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SOME THECATE DINOPHYCEAE FROM INSHORE WATERS OF KARACHI.

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Abstract

The present paper describes the taxonomy and ecology of the following thecate *Dinophyceae*:

Prorocentrum micans, Phalachroma rotundatum, Dinophysis ovum, D. caudata, D. miles and *Ornithocercus steinii*. These were studied from Manora Channel and Korangi Creek near Karachi, Pakistan for a period of one year from April, 1970 to March 1971. Most species were neritic.

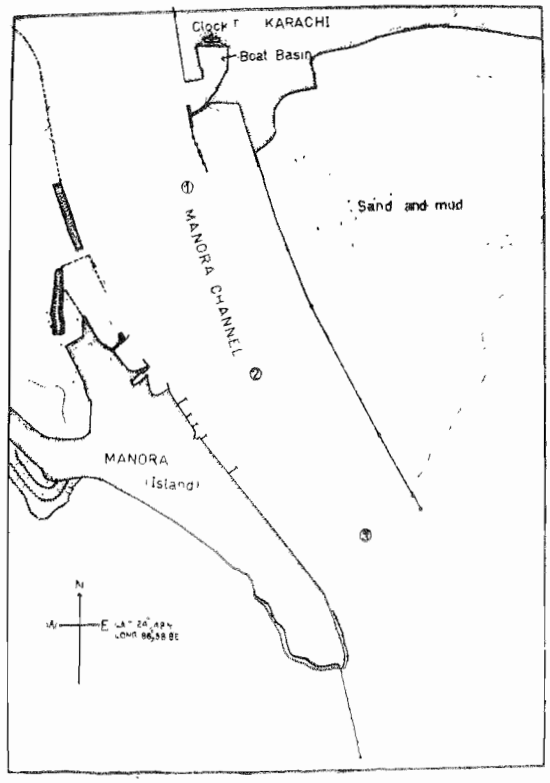
Introduction:

Dinophyceae commonly called as Dinoflagellates constitute a very important group of marine phytoplankton. They are next to Bacillariophyceae (diatoms) in number of species and abundance (Gran, 1915). They are of great economic importance as they are the primary producers and used as food by Zooplankton in sea (Wood, 1954). They also cause fish mortality on a large scale and in such instances they occur in such a large number that the colour of the water changes to that of the pigment contained in them (Wood, 1954). Such a discolouration of water is often termed as "red tides".

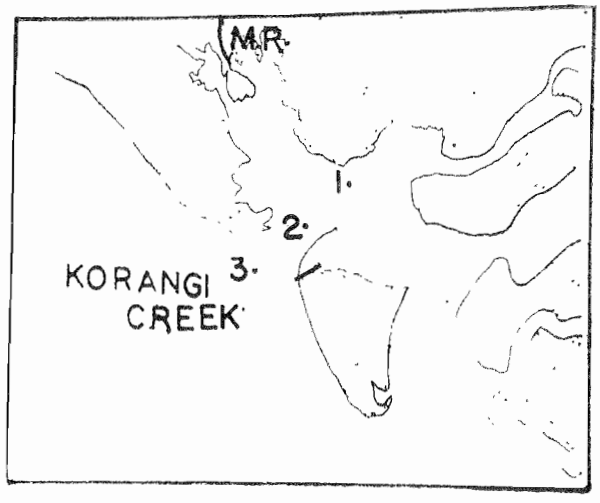
A lot of work on the taxonomy and ecology of marine Dinophyceae have been carried out in many countries like, U.K., Japan, Germany, U.S.A., Eastern Africa etc. (Lebour, 1925; Abe, 1936; Lindemann, 1928; Graham & Bronikovsky, 1944; Paulsen, 1908; Graham, 1942; Sournia, 1967). The North Arabian Sea has been neglected, so far, in this context. The only studies on dinoflagellates carried out in this region was along the West and South West Coast of India (Subrahmanyan & Sarma, 1960; Prakash & Sarma, 1964). Unfortunately no thorough systematic studies have been carried out along the West Pakistan seaboard. Taking into account the above lack of information, the following work was carried out from the inshore waters of Karachi, viz. Manora Channel and Korangi Creek. This paper forms the first part of a series of study on thecate *Dinophyceae* and it includes their taxonomy and ecology.

Materials and Methods

Phytoplankton samples were collected from Manora Channel (lower Harbour) and Korangi Creek at Karachi (Lat. 24^0, 48'N; Long. 66^0, 58. 8'E). The sampling was done fortnightly from April, 1970 to March 1971 with the exception of June and July when the sea was too rough to allow any sampling from it. At Manora Channel sampling was done regularly but in Korangi Creek it was done occasionally.



