BENTHOS OF THE KALI ESTUARY, KARWAR

S. N. HARKANTRA
National Institute of Oceanography, Dona Paula, Goa 403 004

ABSTRACT

Seasonal changes in the benthic production were studied at 7 stations in the Kali estuary from January to December 1974. The production was high in the pre and postmonsoons. Bivalves, *Paphia malabarica* and *Meretrix casta* followed by polychaetes were the dominant animals. The clams contributed to more than 65% of the total biomass, which has been found to vary from 0.125 to 110.52 g/m^2. Salinity showed a wide variation from 6.45 to 33.65‰. A comparison of benthic fauna at different stations showed changes in its composition which may probably be attributed to differences in substrata and fluctuations in salinity.

INTRODUCTION

The river Kali originates in the Western Ghats. It is one of the important rivers of the Karnataka coast and flows in the southwest direction and joins the Arabian sea near Kodibag (Karwar) in front of Kurumgad island in the Karwar Bay. The river receives heavy rains during the southwest monsoon, from June to September/October. During the monsoon the formation of a sand bar at the mouth of the river plays an important role in the water movement. The present communication describes the macrobenthic production of this estuary in relation to changes in the environmental features.

MATERIALS AND METHODS

Benthic samples were collected at monthly intervals from 7 stations. (Fig. 1) for a period of one year, from January to December 1974. A van Veen grab giving a substrata coverage of 0.042 was used for the collection of benthos. The samples were washed in a sieve of 0.05 mm mesh size which retained most of the macrobenthos. The organisms were sorted, counted and weighed. The biomass was expressed as wet weight of the animals excluding the hard parts. At each station, observations were undertaken on the bottom temperature, salinity, dissolved oxygen, suspended matter and depth of the water column.

RESULTS AND DISCUSSIONS

Benthos: Table I and II give the seasonal changes in biomass and the population density of the animals in relation to changes in the environmental features of this estuary.

TABLE I *Seasonal changes (range and mean values) in biomass and population*

Seasons	Biomass (g/m²)	Population (n/m²)
Premonsoon (February—May	90.15—110.52 (100.34)	515—650 (582)
Monsoon (June—September)	0.125—35.125 (17.62)	25—95 (60)
Postmonsoon (October—January)	35.125—90.15 (62.62)	95—515 (305)

TABLE II *Seasonal changes (range and mean values) in the environmental parameters*

Seasons	Suspended matter (g/l)	Temperature (°C)	Dissolved oxygen (ml/l)	Salinity (‰)
Premonsoon (February-May)	0.04—0.112 (0.076)	28.2—31.6 (29.9)	3.68—5.38 (4.53)	30.07—33.65 (31.84)
Monsoon (June-September)	0.112—0.165 (0.138)	26.4—28.8 (27.2)	0.675—5.04 (2.87)	6.45—29.95 (18.2)
Postmonsoon (October-January)	0.06—0.135 (0.147)	26.4—29.5 (28.4)	1.95—5.25 (3.60)	9.40—31.75 (20.57)

