

SOME RARE PLANKTONIC GREEN ALGAE FOUND IN EAST PAKISTAN

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Abstract

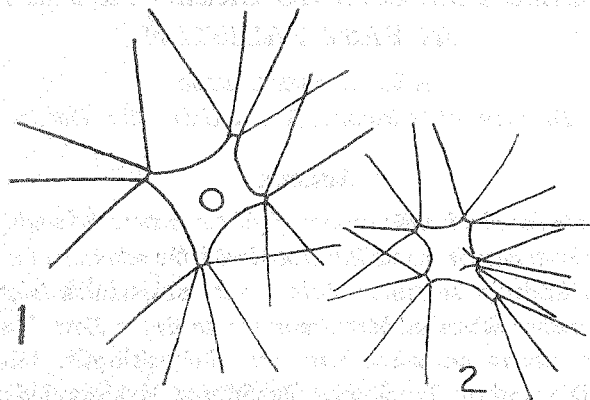
In this paper the planktonic species of fifteen genera belonging to Chlorophyceae have been described and illustrated with the addition of a new variety, namely, Polyedriopsis spinulosa Schm. var. pakistanica Islam, var. nov. Most of the species described here are new records for East Pakistan. The names of the genera included here are: Polyedriopsis, Gloeotaenium, Chodatella, Diacanthos, Trochiscia, Quadrigula, Hyaloraphidium, Dimorphococcus, Tetrastrum, Hofmania, Tetrallantos, Ourococcus, Elakatothrix, Schizochlamys and Cylindrocapsopsis.

During the course of investigations of the freshwater algae in East Pakistan, the present author has come across with many unicellular free or colonial as well as several multicellular planktonic algae in different types of habitats. Some of these phytoplanktons, however, have been reported from polluted waters by Islam and Khatun (1966), and Islam and Nahar (1967). Besides these some planktons found as food in the fish stomachs have recently been reported by Islam (1968) from East Pakistan. Islam (1968a) has further described one of the rarest green algae, namely, *Tetrasporidium javanicum* Moeb. from East Pakistan, which, when well-grown, becomes planktonic in stagnant waters. Although many such planktonic forms belonging to different groups are yet to be reported from this province, the author takes this opportunity to give here an illustrated account of the following green planktonic genera, the species of which are of rare occurrence, at least not easily encountered with. The names of these genera described here are: *Polyedriopsis*, *Gloeotaenium*, *Chodatella*, *Diacanthos*, *Trochiscia*, *Quadrigula*, *Hyaloraphidium*, *Dimorphococcus*, *Hofmania*, *Ourococcus*, *Elakatothrix*, *Tetrallantos*, *Schizochlamys* and *Cylindrocapsopsis*. The present author has followed the recent classifications of Bourrelly (1961-1963) in placing these genera under respective families. All the measurements are in μ .

Descriptions of the taxa

Family: Chlorococcaceae

Genus: *Polyedriopsis* Schmidle



Figs. 1-2. *Polyedriopsis spinulosa*, (after Smith, 1950).

1. *Polyedriopsis spinulosa* Schmidle (Figs. 1-2)

Plant unicellular, free-floating, tetragonal or pyramidal, the angles truncately rounded and furnished with a tuft of 4 (number may vary) long, tapering setae; sides concave or slightly convex; chloroplast a parietal plate with a pyrenoid; cells 10-25 in dia., setae upto 40 long.

Collected from a small earthen water reservoir, Botanical garden, Dacca University, 27.4.67.

