BULL. BOT. SURV. INDIA
Vol. 47, Nos. 1-4 : pp. 63-86, 2005

ALGAL FLORA OF INDIAN BOTANIC GARDEN, HOWRAH, WEST BENGAL

ANKHI SAU AND R.K. GUPTA
Botanical Survey of India, Indian Botanic Garden, Howrah-711103

ABSTRACT

A survey on algal flora of Indian Botanic Garden was undertaken during December 1998 to November 2001. A total of 167 taxa belonging to 79 genera, mainly of Cyanophyceae, Chlorophyceae and Bacillariophyceae have been enumerated for the first time.

INTRODUCTION

Indian Botanic Garden, Howrah was established in 1787 by Lt. Col. Robert Kyd. It comprises an area of 112 hectares of alluvial soil with 1.5 km river front, on the west bank of the river Hoogli. It lies between 22° 35' N. and 88° 21' E. The area experiences annual rainfall of about 1536 mm and the temperature ranges from 21°C-31°C. There are 24 artificial lakes and ponds of different sizes, in the area, covering a total area of 1-5 acres. These are *viz.* King's lake, Prain's lake, Sadir lake, Lerum lake and 4 ponds, mainly Lotus pond and Dhobi pond etc. Some of which are connected with underground pipes receiving water from the river Hoogli.

The algal flora of West Bengal as a whole, is known by the reports of Prain (1905), Brühl and Biswas (1922, 1923), Biswas (1925, 1926), Banerji (1936, 1938), Caller (1926), Gupta (1965, 1975), Sinha and Mukherjee (1975), Mukhopadhyay and Chatterjee (1981), Pal and Santra (1982), Maity and Santra (1985) and Pal and Santra (1985). But there is no report of the algal flora of Indian Botanic Garden, Howrah.

In the present investivation, the algal flora of Indian Botanic Garden, West Bengal has been studied with a view to find out their distributional pattern under varied ecological conditions.

In the paper 39 genera and 70 species of Chlorophyceae; 17 genera and 46 species of Bacillariophyceae; 3 genera and 10 species of Euglenineae; 17 genera and 38 species of Cyanophyceae and 1 each of Xanthophyceae, Dinophyceae and Rhodophyceae have been enumerated.

Date of receipt : 08.02.2003. Date of acceptance : 14.09.2004.

MATERIALS AND METHODS

The algal samples were collected seasonally and periodically, at random, during winter (December February), summer (March May), monsoon (June August) and post monsoon (September November) seasons for three years 1998-2001. The samples were also collected from different habitats of I.B.G. like scum of the moist soils, submerged soils, moist walls, bricks, logs, shell of molluscs etc. for which special care was taken.

Phytoplankton was collected in the morning from different spots of the lakes/ponds with the help of plankton net (mouth area 0.25m^2 and mesh size 0.330 mm) fitted with wooden stick. Phytoplankton, adhered to the surface of aquatic macrophytes, was collected, after washing the submerged macrophytes with distilled water. These were preserved in 4% aqueous solution of formalin, which is added immediately after phytoplankton collection, to prevent zooplanktonic feeding. The filamentous algae (floating, benthic and epiphytic) were preserved in F.A.A. solution.

For phytoplanktons, water samples were centrifuged at 1000 rpm, the liquid supernatant discarded and the pellet examined under compound microscope after mounting under 1% glycerine, for identification.

Identification of the samples has been carried out on the basis of Biswas (1927); Geitler (1932); Smith (1950); Tiffany & Britton (1952); Desikachary (1959); Randhawa (1959); Venkataraman (1961); Pal *& al.* (1962); Ramanathan (1964); Prescott (1966, 1982); Philipose (1967); West & West (1978); Foged (1977); Gonzalves (1981); Iyengar & Desikachary (1981); Sarode & Kamat (1984); Sabat & Nayar, (1985, 1992) and other relevant literature. Different classes, order and families are arranged as per the system of classification proposed by Fritsch (1935, 1945), whereas genera and species are arranged alphabetically. Each species has been provided with up to date nomenclature and details of habitat. The number given in the parenthesis indicate the collection number, and the species are arranged alphabetically. The algal materials have been deposited in the Cryptogamic section of Botanical Survey of India, Howrah.

CLASS: CHLOROPHYCEAE

Order: VOLVOCALES
VOLVOCACEAE

Volvox aureus Ehr. Prescott, Algae of the Western Great lake area, 78, pl. 2. fig. 4, 1982; Tiffany and Britton, The algae of Ilinois, 18, Pl. 2, fig. 21, 1952.
Planktonic in Dhobi pond (71135) and Lotus pond (71110).

Order: CHLOROCOCCALES
CHLOROCOCCACEAE

Chlorococcum humicolo (Naegeli) Rabenhorst, Philipose, Chlorococcales, 73 fig. 3. 1967.
Free floating in Lotus pond (71110) and King's lake (71128).

HYDRODICTIACEAE

Hydrodiction reticulatum (Linn.) Lagerheim Philipose, Chlorococcales, 134, fig. 48. 1967.
Free floating in Prain's lake (71106) and King's lake (71128).

Pediastrum simplex Meyen Philipose, Chlorococcales, 113, figs. 36a-c, 1967.
Free floating in Dhobi pond (71110), Lotus pond (71135).

P. tetras (Ehr.) Ralfs. Philipose, Chlorococcales, 128, figs. 45a-c, 1967.
Planktonic in Prain's lake (71106).

SELENASTRACEAE

Actinastrum hantzschii Lagerheim, Philipose, Chlorococcales, 217, figs. 125 a-c, 1967.
Free floating in Sadir lakes (71107), Prain's lakes (711106) and Dhobi pond (71135).

Ankistrodesmus convolutus Corda, Philipose, Chlorococcale, 213, figs. 122 a-d. 1967.
Free floating in Lotus pond (71110).

A. falcatus (Corda) Ralfs. Philipose, Chlorococcales, 211, pl. 121, figs. a, e. 1967.
Free floating in Sadir lake (71107), King's lake (71128).

Kirchneriella lunaris (Kirchner) Moebius, Philipose, Chlorococcales, 222, fig. 131, 1967.
On most soil near Prain's lake (71106).

K. obesa (W. West) Schmidle, Philipose, Chlorococcales, 224, fig. 133, 1967.
On moist soil near Prain's lake (71106).

CHLORELLACEAE

Chlorella vulgaris Beijerinck. Philipose, Chlorococcales, 173, fig. 82, 1967.
Free floating in Dhobi pond (71135), Sadir lake (71107).

OOCYSTACEAE

Oocystis elliptica W. West. Philipose, Chlorococcales, 186, fig. 100, 1967.
Free floating in King's lake (71128).

COELASTRACEAE

Scenedesmus acuminates (Lagerheim) Chodat. Philipose, Chlorococcales, 251, fig. 161, 1967.
Free floating in King's lake (71128), Lerum lake (71109), Sadir lake (71107) and Dhobi pond (71135).

S. obliquus (Turpin) Kuetzing, Philipose, Chlorococcales, 248, fig. 159,1967.
Free floating in Prain's lake (71106), Dhobi pond (71135).

RADIOCOCCACEAE

Dispora cuneiformis (Schmidle) Printz. Philoipose, Chlorococcales, 193, fig. 107, 1967.
Free floating in Dhobi pond (71135).

Order: ULOTRICHALES
ULOTRICHACEAE

Binuclearia tectorum (Kütz) Beger ex Wichmann, Ramanathan, Ulotrichales, 60, pl. 17 A-V, 1964.
Free floating in Lerum lake (71119).

Schizomeris leibleinii Kuetzing, Ramanathan Ulotrichales, 57, pl. 2, 1964.
Free floating in King's lake (71128).

Ulothrix zonata Kuetzing Tiffany & Britton, The algae of Illinois, 24, pl. 5, fig. 35, 36, 1952.
Free floating in King's lake (71128) and Prain's lake (71106).

Uronema africanum Borge. Ramanathan, Ulotrichales, 51, pl. 13, H-L, 1964.
Attached on submerged aquatics in King's lake (71108).

U. gigas Vischer, Ramanathan Ulotrichales, 53, pl. 14 H-U, 1964.
Attached on submerged aquatic plants of Sadir lake (71107).

MICROSPORACEAE

Microspora amoena (Kütz.) Raben, Ramanathan, Ulotrichales, 132, pl. 29, figs, A-C, Z-W, Pl. 30 A, D-F, J. pl. 31, figs. A-D, pl. 37 fig. A-E, 1964.
Free floating in Prain's lake (71106).

