Annals of Plant Sciences
ISSN: 2287-688X
OPEN ACCESS
www.annalsofplantsciences.com

Original Research Article

Notes on fresh water algae Sawaimadhopur District. Chaetophorales, Rajasthan, India

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Received for publication: January 05, 2015; **Accepted:** February 21, 2015.

Abstract: Algae are ubiquitous in their distribution and one of major part of photosynthetic organisms. The Chaetophorales are most commonly found group in freshwater habitats and are one of the beautiful green organisms in running water. The present work is deals with 15 species of this group namely 1. *Protoderma viridae* Kutz, 2. *Coleochaete scutata* De Brebisson, 3. *Coleochaete pulvinata* A. Braun, 4. *Coleochaete irregularis* Pringsheim, 5. *Stigeoclonium tenue* (C.A. Agardh) Kützing, 6. *Stigeoclonium tenue* (Ag.) Kütz var. *tenue, 7*. *Stigeoclonium lubricum* (Dillw.) Kütz., 8. *Stigeoclonium pusillum* (Lyngbye) Kützing, 9. *Stigeoclonium elongatum* (Hassall) Kützing, 10. *Stigeoclonium protensum* (Dillw.) Kütz., 11. *Stigeoclonium pachydermum* Prescott, 12. *Stigeoclonium stagnatile* (Hazen) Collins, 13. *Chaetophora elegans* (Roth) C.A. Agardh, 14. *Chaetophora incrassata* (Hudson) Hazen and 15. *Aphanochaete repens* A. Braun.

Key Words: freshwater algae, chaetophorales, RNP (Ranthambhore National Park).

Introduction

The research project is carried out in the Sawaimadhopur district of Rajasthan. The district is situated in the western part of the Rajasthan and the rainfall is moderate. It cover area 5042.99.99 sq km and situated in between North longitudinal 25°-45' to 26°-41 and in between 75°-59' to 77°-0 East longitude. The temperature ranges from 4° to 45°c with average rainfall 873.40mm. The district has rolling hills of Aravali and Vindhyas ranges. The work on algal Chaetophorales from various part of country were done by many workers e.g. Biswas (1949), Bhardwaja (1963), Gonzalves and Joshi (1946), Kamat (1962, 63, 68a, 68b, 73), Randhawa (1936), Prasad (1965) except isolated pockets including south Rajasthan. Therefore, the present work is the first report for chatophorales from Rajasthan.

Materials and Methods

A number of collections were made (2013-2014) from all possible habitat e.g. soils, rocks surface water seepages, rivers pools and mostly from lakes and their drainage. Fresh materials were examined as soon as possible after bringing it in to laboratory.

Samples were preserved in 4% formalin for further examination and preserved in departmental herbarium. Camera lucida drawings were made with the help of mirror type of camera Lucida. The identification was done by as work of Sarma (1986), Islam (1963) Smith (1950) and other relevant research papers

Taxonomic Enumeration

Protoderma viridae Kutz. 1843. Pl. III. F. 1. (De Toni 1889a, Syll. Alg. I. p. 147; Collins 1909, p. 217; Heering, 1914, p.116, f.168; Prescott, 1962, p. 123, Pl.9, f.10;Pl.14, f.10; Printz. 1964, P. 290, F. 3-5; Starmach 1972, P. 395, f. 411; Sarma, 1986, P. 46, P.45, f. 234-235.)

Thallus monostromatic, disc irregular or discoid. Cells at center polygonal and elongated, undulating margins with a pyrenoid at periphery region. Cells 4-8µ wide and 4-15µ long.

Habitat-growing on *Cladophora* filament in stream near Gilai Sagar Drainage.

Distribution-not reported from India.

Coleochaete scutata De Brebisson, 1844. Pl. IV, fig. 2, 4, 5.

