

Biodiversity of fresh water algae from Guindy campus of Chennai, India

P. Arulmurugan, S. Nagaraj and N. Anand*

Centre for Advanced Studies in Botany, University of Madras Guindy campus, Chennai, India

Abstract

The present work deals with the 35 fresh water algal samples and description of 62 taxa of biodiversity of fresh water algae from University of Madras Guindy campus of Chennai. Collections of 35 fresh water algal samples were carried out during the month of December 2010 to April 2011. Samples were examined in the laboratory and identified. The following algae were present *Chlorococcum*(1), *Elakatothrix* (1), *Chlorella* (1), *Palmellococcus* (1), *Tetraedron* (1), *Polyedriopsis* (1), *Chodatella* (1), *Oocystis* (2), *Coelastrum* (1), *Scenedesmus quadricauda* (Turpin) Breb. var. *longispina* (Chodat) G. M. Smith, *Scenedesmus* (3), *Microspora* (1), *Rhizoclonium* (1), *Trentipholia* (2), *Closterium* (1), *Cosmarium* (5) of Chlorophyceae, *Cyclotella* (1), *Fragilaria* (2), *Achnanthes* (1), *Amphora* (1), *Navicula* (5), *Pinnularia* (1), *Hantzschia* (1) and *Nitzschia* (1) of Bacillariophyceae and *Microcystis* (1), *Chroococcus* (3) *Chroococciopsis* (1), *Gloeocapsa* (2), *Gleocapsopsis* (1), *Aphanotheace* (1), *Chlorogloea* (2), *Oscillatoria* (3), *Phormidium* (3), *Lyngbya* (3), *Microcoleus* (1), *Microchaete tenera* (1), *Calothrix* (1), *Camptylonema* (1) and *Hapalosiphon* (1) of Cyanophyceae were recorded. Algae are described with photographs.

Keywords: Biodiversity, Bacillariophyceae, Chlorophyceae, Cyanophyceae, Fresh water algae

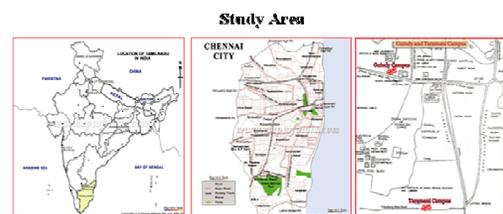
INTRODUCTION

Biodiversity is the level of variation in life forms within a specified ecosystem. The algal diversity is determined by the level of richness of species and their functional importance in the processes they mediate. Algae occur in waters of low salinity (as low as 10ppm) called freshwater. Fresh-water algae, also called phytoplankton, vary in shape and color, and are found in a large range of habitats. The freshwater ecosystem is of lotic and lentic types, lotic include streams, canals, waterfalls, rivers and rivulets. The lentic system includes the pools, puddles, ponds, reservoirs, lakes and the agricultural fields like paddy fields. The freshwater ecosystem is differentiated into various types of planktons (free floating), benthons (attached to sediments) or epiphytic algae (on stones, sand, mud and rock of reservoir and lakes). Studies on algae for over a century were on understanding their structure and reproduction and several treatises (Smith, 1920; Fritsch, 1935; Prescott, 1951) and monographs were published for several groups of algae with details on the occurrence and distribution with reference to diverse habitats (Desikachary, 1959; Randhawa, 1959; Pal *et al.* 1962; Ramanathan, 1964 and Philipose, 1967). Description of taxa have been restricted to generic level with diagnostic keys serving the means of identification of the species and also to identify the major families of blue green algae in South Indian rice field (Anand, 1989) Algae form assemblage of chlorophyllous organisms occurring in wide variety of aquatic and terrestrial ecosystem in India (Anand, 1998).

Manual of fresh water algae of Tamil Nadu is based on studies conducted on different types of lotic and lentic water bodies (Mahendrapurumal & Anand, 2008). The taxonomic groups of fresh water algal ecosystem in Anaimalai hills of Tamil Nadu have also been studied (Sankaran, 2009). Depending on the seasons, the algae appear and disappear (Arulmurugan *et al.* 2010). So, seasonal variation in combination with ecosystem variation results in biodiversity of algal species.

MATERIALS AND METHODS

Study Area (Fig. 1)



Different Algal Habitats of Guindy Campus, Chennai



A. Epiphytic algae of Polyalthia B. Epiphytic algae on Onava
C. Moisture soil algae D. Algae in calcium deposited place
E. Lithophytic algae on cement pillar F. Lithophytic algae
G. Algae in flow waters H. Algae in stagnant waters
I. Algae on the Building

Received: Aug 17, 2011; Revised: Oct 18, 2011; Accepted: Nov 23, 2011.

*Corresponding Author

N. Anand

Centre for Advanced Studies in Botany

University of Madras, Guindy campus Chennai, India

Tel: + 098404 10208; Fax:

Email: anandalgae@gmail.com

The area of study is the campus of University of Madras located at Guindy. Guindy is located in the South-Western part of the city. Guindy is home to many important landmarks in the city and the most famous amongst them is the Guindy National Park - the only National Park that is located opposite to an university campus (Latitude 13.007° and Longitude 80.236°).

Algal samples 35 were collected from different habitats of Guindy campus (Chennai), collection of samples were carried out during the month of December 2010 to May 2011. Random sampling method has been applied in the algal collection procedure. The water, soil is productive and climates are best suited for different class of algae viz. Cyanophyceae, Chlorophyceae and Bacillariophyceae. Collection of Desmides and Diatoms were made after (Willianson, 1999) method, by single a bulb pipette attached to 25 cm of plastic tube which was used to suck up the detritus and grit from selected aquatic habitats. After an initial examination of the living samples, the coarser material was removed by filtration through a mesh net. The algal samples were preserved in 4% formalin (aqueous solution of formaldehyde). Bacillariophycean forms were studied after cleaning by the method called "Mixgen" (Prasad & Singh, 1996). Cyanophycean forms were stained by Methylene blue where Chlorophycean forms were stained by Iodine. Glycerine was used for mounting the material. The centric organism has been photographed using a LABOMED microscope with attached SANYO ccd camera (Arulmurugan *et al.* 2010).

RESULTS

Chlorophyceae

Chlorococcum humicola (Naegeli) Rabenhorst (PI.1, Fig. 1)

Cells spherical, solitary or a number of cells crowded together to form a stratum. Chloroplast a narrow sphere with lateral notch and a single pyrenoid.

Collected from: Guindy campus near Mens hostel – Cemented old water tank (Date: 11. 02. 2011, Voucher No GCHMT-1)

Occurrence: *C.f.* Tamil Nadu (M.Perumal&Anand,2008) and Kerala (Arulmurugan *et al.* 2010).

Elakatothrix gelatinosa Wille

Colonies free –floating, elongate fusiform to irregular with the long axes of cells parallel to the long axis of the colony. Colonies usually with 1-16-32, rarely up to 50 cells. Cells usually in pairs, spindle – shaped with one pole rounded and the other pointed, the rounded end of a pair of cells being in opposition. Cells in single – celled colonies with both ends uniformly attenuated. Chromatophore single, parietal, covering the entire length of the wall and with a pyrenoid. Cells 2.5-6 μ broad, 11 - 30 μ long. Colonies 10 - 30 μ , broad, 70-160 μ long.

Collection from: Anna University ground – stagnant water in cemented tank (Date:11.01.2011, Voucher No. AUMEMO - 01).

Occurrence: *C.f.* India (Philipose, 1967) First reported in Indian region.

Chlorella vulgaris Beijerinck (PI.1, Fig. 3)

Alga free living. Cells usually solitary or in small colonies, spherical and with a thin cell membrane. Chloroplast parietal, cub – shaped and with a pyrenoid which is sometimes indistinct. Cells usually 5 -10 μ in diameter.

Collected from: In front of the Anna University VC office - Moisture cement wall (Date 12.12.2010, Voucher No. AU-22)

Occurrence: *C.f.* India (Philipose, 1967), Tamil Nadu (Mahendrapurumal & Anand, 2008, Anand, 1998) and Kerala (Arulmurugan *et al.* 2010).