Family: Oocystaceae

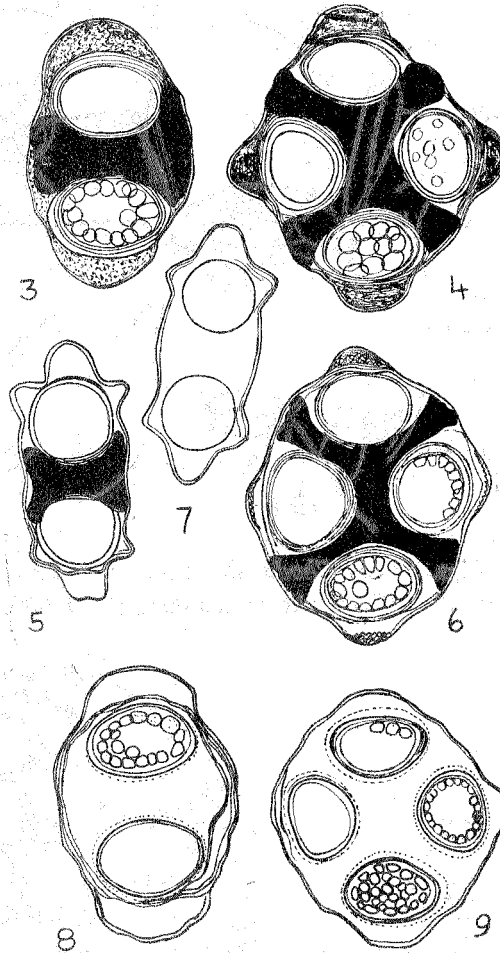
Genus: *Gloeotaenium* Hansgirg

2. *Gloeotaenium loitlesbergerianum* Hansg. (Figs. 3-9)

Colony mostly 2- or 4-celled; cells spherical to ellipsoidal, lie within the closely fitting cell-wall of the previous cell generation, cells are usually separated by dark-coloured gelatinous mass with CaCO_3 ; often a small cap of gelatinous material external to each cell present; parent cell-wall enclosing 2 or 4 cells fairly thick and more or less folded; wall surrounding each cell is thick and stratified; chloroplast single, massive, with or without pyrenoid; 4-celled colony, 55-64 in dia., and 63-72 long; 2-celled colony, 39-43 in dia., and 51-67 long; cell (without sheath) 15.8-17.2 in dia., and 21-26 long.

This rare plant has so far been collected from two localities in East Pakistan, first from Rajshahi town in 1962 and then from a pond at Natore town on 6.3.67, both in the district of Rajshahi. In the earlier collections only a few colonies were observed whereas in the latter collection the colonies were found in abundance.

In the latter case different types of colonies were noticed which vary in shape and size (Figs. 3-9), but interesting feature observed was the lack of dark crosslike-structure in a good number of 2- and 4-celled colonies among the population (Figs. 7-9).

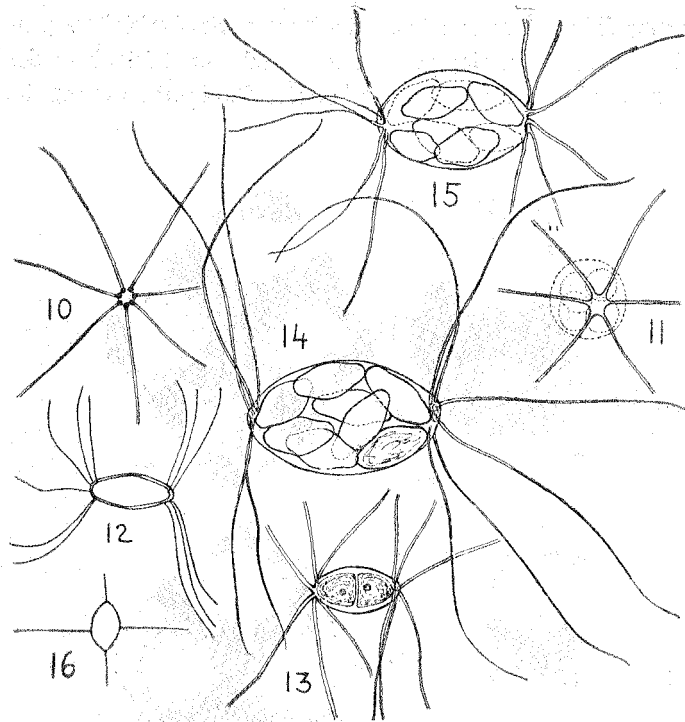


Figs. 3-9. *Gloeotaenium loitlesbergerianum*, x 340.

