

Studies on freshwater algae of Mumbai and its environs

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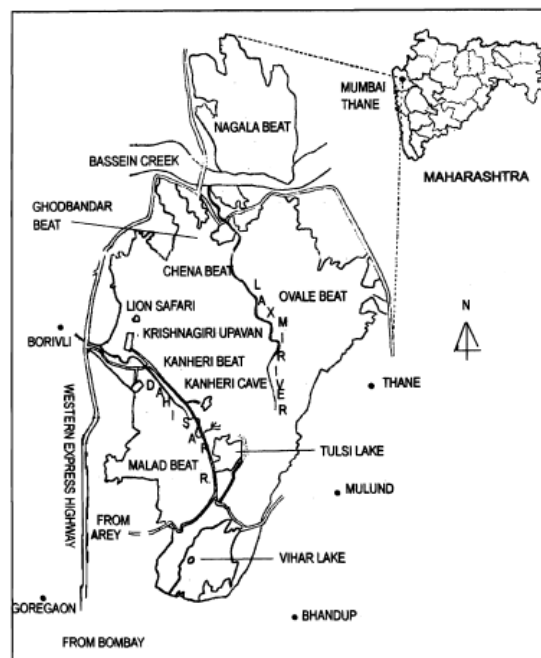
Abstract

Present communication deals with morpho-taxonomic study of 37 taxa belonging to Cyanophyceae, Chlorophyceae, and Xanthophyceae. Algal samples were collected from freshwater bodies of Kanheri Caves in Sanjay Gandhi National Park and Dahisar River, Mumbai. These taxa belong to 25 Genera, 37 species. Cyanophyceae is represented by 9 genera and 11 species, Chlorophyceae by 14 genera and 25 species and a single taxon from Xanthophyceae.

Key Words: Fresh water Algae, Sanjay Gandhi National Park, Mumbai.

INTRODUCTION

Sanjay Gandhi National Park (previously known as Krishnagiri Upawan and later as Borivali National Park) is amongst the four National Parks in Maharashtra, a beautifully preserved green oasis within the confines of Mumbai Metropolis and the adjacent Thane district. This Park (SGNP) is situated about 25 km North of Mumbai city and is only 8 kms from the shores of Arabian Sea at 19.23° N and 72.86° E. The park exhibits a wide diversity of terrain from 30 m to almost 500 m amsl (above mean sea level) and presents varied habitats ranging from coastal to typical dry and mixed deciduous forests of Northern Western Ghats. There are two water bodies (Tulsi and Vihar lakes) with a combined water spread area of about 8.62 km² and also of a number of 2000 years' old Buddhist caves (104 caves) popularly known as Kanheri caves. The Kanheri Caves in the centre of the park were important Buddhist learning centre and pilgrimage site, sculpted by Buddhist monks between 9th and 1st centuries BC. The two lakes form one of the major sources of drinking water for Mumbai Metropolis, while Kanheri caves attracts huge masses of tourists every year. Besides, the National Park has been a heaven for field biologists and naturalists since



its inception in 1952. Present studies have established that the stagnant water has a diverse micro flora and fauna, which includes algae, protozoa, rotifers, bacteria etc., (Pradhan 2006), those are responsible for the precipitation of salts and creation of H₂S gas in the pond. The algae form an important component of aquatic flora and play a vital role in maintaining proper equilibrium of abiotic and biotic components of aquatic ecosystem. Micro-algae have vast industrial and economic potential as valuable sources in pharmaceuticals, health foods and in bioremediation of industrial effluent. Algae are also used as biological indicators of water pollution (Subramanian and Uma, 1996; Handa and Jadhav, 2015). They vary from small, single-celled forms to complex multi-cellular forms. Chlorophycean members form the base of the food chain and they are directly or indirectly a good source of food for various animal groups (Rao, 1975). They are also good source of oxygen for the aquatic life. It is a well-established fact that more than 75% of freshwater fishes feed on plankton at one or the other stage of their life-cycle (Jafri *et al.*, 1999). The current study is undertaken with an objective to understand the presence of the various groups of algae during pre and post monsoon periods

MATERIAL AND METHODS

Random sampling techniques have been applied in the algae collection. Sample collection were done between October 2016 to November 2016 from Freshwater habitats of S.G.N.P. (Kanheri caves) and Dahisar river by using planktonic mesh net. Samples were preserved in 3-4% formalin and slides were prepared with Eosin stain for Cyanophycean algae, for Chlorophycean staining done with Iodine and mounted in Glycerin. Detailed studies were made, by examining specimens, under compound microscope and photo taken with the help of camera attached microscope and Identification of genera, species and varieties were done using authentic literatures or monographs.