Palmellococcus saccharophilus (Krueger) Chodat (PI.1, Fig. 4)

Cells ellipsoid, ovoid or rarely spherical, bean shaped or pear-shaped. Cell membrane thin, colorless and slimy. Chromatophore in the form of a flate and devoid of a pyrenoid.

Collected from : Guindy campus near Nuclear physics department – Guava tree (*Psidium gujava*) (Date : 11.02.2011, Voucher No. GCG-01)

Occurrence: *C.f.* India (Philipose, 1967).

Tetraedron muticum (A. Braun) Hansgirg (PI.1, Fig. 5)

Cells small, flat and triangular with the sides slightly concave angles broadly rounded or truncate. Cell wall smooth. Cells 6-30 μ in diameter.

Collected from: Guindy campus near Mens hostel – Cemented old water tank (Date: 11.02.2011, Voucher No GCHMT-1)

Occurrence: *C.f.* India (Philipose, 1967).

Polyedriopsis spinulosa (Schmidle) Schmidle (PI.1, Fig. 6)

Cells solitary, tetragonal to cruciate with 4-5 angles. Sides of usually concave. Cells without spines 12-25 μ in diameter spines 21-40 μ long.

Collected from: Anna university ground – Stagnant water in cemented tank (Date:11.01.2011, Voucher No. AUMEMO - 01).

Occurrence: *C.f.* India (Philipose, 1967).

Chodatella longiseta (Lemmermann) Printz (PI.1, Fig. 7)

Células solitárias, elípticas, 11,0-14,0 μ m compr.,5,5-8,0 μ m larg.; pólos levemente atenuados. Cada pólocom 3 a 5 setas, longas, levemente fl exuosas, afi landogradualmente em direção ao ápice, 38,0-46,0 μ m compr. Cloroplasto parietal, pirenóide não observado.

Collected from: Anna University ground – stagnant water in cemented tank (Date:11.01.2011, Vucher No. AUMEMO - 01).

Occurrence: Brasil (Luciano Luna Rodrigues *et al.* 2010). First reported in Indian region.

Oocystis ecballocystiformis Iyengar (PI.1, Fig. 8)

Cells oblong – ellipsoid with broadly rounded ends. Cell membrane thin and without polar thickening. Chloroplast 2-4-8, parietal and disc shaped, each with minute pyrenoid. Reproduction by 2-4-8 autospores formed inside the distended mother cells wall. Adult cells 7-9.1um broad, 18-24um long. Young cells 5.5um broad and16um long.

Collected from: Guindy campus near Mens hostel – Cemented old water tank (Date:11.02.2011, Voucher No GCHMT-1)

Occurrence: *C.f.* India (Philipose, 1967).

***Oocystis pusilla* Hansgirg var. *maior* Skuja (Pl.1, Fig. 9)**

Cells elongate-ellipsoid with the ends truncate to rounded and sometimes with a slight median inflation. Solitary or as 2-4 auto-spores inside the old mother cell wall. Cell membrane thin and without polar thickenings. Cells much larger than in the type, measuring 6.8-11 μ in breadth and 11-23 μ in length. Chromatophores apparently without pyrenoid.

Collected from: Guindy campus near Mens hostel – cemented old water tank (Date:11.02.2011, Voucher No GCHMT-1)

Occurrence: *C.f.* India (Phlipose, 1967). First reported in Indian region.

***Coelastrum microporum* Nägeli (Pl.1, Fig. 10)**

Colonies more or less spherical and of 8-16-32-64 (usually 16-34) cells with small intercellular spaces. Cells spherical to ovoid, enclosed by delicate gelatinous sheath interconnected by almost imperceptible gelatinous processes. Cells with sheath 4-27 μ in diameter. Colonies 20-90 μ in diameter.

Collected from: Guindy campus near Mens hostel – Cemented old water tank (Date:11.02.2011, Voucher No GCHMT-1)

Occurrence: *C.f.* India (Phlipose, 1967).

***Scenedesmus quadricauda* (Turpin) Breb. var. *longispina* (Chodat) G. M. Smith (Pl.1, Fig. 11)**

Colonies usually 2-4 celled, rarely 8 celled. Cells ovoid to cylindrical with the cells narrow than in the spines proportionately longer, compared to the length of the cells. Internal cells sometimes with short delicate spine from some of their poles. Cells 2.5 μ broad, 8-15.3 μ long. Spine 7.5-15 μ long.

Collected from: Anna University ground –Stagnant water in cemented tank (Date:11.01.2011, Voucher No.AUMEMO - 01).

Occurrence: *C.f.* India (Phlipose, 1967).

***Scenedesmu quadricauda* (Turp.) Breb. var. *quadrispina* (Chodat) G. M. Smith(Pl.1, Fig. 12)**

Colonies usually 2-4 celled. Cells broadly ovoid and about twice as long as broad. Poles of terminal cells with a single short recurved spine. Cells 3.5-8.5 μ broad, 8.5-15-19 μ long spine, 2.5-5.5 μ long.

Collected from: Anna University ground – Stagnant water in cemented tank (Date:11.01.2011, Voucher No. AUMEMO - 01).

Occurrence: *C.f.* India (Phlipose, 1967), Kerala (Arulmurugan *et al.* 2010).

***Scenedesmus quadricauda* (Turp.) Breb. var. *westii* G. M. Smith (Pl.1, Fig. 13)**

Colonies usually four to eight celled. Cells 4.5-9-13 μ broad,10-22-29 μ long. Spines 10.6-16.7 μ long.

Collected from: Anna University ground – stagnant water in cemented tank (Date:11.01.2011, Vucher No. AUMEMO - 01).

Occurrence: *C.f.* India (Phlipose, 1967)

***Microspora willeana* Lagerheim (Pl.1, Fig. 14)**

Filamentous unbranched, uniseriate, thick, slightly

constricted at cross wall; cells quadrate or slightly cylindrical, cell wall thin, H shaped chloroplast not prominent; chloroplast perforated plate; covering only margin of side walls; pyrenoids absent; akinetes spherical and light brown arranged in series.

Collected from: Slow running water in water tank of CASB building – attached in a cement wall and wood (Date:25.4. 2011, Voucher No. GCCASB -1)

Occurrence: Asia (Ramanathan, 1964) and Uttaranchal (GUPTA, 2005)

***Rhizoclonium hieroglyphicum* (C. A. Ag.) Kutz. (Pl.1, Fig. 15)**

Filaments long wiry, unbranched, unconstructed at septa ; cells long, cylindrical with 2-3 8 μ m, thick stratified walls, multinucleate; chloroplast parietal reticulate with several pyrenoids; rhizoids primary, long and colourless, formed from the direct prolongation of the lower end of filaments.

Collected from: Near Guindy campus biophysics department – Stagnant water tank (Date: 22. 4. 2011, Voucher No. GC CAS BIO PHY -1)

Occurrence: Andaman and Nicobar Islands (Prasad & Misra, 1984)

***Trentipohlia tenuis* (Zell.)De Toni (Pl.1, Fig. 16)**

Epilithic and epiphytic, stratum thick, consisting of minute, closely packed tufts, dark green to orange colored when fresh, grayish to orange when dry: filaments nearly straight or flexuous, those of higher order divaricates, distinctly constricted at cross wall; cells elongate ellipsoidal on short sub-cylindrical, often asymmetric in primary and secondary filaments,5.5-7 μ m broad,8-16.5 μ m long: cell wall1-1.5 μ m thick very rough or outer surface: sporangia sparsely present in terminal or lateral position, sub-spherical to ovoid, mostly sessile,8.5 μ m broad,10.5-13 μ m long.

Collected from: Guindy campus near Nuclear Physics department – Guava tree (*Psidium guajva*) (Date: 11.02.2011, Voucher No. GCG-01)

Occurrence: Andaman and Nicobar Islands (Prasad & Misra, 1984, 1992)

***Tretepohlia torulosa* Wildeman (Pl.1, Fig. 17)**

Epiphytic, stratum, thin, flexus, consisting of small compact tufts or spreading in the form of soft cushion, yellowish-green to dark orange when dry, vegetative filaments torulose and branched, distinctly constricted at cross- wall; cells ellipsoid or sub- spherical in centre of filaments, 14.5-17 μ m broad, 2-34.5 μ m long; cell wall thin and smooth; sporangia spherical to ovoid, usually lateral or terminal, rarely intercalary, 18-21.5 μ m broad, 21-26.5 μ m long.

