Observations

OBSERVATIONS

Class: Cyanophyceae Sachs

General characters of class Cyanophyceae

Unicellular or multicellular algae without a true nucleus or chromatophore. Protoplast differentiated into peripheral zone with photosynthetic pigment (chromatoplasm) and a central colorless portion with a generative function (centroplasm), and assimilation pigments chlorophyll, phycocyanin, phycoerythrin, carotinoids; contents blue-green, olive-green, yellowish, rose violet seldom yellow-green, green or yellowish brown, never really chlorophyll green or real brown coloration seen. Cell wall thin or after gelatinization very thick, colorless, or often yellow to brown, never really chlorophyll green or real brown, seldom red, blue or violet colored. Photosynthetic product glycogen or glycosides, starch absent. Reproduction by division or through endospores, exospores, hormogones, planococci, seldom through the heterocysts, fragmentation of the thallus and also of the trichome into parts or individual cells (hormogones), spores or pseudohormogonia (hormocysts). Motile flagellated stages absent. Sexual reproduction not known or absent.

Key to the Orders

1. Plants unicellular, or colonial sometimes forming a pseudo-filamentous colony, never with a "trichome organisation," no differentiation into base and apex, endospores not formed in sporangia, no exospores, nannocytes present
.....*Chroococcales*

2. Plants more or less distinctly filamentous, attached, arrangement very uniform, chroococcaceous structure, often forming parenchymatous thalli with prostrate and erect filaments, without differentiation into trichome and filament, no hormogones, no heterocysts, endospores in sporangia
.....*Pleurocapsales*

3. Plants filamentous, with trichome and filament organized or 'hormogonalean organisation', hormogones present, often with heterocysts, akinetes, exospores, or endospores, pseudo-hormogonia present.
Without true branching, unbranched or with false branching
.....*Nostocales*

Order: Chroococcales Wettstein

Key to the families

1. Cells unicellular or forming colonies, not forming filament like growth
.....*Chroococcaceae*
2. Cells of thallus arranged in a linear series forming pseudo filamentous growth
.....*Entophysalidaceae*

Family: Chroococcaceae Nageli

Cells mostly spherical, ellipsoidal, cylindrical, seldom spindle shaped, single or forming colonies; membrane thick, mucilaginous, often lamellated, with an overall formation of amorphous mucilaginous masses; colony shapeless, spherical, ellipsoidal, tubular or hemispherical; cell-division in two or three directions, in elongate cells often only in one direction transverse, cells of many generations in a single parent sheath; multiplication by division, sometimes through nannocytes, spores with firm membranes present in some genera, also planococci.

Key to the genera:

1. Cells single or a few together, in a shapeless colony 2
1. Cells generally many in a single colony 8
2. Cells spherical 3
2. Cells elongate 4
3. Without individual mucilage envelopes .....*Synechocystis*
3. With a distinct envelope 5
4. Sheath vesicular .....*Gloeocapsa*
4. Sheath not vesicular .....*Chroococcus*
5. Cell division transverse, with a firm vesicular sheath .....*Gloeothece*
5. Cell division transverse without such a sheath 6

6. Cells ellipsoidal or cylindrical with round ends 7

7. Cells single, or 2-4 together, erect without common mucilage .....*Synechococcus*

8. Cells without any regular or definite arrangement 9

8. Cells with definite arrangement in distinct colonies 14

9. Cells in a general amorphous mucilage without or with a few distinct sheath round the individual cells 10

9. Cells with distinct individual envelopes or sheaths, colonial mucilage not homogeneous 12

10. Cells typically well packed into microscopic colonies of definite shapes mostly planktonic .....*Microcystis*

10. Cells loosely arranged, mostly not planktonic, forming macroscopic colonies 11

11.Cells spherical .....*Aphanocapsa*

11. Cells ellipsoidal to cylindrical .....*Aphanothece*

12. Individual sheaths vesicular and broad, and formed one in another 13

12. Individual sheaths not vesicular, cells spherical .....*Chroococcus*

13. Cells spherical .....*Gloeocapsa*

13. Cells ellipsoidal to cylindrical .....*Gloeothece*

14. Colony with cells arranged in a tabular or cubical or three dimensional colonies 15

15. Cells in regular transverse and longitudinal rows, tabular or flat colonies .....*Merismopedia*

General characters of *Gloeocapsa* Kutzing

Cells spherical, 2-8 in colonies, seldom many, with a number of concentric special envelopes; colonies single or many together forming an expanded mass, individual sheaths lamellated or unlamellated, cell division very regularly in three directions, cells in large colonies often with secondary colonies, arranged irregularly; occasionally with nannocyses, resembling *Aphanocapsa* stage; spores with firm thick walls often formed in a number of species.