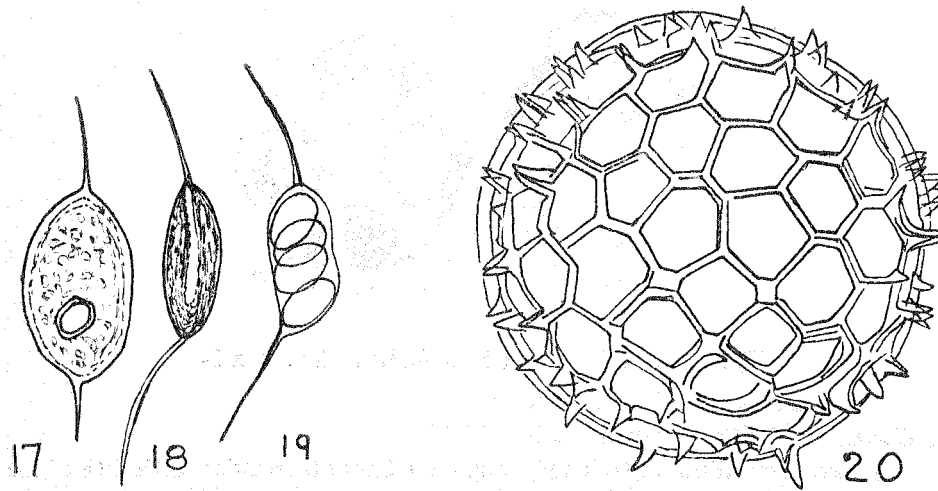
Genus: *Chodatella* Lemmermann

3. *Chodatella longiseta* Lemm. (Figs. 10-15)

Cells ovate or ellipsoid, with very long setae (more than twice the length of the cell) arranged in a whorl of 5-7 (number may vary) near the poles; chloroplast



Figs. 10-15. *Chodatella longiseta*, x 900.
 Fig. 16. *Chodatella wratislawiensis*, x 900.



Figs. 17-19. *Diacanthos* sp., x 900. Fig. 20. *Trochiscia reticularis*, x 900.

parietal, pyrenoid absent; cell 11.5-17 in dia., and 20-20.7 long without setae; cell after autospore formation, 21.6-34.5 in dia., and 28.8-34.5 long without setae; autospores 8 per cell, ellipsoid, 7-10 in dia., 14-15.8 long; setae 57.6 (or more) long.

Found in a collection from a small cemented tank used for ablution in Tara mosque, Dacca, 25.11.65.

4. *Chodatella wratislawiensis* (Schroeder) Ley (Fig. 16)

Plant solitary, free-floating; chloroplast massive, without pyrenoid; four straight setae, two shorter projecting, one from each pole and the other two are longer and equatorial; cells 6.8 long and 5.5 in dia., setae range from 6.6-8.8 in length.

This is a very rare species and was found only once in a collection from a ditch of polluted water at Shantinagar, Dacca, 30.7.67.

Genus: *Diacanthos* Korchikov

5. *Diacanthos* sp. (Figs. 17-19)

Cells solitary, free-living, ellipsoidal with one seta at each pole; chloroplast massive with one pyrenoid which is absent in young cells; cells, 11-15.5 long and 4.5-8.8 in dia., setae 4.4-8.8 long; multiplication by autospore-formation.

This was found in a collection from a ditch of polluted water at Shantinagar, Dacca, 30.7.67.

This plant resembles *Diacanthos belenophorus* Korch., but differs from it by its shorter setae and in cell shape. Four autospores (Fig. 19) are found in each cell.

Genus: *Trochiscia* Kuetzing

6. *Trochiscia reticularis* Kg. (Fig. 20)