Collected from: Near Anna University check post - Cemented wall (Date: 12. 12. 2010, Voucher No. AU-20)

Occurrence: Andaman and Nicobar Islands (Prasad & Misra, 1984, 1992), West Bengal (Bruehl & Biswas, 1923).

***Closterium pritchadianum* Arch. (Pl.1, Fig. 18)**

Cells medium size or large, finely curved to more or less,7-14 times longer than broad ,outer margin straight or slightly concave, cells gradually attenuated to narrow, truncate and faintly recurved apices: cell wall striated, strions composed of fine punctate, punctuations more prominent in longer specimens; chloroplast with

5-7 ridges & 6-8 pyrenoides arranged in a row.

Collected from: Near AC Tech. Canteen-moisture soil. (Date:12.12.2010, Voucher No.ACT-08).

Occurrence: Andaman and Nicobar Islands (Prasad & Misra, 1984).

***Cosmarium amoenum* Breb. Var. *maius* Kamat (Pl.1, Fig. 19)**

Cells of medium size, twice as long as broad, slightly constricted sinus broad and acute-angled; semi cells rounded-obovate, margin with 23-30 undulations; cell wall with granules arranged in indistinct vertical rows.

Collected from: Guindy campus near Mens hostel – cemented old water tank (Date: 11. 02. 2011, Voucher No GCHMT-1)

Occurrence: Andaman and Nicobar Islands (Prasad & Misra, 1984, 1992)

***Cosmarium angulosum* Breb. (Pl.1, Fig. 20)**

Cells 1.2-1.5 times longer than broad, deeply constricted in the middle; sinus linear; semi cells sub quadrate to sub rectangular, lateral margins smooth, straight and parallel, apex straight to slightly retuse, basal angles almost rectangular, apical angles obliquely truncated; semi cells in apical view elliptic, in lateral view elliptic-oblong; chloroplast with 1 pyrenoid.

Collected from: Guindy campus Mens hostel- cemented old water tank (Date: 11.02.2011, Voucher No GCHMT-1)

Occurrence: Southern Brazil (Gloria Massae Taniguchi *et al.* 2003), First reported in Indian region

***Cosmarium medioglabrum* Turn. (Pl.1, Fig. 21)**

Cells very small, slightly longer than broad, deeply constricted, sinus narrow and open outwards: semi cells sub-hexagonal, angles sub-rotunda, sides faintly converging to slightly narrowed and truncate apex, margin with 14-16 slight undulations: cell wall finely punctate: each semicell with an axils chloroplast, containing one pyrenoid.

Collected from : Guindy campus near Mens hostel – Cemented old water tank(Date:11.02.2011, Voucher No GCHMT-1)

Occurrence: Andaman and Nicobar Islands (Prasad & Misra, 1984, 1992)

***Cosmarium moniliformae* (Turp.) Ralfs (Pl.1, Fig. 22)**

Cells, 23.25-35.68 µm long, 13.27-20.26 µm broad; margin entire; semi circular or sub circular; isthmus, 7.36-9.47 µm broad; constriction deep; sinus open; wall smooth; chloroplast axils, in each semicell; pyrenoides 2.

Collected from: Guindy campus near Mens hostel – cemented old water tank (Date:11.02.2011, Voucher No GCHMT-1)

Occurrence: Uttaranchal (Gupta, 2005) and Tamil Nadu (Mahendrapurumal & Anand, 2008).

***Cosmarium pseudogranatum* Nordst. (Pl.1, Fig. 23)**

Cells of medium size, about 1.5 times longer than broad, slightly constricted, sinus broad and shallow; semi cells semi elliptic with circular outline: cell wall finely punctate: top-view sub-circular, each semi cells with 2 axils chloroplast, each containing one

pyrenoid.

Collected from: Guindy campus near Mens hostel – Cemented old water tank (Date:11. 02. 2011, Voucher No. GCHMT-1)

Occurrence: Andaman and Nicobar Islands (Prasad & Misra, 1984, 1992)

Bacillariophyceae

***Cyclotella maneghiniana* Kuetz. (Pl.1, Fig. 24)**

Frustules discoid in valve view, rectangular and undulated in griddle view, margin view well defined, coarsely striated and the striae wedge-shaped. The central portion at first straight appears to be quite smooth, but under very high magnifications show extremely fine radially arranged punctae as figured by Van Heurck (op. cit., pl. 22, fig. 656). Cells 20 µm.

Collected from: Guindy campus near Mens hostel – Cemented old water tank (Date:11. 02. 2011, Voucher No GCHMT-1)

Occurrence: Tamil Nadu (Venkataraman, 1939, Mahendrapurumal & Anand, 2008), Andaman and Nicobar Islands (Prasad & Misra, 1984), Uttaranchal (Gupta, 2005) and Kerala (Arulmurugan *et al.* 2010).

***Fragilaria breviasteriata* Grun f. *elongate* G.Venkataraman (Pl. 1, Fig. 25)**

Frustules in girdle view linear, rectangular, forming small bands. Valves linear lanceolate with rounded ends. Striae very short and marginal. Cells 30-41 µ, breadth 3-4.5, striae 12-14 in 10 µ.

Collected from: Guindy campus CAS in Botany-Garden soil (Date 12.12.2010, Voucher No. 03)

Occurrence: Tamil Nadu (Venkataraman, 1939), Kerala (Arulmurugan *et al.* 2010).

***Fragilaria vaucheriae* Kutz. (Pl. 2, Fig. 1)**

Frustules typically linked at the valve face to form chains. Valve to linear to linear- lanceolate in outline narrow towards rotate poles. Striae are parallel, sometimes becoming slightly radiate towards the poles.

Collected from: Slow running water in water tank of CASB building – attached in a cement wall and wood (Date: 25.4. 2011, Voucher No. GCCASB -1).

Occurrence: Tamil Nadu (Mahendrapurumal & Anand, 2008).

***Achnanthes inflata* (Kutz.) Grun. (Pl. 2, Fig. 2)**

Valves linear with two strong concave undulations forming gibbous centre and two long broadly rounded ends; hypo valve with thin, straight median raphae with distinct central nodules; axial area narrow gradually widening towards centre; central area broad, stauroid reaching the sides; striae coarse, punctate, radial in the middle becoming convergent towards apices; epivalve with linear, narrow, excentrically placed marginal psuedo raphae; striae coarsely punctate parallel in the middle but at apices slightly curved and radial. Collected from: Near Guindy campus Biophysics department – stagnant water tank

Occurrence: Tamil Nadu (Venkataraman, 1939), Andaman and Nicobar Islands (Prasad & Misra, 1984)

PLATE 1

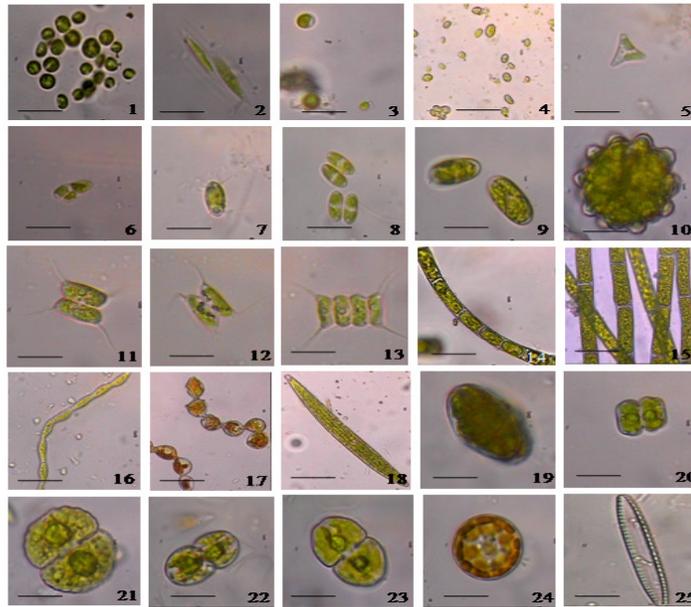


Fig- 1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 19, 21, 22, 23, 24, 25 Scale bar (1cm = 5 µm)

