

## Occurrence of *Hydroclathrus tenuis* Tseng & Baoren, (Phaeophyta) from Gulf of Kutch, northwest coast of India

T G Jagtap & A G Untawale

National Institute of Oceanography (CSIR), Dona Paula, Goa-403 004, India

Received 31 July 1995, revised 9 January 1996

*Hydroclathrus clathratus* (C. Agardh), a marine brown alga was considered to be a monotypic, till *H. tenuis* Tseng & Baoren was reported during 1983 from south China Sea. Recently the same alga was noticed to be abundant from Kalubhar Island in the Gulf of Kutch (India), during February-March 1994. A few ecological and relevant taxonomical observations made on the alga have been described here, which is incidentally the first record from the Indian Ocean.

The genus *Hydroclathrus* belonging to Phaeophyceae and represented by *H. clathratus* (C. Agardh) Howe, was described as monotypic till *H. tenuis* was reported<sup>2</sup> from the south China Sea. *H. clathratus*, was reported<sup>3-5</sup> to be very common in the tropics and from few regions in the subtropics. Earlier<sup>5</sup> it was also known as *Enocoelium clathratus* C. Agardh, *Ficus clathratus* Bory de Saint-Vincent MSCR, *H. clathratus* Bory de Saint-Vincent and *Ulva reticulata* Forsskal. Marine algal flora of India is represented<sup>6-8</sup> by over 630 species, which includes *H. clathratus* as a single species.

During one of the regular marine algal collections along the west coast of India, a species of *Hydroclathrus* collected was found to be totally different, which is not recorded from the Indian Ocean region. This species was identified as *H. tenuis* Tseng & Baoren. The paper presents some of the observations on distribution, seasonality and eco-biology of this brown alga. The alga was collected during February-March (premonsoon) 1994, on the dead coral reefs and from the leeward side of Kalubhar and adjacent islands, off Sikka (Jamnagar), Gulf of Kutch, Gujarat (Fig. 1a). The same locality was visited for evaluation and collection of the alga during monsoon (August) and postmonsoon (November-December 1994). Seaweed samples were collected and were mounted on herbarium sheets as well as preserved in 4% seawater-formalin solution, and deposited in the Marine Biology Museum and Taxonomy Reference Centre, of National Institute of Oceanography (CSIR), at Goa, India (NIO/DOD/DIO 682-Jagtap & Untawale).

Ecological data (substratum, major associated biota and hydrological parameters), were collected at

the sampling sites. Physico-chemical parameters during various seasons at the study site were compiled<sup>9</sup> and, are given in Table 1. Per cent frequency occurrence (%FO) of alga was studied by quadrant (0.25 cm<sup>2</sup>) method and expressed on per cent basis. A line transect was laid down from low

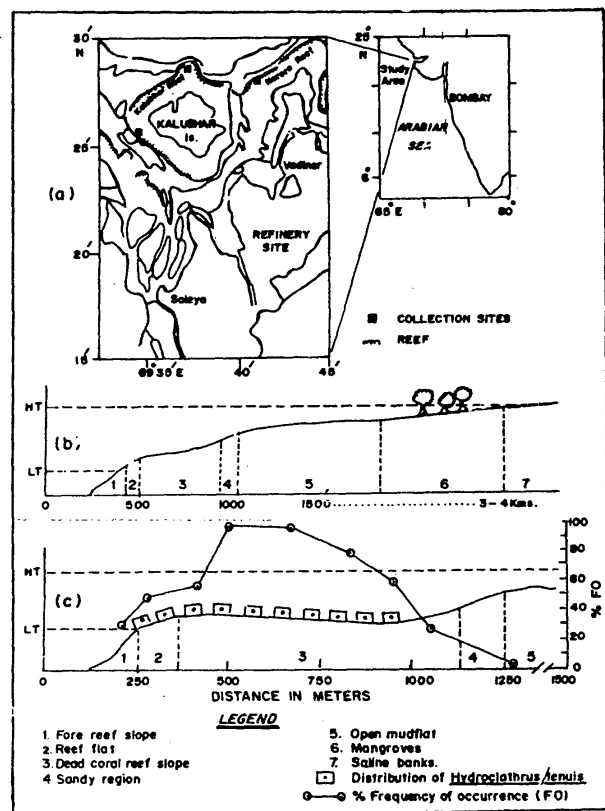


Fig. 1—a) Geographical map of sampling site, b) Schematic representation of profiles of Kalubhar Island showing general gradient, c) Distribution of *H. tenuis* on the reef

tide mark on the reef slope to the high tide mark landward at every 50 m sampling interval. Three quadrants were taken along the transect at each sampling interval and per cent FO was estimated as:

$$\% \text{ FO} = \frac{100 \times \text{Number of quadrants in which alga was observed}}{\text{Total number of quadrants observed}}$$