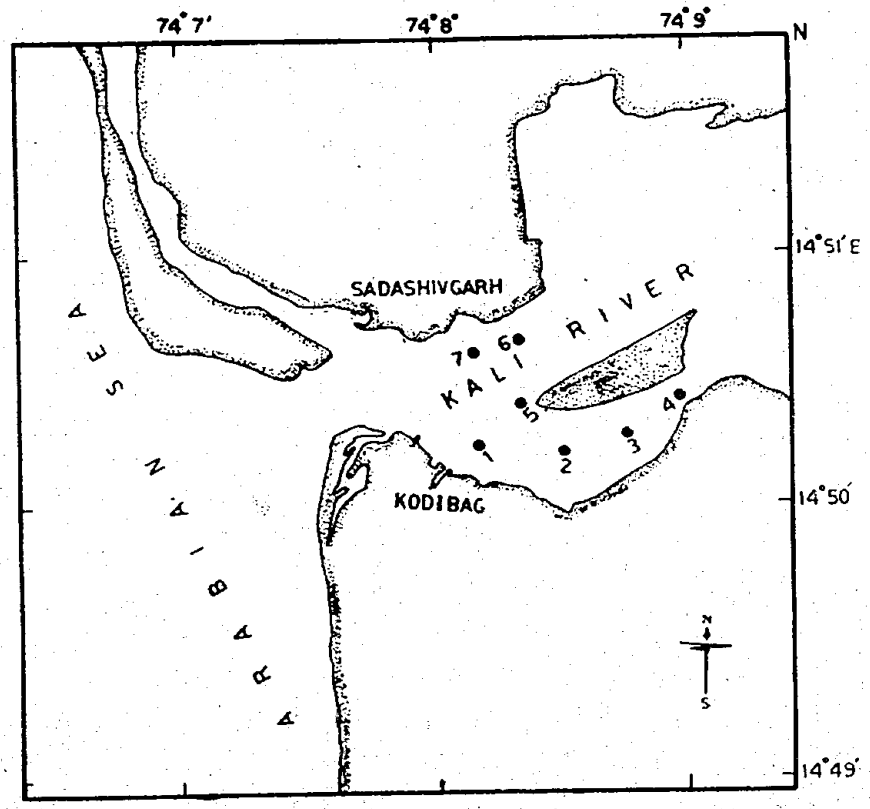

Fig. 1. Map of Kali estuary, solid circles indicate position of the stations.

It is clear from the table that an increase in biomass was observed from postmonsoon to premonsoon season. Then there was a decline in these values with the onset of monsoon and the biomass continued to be low throughout the monsoon period at all the stations. Table III shows the qualitative distribution of benthic organisms at stations 1 to 7 in relation to substratum. The fauna was mainly composed of bivalves, *Paphia malabarica* and *Meretrix casta*, polychaetes, gastropods, gammarids, isopods, amphipods, mysids, worms and crabs in the Kali estuary. Dominance of bivalves was observed at stations 1 to 5 which have sandy bottoms and polychaetes abundance occurred at stations 6 and 7 which have muddy bottoms. A denser population of *P. malabarica* was observed at stations 1 and 2 whereas polychaetes were abundant at stations 6 and 7, where higher salinity prevailed. *M. casta* was abundant at stations 3 to 5 where low salinity prevailed. Population density varied from 25 to 650/m^2 with the corresponding biomass of 0.125 g/m^2 in September to 110.52 g/m^2 in March (Table I). The biomass values were directly linked with the animal counts per unit area at all the stations. Bivalves contributed more than 65% of the total biomass. Figures 2 and 3 give the range in biomass and population density in relation to variations in the environmental features at different stations. Maximum

TABLE III *Nature of substratum and faunal composition*

Type of substratum	Stations	Faunal composition	Dominant group
Coarse sand 20%, medium and fine sand 65%, shell gravel 10% and debris 5% (Sandy)	1,2,3 and 4	Bivalves, gastropods, polychaetes, isopods, amphipods, gammarids, mysids worms and crabs.	Bivalves
Medium and fine sand 80%, shell gravel 10%, and debris 5%. (Sandy)	5	Bivalves, gastropods polychaetes, isopods, amphipods, gammarids, mysids, worms and crabs.	Bivalves
Fine sand 20%, silty 50%, clay 10%, shell gravel 10% and debris 10%. (Muddy)	6 and 7	Polychaetes, isopods, gammarids, amphipods, mysids, worms and crabs.	Polychaetes

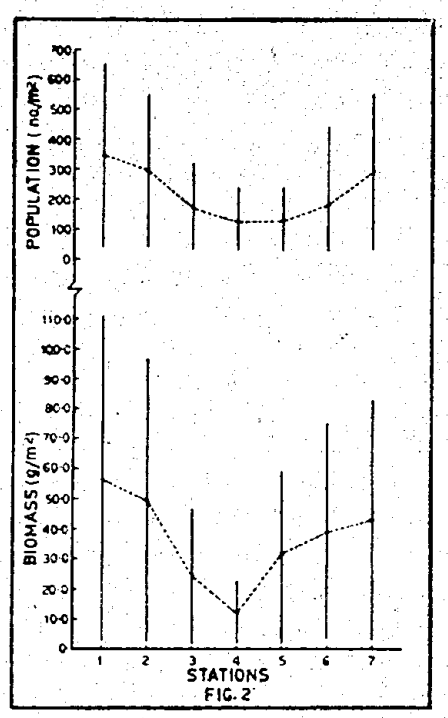

Fig. 2. Variations (range : vertical lines and mean values: points) in biomass and population at stations 1 to 7.