Order: CLADOPHORALES
CLADOPHORACEAE

Cladophora glomerata (L.) Kuetzing Prescott, Algae of the western great lakes area, 138, pl. 20, figs. 8, 9 pl.. 21, figs 1, 2. 1982.
In stagnant water of earthen pots (71134/255., 249, 239), Lotus pond (71110) and Dhobi pond (71135).

Pithophora mooreana Collins, Prescott, Algae of the Western great lakes area, 140, pl. 22, figs. 5, 6, 1982.

Free floating in Lotus ponds (7110), Ohobi pond (71135), King's lakes (71128) and Prain's lake (71106).

Pithophora oedogonia (Mont) Wittrock, Prescott, Algae of the western great lakes area 140, pl. 22, figs. 7-10, 1982.
Free floating in Lerum lake (71119) and Lotus ponds (71110) forming tangled mats.

P. varia Wille, Prescott, Algae of the Western great lakes area, 140, pl. 24, fig. 5-6, 1982.
Free floating in King's lake (71128) and Sadir lake (71107).

Rhizoclonium crassipellitum West & West. Prescott, Algae of the Western great lakes area 141, pl. 23, fig l. 1982.
Free floating in Lerum lake (71119) and Dhabi pond (71135).

R. hieroglyphicum (Ag.) Kuetzing, Prescott, Algae of the Western great lakes area, 142, pl. 23, fig. 3, 1982.
Free floating in Lerun lake (71119) and Dhobi ponds (225, 245).

Order: CHAETOPHORALES
CHAETOPHORACEAE

Drapernaldia glomerata (Vaucher) Ag. Tiffany & Britton, The algae of Illinois, 38, pl. 11, fig. 80, 1952.
Attached on *Rhizoclonium* sp. in Dhabi pond (71135).

Stigeoclonium subsecundum Kuetzing Tiffany & Britton, The algae of Illinois, 36, pl. 8, fig. 68, 1952.
Attached on submerged logs in Lotus pond (71110).

COLEOCHAETACEAE

Coleochaete soluta (Breb) Pringsheim, Tiffany & Britton, The algae of Illinois, 214, pl. 10, fig. 73, 1952.
Free floating in Prain;s lake (71106).

Order: OEDOGONIALES
OEDOGONIACEAE

Oedogonium angustum (Him.) Tiffany. Prescott, Algae of the western great lakes area, 165, pl. 29, fig. 1, 2. 1982.
Attached on submerged aquatic in Sadir lake (71107).

O. anomalum Him., Prescott, Algae of the Western great lakes area 166, pl. 29, figs. 3,4, 1982.
Attached on submerged aquatic on Sadir lake (71107).

O. eardiaeum (Hass) Wittrock. Prescott, Algae of the western great lakes area, 168, pl. 29, figs. 7, 8, 1982.
Attached with submerged aquatic in King's lake (71128).

Oedogonium figaratum Tiff., Gonzalves, Oedogoniales, 323, fig. 9.202, 1981.
Free floating in Lerum lake (71112).

O. gallicum Hirn. Prescott, Algae of the western great lakes of area, 195, pl. 39 fig. 4. 1982.
Free floating in Sadir lake (71107), Dhobi pond (71135), Lotus pond (71110).

O. globosum Nordstedt, Prescott. Algae of Western greallakcs area, 178, pl. 31, fig. 1-3, 1982.
Growing on aquatic plants in Prain's lake (71109/204, 206).

O. majus (Hansg.) Tiffany. Gonzalves, Oedogoniales, 283, fig. 9. 161. 1981, Prescott, Algae of the western great lakes area, 172. 1982.
Free floating in King's lake (71128).

O. rivulare A. Braun, Prescott, Algae of the western great lake areas, 174, pl. 32, fig. 5, 6: 1982.
Epiphytic on submerged aquatics of Prain's lake, King's lake (71106/117, 71128/104).

O. tyrolicum Wittrock., Prescott. Algae of the Western great lakes area, 181, pl. 32, figs. 11, 1982.
Epiphytic on submerged aquatic plants in Prain's lake (71106).

O. varians Wittrock & Lundell. Prescott. Algae of the Western great lakes area 181, pl. 32, fig. 10, 1982.
Free floating in Lotus pond (7110/1 14), Dhobi pond (71135).

Order: CONJUGALES
ZYGNEMACEAE

Spirogyra ellipsospora Transeau, Randhawa, Zygnemaceae 323, fig. 304, 1959.
Free floating in Prain's lake (71106), Lerum lake (71119) and Lotus pond (71110).

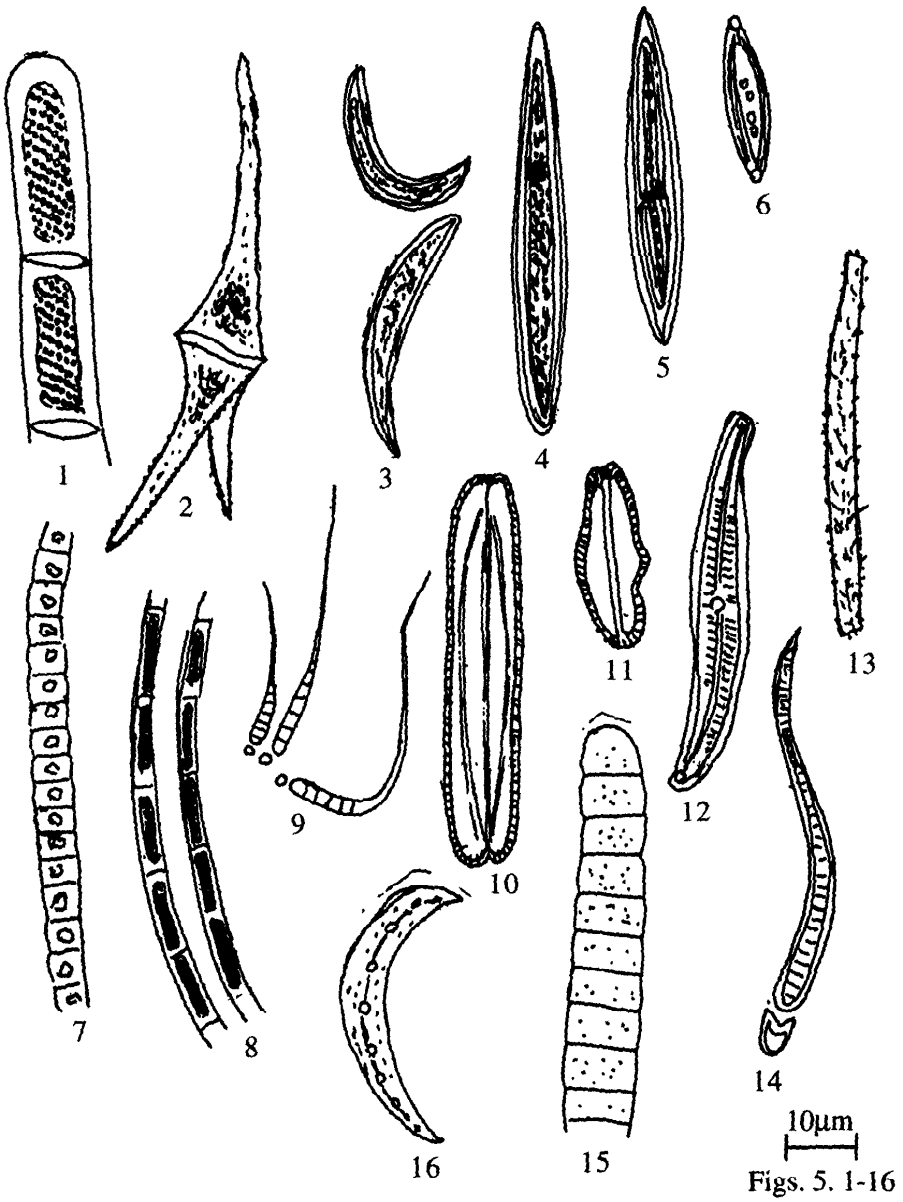
S. gracillis (Hassall) Kutzing, Randhawa, Zygnemaceae 296, figs. 253a-c, 1959.
Free floating in Lotus pond (7110) and stagnant water of earthen pots (71134/224).

S. maxima (Hassall) Wittrock., Randhawa, Zygnemaceae 348, fig. 356. 1959.
Free floating in Dhobi pond (71135), Sadir lake (71107).

S. neglecta (Hassall) Kutzing. Randhawa, Zygnemaceae 324, fig. 308, 1959.
In stagnant water of earthem pots (71134/201).

Zygnema cyanosparum Eleve, Randhawa, Zygnemaceae 225, fig. 159, 1959.
Free floating in King's lake (71128), Prain's lake (71106).