However, the graphical representation for FO was done by taking average data from adjacent sampling intervals. Associated algal flora as well as corals were identified using standard literature mentioned elsewhere<sup>10-12</sup>. *Hydroclathrus tenuis* was profusely growing only during February-March, in the lower intertidal as well as in the subtidal (0.2-1 m) regions. It was also found on the dead coral debris, coarse seaweeds present on the reef slope and on the reef flat (Fig. 1b, c). It was, however, more abundant (Fig. 1c), from the forereef slope to about 800 m landward side. The width of the reef flat and dead coral reef slope was approximately 50 m and 1500 m respectively. Beyond the low tide mark, the mudflats were covered with *Enteromorpha clathrata* (Roth) Greville, *E. flexuosa* (Wulfen) J. Agardh and *Cladophora patentiramea* Mont. Kutz. Landward mudflats were covered with dwarf (0.5-1.5 m) vegetation of *Avicennia marina* (Forsk.) Vierh (Fig. 1b). Other commonly associated algal flora was represented by *Ulva reticulata* Forssk. (green alga), *H. clathratus*, *Padina tetrastomatica* Hauck (brown algae), *Gracilaria* and *Hypnea* spp, and *Champia indica* Boergesen (red algae). *Hincksia mitcgelliae* (Harvey) P.C. Silva (brown alga), was found to be the most common epiphyte on all the Phaeophyceae members. The major associated living corals on the dead reef were represented by the scleractinians.

The tidal amplitude along the Gulf of Kutch ranges from +0.71 to 5.83 m. Salinity of the water varied from 38 to 39  $\times 10^{-3}$  and remained high round the year due to low precipitation (300 mm/y), excessive evaporation, and seepage of high saline water from the salt pans in the intertidal and supratidal regions. Water and air temperatures ranged between 21-28.2°C during different seasons, however, remained lowest during December-January. Nitrate (NO<sub>3</sub>-N) and phosphate (PO<sub>3</sub>-P) concentrations in the water were found to be in the range of 0-186 and 19-260  $\mu\text{g-at.l}^{-1}$ , respectively, while dissolved oxygen varied from 3.2-8.2 ml.l<sup>-1</sup>. The pH was recorded to be in the range from 7.8-8.3.

Thalli were soft textured, delicate, dark brown in colour, irregularly vesicular, sessile by broad

Table 1—Temporal variations in the physico-chemical characteristics of water at the study site

Physico-chemical parameters	Feb.-March (premonsoon)	August (monsoon)	Nov.-Dec. (postmonsoon)
Temperature (°C)	21-27	27.5-28.2	24.3-25.5
pH	7.9-8.3	—	8.1-8.15
DO <sub>2</sub> (mg.l <sup>-1</sup> )	3.2-8.1	5.6-6.9	6.3-6.6
Salinity ( $\times 10^{-3}$ )	38.1-39.5	39.1-40.6	39.5-40.8
NO <sub>3</sub> -N $\mu\text{g-at.l}^{-1}$	0-105	114-186	120-126
PO <sub>4</sub> -P $\mu\text{g-at.l}^{-1}$	19-260	68-111	45-56
NH <sub>4</sub> -N $\mu\text{g-at.l}^{-1}$	2-35	1-6	17-25

Table 2—Major distinguishing characters of *Hydroclathrus tenuis* and *H. clathratus*

Characters	<i>H. tenuis</i>	<i>H. clathratus</i>
Thallus	Texture soft, delicate, long	Crisp and fragile, massive, slightly mucilaginous
Perforations-aperture (dia)	0.3-2.5 cm	1-2cm
Membrane (diam)	Thinner 250-300 $\mu\text{m}$	Thicker 600-800 $\mu\text{m}$
Medullary cells (dia)	70-80 $\mu\text{m}$	100-130 $\mu\text{m}$
Plurangia length	20-25 $\mu\text{m}$	10-15 $\mu\text{m}$