Key to the species of *Gloeocapsa*

1. Sheath colourless 2
1. Sheath coloured 8
    2. Sheath unlamellated 5
    2. Sheath lamellated 3
3. Cells without sheath up to 8 µm diam. .....*Gl. decorticans*
3. Cells without sheath narrower 4
    4. Cells without sheath 2.5 µm broad .....*Gl. gelatinosa*
    4. Cells without sheath 3-5 µm broad .....*Gl. polydermatica*
5. Thallus without calcium impregnation 6
    6. Cells without sheath broader up to 5µm broad 7
7. Sheath lamellated .....*Gl. atrata*
    8. Sheath yellowish to brownish 9
9. Freshwater species 10
    10. Cells smaller 11
11. Sheath unlamellated 12
    12. Cells without sheath 4 µm broad .....*Gl. luteofusca*

G. atrata (Turp.) Kutz.

Plate: II fig-10, Plate: XI

Cyanophyta : T. V. Desikachary, 1959, P-116

Thallus crustaceous, mucilaginous, blackish; cells without sheath 3.5-4.5(-5) µm in diameter; with sheath 9-14.5 µm in diameter; pale blue green, mostly many in a colony; sheath colorless or pale bluish, thick, unlamellated or indistinctly lamellated.

Locality: Yevateshwar hills, Kas, Kurneshwar.

G. decorticans (A. Br.) Richter

Plate: II fig-11

Cyanophyta: T. V. Desikachary, 1959, P-114

Cells spherical or sometimes oval, blue-green, single or up to 2-4 together; single cells with 19-21 µm without sheath 6-8 µm, in a two celled stage with sheath 22-30 µm without sheath up to 12 µm long; sheath colourless, thick distinctly lamellated.

Locality : Yashwantrao Chavan College Campus Satara.

G. gelatinosa Kutz.

Plate: II fig-12

Cyanophyta: T. V. Desikachary, 1959, P-114

Cells without sheath about 2.5 µm and with sheath 6.2-10 µm in diameter, sheath colorless, seemingly thin, when old lamellated.

Locality: Yevateshwar hills.

G. luteo-fusca Martens.

Plate: III fig-1

Cyanophyta: T. V. Desikachary, 1959, P-119

Thallus compact, expanded leathery, blackish to olive green in color; cells with a colorless sheath at first, later dull brown or yellowish, 6-7 µm long, 4 µm broad, with sheath 16 µm long and 12 µm broad.

Locality: Yevateshwar hills.

G. polydermatica Kutz.

Plate: III fig-2

Cyanophyta: T. V. Desikachary, 1959, P-114

Thallus mucilaginous, compact; cells spherical, without sheath 3-4.5 µm in diameter, blue- green; sheath colorless very thick, as thick as protoplast, very distinctly and many times lamellated.

Locality: Yevateshwar hills.

General characters of *Chroococcus* Nag.

Cells spherical or subspherical, hemispherical, after division in small groups of 2-4 individuals, some times 8-16, rarely single, in a gelatinous or mucous matrix; sheath of individual cells distinct, firm, generally lamellated, in some homogeneous, persistently or irregularly broken; reproduction by cell division and fragmentation by colonies; division of cells in three directions. nannocytes occasionally seen.

Key to the species of *Chroococcus*

1. Cells single or after division mostely 8(-16) together 2

1. Cells forming a large thallus 6

2. Sheath lamellated 3

2. Sheath not lamellated 5

3. Envelope yellowish or brownish 4

4. Cells without sheath 5.8-11 µm broad .....*Chr. schizodermaticus*

5. Cells without sheath 4-10 µm broad .....*Chr. minutus*

6. Colonies attached, mostly subaerial 7

7. Sheath lamellated 8

7. Sheath unlamellated 9

8. Sheath thick, colourless, or yellowish, cells 2-4 µm diam .....*Chr. varius*

9. Cells without sheath 4-8 µm broad .....*Chr. pallidus*

C. minutus (Kutz.) Nag.

Plate: II fig-6

Cyanophyta: T. V. Desikachary, 1959, P-103

Cells spherical or oblong, single or in group of 2-4, light blue- green, with sheath 6-15 µm in diameter and without sheath 4-10 µm in diameter, colonies 10-13 x 15-20 µm; sheath not lamellated, colorless.

Locality: Yevateshwar hills.

C. pallidus Nag.

Plate: II fig-7

Cyanophyta: T. V. Desikachary, 1959, P-108

Thallus gelatinous, yellowish or colorless; cells single or 2-4 seldom up to 8 in elliptic oblong colonies, without sheath 5-8 µm with sheath 7-11.5(13) µm broad, blue-green or yellow; sheath colorless, unlamellated

Locality: Yevateshwar hills.

C. schizodermaticus West.

Plate: II fig-8

Cyanophyta: T. V. Desikachary, 1959, P-103

Cells in groups of 2-4, blue-green, without sheath 5.8-11 µm with sheath 21-42 µm in diameter; sheath yellow to brown, very distinct, lamellated, 5-10 lamellae, outer layers often broken.

Locality: Yevateshwar hills.

C. varius A. Br.

Plate: II fig-9

Cyanophyta: T. V. Desikachary, 1959, P-107

Thallus gelatinous, dirty olive green or brownish; cells globular, single or 2-4 together, seldom more in small or big groups, irregularly arranged without sheath 2-4 µm with sheath 4-8 µm in diameter, pale blue or olive green, seldom yellowish or golden yellow; sheath apparently thick, indistinctly lamellated, colorless or yellowish or pale orange yellow

Locality: Yevateshwar hills.

General characters of *Gloeothece* Nag.

Cells cylindrical to ellipsoidal, straight or bent, not attenuated at the ends, but broadly rounded, in small colonies or forming large thallus, division of cells at right angles to the longitudinal axis, sometimes the daughter cells divide in all the three directions; sheath structure and colony structure as in *Gloeocapsa*; nannocytes present.