PLATE - 1



Figs. 5. 1-16

Figs. 1-16 : 1. *Spirogyra maxima*, 2. *Ceratium hirundiniella*, 3. *Closterium pervulum*, 4. *Closterium acerosum*, 5. *Closterium moniliferum*, 6. *Micrastehrias meissa*; 7. *Ulothrix zonata*, 8. *Tribonema bombycinum*, 9. *Rivularia aquatica*, 10. *Nitzschia amphibia*, 11. *Cyclotella comta*, 12. *Pleurosigma angulatum*, 13. *Gonatozygon pilosum*, 14. *Calothrix castethlii*, 15. *Oscillatoria subbrevis*, 16. *Closterium lanceolatum*.

MOUGEOTIACEAE

Mougeotia recurva (Hassall) de Toni 1889. Randhawa, Zygnemaceae 127, fig. 17, 1959.
Free floating in Dhobi pond (71135) and stagnant water of earthen pot (71134/140, 240).

Sirogonium reticulatum Randhawa, Randhawa, Zygnemaceae, 430, figs. 517a-c, 1959.
In stagnant water of earthen pot (71134/127) and Dhobi pond (71135).

GONATOZYGACEAE

Gonatozygon brebissonii de Bary, Tiffany & Britton, The algae of Illinois, 166, pl. 51, fig. 535, 1952.
Free floating in Dhobi pond (71135).

G. **pilosum** Wolle, Prescott, Algae of the Panama Canal and its tributaries, 2, 1966.
Free floating in King's lake (71128).

G. **ralfsii** de Bary, Prescott, Algae of the panama canal and its tributaries, 2, pl. 11, figs. 11,12,1966.
Free floating in Dhobi pond (71135) and Lotus pond (71110).

DESMIDIACEAE

Closterium acerosum (Schrank) Ehrenberg, Tiffany & Britton, The algae of Illinois, 169, pl. 52, fig. 550, 1952.
Free floating in King's lake (71128) and Lotus pond (71110).

C. **ehrenbergii** Meneghini, Tiffany & Blitton, The algae of Illinois, 172, pl. 52, Fig. 558. 1952.
Free floating in Lerum lake (71112).

C. **lanceolatum** Kuetzing, Tiffany & Britton, The algae of Illinois, 173, pl. 52, figs. 552, 1952.
Free floating in King's lake (71128), Sadir lake (71107).

C. **moniliferum** (Bory) Ehrenberg, Tiffany & Britton, The algae of Illinois, 172, pl. 52, fig. 549, 1952.
Free floating in Prain's lake (71116), King's lake (71128) Dhabi pond (71135) and Lotus panel (71110).

C. **pervulum** Naegeli Tiffany & Britton, The algae of Illinois, 173, pl. 51, fig. 543, 1952.
Free floating in King's lake (71128).

Cosmarium circulare Reinsch, Prescott, Algae of the Panama canals and its tributaries, 13, pl. 3, figs. 11, 1966.
Free floating in King's lake (71128), Prain's lake (71106) and Dhohi pond (71135).

C. connatum W. West, Prescott Algae of the Panama canal and its tributaries, 14, pl. 5, fig. 45, 1966.
Free floating in Lotus pond (71110) and Sadir lake (71107).

C. obtusatum Schmidle, Prescott, Algae or the Panama canal its tributaries, 19, pl. 4, figs. 26, 1966.
Free floating in King's lake (71128) and Sadir lake (71107).

Euastrum insulare Grönblad, Prescott, Algae of the Panama canals and its tributaries, 27, pl. 5, fig. 25, 1966.
Planktonic in King's lake 71128, Prain's lake (71109).

Micrasterias meissa Hassal., Prescott, Algae of the Panama canal and its tributaries, 30, pl. 10, fig. 4. 1966.
Free floating in Lerum lake (71119) and King's lake (71128).

Penium navicula Perty. Prescott, Algae of the Panmna canals and its tributaries, 4, pl. 4, fig. 2, 1966.
Planktonic in Lotus pond (71110).

Pleurotuenium ehrenbergii (Breb.) De Bary, Prescott, Algae of the Panama canals and its tributaries 9, pl. 12 fig. 1,1966.
Planking in Lotus pond (71110) and Lerun lake (71119).

Staurastrum dejectum Nordstedt., Prescott, Algae of the Panama canal and its tributaries, 34, pl. 9, figs. 28, 29, 1966.
Free floating in Dhobi pond (71135) and King's lake (71128).

Order : SIPHONALES
VAUCHERIACEAE

Dichotomosiphon tuberosus (A. Br.) Ernst., Venkataraman, Vaucheriaceae, 38, figs. 28a-f, 1961.
Free floating in Dhobi pond (71135/131).

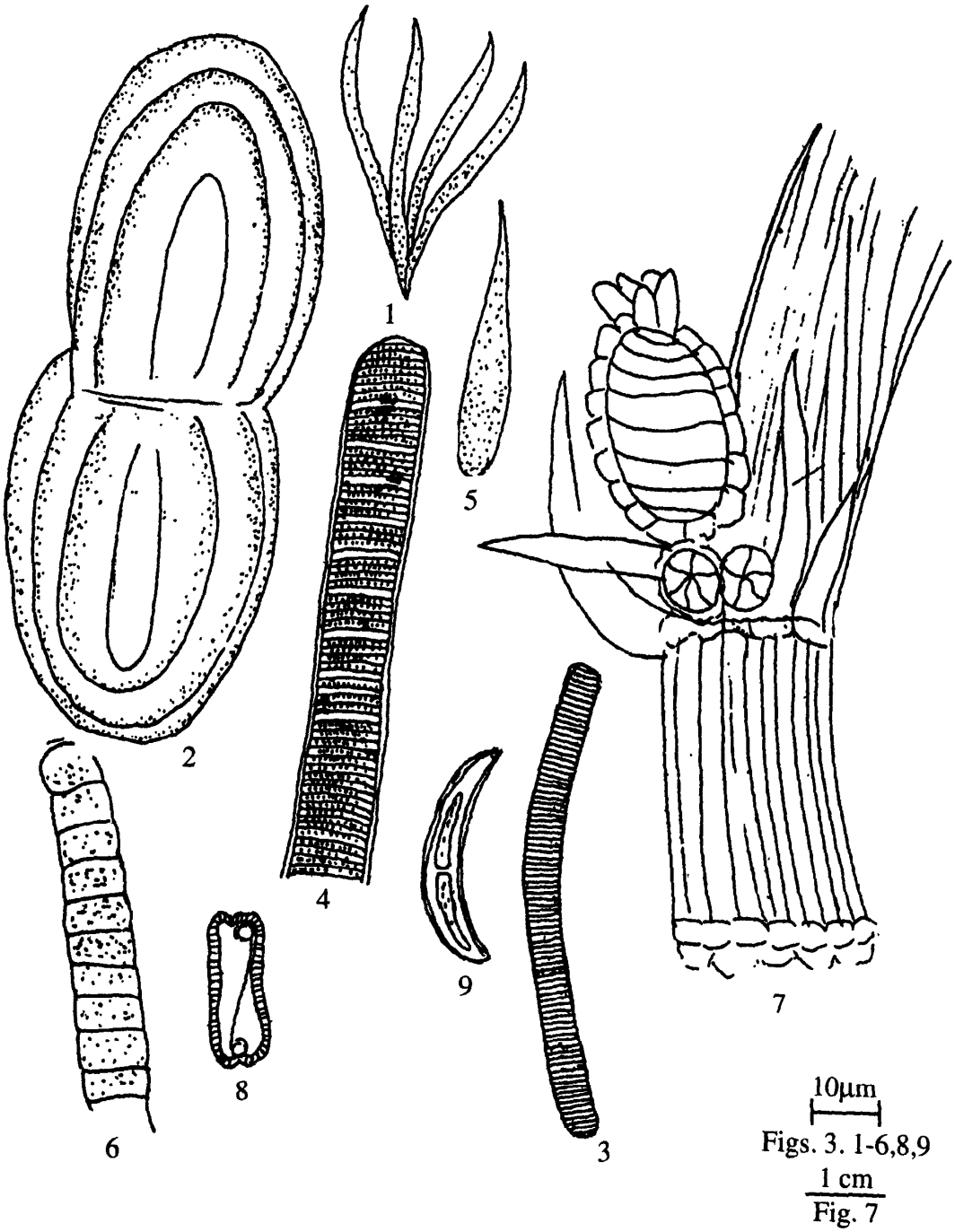
Vaucheria sessilis (Vanch) De Condole, Venkataraman, Vaucheriaceae, 68, fig. 469. 1961.
On moist soil near Sadir lake (252)

Order : CHARALES
CHARACEAE

Chara brachypus Braun., Pal Kundu Sundalingam & Venkataraman, Charophyta, III, fig. 259-260, 1962.
As benthic in stagnant water of earthen pots (71134), King's lake (71128).