Fig- 4, 15, 20 Scale bar (1cm = 10 µm)

Fig- 14, 17, 18 Scale bar (1cm = 15µm)

PLATE -1

Chlorophyceae: 1. *Chlorococcum humicola* (Naegeli) Rabenhorst(Cells 7 µm), 2. *Elakatothrix gelatinosa* Wille (Length 20µm, Breadth 5 µm) 3. *Chlorella vulgaris* Beijerinck(Length 8 µm, Breadth 5 µm), 4. *Palmellococcus saccharophilus* (Krueger) Chodat (Cells 8-12 µm), 5. *Tetraedron muticum* (A. Braun) Hansgirg (Cells 8 µm), 6. *Polyedriopsis spinulosa* (Schimidle) Schimidle (Length with spine 20 µm & without 15 µm, Breadth with spine,15 µm, without,10 µm), 7. *Chodatella longiseta* (Lemmermann) Printz (Length 11 µm, Breadth 6 µm), 8. *Oocystis ecballocystiformis* lyengar (Length 12 µm, Breadth 6 µm.), 9. *Oocystis pusilla* Hansgirg var. *maior* Skuja(Length 20 µm, Breadth 10 µm), 10. *Coelastrum microporum* Nägeli(Cells 30 µm), 11. *Scenedesmus quadricauda* (Turpin) Breb. var. *longispina* (Chodat) G. M. Smith(Cells 30 µm), 12. *Scenedesmus quadricauda* (Turp.) Breb. var. *quadrispina* (Chodat) G. M. Smith(Length 5 µm, Breadth 8 µm, spine 8-10 µm), 13. *Scenedesmus quadricauda* (Turp.) Breb. var. *westii* G. M. Smith (Length 10 µm, Breadth 5 µm, spine 11 µm), 14. *Microspora williana* Lagerheim (Length 20 µm, Breadth 10 µm), 15. *Rhizoclonium hieroglyphicum* (C. A. Ag.) Kutz.(Length 100 µm, Breadth 30 µm), 16. *Trentepohlia tenuis* (Zell.) De Toni (Length 12 µm, Breadth 7 µm), 17. *Trentepohlia torulosa* Wildeman(Length 21 µm, Breadth 17 µm), 18. *Closterium pritchadianum* Arch.(Length 280 µm, Breadth 12 µm), 19. *Cosmarium amoenum* Breb. Var. *maius* Kamat(Length 60 µm, Breadth 35 µm), 20. *Cosmarium angulosum* Breb.(Length 15.5 µm, Breadth 12 µm), 21. *Cosmarium medioglabrum* Turm. (Length 30 µm, Breadth, 25 µm), 22. *Cosmarium moniliformae* (Turp.) Ralfs, 23. *Cosmarium pseudogranatum* Nordust.(Length 25 µm, Breadth 15 µm) Bacillariophyceae: 24. *Cyclotella maneghiniana* Kuetz.(20 µm), 25. *Fragilaria breviasteriata* Grun f. *elongate* G.Venkataraman(Length 50 µm, Breadth 10 µm)

***Amphora coffeaformis* Ag. var. *africana* Fritsch and Rich (Pl. 2, Fig. 3)**

Valves arcuate on the dorsal margin and straight on the ventral margin. The ends of pronouncedly capitate and slightly but outwards. The dorsal side bears slightly divergent punctate striae; the ventral side structure less. Length 25-37 µ, breadth, 4.5-7 µ, striae 17-19 µ,.

Collected from: Near Anna University VC office –Moisture wall (Date: 12.12. 2010, Vaucher No.22)

Occurrence: Tamil Nadu (Venkataraman, 1939), Andaman and Nicobar Islands (Prasad & Misra, 1984)

***Navicula cryptocephala* Kützinger (Pl. 2, Fig. 4)**

Valves linear-lanceolate with constricted produced somewhat capitates ends; raphae thin, straight median with distinct central nodules; central area somewhat rounded; striae lineate, short in central area, radiate in the middle becoming convergent towards apices.

Collected from: Guindy campus CAS in Botany–Garden soil (Date 12.12 2010, Voucher No. 03)

Occurrence: Andaman and Nicobar Islands (Prasad & Misra, 1984,

1992) and Tamil Nadu (Mahendrapuram & Anand, 2008)

***Navicula fluens* Hust. (Pl. 2, Fig. 5)**

Valves small, elliptical lanceolate with rounded ends, raphe thin, straight, median: axial area very narrow, linear, central area somewhat elliptical; striae fine, lineate, slightly radiate through the valve.

Collected from: Near Anna University VC office–Moisture wall (Date:12.12.2010, Vaucher No.22)

Occurrence: Andaman and Nicobar Islands (Prasad & Misra, 1984).

***Navicula halophila* (Grun.) Cleve f. *subcapitata* Ostrup. (Pl. 2, Fig. 6)**

Valves, lanceolate with distinctly constricted highly produced rounded ends; raphe thin straight, median, with distinct closely placed central nodules; axial area narrow, central area moderately broad; striae fine, lineate, parallel throughout the valve.

Collected from: Guindy campus near Mens hostel – Cemented old water tank (Date: 11.02.2011, Voucher No GCHMT-1)

Occurrence: Andaman and Nicobar Islands (Prasad & Misra, 1984)

***Navicula rostellum* W. Smith (Pl.2, Fig. 7)**

Valves linear -lanceolate with constricted, produced ends, lineate and radial in the middle and convergent at the ends.

Collected from: Guindy campus near Mens hostel – Cemented old water tank (Date: 11.02.2011, Voucher No GCHMT-1)

Occurrence: *C.f.* Tamil Nadu (Mahendrapurumal & Anand, 2008)

***Navicula twoutiensis* Cholnoky (Pl. 2, Fig. 8)**

Cells solitary and free floating, valves elongate, usually attenuated towards capitates rounded, outline commonly triundulated.

Collected from: Guindy campus near Mens hostel – cemented old water tank (Date: 11.02.2011, Voucher No GCHMT-1)

Occurrence: Tamil Nadu (Mayakkannan, 2010)

***Pinnularia interrupta* W. Smith f. *subcapitata* Fritsch (Pl. 2, Fig. 9)**

Sides of the valve straight and parallel. Striation interrupted at the centre of the valve. Ends not very markedly capitates. Length 26.7-36 μ , breadth 5-7 μ , Striae 10-11 in 10 μ .

Collected from: Near Anna university VC office–Moisture wall (Date: 12.12.2010, Voucher No.22)

Occurrence: Tamil Nadu (Venkataraman, 1939).

***Hantzschia amphioxys* (Ehr.) Grun. (Pl. 2, Fig. 10)**

Valves freely accuate, linear dorsal side convex, ventral side somewhat concave with distinct depression in the middle; ends broadly produced and bluntly rounded; keel punctate coarse distinct, slightly elongated median two somewhat placed distantly, rudiments of nodules present below the depression of ventral valve; striae fine, lineate parallel throughout the valve.

Collected from: Near Anna University ENVIS Center-Moisture wall (Date: 12. 12. 2010, Vooucher No.27)

Occurrence: Andaman and Nicobar Islands (Prasad & Misra, 1984)

***Nitzschia obtusa* W. Smith var. *scalpelliformis* Grun. (Pl. 2, Fig. 11)**

Frustules broad. linear with ends obliquely truncate. Keel fairly large inflexed in the middle region. The two median keel punctate distant. Striation punctae fine and linear. Cells length 89-112 μ , breadth 10-12 μ , Keel punctae 6-8 in 10 μ , striae 26-27 in 10 μ .

Collected from: Guindy campus near Mens hostel – cemented old water tank (Date: 11.02.2011, Voucher No GCHMT-1)

Occurrence: Tamil Nadu (Venkataraman, 1939)

Cyanophyceae***Microcystis elongata* Desikachary (Pl.2, Fig. 12)**

Colony elongate, sometimes clathrate, up to 1mm. in length. constricted colonial mucilage distinct, occasionally lamellated, hyaline, referactive; cells often closely arranged, grouping absent, arrangement on uniform, 3.9-5.2 μ broad, gas vacuole present.