Gloeothece palea (Kutz) Rabenh.

Plate: III fig-3

Cyanophyta: T. V. Desikachary, 1959, P-127

Thallus mucilaginous, mostly blue-green; cells long cylindrical, without envelope 2.5-4.5 µm broad, 1½-3 times as long as broad, with envelope 8-12 µm broad, blue-green or nearly colorless; individual mucilaginous envelopes colorless or partly colored yellowish, not lamellated, nannocytes present.

Locality: Pateghar.

General characters of *Synechococcus* Nag.

Cells oblong, cylindrical or ellipsoidal, erect, seldom slightly bent with rounded apices, single or in colonies of 2, rarely in fours, mucilage envelope absent or a very thin and narrow one present; division transverse.

Synechococcus aeruginosus Nag.

Plate: III fig-6

Cyanophyta: T. V. Desikachary, 1959, P-143

Cells cylindrical, 5-16 µm broad, up to 30 µm long single, or 2-4 together, pale blue-green.

Locality: Yevateshwar hills.

General characters of *Microsystis* Kutzing

Cells spherical or elongated, many in spherical, ellipsoidal or irregularly overlapping or net-like colony, free-swimming, often with attached daughter colonies; cells in homogeneous colourless, often diffluent, mucilage, individual envelopes absent; cells mostly very densely arranged, cell division in all directions, generally transverse in elongate cells; gas-vacuoles often present; nannocytes present in *M. flos-aquae*.

Microcystis pulverea (Wood) Forti.

Plate: III fig-5

Cyanophyta: T. V. Desikachary, 1959, P-96

Colonies rounded to ellipsoidal, often many together, limits of colonial mucilage distinct, cells spherical or ellipsoidal, closely arranged 2-3 µm broad, blue green or olive-green, without gas vacuoles.

Locality: Yashwantrao Chavan College Campus Satara.

General characters of *Aphanocapsa* Nag.

Cells spherical or nearly so, many loosely arranged without an order, forming a formless gelatinous mass, often a few cm. in diameter, mucilage homogeneous, colorless, cells often with a thin more or less gelatinized individual sheaths; division in two (or various?) directions, often two, four and sometimes many within a common mucilaginous envelope of the parent cell; nannocytes present in some species, formed by repeated division.

Aphanocapsa roseana de Bary.

Plate: II fig-5

Cyanophyta: T. V. Desikachary, 1959, P-131

Thallus broad, irregularly spherical, brownish green to blue green, often gelatinous and upto 30 cm.; cells 5 – 8 µm in diameter; nearly oval, pale blue green, mucilage sheath homogenous.

Locality: Yevateshwar hills, Nune villlge, Medha.

General characters of *Aphanothece* Nag

Cells ellipsoidal to cylindrical, straight or slightly bent, many in a more or less shapeless expanded thallus, mucilage homogeneous, occasionally with lamellated individual envelopes, often gelatinizing; division transverse. Nannocytes present.

Key to the species of *Aphanothece*

1. Thallus mucilaginous, expanded, amorphous 2

2. Cells up to 2 µm broad 3

2. Cells broader 5

3. Cells 1µm broad or broader 4

4. Cells 1.5-2 µm broad .....*A. saxicola*

5. Cells 3.5-8 µm broad 6

6. Cells (-3) 5-8 µm broad .....*A. pallida*

6. Cells 3.5-5 µm broad 7

7. Subaerial .....*A. naegelli*

7. Submerged 8

8. Non-thermal .....*A. microscopia*

Aphanothece microscopia Nag.

Plate: II fig-1, Plate: XI

Cyanophyta: T. V. Desikachary, 1959, P-142

Thallus small, gelatinous, at first rounded, latter amorphous; up to 2 mm in diameter; cells oblong, cylindrical, more or less 4.5 µm broad, 1½- 2 times as long as broad, with sometimes distinct individual sheath, blue green, colorless nannocysts present.

Locality: Yevateshwar hills

A. naegelii Wartm.

Plate: II fig-2

Cyanophyta: T. V. Desikachary, 1959, P-141

Thallus gelatinous, yellow-brown, or olive green; cells oval, after division spherical, 3.5- 4.5 x 6.5-8 µm in size, blue-green; sheath diffluent.

Locality: Yevateshwar hills.

A. pallida (Kutz.) Rabenh.

Plate: II fig-3

Cyanophyta: T. V. Desikachary, 1959, P-140

Thallus gelatinous, soft, blue-green or brownish up to 4-6 mm in diameter; cells oblong, elliptical, or cylindrical, 3-8 µm broad and 1½-3 times as long as broad, blue-green, olive green, sheath very distinct in the peripheral part of the thallus, often lamellated, yellow to brown, diffluent in the inner part.

Locality: Yevateshwar hills, Pateghar, Ajinkyatara, and Morawle.

A. saxicola Nag.

Plate: II fig-4

Cyanophyta: T. V. Desikachary, 1959, P-138

Thallus mucilaginous, colorless or yellowish; cells cylindrical, 1-2 µm broad and 2-3 times as long, single or in pairs, seldom many in a common mucilaginous envelope, pale blue-green.

Locality: Yevateshwar hills.

