
6. SUMMARY

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The Manakkudy estuary is located in Kanyakumari district, Tamilnadu on the south west coast of India (Lat . 8. 05'; long. 77 .32'). It is a bar built temporary estuary which receives Pazhayar river that originates from Mahendragiri peak of the Western ghats.

For the present study, three stations of diverse ecological characteristics are selected. Station I is the marine zone flanked by retting pits, station II is the estuarine zone and station III is the riverine zone.

Investigations are made on physico-chemical parameters, nutrients, plankton, primary production, plant pigments, organic carbon, sediment composition and benthic fauna, for a period of two years, 1990-'91 and 1991-'92.

The data on rainfall indicated a clear variation between seasons and years. The annual rainfall for 1990-'91 was 1114.9mm and for 1991-'92 was 1329.7mm. It was high during 1991-'92 and low during 1990-'91. The seasonal total was high in postmonsoon (719.7mm) during 1990-'91 and in monsoon (845.9mm) during 1991-'92.

The estuary remained open for 85 days during 1990-'91 and during 1991-'92 it was for 103 days. On other days, the estuary remained land-locked. The estuary became connected to the sea for more number of days in the postmonsoon seasons during both the years.

In both the years average depth of station I was significantly higher than that of station II and III. The maximum average depth was recorded in the monsoon season.

The minimum light penetration was 0.1m and the maximum was 0.9m. The light penetration did not show much variation between the stations. The average light penetration was low during post monsoon season and it was due to the heavy influx of turbid water.

The atmospheric temperature varied from a low value of 24.1°C to a high value of 32.9°C. Maximum atmospheric temperature was recorded during premonsoon seasons and minimum temperature was recorded during postmonsoon seasons.

The surface water temperature ranged from a low of 22.3°C to a high of 32.1°C and the variations in temperatures observed among the three stations in both the years were significant. Minimum surface water temperature was recorded during monsoon season and maximum was recorded during premonsoon season. The surface water temperature was lower than that of the atmospheric temperature .

The bottom water temperature showed a minimum of 21.8°C and a maximum of 32.1°C . Station II recorded higher average temperature than that of station I and III. The mean bottom water temperature was minimum during postmonsoon season and maximum during premonsoon season. On most of the occasions the bottom water temperature was lower than that of the surface water temperature.

The average surface water salinity had no significant difference in any of the three stations during 1991-'92; however, in 1990-'91 the average was highest for station I. The average bottom water salinity did not show any variation among the stations in both the years. The surface water salinity fluctuated from a low value of 0.2 ‰ to a high value of 24.1 ‰. The bottom salinity ranged between 0.2 ‰ and 28.5 ‰. The salinity distribution observed was typical of an estuary. It was low on the surface. It was minimum during monsoon and postmonsoon and maximum during premonsoon. Station I exhibited maximum salinity which gradually decreased towards station III (riverine zone) through station II (estuarine zone).

The minimum level of dissolved oxygen content of surface water was 2.14ml/l in March at station II in 1990-'91 and the maximum was 7.11ml/l in November at station III during 1991-'92. Dissolved oxygen content of bottom water varied from 2.04ml/l in March at station II during 1990-'91 to 6.73 ml/l in November at station III during 1990-'91. The average level at the surface and bottom did not change from station to station in both the years. The concentration of dissolved oxygen of both surface and bottom water was high during monsoon and post monsoon seasons and low during premonsoon season.

The minimum pH recorded was 6.81 in March at station I and the maximum was 8.31 in April at station I during 1990-'91. The average pH level was almost the same in all the stations over the two years both at the bottom and surface. The pH of the water always remained on the

alkaline side except on two occasions in station I. Maximum mean values of pH were recorded in the premonsoon season and minimum values in the monsoon season.

Hydrogen sulphide was totally absent in station II and III. Even in station I it was absent during certain monsoon and postmonsoon months. The maximum value of hydrogen sulphide registered was 4.88mg/l. The concentration of hydrogen sulphide in the bottom water was always found to be lower than that of surface water. The concentration increased in the premonsoon when there was stagnation of water. It decreased in the monsoon season and disappeared completely in certain monsoon and postmonsoon months.

The silicate content fluctuated from 31.6 μ gm at Si/l in May at station I to 192.6 μ gm at Si/l in June at station III. The average silicate content was higher in the monsoon season and it was due to heavy discharge of riverine water. The annual average silicate content was high in station III and low in station I in both the years. It showed a negative correlation with salinity.

The total phosphorus varied from 0.41 μ gm at P/l at station I to 2.81 μ gm at P/l at station III. The total phosphorus was high in the monsoon months. It was high at station III and low at station I. It showed a negative correlation with salinity.

The concentration of inorganic phosphate registered a minimum value of 0.16 μ gm at P/l and maximum value of 2.11 μ gm at

P/l. Maximum mean values were recorded in the monsoon season and it followed the pattern of total dissolved phosphorus. It showed negative correlation with salinity.

The concentration of nitrate content varied from 0.45μ gm at N/l to 17.24μ gm at N/l. Maximum average values of nitrate were recorded in the monsoon season. It was high in station III and low in station I. It showed negative correlation with salinity.