RESULTS AND DISCUSSION

The species identification has been done after Prescott (1951), Komarek and Fott (1983), Desikachary (1959), Tiffany and Britton (1952), Scott and Prescott (1961) Hortobagyi (1973), Prasad and Misra (1992) Prasad and Srivastava (1992), Philipose (1967)

Aphanothece microscopica Nag. (Pl. 1, Fig. 2)

Desikachary, T.V. (1959); (Pl. 22, Fig. 4,5,9, PP. 104).

Thallus mucilaginous, Cells 3.5-8 μ m broad, submerged, Non-thermal.

Collection Number and Date: MAHA-MUM 02, 29/10/16

Locality: Dahisar River.

Merismopedia punctata Meyen. (after Smith). (Pl. 1, Fig. 3)

Desikachary, T.V. (1959); (Pl. 29, Fig. 6, PP 151).

Colonies small, 4-64 cells, about 60 μ m broad. Cells, 2.5-3.5 μ m broad.

Collection Number and Date: MAHA-MUM 01, 04/11/16

Locality: SGNP (Kanheri caves).

Gloeotheca samoensis Wille. (Pl. 1, Fig. 7)

Desikachary, T.V. (1959); (Pl. 23, Fig. 3, PP 110).

Cells ellipsoidal, without sheath 4-5 μ m broad, 8 μ m long, 2-4 in common colourless, un-lamellated envelope.

Collection Number and Date: MAHA-MUM 04, 29/10/16

Locality: Dahisar River.

Gloeocapsa coracina Kuetz. (after Wille) (Pl. 1, Fig. 8)

Desikachary, T.V. (1959); (Pl. 24, Fig. 11 PP. 122).

Cells single, round small, with sheath 6-14 μ m and without sheath about 3 μ m broad, single or in groups of 9-75 μ m diam.,

Collection Number and Date: MAHA-MUM 03, 29/10/16

Locality: Dahisar River.

Chroococcus limneticus Lemmermann. (after Smith) (Pl. 1, Fig. 11)

Desikachary, T.V. (1959); (Pl. 26, Fig. 2, PP. 129).

Cells without sheath 10 μ m in diameter; with sheath 14 μ m in diameter

Collection Number and Date: MAHA-MUM 02, 29/10/16

Locality: Dahisar River.

Lyngbya hieronymusii Lemm. (after Lemm.) (Pl. 1, Fig. 4)

Desikachary, T.V. (1959); (Pl.48, Fig. 4, PP. 288).

Filaments single 12-14 μ broad, sheath firm, cells 11-13 μ broad, 2.5-4 μ long, not constricted at the cross-walls, granulated.

Collection Number and Date: MAHA-MUM 05, 04/11/16

Locality: SGNP (Kanheri caves)

Oscillatoria subbrevis Schmidle (Pl. 1, Fig. 5)

Desikachary, T.V. (1959); (Pl. 37, Fig. 2. PP. 204).

Trichomes single, 5-6 μ broad, nearly straight, not attenuated at the apices. Cells 1-2 μ long.

Collection Number and Date: MAHA-MUM 03, 29/10/16

Locality: Dahisar River.

O. agardhii Gom. (Pl. 1, Fig. 6)

Hortobagyi, T. (1973); (Pl. 14, Fig. 40. PP. 210).

Width of trichomes 7-8 μ , cells cubiform, end-cell bearing a cap.

Collection Number and Date: MAHA-MUM 04, 29/10/16

Locality: Dahisar River.

O. princeps Vaucher ex. Gomont (after Frey) (Pl.1, Fig. 9)

Desikachary, T.V. (1959); (Pl. 37, Fig. 10, 11, 13, 14, PP. 204).

