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Short Communication

Bloom of *Noctiluca scintillans* MaCartney in the Arabian Sea Off Mangalore Southwest India

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Abstract

A unique account on a bloom, exclusively of *Noctiluca scintillans* in the Arabian Sea off Mangalore is discussed here. The bloom with an intense red discoloration was observed in the first week of November 1998 with a displacement volume of 210·ml l⁻¹ and a cell density of 1.63 x 10⁸ nos. l⁻¹. A comparison of the hydrographical parameters revealed a marginally higher water temperature (29.6°C) and salinity (32.1 x 10⁻³) and with reduced pH (7.87) during the bloom.

Introduction

Incidence of algal blooms and discolorations of water in the Indian seas (Aiyar 1935, Bhimachar and George 1950, Subrahmanyam 1954, Prakash and Sharma 1964, Prabhu et al.1965, Sakthivel and Haridas 1974, Devassy et al. 1987, Devassy and Nair 1987) and in waters elsewhere (Adnan 1989, Bologna et al. 1995, Han et al. 1995, Kang et al. 1996, Nwankwo 1997, Scheffel and Weisse 1997, Gomez 1998, Hori et al. 1998, Figueroa 1999) have been reported by several workers. Most of these blooms have been attributed to the

blue green algae *Trichodesmium erythraeum* or to the raphidophyte *Chattonella marina*.

A few works point out the occurrence of the dinoflagellate *Noctiluca scintillans* in bloom proportions (Prasad 1953, Subrahmanyam 1953, Prasad and Jayaraman 1954, Katti et al. 1988, Shetty et al. 1988, Zaitsev et al. 1988, Sargunam et al. 1989, Cortes et al. 1995). Blooms of *Noctiluca scintillans* have been regularly observed in the Arabian Sea off Mangalore (Katti et al. 1988, Shetty et al. 1988), in association with other green flagellates. For the first time a bloom exclusively of *N. scintillans* is being reported.

In the present study intense red discoloration with a thick soup-like consistency was observed in the first week of November 1998. In its full-est intensity, this phenomenon was recorded as a patch about 4000 m long and about 500 m wide located between the 20 to 30 m deep contours off Thaneerbavi (Fig. 1).

Discussion

Surface water samples were collected from the 20 and 30 m depth contours off Panambur (P_{20} and P_{30}) in the north, Thaneerbavi (T_{20} and T_{30}) in the middle and Ullal (U_{20} and U_{30}) in the south. In Panambur and Ullal which were chosen as reference stations, no indication of the bloom was observed. Dense bloom of the dinoflagellate *N. scintillans* (Fig. 2) was recorded with a displacement volume of $210 \text{ ml}\cdot\text{l}^{-1}$ and a cell density of 1.63×10^8 nos. l^{-1} . Highest density was observed in the surface waters at 25 m deep off Thaneerbavi.

Earlier reports on the bloom of *N. scintillans* off Mangalore were also recorded off Thaneerbavi between 18 and 20 m depth contours (Katti et al.

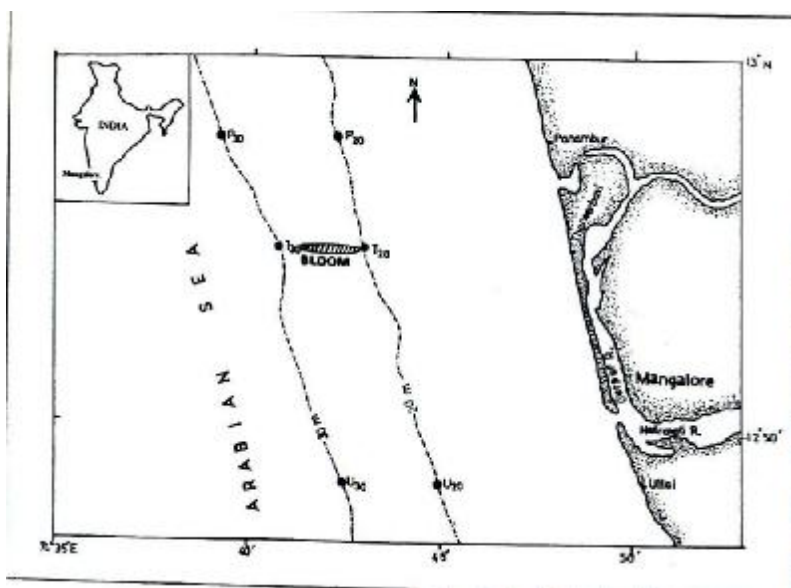


Fig. 1. Location of the bloom and sampling stations.

1988, Shetty et al. 1988). The density of the bloom was so great that hauling of the plankton net was impossible. The sample therefore had to be collected using a bucket.

Surface water samples were analyzed for eight hydrographical parameters to find out the impact of the bloom. Two stations (T_{20} and T_{30}), located near the bloom patch recorded very high concentrations of $\text{NH}_3\text{-N}$ and $\text{PO}_4\text{-P}$ (Table 1). Shigeru et al. (1998) observed similar trends in the coastal waters off Japan, reporting up to 16 to 25 times higher concentrations of $\text{NH}_3\text{-N}$ and $\text{PO}_4\text{-P}$ in the uppermost strata (0 to 10 cm depth) of the water column. It is believed that the cell fluid of *N. scintillans* has very high concentrations of these two nutrients, which leach out when the cells lyse.

