

STUDIES ON THE BLOOMS OF *TRICHODESMIUM ERYTHRAEUM* (EHR.) IN THE WATERS OF THE CENTRAL WEST COAST OF INDIA

V. D. RAMAMURTHY,* R. ALFRED SELVAKUMAR AND R. M. S. BHARGAVA
National Institute of Oceanography, Panjim, Goa

THE marine blue-green alga *Trichodesmium* sp. is well known by various common names such as "whale sperm", "whale food", "coral spawn" and "sea scum". A three-member team was set up at the National Institute of Oceanography to study the phenomenon of *Trichodesmium erythraeum* blooms in all its aspects.

The bloom of *Trichodesmium erythraeum* made its appearance on March 28th of 1972 in the Arabian Sea off the central part of the West Coast of India. The bloom lasted for 9 days in the first instance and again it appeared on 14th April and lasted for 4 days. The blooms were very striking. They stretched for about 5 to 7 metres in width and extended to several miles (40 to 50 approx.) in the form of streaks. In some places they also occurred as 'patches'. The bloom on close inspection was about 0.5 to 1.0 metre in thickness with maximum concentration of filaments at the surface. The colour of the bloom in daylight was mostly grey with some dark brown patches. The odour of the bloom was not particularly noticeable except during post-bloom period. No mortality of fish or other organisms was associated with this bloom. It has also been observed that the people swimming in the areas of red tide patches of Calangute and Colva beaches did not feel any irritation or ill-effects when they were interviewed by the first author and also there were no reports on fishery food poisoning due to *Trichodesmium erythraeum* blooms in and around Goa.

Samples taken during the bloom were found to contain exclusively filamentous blue-green alga *Trichodesmium erythraeum* with filaments clustered together and forming characteristic rafts. In Coondapore (near Mangalore) another species *Trichodesmium thiebautii* (Gomont) also occurred as small patches along with *Trichodesmium erythraeum* streaks. Differential concentration of filaments during the peak and non-peak periods of the blooms was also observed. In peak periods about 15 to 25 filaments and during non-peak periods 6 to 12 filaments were seen clustered together. In

rough weather these bundles were dispersed and appeared as grey, sawdust-like flocks. Under very calm weather they float to the surface and were concentrated by the wind into great surface streaks. The other phytoplanktonic and zooplanktonic organisms were very poor during bloom period. Some marine flagellates and ciliates also occurred during post-bloom period. It was also observed that the bloom of *Trichodesmium erythraeum* succeeded the mixed bloom of centric and pennate diatoms. The diatom bloom consisted of *Asterionella* sp., *Thalassiothrix* sp., *Coscinodiscus* sp., *Melosira* sp. and *Stephanopyxis* sp. which occurred from March 22 to 28, 1972.

As may be seen from Table I, the salinity remained almost constant and there was no evidence of the dilution of sea-water due to fresh water drainage or rainfall from land sources. Though there was a decrease in N:P ratios, total depletion was not observed. Chlorophyll *a* and *c* did not seem to show any relationship with *Trichodesmium erythraeum* in the present study. Turbulence factor had not been taken into consideration. The cell counts of alga were denser in Calangute and Colva than in other stations (Table I). The possible explanation for this may be that *Trichodesmium erythraeum* is a stenohaline form and it is not capable of surviving in low salinities especially in bays and estuaries.

Some believe that during the bloom season only dead cells of *Trichodesmium* accumulate in the surface layers. We doubt whether this is the correct position. Though the surface isolates (cells) do lose their viability to some extent, they cannot be considered as dead cells. The main difference between the surface isolates and bottom isolates is as follows. Structurally the bottom isolates contain more number of 'vacuole'-like structures (commonly known as gas vacuoles) than the surface ones. Although the surface isolates were not suitable for cultivation as pointed out by Ramamurthy¹, they can be kept alive for about 4 to 5 days in culture media.

* Present address: Deep Sea Fishing Organisation, Saseon Docks, Colaba, Bombay-5.

It could also be observed that the bloom of *Trichodesmium erythraeum* occurred only during hot

TABLE I

Various parameters during bloom period of *Trichodesmium* at four selected stations off Goa region

Particulars	Calangute	Colva	Dona Paula	Siridao
<i>Trichodesmium</i>				
Cell counts (000 cells/0.1 ml)	66-220	60-338	44-98	36-80
N : P ratio ..	6 : 1 8 : 1	5 : 1 8 : 1	7 : 1 9 : 1	7 : 1 8 : 1
Chlorophyll <i>a</i> ..	2.118	1.711	1.106	1.897
(mg/m ³) Chlorophyll <i>c</i> ..	0.572	2.769	0.544	..
Salinity ‰ ..	34.26	34.32	32.64	32.41

TABLE II

The range of variation of *Trichodesmium* cell counts in the Central West Coast of India collected during the bloom period of *Trichodesmium*

Particulars	Vengurla	Srivardhan	Karwar	Malpe
<i>Trichodesmium</i>				
Cell counts (000 cells/0.1 ml)	72-310	68-300	68-250	74-316
Salinity ‰ ..	34.71	34.76	34.73	34.63

weather seasons where the atmospheric temperature ranged round about 33° to 34° C. These observations concerning hot weather may be reflections of other conditions such as lack of strong wind (less than 4 to 5 knots, data provided by Goa Observatory) and the prevailing calmness of the sea when compared to other seasons.

ACKNOWLEDGEMENTS

The authors are grateful to Dr. N. K. Panikkar, Director, National Institute of Oceanography (CSIR),

Panaji, for facilities, advice and guidance. Thanks are also due to Dr. S. N. Dwivedi and Shri R. Jayaraman for suggesting improvements in the manuscript. The authors also wish to thank Shri A. L. Mirajkar, Officer-in-charge, Goa Observatory, for providing useful information of climatological data. One of the authors is grateful to CSIR for the award of a Research Fellowship.

1. Ramamurthy, V. D., *Mar. Biol.*, Springer Verlag, Berlin, 1972, 14, 232.

THE INDIAN ACADEMY OF SCIENCES

THE 38th Annual Meeting of the Indian Academy of Sciences will be held from the 18th to the 20th December 1972 at the Bhabha Atomic Research Centre, Trombay, Bombay-85.

The Programme will be as follows:

Monday, the 18th, Inaugural Function and Address by the President Prof. T. S. Sadasivan on

"Water Permeability and Ionic Imbalance Under Pathogenesis". Tuesday, the 19th: Forenoon, Symposium in "Nuclear Physics"; Afternoon, Symposium on "Perspectives in Modern Genetics". Wednesday, the 20th, Forenoon, Symposium on "Mechanisms of Biological Transport"; Afternoon, Symposium on "Corrosion".