Trichomes 16-60 μ broad, commonly 25-50 μ cells 1/11-1/4 as long as broad, 3.5-7 μ long;

Collection Number and Date: MAHA-MUM 02, 29/10/16

Locality: Dahisar River.

Nostoc piscinale Kütz (after Frey) (Pl. 1, Fig.10)

Desikachary, T.V. (1959); (Pl. 69, Fig. 3, PP. 377)

Trichomes mucilaginous, 3-7 μ broad, heterocyst 4.5-6 μ broad cells 1/11-1/4 as long as broad, 3.5-7 μ long;

Collection Number and Date: MAHA-MUM 02, 29/10/16

Locality: Dahisar River.

Ankistrodesmus arcuatus Korsch. (Pl. 1, Fig. 12)

Hortobagyi, T. (1973); (Fig. 117-120, PP. 222).

Cells appear in a semicircular or almost circular form, ends needle-sharp, only rarely blunt. Cells width 2.6-4 μ , diameter 35-52 μ

Collection Number and Date: MAHA-MUM 05,04/11/16

Locality: SGNP (Kanheri caves).

Anabaena iyengarii var. *tenuis* Rao, C.B. (after Rao) (Pl. 1, Fig. 1)

Desikachary, T.V. (1959); (Pl. 76, Fig. 1, PP. 407).

Plant mass thin free-floating, trichomes single, straight or curved, 3.5-4.5 μ m broad, cells slightly shorter than or longer than broad, (2.5-) 3-6.4 μ m long; heterocysts barrel-shaped 4.8-6.4 (-8) μ m broad and 5.2-9 (-12) μ m long; spores ellipsoidal, or cylindrical, single or in pairs on either side of a heterocyst, 7.5-9.6 μ m rarely 10.5 μ m broad and 9-19 μ m rarely 21 (-24) μ m long, with a smooth hyaline outer wall.

Collection Number and Date: MAHA-MUM 01, 29/10/16.

Locality: Dahisar River.

Coelastrum astrodeum De-Not. (Pl. 1, Fig. 14)

Komarek, J. And Fortt, B. (1983); (Pl. 202, Fig. 4, PP. 725-726).

Diameter of cell 17-22 μ m, diameter of colony - 63 μ m.

Collection Number and Date: MAHA-MUM 03, 04/11/16

Locality: SGNP (Kanheri caves).

C. microporum Naegeli var. *microporum* (Pl. 1, Fig. 15)

Komarek, J. And Fott, B. (1983); (Pl. 202, Fig. 1, PP. 725-727).

Diameter of cell 5 μ m, diameter of colony 25 μ m.

Collection Number and Date: MAHA-MUM 03, 04/11/16

Locality: SGNP (Kanheri caves).

C. printzii Rayss. (Pl. 1, Fig. 19),

Komarek, J. And Fott, B. (1952); (PL. 205 Fig. 1, PP. 735).

Cell spherical to slightly irregular, 11-18 x 10-15 μ m.

Cosmarium impressulum Elfv (Pl. 1, Fig. 16)

Hortobagyi, T. (1973); (Fig. 592-593 PP. 336).

Cell wall, cells 23.4-26.5 x 18.2-21 μ m Isthmus 4-5.8 μ m.

Collection Number and Date: MAHA-MUM 02, 29/10/16

Locality: Dahisar River.

C. granatum Breb. (Pl. 1 Fig. 17)

Prasad and Misra, (1992); (Pl. 21, fig. 20. PP. 160)

Cells 30 μ m long, 20 μ m broad and isthmus 5 μ m.

Collection Number and Date: MAHA-MUM 02, 29/10/16

Locality: Dahisar River.

C. botrytis Meneghinii. var. *subtumidum* Wittr. (Pl. 1, Fig. 18)

Hortobagyi, T. (1973); (Fig. 590, PP. 336).

Dimensions of cells 57-62.4 x 49-57.2 μ , Isthmus 11-15.6 μ

Closterium moniliferum (Bory.) Ehrenberg. (Pl. 2, Fig. 1)

Tiffany, L.H. and Britton, M.E. (1971); (Pl. 52, Fig.549, PP.170)

Cells 30-68 x 188-420 μ (apices 8-13 μ wide), stout, 6-8 times longer than wide.