The concentration of nitrite varied from 0.09μ gm at N/l to 1.11μ gm at N/l. The values of nitrite were remarkably low when compared with other nutrients. The average concentration of nitrite was higher in the monsoon season. When the average concentrations were compared, the values decreased from station III to I. It showed negative correlation with salinity.

The N:P ratio varied from a minimum value of 2.11 to a maximum value of 11.68. The annual average of N: P ratio showed high values at station II. Seasonal N:P ratio showed maximum values in the monsoon and postmonsoon seasons.

The gross primary production fluctuated from $9\text{ mg.c/m}^3/\text{hr}$. to $164\text{ mg. c/m}^3/\text{hr}$. The annual average gross primary production was high at station II, the estuarine zone and low at station I, the marine zone. The seasonal average gross primary production showed maximum values during premonsoon and minimum values during monsoon period except at station I which during 1990-'91 registered minimum values in the

postmonsoon. The annual average was high during 1991-'92 and low during 1990-'91. The gross primary production showed positive correlation with salinity, nutrients and phytoplankton and negative correlation with hydrogen sulphide.

The seasonal variation of net primary production followed the pattern of gross primary production. It ranged from 6 mg. c/m³/hr. to 124 mg. c/m³/hr. The annual average net primary production was high at station II and low at station I. The seasonal average net primary production was maximum during premonsoon season and minimum during postmonsoon season except station I which during 1990-'91 recorded minimum values in the premonsoon season. The annual average of net primary production was high during 1991-'92.

Chlorophyll 'a' concentration varied from 0.41 mg/m³ to 8.3 mg/m³. The annual chlorophyll 'a' concentration was high at station II and low at station I. The seasonal average of chlorophyll 'a' showed the maximum values during premonsoon season and minimum values were recorded during monsoon season. The annual average was higher for 1991-'92.

The concentration of chlorophyll 'b' was the lowest when compared to that of 'a' and 'c'. Again it was completely absent in February 1990-'91 and June 1991-'92. The value fluctuated from 0.33 mg/m³ to 4.56 mg/m³. The annual average values of chlorophyll 'b' were higher at station III and lower at station I. The seasonal mean values of chlorophyll 'b' showed maximum during monsoon season. The annual average was high during 1991-'92.

The concentration of chlorophyll 'c' ranged from 0.20 mg/m³ to 5.01 mg/m³. The annual average values of chlorophyll 'c' were high at station III and low at station I. The seasonal variation showed maximum values during premonsoon season. The annual average was high for 1991-'92.

The c/a ratio was high in station III and low in station I. Maximum seasonal value was recorded in premonsoon season. The c/a ratio varied from 0.26 to 0.78. The annual average was high for 1991-'92. The plant pigments exhibited positive correlation with salinity, nutrients, primary production and phytoplankton and negative correlation with hydrogen sulphide.

Phytoplankton was composed of 78 species. Diatom was the dominant group. However, during monsoon period Chlorophyceae dominated. The population density fluctuated from 2375 cell/l to 41400 cells/l. Comparatively station II recorded more species. The population density, species diversity, richness and evenness were high during premonsoon and low during postmonsoon seasons. The highest density was noted during 1991-'92. The phytoplankton density showed positive correlation with salinity, plant pigments and primary production and a negative correlation with nutrients and hydrogen sulphide.

In the zooplankton population, 41 species were recorded. Copepoda was the dominant group. The population density varied from a low density of 140 individuals/m³ to a high density of 16691 individuals/m³.

The annual average population density was high at station II and low at station I. The population density, species diversity, species richness and evenness were high during premonsoon season and low during monsoon season. The annual population density was high during 1991-'92. There was positive correlation of zooplankton with salinity, primary production, plant pigments and phytoplankton and negative correlation with nutrients and hydrogen sulphide.

The texture of the sediment was sand silt clay in station I and II and silty sand in station III. Station I recorded high percentage of clay and station III recorded high percentage of sand. The percentage composition of sand was high at station III and it decreased downstream. The percentage composition of sand was higher during postmonsoon period.

Organic carbon varied from 0.38% to 5.02% . Maximum values of organic carbon were recorded during premonsoon season. The values of organic carbon decreased upstream from station I to III through station II. The percentage of organic carbon showed a negative correlation with benthic faunal density and positive correlation with salinity and hydrogen sulphide.

The benthic population was composed of ten groups. The benthic fauna was abundant in station II and less in the retting influenced station I. At station I nematodes were the dominant taxon while at station II and III polychaetes were the dominant taxon. A total number of 31

species were recorded. The population density of benthic fauna varied from 246 individuals/m² to 3399 individuals/m². The maximum population density occurred during premonsoon season at station II and III. However, the retting affected station I showed maximum density in the postmonsoon season and minimum in the premonsoon season. Species diversity, species richness and species evenness were maximum in the premonsoon season in station II. The benthic fauna of 1990-'91 was slightly lower than that of 1991-'92.

An alarming feature of Manakkudy estuary is that live adult molluscan population is completely depleted, though it contains heavy sub-soil deposits of molluscan shells.