In the German Bight in the North Sea, Schaumann et al. (1988) reported higher concentrations of NH_4^+ and PO_4^{3-} in the patch area and attributed it to secretion, exudation and enhanced lysis of *Noctiluca* cells. Though Schoemann et al. (1998) reported a decline in pH and dissolved oxygen concentrations in areas with blooms of *Noctiluca* sp. in the shallow coastal waters of the North Sea, we did not record any significant variation in pH and DO in our study.

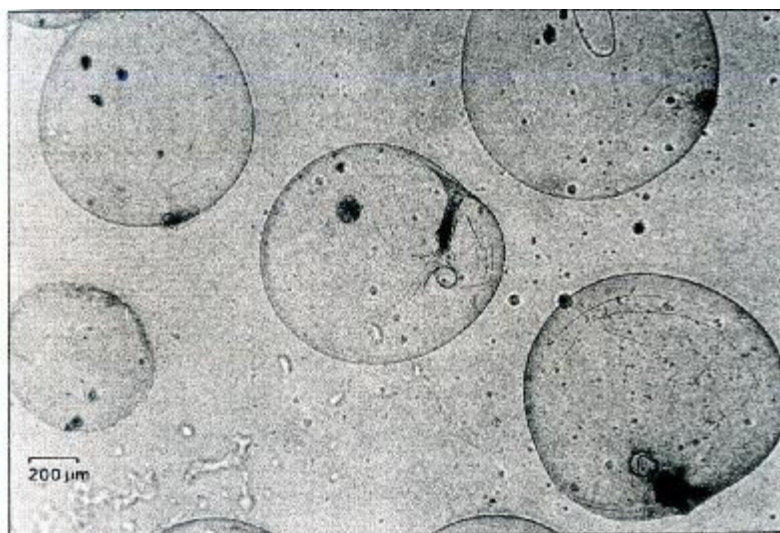


Fig. 2. Photomicrograph of *Noctiluca scintillans* Ma Cartney.

Table 1 : Hydrographical parameters in the Arabian sea off Mangalore.

Parameters	Stations					
	U_{20}	U_{30}	T_{20}	T_{30}	P_{20}	P_{30}
Water						
Temperature ($^{\circ}\text{C}$)	28.8	28.1	29.6	29.5	28.8	28.6
pH	7.98	7.98	7.87	7.90	7.97	7.94
Salinity ($\times 10^{-3}$)	30.3	30.9	31.5	32.1	30.3	31.1
DO ($\text{ml}\cdot\text{l}^{-1}$)	4.19	3.93	3.40	3.93	4.19	3.95
$\text{NH}_3\text{-N}$ ($\mu\text{g}\cdot\text{at}\cdot\text{l}^{-1}$)	30.16	29.40	32.1	32.16	25.42	22.39
$\text{NO}_2\text{-N}$ ($\mu\text{g}\cdot\text{at}\cdot\text{l}^{-1}$)	1.26	1.39	1.93	2.08	1.39	1.79
$\text{NO}_3\text{-N}$ ($\mu\text{g}\cdot\text{at}\cdot\text{l}^{-1}$)	28.76	20.45	22.16	27.35	28.78	25.74
$\text{PO}_4\text{-P}$ ($\mu\text{g}\cdot\text{at}\cdot\text{l}^{-1}$)	8.85	7.17	8.08	15.96	9.41	7.58

High concentrations of $\text{NO}_3\text{-N}$ and other nutrients recorded during the postmonsoon season (October to January) in this study are comparable to the findings of other researchers in the coastal waters off Mangalore (Reddy and Hariharan 1985, Reddy et al. 1991; Nagarajaiah and Gupta 1983, Nayar et al. 2000). This is attributed to the increased run off from the Nethravathi-Gurupur Rivers into the Arabian Sea.

Surface water temperatures were marginally higher in the bloom area, when compared to that of the moderately clearer areas. In an earlier study in the same region, Katti et al. (1988) reported surface water temperatures 2.4°C higher in the area of bloom. In a study in a frontal zone in the sea of Japan, Chul and Choi (1997) reported the preference of this species for warmer waters, thus offering a possible explanation for our findings. Salinity was also high, while pH was low in the area. Release of metabolites could be attributed to the lowering of pH.

Heavy rainfall, besides wind, are believed to be meteorological parameters of paramount importance in governing the mechanism of increasing incidences of red tide occurrence (Tamiji et al. 1997). Rainfall through river discharge brings in nutrients and other chemical substances, a factor responsible for the bloom. This coincides with the generally productive fishing season.

While it is known that *N. scintillans* do not release any toxins, their blooms are of interest to fishermen because fishes are known to avoid the areas where the bloom occurs (Shetty et al. 1988, Devassy 1989, Lam and Ho 1989). This may be due to the low dissolved oxygen (DO) level resulting from the death and decay of the bloom (Prasad 1953) or the metabolites released by the lysing cells. Fishermen avoid these waters for fishing.

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