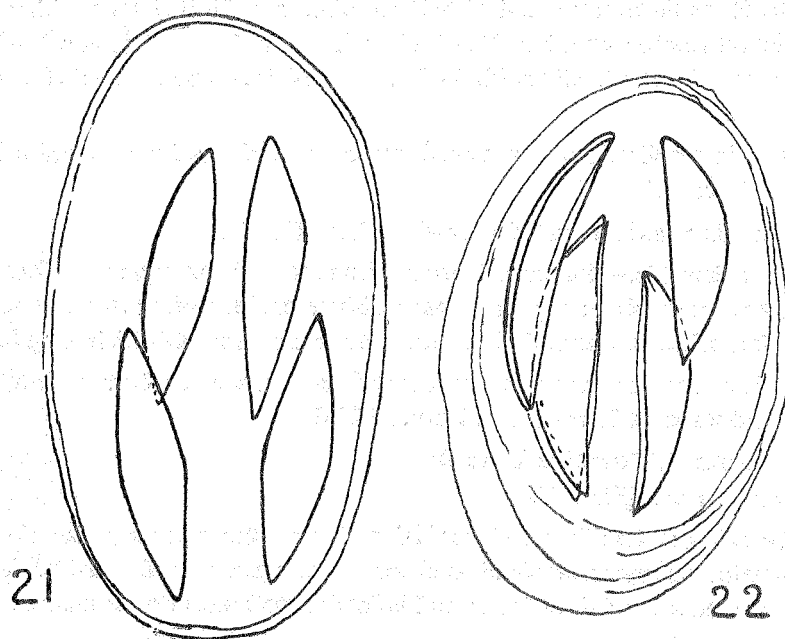
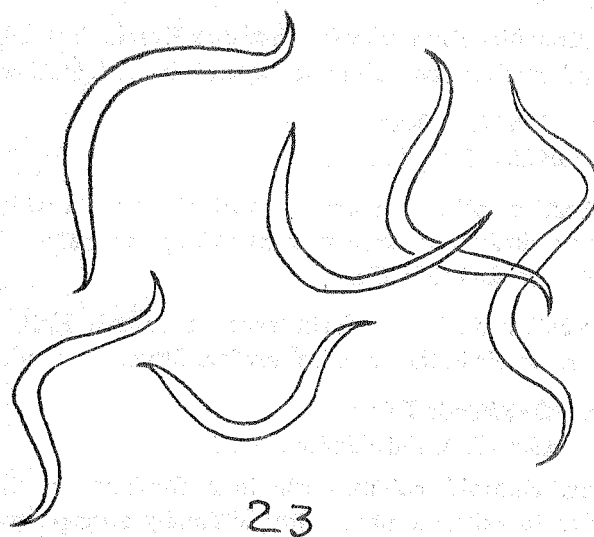
Cells free-floating, solitary, spherical, with thick walls which are externally ridged to form a reticulum in which as many as 70 polygonal areas may be marked out; cells 26-33 to up to 40.5 in dia.

Found in a collection from a drain near Jagannath Hall, Dacca, 28.5.67; also in a water reservoir in the botanical garden, Dacca University, 12.9.67.

Genus: *Quadrigula* Printz

7. *Quadrigula chodati* (Tan.-Ful.) Smith (Fig. 22)

Free-floating, ellipsoid colony; cells long fusiform to slightly lunate or arcuate, tapering to subacute points, longitudinally arranged within a broadly ellipsoid (or fusiform) colonial envelope; chloroplast a parietal plate with a median notch containing pyrenoids; cells 3-7 in dia., 31-35 long; colony up to 250 long.

Fig. 21. *Elakatothrix viridis*, x 675.Fig. 22. *Quadrigula chodati*, x 675.Fig. 23. *Hyaloraphidium contortum*, x 960.

Found in a collection from a pond at Natore town, 6.3.67.

This plant agrees well with the descriptions as given by Prescott (1951) for this species.

Genus: *Hyaloraphidium* Pascher & Korchikov

8. *Hyaloraphidium contortium* Pasch. & Korch. (Fig. 23)

Plant free-living, solitary, faint greenish, needle-like which is twisted in different directions; cells, 2.2-2.5 in dia., and 19.8-28.6 long.

Found in a collection from a glass aquarium in a house at Malibag, Dacca, 4.6.67.

Family: Dictyosphaeriaceae

Genus: *Dimorphococcus* A. Braun

9. *Dimorphococcus lunatus* A. Br. (Figs. 24-25)

Colony free-floating; cells in groups of four on the ends of fine, branched threads composed of fragments of the mother cell-wall, the two inner cells of the quadrate are ovate or subcylindric, the other two are cordate; cells, 3.3-8.6 in dia., and 8.8-17.6 long; one parietal chloroplast with one pyrenoid in each cell.

Found in a small cemented water reservoir in a house, August, 1966; in a small tank at Malitola mosque, 2.10.66; also recorded from less polluted water of a pond.

Family: Coelastraceae

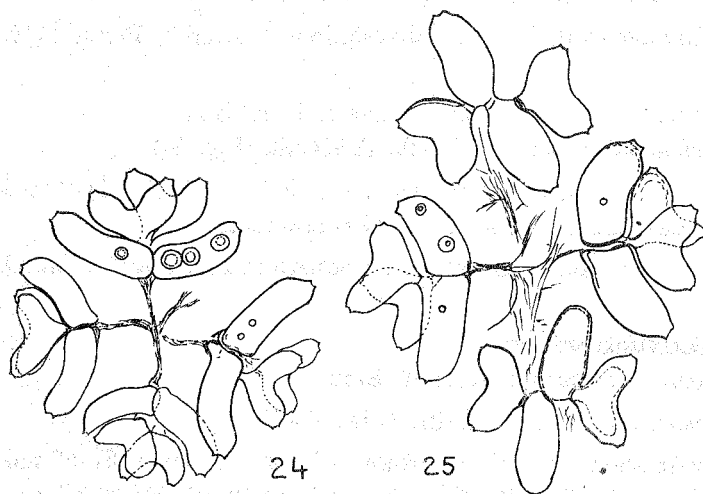
Genus: *Hofmania* Chodat

10. *Hofmania lauterbornii* (Schm.) Wille (Figs. 27-29)

