OBSERVATIONS ON THE BLOOM OF A DIATOM *FRAGILARIA OCEANICA* CLEVE

ABSTRACT

Fragilaria oceanica Cleve the dominant component in a mixed bloom of diatoms and a blue green alga which occurred near Mangalore in August 1972 showed a density of 36.8×10^6 cells/l and constituted 92% of the total number of cells in the bloom. The components of the bloom were *Rhizosolenia* sp. *Pleurosigma* sp. *Coscinodiscus* sp. and the alga *Richelia intracellularis*. The bloom occurred at a salinity of $32.36^0/_{00}$. The values of chlorophyll *c* and carotenoids were lower than that of chlorophyll *a*. Species diversity index (0.48) indicated that the bloom was at its peak. During the bloom values of nutrients especially those of inorganic phosphate were fairly high.

Algal blooms are known to occur along the west coast during the monsoon and postmonsoon months. These blooms are generally caused by factors associated with the rainfall (Bhimachar and George, 1950; Subrahmanyan, 1954 and 1959; Prakash and Sarma, 1964 and Qasim *et al.* 1972). The red water phenomenon mainly caused by the blooms of *Trichodesmium erythraeum* has been studied by Qasim (1970) and Ramamurthy *et al.* (1972). Although diatoms play an important role as primary producers in the sea, little is known on the exact conditions prevailing during their blooms. Earlier, Nair and Subrahmanyan (1955) reported that *Fragilaria oceanica* acts as an indicator species for the abundance of oil sardine. Subba Rao (1969) investigated the *Asterionella japonica* bloom and the discoloration of waters off Waltair. Ramamurthy *et al* (1972) reported a mixed bloom of centric and pennate diatoms. A bloom of *Asterionella japonica* has been observed at Cannanore (west coast of India) by Ramamurthy (Personal communication). Blooms of *Nitzschia sigma* and *Skeletonema costatum* have been observed in the Cochin Backwater in May and November 1970, respectively (Devassy and Bhattathiri, 1974).

This communication gives some information on the occurrence of a mixed bloom of diatoms and blue green alga near Mangalore. The diatoms were *Fragilaria oceanica*, *Rhizosolenia* sp., *Pleurosigma* sp. and *Coscinodiscus*, and the blue green alga was *Richelia intracellularis*. The latter is known to be a symbiotic species inhabiting the diatom cells of *Rhizosolenia* sp.

The bloom was brown in colour during the daylight and extended to about 300 m^2 at Kaikani (Lat' $14^02'N$ and Long. $74^02'E$) near Mangalore on 9 August 1972. Due to surf action, the bloom was mixed with the foam and appeared as cotton wool

Fig. 1 Accumulation of the blooming organism along with surf foam (indicated by arrow, on Kaikani beach near Mangalore)

accumulated on the beach (Fig. 1). The bloom patches gave a brownish green colour to the intertidal sands.

Table I gives the cell numbers and some environmental conditions during the bloom. Data on some of the environmental factors collected by other authors during blooms have also been included in the table.

Cell counts showed a population of 36.8 x 10^6 cells/l of *Fragilaria oeeanica*, 2 x 10^6 cells/l of *Rhizosolenia* sp., 1 x 10^6 cells/l of *Pleurosigma* sp.

Thus *Fragilaria oceanica* alone constituted 92% of the total number of cells in the bloom.

As noted by an earlier worker, the bloom of *Asterionella japonica* at Cannanore had a cell concentration of 90x10^6 cells/l (Table 1). Subba Rao (1969) recorded the range in the density of *Asterionella* bloom as 6 70 - 93.2x10^6 cells/l. The concentration of diatoms, *Nitzschia* and *Skeletonema*, from the Cochin Backwater never attained such high cell concentrations during the blooms (Devassy and Bhattathiri, 1974). But the blooms of *Nitzschia* and *Skeletonema* were observed when the sal nity was 20.3‰ and 19.1‰, respectively. However, *Fragilaria* bloom occurred at a salinity of 32.36‰. Subba Rao observed the *Asterionella japonica* bloom in

TABLE - I

Comparison of the concentration of phytoplankton during blooms along with different environmental factors

Organism	10^6 cells/l	Salinity ‰	NO_3-N (µgat/l)	PO_4-P (µgat/l)	Chlorophyll *a* µg/l	Chlorophyll *c*	Carotenoids (µg SPU/l)	Location	Authors
Fragilaria oceanica	36.8	32.36	1.78	2.40	123.47	70.31	43 40	Off Kaikani (near Mangalore), west coast 9–8–'72	Present work
Nitzschia sigma	1.4	20.30	–	–	–	–	–	Cochin Backwater 12–5–'70	Devassy & Bhattathiri 1974
Skeletonema costatum	0.9024	19.1	–	–	–	–	–	Cochin Backwater 26–11 '70	Devassy & Bhattathiri 1974
Asterionella japonica	90.0	–	–	–	–	–	–	Off Cannanore, west coast. 18–6– '72	Ramamurthy-Personal communication)
Asterionella japonica	6.70 93.20	34.68 33.83	– –	0.78 2.20	0.78 2.20	10.95 35.99	–	Off Waltair, Bay of Bengal.	Subba Rao 1969.

the Bay of Bengal when salinity varied from 34.68°/₀₀ to 34.83°/₀₀ (Table 1).

The relative composition of chlorophyll *a* and *c* and carotenoid (Table 1) in the samples indicates that the bloom was at its peak. The *c*/*a* ratio during the bloom was 0.57. Qasim and Reddy (1967) during their investigations on the pigment characteristics of the Cochin Backwater suggested that high values of chlorophyll *c* and carotenoids are probably due to the presence of a substantial quantity of dead chlorophyll and its derivatives. In the present study the values of chlorophyll *c* and carotenoids were lower than that of chlorophyll *a*.

During the bloom fairly high values of nutrients especially those of inorganic phosphate were recorded (Table 1). Subba Rao (1969) also observed high values of PO_4-P ranging from 0.78 to 2.20 µg-at/l during the *Asterionella* bloom.

Species diversity index of the bloom calculated according to Shannon and Weaver (1963) was 0.48. Platt and Subba Rao (1970) showed that the diversity index of a mixed bloom varied from 0.57 to 3.30. On an earlier occasion, during the blooms of *Nitzschia* and *Skeletonema* in the Cochin Backwater (Devassy and Bhattathiri, 1974), the diversity indices were found to be 0.64 and 1.37 respectively. The low values of diversity index recorded during the present study may be because the observations were made when the bloom was at its peak.

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