Collection Number and Date: MAHA-MUM 01, 04/11/16

Locality: SGNP (Kanheri caves).

C. libellula Foeke. (Pl. 2, Fig. 2)

Hortobagyi, T. (1973); (Fig. 585, PP. 334).

Cells 367 x 53.5 μ

Collection Number and Date: MAHA-MUM 01, 04/11/16

Locality: SGNP (Kanheri caves).

C. lunula (Mueller) Nitzsch. (Pl. 2, Fig. 3)

Tiffany, L.H. and Britton, M.E. (1971); (Pl. 52, Fig. 561, PP. 170).

Cells 71-116 x 435-680 μ (apices 18-25 μ wide), stout, 6-7 times longer than wide, chromatophore with about 10-12 ridges.

Collection Number and Date: MAHA-MUM 01, 04/11/16

Locality: SGNP (Kanheri caves)

C. lanceolatum Kuetzing (Pl. 2, Fig. 4)

Tiffany, L.H. & Britton, M.E. (1971); (Pl.52, Fig.552, PP.170).

Cells 32-72 x 234-550 μ (apices 7-8 μ wide), 5-10 times longer than wide, zygote sub-globose or oblong-ellipsoid, smooth, 81-104 μ in diameter.

Collection Number and Date: MAHA-MUM 01, 04/11/16

Locality: SGNP (Kanheri caves).

C. acerosum var. *elongatum* Breb. (Pl. 2, Fig. 5)

Tiffany, L.H. and Britton, M.E. (1971); (Pl.52, Fig. 551, PP. 170).

Cells 28-54 x 325-790 μ cell-wall yellowish-brown.

Collection Number and Date: MAHA-MUM 01, 04/11/16

Locality: SGNP (Kanheri caves)

Euastrum spinulosum Delp. var. *bellum*. (Pl. 2, Fig. 6)

Scott and Prescott (1961); (Pl. 10, Fig. 5, PP. 40).

Long cell 85 µm, lateral cell 75 µm, isthmus 20 µm.

Collection Number and Date: MAHA-MUM 01, 04/11/16

Locality: SGNP (Kanheri caves).

Dimorphococcus lunatus A. Braun. (Pl. 2, Fig. 7)

Tiffany, L.H. and Britton, M.E. (1952); (Pl. 31, Fig. 314, PP. 115).

Cells 4-15 x 9-25 µm; colonies 50-150 µm in diameter.

Collection Number and Date: MAHA-MUM 05, 04/11/16

Locality: SGNP (Kanheri caves)

Kirchneriella lunaris (Kirchner) Moebius (Pl. 2, Fig. 18)

Tiffany, L.H. and Britton, M.E. (1952); (Pl. 31, Fig. 308, PP. 98).

Cells 3-8 x 6-15 µm crescent shaped, colonies up to 250 µm in diameter.

Collection Number and Date: MAHA-MUM 01, 04/11/16

Locality: SGNP (Kanheri caves)

Staurastrum tetracerum Ralfs forma. (Pl. 2, Fig. 9)

Hortobagyi. T (1973); (Fig. 604, PP. 338).

Dimensions of cells 30 x 28.6 µm Isthmus 6.5 µm

Collection Number and Date: MAHA-MUM 05, 04/11/16

Locality: SGNP (Kanheri caves)

Oocystis borgei Snow (Pl. 2, Fig. 13)

Philipose (1967) (Fig. 93, PP. 182-183)

Cells 9-13 µm broad, 9-19 µm long, 2-8 celled colonies.

Collection Number and Date: MAHA-MUM 01, 04/11/16

Locality: SGNP (Kanheri caves)

Oocystis irregularis (Petkof) Printz. (Pl. 2, Fig. 16)

Philipose (1967) (Fig. 95, PP. 184-185)

Cells 16-20 µm broad, 24-30 µm long, 4 celled colonies

Collection Number and Date: MAHA-MUM 04, 29/10/16

Locality: Dahisar River

Scenedesmus quadricauda (Turp.) Breb. (Pl. 2, Fig. 10)

Tiffany, L.H. and Britton, M.E. (1952) (Pl. 35, Fig. 359, Pg. 122)

Cells 19 μ m long, 7 μ m broad and spine 7 μ m long 1 μ m broad. Colony consisting of 2-4-8 oblong-cylindric cells usually in one series

Collection Number and Date: MAHA-MUM 02, 04/11/16

Locality: SGNP (Kanheri caves).