Colony of 4-16 (more) subspherical cells, free-floating; cells arranged in square, without setae but with one hyaline appendage projecting from free surface of each cell: cells without "tractus", in contact only at their inner corners; one chloroplast along the outer convex wall with one pyrenoid; cells, 4.4-6.6 in dia., and 5.7-6.7 long; appendage 2.2 wide and 4.4 long; quartet of cells adjoined in multiples by remains of old mother-cell-walls.

Found in few collections from Dacca: water reservoir in the botanical garden, Dacca University, 27.4.67 and 28.8.67; in a ditch near Kakrail bazar, Shantinagar, 30.7.67; in Dhanmondi lake, 17.8.67; in a ditch near Press Club, 17.11.67.

Four-celled colony of this plant may resemble *Tetrastrum heteracanthum* fa. *elegans* (Playf.) Ahl. & Tiff. (Fig. 26) which is fairly a common plankton. The latter plant, however, possesses setae instead of appendages formed by the remains of old mother-cell-walls as in *Hofmania lauterbornii* (Schm.) Wille. In the general



Figs. 24-25. *Dimorphococcus lunatus*, x 450.

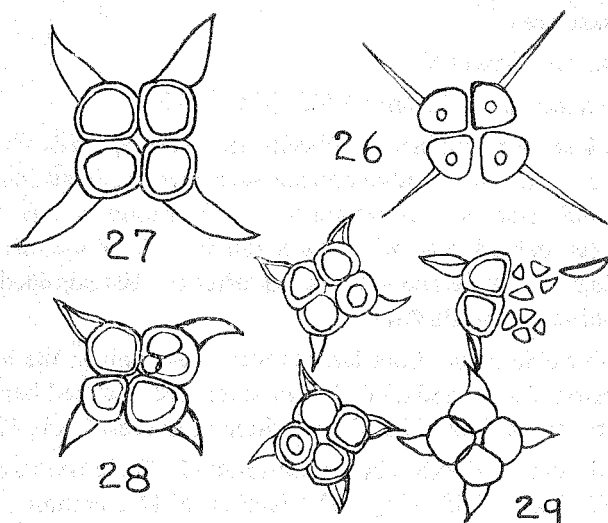


Fig. 26. *Tetrastrum heteracanthum* fa. *elegans*, x 900.

Figs. 27-29. *Hofmania lauterbornii*, x 900.

arrangement of the cells in 4- or 16-celled colonies this plant also resembles the species of *Crucigenia* and *Coronastrum*.

Genus: *Tetrallantos* Teiling

11. *Tetrallantos lagerheimii* Teiling (Figs. 31-33)

Colony of 4 crescent-shaped or sausage-shaped cells which are bluntly rounded at their apices and enclosed by a colonial mucilage; cluster of daughter cells often held in approximation by the fragments of old mother-cell-wall; cells in two pairs and in two planes, one pair facing each other and contact at their poles, the other pair in a longitudinal plane vertical to the former, so arranged that each member has one pole at the point of contact of the poles of the other pair; chloroplast a parietal plate with one pyrenoid; cells, 4-6.6 in dia., and 8.6-15.4 long; multiplication by autospore-formation.

This rare monotypic genus has been observed in five different collections, all from Dacca, but never it was found in abundance. Following is the list of habitats from where this plant was collected along with other planktonic forms: a pond near Dacca University Medical Centre, 4.4.67, and 2.5.67; a pond attached to Mirpur Mazar, 9.4.67; in a water reservoir in the Dacca University botanical garden, 2.8.67; in a ditch near new Dacca Railway Station at Kamalapur, 30.8.67.

Skuja (1949) has reported this plant from Burma and only recently its occurrence has been reported for the first time from India by Patel (1966).

