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RESEARCH NOTE

DISTRIBUTION OF ORGANIC MATTER IN THE SUBSTRATE OF THE PENNAR RIVER ESTUARY, ANDHRA PRADESH

Abstract : The Pennar River estuary (N. Lat. 14°33'3"; and 14°6'13" E.Long. 80°11'54", Fig.1) sediments were studied seasonally over a period of one year for their organic matter content and its distribution. It is more during monsoonal months than in summer months at the mouth and its increase gradually towards the upper estuary indicates its derivation is more from the terrestrial sediments than from the sea. A moderate positive correlation has been obtained between organic carbon and organic nitrogen. A rough inverse relationship is noted between the organic carbon (or organic nitrogen) and the weight percentage of the fine fraction of the sediments.

Keywords : Sedimentology, Pennar estuary, Andhra Pradesh

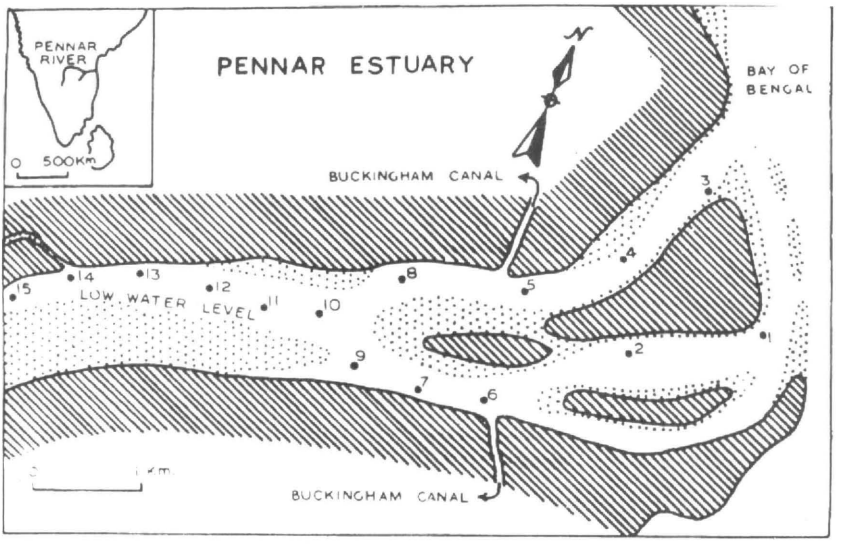

Fig.1. Location of sediment samples collected in Pennar Estuary.

Method of Study: Organic matter was estimated in 65 bottom sediment samples collected seasonally at 15 stations over a period of one year. The sediment samples were dredged out with an aluminium container of triangular cross section. The thickness of the sediment layer collected was about 10 cm and usually represented the deposition during the season of collection. Sediment sample was disaggregated in water in an ultrasonic shaker of systronic make, similar to the one recommended by Kravitz (1966). Organic carbon was estimated by Elwakeel and Riley method (1957) and organic nitrogen by microkjedhal method given by Oser (1965). No estimations were made for such sediments that contain less than 10 per cent of silt/clay fraction as their organic matter content is negligible.

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Results and Discussion: The organic carbon ranges from 0.25 to 0.92 ppm, averaging 0.54 ppm, while organic nitrogen ranges from 0.02 to 0.09 ppm averaging 0.04 ppm. According to Trask (1932) who made analysis of organic nitrogen in sediments of estuaries and lagoons throughout the world, organic C/organic N ratio averages about 8.5. In the present work, the