(De Brebisson 1844, p. 29, pl. 2.f. 1-7; Kützing 1849, Spec. alg. p. 424; Pringsheim 1860, p. 35, pl.1, f.4; pl. 3, f.3-4; pl. 4, fo. 3; De Tonie 1889 a. Syll. alga. I.P. 9; Heering 1914, p. 135, f. 192, 5-7, 194; Gauthier-Lievre 1956, p. 39. pl. 3 f. 42, 45-46; Printz 1964, p. 360, p. 112, f 3-11; Starmach 1972, p. 532; f. 548)

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Thallus forming a regular or lobed, often reniform monostromatic disc of branching filaments radiating from a common centre and laterally coalescent. Cells quadrangular. 12-20µx 15-25µ in collected material, may up to 45µ broad and 65µ. Many cells bearing a seta each; plant heterothallic; antheridia in group of four, up to 7-8µ in length and breadth; Oogonia located near the periphery cane shaped, dark green in colour, 60-62µ broad. May be up to 145µ broad: Spermocarp or bicular 55-95µ in diameter in collected material.
Habitat-Growing on *Vallisneria* species near Saleem Lake, RNP, on aquatic plant in ponds, running water in Kawalji and way to Bamanwas. Most commonly found chaetophoracean member from study area.
Distribution-Cosmopolitan, previously reported from India by Biswas (1949), Ganzalved and Joshi (1946) Kamat (962, 63), Patel (1968), Randhawa (1936a, 1936b, 1936c), Vankataraman (1962), Saxena (1961), Schmidle (1900b), Singh (1941), Turner (1892), Venkataraman (1957).

Coleochaete pulvinata A. Braun in Kützing 1849 (Kützing 1849, Spec. alg. p. 424; Pringscheim 1860, p. 35, pl. 2, f. 1; De Toni 1889a. Syll. alg. I, p. 7; Heering 1914, p. 134, f. 187-188; Gauthier-Lievre 1956, p. 37, pl. I.f. 11-14; Prescott 1962, p. 129, pl. 18, f. 7-8; Printz 1964, p. 353, pl. 110, f. 1-5; Starmach 1972, p. 527, f. 537).
Thallus forming an epiphytic cushion on aquatic plant leaves and irregularly branched filaments projecting out firom a common centre. Cells cylindrical often broader at the anterior end, 15-30µ wide and 21-55µ long. Sexual structures not observed in collected material. However Antheridia flask shaped, 2-3 developing at the end of branches, about 4µ broad. Oogonia globose, corticated 135-150µ in wide. Spermocarp 150µ in diameter.
Habitat-Growing on *Hydrilla* leaves, near Gilai Sagar, near Chauth Ka Barwara, drainage of Gilai Sagar.
Alga previously reported from India by Patel (1966), Singh (1941).
Distribution - Cosmopolitan