Collected from: Anna University ground – stagnant water in cemented tank (Date: 11.02.2011, Voucher No. GCM-01)

Occurrence: *C.f.* India (Desikachary, 1959)

***Chroococcus minimus* (Keisseler)Lemm. var. *crassus* Rao,C.B. (Pl. 2, Fig. 13)**

Thallus membranous, soft, pale blue- green; cells spherical, sub spherical or ellipsoidal, single or in more or less rounded or ellipsoid colonies with 2-8 (rarely up to 12) cells, colonies with sheath 4.5-8 X 2-6.5 μ rarely up to 14.2 μ ; cells 2-4.5X2.65 μ , with 4.5-8 X 4.5-9.5;sheath.

Guindy campus near Theoretical Physics department, moisture wall (Date: 12.12.2010, Voucher No.ACT-16).

Occurrence: *C.f.* India (Desikachary, 1959)

***Chroococcus minutus* (Kutz.)Nag. (Pl. 2, Fig. 14)**

Cells spherical or oblong, single or in groups of 2-4, light-blue green, with sheath 6- 15 μ diam., and without sheath 4-10 μ diam., colonies 10-13 X15-20 μ ; sheath not lamellated, colorless.

Collected from: Guindy campus near Mens hostel – cemented old water tank (Date: 11.02.2011, Voucher No GCHMT-1).

Occurrence: *C.f.* India (Desikachary, 1959)

***Chroococcus turgidus* (Kutz.) Nageli (Pl. 2, Fig. 15)**

Cells spherical or ellipsoidal single, or in groups 2-4, very seldom many, blue-green, olive green or yellowish, without sheath 8-32 μ , with sheath 13-25 μ diam. Rarely 40 μ ; sheath colorless, not distinctly lamellated.

Collected from: Guindy campus near Xerox center epiphytic algae-Mangifera (*Mangifera indica*) (Date: 11.02.2011, Voucher No. GCM-01)

Occurrence: *C.f.* India (Desikachary, 1959), Tamil Nadu (Mahendrapurumal & Anand, 2008)

***Chroococidiopsis kashayi* Fried (Pl. 2, Fig. 16)**

Unicellular; spherical cells, rarely solitary, sometimes gathered in free living irregular agglomerations or forming more or less spherical or irregular colonies. Cells or small group of cells are enveloped by thin. Firm, colorless, sometime slightly layered sheaths (envelops), with split during the liberation of daughter cells 6-6.7 μ m in diameter.

Collected from: Guindy campus near Xerox center epiphytic algae-Tamarind (*Tamarindus indica*) (Date: 11.02.2011, Voucher No. GCT-01)

Occurrence: *C.f.* Mexico (Komarek & Anagnostidis, 1998)

***Gloeocapsa aeruginosa* Kützing (Pl. 2, Fig. 17)**

Thallus crustaceous, granulose or cartilaginous, mucilaginous; cells 2-3 μ broad, with sheath 4.8 μ broad, in colonies; colonies spherical, 16-50 μ diam., sheath distinctly lamellated.

Collected from: Guindy campus near Mens hostel – cemented old water tank (Date: 11.02.2011, Voucher No GCHMT-1)

Occurrence: *C.f.* India (Desikachary,1959) and Tamil Nadu (Mahendrapurumal&Anand, 2008).

***Gloeocapsa crepidium* Thuret (Pl. 2, Fig. 18)**

The gelatinous, olivaceous, when dried bakish, gelatinous soft; cells in groups of 2-4, rarely more, colonies spherical or oval,

12-14µ diam, closely arranged in spherical regions and loosely arranged in the middle cells without sheath 4-8 µ diam.; with thin yellowish to brownish sheath in the outer regions and colorless or different in the sheaths inside, sheath un lamellated; often with nonocyst formation 2.5-3.5µ diam.

Collected from: Guindy campus near central Library epiphytic algae-Polyalthia (*Polyalthia longifolia*) (Date: 11.02.2011, Voucher No. GCP-01)

Occurrence: C.f. India (Desikachary, 1959)

***Gloeocapsopsis chroococcides* (Novacek) J. Komerk (Pl. 2, Fig. 19)**

Cells more or less spherical, latter irregular or rounded polyedrical, agglomerated in to irregular packets, differently large, with own mucilaginous, limited firm, lamellated or not lamellated and colored, usually not very wide envelopes which sometimes more or less copy the cell shape; group of cells unified together by the common mucilaginous sheath. Cells with-blue green, usually homogeneous content. Sheath colored, yellow-brown or orange – redsish up to violet. Cells 6.5-8.5 µ diam.

Collected from: Guindy campus near Xerox center epiphytic algae-Tamarind tree (*Tamarindus indica*) (Date: 11.02.2011, Voucher No. GCT-01)

Occurrence: C.f. Mexico (Komarek & Anagnostidis, 1998)

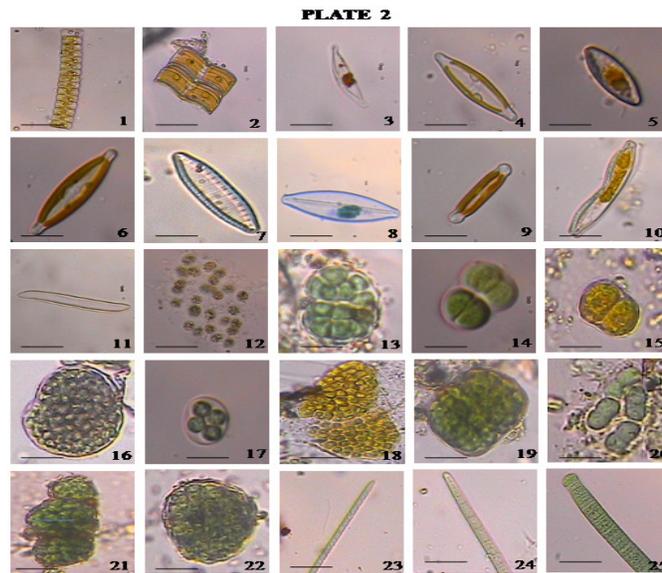


Fig- 1, 2, 3, 4, 5, 6, 7, 9, 10, 12, 13, 14, 16, 17 Scale bar (1cm = 10 µm)

Fig- 8, 11, 15, 18, 19, 20, 21, 22, 23, 24, 25 Scale bar (1cm = 5 µm)

PLATE -2

1. *Fragillaria vaucheriae* Kutz.(Length 15 µm, Breadth 10 µm), 2. *Achnanthes inflata* (Kutz.) Grun.(Length 50 µm, Breadth 15 µm), 3. *Amphora coffeaeformis* Ag. var. *africana* Fritsch and Rich.(Length 20 µm, Breadth 5 µm), 4. *Navicula cryptocephala* Kutzing (Length 30 µm, Breadth 10 µm), 5. *Navicula fluens* Hust.(Length 10 µm, Breadth 5 µm), 6. *Navicula halophila* (Grun.) Cleve f. *subcaptata* Ostrup.(Length 35 µm, Breadth 9 µm), 7. *Navicula rostellum* W. Smith.(Length 27 µm, Breadth 8 µm), 8. *Navicula twoutiensis* Cholnoky (Length 50 µm, Breadth 13 µm), 9. *Pinnularia interrupta* W.Smith f. *subcapitata* Fritsch.(Length 26 µm, Breadth 5 µm), 10. *Hantzschia amphioxys* (Ehr.) Grun. (Length 40 µm, Breadth 10 µm) and 11. *Nitzschia obtusa* W. Smith var. *scalpelliformis* Grun. (Length 90 µm, Breadth 10 µm) Cyanophyceae: 13. *Microcystis elongata* Desikachary (Cells 4 µm, colony 40 µm), 14. *Chroococcus minimus* (Keisseler)Lemm. var. *crassus* Rao,C.B. (Cells 15 µm), 15. *Chroococcus minutus* (Kutz.) Nag. (Cells 15 µm), 16. *Chroococcus turgidus* (Kutz.) Nageli.(Length 22 µm, Breadth 18 µm), 17. *Chroococciopsis kashayi* Fried (Cells 6 µm colonies 30 µm), 18. *Gloeocapsa aeruginosa* Kützing (Length 5 µm, Breadth 3µm), 19. *Gloeocapsa crepidium* Thuret (Cells 4 µm), 20. *Gloeocapsopsis chroococcides* (Novacek) J. Komerk (Cells 7 µm), 21. *Aphanotheace staginina* (Spreng.) A. Br.(Length 10 µm, Breadth 6 µm), 22. *Chlorogloea fritschii* Mitra (Cells 7 µm), 23. *Chlorogloea microcystiodes* Geitler (Cells 4.5 µm), 24. *Oscillatoria cortiana* Meneghini ex Gomont(Cells 5 µm), *Oscillatoria calcuttensis* Biswas(Length 8 µm, Breadth 4 µm), 25. *Oscillatoria proboscidea* Gomont (Length 5 µm, Breadth 10 µm)