Family: **Coccomyxaceae**

Genus: *Ourococcus* Grobety

12. *Ourococcus bicaudatus* Grobety (Fig. 30)

Cell solitary, free-floating, bright-green with thin wall and laminate parietal chloroplast with a single (or, rarely two) pyrenoids; cell fusiform and straight, slightly sigmoid, lunate, irregularly bent with drawn out seta-like poles which project and bend towards inner side; both the poles may be sharply pointed, or one pole is slightly blunt than the other; cell, 5.7. in dia., and 31.6 long.

Found only once in a collection from Mirpur Mazar pond, Dacca, 9.4.67.

Genus: *Elakatothrix* Wille

13. *Elakatothrix gelatinosa* (?) Wille (Fig. 34)

Colony free-floating; cells small, fusiform or spindle-shaped, tapering to a point at both poles; cells 2-2.5 in dia., 11-13 long.

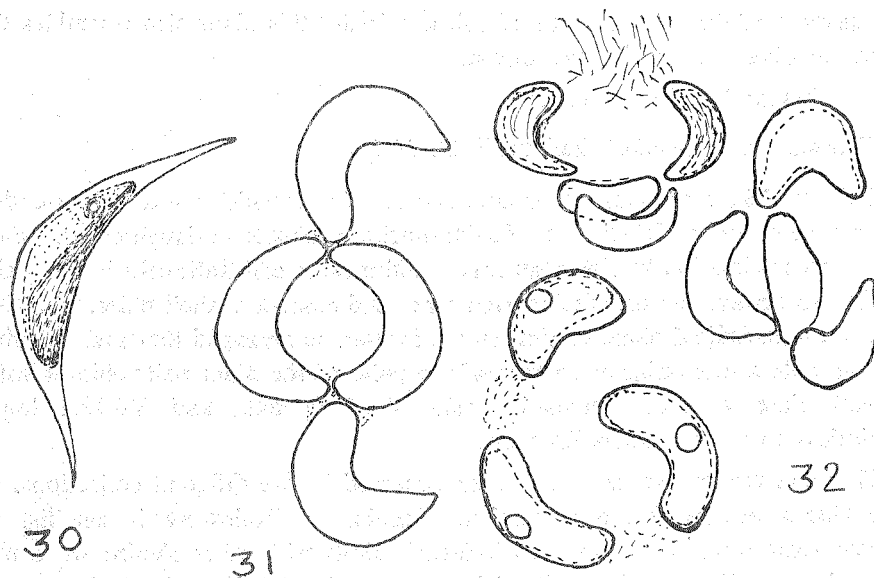
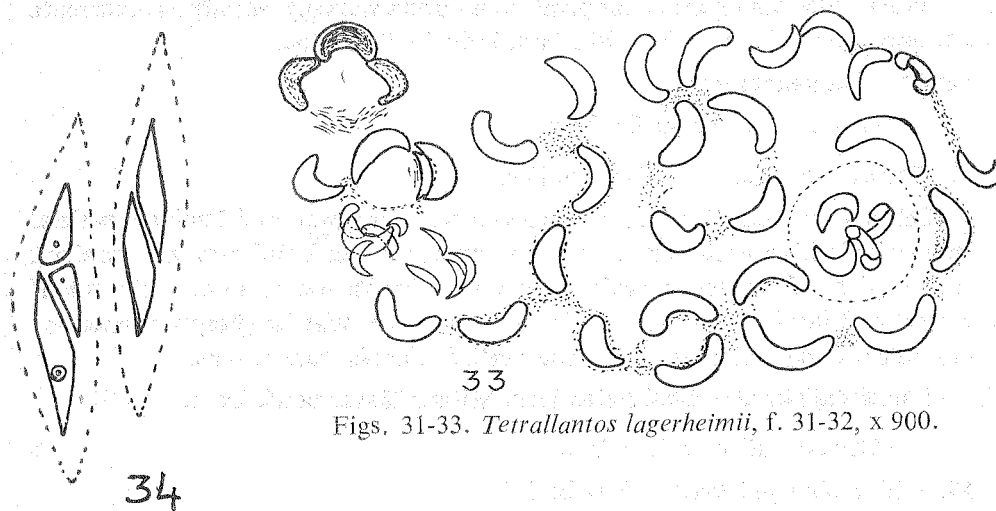


Fig. 30. *Ourococcus bicaudatus*,
x 900.



Figs. 31-33. *Tetrallantos lagerheimii*, f. 31-32, x 900.

Fig. 34. *Ehakatothrix gelatinosa*, x 900.