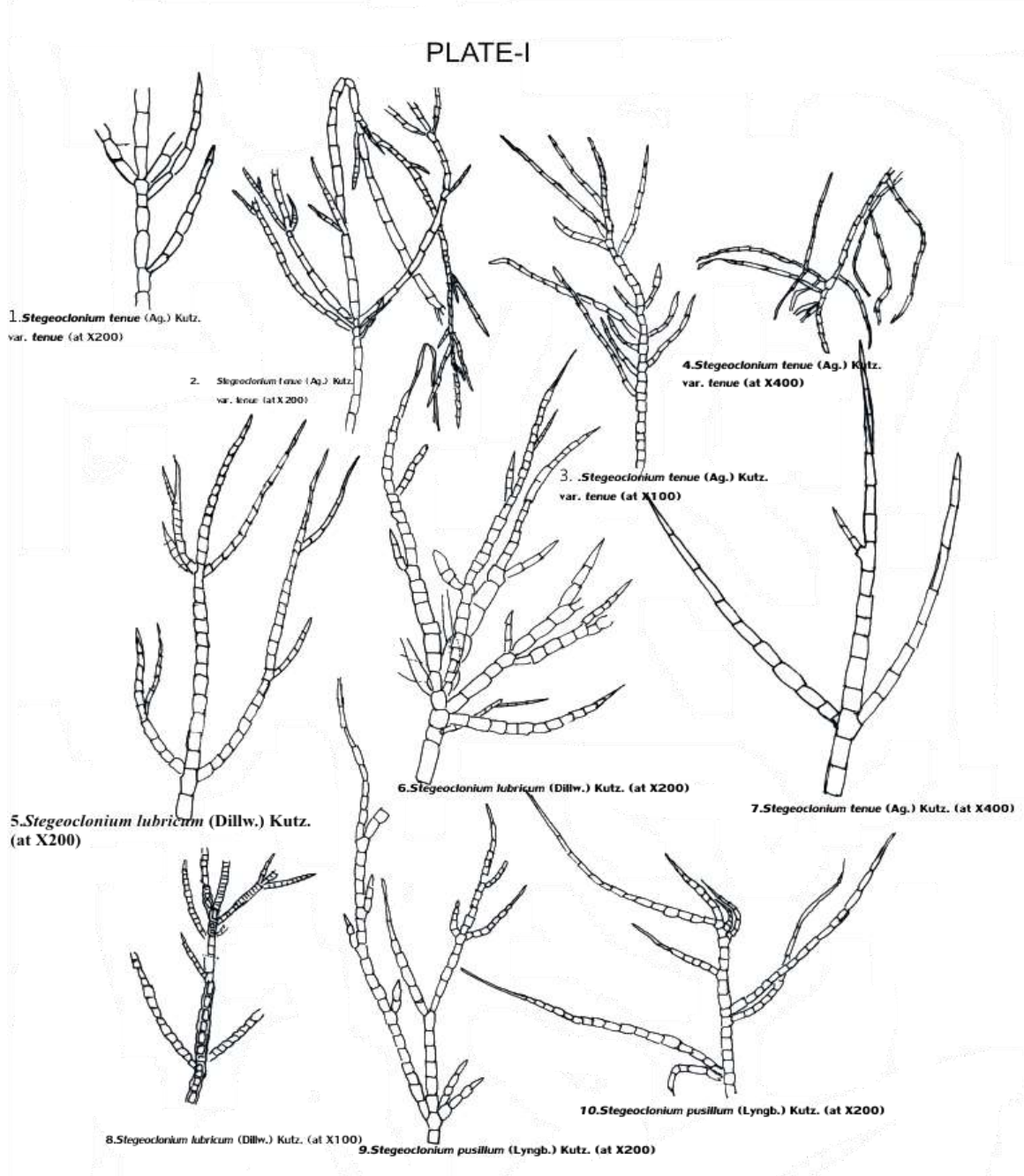
Coleochaete irregularis Pringsheim 1860 pl. IV fig. 5, 6.
(Pringscheim 1860, p. 11, pl. 1, f. 6; pl. 6, f. 3-9; De Toni 1889a. Syll. alg. I. p.9; Heering 1914, p. 135. f. 189-190; Gauthier-Lievre, 1956, p. 38, pl. 2, f. 28-33; Prescott 1962, p. 129, pl. 17, f. 8-9; Printz. 1964, p. 358, pl. 112, f. 2; Nishihama 1970. p. 529, pl. 4, f. E-F; Starmach 1972, p. 534, f. 546).
Thallus consisting of irregularly branched filaments which do not radiate from a common centre but spread in various directions forming a loose monostromatic expansion; filaments usually free but sometimes laterally coalescent for a short distance; cells rectangular or polygonal. 7-15µ wide and 17-19µ long; setae few projecting laterally. Sexual structures not observed from collections.
Habitat- Grow on hydrophytes or on algal filaments in stream RNP.
Distribution-Cosmopolitan, previously recorded from India by (Kamat 1963).

