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SYSTEMATIC DESCRIPTION OF ALGAE OF RIVER GOMATI AT LUCKNOW: CHLOROPHYCEAE

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ABSTRACT:

The river Gomati at Lucknow supports a rich and diverse array of algal growth as it passes through the state capital. Studies conducted between Gaughat and Gomati barrage reveal a luxuriant infestation of Chlorophycean members besides other forms.

The present paper deals with 26 Chlorophycean forms recorded from three different locations at Lucknow as the river passes through polluted and relatively unpolluted zones in its course through the city. Of the Chlorophycean forms which usually preferred only cleaner waters, it was observed that while Rhizoclonium species showed a distinct preference for clean water, Spirogyra species were the most dominant and comparatively tolerant to pollution.

KEYWORDS:

RIVER GOMATI, CHLOROPHYCEAE, ALGAL, POLLUTION

INTRODUCTION

In Northern India the Gomati River at Lucknow is a tributary of the Holy Ganga. The river meanders its way through the State Capital of Uttar Pradesh and studies reveal that it supports a rich and diverse array of algal growth.

The present paper deals with the identification and systematic study of 26 Chlorophycean species recorded from five different locations at Lucknow as the river passes through relatively unpolluted and polluted zones of the city. Compared to other algal groups, the Chlorophycean forms usually preferred only cleaner waters. Studies revealed that *Rhizoclonium* species showed a definite preference for clean water while Spirogyra species were the most dominant and comparatively tolerant to pollution.

Further study of algal flora of the Gomati requires to be done so that the potential of algae may be utilised after understanding the complete role they play in the ecosystem.

MATERIALS AND METHODS

Monthly collection of algae was made from five different locations along the course of the Gomati River at Lucknow. The Locations are:

1. Gaughat Pumping Station (upstream)
2. Hardinge Bridge
3. Hanuman Setu Bridge
4. Nishatganj Bridge
5. Gomati Barrage (11 km. downstream)

Specimens collected were examined in living condition and then preserved in 4% formalin for detailed studies later on. The samples were identified on the basis of camera-lucida figures using standard texts.

OBSERVATIONS

CHLOROPHYTA

CHLOROPHYCEAE

CHARACIACEAE

Genus CHARACIUM A. Braun

Characium ambiguium Hermann. Tiffany and Britton, *op. cit.*, 108, Pl. 29, Fig. 286, 1952.

Cells solitary, straight, somewhat lanceolate, with pointed, somewhat bent apex; stipe short, without basal thickening.

Dimensions: Cells 4.5-6.8 micron broad and 24.5-28.0 microns long.

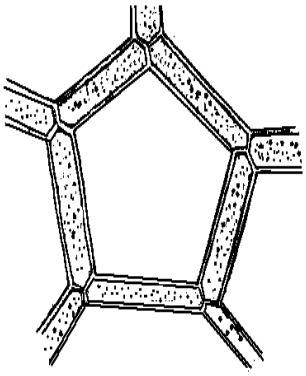
Distribution: Epiphytic on filamentous algae.

HYDRODICTYACEAE

Genus HYDRODICTYON Roth

Hydrodictyon reticulatum (Linnaeus) Lagerheim. Prescott, *op. cit.*, 219, P1.47; Fig. l,

1951; Tiffany and Britton, *op. cit.* 110, Pl. 29, Fig. 289, 1952.

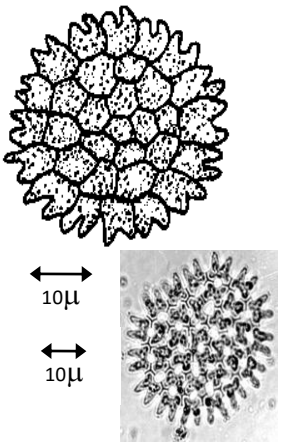


Thallus macroscopic, composed of elongate-cylindrical cells, united into a free-floating, saccate, reticulate coenobium; light yellow-green colour; cells coenocytic with parietal chromatophores, reticulate at first and later diffuse, with pyrenoids.

Dimensions: Cells 10-30.8 micron broad and 86.5-200 micron long.

Distribution: Free-floating in Gomati water.

Genus PEDIASTRUM Meyen

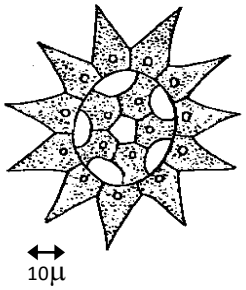


Pediastrum boryanum (Turpin) Meneghini. Tiffany and Britton, *op. cit.*, 112, Pl.30, Figs. 295, 296, 1952.