S. dimorphus (Turp.) Kuetz. (Pl. 2, Fig. 11)

Komarek, J. And Fott, B. (1952); (Pl. 228, Fig. 3, PP.842-843).

Cells 2-5 x 18-23 μ m fusiform with delicately pointed apices, in linear or alternating series;

Collection Number and Date: MAHA-MUM 03, 04/11/16

Locality: SGNP (Kanheri caves).

S. bijugatus (Turp.) Kuetz. (Pl. 2, Fig. 12)

Prasad, B.N. and Misra, P.K. (1992); (Pl. 5, Fig. 9, PP. 37).

Cells 18.5 μ m long, 7 μ m broad.

Collection Number and Date: MAHA-MUM 02, 29/10/16

Locality: Dahisar River

Gonium pectorale Mueller (Pl. 2, Fig. 14)

Tiffany, L.H. and Britton, M.E. (1952); (Pl. 1, Fig. 12, PP. 16).

Cells 5-14 x 5-16 μ m Ovoid; colonies 70-100 μ m in diameter.

Collection Number and Date: MAHA-MUM 01, 04/11/16

Locality: SGNP (Kanheri caves)

Vaucheria sp. (Pl. 2, Fig. 8)

Tiffany, L.H. and Britton, M.E. (1952); (Pl. 36, Fig. 378, PP. 212)

Filament 50-130 μ m oogonia usually 2, 80 X 100 μ m sessile.

Collection Number and Date: MAHA-MUM 02, 29/10/16

Locality: Dahisar River.

Oedogonium franklinianum Wittrock (Pl. 2, Fig. 17)

Tiffany, L.H. and Britton, M.E. (1952); (Pl. 16, Fig. 119, PP. 64)

Female vegetative cell 8-12 X 30-95 μ m, oogonium 26-30 X 29-41 μ m, Oospore 24-30 X 24-30 μ m

Collection Number and Date: MAHA-MUM 05, 04/11/16

Locality: SGNP (Kanheri caves)

Ulothrix sp. (Pl. 2, Fig. 15)

Tiffany, L.H. and Britton, M.E. (1952); (Pl. 4, Fig. 35, PP. 24)

Filament unbranched, vegetative cell uninucleate, cylindrical with pyrenoids, cells 5-9 μ m in diameter

Collection Number and Date: MAHA-MUM 01, 04/11/16

Locality: SGNP (Kanheri Caves)