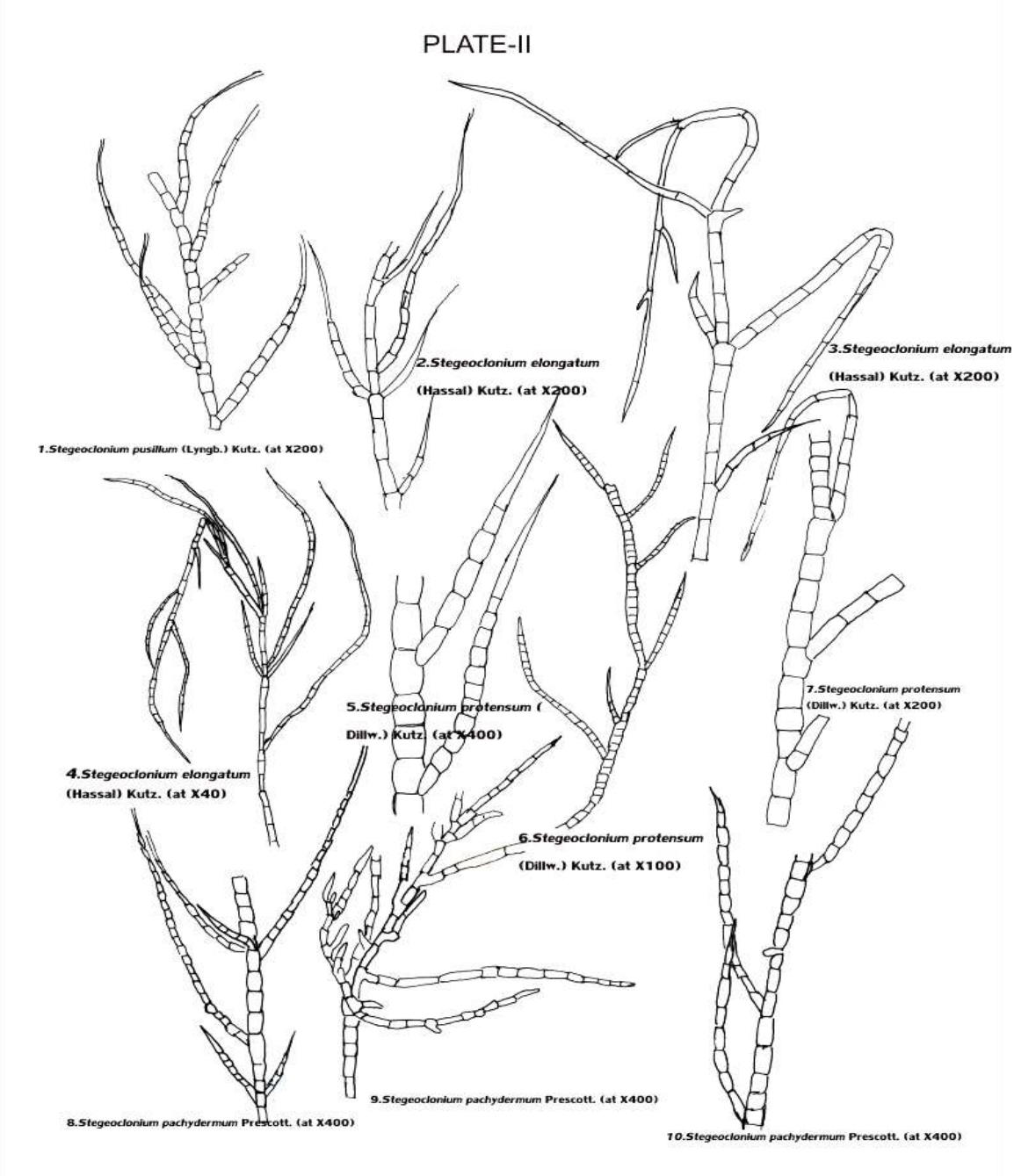
Stigeoclonium tenue (C.A. Agardh) Kützing 1843 pl. I, fig. 7.
(Kützing 1853, Tab Phyc. III, p. 3, pl. 3, f. 1; De Toni 1889a, Syll. alg. I, p. 197; Hazen 1902, p. 202, pl. 32, as *Myxonema tenue* (Ag.) Rabh.; Collins 1909, p. 220; Heering 1914, p. 78; Prescott 1962, p. 117; Islam 1963, p. 92, pl. 4, f.9; pl.8, f.1; pl. 14, f. 2-4; pl. 19, f.1; pl. 21, f. 5; Printz 1964, p. 146, pl. 31, f. 6; Starmach 1972, p. 324, f. 335).
Thallus bright green, 2-5 cm long, lubricous, profusely branched, prostrate system much reduced, branched simple, alternate and opposite, branch tips tapering without a hair. Primary axis consisting of two types of cells: large cylindrical sometimes slightly constricted 8-12µ × 15-25µ and short, inflated or angular cells, 06-11µ × 5 × 15µ, the latter generally producing branches. Rhizoids developing from the base of the filaments.
Distribution-Cosmopolitan, previously recorded from India by Biswas (1949), Dixit (1937), Kamat (1962, 68a, 68b), Randhawa (1936a), Sexena (1961), Schmidle (1900b), Singh (1941).
Habitat-Growing on stones and on aquatic plants in streams and various lakes in study area.