***Aphanotheace staginina* (Spreng.) A. Br. (Pl. 2, Fig. 20)**

Thallus gelatinous, spherical, ellipsoidal, up to many cm. in diam. Pale blue-green, dull brown or brownish, in the inside often with calcareous crystals; cells oblong, more or less ovoid or cylindrical, 3-6.5 µ broad, 4.5-11 µ long, more or less blue green, densely or sparsely arranged, generally densely in the peripheral region of the colony and sparsely in the inside of the colony, without individual envelop, homogeneous mucilage.

Collected from: Guindy campus near Xerox center epiphytic algae-Mangifera (*Mangifera indica*) and Jambal tree (*Syzygium cumini*) (Date : 11.02.2011, Voucher No. GCMX-01)

Occurrence: C.f. India (Desikachary, 1959)

***Chlorogloea fritschii* Mitra (Pl. 2, Fig. 21)**

Thallus a deep blue green crust of indefinite size, composed of rounded or irregular cells packet; cells arranged in vertical and horizontal rows, rounded or angular, without evident mucilage envelop, with pale blue-green, granular contents, usually 6-8-16-50µ diam.(4-12 µ), single or in groups of two or more cells separating for propagation; endospore naked, spherical,4-9 µ diam., formed singly within the cell and liberated by the rupture of the membrane, on germination forming a uni seriate filament of 3-12 cells which divide in three direction to produced packets.

Collected from: Guindy campus near Biophysics department epiphytic algae-Mangifera (*Mangifera indica*) (Date: 11.02.2011, Voucher No. GCM-01)

Occurrence: *C.f.* India (Desikachary, 1959).

***Chlorogloea microcystiodes* Geitler (Pl. 2, Fig. 22)**

Thallus thin, gelatinous, forming a slightly lobed dull green to brownish crust mostly hemi spherical or larger thallus made up of by the union of a number of daughter colonies; cells spherical or ellipsoidal, mostly very closely arranged and polygonal in erect or radial row of branched or more or less indistinct rows, generally without a distinct individual sheath; colonial mucilage colorless, or yellowish to brownish only in peripheral parts; cells 2-3.8 μ diam., blue-green, olive-green or yellowish; nonocysts formed in somewhat broader cells by repeated division, 1.5-2 μ diam.

Collected from: Guindy campus near Biophysics department epiphytic algae-Mangifera (*Mangifera indica*) and Mahua tree (*Maduca longifolia*) (Date: 11.02.2011, Voucher No. GCM BLX-01)
Occurrence: *C.f.* India (Desikachary, 1959)

***Oscillatoria cortiana* Meneghini ex Gomont (Pl. 2, Fig. 23)**

Thallus dull blue green; trichome straight, slightly constricted at the joints, 5.5-8 μ broad, gradually tapering at the ends, bent, not capitate, blue green; cells as long as broad or longer or shorter than broad, 5.4-8.2 μ long at the ends up to 14 μ long, septa not granulated; cells obtuse, without calyptra.

Collected from: Guindy campus near Theoretical Physics department - Moisture soil (Date: 12.12.2010, Voucher No. ACT-10).
Occurrence: *C.f.* India (Desikachary, 1959)

***Oscillatoria calcuttensis* Biswas (Pl. 2, Fig. 24)**

Thallus leathery brown; trichomes parallel straight, not constricted at the cross wall, 2 μ broad, at the end briefly attenuated, curved or bend; cells 2-5 times as long as broad, 6-10 μ long, cross - wall 3 granules, blue-green, end cell conical, pointed, not capitate.

Collected from: Guindy campus near Theoretical Physics department - Moisture soil (Date: 12.12.2010, Voucher No. ACT-10).
Occurrence: *C.f.* India (Desikachary, 1959) and Tamil Nadu (Mahendrapurumal & Anand, 2008).

***Oscillatoria proboscidea* Gomont (Pl. 2, Fig. 25)**

Thallus dull green to dark blue-green; trichome more or less straight, not constricted at cross- wall, 12-15 μ broad, at the ends distinctly blue-green; cells 1/3-1/6 times as long as broad, 2-4 μ ; cells 1/3-1/6 times as long as long, not granulated at the cross- wall; end-cells flatly rounded, capitate, with slightly thickened membrane.

Collected from: Guindy campus near Mens hostel, Theoretical Physics department soil and epiphytic on - Mahua tree (*Maduca longifolia*) (Date: 11.02.2011, Voucher No. GCBLX-01)
Occurrence: *C.f.* India (Desikachary, 1959)

***Oscillatoria raoi* De Toni (Pl. 3, Fig. 1)**

Plant mass thin, membranous, firm, pale blue- green to pale bluish violet; trichome straight, usually of uniform thickness, and only rarely slightly tapering at the ends, without constrictions at the joints, 5.2-6 μ broad, septa indistinct, but with distinct granules closely arranged on either side; cells 2.5-6 μ (average 5 μ) long, with homogenous contents, end cells rounded rarely conical, sometimes

with constrictions at the septum, not capitate, without many calyptra. Collected from: Guindy campus near Biophysics department epiphytic algae-Mangifera (*Mangifera indica*)

Occurrence: *C.f.* India (Desikachary, 1959) and Tamil Nadu (Mahendrapurumal & Anand, 2008).

***Phormium corium* (Ag.) Gomont (Pl. 3, Fig. 2)**

Thallus expanded, membranous, leathery, bluish to brownish green, filaments long, more or less flexuous, densely entangled; sheath thin gelatinizing diffuent, colored violet by chloro - zinc-iodide; trichome blue green, not constricted at the cross wall, ends straight, briefly attenuated, not capitate, 3-4.5 μ broad; cells nearly quadrate, up to twice as long as broad, 3.4-8 μ long, not granulated at the cross-walls; end - cells obtuse conical, calyptra absent.

Collected from: Guindy campus near Mens hostel (Date: 11.02.2011, Voucher No GCHMT-1)
Occurrence: *C.f.* India (Desikachary, 1959)

***Phormidium incrustatum* (Nag.) Gomont (Pl. 3, Fig. 3)**

Thallus brownish-red or violet, with calcium incrustation, very hard; trichome entangled or erect and parallel, not constricted at the cross wall, 4-5 μ broad; ends briefly attenuated, erect, not capitate; sheath thin, mucilaginous, not colored violet by chloro-zinc-iodide; cells nearly quadrate. 3.5-5 μ long, cross-wall generally invisible sometimes granulated; end cells obtuse conical, calyptra absent.

Collected from: Guindy campus near theoretical physics department, moisture soil and epiphytic on Jambal tree (*Syzygium cumini*)
Occurrence: *C.f.* India (Desikachary, 1959)

***Phormidium tenue* (Menegh.) Gomont (Pl. 3, Fig. 4)**

Thallus pale blue green, thin membranous, expanded; trichome straight or slightly bent, densely entangled, slightly constricted at the cross wall, attenuated at the ends, 1-2 μ broad, pale blue green; sheath thin, diffuent, colored violet by chloro-zinc-iodide; cells up to 3 times longer than, 2.5-5 μ long, septa not granulated, cross-walls not commonly visible; end-cell acute-conical, calyptra absent.