C. braunii Gmelin, Pal, Kundu, Sundaralingam &. Venkataraman, Charophyta 89, figs 200-203, 1962.
As benthic in Prain's lake (71106) and Dhobi pond (71135).

PLATE - 2



Figs. 1-9 : 1. *Ankistrodesmus convolutus*, 2. *Cosmarium obtusatum*, 3. *Phormidium ambiguum*, 4. *Lyngbya ceylanica*, 5. *Euglena acus*, 6. *Phormidium retzii*, 7. *Chara brachypus*, 8. *Diatoma vulgare*, 9. *Closterium ehrenbergii*.

Chara zeylanica Willdenow, Pal, Kundu, Sundaralingam & Venkataraman, Charophyta, 105, figs. 253-255, 1962.
As benthos in King's lake (71128).

Nitella flagellifera Grooves &. Allen, Pal, Kundu, Sundaralingam, Venkataraman, Charophyta, 56, 1962.
As benthos in King's lake (71128).

Tolypella prolifera Lconhardi, Pal, Kundu, Sundaralingam & Venkataraman, Charophyta, 78, figs. 165-167, 1962.
King's lake (71128), Prain's lake (71106).

CLASS : XANTHOPHYCEAE

Order: HETEROTRICHALES
TRIBONEMACEAE

Tribonema bombycinum (Ag.) Derbes &. Solier., Prescott, Algae of the western great lakes area, 367, pl. 96, fig. 10, 1982.
Free floating in Dhobi pond (71135).

CLASS: BACILLARIOPHYCEAE

Order: PENNALES
FRAGILARIACEAE

Fragalaria brevistriata Grun., Foged, Freshwater Diatoms in Ireland, 60, pl. vi, fig. 15, 1977.
Free floating in Sadir lake (71107).

F. capucina Desmaz. Foged, Freshwater Diatoms in Ireland, 60, pl. vi, fig. 5, 1977.
Free floating King's lake (71128), Prain's lake (71106) and Dhobi pond (71135).

Synedra acus Kütz., Foged, Freshwater Diatoms in Ireland, 112, 1977.
Free floating in Dhobi pond (71135) and Lotus pond (71110).

S. pulchella (Ralfs) Kütz., Foged, Freshwater Diatoms in Ireland, 112, pl. vii, figs., 5, 6, 1977.
Free floating in Dhobi pond (71135) and King's lake (71128).

S. rumpens Kütz., Foged, Freshwater Diatoms in Ireland, 113, pl. vii, fig. 8,1977.
Free floating in King's lake (71106).

S. ulna (Nitzsch) Ehr., Foged, Freshwater Diatoms in Ireland, 113, pl. vii, figs. 1,2, 1977.
Free floating in King's lake (71128).

NAVICULACEAE

Caloneis bacillum *(Grun.) Mereschk.*, Foged, Freshwater Diatoms in Ireland, 32, pl. xx, fig. 6, 1977.
Free floating in Dhobi pond (71135).

Meridion circulare (Grev.) Ag., Paged, Freshwater Diatoms in Ireland, 75, pl. v, fig. 4, 1977.
Free floating in King's lake (71128).

Navicula bacillum Ehr., Foged, Freshwater Diatoms in Ireland, 76. pl. xxix, fig. 19, 1977.
Found in Scrappings or submerged brides in Dhabi pond (129).

N. pusilla W. Smith., Foged, Freshwater Diatoms in Ireland, 86, pl. xxvii, fig. 12, 1977.
Free floating in King's lake (71128) and Prain's lake (71106).

N. radiosa Kütz., Foged, Freshwater Diatoms in Ireland, 87, 1977.
Free floating in Prain's lake (71106) and Lotus pond (71110).

N. viridula Kütz. Foged, Freshwater Diatoms Ireland, 90, 1977.
Found in scrappings of submerged bricks in Dhobi pond (129).

N. viridula var. **capitata** Mayer, Foged, Freshwater Diatoms in Ireland, 90, pl. xxvii, fig. 9, 1977.
Free floating in Prain's lake (71109).

N. viridula var. **rostellata** (Cleve) Meister Sarode & Kamat, Freshwater Diatoms of Maharashtra, 127, pl. 14, fig. 329, 1984.
Free floating in King's lake (71128) and Sadir lake (71107).

Pinnularia borealis Ehr., Foged, Freshwater Diatoms in Ireland, 100, pl. xxxiii, figs. 8.9, 1977.
Free floating in Prain's lake (71109).

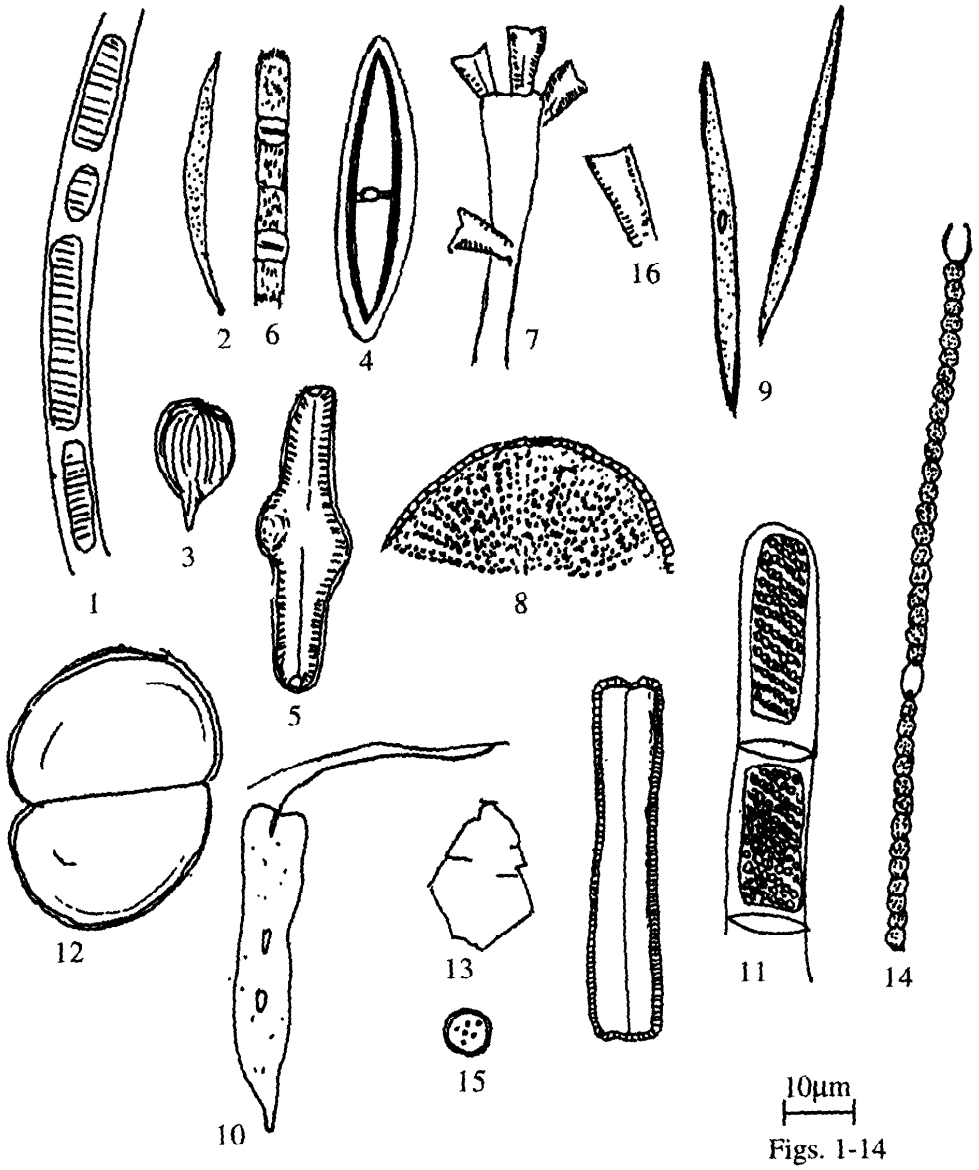
P. viridis (Nitzsch) Ehr., Faged, Freshwater Diatoms in Ireland, 105, pl. xxxii, fig. 3, pl. xxxiv, fig. 1, 1977.
Free floating in Dhobi pond (71135).

Pleurosigma angulatum (Querett) W. Smith, Sarode & Kamat, Freshwater Diatoms of Maharashtra, 69, pl. 8, fig. 156, 1984.
Free floating in Lerum lake (71112), Lotus pond (71110) and Dhobi pond (71135).