Stigeoclonium tenue (Ag.) Kütz var. *tenue* pl. 1 fig. 1-4. (Synonym is as the species)
Thallus bright green, filaments delicate, lubricous, simple both alternate and opposite, mostly from short angular cells, cells of main filaments 7-11µ in diameter, 2-5 times longer than broad little constricted.
Distribution-Cosmopolitan, previously recorded from India by Sexena from Hyderabad.

Habitat-Attached on stones in Padamlata pond, RNP during heavy rainy season.

Stigeoclonium lubricum (Dillw.) Kütz. 1845 pl. I fig. 6, 8.
(Kützing 1853, Tab. phyc. III, pl. 6, f. 1; Berthold 1878, p. 195, pl. 15, f. 9, 11, 12, 14 Hazen 1902, p. 195, pl. 28, f. 1-2 as *Myxonema lubricum* (Dillw.)
Fries; Heering 1914, p. 81, f. 114, 117; Islam 1963 p. 118, pl. 8, f. 4; pl. 17, f. 1-4; pl. 18, f. 1-4; pl. 19, fig. 3; Printz 1964, p. 147, pl. 35, f. 7; Starmach 1972, p. 329, f. 343; Sarma 1976, figs 278-283, 290-293).
Thallus bright green, 1-4 cm long, lubricous, robust; prostrate system creeping, attached by rhizoids. Erect filaments profusely branched, mostly opposite. Primary axis consisting of two types of cells : large, mostly inflated, 15-18µ wide × 19-30µ long and short barrel-shaped 12-16µ wide × 14-22µ long, often several in a series, usually latter producing the branches; branch tips blunt or sometimes acute, without a hair.
Distribution-Cosmopolitan, previously recorded from India by Biswas (1949), Dixit (1937), Kamat (1962, 63), Randhawa (1936a, 36c), Islam (1963).
Habitat-Growing on pebbles and on aquatic plants in stream of RNP.





Stigeoclonium pusillum (Lyngbye) Kützing 1845. pl. I fig. 9-10, pl. II fig. 1
(Kützing 1853, Tab. phyc. III, pl. 9, f. 1; De Toni 1889a, Syll. alg. I, p. 199; Islam 1963, p. 88, pl. 37, f. 2-4; pl. 38, f. 5-7; Starmach 1972, p. 333, f. 347; Sarma 1976, figs 302-305).

Thallus bright green, 1-3cm long, prostrate more or less absent, branches alternate or irregular, branch tip with multicellular hair. Cells in primary axis inflated twice longer than wide, 12-18µ wide and 22-42µ longer, constricted at cross wall rhizoids arises from base of the filament.