General characters of *Merismopedia* Meyen

Cells 4-16 (or more) in tabular colonies arranged in a homogeneous mucilage, generally in fours, arranged in a single plane, free floating, cells globose, oblong before cell division, subspherical after division; contents blue-green rarely violaceous or reddish; multiplication by division in two directions perpendicular to the plane of the colony.

Merismopedia glauca (Ehrenb.)Nag.

Plate: III fig-4

Cyanophyta: T. V. Desikachary, 1959, P-155

Colonies mostly small with 16-64 cells, rarely more, 45-150 µm in diameter; cells oval or spherical, closely arranged, 3-6 µm broad, pale blue-green.

Locality: Yevateshwar hills.

General characters of *Synechocystis* Sauvageau

Cells spherical, single or two together after division, or rarely in colonies of a few cells, without distinguishable mucilage envelopes.

Synechocystis pevalekii Ercegovic.

Plate: III fig-7

Cyanophyta: T. V. Desikachary, 1959, P-145

Thallus indefinite, among other algae; cells spherical, after division hemispherical, 2.5 – 3.5 µm broad, single or two together, contents blue green homogeneous.

Locality: Yevateshwar hills.

Family: Entophysalidaceae Geitler

Thallus generally attached, in some free-floating; cells arranged in erect radial rows, rarely in irregular rows or groups or without the formation of a typical filament, sometimes with a prominent one sided development of a sheath forming a mucilaginous filamentous stalk with a cell or groups of cells at the apices; cells spherical or ellipsoidal seldom cylindrical, often in a homogeneous mucilage with or without individual sheaths; sheath narrow or broad; nannocytes known; spores also present.

General characters of *Chlorogloea* Mitra

Cells spherical or ellipsoidal mostly without individual envelopes or with a thin unlamellated sheath, in a common mucilage, in straight erect or radial rows, rows sometimes indistinct,forming more or less hemispherical or flat irregularly lobed thalli, sometimes with daughter colonies; cell division in three directions but generally in a single determined direction; gonidia and nannocytes present.

Chlorogloea fritschii Mitra.

Plate: III fig-8, Plate XI

Cyanophyta: T. V. Desikachary, 1959, P-163

Thallus a deep blue green crust of indefinite size, composed of rounded or irregular cell packets; cells arranged in vertical and horizontal rows, rounded or angular, without evident mucilage, with pale blue hreen, granular contents, usually 6-8 µm in diameter. (4-12 µm), single or in groups of two or more cells separating for propogation; endospors naked, spherical, 4-9 µm in diameter, formed singly within the cells and liberated by the rupture of the membrane, on germination forming a uniseriate filament of 3-12 cells which divide in three directions to produce packets.

Locality: Umbraj.

Order Pleurocapsales Geitler

Key to the Families

Thallus with a filamentous condition without any hormogone formation, with a firm or gelatinous membrane; filaments with one to many rows of cells, with apical growth, unbranched or mostly branched often growing together forming a pseudoparenchymatous structure; branching by the longitudinal division of the apical, dichotomous or tetrachotomous or by the slipping out of an intercalary cells or cells on one side and developing in to a lateral branch pseudodichotomous by the slipping out of the penultimate cell and growing forth; thallus made of prostrate region with radially growing filaments forming a discoid thallus and of erect filaments with often endolithic filaments endospores formed in enlarged sporangia.

1. Thallus forming filaments or with a structure which is filament like

.....*Hyellaceae*

General characters of ***Hyella*** Born. et Flah.

Thallus filament like, growing on calcareous stones, shells, mollusks, or corals, made of a lower expanding many seriate, creeping filaments and very short erect filament, free or laterally concrescent forming a nematoparenchymatous thallus; pseudoparenchymatously or laterally branched; filaments generally with a thick often lamellated gelatinous wall; perforating portion with cells in a single row, rhizoid like in appearance, cells very long, pseudo-dichotomous, dichotomous or laterally branching; sporangia in upper parts of the thallus terminal or intercalary; endospores many formed by successive divisions; often in chroococcaleen condition; nannocytes present.

Hyella caespitosa Born.et Flah.

Plate: III fig-9

Cyanophyta: T. V. Desikachary, 1959, P-183

Thallus at first punctuate or in flakes or cushion shaped. 1-2 mm., later coalescing to form a yellowish green or yellow-brown thallus, often gelatinous, primary filaments on the upper surface prostrate bent or curved, with cells in one row or in many rows forming a chroococcaleen stage; perforating filaments elongate, single rowed, filaments up to 100-200 µm long, cells 4-10 µm broad, end cells up to 60 µm long, yellow-green or blue-green; wall mostly thick in the upper part, often lamellated, sometimes gelatinous, colourless; sporangia intercalary or terminal, generally very prominently enlarged pyriform, with thickened wall; endospores many formed by successive division.