P. elongatum W. Smith, Sarode & Kamat, Freshwater Diatoms of Maharashtra, pl. 8, fig. 158, 1984.
Free floating in Lerum lake (71119).

P. salinarum Grun., Sarode & Kamat, Freshwater Diatoms of Maharashtra, 70, pl. 8, fig. 157, 1984.
Free floating in Dhobi pond (71135).

PLATE - 3



Figs. 1-14

Figs. 1-16 : 1. *Lyngbya semiplena*, 2. *Ankistrodesmus falcatus*, 3. *Phacus acuminatus*, 4. *Navicula radiosa*, 5. *Rhopalodia gibba*, 6. *Melosira islandica*, 7. *Gomphonema abbreviatum*, 8. *Coscinodiscus locustris*, 9. *Synedra acus*, 10. *Euglena oxyuris*, 11. *Spirogyra maxima*, 12. *Cosmarium circulare*, 13. *Euastrum insulare*, 14. *Anabaena ambigua*, 15. *Chlorella vulgaris*, 16. *Synedra ulna*.

Stauroneis anceps Ehr., Foged, Freshwater Diatoms in Ireland, 106, 1977.
Free floating in Sadirlake (71107) and Lotus pond (71110).

MELOSIRACEAE

Cyclotella comta (Ehr.) Kütz., Foged, Freshwater Diatoms in Ireland, 36, pl. II, figs. 6,7, 8, 1977.
Free floating in Dhobi pond (71135).

C. meneghiniana Kütz., Foged, Freshwater Diatoms in Ireland, 37, pl. ii, figs. 17, 18, 1977.
Free floating in King's lake (71128).

Melosira islandica O. Müller, Foged, Freshwater Diatoms in Ireland, 74, pl. 1, fig. 13, 1977.
Free floating in King's lake (71128) and Dhobi pond (71135).

EUNOTIACEAE

Eunotia major (W. Smith) Rabh., Foged, Freshwater Diatoms in Ireland, 56, pl. xii, fig. 12, 1977.
Free floating in Dhobi pond (71135).

E. tschirchiana O. Muell. Sarode & Kamat, Freshwater Diatoms of Maharashtra, 47, pl. 4, fig. 88, 1984.
Free floating in King's lake (7ll28).

NITZSCHIACEAE

Nitzschia amphibia Grun., Foged, Freshwater Diatoms in Ireland, 93, pl. xLv, figs. 5,6,7, 1977.
Free floating in King's lake (71128).

N. angustata var. **acuta** Grun., Poged, Freshwater Diatoms in Ireland, 93, pl. xLiv, fig. 5, 1977.
Free floating in Sadir lake (71107).

N. apiculata (Greg.) Grnu., Foged, Freshwater Diatoms in Ireland, 94, pl. xliii, fig. 11, 1977.
Free floating in King's lake (71128) and Dhobi pond.(71135).

N. linearis W. Smith, Foged, Freshwater Diatoms in Ireland, 96, 1977.
Free floating in King's lake (71128).

CYMBELLACEAE

Cymbella aspera (Ehr.) Cleve, Foged, Freshwater Diatoms in Ireland, 40, 1977.
Free floating in Sadir lake (71107) and Lotus pond (71110).

C. cesatii (Rabh.) Grun., Foged, Freshwater Diatoms in Ireland, 40, pl. xxxiv, fig. 15. pl. xxxv, fig. 4, 1977.
Free floating in Lerum lake (71112) and Prain's lake (71109).

Cymbella cuspidata Kütz.., Foged. Freshwater Diatoms in Ireland. 40. pl. xxxix, fig. 25, 1977.
Free floating in Prain's lake (71106).

C. cymbiformis (Ag.) van Heurck., Foged, Freshwater Diatoms in Ireland, 41, pl. xxxix, fig. 1, 1977.
Free floating in King's lake, (71128) and Lotus pond (71110).

C. lanceolata (Ehr.) van Heurck, Foged, Freshwater Diatoms in Ireland, 43, pl. xxxvii, fig. 2,1977.
Attached on *Rhizoclonium* sp. in Prain's lake (71106).

C. tumida (Breh.) van Heurck, Foged, Freshwater Diatoms in Ireland, 46, pl. xxxvii, fig. 8,1977.
Attached on *Rhizoclonium* sp. in Prain's lake (71109).

C. turgida (Greg.) Cleve, Foged, Freshwater Diatoms in Ireland, 46, pl. xxxvi, fig. 6, 1977.
Attached on *Cladophora* sp. in King's lake (71128) and Dhobi pond (71135).

GOMPHONEMACEAE

Gomphonema abbreviatum (Ag.) Kütz., Foged, Freshwater Diatoms in Ireland, 65, pl. xLii, figs 2, 3, 1977.
Free floating in King's lake (71109).

G. acuminatum Ehr., Foged, Freshwater Diatoms in Ireland, 65, pl. xl, figs. 2, 7, 1977.
Attached on green filamentous algae in Lerum lake (71119).

G. constrictum Ehr., Foged, Freshwater Diatoms in Ireland, 67, pl. xli, figs. 15,22, 1977.
Attached on green filamentous algae in Dhobi pond (71135) and Lotus pond (71110).

G. lanceolatum Ehr., Foged, Fresh water Diatoms in Ireland, 68, pl. xl, fig. 23, 1977.
Attached on filamentous green algae in Lotus pond (71110).

G. parvulum (Kütz.) Grun., Foged, Freshwater Diatoms in Ireland, 69, pl. xlii, fig. 4, 1977.
Attached on filamentous green algae in King's lake (71128).

G. subtile Ehr., Foged, Freshwater Diatoms in Ireland, 70, pl. xlI, fig. 6, 1977.
Attached on filamentous green algae in King's lake (71128) and Lotus pond (71110).

Rhopalodia gibba (Ehr.) O. Müller, Foged, Freshwater Diatoms in Ireland, 106, 1977.
Free floating in Prain's lake (71109).

COSCINODISCACEAE

Coscinodiscus locustris Grum., Sarode & Kamat, Freshwater Diatoms of Maharashtra, 22, pl. 1, fig. 14, 1984.
Free floating in King's lake (71128).

Coscinodiscus radiaus Kütz., Foged, Freshwater Diatoms in Ireland, 27, pl. 18, fig. 22.1977.
Free floating in King's lake (71128) and Lerum lake (71119).

DIATOMACEAE

Diatoma vulgare Bory., Foged. Freshwater Diatoms in Ireland, 48, pl. v, fig. 8, 1977.
Planktonic in Dhobi pond (71135).

CLASS: DINOPHYCEAE

Order: DINOFLAGEALES
CERATIACEAE

Ceratium hirundiniella (OFM) Dujardin., Prescott, Algae of the Western great lakes area, 437, pl. 92, fig. 4, 5, 1982.
Planktonic in Prain's lake (71106).

CLASS: EUGLENINAE

Order: EUGLENALES
EUGLENACEAE

Euglena acus Ehr., Prescott, Algae of the Western great lakes area, 390, pl. 85, fig. 28; 1982.
Free floating in Lotus pond (71110) and Lerum lake (71119).

E. breviflagellum Prescott & Gojdies, Prescott, Algae of the Western great lakes area, 391, pl. 86, figs. 7-9, 14, 1982.
Free floating in Sadir lake (71107) and Dhobi pond (71135).

E. elastica Prescott, Algae of the Western great lakes area, 392, pl. 86, figs. 10-12, 1982.
Free floating in King's lake (71128), Lerum lake (71119) and stagnant water of earhen pots (71134).

E. gracilis Klebs, Prescott, Algae of the Western great lakes area, 393, pl. 85, fig. 17, 1982.
Free floating in Lotus pond (71110), Dhobi pond (71135) and Lerum lake (71119).

E. oxyuris Schmarda, Prescott, Algae of the Western great lakes area, 393, pl. 85, fig. 18. 1982.
Free floating in King's lake (71128), Prain's lake (71109) and Lotus pond (71110).

E. polymorpha Dangeard, Prescott, Algae of the Western great lakes area, 393, pl. 85, figs. 21, 22, 1982.
Free floating in Sadir lake (71107) and Prain's lake (71106).

E. tripteris (Duj.) Klebs, Prescott, Algae of thc Western great lakes area, 394, pl. 86, fig, 4-6, 1982.
Free floating in King's lake (71118), Lerum lake (71112) and Dhohi Pond (71135).

Phacus acuminatus Stokes, Prescott, Algae of the Western great lakes area, 396, pl. 88, fig, 4, 1982.
Free floating in Prain's lake (71106), Sadir lake (71107), King's lake (91128) and Dhobi ponds (71135).