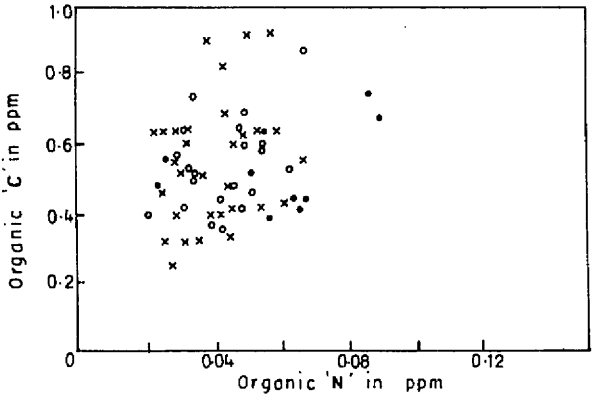

Fig. 2

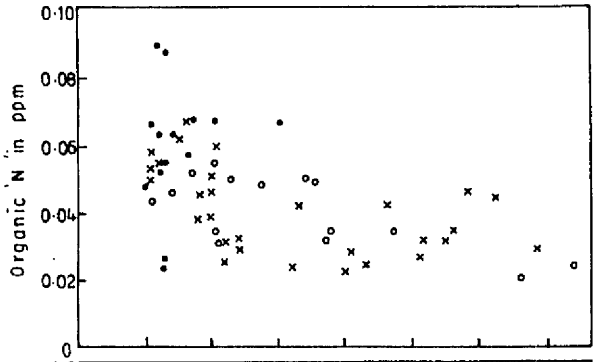

Fig. 3

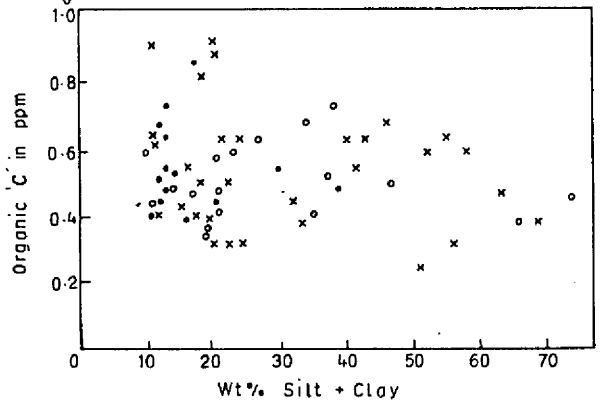

Fig. 4

Fig.2. Scattergram relating organic nitrogen and organic carbon of sediment samples.

Fig.3. Scattergram relating weight percentage of finer fraction (i.e. silt and clay) and organic nitrogen of sediment samples.

Fig.4. Scattergram relating weight percentage of finer fraction and organic carbon of sediment samples.
Sediment samples from sampling stations 1 to 4 are shown as crosses (Lower estuary), from 5 to 9 as open circles (Middle estuary), and from 10 to 15 as solid circles (Upper estuary).

organic C/organic N ratio ranges from 6.2 to 26.7 with an average of 13.2. This indicates that the average ratio of organic carbon to organic nitrogen is nearly 11/2 times more than the usual ratio. The scattergram (Fig.2) shows a rough positive relation between the two parameters in sampling stations 1-4 and 10-15 i.e. in lower and upper estuaries. This may be due to the biogenic activity (lower estuary) and river run off (upper estuary) which favours high organic mater during monsoonal months.

A perusal of the distribution of organic matter in the estuary indicates, that it increases generally from the mouth towards the upper estuary, indicating that its derivation is mostly from the terrestrial sediments brought by the River Penner. The low concentration of this organic matter at the lower estuary may be because of the constant removal of the finer particles (silt + clay) of the sediment by the wave action and the low rate of deposition of the sediment. The sediment at station 13 invariably contains relatively high organic carbon and organic nitrogen in all seasons.

A rough inverse relationship is obtained between organic nitrogen (or organic carbon) and weight percentage of silt and clay of samples (Fig.3 and 4). The high carbonate/ nitrogen content is mainly of biogenic origin, which is normally supported by the sandy substrate (Sebastian *et al.* 1990). Comparatively lower values of carbonate/nitrogen content in clay + silt of the middle estuary and part of upper estuary is due to the influx on non-carbonate terrigenous material brought down by the river. Thomas (1969) and Kemp (1971) demonstrated a positive correlation between the mineral clay-content and organic matter in Great Lake sediment. But Reddy (1973) obtained a rough inverse relationship between organic matter and weight percentage of silt and clay fractions of samples of the Pennar River Estuary. A positive correlation could probably have been obtained if the whole sediment has been used to estimate its organic matter content. The average concentration of organic matter in the estuarine sediments is comparable with that obtained by Narasimha Rao (1971) for the sediments of the Pulicat Lake. The lower content of organic matter may be in part due to low quantity of organic matter supplied by Pennar River and in part due to unfavourable conditions for its preservation in the sediments.

Conclusions: In view of the high organic C/organic N ratio in the silt/clay fraction of the sediments of the Pennar River Estuary, it is felt that organic matter in these sediments can be calculated approximately by multiplying organic carbon values with 1.7 and organic nitrogen values with 22.4. Organic matter is more in the upper estuary than in the lower estuary, more in the monsoonal months than during the summer months. From this observation it is concluded that organic matter which is mostly of terrestrial origin increases from mouth towards the upper estuary. Organic matter in the coastal sediments is derived mostly from the planktonic and benthonic organisms and subordinately from the humic matter derived from the land through rivers.

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