Found in the collections from a water reservoir in the Dacca University botanical garden, on 27.4.67, 5.5.67, and 30.5.67.

14. *Elakatothrix viridis* (Show) Printz (Fig. 21)

Colony broadly ellipsoid, free-floating; cells ovate or fusiform, and arranged in pairs; cells, 6-8 in dia., and up to 35 long.

Found in a collection from a pond at Natore town, 6.3.67.

Family: Tetrasporaceae

Genus: *Schizochlamys* Braun

15. *Schizochlamys gelatinosa* (?) A. Br. (Figs. 35-36)

Colonial mass macroscopic, sac-like, spherical to extensive, irregular in outline, attached at one point, but later becomes free-floating, 10-60 in dia., mucilage thick but soft, amorphous or gregarious, light brownish in colour; vegetative cells within mucilage matrix innumerable, spherical or slightly depressed-globose, 12.9-17 in dia. and 12.9-17 long; cells dividing by a splitting of the old cell-wall into 2 or 4 portions, these wall-fragments persist and partially enclose the daughter cells in pairs or in 4's; usually a single, parietal cup-shaped massive chloroplast with one pyrenoid in each cell.

Collected from a small ditch at Mirpur, Dacca on 10.10.67.

This plant agrees well with the descriptions of *S. gelatinosa* A. Br. except the sac-like nature of the present thallus, which is hollow, balloon-like when young.

Family: Cyliandrocapsaceae

Genus: *Cyliandrocapsopsis* Iyengar (1957)

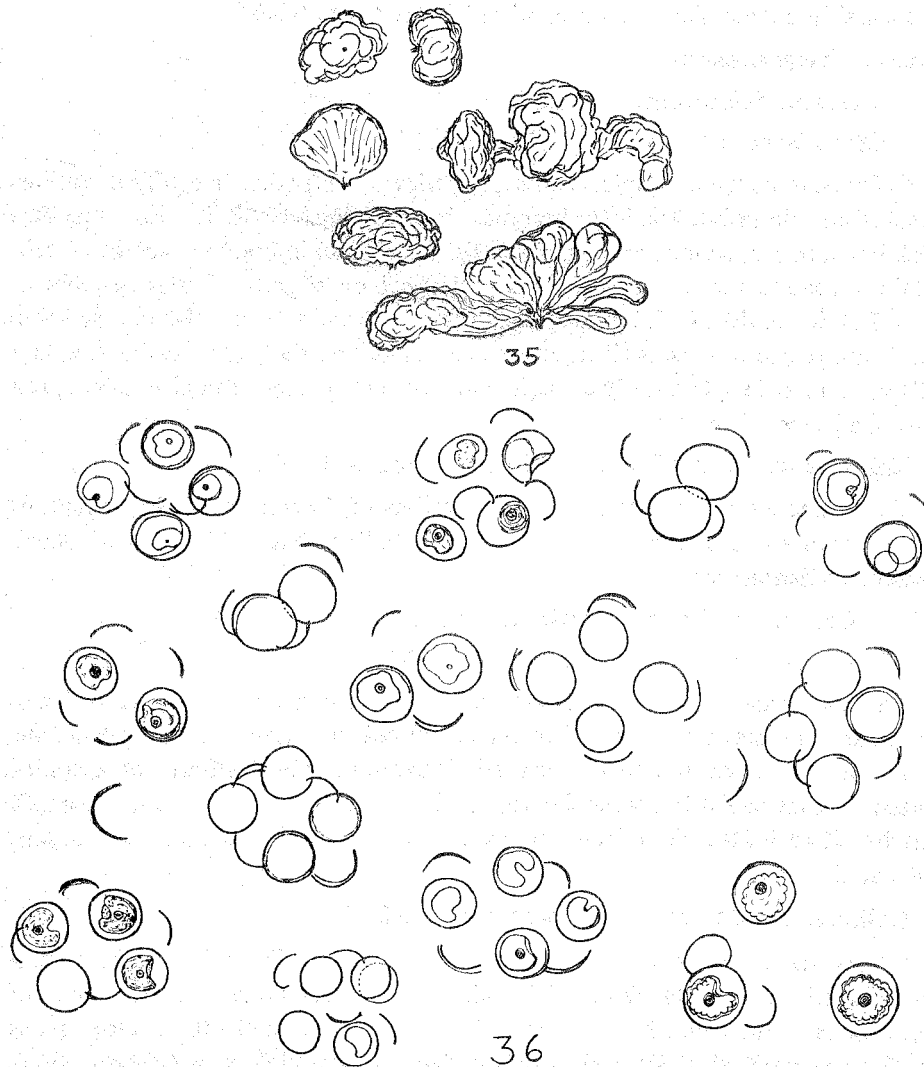
16. *Cyliandrocapsopsis indica* Iyengar (Figs. 37-39)