Map 1. Manora Channel



Map 2. Korangi Creek.

Manora Channel, is approximately 2 kilometers long (from the clock tower) and 914 meters wide (Map 1). Sampling was carried out at 3 stations equidistant from each other (Map 1) with a difference of 960 meters. All stations were about 8.2 meters deep. Korangi Creek (Map 2) was 9 mile away from Manora Channel and is surrouded by mangroove swamps. It was from 5.5 to 9.1 meters deep in the area of sampling.

Sampling was carried out by phytoplankton net of mesh size 76 ± 8u from sailing boats. The net hauls were horizantal and were of 15 to 10 minutes duration. The time of sampling coincided with the time of high tide. Numerical estimates of phytoplankton could not be made because of the use of net and variable speed of the sailing boat.

The samples were preserved in 5% formalin on the spot and were later studied on a conpound Zeiss Microscope in the laboratory. As the taxonomy of thecate Dinophyceae is based on the structure and shape of the theca, so great care was taken in treating them. They were first washed in distilled water, treated with dilute HCl to remove calcium carbonate and were then stained with Trypan blue. All the diagrams were made from Camera lucida. The following abbreviations have been used in the text.

d = transdiameter of girdle region.
l = total length of organisms.
w = width.

ORDER ADINIFERIDEA
Family PROROCENTRIIDAE Kofoid
Genus PROROCENTRUM Ehrenberg
Prorocentrum micans Ehrenberg

(Fig. 1)

Paulsen, 1908, p.8. Fig. 4.
Lebour, 1925, p.16, Fig. Sac.
Lindemann, 1928, p. 38, Fig. 17 A, B.
Silva, 1952, p. 28, Est. 11, Fig. 3a.
Wood, 1954, p. 179. Fig. 5.
Wood, 1968, p. 123, Fig. 380.

Cell heart shaped, compressed laterally, broadest at the mid body. Solid spine only at anterior of left valve. Theca porous.