Outer half of marginal cells with 2 short processes ending in short spines; coenobia 4-256 celled, compact.

Dimensions: Cells 5.6-16.8 micron in diameter.

Distribution: In stagnant Gomati water.



Pediastrum simplex var. duodenarium (Bailey) Rabenhorst Tiffany and Britton, *op. cit.*, 110, Pl. 30, Fig.292, 1952.

Cells with smooth or finely punctate walls; perforations of coenobia large.

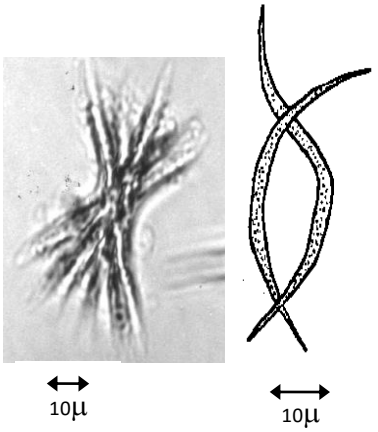
Dimensions: Cells 12-24.6 micron broad, nd 22.0-41.8 micron long.

Distribution: Free-floating in Gomati water

SELANASTRACEAE

Genus

ANKISTRODESMUS Corda



Ankistrodesmus falcatus Corda. Prescott, *op. cit.*, 254, Pl. 56, Fig. 5, 1951.

Solitary or in groups of 2-4 cells, fusiform in shape, twisted and sigmoid; apices sharply pointed and often twisted in opposite directions.

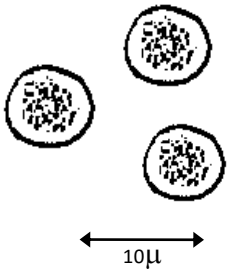
Dimensions: Cells 2.0-2.8 micron broad and 50-70 micron long.

Distribution: Planktonic in Gomati water

OOCYSTACEAE

CHLORELLOIDEAE

Genus CHLORELLA Beyerinck



Chlorella vulgaris Beyerinck. Tiffany and Britton *op. cit.*,114, P1. 29, Fig. 280, 1952; Prescott, *op. cit.*, 237, P1. 53, Fig. 13, 1951. Cells spherical.

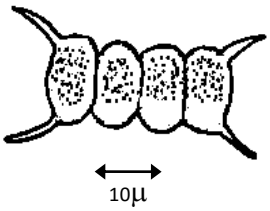
Dimensions: Cells 6.5-9.5 micron in diameter.

Distribution: Planktonic in shallow Gomati water, scattered among other algae.

SCENEDESMACEAE

SCENEDESMOIDEAE

Genus SCENEDESMUS Meyen.



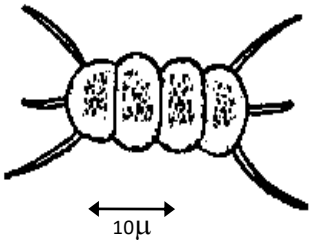
Scenedesmus armatus (Chodat) G.M. Smith. Prescott, *op. cit.*, 276 , Pl. 62, Figs.13, 14, 1951; Tiffany and Britton, *op. cit.*, 122, Pl. 35, Fig. 353, 1952.

Plant composed of 2-8 cells arranged in a single, partially alternating series, oblong-ellipsoid but with ends broadly rounded; terminal cells with a single, long, usually curved spine at each pole.

Dimensions: Cells 4-6.4 micron in diameter, and 8.0-13.2 micron long.

Scenedesmus abundans (Kirchner) Chodat.

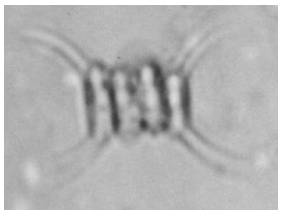
Prescott, op. cit. 274, Pl. 61, Fig.21, 951;Tiffany and Britton, op. cit., 123, P1. 35, Fig. 365, 1952; Philipose, M.T., Chlorococcales 278, Fig. 184, a-d, 1967.