The short inflated cells twice longer than wide, alternate branching, hyaline multicellular hairs at the tips of branches are characteristic of this species. This species comparable to *S. lubricum* (Dillw.) Kütz. Which is characterized by opposite or whorled branching, specialized branch producing cells and thickened cell wall? This is first record from Asian continent.

Distribution-New Zealand, Africa (Algeria), Europe Arctic and Subarctic (Alaska).

Habitat-Growing on aquatic plants leaves, stem in stream way to RNP.

Stigeoclonium elongatum (Hassall) Kützing 1849, pl. II figs 2, 3, 4.
(Kützing 1853, Tab. phyc. III, pl. 9, f. 2; Islam 1963, p. 104, pl. 10, f. 4; pl. 30, figs. 1-3; pl. 32, fig. 9; pl. 34, figs 6-8; Starmach 1972, p. 32b, f. 337; Sarma 1976 figs 246-251).
Thallus grass green tufts, 2-8cm long, lubricous, slender main axis consisting of cylindrical and inflated, little or no constriction, 5-9µ wide and 18-42µ long, branching sparse, alternate, dichotomous or opposite branch tips gradually terminating in multicellular hairs.
Distribution-Cosmopolitan, previously studied from India by Sinha and Das as *S. falkandicum* Kütz. (1963-64), Venkataraman as *S. attenuatum* (Haz.) Collins (1957).
Habitat-Collect from hydrophytes leaves, near Gilai Sagar, found in single collection.