Collected from: Guindy campus near Theoretical Physics department, moisture soil (Date: 12.12.2010, Voucher No. ACT-10).
Occurrence: *C.f.* India (Desikachary, 1959) and Tamil Nadu (Mahendrapurumal & Anand, 2008).

***Lyngbya confervoides* C.Ag. ex Gomont (Pl. 3, Fig. 5)**

Thallus caespitose, fasciculate, up to 5 cm in height, yellowish brown or dull green, when dried often violet; filament at the base document, above ascending and entangled, straight; sheath colorless, when old lamellated, outside rough up to 5 μ thick, not colored violet by chlor-zinc iodide; trichome olive-green or blue green, not constricted at the cross wall, cross wall commonly granulated, not attenuated at the apices, 9-25 μ mostly 10-16 μ broad; cells 1/3-1/8 time long as broad, 2-4 μ long; end cell round, calyptra absent.

Collected from: Guindy campus near biophysics department and central library epiphytic algae-Mangifera (*Mangifera indica*) and Polyalthia (*Polyalthia longifolia*) (Date: 11.02.2011, Voucher No.

GCM-P-01)

Occurrence: *C.f.* India (Desikachary, 1959)***Lyngbya dendrobia* Bhrul et Biswas (Pl. 3, Fig. 6)**

Stratum more or less expanded, compact, thin, minutely and densely tomentose; filaments long and flexible; closely interwoven, with sheath 10-11 μ thick; sheath usually thin, 1-1.5 μ thick, smooth, hyaline, usually colorless, more rarely when old brownish and very moderately stratified; trichomes 9-10 μ broad as long as, 4-6 long; contents of various shades of brown, uniformly and densely granular; dissepiments conspicuous, not marked by granules.

Collected from: Guindy campus near Biophysics department epiphytic algae- *Mangifera* tree (*Mangifera indica*) (Date: 11.02.2011, Voucher No. GCM-01)

Occurrence: *C.f.* India (Desikachary, 1959) and Tamil Nadu (Mahendrapuram & Anand, 2008).

***Lyngbya lutea* (Ag.) Gom. (Pl. 3, Fig. 7)**

Thallus somewhat gelatinous, leathery, yellowish brown to olive green, when dry often dark violet: filaments coiled and

densely entangled; sheath colorless, smooth at the first thin, but alter up to 3 μ thick and lamellated at the cross wall, not attenuated at the ends, 2.5-6 μ broad, olive green, cross-walls granulated: cells quadrate to 1/3 times long as broad, 1.5-5 μ long; end cells with rounded calyptra.

Collected from: Guindy campus near Mens hostel – Cemented old water tank (Date: 11.02.2011, Voucher No GCHMT-1)

Occurrence: *C.f.* India (Desikachary, 1959) and Kerala (Arulmurugan *et al.* 2010)

***Microcoleus lacustris* (Rabenh.) Farl. (Pl. 3, Fig. 8)**

Thallus blackish blue-green, filament contorted, seldom branched, sheath colorless, slimy, not colored violet by chlor-zinc-iodide, sometimes gelatinizing, many trichomes in each; trichomes distinctly constricted at the cross-walls, 4-5 μ broad; cells cylindrical, 1-3 times as long as broad 6-4 μ long, bright blue-green; end cell more or less rounded, conical, not capitate.

Collected from: Guindy campus near Mens hostel– Moisture soil (Date: 11.02.2011, Voucher No GCHMT-1)

Occurrence: *C.f.* India (Desikachary, 1959)

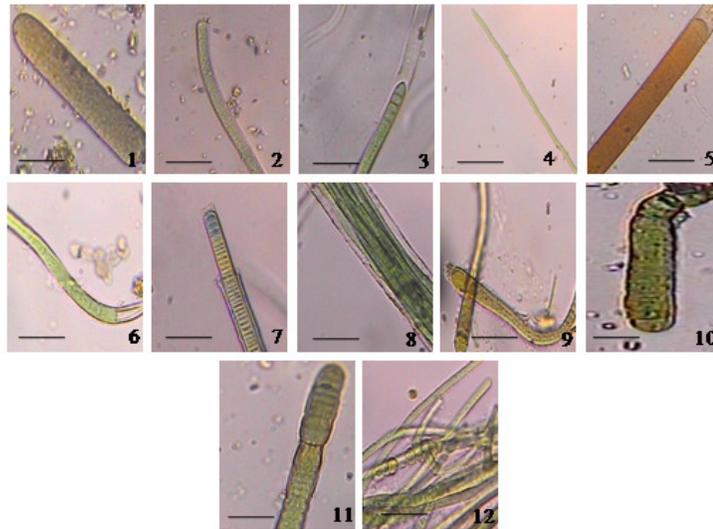
PLATE 3

Fig- 1, 2, 3, 5, 7, 8, 9, 10, 12 Scale bar (1cm = 10 μ m)

Fig- 4, 8, 11 Scale bar (1cm = 5 μ m)

PLATE -3

1. *Oscillatoria raoi* De Toni (Length 15 μ m, Breadth 9 μ m), 2. *Phormidium corium* (Ag.) Gomont (Length 8 μ m, Breadth 4.5 μ m), 3. *Phormidium incrustatum* (Nag.) Gomont (Length 5 μ m, Breadth 5 μ m), 4. *Phormidium tenue* (Menegh.) Gomont (Length 3 μ m, Breadth 4 μ m), 5. *Lyngbya confervoides* C.Ag. ex Gomont (Length 10 μ m, Breadth 18 μ m), 6. *Lyngbya dendrobia* Bhrul et Biswas (Length 6 μ m, Breadth 9 μ m), 7. *Lyngbya lutea* (Ag.) Gom. (Length 1.5 μ m, Breadth 3 μ m), 8. *Microcoleus lacustris* (Rabenh.) Farl. (Bundle 30 μ m, Length 6.5 μ m, Breadth μ m), 9. *Microchaete tenera* Thuret ex Born. et Flah. (Length 8 μ m, Breadth 6 μ m), 10. *Calothrix fusca* (Kutz.) Bornet et Flahault (Length 12 μ m, Breadth 7 μ m), 11. *Camptylonea indicum* Schmidle (Length 7 μ m, Breadth 12 μ m) and 12. *Hapalosiphon welwitschii* W. et G. S. West (Length 6.5 μ m, Breadth 5 μ m)

***Microchaete tenera* Thuret ex Born. et Flah. (Pl. 3, Fig. 9)**

Filaments 10-16 μ broad, seldom up to 20 μ broad, single or in tufts, forming dirty grayish green thallus, straight or curved; sheath thick, lamellated often more or less in crushed, colorless; cells at the base of filaments 6-8 μ broad, 1/3 to as long as broad, distinctly constricted at the cross-wall, olive coloured, heterocysts mostly basal, nearly oval to long ellipsoidal, 6 μ broad, up to 8 μ long.

Collected from: Anna University ground – Stagnant water in

cemented tank (Date: 11.01.2011, Voucher No. AUMEMO - 01).

Occurrence: *C.f.* India (Desikachary, 1959)

***Calothrix fusca* (Kutz.) Bornet et Flahault (Pl. 3, Fig. 10)**

Filaments single, seldom gregarious, in the gelatinous thallus of other algae 200-300 μ high, 10-12 μ broad, bent at the base and inflated, up to 15 μ broad, at the base, ending in a long thin hair; cells often discoid shorter than broad; heterocyst basal,

hemispherical, single or double, smaller than the basal cells of the trichome.

Collected from: Guindy campus near central Libruary epiphytic algae- *Polyalthia* tree (*Polyalthia longifolia*) (Date: 11.02.2011, Voucher No. GCMP-01)

Occurrence: C.f. India (Desikachary, 1959) and Tamil Nadu (Mahendraperumal&Anand, 2008).

