

OCCURRENCE OF A BLOOM OF THE DIATOM *ASTERIONELLA GLACIALIS* (CASTRACANE) IN THE RUSHIKULYA ESTUARY, EAST COAST OF INDIA

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ABSTRACT

The occurrence of a bloom of the diatom *Asterionella glacialis* Castracane was recorded in the Rushikulya estuary (Orissa), east coast of India for a period of about 5 weeks during April-May 1988. Phytoplankton cell counts during this period ranged from $3.98-9.42 \times 10^4$ cells l^{-1} in which *A. glacialis* alone contributed 72 - 86.2% of the total population. Intensity of the bloom declined towards later part of May.

Key-words : Bloom, *Asterionella glacialis*, Rushikulya estuary, east coast.

The occurrence of phytoplankton blooms is one of the striking biological events taking place in various parts of the marine ecosystems of the world. Formation of blooms by the blue green alga *Trichodesmium erythraeum* Ehrenberg every year, is a very wide spread phenomenon in the Arabian Sea (Qasim, 1970; Devassy, Bhattathiri, and Qasim, 1978; Devassy, 1987). But information on bloom forming diatoms is scarce. The occurrence of an *Asterionella japonica* bloom in Bay of Bengal, off Waltair, was reported by Subba Rao (1969). Devassy (1974) reported the occurrence of the bloom of a diatom *Fragilaria oceanica* from the west coast of India. Subsequently Chandran (1985) reported the bloom of *Asterionella glacialis* in the Vellar estuary, while a bloom of *Asterionella glacialis* in the nearshore waters of Gopalpur was reported by Choudhury and Panigrahy (1989). The present communication reports the occurrence of a bloom of the diatom *Asterionella glacialis* in the Rushikulya estuary (Orissa), east coast of India.

During the course of our studies on phytoplankton, a bloom of *Asterionella glacialis* was encountered on 4th April, 1988 in the study area. Surface water samples from two stations in the estuary (Fig. 1) were collected for analysing the bloom density and certain physico-chemical parameters. Samples were taken at an interval of 7-10 days over a period of 6 weeks (4 April - 24 May, 1988). Samples for estimation of salinity and nutrients, dissolved oxygen and phytoplankton were taken in separate containers and were transported to the laboratory. Chemical estimations were made using the methods of Parsons, Maita and Lalli (1984). Phytoplankton samples were fixed with Lugol's iodine solution and the counting of cells was carried out using Sedgewick-Rafter cell. Density of phytoplankton was expressed as cells l^{-1} .

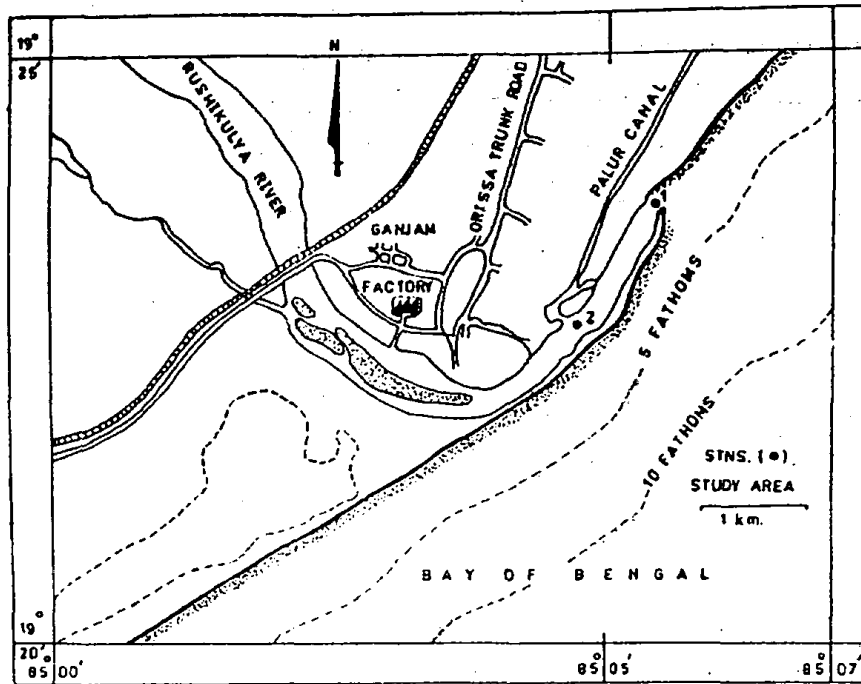


Fig.1. Map of Rushikulya estuary depicting collection sites.