Thallus filamentous, unbranched, attached when young, but later becomes free-floating; filaments composed of cells arranged in a single series; cells having single stellate chloroplast with 1 or rarely 2 pyrenoids; cells elliptic or cylindric oblong to quadrate with rounded corners, 17-20 in dia., and 17-28.8 long (length may be 1/2 to 3/4 the dia. of the cell); cell-wall thick and stratified; sex organs not found.

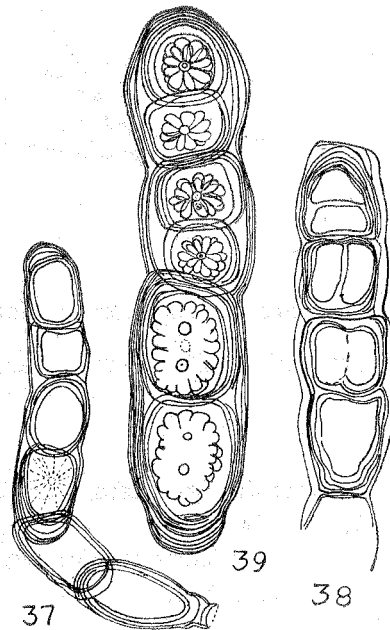
Collected from a pond at Natore town on 6.3.67.

Several sterile filaments were observed in floating condition during the investigation of the above collection. This plant looks very much like the species of *Cyliandrocapsa*, but according to Iyengar (1957, p. 66) it differs from the latter genus by the presence of stellate chloroplast (and not parietal as in *Cyliandrocapsa*). Besides, during the cell division in the present genus the protoplast divides into

two and the two daughter protoplasts then surround themselves with new walls of their own inside the parent membrane. Bourrelly (1961), however, recently reported that stellate chloroplast is also present in *Cylindrocapsa geminella* var. *minor* Hansg., and this brings out the question whether Iyengar's (*l.c.*) genus is really a distinct and separate one from *Cylindrocapsa*. Iyengar, however, has shown



Figs. 35-36. *Schizochlamys gelatinosa* (?); f. 35, x 1, f. 36, x 340.



Figs. 37-39. *Cylindrocapsopsis indica*, f. 37-38, x 340, f. 39, x 450.

and claimed that the mode of sexual reproduction is also different in his plant than in case of latter genus. The East Pakistan plant is provisionally placed under *Cylindrocapsopsis* until more is known about the differences between these two genera.

Addendum

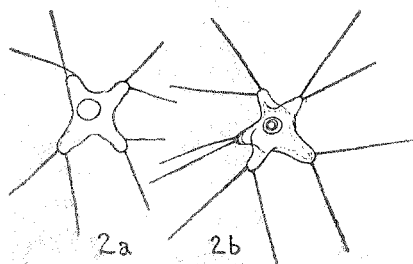
1. *a. Polyedriopsis spinulosa* Schm. var. *pakistanica* Islam var. nov. (Figs. 2a-2b)

Plant solitary, free-floating, 4- or 5-angled, with two delicate setae (or spines) at each arm-like projection; vegetative cell irregular with one pyrenoid, 12.9-14.5 x 12.9-14.5 dia.; setae, 11.5-20 long.

TYPE: Figs. 2a-2b; Type locality: small earthen water reservoir, botanical garden, Dacca University, August 5, 1967.

Planta solitaria, planctonica, tetra-et pentagonal, bispinosus; cellulis vegetativis irregularis, 12.9-14.5 x 12.9-14.5 crassis; setae, 11.5-20 longis; pyrenoides singulis.

There are two species of this genus, namely, *P. quadrispina* Smith, with only one spine-like seta at each angle, and *P. spinulosa* Schm., with four to six long setae at



Figs. 2a-2b. *Polyedriopsis spinulosa* var. *pakistanica* Islam var. nov. x 900.

each angle. The present new variety differs from the latter species by the presence of two setae at each angle.

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