Locality: Yevateshwar hills

Order: Nostocales Geitler

Key to the families

1. Trichomes without false branching or with incipient false branching 2
1. Trichomes commonly false branched 4
    2. Without heterocysts, spores commonly absent ....**Oscillatoriaceae**
    2. With heterocysts and spore 3
3. Trichomes differentiated into base and apex .....**Microchaetaceae**
3. Trichomes not so differentiated .....**Nostocaceae**
    4. Without an intercalary meristematic zone and generally with a terminal hair .....**Scytonemataceae**

4. With an intercalary meristematic zone and a terminal hair

.....**Rivulariaceae**

Family: Oscillatoriaceae Kirchner

Trichome with a single row of similar and uniformly broad cells, only sometimes tapering at the extreme ends, not forming a hair, not branched, without or with diffluent mucilage or a more or less lamellated firm sheath; generally unbranched but occasionally branched in a genera with a firm sheath; growth intercalary in some apical; trichome straight or regularly or irregularly spirally coiled; heterocysts and spores absent; hormogones present, many showing a spiral movement by rotation along the longitudinal axis.

Key to the genera

1. Trichomes cylindrical 2

2. Trichomes typically many in a sheath; sheath at the apex generally closing after hormogone formation 3

2. Trichomes without a sheath or single with a sheath; end sheaths open always 6

3. Trichomes very many in a sheath, densely arranged 4

3. Trichomes fewer, loosely arranged 5

4. Sheath more or less slimy; filaments twisted into rope-like bundles .....*Microcoleus*

5. Filaments unbranched .....*Polychlamydum*

6. Trichome without a sheath 7

7. Trichome more or less straight, not regularly spirally coiled 8

7. Trichome regularly spirally coiled 9

8. In free swimming bundles .....*Trichodesmium*

8. Not in bundles .....*Oscillatoria*

9. Cells of trichome not visible or unicellular .....*Spirulina*

9. Cells of trichome clearly visible .....*Arthrospira*

General characters of *Microcoleus* Desmazieres

Filaments unbranched or sparsely branched; sheath mostly colourless, more or less regularly cylindrical, not lamellated, sometimes when old, gelatinizing; trichomes very many in each sheath, densely arranged, often coiled or contorted like a rope; ends straight, mostly attenuated; end cell more or less conical seldom capitate.

Microcoleus paludosus (Kutz) Gomont

Plate: IV fig-6, Plate XII

Cyanophyta: T. V. Desikachary, 1959, P-344

Filaments single or forming a dark blue-green stratum, unbranched or sometimes divided at the end; sheath slightly gelatinous, not coloured violet by chlor-zink-iodide, with many straight rope like trichomes; trichomes not granulated at the cross walls, constricted at the cross walls, 5-7 μm broad; cells nearly as long as or twice as long as broad, 4-13 μm long, bright blue-green; end cell not capitate, conical.

Locality: Mahabaleshwar (On moist soil)

General characters of *Polychlamydum* West et West

Trichome single or seldom 2-3 in a thick lamellated sheath, inner lamellae of sheath firm, brown, the outer ones colorless, and swollen, or the inner and outer ones of similar structure; filaments unbranched.

Polychlamydum varium Ghose

Plate: V fig-3, Plate XII

Cyanophyta: T. V. Desikachary, 1959, P-249

Filaments 25-100 μm broad; sheath lamellated the inner lamellae dull brown, the outer ones colourless, the middle ones dark brown; trichomes 6-13 μm broad, not constricted at the cross walls; cells shorter than broad; end cells rounded.

Locality: Mahabaleshwar (on the bark of tree)

General characters of *Trichodesmium* Ehrenb.

Trichomes cylindrical without sheath, forming free-swimming bundles or flocculent masses, through diffluent mucilage, apex more or less straight, slightly capitate; typically pelagic, forming waterbloom in high seas.

Key to the species of *Trichodesmium*

1. Trichomes distinctly attenuated 2

    2. Trichomes unconstricted at the cross-walls .....*T. hildebrantii*

    2. Trichomes constricted 3

3. Freshwater, trichomes 5-6 µm broad .....*T. lacustre*

Trichodesmium hildebrantii Gomont

Plate: V fig-1

Cyanophyta: T. V. Desikachary, 1959, P-245

Trichomes in free swimming bundles, 13-22 µm broad, unconstricted at the cross walls, slightly attenuated at the apex; cells up to 1/3 as long as broad.

Locality: Umbraj.

Trichodesmium lacustre Klebahn

Plate: V fig-2

Cyanophyta: T. V. Desikachary, 1959, P-246

Trichomes straight, arranged parallel forming free floating bundles, or masses, not attenuated or slightly attenuated end cells rounded, not capitate; cells shorter than broad short barrel shaped 5-7 µm broad, and 3-7 µm long.

Locality: Umbraj

General characters of *Oscillatoria* Vaucher

Trichome single or forming a flat or spongy free-swimming thallus, sheath absent, rarely with a more or less very delicate sheath, mostly by a creeping movement causing rotation on the longitudinal axis; end of trichome distinctly marked, pointed, bent like a sickle or coiled or coiled more or less like a screw. Hormogones formed by the division of the trichome.

Key to the species of *Oscillatoria*

1. Cells up to ⅓ as long as broad 2

    2. Trichome distinctly attenuated 9

    2. Trichome otherwise 3

3. Trichome constricted 4

3. Trichome unconstricted 6

4. In freshwater 5

5. Trichomes 7.5-8 µm broad .....*O. annae*

6. Trichomes straight 7

7. End cells without a thickened outer wall 8

8. Trichomes 5-6 (or 10-10.5) µm broad .....*O. subbrevis*

9. Trichomes up to 8 µm broad 10

10. Trichome blue-green 11

11. Apices not so coiled, ends only bent or curved 12

12. Apices distinctly attenuated 13

13. End cells capitate .....*O. amoena*

Oscillatoria annae van Goor

Plate: IV fig-1, 2

Cyanophyta: T. V. Desikachary, 1959, P-203

Trichome straight, dull blue-green, slightly constricted at the cross walls, 7.5-8 µm broad; mostly attenuated at the ends up to 7 µm broad and bent; cells 1/3-1/5 as long as broad, 1.5-3 sometimes up to 4 µm long, not granulated at the cross walls; end cell rounded, calyptra absent.