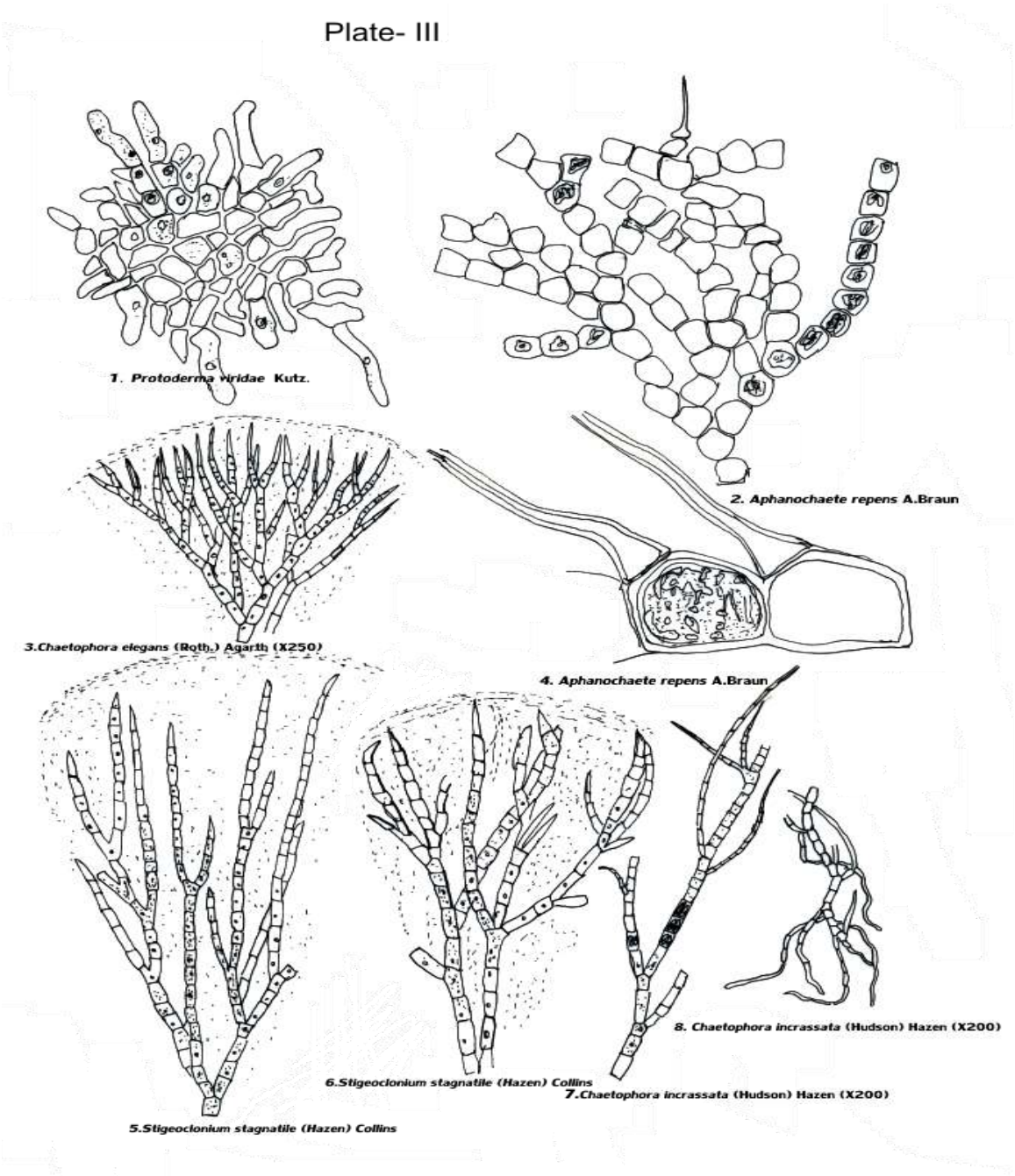
Stigeoclonium protensum (Dillw.) Kütz. 1845, pl. II, figs. 5, 6, 7
(Kützing 1853, Tab. phyc. 3: pl 8, f. 2. Cooke 1882, Fr. W. Alg. 84, pl. 74, f.1; De Toni, 1889, Syll. Alg. pl. I fig. 199. Heering 1914, p. 81, f. 74. Islam 1963, pl. 9, figs.; pl. 18, fig. 5; pl. 20, fig. 1; pl. 34, figs. 1-3; pl. 36, figs. 2, 4; pl. 41, fig.1)
Thallus yellowish, slender, branching alternate, sparse, more than two branches also arises from one place, end cells of branches with colourless hairs with tapering end. Cells slightly constricted in young branches; width of main axis filaments 17-22µ and 2-3 times longer than wide.
The most nearly related species is *S. stagnatile* and regarded as *S. stagnatile* is young stage of *S. protensum*. It is strongly claimed by Islam (1963).
Distribution-Species was examined in Africa, N. America, and Europe but not observed from Indian subcontinent. So it is first report from this subcontinent.
Habitat: Growing on pebbles and dead plant parts, slowly running water way to Chambal River.

Stigeoclonium pachydermum Prescott 1944. Pl. II figs. 8, 9.
(Prescott 1944, p. 350, pl. 2, f. 1-3; 1962, p. 116, pl. 12, f. 1-4, 9-10; Islam 1963, p. 132, pl. 8, f. 7-8; pl. 24, f. 1-5; pl. 25, f. 1-3; pl. 27, f. 4; pl. 44, f. 4-5; Starmach 1972, p. 322, f. 332-334. Sarma 1976. Figs. 342-345).
Thallus dark green 1-2 cm long, basal system absent, erect filaments profusely branched and crooked branches often found branching mostly opposite and sometimes alternate, thallus attached to surface by rhizoids and tip of branches blunt. Cells of main axis two types, large, mostly cylindrical 12-15µ wide, 25-40µ long short barrel shaped or sub-globosely, 11-13µ wide and 14-17µ long, the letter producing branches.
Distribution-New Zealand, Europe, N. America but not reported from Asia. So it is first report from Asia.
Habitat-Growing on stones, in running water near Gilai Sagar.