P. caudatus Huebner, Prescott, Algae of the Western great lakes area, 398, pl. 87, fig. 13, 1982.
Free floating in Lotus pond (71110), Prain's lake (71109) and Sadir lake (71107).

Trachelomonas volvocina Ehr., Prescott, Algae of the Western great lakes area, 419, pl. 83, figs. 1, 7, 8, 1982.
Free floating in King's lake (71111).

CLASS : RHODOPHYCEAE

Order: BANGIALES
ERYTHROTRICHIACEAE

Compsopogon coeruleus (Balbis) Mont., Smith, The fresh water algae of United States, 610, fig. 531, 1950.
Free floating in King's lake (71128) and Dhobi pond (71135).

Note: It is commonly found in major lakes and ponds of Indian Botanic Garden.

CLASS : CYANOPHYCEAE

Order : CHROOCOCCALES
CHROOCOCCACEAE

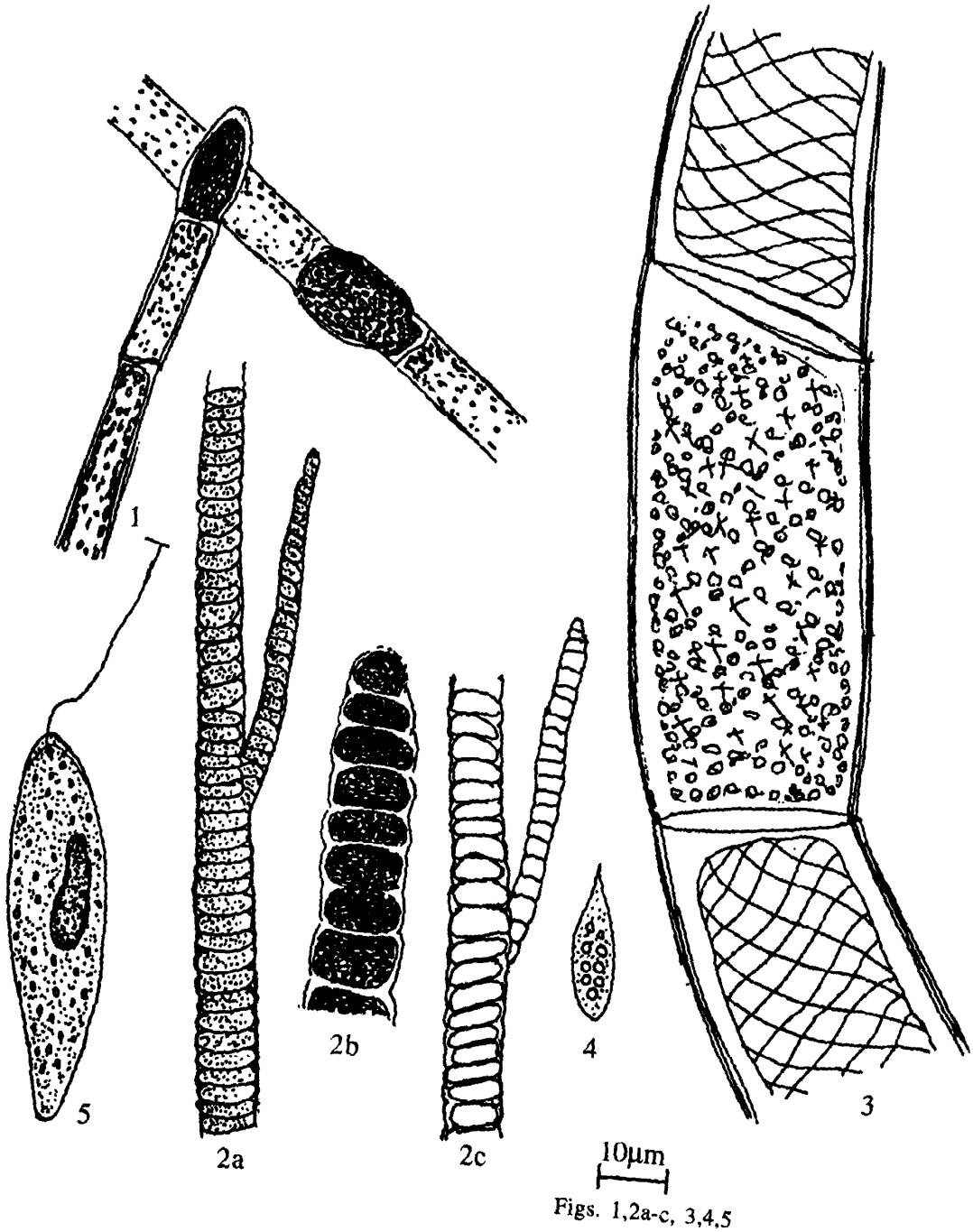
Gloeocapsa atrata (Turp.) Kütz., Geitler, Kryptogamen flora 188, 1932, Desikachary, Cyanophyta, 116, pl. 24, fig. 8, 1959.
On moist walls near Dhobi pond (71134).

G. rupestris Kütz. Geitler, Kryptogamen flora 194, figs. 88e, 89, 1932, Desikachary, Cyanophyta, 117, pl. 25, fig. 4, 1959.
Epiphytic on some aquatic plants in Dhobi pond (71135) and Lotus pond (71110).

Microcystis aeruginosa Kütz., Geitler, Kryptogamen flora 137, fig. 59d, 1932; Tiffany & Britton, The algae of Illinois, 336, pl. 91, figs. 1953, 1054, 1952, Desikachary, Cyanophyta, 93, pl. 17, figs. 1,2,6, and pl. 18, fig. 10, 1959.
Free floating in Dhobi pond, (71135) and Lotus pond (71110).

M. convoluta Breb., Geitler Kryptogmenflora, 262, 1932; Tiffany and Britton, The algae of Illinois, 334, pl. 91, fig. 1051, 1952; Desikachary, Cyanophyta, 152, pl. 29, figs. 8, 12, 13, 1959.
Planktonic in Prain's lake (71106) and in Lotus pond (71110).

PLATE - 4



Figs. 1,2a-c, 3,4,5

Figs. 1-5: 1. *Pithophora oedogonia*, 2a-c *Compsopogon coeruleus*, 3. *Spirogyra ellipsospora*, 4. *Euglena polymorpha*, 5. *Euglena gracilis*.

Order: NOSTOCALES

OSCILLATORIACEAE

Lyngbya aerugineo-coerulea (Kütz.) Gom., Geitler Kryptogamen flora 1062, figs. 670, 1932; Desikachary, Cyanophyta, 315, pl. 48, fig. 9, 1959.

On bark of trees (71134/111), on stagnant water of earthen pots (71134) of *Nymphaea* sp. culture and Dhabi pond (71135).

L. aestuarii Liebm. ex Gomont., Geitler Kryptogamen flora 1052, figs. 666, 1932; Tiffany & Britton, The algae of Illinois, 339, pl. 92, figs. 1069, 1065, 1952; Desikachary, Cyanophyta, 305, pl. 52, fig. 8, 1959.

Free floating in Prain's lake (71106), Sadir lake (71107), Lerum lake (71119), and King's lake (71128).

L. allorgei Fremy, Geitler, Kryptogamen flora, 1059 figs. 671, 1932, Desikachary, Cyanophyta, 313, pl. 54, fig. 6, 1959.

On moist soil near Dhobi pond (71134/209) and serapings of the submerged object in flowing waters of tap in Indian Botanic Garden (71134/208).

L. ceylanica Wille, Geitler, Kryptogamen flora, 1054 figs. 668a, 1932; Desikachary, Cyanophyta, 299, pt 54, fig. 4, 1959.

Free floating in King's lake (71109).

L. semiplena (C. Ag.) J. Ag. ex Gamont., Geitler, Kryptogamen flora, 1061, fig. 672a, 1932; Desikachary, Cyanophyta, 315, pl. 49 figs. 8; pl. 52, fig. 7, 1959.

In stagnant water of Dhobi pond (71135) and Lotus pond (71110).

L. subtilis West, W., Geitler, Kryptogamen flora, 1046, 1932, Desikachary, Cyanophyta, 294, pl. 1959.

On the bark of *Borrassus flavelifer* (71134/111).

Oscillatoria acuminata Gomont, Geitler Kryptogamen flora, 978, fig. 603 d, 1932; Desikachary, Cyanophyta 240, pi 38, fig. 7; pl. 40. fig. 13, 1959.

Free floating in Sadir lake (71109) and Lotus pond (71110).

