Indian Journal of Marine Sciences
Vol. 15, September 1986, pp. 199-200

Monthly Variations in Some Chemical Characteristics of Nearshore Waters along the South Orissa Coast

S K SASAMAL, B K SAHU & R C PANIGRAHY
Department of Marine Sciences, Berhampur University, Berhampur 760 007

Received 20 *December* 1985; *revised received* 17 *June* 1986

Salinity, *p*H, dissolved oxygen and nutrients (NO_3^-–N, PO_4^{3-}–P and SiO_4^{4-}–Si) estimated in the nearshore waters during Jan. to Dec. 1984 reveal well defined seasonal variations. Negative correlation obtained between the salinity and each of the nutrients indicates that the land drainage plays significant role in the nutrient economy of these waters.

In view of the important role the physico-chemical parameters play on the productivity potential of coastal waters and their fisheries, numerous studies have been made in India to evaluate their seasonal behaviour. However, similar studies are meagre beyond north of Visakhapatnam and particularly along the Orissa coast. Hydrographical properties of the coastal waters of Gopalpur have been studied earlier covering only premonsoon and monsoon months[1]. It is believed that, the newly established industrial complexes along the south Orissa coast may lead to substantial change in the physico-chemical properties of the coastal waters in future. Keeping this in view, base line information on some chemical properties of these waters are estimated which may help in the management of these coastal waters.

The study was made at 3 stations, located 10 km away from each other along the south Orissa coast. The first station (lat. 19 22′ N, long. 85 4′ E) is located at Rushikulya river mouth nearly 1 km away from Jayashree Chemicals Complex. St. 2 (lat. 19 19′ N, long. 84 59′ E) is situated near the Gopalpur port of about 1/2 km away from Indian Rare Earths Ltd. St. 3 (lat. 19 16′ N, long. 84 55′ E) is located along the Gopalpur coast.

Surface water samples were collected thrice in a month during Jan. to Dec. 1984, from each of the stations which are 1/2 km away from the coast, using clean plastic bottles. Salinity, *p*H, dissolved oxygen, nitrate-N, phosphate-P and silicate-Si were determined employing standard methods[2]. The seasons along this coast are (a) SW monsoon (June-Sept.), (b) NE monsoon (Oct.-Jan.) and (c) summer (Feb.-May).

The stations being situated in between 2 monsoon fed rivers the Rushikulya to north and the Bahuda to south, the huge amounts of fresh water discharged from them greatly influence the chemical characteristics (Fig. 1).

At all stations salinity exhibited unimodality with high values during April-May and low values during rainy months Aug.-Sept. *p*H showed moderate fluctuation at all stations. The low values recorded correspond to low salinities during monsoon months. *p*H variations in the present study followed closely those of Chilka mouth waters[3].

Dissolved oxygen distribution exhibited a bimodal oscillation at all stations. The primary maximum occurred in Sept./Oct. followed by the secondary maximum in march/April. Minimum oxygen was observed during Feb., June and July respectively at sts 1-3. High primary production rates have been reported in the coastal waters of the Bay of Bengal during premonsoon (March-May)[4]. The high oxygen concentration during March/April therefore, could possibly be due to high primary productivity. But the high values during monsoon (June-Sept.) may be due to admixture of oxygen rich fresh water introduced through land drainage.

Only 3 important nutrients, viz. nitrate-N phosphate-P, and silicate-Si are estimated (Fig. 1). Nitrate-N exhibited bimodality. High values were observed during Sept./Oct. and again in March. Increased nitrate-N concentration during monsoon indicates its origin from land drainage.

