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ON A *GONYAULAX* BLOOM OFF MT DALLEY, IN THE ARABIAN SEA

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Introduction

SEVERAL reports were published on the ' red tide ' or ' discoloration of water ' of the sea by Torrey (1902), Sommer *et al.* (1937), Allen (1946), Hayes and Austin (1951) and Brongersma-Sanders (1957). Various organisms were found to be responsible for such phenomenon in the west coast of India; an unidentified *Peridinium* was reported by Hornel (1917), two species of *Coclodinium* by Hornel and Nayudu (1923), *Noctiluca miliaris* by Bhimachar and George (1950), *Gymnodinium* sp. by Subrahmanyan (1959) and *Gonyaulax polygramma* by Prakash and Sarma (1964).

During regular research cruise of R/V *Varuna*, on November 13, 1963, at 12.20 hrs a thick tomato-soup like phenomenon of discoloured water was observed off Mt Dalley (position: N 12°53', E 75°15'; depth of station: 18 m) in the Arabian Sea. This occurred over an area of nearly 4 sq miles, and was moving eastwards. In the same locality, ' dirty water ' was noticed during the following cruise on December 5, 1963, while during the return on the 13th of the same month, water was quite clear. Since there was no report on the stratification of the bloom organism, attempts were made to study this during the different phases of the bloom.

On all the three occasions water samples were drawn from three to four different spots in the bloom from the following depths: surface, 3, 5, 10 and 15 m. Surface water was collected in a bucket, while others, with reversing Nansen water bottles. All the samples were individually preserved in formalin and enumerated for the phytoplankton organism in them.

The distribution of the major organisms in the bloom is given in tabular form. The number indicates the number of specimens per litre of water sample. Besides these three major organisms given in Table 1, 78 other species of Dinoflagellates and 72 species of diatoms were recorded in the bloom. Since these

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Table 1 — Vertical Distribution of Major Phytoplankton Organisms in the Red Water

(Calculated as number of organisms per litre of sea water)

	November 13				
	Surface	3 m	5 m	10 m	15 m
Gonyaulax polygramma Stein.	558,000	3,760,000	304,500	5,000	—
Ornithocercus magnificus Stein.	10,000	4,000	12,000	117,500	500
Prorocentrum micans Ehrenb.	—	—	500	500	—
Other Dinophyceae	2,000	—	500	3,500	2,500
Diatoms	3	—	—	—	3,500

	December 5			
	Surface	3 m	5 m	10 m
Gonyaulax polygramma Stein.	16,500	151,240	57,810	4,700
Ornithocercus magnificus Stein.	5,000	14,375	17,500	625
Prorocentrum micans Ehrenb.	20,000	20,625	19,375	12
Other Dinophyceae	2,830	1,384	2,300	1,310
Diatoms	136	425	312	285

	December 13			
	Surface	3 m	5 m	10 m
Gonyaulax polygramma Stein.	—	1	—	2
Ornithocercus magnificus Stein.	20	22	1,120	20,600
Prorocentrum micans Ehrenb.	—	33	—	18
Other Dinophyceae	10	67	48	6
Diatoms	15,145	12,400	15,400	1,300

species were unevenly distributed and fewer in numbers, only their total number is mentioned.

It is clear from the data given above that *Gonyaulax polygramma* is the most abundant single species in the bloom. It was invariably most concentrated at a depth of 3 m. Moreover, the results of different samplings in the bloom revealed that, though the pattern of vertical distribution of the major organism remained

the same, the density of the organism varied considerably in the different patches showing thereby non-uniformity of the bloom. *Ornithocercus magnificus*, though found conspicuously in the bloom, differed from the former in its vertical distribution. Moreover, its occurrence in similarly large numbers throughout the west coast during the period (unpublished data) is an indication that this is not directly responsible for the red tide. The occurrence of *Prorocentrum micans* in fairly large numbers during the waning period of *Gonyaulax polygramma* might have been due to its regressive effect on the main bloom organism.

Moreover, when the counts of different organisms in different stages of the bloom, i.e. when water was ' red ', ' dirty ' and ' clear ', were compared, *Gonyaulax polygramma* counted extremely high in the first instance, declined in the second, and was almost absent in the last; *Ornithocercus magnificus* counted fairly high throughout, while *Prorocentrum micans* counted fairly high only in the second stage. Moreover, other Dinoflagellates were counted high only when *Gonyaulax polygramma* was less concentrated; similarly diatoms were most when water was clear, indicating that ''tomato-soup ' like coloration of the water during the bloom was only due to *Gonyaulax polygramma* and may not be due to other associated phytoplanktons.

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