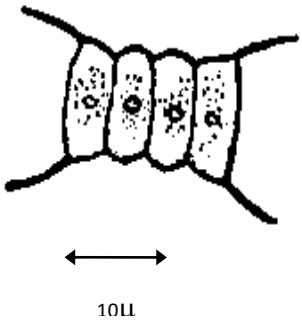
Cells oblong or ovate, in a linear series of 4, the terminal cells with 1 or 2 spines at each pole, and additional spines on outer face of terminal cells.

Dimensions: Cells 4.5-5.6 micron in diameter, and 7-8.5 micron long.

Distribution: Planktonic in Gomati water and in ditches on the bank of river Gomati.



Scenedesmus quadricauda (Turpin) Brebisson. Tiffany and Britton, *op. cit.*, 122, Pl. 35, Fig. 357, 1952.



Cylindrical- ovoid with rounded ends, in a linear or sub-alternating series; poles of outer cells with spines, inner cells without spines.

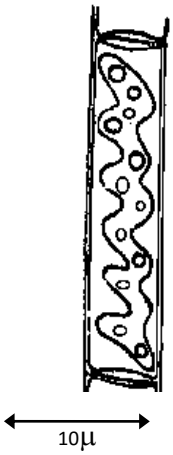
Dimensions: Cells 5.6-6.0 micron broad and 11.2-15.6 micron long.

Distribution: Planktonic in Gomati water.

ZYGNEMATALES

ZYGNEMATACEAE

Genus MOUGEOTIA C.A. Agardh.



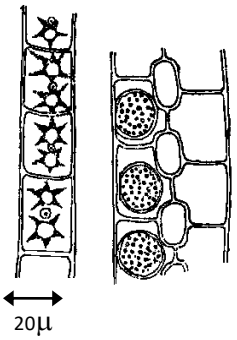
Mougeotia sp.

Cells cylindrical ; chromatophore with usually 4-6 pyrenoids; zygote quadrate to triangular, corners somewhat rounded.

Dimensions: Vegetative cells 4.0-5.8 micron broad and 25.0-60.0 micron long; zygote not seen.

Distribution: Intermingled with other filamentous forms in shallow Gomati water.

Zygnema sp.



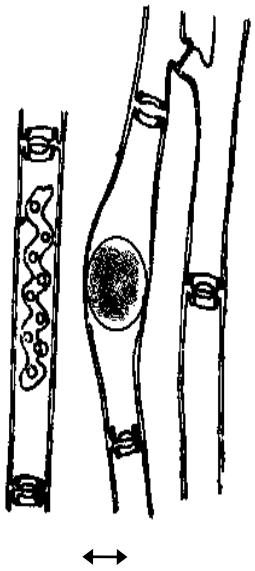
Filaments simple.

Dimensions: Cells 19.0-24.2 micron broad and 20.0-45.8 micron long.

Distribution: Intermingled with other filamentous algae in shallow Gomati water.

SPIROGYROIDEAE

Genus **SPIROGYRA** Link



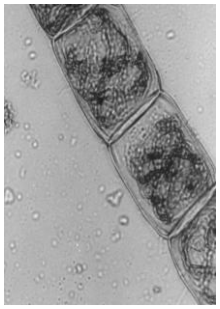
Spirogyra affinis (Hass) Petit. Randhawa M. S. *op. cit.*, 300 Fig. 261 b, 1959.

Septa not swollen; chloroplast single with 2.5 to 4 spirals; conjugation scalariform, fruiting cells slightly swollen on both sides; zygospores ellipsoid, yellow in colour, spore wall smooth.

Dimensions: Vegetative cells 22.0-30.0 micron broad; zygospores 25.0-32.0 micron broad, 36.0-46.0 micron long .

Distribution: In shallow Gomati water.

Spirogyra sp.



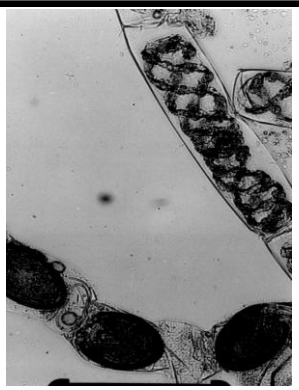
Vegetative cells with plane end walls; 1 chromatophore making 4-6 turns in the cell; zygote not seen.

Dimensions: Vegetative cells 27.0-38.0 micron broad and 100.0-180.0 micron long.

Distribution: In shallow Gomati water.

Spirogyra ellipsospora Transeau. Tiffany and Britton. *op. cit.*, 152, P1.46, Fig. 484, 1952.