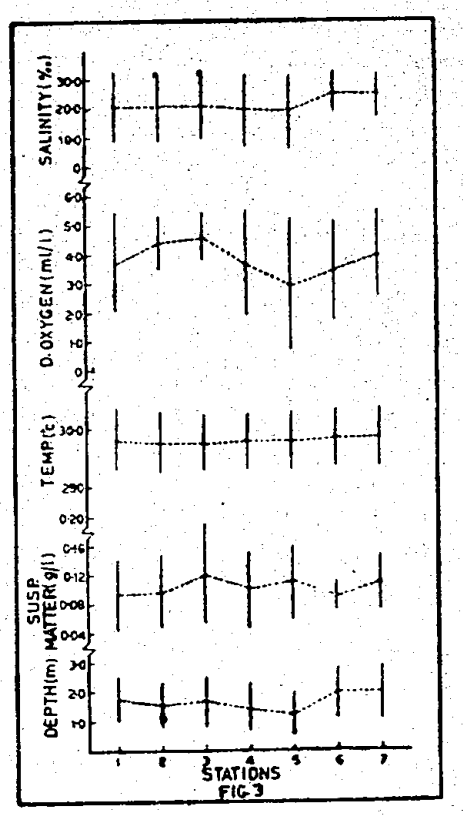

Fig. 3. Variations (range: vertical lines and mean values: points) in environmental parameters at stations 1 to 7.

variations in biomass and the environmental features were observed at stations 1, 2, 6 and 7 which are located close to the sea where as the changes were not pronounced at other stations which were located in the lower reaches of the river. The poorest biomass was observed at station 4 where a creek opens and the higher biomass was recorded at station 1. Bivalves, gastropods and crustaceans were found in varying numbers throughout the year but polychaetes were practically absent during the monsoon period.

Environmental Features

Depth: The depth of the water column varied from 0.5 to 2.75 m (Fig. 3). Stations 1 to 5 were relatively shallower as compared to stations 6 and 7. The depth varied with the tides, fresh water discharge and topography of the bottom. But depth alone does not seem to affect the benthic organisms in the estuary.

Suspended matter : The values of suspended matter ranged from 0.05 in February to 0.165 g/l in July at all the stations (Fig. 3). High values were found during the monsoon when because of rains the turbidity was maximum. The macrobenthos being filter or bottom feeders probably depend largely on detritus or suspended material. But these values showed

no correlation with the benthos during the monsoon months (Table I and III).

Temperature: The temperature was almost uniform at all the stations and showed a difference of 4 to 5°C seasonally. It varied from 26.3 in November to 31.6°C in May. A decline in the bottom temperature was noticed with the onset of monsoon which continued during the postmonsoon period upto November. The pattern of temperature variation was bimodal and similar to the cycle shown by Annigeri (1968) in the Karwar Bay Table I and II indicate that low biomass coincided with the low temperature during the monsoon. This seems to be one of the factors affecting the benthos distribution and abundance in the estuary.

Dissolved oxygen: The values varied from 0.675 in July to 5.54 ml/l in March (Fig. 3). The changes in dissolved oxygen are mainly due to rain fall and land runoff as indicated by Parulekar and Dwivedi (1972). Lower values were found during the monsoon and these corresponded with the poor biomass (Table I and II). This dissolved oxygen seems to be one of the factors influencing the benthic community in the estuary.

Salinity: Salinity showed a wide range from 6.45‰ in October to 33.65‰ in May. During the monsoon the range in salinity of all the stations were considerable. The formation of a sand bar at the mouth during this period also played an important role in the water movement. These changes in pre and postmonsoons were relatively small (Table III) and largly depended on the tidal influences and fresh water discharge. Little changes in salinity were noted at stations 6 and 7 probably because of their greater depth (Fig. 3). Poor biomass during the monsoon coincided with low salinity (Table I and II), as has been observed by several earlier workers (Seshappa 1953., Desai and Krishnankutty 1967 and Kurian 1972). The absence of polychaetes during the monsoon is probably because of the decline in salinity and wide fluctuations in the other environmental parameters. The predominance of this group at stations 6 and 7 clearly indicates their preference to high salinity water. The presence of other groups of animals throughout the year indicates their greater tolerance to salinity. The abundance of *P. malabarica* at stations 1 and 2 and *M. casta* at stations 3 to 5 indicates preference of high or low salinity water respectively. In the light of this, salinity seems to have maximum influence on the distribution and abundance of benthos.

Substrata: Table III gives the type of substrata at stations 1 to 7 and its faunal composition. The nature of the bottom more or less remained unchanged seasonally (Table III), except during the monsoon period when it got mixed with large quantity of coarse sand and debris brought through land run-off. The presence of one group of animals at a particular station and their absence at the other stations indicate that animals showed a strong preference towards a particular type of substratum, similar to what has been reported in Goa estuaries (Parulekar and Dwivedi, 1972, 1974) and in other places by Damodaran (1973) and Kurian (1972). The presence of crustaceans

at all the stations indicates their epifaunal habit with no preference towards the nature of bottom (Parulekar and Dwivedi 1972). Salinity and nature of bottom, seem to have the maximum influences in the distribution and abundance of benthos.

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