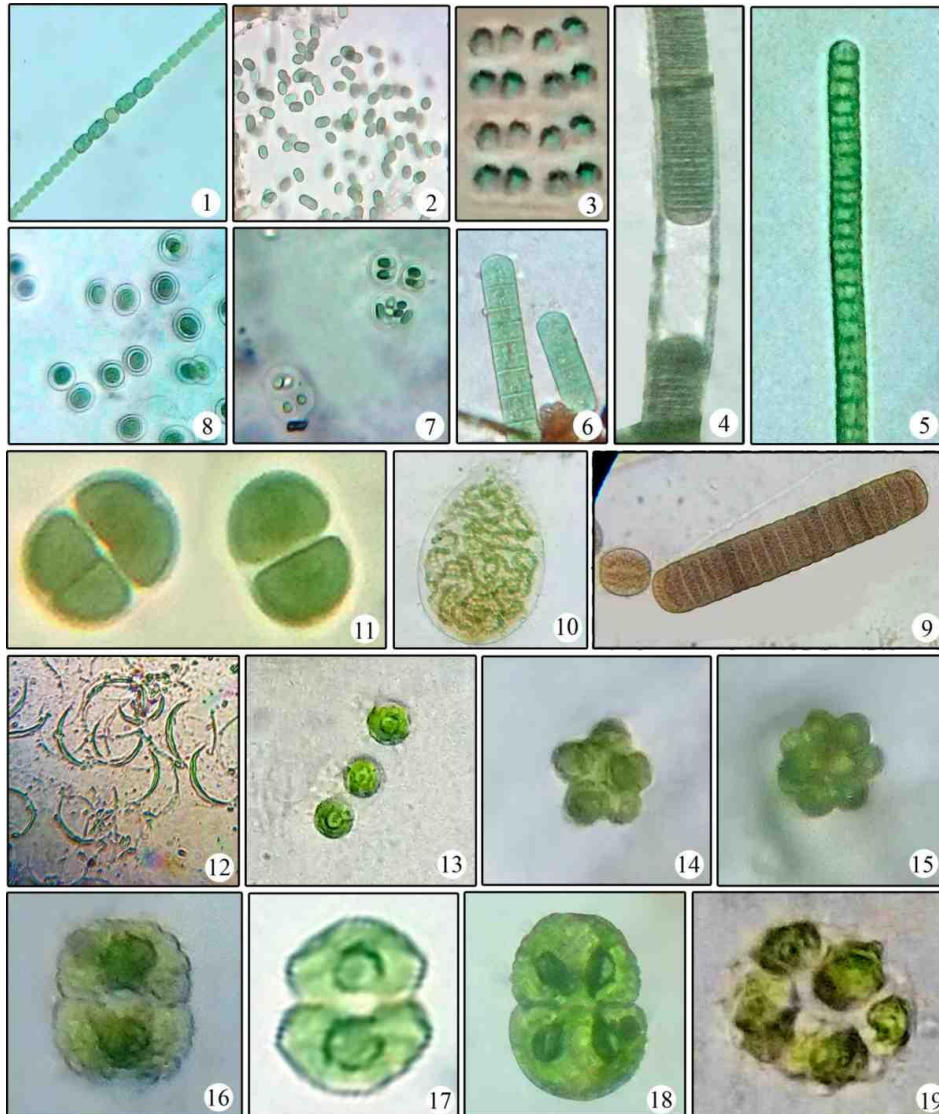


Plate 1. Fig. *Anabaena iyengaraii* var. *tenuis* Rao,C.B., Fig. 2. *Aphanothece* *microscopica* Nag., Fig. 3. *Merismopedia punctata* Meyen., Fig. 4. *Lyngbya hieronymusii* Lemm.(after Lemm.), Fig. 5. *Oscillatoria subbrevis* Schmidle (orig.), Fig. 6. *O. agardhii* Gom., Fig. 7. *Gloeotheca samoensis* Wille., Fig. 8. *Gloeocapsa coracina* Kütz., Fig. 9. *Oscillatoria princeps* Vaucher (orig.), Fig.10. *Nostoc piscinale* Kütz (after Frey) Fig. 11. *Chroococcus limneticus* Lemmermann., Fig. 12. *Ankistrodesmus arcuatus* Korsch., Fig. 13. *Chlorella* sp., Fig. 14. *Coelastrum astrodeum* De-Not., Fig. 15. *C. microporum* Naegeli var. *microporum* Kom. & Fott., Fig.16. *Cosmarium impressulum* Efv., Fig. 17. *C. granatum* Breb., Fig. 18. *C. botrytis* Meneghinii var. *subtumidum* Wittr., Fig. 19. *Coelastrum printzii* Rayss.

