SIX

ECOLOGY OF MUDBANKS — HYDROGRAPHY

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ABSTRACT

The variations in physical and chemical parameters of the Alleppey mudbank waters are discussed in this paper. The fluctuations in temperature, salinity, oxygen and the comparatively high nutrient contents of the mudbank waters are highlighted.

INTRODUCTION

Observations on the physical and chemical properties of the mudbank are very meagre. Damodaran and Hridayanathan (1966) and Damodaran (1973) have studied some of the hydrographical properties of the Narakkal mudbank and recently Kurup (1977) reported the temperature and salinity distribution at the mudbank at Purakkad. However, a detailed study on the physico-chemical aspects of the mudbank area is still lacking.

The following account deals with the physical and chemical aspects of Alleppey mudbank, based on observations made during 1971-72, which covered two mudbank seasons. In the year 1971-72, mudbank was formed between Kakkazham in the north and Karoor (near Purakkad) in the south with Ambalapuzha at the centre, and it extended about 3 km along the coast and about 5 km offshore. The average depth was about 4 m.

MATERIAL AND METHODS

A country-craft was used for carrying out investigations in the mudbank. For regular monitoring of the biological and ecological parameters, 4 stations were fixed in the mudbank, (Fig. 1, Chapter 5). The observations were made at surface and bottom for temperature, salinity, dissolved oxygen, reactive phosphate, reactive silicate, nitrite and nitrate. Observations on temperature was made using a bucket thermometer for surface waters and reversing thermometer for bottom. Seawater samples for chemical analysis were collected by Nansen bottle. Salinity was determined by the titration method, dissolved oxygen by Winkler's method and the nutrients by the method of Strickland and Parsons (1968).

RESULTS

Temperature: The variations of the mean temperature at surface and bottom are presented in fig. 1. Before the start of the mudbank season, the temperature was about 28.5°C both at the surface and bottom. During the mudbank season (June-August), the temperature of the waters was between 26 and 27°C at the surface and between 25 and 26°C at the bottom. During November-December 1971 the temperature of the surface was around 29°C and at the bottom it was 28°C. During

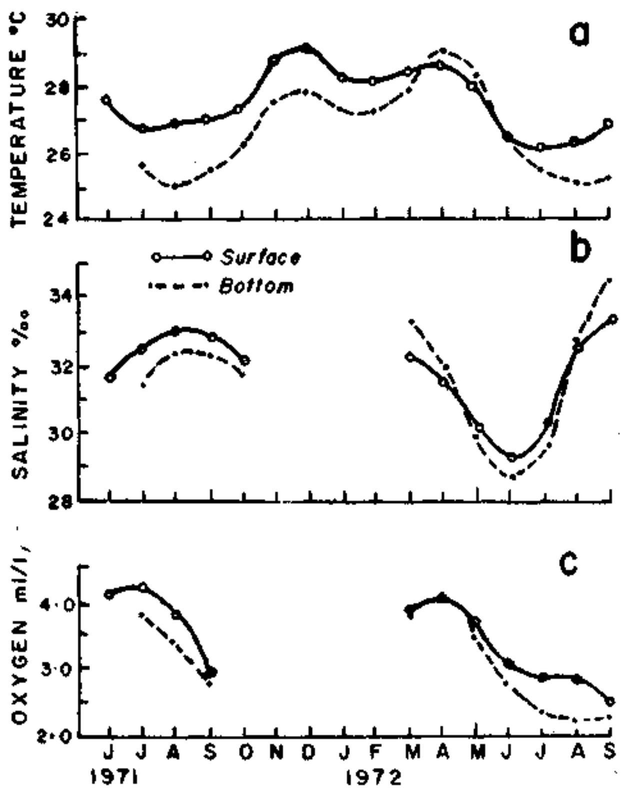

Fig. 1 Monthly mean variations of hydrographic parameters: a. temperature (surface and bottom); b. Salinity (surface and bottom); c. dissolved Oxygen (Surface and bottom).

January-March 1972, the temperature for surface water was 28°C, and at the bottom it was 1°C less.

Salinity: The salinity values at both surface and bottom were relatively high during the pre-mudbank and post-mudbank seasons. During the 1972 mudbank season the average salinity values reached as low as 28.5‰. It is interesting to note that the salinity values at the bottom were slightly lower than at the surface during the mudbank seasons (fig. 1 b).

Dissolved oxygen: The fig. 1 c represent the mean values of dissolved oxygen at the surface and at the bottom. The value rose to around 4 ml/l during the pre-mudbank season. The dissolved-oxygen values in the mudbank season were the same as the pre-monsoon values at surface of 1971. However, during the 1972 mudbank season the dissolved oxygen of both surface and bottom waters was reduced to about 3.2 ml/1.