Locality: Yevateshwar hills (On bark of tree)

O. subbrevis Schmidle

Plate: IV fig-3, 4

Cyanophyta: T. V. Desikachary, 1959, P-207

Trichomes single, 5-6 µm broad, nearly straight, not attenuated at apices; cells 1-2 µm long, not granulated at the cross walls; end- cell rounded, calyptra absent.

Locality: Yevateshwar Hills, Kurneshwar, Dabewadi.

O. amoena (Kutz.) Gomont

Plate: IV fig-5

Cyanophyta: T. V. Desikachary, 1959, P-230

Thallus more or less Blue green; trichomes straight, slightly constrictedat the cross walls, ends gradually attenuated, 2.5-5 µm broad, dull Blue green; cells nearly

as long as broad, 2.5-4.2 µm long, septa granulated, end cells capitate, broadly conical with calyptra.

Locality: Kurneshwar, Yevateshwar hills, Pateghar, Nune

General characters of *Spirulina* Turpin em. Gardner

Trichomes unicellular or multicellular cylindrical, sheath absent; loosely or tightly coiled into a more or less regular spiral; apex of trichome usually not attenuated; cross-walls if present obscured; terminal cell rounded, without calyptra.

Spirulina subsalsa Oerst. ex Gomont

Plate: V fig-5

Cyanophyta: T. V. Desikachary, 1959, P-193

Trichomes 1-2 µm broad, blue-green to reddish violet, mostly some what irregularly densely spirally coiled, rarely regularly coiled, sometimes loosely coiled, forming a bright blue-green or yellowish-green thallus, or single among other algae, spirals very close to each other, 3-5 µm broad.

Locality: Pond near collector office.

General characters of *Arthrospira* Stizenberger

Trichomes multicellular, cylindrical, without sheath, loosely and regularly coiled, usually of relatively large diameter and large spirals, with comparatively short and fewer coils; cross-walls distinct, apices slightly or not all tapering, terminal cell rounded, calyptra absent.

Arthrospira platensis (Nordst.)Gomont

Plate: V fig-4, Plate: XII

Cyanophyta: T. V. Desikachary, 1959, P-190

Thallus blue-green; trichomes slightly constricted at the cross walls, 6-8 µm broad, not attenuated at the ends or only a little attenuated, more or less regularly spirally coiled; spirals 26-36 µm broad, distances between the spirals 43-57 µm; cells nearly as long as broad, or shorter than broad, 2-6 µm long, cross walls granulated: end cells broadly rounded.

Locality: Kas

Family : Microchaetaceae Lemmermann

Trichomes with a single row of cells, uniformly broad, with a differentiation of base and apex, apex sometimes slightly narrowed or broadened, without an apical hair; unbranched, sometimes false branches present; sheath distinct enclosing a single trichome; heterocysts intercalary or basal or terminal; hormogones present; spores present.

Key to the Genera

1. Trichomes uniformly broad throughout or slightly narrower at the tips

.....*Microchaete*

1. Trichomes with end cells generally broader than the rest of the trichomes

.....*Fortia*

General characters of *Microchaete* Thuret

Trichome single with a distinct sheath, more or less attenuated at the apices, seldom equally broad all through; filaments attached, single or in groups or clusters, seldom with single pseudo-branches false branches; heterocysts basal, seldom intercalary; spores mostly single, seldom in series, away from the heterocyst or near it; hormogones present.

Key to the species of *Microchaete*

1. Freshwater form 2

2. Sheath lamellated 6

2. Sheath not lamellated 3

3. Not constricted at the cross walls 4

4. Filaments less broad 5

5. Filaments 4.5-5 µm broad .....*M. aequalis*

5. Filaments 6.8-5 µm broad .....*M. tenera*

6. Filaments 10-16 µm broad .....*M. calothricoides*

Microchaete aequalis (Fremy) comb.nov.

Plate: VIII fig-3

Cyanophyta: T. V. Desikachary, 1959, P-513

Thallus expanded, blakish-blue; filaments sufficiently elongated, more or less intricate, base erect, 4.5-5 µm broad; sheath thin, close, papery, colourless or rarely yellowish or brownish, coloured blue by chlor-zink-iodide trichome uniform, 3-3.5 µm broad, not constricted at the cross walls; cells 2-4 times as long as broad; spores and hormogones not seen.

Locality: Yevateshwar hills, Pateghar, Medha, Morawle, Pond near collector office.

Microchaete calothricoides Hansgirg

Plate: VIII fig-1

Cyanophyta: T. V. Desikachary, 1959, P-514

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

Locality : Pateghar, Nune, Pond near collector office.