Dimensions: l =57 micron
w =48 micron

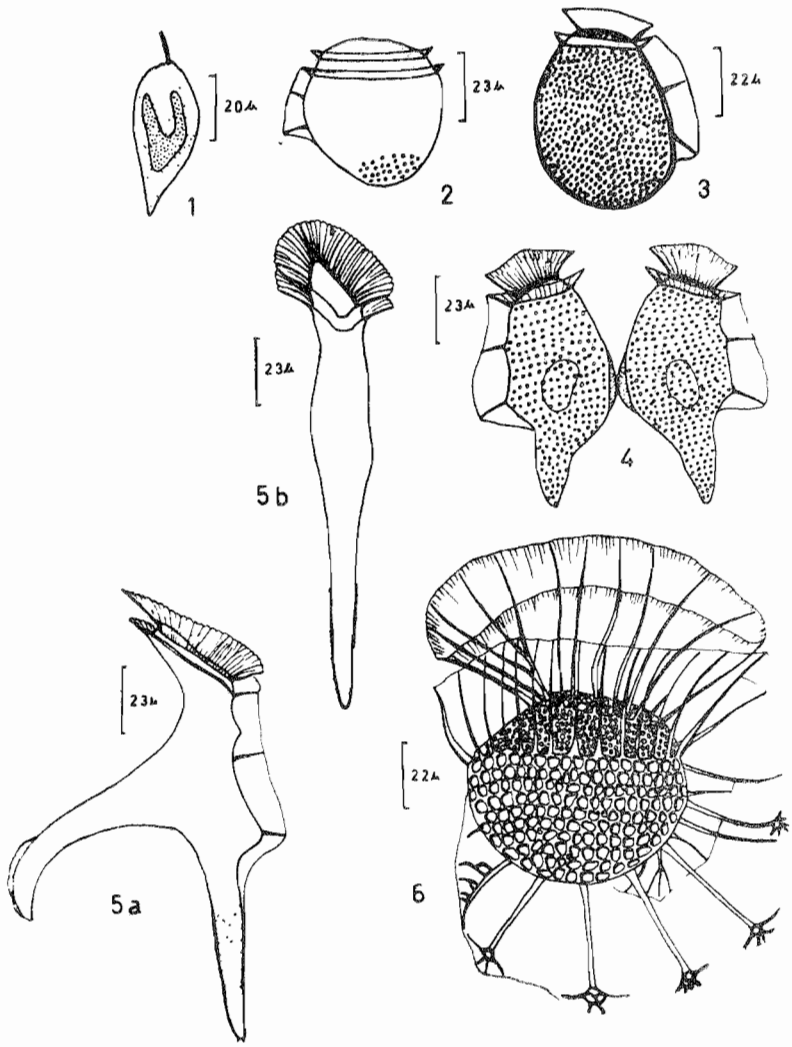


Fig 1. *Prorocentrum micans.*
Fig. 2. *Phalacroma rotundatum* (Lateral view)
Fig. 3. *Dinophysis ovum* (Lateral view).
Fig. 4. *Dinophysis caudata* (Lateral view).
Fig. 5a. *Dinophysis miles* (Lateral view).
Fig. 5b. *Dinophysis miles* (ventral view)
Fig. 6. *Ornithocercus steinii* (Lateral view).

Table I. Seasonal occurence of Dinophyceae at Manora Channel.

NAME OF SPECIES	April	May	Aug.	Sept.	Oct.	Nov.	Dec. 1970	Jan.	Feb.	Mar. 1971
Dinophysis caudata	–	–	–	+	+	+	+	+	+	+
D. miles	+	+	+	+	+	+	+	+	+	+
D. ovum	–	–	–	–	+	–	–	–	–	–
Ornithocercus steinii	–			–		–	+	–	–	
Phalachroma rotundatum	–	–	–	–	–	–	–	–	–	+
Prorocentrum micans	–	–	–	+	+	+	+	–	–	–

Local Distribution: Manora Channel St. I, II, III.
Korangi Creek St. I. II.

General Distribution: English Channel (Lebour, 1925): lagoa deObidos (Silva, 1952); Jervis Bay N.S.W. to New Guinea, Storm Bay (Wood, 1954); Santaran Channel, Straits of Florida, Benguela Current, Brazil (North Coast), Caribbean Sea (Wood, 1968).

Eological Remarks:

As *Prorocentrum micans* is ubiquitous in distribution it is both neritic and oceanic. It was found growing in a temperature range of 25– 30°C and salinity range of 26.3‰ 36.7‰. The seasonal occurrence of this species is shown in Table I.

ORDER DINIFERIDEA
Family DINOPHYSIDAE Kofoid and Michener
Genus PHALACROMA Stein

Phalacroma rotundatum (Claparede & Lachmann) Kofoid & Michener

(Fig. 2)

Lebour,	1925, p. 78, pl. II. 3a-3c.
Grontved & Seidenfaden,	1938, p. 204.
Brunel,	1962, p. 203, pl. 55.
Wood,	1968, p. 118, Fig. 359.

Body sub-circular. Epitheca low, rounded. Hypotheca rounded. Girdle anterior not depressed, with narrow lists, Sulcal lists reaching middle of the hypotheca, wider at R3 Theca poroid.

Dimensions: l = 50 Micron
d = 41 Micron
Local Distribution: Manora Channel Station III.
General Distribution: Plymouth (Lebour, 1925); West of Greenland Grontved & Seidenfaden, 1938); Bay of Chaleurs (Brunel, 1962); Straits of Florida, Benguela Current (Wood, 1968).

Ecological Remarks:

This species is neritic cosmopolitan and prefers cold water. It was found growing at temperature of 26°C. It was recorded only once (Table 1).

Genus *DINOPHYSIS* Ehrenberg

Key to species of the genus Dinophysis

1. – Body oval. *D. ovum*
– Body of variable shape. 2

2. (1)— Hypotheca long, widest at the middle, then gradually drawn out in to a tapering process of rounded end. *D. caudata*

— Hypotheca with a dorsal process on dorsal side, which is curved from base, straight and then obliquely running backward, and straight and possessing a wing. *D. miles*

Group *ACUTA*

Dinophysis ovum Schutt

(Fig. 3)

Paulsen, 1908, p. 7, Fig. 17.
Lebour, 1925, p. 81, pl. XII, Fig. 3.
Wood, 1954, p. 195, Fig. 37a, b.
Wood, 1968, p. 50, Fig. 120.

Body oval, Epitheca disc shaped. Hypotheca base broadly rounded, dorsal contour strongly convex then ventral. Girdle anterior, anterior girdle list wide. Left sulcal list bcoad, extend to half body length. Theca porulate.