***Camptylonema indicum* Schimidle (Pl. 3, Fig. 11)**

Filaments mass brownish; filaments crescent shaped, in the middle portion 13.1-15.7 μ broad and in the erect portions(7.9-) 9.2-11.1 μ broad; sheath lamellate yellowish brown; branching rare, true and false branches present, branches from erect portions; trichomes torulose in the middle portion and unconstructed or slightly constricted the erect branches; cells 7.9-11.8 μ broad and 3.9-9.2 μ long in the prostrate region and 3.9-6.6 μ broad and 7.9-183 μ long in the erect portions; heterocyst intercalary, as broad as the trichomes, as long as broad or slightly longer; hormocyst formed epically consisting of 4-12 cells, with a thick lamellated brownish sheath.

Collected from: Guindy campus near central Libruary epiphytic algae - *Polyalthia* (*Polyalthia longifolia*) (Date: 11.02.2011, Voucher No. GCP-01)

Occurrence: C.f. India (Desikachary, 1959)

***Hapalosiphon welwitschii* W. et G. S. West (Pl. 3, Fig. 12)**

Filaments single among other algae, somewhat flexuous, 5.5-7.5 μ broad; sheath very close, hardly visible, colorless; cells sub spherical or elongate, as long as broad or longer; lateral branches short, as broad as the main filament narrower, 3.5-5.7 μ broad, slightly attenuated at the ends; cells of the branches $\frac{1}{2}$ -3 time as long as broad; heterocyst rare, intercalary, quadrate rounded or cylindrical, 6 μ broad, 6-8 μ long; spores sub-spherical or oblong, 5 μ broad 1-2 times as long as broad.

Collected from: Anna University ground – Stagnant water in cemented tank (Date:11.01.2011, Voucher No. AUMEMO - 01).

Occurrence: C.f. India (Desikachary, 1959) and Tamil Nadu (Mahendraperumal&Anand, 2008).

DISCUSSION

A total number of genera 39 and species 62 belonging to Chlorophyceae (Genus 16, Species 23) of *Oocystis* (2), *Scenedesmus* (3) and Desmids of *Cosmarium* (5) were dominant genus, Bacillariophyceae (Genus 8, Species 13) of *Fragillaria* (2) and *Nvicula* (5) were dominant genus and Cynophyceae (Genus 15, Species 26) of *Chroococcus* (3), *Gleocapsa* (2), *Chlorogloea* (2), *Oscillatoria* (4), *Phormidium* (3) and *Lyngbya* (3) were dominant genus are recorded from Guindy campus of Chennai, India.

ACKNOWLEDGEMENT

The authors thank the Ministry of Environment and Forests, Govt. of India for financial assistance through the All India Coordinated Project on Taxonomy (AICOPTAX) of fresh water algae, No. J. 22018/72/04-CSC (TAX). We thanks for Prof. R. Rengasamy, Director, Centre for Advanced Studies in Botany, University of Madras, for providing laboratory facilities.

REFERENCES

- [1] Agarkar, D.S. 1971. Algae of Tighra lake Reservoir, Gwalior, Madya Pradesh- 1. *J. Jiwaji Uni.*, 3(2):140-66pp.
- [2] Anand, N. 1989. Handbook of Blue-green algae (of rice fields of south India). Bishen Singh Mahendrapal Singh, 23-A, Cannought Place, Dehra Dun, 1-79 pp.
- [3] Anand, N. 1998. Indian Fresh water Microalgae. Bishen Singh Mahendrapal Singh, 23-A, Cannought Place, Dehra Dun, 94 pp.
- [4] Arulmurugan, P., S. Nagaraj & N. Anand. 2010. Biodiversity of fresh water algae from temple tanks of Kerala. *Rec. Res. Sci. Tech.* 2: 58-72 pp.
- [5] Bruhl, P. & Biswas, K. 1923. Algae of Bengal filter-beds. *J. Dept. Sci. Calcutta University*, 5: 1-22 pp.
- [6] Desikachary, T. V. 1959. Cyanophyta, *Indian Council of Agricultural Research, New Delhi*, 1-686 pp.
- [7] Fritsch, F. E. 1935. The structure and reproduction of algae. Vol. I. *Cambridge University Press, London*. 1-791 pp.
- [8] Gloria Massae Taniguchi, Anaclaudia Peres, Pedroamerico, Senna & Pierre Compere. 2003. The desmid genera *Cosmarium*, *Actinotaenium* and *Cosmocladium* from an oxbow lake, *Jatai Ecological Station (Southeastern Brazil)*. *Syst. Geogr. Pl.* 73: 133-159.
- [9] Gupta, R. K. 2005. Algal flora of Dehradun District *Uttanchal. Bot. Surv. of India* 1-298pp.
- [10] Komárek & Anagnostidis, K. 1998. Cyanoprokaryota 1. Teil: *Chroococcales*.- In: Ettl, (eds.), *Subwasserflora von Mitteleurop.* Bd. 19/1. *Gustav Verlag, Jena*.
- [11] Mahendraperumal, G. & N. Anand. 2008. Manual of fresh water algae of Tamilnadu. Bishen Singh Mahendrapal Singh, 23-A, Dehra Dun. 1-124 pp.
- [12] Mayakkannan. G. 2010. Ph.D. thesis title on Biodiversity and Biology of Microalgae of Forest soils and Subaerial Habitats of Tamil Nadu State, *University of Madras*.
- [13] Ninan K. N., S. Jyothis, P. Babu & V. Ramakrishnappa. 2007. *The Economics of Biodiversity Conservation*. Earthscan, London. 1 - 2 pp.
- [14] Philipose, M. T. 1967. *Chlorococcales*, *Indian Council of Agricultural Research, New Delhi*, 1-365 pp.
- [15] Prasad B. N. & Singh, Y. 1996. Algal indicators of water pollution. Bishen Singh Mahendrapal Singh, 23-A, Dehra Dun.
- [16] Prasad, B. N & Misra, P. K. 1984. Some new taxa of desmids from Andaman Islands. *Phykos*, 109: 149-158.
- [17] Prasad, B. N & Misra, P. K. 1992. *Fresh water algal flora of Andaman and Nicobar Islands, Vol. II*. Bishen Singh and Mahendra Pal Singh, Dehradun, India. 1-284 pp.
- [18] Prasad, B. N. & Srivastava, M. N. 1984. On some filamentous green algae –new to Indian flora. *J. Indian bot. soc.* 63: 456-459 pp.

- [19] Prasad, B. N. & Srivastava, M. N. 1992. *Fresh water algal flora of Andaman and Nicobar Islands, Vol. I*. Bishen Singh and Mahendra Pal Singh, Dehradun, India. 1-369 pp.
- [20] Prescott, G.W. 1951. *Algae of Western great lakes area: Wm. C. Brown Co. Publishers Dubuque Iowa.*
- [21] Ramanathan, K. R. 1964. *Ulotrichales*, ICAR. New Delhi.
- [22] Randhwa, M. S. 1959. Zygnemaceae. *Indian Council of Agricultural Research, New Delhi*, 1-477 pp.
- [23] Rodrigues L. L, Célia Santannal & Atucci. 2010. Chlorophyceae das Represas Billings (Braço Taquacetuba) e Guarapiranga, SP, Brasil. *Revista Brasil. Bot.*, Vol. 33(2): 247-264 pp.
- [24] Sankaran, V. 2009. Fresh water algal biodiversity of the Anaimalai hills, Tamil Nadu-Chlorophyta- Chlorococcales. *Biology and Biodiversity of Microalgae* (Ed. Prof. N. Anand) Centre for Advanced Studies in Botany, University of Madras, India. 84-93pp.
- [25] Smith, G.M. 1920. Phytoplankton of the Inland Lakes of Wisconsin part. I. Myxophyceae, Phaeophyceae, Heterokontae and Chlorophyceae, Wisconsin *Geological and Natural History Survey. Bull.* 57 Sc. Ser. 12: 1-243.
- [26] Venkataraman, G. 1939. December. A systematic account of some south Indian Diatoms, *Proceeding of the Indian Academy of Sciences: Vol. X, No. 6: 293-368 pp.*
- [27] Williamson, D. B. 1999. A proposed new desmids genus *Cruiangulum* and description of three new desmids species from rock pools in the Western Cape Town, South Africa, *Algological Studies* 93: 55-62.