O. acuta Bruhl et Biswas in J. Dept. Sci. Calcutta, Univ., 5: 3 pl. 1, figs. 6a-b, 1922; Geitler, Kryptogamen flora 978, 1932; Desikachary, Cyanophyta, 240, pl. 39, figs. 5,8, 1959.

On road slimes (138).

O. amphibia Ag., Geitler, Kryptogamen flora, 966, 1932; Desikachary, Cyanophyta, 229, pl. 37, fig. 6, 1959.

Planktonic in Dhobi ponds (71135), King's lake (71128) and on the moist soil (102).

Oscillatoria limosa Ag. ex Gamont, Geitler Kryptogamen flora 944, fig. 598d, 1932; Desikachary, Cyanophyta, p.206, pl. 42, fig. 11 and pl. 38, fig. 1, 1959.
In stagnant fresh water of earthen pots of Indian Botanic Garden (140, 138, 14, 144, 145).

O. princeps Vauch. ex Gomont., Geitler, Kryptogamen flora, 947, figs. 598 a, 601 e-g, 1932; Desikachary, Cyanophyta 210, pl. 37, fig. 1, 10, 11, 13, 14, 1959.
On moist soil near King's lake (71128, 102, 123, 126).

O. subbrevis Schmidle, Geitler Kryptogamen flora, 49, fig. 601b, 1932; Desikachary, Cyanophyta, 207, pl. 37, fig. 2; pl. 40, fig. 1,1959.
In stagnant water of earthen pots (71134) in Indian Botanic Garden and Lerum lake, (71119).

O. tenuis ag. ex Gomont, Geitler, Kryptogamen flora, 959, fig. 611 f-g, 1932; Desikachary, Cyanophyta, 222, pl. 42, fig. 15, 1959.
Free floating King's lake (71128), Lotus pond (7110) in and on moist soils as slimy masses (102, 145).

Phormidium ambiguum Gom. Geitler Kryptogamen flora, 1015, figs. 647C, 1932; Desikachary, Cyanophyta, 266. pl. 4, fig. 16 and pl. 45, fig. 5-8, 1959.
Attached on the submerged aquatic plants, (226, 241) in Prain's lake (71106).

P. calcicocola Gardner, Geitler Kryptogamen flora, 1013, figs. 646a, 1932, Desikachary, Cyanophyta, 267, pl. 43, figs. 4, 5. 1959.
Attached on, *Spirogyra* sp. in Prain's lake (71106).

P. fragile (Meneghini) Gomont, Geitler Kryptogamen flora, 999, fig. 636b, 1932; Desikachary, Cyanophyta, 253, pl. 44, figs. 1-3, 1959.
Free floating in Prain's lakes (71106), Dhobi ponds (71135) and on moist-soil (119).

P. retzii (Ag.) Gomont, Geitler Kryptogamen flora 1012. fig. 647, 1932; Desikachary, Cyanophyta, 268, pl. 44, figs. 13, 15, 1959.
Attached on submerged aquatic macrophytes in King's lake (71128) and Prain's lake (71116, 102).

P. tenue (menegh) Gom., Geitler Kryptogamen flora 1004, figs. 642 d, e, 1932; Desikachary, Cyanophyta, 259, pl. 43, figs. 13-15 & Pl. 44, figs. 7-9, 1959.
Attached to the submerged aquatic plants, and free floating in King's lake (71128), Lotus pond (71110), stagnant water in earthen pots of *Nymphaea* sp. cultures (71134).

Spirulina major Kuetzing., Geitler Kryptogamen flora 930, figs. 595, 1932; Desikachary, Cyanophyta, 196, pl. 36, figs. 13, 1959.
Planktons in Dhobi pond (71135), Lotus pond (71110) and stagnant water of earthern pots of *Nymphaea* sp. culture, (71134).

NOSTOCACEAE

Anabaena ambigua Rao, C.B., Desikachary, Cyanophyta, 400, pl. 76, fig. 2, 1959.
Epiphytic on submerged plants in Prain's lake (71106)

A. circinalis (Kuetzing) Raben., Geitler Kryptogamen flora 981, fig. 5729, 1932; Desikachary, Cyanophyta, 414, pl. 77, fig. 2.,1959.
In Sadir lake (71107), Prain's lake (71106) and in stagnant water of' earther pots (71134).

A. spherica Barnet et Flahault., Geitler, Kryptogamen flora 878, 1932; Desikachary, Cyanophyta, 393, 1959.
Free floating in King's lake (71128) and Lotus pond (71110).

Cylindrospermum doryphorum Bruhl et Biswas, Desikachary, Cyanophyta, 368, pl. 65, Fig. 2, 1959.
In stagnant water of earthen pots (71134) and Dhobi pond (71135).

Nostoc ellipsporum (Desm.) Raben. ex Born *et* Flah., Geitler, Kryptogamen flora 841, Fig. 533, 1932, Desikachary, Cyanophyta, 383, pl. 69, fig. 5, 1959.
In moist soil (10l), near Dhabi pond.

N. linckia (Roth) Bornet ex Barnet *et* Flah., Geitler Kryptogamen flora, 838, fig. 528 b, 1932; Desikachary, Cyanophyta 377, pl. 69, fig. 4. 1959.
In stagnant water of earthen pots of *Nymphaea* sp. culture (71134/238).

Order: STIGONEMATALES
STIGONEMATACEAE

Stichosiphon sansibaricus (Hieron) Drouet *et* Daily, Geitler, Kryptogamen flora, 14: 411, 1932; Desikachary, Cyanophyta, 176, pl. 32, figs. 9-13, pl. 33, fig. 8-10,1959.
Epiphytic on other algae in Sadir lake, (71107, 137).

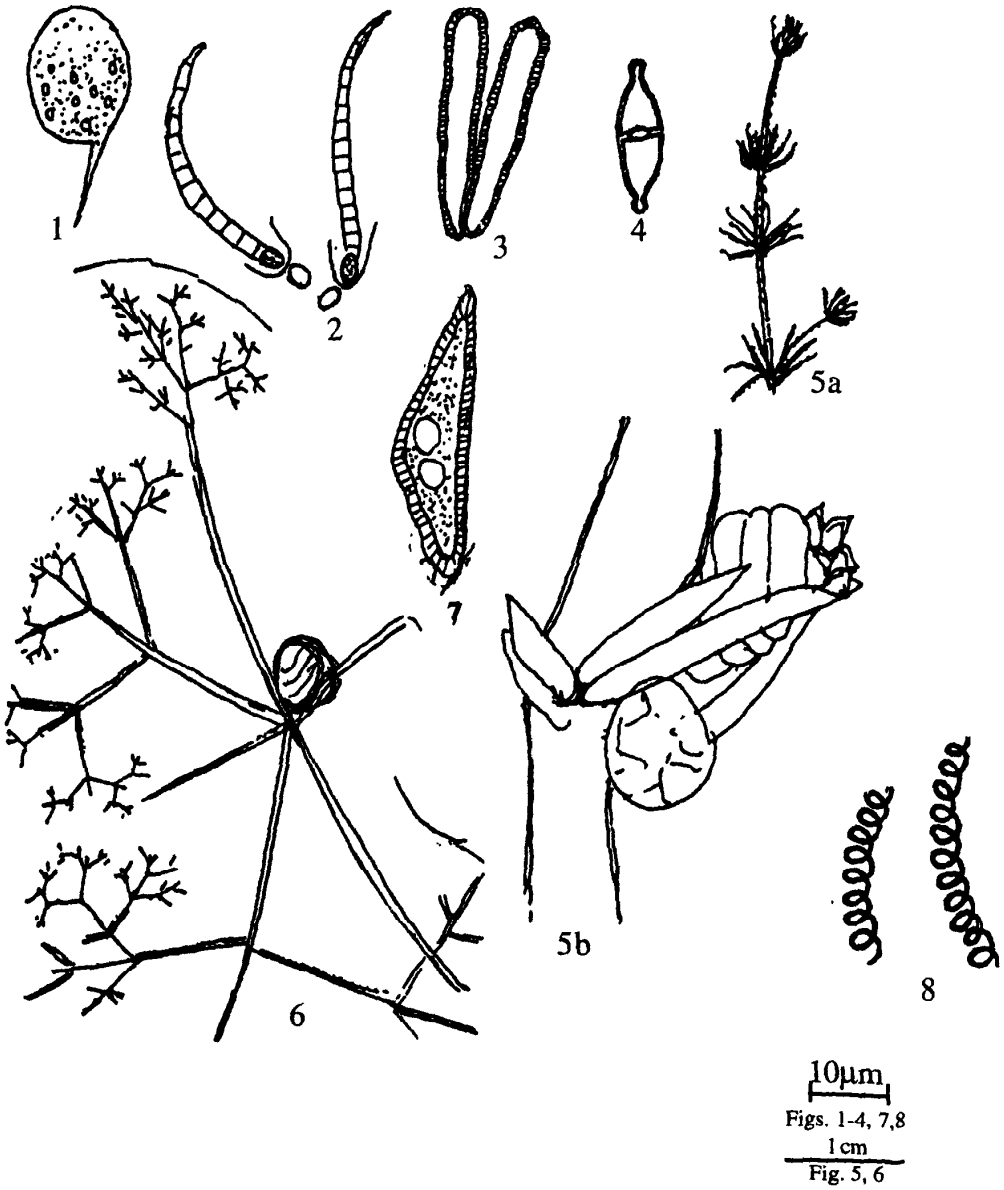
S. ocellatum (Dillw.) Thuret ex Born *et* Flah., Geitler, Kryptogamen flora, 504, fig. 305-307, 1932; Desikachary, Cyanophyta, 607, pl. 138, fig. 2, 1959.
Attached on other algae in Prain's lake (71106), King's lake (71128).