Vegetative cells with plain end walls and 3-8 chromatophore making 0.4-5.0 turns; conjugation scalariform; tubes formed by both gametangia; fertile cells cylindrical; zygote ellipsoid, more or less pointed with smooth yellow- brown median spore wall.



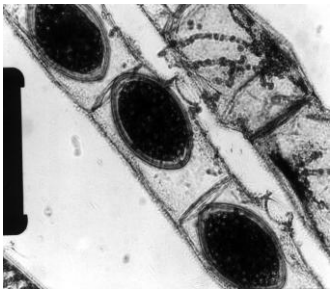
100µ

Dimensions: Vegetative cells usually 129.6-140.4 micron broad and 194.4- 237.6 micron long; zygote 108.0-129.6 micron broad and 162.0-216.0 micron long.

Distribution: In shallow Gomati water attached to boat and logs.

Spirogyra submaxima Transeau. Randhawa, M.S. *op. cit.*, 34. Fig. 349 a, b, 1959.

Vegetative cells with plane end walls; 8 to 9 chloroplasts, Making 0.1 to 1 turn; conjugation scalariform; tubes formed by both gametangia; fertile cells cylinderic, enlarged, slightly inflated; zygospore spherical; medial spore wall brown, smooth .



100µ

Dimensions: Vegetative cells 70.0-100.0 micron broad and 100.0-300.0 micron long; zygote 50.0-75.0 micron broad and 70.0-100.0 micron long .

Distribution: In shallow Gomati water.

CONJUGALES

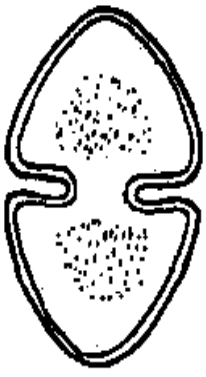
DESMIDIOIDEAE

DESMIDACEAE

Genus COSMARIUM Corda.

Cosmarium granatum Brebisson. Tiffany and Britton, *op. cit.*, 186, Pl. 53, Fig. 565, 1952.

Cells sub-rhomboid elliptic, deeply constricted, sinus linear, slightly dilated at apex, basal angles rounded, apex narrowly truncate and straight, slightly convex sub-parallel



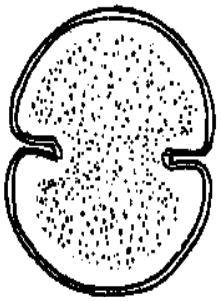
10µ

at base and covering towards the apex, upper angles obtuse, cell wall finely punctate, chromatophores axial; pyrenoid single central.

Dimensions: Cells 19.0-22.0 microns by 26.0-30.0 microns and isthmus 10.0-15.0 micron wide.

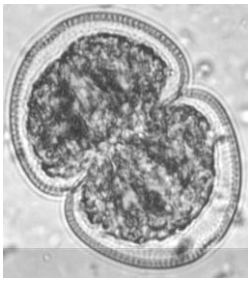
Distribution: In ditches along the bank of river Gomati.

Cosmarium nitidulum De Notaris. Tiffany and Britton, *op. cit.*, 185 P1. 53, Fig. 572, 1952.



10µ

Cells a little longer than wide, deeply constricted, sinus narrowly linear, the apex slightly dilated ;semi-cells truncate, sub-semicircular, basal angles broadly rounded, sides convex and converging upward, upper angles slightly rounded; apex small, truncate-convex, straight or slightly retuse ; vertical view elliptic, lateral view of semi-cell



10µ

subcircular; cell-wall minutely and often obscurely punctate, chromatophores axial, one in each semi-cell pyrenoid single, central.

Dimensions: Cells 23-28 by 30-32.4 micron and isthmus 17-19.8 micron wide.

Distribution: In ditches along the bank of river Gomati.

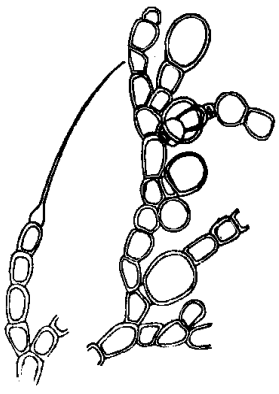
OEDOGONIALES

OEDOGONIACEAE

Genus Bulbochaete Ag.

Bulbochaete sp.