Dimensions: l =60 micron
d =25 micron
w =45 micron

Local distribution:- Manora Channel Station II.
General distribution:- Plymouth (Lebour, 1925); Port Hacking, N.S.W. Storm Bay (Wood, 1954); Straits of Florida, Sargasso Sea, Brazil (North Coast), Benguela Current, Caribbean Sea Wood, 1968).

Ecological remarks: It is sub-tropical and temperate in distribution. It was recorded only once (Table 1) when the temperature was 28.5°C and salinity was 36.5‰.

Group **CAUDATA**

Dinophysis caudata Saville - Kent

(Fig. 4)

Lebour,	1925, p. 82, Fig. 21 C.
Wood,	1954, p. 201, Fig. 49 a-e.
Curl,	1959, p. 305, Fig. 110.
Klement,	1964, p. 358, pl.2, Fig. 5.
Wood,	1968, p. 47, Fig. 112.

Body elongate. Epitheca low. Hypotheca long, widest at the middle, then gradually drawn out into a tepering process with rounded end. Girdle anterior, anterior girdle list funnel shaped, larger than posterior girdle list, ribbed. Left sulcal list extends to the base of peduncle. Two daughter cells jointed together at the dorsal point by wings. Theca areolate.

Dimensions: l = 75 - 100 micron
d = 18 - 26 micron
w = 30 -45 micron

Local distribution: Manora Channel Stations I, II, III.
Korangi Creek Stations I, II.

General distribution: Plymouth (Lebour, 1925); Port Hacking N.S.W. to Moreton Bay, Queensland, New Guinea, Solomon Is. (Wood, 1954); Apalachee Bay (Curl, 1959); Gulf of California (Klement, 1964); Gulf of Mexico (Balech, 1967); Caribbean Sea (Wood, 1968).

Ecological Remarks: It is neritic, tropical and sub-tropical in distribution. It was found growing in a temperature range of 20.5-32°C and a salinity range of 26.3‰ -36.7‰. Its seasonal distribution is shown in Table 1.

Dinophysis miles Cleve
(Fig. 5a, 5b).

Wood, 1954, p. 208, Fig. 52.

Body variable in shape. Epitheca low, flat. Ventral margin of hypotheca straight with two bulges; one between R1 and R2, and at R3. Dorsal process on the dorsal side of hypotheca, curved from base, straight and then obliquely running backward. End straight and possessing a wing, daughter cells joined by this wing to each other. Posterior process long, straight, tapering, ending in blunt point. Anterior and posterior girdle lists similar, broad, ribbed, toothed edges. Left sulcal list reaching to mid of posterior process. daughter cells 2-8 remaining attached together looking like a flower. Theca porolate.

Dimensions: l =160 micron
d =25-35 mixron
doesal process =95—132 micron
Local distribution: Manora Channel Stations I, II, III.
Korangi Creek Stations I, II, III.

General distribution: Thursday I., Northern New Guinea (Wood, 1954).
Ecological Remarks: It is neritic and tropical in distiibution. It was recorded through out the period of study (Table 1) but abundantly only in September when highest temperatures were recorded. It was found growing in a temperature range of 20.5-32°C and a salinity range of 26.3‰—36.7‰.

Genus **ORNITHOCERCUS** Stein
Ornithocercus steinii Schutt
(Fig. 6)

Wood, 1954, p. 209, Fig. 62.
Sournia, 1967, p. 426, pl. 1. Fig. 3-4.
Wood, 1968, p. 86. Fig. 244.

Body sub-rotund, compressed laterally. Epitheca low, disclike. Hypotheca subcircular. Girdle oblique, wide, lists large. Anterior girdle list funnel shapped, supported by strong simple ribs. Posterior girdle list smaller than anterior, supported by strong simple ribs. Left sulcal list large, ending dorsally near posterior girdle list, margin rotunded, 4 posterior lobes. Supported by 9-10 strong, and near posterior contour of body. Theca reticulate.

Dimensions: l =68 micron
d =75 micron

Local distribution: Manora Channel Station II.
General distribution: Trial Bay, N.S.W. to Moreton Bay, Queensland port Hacking (Wood 1954); Coral Sea, Timor Sea, Anafura Sea (Wood, 1964); North eastern Gulf of Mexico (Balech, 1967); Mozambique Canal (Sournia, 1967); Straits of Florida, Benguela Current, Caribbean Sea (Wood, 1968).

Ecological Remarks: It is truly oceanic (Wood, 1964) and tropical in nature. Its occurrence in Manora Channel shows influx of oceanic water in it. It was recorded only once (Table 1) at a temperature of 23°C and salinity of 36.5‰.

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