using Systat 8.0 software.

RESULTS

The abundance of the polychaete genus *Glycera*, commonly known as the marine blood worm was found dominant in all the sampling stations. The other opportunistic invader polychaete genera in the study areas were *Ancistrosyllis*, *Heteromastides*, *Nephthys*, *Neries*, *Paraheteromastus*, *Polydora*, *Sabellidae* and *Syllis*. Cluster analysis was applied to find out the similar genera of polychaetes between the sampling stations having sediment texture rich in sand silt, clay and organic carbon. It resulted in a dendrogram (Fig. 2) in to six statistically meaningful clusters. Cluster 1 showed the abundance of micro type *Glycera* and macrotype *Polydora* and *Neries* in the sediment texture rich in sand. The communities interrelationship of different polychaete genera at the sampling stations was more pronounced in the clusters 2, 3, 4 and 5. Cluster 6 corresponds to *Glycera* genus habitat preference and abundance. From this it is inferred that meio type *Glycera* shows great affinity to sediment texture and organic carbon throughout the study. The meio type *Glycera* polychaete was represented more in most of the stations, especially Neendakara, Cochin, Ponnani and Kasargod.

DISCUSSION AND CONCLUSION

Polychaetes are one of the most characteristic groups of soft-bottom benthic organisms and are an important component of benthic communities (Arvanitidis et al. 2002). In the present study, the polychaetes, especially the meio category of the genus *Glycera*, were found as the major module among them. The results of the present observations revealed that the genus *Glycera* occurs in areas where the percentage of silt and clay components of sediments were more than that of the sand fraction having rich organic carbon content. The sand dwelling habit of polychaetes along the south-west coast of India, especially in the Cochin mangrove ecosystem, is well documented (Sunil Kumar & Antony 1994).

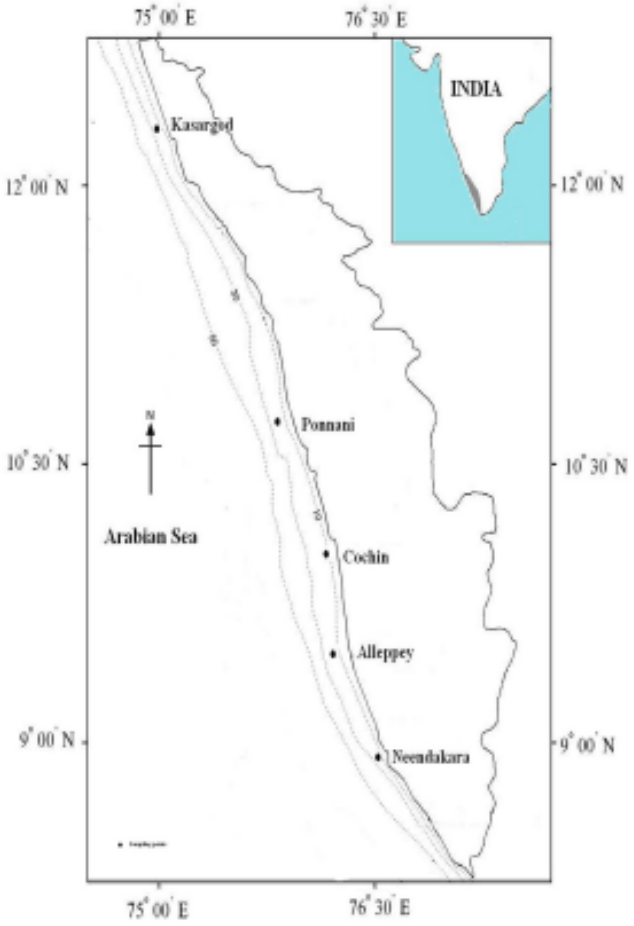

Fig. 1: Map of Kerala showing the sampling points.

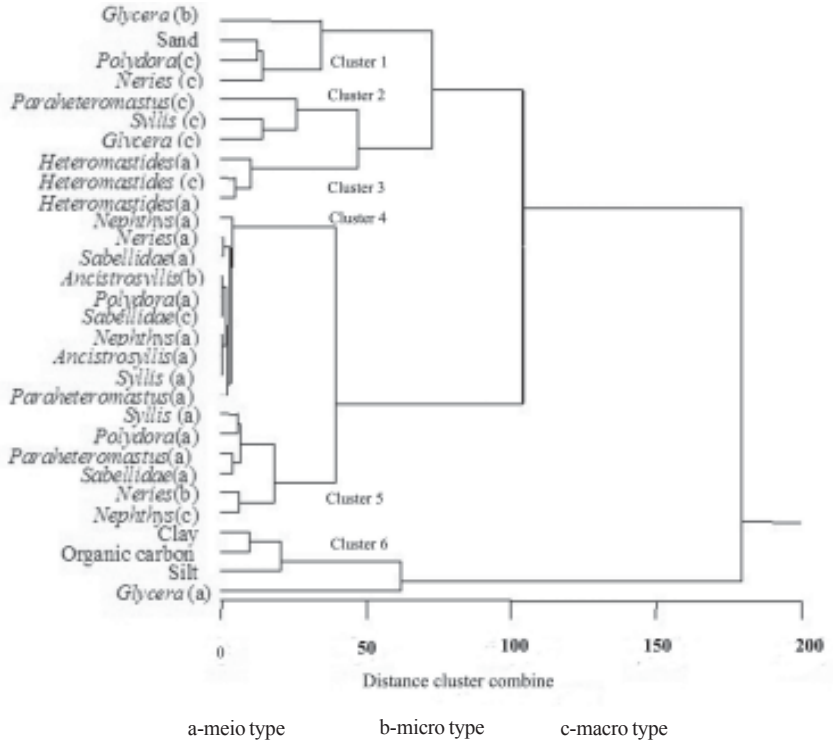

Fig. 2: Dendrogram of cluster analysis for benthic polychaetes, sediment texture and organic carbon using Euclidean distance Ward minimum variance method.

Gray & Pearson (1982) noticed significant abundance of polychaetes in marine sediments due to increased organic matter. In the present case a more or less similar association between *Glycera* and organic carbon in sediments was noticed in all the stations studied. Brock et al. (2002) in their studies on benthic polychaete communities of Hawaiian waters used these organisms as indicator of organic enrichment. The reduced numbers of macro *Glycera* recorded in the present study may be due to the impact of bottom trawling carried out in this region causing damage to the fauna by means of the fishing gears or exposure to predators (Thomas et al. 2006).

The statistical analysis substantiated the profusion of genus *Glycera* in all seasons in sediments rich in silt, clay, sand and with high organic matter, tend to suggest them as a good indicator of organic enrichment along the south-west coast of India in coastal pollution monitoring surveys. Obviously more detailed studies on the habitat selection and the role of organic carbon in the life of this important genus of marine polychaete are required.

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