attachment, 5-7.5 cm dia, 15-45 cm long, numerous irregular perforations of 0.3-2.5 cm dia, forming characteristically reticulate thalli (Fig. 2A) with involute margins, 10-15 mm across the nets. Thalli very thin, diameter of transverse section 200-300  $\mu\text{m}$ , consisting of outer cortex and inner medulla. Cortex consists of small quadrate pigmented cells, 7-10.5  $\mu\text{m}$  across and medulla of many colourless parenchymatous cells, 70-80  $\mu\text{m}$  dia. Septate colourless hair grouped in shallow depressions. Plurangia dense, scattered over the surface, loculi usually in two rows, 20-25  $\mu\text{m}$  long and 5-10  $\mu\text{m}$  dia (Table 2). Gujarat coast, particularly the Gulf of Kutch region, has been reported<sup>6-8,10</sup> to be the site for luxuriant seaweed growth and harbours 222 species of marine algae. The west coast of India exhibits maximum species as well as richness and abundance of marine algae during October to March. The Gulf of Kutch is known for its rich marine algal diversity which is dominated by Phaeophyceae members and particularly the species of *Sargassum* and *Cystoseira*. However, the alga described presently was not reported till recently from the study site, as well as from the Indian Ocean. *Sargassum* stock from the Gulf of Kutch is usually harvested during January to March, for alginic extraction. The algal biomass also gets detached and

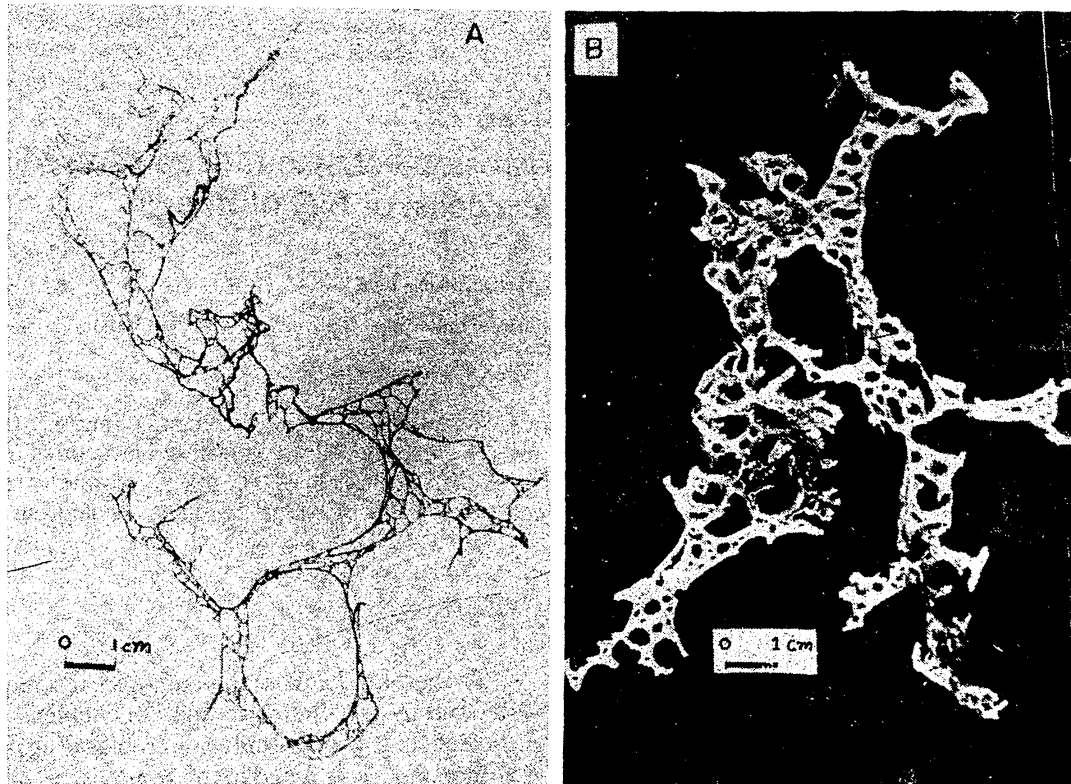


Fig. 2—Thallii of A) *Hydroclathrus tenuis*, B) *H. clathratus*

degenerates during February/March. The growth of *H. tenuis* perhaps starts after declining of *Sargassum* and *Cystoseira* crop during January-February, and reaches to its maximum growth and abundance during March, when there is minimum or no competition. The percentage FO varied from 5-100 with maximum on the dead reef slope (Fig. 1c), as the region is relatively protected from the tidal and current impacts, and water remains for longer durations. Morphological and anatomical features of the alga, greatly differed from that of *H. clathratus* and resembled with *H. tenuis* described from China (Table 1) which lead us to identify the species as *H. tenuis*. The alga in the natural habitat can be easily distinguished visually from the former by comparing their morphological characters (Table 1, Fig. 2A, B). Although *H. tenuis* was found to grow abundantly in this region, it was not reported so far possibly due to its occurrence during the off season, after peak growth of *Sargassum* and *Cystoseira*.

Authors are grateful to Prof Tseng and Dr Lu Baoren of Institute of Oceanography Academia,

Sinica, China, for confirming the taxonomic nomenclature of the alga.

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