Microchaete tenera Thuret ex. Born. et Flah

Plate: VIII fig-2

Cyanophyta: T. V. Desikachary, 1959, P-513

Filaments up to 1mm long, single or in small stellate clusters, 6-7 (-8.5) µm broad, slightly bent, prostrate at the base; sheath thin, close in the trichome, hyaline, unlamellated, trichome 5 µm broad, blue-green; cells at the base twice as long as broad, at the apices as long as broad; heterocysts basal and intercalary, nearly spherical or cylindrical, 6 µm broad, 6-8.5 µm long; spores single or in series, basal or intercalary, cylindrical with brownish wall, 6-7.5 µm broad, 13-17 µm long.

Locality: Nune

General characters of *Fortia* De Toni, J.

Filaments unbranched, trichomes with a firm sheath, attenuated at the base, broadened at the apices, with a basal and intercalary heterocysts, generally attached by the basal end; hormogones and spores present.

The genus bears a close resemblance to scytonemataceae where growth is apical and the apical portions are broader and not attenuated. Spores were not originally known. In a Fortia from south India spores were observed. There were a few together in series on either side of the intercalary heterocysts. These are liberated by the death of the vegetative cells and often the two spores on either side of the heterocyst remain attached to the heterocyst. These spores were also found to germinate in situ.

Fortia bossei (Fremy) comb.nov.

Plate: VIII fig-4

Cyanophyta: T. V. Desikachary, 1959, P-516

Filaments sparse, long, flexuous; sheath hyaline, thick and with parallel stratification; cells 2-3 μm braod, not consricted at the cross walls, 3-10 μm long at the apices broader and up to 8 μm broad and constricted at the cross walls, shorter; heterocysts common, single or in two, rectangular, 3-5 μm broad, 4.5-15 μm long, rarely subquadrate; hormogones formed terminally 7 μm broad, up to 150 μm long, with short cells.

Locality: Yevateshwar hills, Nune

Family: Nostocaceae kutzing

Trichomes free or in common mucilage, generally with cells in a single row, cells generally similar throughout, ends or end cells sometimes attenuated, with intercalary growth; sheath thick and gelatinous or thin and firm; hormogones present; heterocysts present or absent, when present intercalary or terminal, generally single, in some more than one together; spores present or absent, single or in series, formed in a definite manner beginning from near the heterocyst or in between two of them.

Key to the genera

1. Trichomes without firm sheath 2

1. Trichomes with a firm sheath 10

2. Trichomes generally endophytic .....*Richelia*

2. Trichomes generally not endophytic 3

3. Heterocysts present 4

3. Heterocyst absent 9

4. Intercalary heterocysts generally single 5

5. Heterocysts present commonly terminally with a single large spore adjoining .....*Cylindrospermum*

5. Heterocyst rarely terminal, generally intercalary 6

6. End cells not elongated, hair like, colourless 7

7. Filaments single or in a formless gelatinous mass .....*Anabaena*

7. Filaments generally in a definite colony 8

8. Thallus otherwise .....*Nostoc*

9. Trichomes with uniform cells .....*Pseudoanabaena*

10. Trichomes single within a sheath 11

11. Cells not discoid .....*Aulosira*

General characters of *Richelia* Schmidt Johs.

Plants mostly intracellular, trichome without sheath, few-celled, straight or slightly bent, uniformly broad; heterocysts at one end or sometimes at both ends; spores not known; hormogones not seen .....*Richelia intracellularis*

Richelia intracellularis Johs. Schmidt

Plate: VII fig-11

Cyanophyta: T. V. Desikachary, 1959, P-353

Trichomes up to 10.5 µm long, 3-20 celled, straight or nearly bent, pale blue-green, 5.6-9.8 µm in diameter; cells barrel shaped, after division half as long as broad; heterocyst at one end or sometimes at both ends, nearly spherical, 9.8-11.2 µm broad.

Locality: Umbraj

General characters of *Cylindrospermum* Kutz.

Thallus mucilaginous, mostly dull blue-green; trichome uniformly broad, short, without sheath, but in a common mostly very delicate and often imperceptible, mucilage of thin consistency; cells cylindrical, constricted at the cross-walls; heterocysts terminal, at both ends or at one end only, sometimes intercalary; spores

single, rarely in series, next tc the heterocyst on one side, much bigger than the vegetative cells.

Key to the species of *Cylindrospermum*

1. Spores not spherical 2
   2. Spores cylindrical .....*C. stagnale*
   2. Spores ellipsoidal 3
3. Spores not oval, narrower 4
   4. Spores narrower than 10 µm 5
5. Spores 8.8-9 µm broad, 15-18.5 µm long .....*C. indicum*

Cylindrospermum indicum Rao,C . B., Orth. mut. De Toni

Plate: IX fig-3

Cyanophyta: T. V. Desikachary, 1959, P-369

Trichome single with deep constrictions at the joints, 3-7 µm broad, dark blue-green; cells almost quadrate, or more or less barrel shaped, 3-4.5 µm long; heterocysts spherical, subspherical, subconical, or ellipsoidal, sometimes cylindrical, one at each end of the trichome, 2.8-5.8 µm broad and 3-7.6 µm long; sparse almost ellipsoidal, sometimes cylindrical, subterminal at either end of the trichome, with a thick yellowish brown outer membrane possessing a smooth outer margin and exhibiting faint lines running across in optical section, without membrane 15-18.5 µm long and with membrane 18-22 µm long.