Phosphate-P exhibited bimodal annual cycle with peaks during March and Aug. (Fig. 1). Comparatively higher values at st 1 coupled with peaks during early monsoon period clearly indicated that the phosphorus budget of this part of the Bay of Bengal is significantly influenced by input of Rushikulya river waters. Both nitrate-N and phosphorus-P showed high values during March, which may be attributed to some

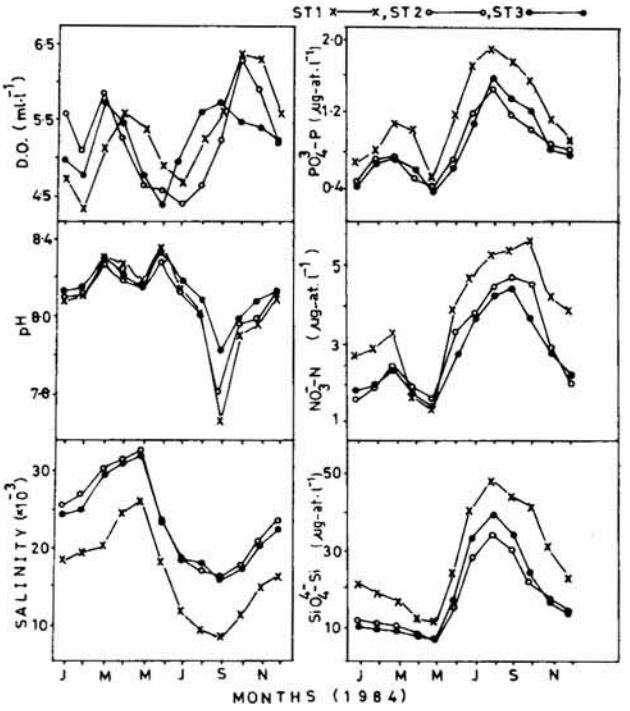

Fig. 1 – Monthly variations of chemical characteristics at different stations

terrestrial drainage with rich effluents as well as the extension of nutrient rich upwelling water mass, which usually occurs in the east coast of India during this period[5,6].

Silicate-Si showed a unimodal distribution at all the stations. At all stations peak value were noticed in Aug. while lowest concentrations were observed in May. High concentrations of silicate-Si were observed during the monsoon when influx of fresh water was high. The pattern of silicate-Si distribution in the present study is similar to earlier reports[7–9]. The decrease in silicate-Si concentration from Aug. till May was primarily due to the decrease in influx of silicate rich fresh water into the bay. In addition, it may also be due to silicate assimilation by diatoms and formation of polymeric colloidal forms of silicic acid[10].

When each nutrient was correlated with existing salinity regime, a significant negative correlation was obtained. The correlation coefficients (r) for sts 1 to 3 respectively, were -0.893, -0.890 and -0.886 for nitrate-salinity relationship; -0.868, -0.826 and -0.862 for phosphate-salinity relationship, and -0.969, -0.849 and -0.908 for silicate-salinity relationship. Therefore, it is clear that the nutrient budget of the surface waters of this area is considerably affected by the magnitude of land drainage discharged into the bay.

One of the authors (SKS) acknowledges the financial support of the Department of Ocean Development, New Delhi.

References

1 Panigrahy R C, Sahu J P & Misra P M, *Bull Env Sci*, **1** (1984) 10.
2 Strickland J D H & Parsons T R, *A practical hand book of seawater analysis*, Bull No. 167 (*Fish Res Bd Can*) 1983, 311 pp.
3 Mohanty S K, *Bull Dept mar Sci Univ Cochin*, **1** (1975) 69.
4 Panigrahy R C & Mohapatra K N, *Bull Env Sci*, **3** (1984) 70.
5 Murty C S & Varadachari V V R, *Bull Natn Inst Sci India*, **38** (1968) 80.
6 Lafond E C, *Andhra Univ Mem Oceanogr*, **1** (1954) 117.
7 Ganapati P N, Lafond E C & Bavanarayana P V, *Proc Indian Acad Sci*, **44B** (1956) 68.
8 Reddy C V G & Sankaranarayanan V N, *Bull Natn Inst Sci India*, **38** (1968) 103.
9 Reddy C V G & Sankaranarayanan V N, *Bull Natn Inst Sci India*, **38** (1968) 206.
10 Liss P S, in *Estuarine chemistry*, edited by J D Burton & P S Liss (Academic Press, London) 1976, 93.