Rushikulya estuary is a shallow tidal estuary that opens into the Bay of Bengal near Ganjam (Orissa), east coast of India. Data obtained on the characteristics of *Asterionella* bloom and certain environmental features are given in Table I. Surface water temperature, salinity and dissolved oxygen concentrations varied between 28° and 31.3°C, 33.3 and 34.7 ppt and 4.07 and 6.79 ml l⁻¹ respectively. Levels of nutrients showed conspicuous variations with least values towards mid-May. During the period of bloom, phytoplankton density ranged from 3.06 - 9.88 x 10⁴ cells l⁻¹ of which *Asterionella glacialis* alone contributed to 72 - 86.2% of the total population. A sudden fall in *Asterionella* density (1.2 x 10³ cells l⁻¹) was observed on 24 May 1988 indicating the senescent phase of the bloom after 5 weeks or so. In many earlier studies, numerical abundance has been considered as the index for recognising a diatom bloom. Cell numbers of *A. glacialis* during 4 April - 15 May 1988 in the present case contributed more than 72% of the total population. Sudden decline in *Asterionella* density was observed on 24 May. Another feature observed was the predominance of *Asterionella glacialis* leading to an almost monospecific population as was reported by Chandran (1985) for *Asterionella japonica* in the Vellar estuary. During the period of the bloom both temperature and salinity were comparatively less fluctuating than the dissolved oxygen. Nutrient levels, particularly of silicate and phosphate, reduced to minimum in May coinciding with the decline of *Asterionella* cell density. Subba Rao (1969) and Choudhury and Panigrahy (1989) reported that abrupt termination of *Asterionella*

Table I - Surface water temperature, salinity, nutrient concentration and phytoplankton abundance during the bloom period.

Date	Stn.	Water level	Temp. (°C)	Sal. ($\times 10^{-3}$)	DO (ml l^{-1})	Nitrite ($\mu\text{g at l}^{-1}$)	Nitrite ($\mu\text{g at l}^{-1}$)	Phosphate ($\mu\text{g at l}^{-1}$)	Silicate ($\mu\text{g at l}^{-1}$)	Total plankton counts (cells l^{-1})	<i>Asterionella</i> (cells l^{-1})	% of <i>Asterionella</i>
4.4.88	1	High	29.0	34.1	5.58	0.19	0.42	1.07	6.29	98,800	85,200	86.23
	2		28.3	34.7	4.96	0.09	0.90	0.67	8.45	94,200	79,800	84.71
10.4.88	1	Low	31.0	34.5	4.41	0.05	1.11	0.56	28.97	48,200	36,800	76.34
	2		31.0	33.3	4.08	0.33	1.71	0.33	29.38	39,800	29,800	74.87
18.4.88	1	High	30.2	34.8	4.41	0.03	1.65	1.07	6.30	82,600	69,800	84.5
	2		31.2	34.5	4.16	0.25	1.54	0.60	8.56	89,800	73,400	81.7
28.4.88	1	Low	30.5	34.4	4.41	0.09	1.10	0.37	26.31	54,400	41,800	76.8
	2		30.8	34.3	4.07	0.17	1.71	0.33	23.71	59,800	44,200	73.9
9.5.88	1	Low	30.2	34.1	6.79	0.21	1.12	0.05	1.03	61,200	45,400	79.6
	2		31.5	33.9	6.59	0.21	0.56	0.23	6.08	71,400	43,200	72.0
15.5.88	1	High	30.0	34.1	4.78	0.17	1.23	0.14	3.40	61,100	44,000	72.0
	2		29.5	34.1	4.78	0.17	1.23	0.14	3.40	61,100	44,000	72.0
24.5.88	1	Low	29.5	34.1	4.16	0.12	2.17	0.88	1.51	32,000	12,200	38.1
	2		30.5	33.9	5.74	0.09	1.97	0.94	2.12	30,600	12,000	30.9

bloom in the Bay of Bengal occurred mainly due to depletion of silicate and phosphate as was observed in the present study. The results of the present study coupled with earlier observations lead to the conclusion that *Asterionella glacialis* is an important bloom-forming diatom in the coastal waters of the east coast of India.

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REFERENCES

- Chandran, R., 1985. Seasonal and tidal variations of phytoplankton in the gradient zone of Vellar estuary. *Mahasagar - Bulletin of the National Institute of Oceanography*, 18 : 37-48.
- Choudhury, S.B. and R.C. Panigrahy. 1989. Occurrence of a bloom of diatom *Asterionella glacialis* in nearshore waters of Gopalpur, Bay of Bengal. *Indian Journal of Marine Sciences*, 18 : 204 - 206.
- Devassy, V.P., 1974. Observations on the bloom of a diatom *Fragilaria oceanica* Cleve. *Mahasagar - Bulletin of the National Institute of Oceanography*, 7 : 101-105.
- Devassy, V.P., P.M.A. Bhattathiri and S.Z. Qasim, 1978. *Trichodesmium* phenomenon. *Indian Journal of Marine Sciences*, 7 : 168-186.
- Devassy, V.P., 1987. *Trichodesmium* : Red tides in the Arabian Sea. In : *Contribution in Marine Sciences, Dr. S.Z. Qasim Sastyabdapurti Felicitation Volume*, National Institute of Oceanography, Goa : 61-66.
- Parsons, T.R., Yoshiaki Maita and C.M. Lalli, 1984. *A Manual of Chemical and Biological Methods for Seawater Analysis*. Pergamon Press, New York, 173 pp.
- Qasim, S.Z., 1970. Some characteristics of *Trichodesmium* bloom in Laccadives. *Deep Sea Research*, 17: 655-660.
- Subba Rao, D.V., 1969. *Asterionella japonica* bloom and discolouration off Waltair, Bay of Bengal. *Limnology and Oceanography*, 14 : 632-634.