Stigeoclonium stagnatile (Hazen) Collins 1909, pl. III, fig. 5, 6.
(Hazen 1902; p. 207, pl. 36, f. 1-2, as *Myxonema stagnatile* Hazen; Collins 1909, p. 221; Prescott 1962, p. 117, pl. 11, f. 3; Islam 1963, p. 89, pl. 9, f. 2; pl. 29, f. 1-3; Starmach 1972, p. 335, f. 348; Sarma, 1976, p. 57, f. 309-311)
Thallus yellowish green, up to 1.5cm long, delicate, prostrate part not observed; primary axis consisting of cylindrical cells, without constriction at cross wall, 5-13µ wide and 8-29µ long. Branching by erection, alternate, opposite and more than one branch arising from the same place, which is characteristic feature of species. End of branch terminating with tapering ends rhizoids numerous at nodes.
This species shows resemblance with *S. protensum* (Dillw.) Kütz. However it differs in having non-constricted cylindrical cells and in its alternate and opposite arrangements of branches with tapering or setiferous tips.
Distribution-New Zealand, Asia, N. and Central America (icluding Carrabean islands). Previously reported from India by Chowdhary (1967).
Habitat-Growing on aquatic plants leaves.

Chaetophora elegans (Roth) C.A. Agardh 1812 pl. III, figs. 3.
(Hazen 1902, p. 211, pl. 37, f. 1-3; Heering 1914, p. 93, f. 134-140; Saxena 1961, p. 22, f. 1E; Prescott 1962, p. 118, pl. 14, f. 3-4; Islam and Ahia 1964, p. 105, f. 14; Printz 1964, p. 197. pl. 54, f. 4-6; Starmach 1972, p. 347, f. 358, Sarma 1976, p. 34, f. 97-106).
Thallus, 2-5cm in diameter, green, mucilaginous filament, dichotomously branched but trichotomous not rare. Branches terminate with multicellular hairs, Cells quandrangular or cylindrical, 10-12µ wide and 18-42µ long. Chloroplast generally girdle shaped. This taxon is widely distributed in study area.

Distribution-Cosmopolitan, previously reported from India by Biswas (1949), Dixit (1937); Kamat (1962, 1968a); Martens (1871 as *C. Radians* Kutz.); Roy and Gupta (1973); Shukla (1971); Singh (1941).
Habitat-Growing on aquatic plants on stem, leaves or other objects. Common species in study area.



Chaetophora incrassata (Hudson) Hazen 1902 pl. III, figs. 7, 8.
(Hazen 1902, p. 214, pl. 38, f. 2-3; Heering 1914, p. 96, f. 143; Sexena 1961, p. 21, f. 2B; Prescott 1962, p. 118, pl. 14, f. 1-20, 11; Printz 1964, p. 198, pl. 54, f. 9; pl. 55, f. 2-3; Starmach 1972, p. 352, f. 360. Sarma, 1976, p. 35. f. 109-112 and 211).
Thallus yellowish green, branched, branches usually curved, projecting outward terminating in multicellular hair; cells cylindrical 3-4µ wide and 11-17µ long.

Distribution-Asia, Europe, N. America, New Zealand. Previously examined in India by Biswas (1949), Saxena (1961).
Habitat-Collect from running water of drainage of Isherda Dam.

Aphanochaete repens A.Braun 1850 (Pl. III, Fig.2, 4)
Thallus filamentous, profusely dichotomously branched. Cells polygonal or somewhat quadrangular, with one setae in few cells. Setae up to 70µ long and found in series of cells. The setae are with swollen base. Cells are 16-18µ wide and 19-21µ long. Chloroplasts are with many paranoids. Eugenia found in series with red coloured cells.
The specimen is differing from type in having profusely branched filament and cell shape.
The alga was growing on hydrophytes or on their dead part in Salim Lake (RNP) near water plant.

Acknowledgement

The author is thankful to University Grant Commission (UGC) for providing financial assistant to carry out the study.

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Source of support: University Grant Commission (UGC), New Delhi, India
Conflict of interest: None Declared