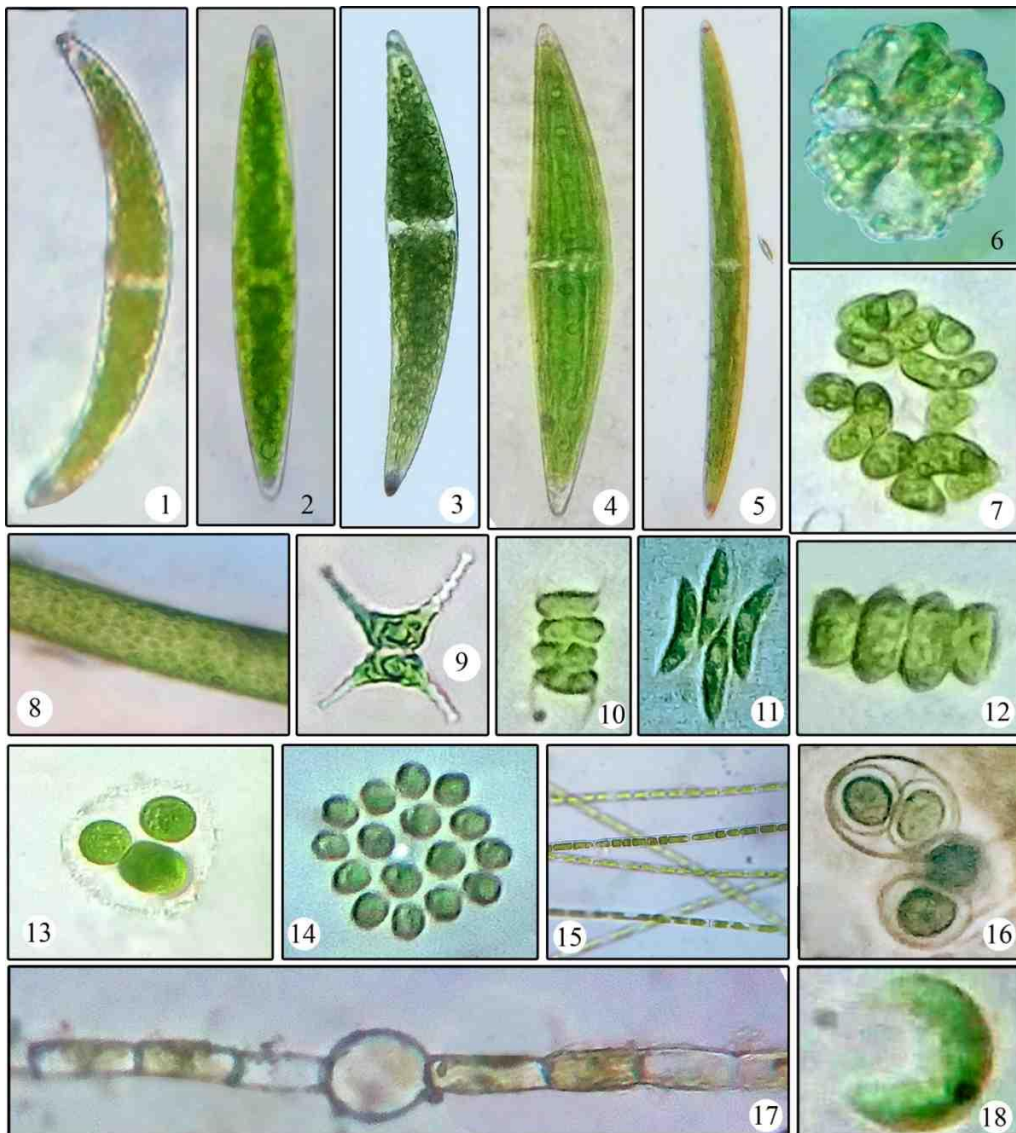


Plate 2. Fig. 1. *Closterium moniliferum* (Bory) Ehrenberg., Fig. 2. *C. libellula* Foeke., Fig. 3 *C. lunula* (Mueller) Nitzsch., Fig. 4. *C. lanceolatum* Kuetzing., Fig. 5. *C. acerosum* var. *elongatum* Brebisson., Fig. 6. *Euastrum spinulosum* Delp. var. *bellum*., Fig. 7. *Dimorphococcus lunatus* A. Braun., Fig. 8. *Vaucheria* sp., Fig. 9. *Staurostrum tetracerum* Ralfs forma., Fig. 10. *Scenedesmus quadricauda* (Turp.) Breb., Fig. 11. *S. dimorphus* (Turp.) Kutz., Fig. 12. *S. bijugatus* (Turp.) Kuetz., Fig. 13. *Oocystis borgei* Snow., Fig. 14. *Gonium pectorale* Mueller., Fig. 15. *Ulothrix* sp., Fig. 16. *Oocystis irregularis* (Petkof) Printz., Fig. 17. *Oedogonium franklinianum* Wittrock Fig. 18. *Kirchneriella lunaris* (Kirchner) Moebius

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