Reactive phosphate: The variations of the values of reactive phosphate of surface and bottom waters are given in fig. 2 a. The values during winter were generally lower at the two levels and less than 2 µg at P/l. The

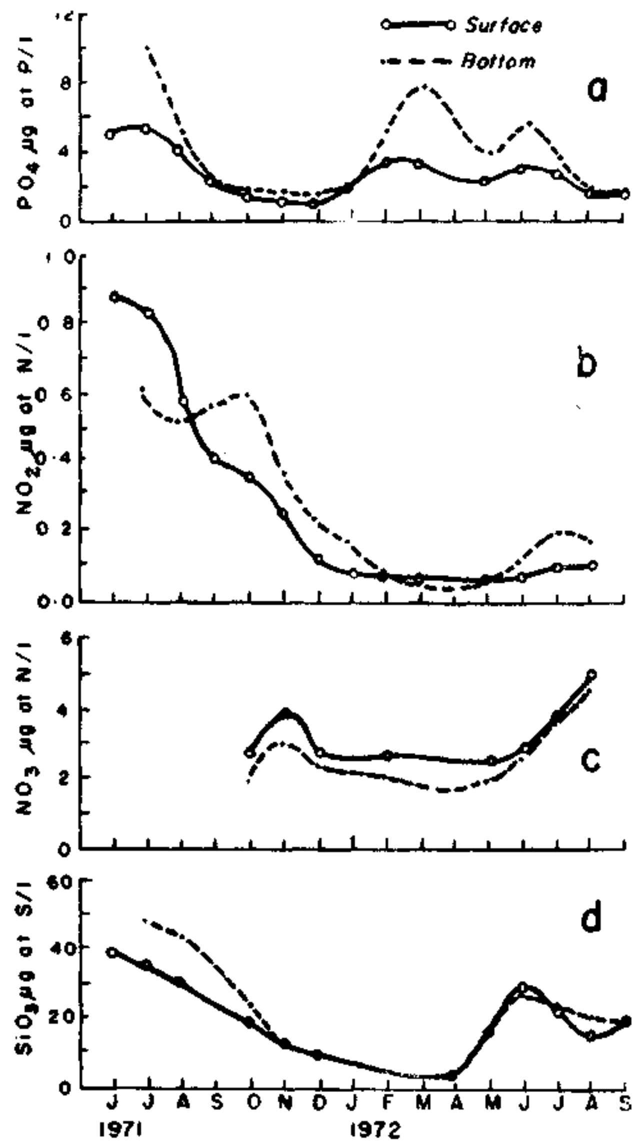

Fig.2 Monthly mean variations of hydrographic parameters: a, phosphate (surface and bottom); b, nitrite (surface and bottom; c, nitrate (surface and bottom); d, silicate (surface and bottom).

seasonal value of phosphate of the surface water, as well as the bottom water, indicated the maximum during the mudbank season of the years 1971 and 1972. However, a sharp rise in the phosphate values was noted in March 1972. As is usually the case, the phosphate values were more at the bottom than at the surface.

Nitrite and nitrate: Fig. 2 b shows the variations in the values of nitrite content. Generally speaking, the values during 1972 mudbank season were much less than those corresponding to the 1971 season. The nitrate nitrogen (fig. 2 c) was low during the pre-mudbank season and appareciably high during the mudbank season. The bottom and surface values did not show much difference in the case of nitrates. The nitrate nitrogen values showed maximum during post-mudbank season at both surface and bottom.

Reactive silicate: The figure 2 d gives the variations in reactive silicate values at surface and bottom. The silicate values at the two levels were at their ebb, being less than 10 µ g at SiO_3/l during the pre-mudbank and post-mudbank seasons. During the mudbank season, the silicate values were high. In general, the bottom silicate values were higher than there at the surface during the post-mudbank season.

DISCUSSION

The reduced temperature observed during the mudbank season could be due to the reduced incoming solar radiation on account of the thick monsoon clouds. The observed reduction in salinity values from the pre-mudbank to the mudbank season may be attributed to precipitation, run off and also due to the freshwater discharge from the nearby spillway The slight decrease of salinity at the bottom of the water column during the mudbank season may be attributed to the seepage of water-borne mud from the subterranean porous stratum of the coastal strip, an observation supporting Crawford's views (see Chapter 3 on mudbank formation).

Heavy blooming of organism *Noctiluca* can cause a rapid reduction in the dissolved-oxygen content of the water, especially when it is calm. Thus during the post-mudbank season (September–November), the minimum values of dissolved oxygen can be attributed to the observed blooms of *Noctiluca miliaris.*

The nitrogenous compounds and the phosphate contents of the water column showed an approximate inverse relationship (fig. 2), which indicates that the planktonic algae utilises one of the nutrient compounds at a faster rate during a particular season.

The high silicate values during the mudbank season may be due to the fine sediments present in suspension in the water. This increase may also indicate the heterogenous character in space and time of the silica recycling mechanism by the diatoms during its growth and multiplication.