Dimensions: Vegetative cells 14.28-16.66 micron broad and 19.0-23.80 micron long. Oogonium 28.56 micron broad and 28.56- 38.08 micron long. Antheredia 4.76 micron broad and 9.52 micron long.

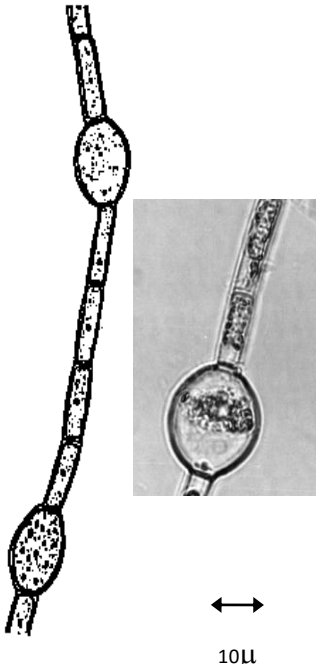


20µ

Distribution: On other algae and stones in shallow Gomati

water.

Genus Oedogonium Link



Oedogonium gracillimum Wittrock and Lundell. Prescott, *op. cit.*, 190, P1.34, Figs. 13, 14, 1951. Tiffany and Britton, *op. cit.*, 82, Pl. 23, Fig.217, 1952.

Macrandrous; monoecious; vegetative cells cylinderic; oogonia solitary, oblong, operculate, division superior; oospores oblong-ellipsoid, not filling oogonia; spore wall smooth; antheridium one, division horizontal.

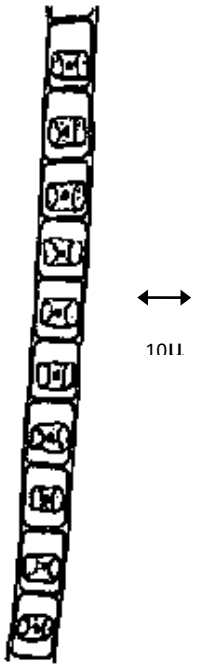
Dimensions: Vegetative cell 5.2-6.5 micron broad, and 18.0 – 20.0 micron long; oogonium 14.0-14.5 micron broad, 20.0-25.0 micron long; oospore 14-15.4 micron broad and 25.2 – 28.0 micron long.

Distribution: Attached to aquatic plants of river Gomati

ULOTRICHALES

ULOTRICHACEAE

Genus ULOTHRIX Kuetzing



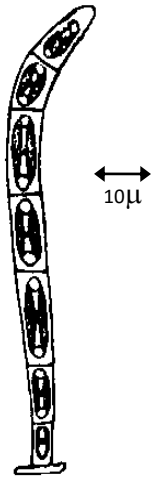
Ulothrix zonata (Weber and Mohr) Kuetzing. Tiffany and Britton, *op. cit.*, 26 , pl. 4, Fig 9, 1952; Prescott, *op. cit.*, 97, pl. 6, Fig.21,1951.

Filaments long and stout; vegetative cell cylinderic or swollen, with constrictions at the cross walls; cell wall thick at maturity; chromatophore usually a median band with several pyrenoids.

Dimensions: Cells 10-35.8 micron long, 10.8-28.5 micron broad.

Distribution: Either attached or free floating in Gomati water.

Genus URONEMA Lagerheim



Uronema sp.

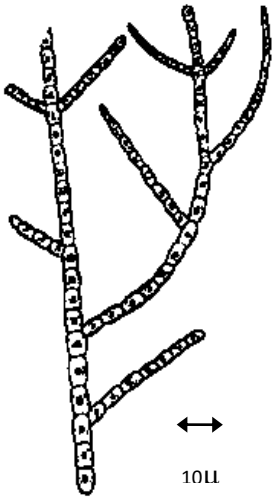
Dimensions: Cells 4.5-7.2 micron broad and 4.5-14.48 micron long.

Distribution: Epiphytic on *Cladophora glomerata* and *Oedogonium gracillimum* in Gomati water.

CHAETOPHORALES

CHAETOPHORACEAE

Genus STIGEOCLONIUM Kuetzing



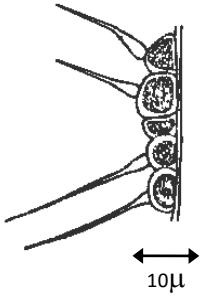
Stigeoclonium tenue (Agardh) Kuetzing. Tiffany and Britton, *op. cit.*, 34, Pl.10 ,Fig27, 1952; Prescott, *op. cit.*, 117, 1951.