RIVULARIACEAE

Calothrix castellii (Massal) Born *et* Flah., Geitler, Kryptogamen flora, 611, fig. 385, 1932; Desikachary, Cyanophyta, 529, pl. 114, fig. 7. 1959.
In Dhobi pond (71135) attached on other algae.

Gloeotrichia echinulata (J.E.) Smith Geitler, Kryptogamen flora, 642, fig 409, 1932; Desikachary, Cyanophyta, 556, pl. 116, figs, 9, 10, 1959.
Free floating in Sadir lake (71107).

PLATE - 5



Figs. 1-8: 1. *Phacus caudatus*, 2. *Gloeotrichia echinulata*, 3. *Meridion circulare*, 4. *Nitzschia angustata var. acuta*, 5a-b. *Chara zeylanica*, 6. *Nitella flagellifera*, 7. *Gomphonema parvulum*, 8. *Spirulina major*.

Gloeotrichia natans (Hedwig) Rabenhorst, Geitler, Kryptogamen flora 639, figs. 406, 407, 1932, Desikachary, Cyanophyta, 561, pl. 118, fig. 715.1959.
Free floating in Lerum lake (71119) and Lotus pond (71110).

Raphidiopsis curvata Fritsch, Tiffany & Britton, The algae of Illinois, 378, pl. 105, fig. 1167, 1170, 1952.
Free floating in Prain's lake (71106) and Sadir lake (71107).

Rivularia aquatica De Wilde, Geitler, Kryptogamen flora 652, 1932; Desikachary, Cyanophyta, 552, 1959.
Attached on *Nitella* sp. in King's lake (71128).

SCYTONEMATACEAE

Scytonema rivulare Borri ex Born et Flah., Geitler Kryptogamen flora 751, 1932; Desikachary, Cyanophyta, 452, pl. 100, Fig. 2, 1959.
Free floating in Prain's lake (71106).

Tolypothrix tenuis (Kütz.) Johs Desikachary, Cyanophyta, 494, pl. 102, fig. 4, 1959.
On moist walls (212) and moist soils (102).

ACKNOWLEDGEMENTS

The authors are grateful to the Director, Botanical Survey of India, Kolkata for encouragements and to the Joint Director, Botanical Survey of India, Northern Circle, Dehradun for providing facilities.

REFERENCES

Banerji, J.C. Studies on the Myxophyceae of lower Bengal. I. *J. Indian, Bot. Soc.* 15: 285-302. 1936.
———— Studies on Myxophyceae of lower Bengal. II. *J. Dept. Sci. Calcutta Univ.,* 1 : 95-109. 1938.
Biswas, K. Road slimes of Calcutta, *J. Dept. Sci.,* 7: 1-10. 1925.
———— Flora of Salt lakes, Calcutta, *Ibid,* 8: 1-47,1926.
———— Flora of Salt lake, Kolkata. *J. Deptt. Sci. Calcutta Univ.* 8: 1-114. 1927.
Bruhl, P. and K Biswas. Algae of Bengal filter beds. *J. Dept. Sci.,* 4: 1-17. 1922.
———— and ———— Indian bark algae. *Ibid,* 5: 1-22. 1923.
Carter, N. Fresh water algae from India, *Rec. Bot. Surv. India,* 2: 263-302. 1926.
Desikachary, T.V. *Cyanophyta,* Indian Council of Agricultural Research, New Delhi. 1959.
Foged, N. Freshwater Diatoms in Ireland. West Germany. 1977.
Fritsch, F.E. The structure and reproduction of the algae. Vol. I, II, Cambridge University Press, London, 1935, 1945.
Geitler, L. Kryptogamen.flora, Koeltz Sckentific Books, West Germany 1932.
Gonzalves, E.A. *Oedogoniales.* Indian Council of Agricultural Research, New Delhi. 1981.
Gupta, D. Some new records of blue-green algae from West Bengal. *Bull. Bot. Soc. Bengal,* 19: 1-2. 1965.
———— Some new records of blue-green algae from West Bengal. II. *Ibid.* 29-31. 1975.
Iyengar, M.O.P. and T.V. Desikachary. *Volvocales,* Indian Council of Agricultural Research, New Delhi. 1981.
Maity, H. and S.C. Santra, Blue-green algal flora of 24-Parganas West Bengal (India). *Phykos.* 24: 46-51. 1985.

MUKHOPADHYAY, A. AND P. CHATTERJEE. A checklist of blue-green algae from the paddy fields of 24-Paraganas and Howrah distict of West Bengal. *Ibid.* 20(1 & 2): 81-84. 1981.

PAL, B.P., B.C. KUNDU, V.S. SUNDARALINGAM AND G.S. VENKATARAMAN. *Charophyta,* Indian Council of Agricultural Research, New Delhi. 1962.

PAL, T.K. AND S.C. SANTRA. Contribution to the Cyanophyceae of Murshidabad. *Phykos,* 21: 150-152. 1982.

PAL, U.C. AND S.C. SANTRA. Algal flora of Midnapore, West Bengal (India): 1, Cyanophyceae. *Ibid.* 24: 12-17. 1985.

PHILIPOSE, M.T. *Chlorococcales,* Indian Council of Agricultural Research, New Delhi. 1967.

PRAIN, D. The vegetation of the districts of Hugli, Howrah and the 24-Paraganas. *Rec. Bot Surv. India* 3: 143-339. 1905.

PRESCOTT, G.W. Algae of the Western great lakes area. Bishen Singh Mahendra Pal Singh; Dehradun. 1982.

PRESCOTT, G.W. Algae of the Panama Canal and its tributaries-ii. Conjugales. *Phykos* 5(1-2) : 1-49. 1966.

RAMANATHAN, K.R. *Ulotrichales,* Indian Council of Agricultural Research, New Delhi. 1964.

RANDHAWA, M.S. *Zygnamaceae,* Indian Council of Agricultural Research, New Delhi. 1959.

SABAT, B.C. AND M.P. NAYAR. Taxonomy of algae of river Hoogly. *Bull. Bot. Surv. India.* 34 (1-4): 94-204. 1992.

SABAT, B.C. AND M.P. NAYAR. Phytoplanktonic studies in river Hoogly. *Ibid.* 27 (1-4): 219-221. 1985.

SARODE, P.T. AND N.D. KAMAT. Fresh water diatoms of Maharashtra. Saikripa Prakashan, Aurangahad. 1984.

SINHA, J.P. AND D. MUKHERJEE. On blue-green algae from the paddy field of Bankum district of west Bengal. 1. *Phykos,* 14: 117-118. 1975.

SMITH, G.M. The fresh water algae of the United States, Mc Graw Hill Book Company, I.N.C. 1950.

TIFFANY, L.H. AND M.E. BRITTON. The algae of Illinois. The University of Chicago Press. Chicago. 1952.

VENKATARAMAN, G.S. *Vaucheriaceae,* Indian Council of Agricultural Research, New Delhi, 1961.

WEST, W. AND G.S. WEST, Freshwater algae from Burma, Including a few from Bengal and Madras, periodical experts Book Agency, 1978.

भारतीय वनस्पति उद्यान, हावड़ा, पश्चिम बंगाल के शैवाल वनस्पतिजात

आँखि साउ एवं आर. के. गुप्ता

सार संक्षेप

दिसम्बर 1998 से नवम्बर 2001 अवधि में भारतीय वनस्पति उद्यान के शैवाल (algal) वनस्पतिजात का सर्वेक्षण किया गया। मुख्यतः साइनोफाइसी, क्लोरोफाइसी एवं बेसिलेरियोफाइसी के साथ 79 जेनेरा के कुल 167 टैक्सा का पहली बार अंकन हुआ।