Thallus is an elongate tuft of very slender, gracefully tapering filaments; the branches mostly opposite, but occasionally alternate (solitary), tapering to setae; cells long and cylindrical, sometimes nearly quadrate or with walls slightly convex and constricted at the cross walls.

Dimensions: Vegetative cell 5.6- 7.84 micron broad, 7.84-16.8 micron long.

Distribution: Attached on stones on the bank of Gomati river.

Genus APHANOCHAETE A. Braun



Aphanochaete repens A. Braun

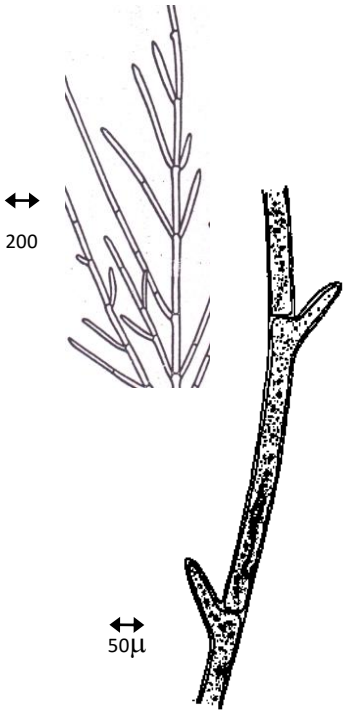
Dimensions: Cells 6.33 - 9.95 microns broad and 7.24- 12.61 microns long. Setae 2.71- 3.62 microns thick and upto 195 microns long.

Distribution: Epiphytic on *Cladophora glomerata*.

CLADOPHORALES

CLADOPHORACEAE

Genus CLADOPHORA Kuetzing



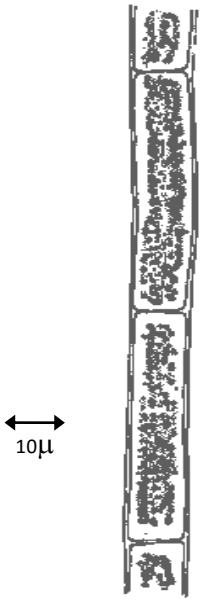
Cladophora glomerata (Linnaeus) Kuetzing. Tiffany and Britton, *op. cit.*, 138, pl. 20, Fig 7, pl.21 , Figs.1,2, 1951.

Plant mass dark green; filaments successively and regularly branched; the branches usually crowded in the upper limits; cells very slightly attenuated towards the apices of the branches, which are bluntly pointed.

Dimensions: Cells of the main axis are 48.6- 59.4 micron broad and 302.4-324 micron long.

Distribution: Attached to concrete slabs on the bank of river.

Genus RHIZOCLONIUM Kuetzing



Rhizoclonium hieroglyphicum (Agardh) Kuetzing. Tiffany and Britton, *op. cit.*, 46, Pl.13, Fig. 91, 1952; Prescott, *op. cit.*, 142, Pl.23, Fig.3, 1951.

Filaments long, wiry, unbranched, slightly or not at all constricted at the cross walls; grass green or yellow green; cell walls usually thin, chloroplasts a close net and very dense.

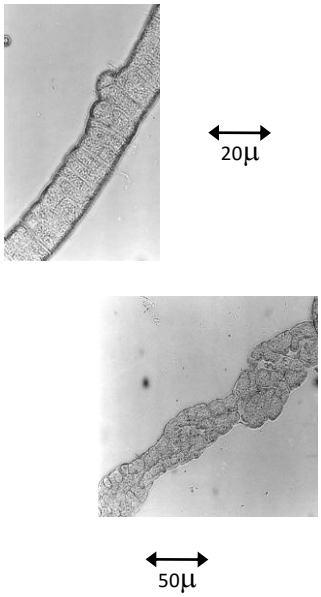
Dimensions: Cells 12.6-14.0 micron broad, and 44.8-84.0 micron long.

Distribution: In shallow Gomati water

SCHIZOMERIDACEAE

Genus SCHIZOMERIS Kuetzing

Schizomeris leibleinii Kuetzing.



Filaments stout, macroscopic. Mutiseriate and broad in the upper portions of filaments.

Dimensions: Cells 15-30 microns broad, 20-25 microns in diameter below, up to 150 microns broad in upper multi-seriate portion.

Distribution: Attached in shallow Gomati water close to sewage outlets.

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