Locality: Yevateshwar hills, Pond near collector office

C. stagnale (Kutz) Born.et.Flah

f. variabilis Prasad, B. N.

Plate: IX fig-1, 2, Plate: XV

Cyanophyta: T. V. Dasikachary, 1950, P-363

Plant mass soft, dense, mucilaginous, light blue-green, forming a mat; trichomes single, blue-green, often entangled with each other, 4-4.8 µm broad, cylindrical or quadratic, 6.5-8 µm long, slightly constricted at the septa, heterocysts at both ends of filaments, varying in shape, narrowly cylindrical, subelliptical or almost ellipsoidal, 5.6-6.4 µm broad and 9.6-16 µm long, with elongate bacteria attached;

spores elongate, subcylindrical, broader at the heterocyst ends and flattened slightly at the sides, forming singly, subterminally with a thick hyaline exospore, and a thin colourless endospore, 16.4-17.6 µm broad and 29-32 µm long.

Locality: Pateghar, Dabewadi

General characters of *Anabaena* Bory

Trichomes uniformly broad throughout or apices alone some what attenuated, sheath absent or more or less diffluent, forming a free, torn or floccose or soft mucilaginous thallus; heterocysts generally intercalary; spores single or in long series, formed from near the heterocysts or in between the heterocysts.

Key to the species of *Anabaena*

1. Akinetes spherical or subspherical 2

1. Akinetes otherwise 7

2. Akinetes usually contiguous to the heterocysts sometimes shortly ellipsoidal 3

2. Akinetes not contiguous 4

3. Trichomes spirally coiled, with pseudovacuoles akinetes broader .....*A. spiroides*

4. Akinetes not contiguous with the intercalary heterocyst, but occasionally next to the terminal heterocyst, sometimes short ellipsoidal .....*A. oryzae*

4. Akinetes remote from the heterocysts, usually spherical 5

5. Trichome 5-7.5 µm wide, heterocysts broader than the trichome 6

6. Trichome 5-5.6 µm broad, end cell rounded, akinetes 4.8-8 µm broad .....*A. fertilissima*

7. Akinetes ellipsoidal 8

8. Akinetes usually contiguous to the heterocyst 9

8. Akinetes away from the heterocysts about twice as long as broad 11

9. Several trichomes commonly with a well-defined mucilaginous sheath, akinetes

Shortly ellipsoidal 10

10. Akinetes single on either side of the spherical heterocysts

.....*A. ambigua*

11. Akinetes barrel-shaped with flattened ends. .....*A. variabilis*

A. spiroides Klebahn

Plate: IX fig-7, Plate: XIV

Cyanophyta: T. V. Desikachary, 1959, P-395

Trichome single, free floating, regularly spirally coiled, with thick and mucilaginous sheath, spirals 45-54 µm broad and 40-50 µm distant; cells spherical, 6.5-8 µm broad, mostly some what shorter than broad, with gas-vacuoles; heterocysts subspherical, 7 µm broad; spores at first spherical, later elongate, slightly bent, in optical longitudinal section hexagonal, next to the heterocyst or away from it, 14 µm broad.

Locality: Yevateshwar hills.

A. oryzae Fritsch

Plate: IX fig-6

Cyanophyta: T. V. Desikachary, 1959, P-396

Thallus soft, green gelatinous, membranous, trichomes short, densely arranged, generally parallel cells 2.5-3 µm broad, more or less barrel shaped, 1½-2 times as long as broad; heterocysts terminal and intercalary, broader than the vegetative cells, 3-3.5 µm broad, terminal ones conical and twice longer than broad, intercalary ones, single or 2-3 in series, generally barrel shaped, sometimes spherical, single; spores rarely single next to the terminal heterocyst, commonly away from the intercalary heterocysts, single or 2-7 in series, subspherical or short ellipsoidal, 5×5, 6.5×7, 5 ×5.5, 5× 6.5, 5×6 µm, exospore yellowish brown.

Locality: Medha, Kas, Yevateshwar hills.

A. fertilissima Rao, C. B.

Plate: IX fig-5, Plate: XIV

Cyanophyta: T.V. Desikachary, 1959, P-398

Trichome single, straight, or bent, with almost rounded end cells, up to 350 µm long, 5-5.6 µm broad, at the apex 4 µm broad; cells barrel shaped, 4.8-8 µm long; heterocyst almost spherical, 6.4-8.4 µm broad; spores in long chains, often making the whole trichome sporogenous, adjoining the heterocysts but formed centrifugally almost spherical, with a smooth hyaline outer wall, 4.8-8 µm broad and 3.2- 8.8 µm long.

Locality: Yevateshwar hills, Nune, Medha, Morawle, Kas, Kurneshwar.

A. variabilis Kutzing ex. Born. et. Flah.

Plate: IX fig-4

Cyanophyta: T. V. Desikachary, 1959, P-410

Thallus gelatinous, dark-green; trichome without any sheath, flexuous 4-6 µm broad, more often 4.2-5 µm broad, slightly constricted at the cross walls, end cells conical, obtuse; cells barrel shaped, sometimes with gas vacuoles, 2.5-6 µm long; heterocysts spherical or oval, 6 µm broad, up to 8 µm long; spores formed centrifugally, not contiguous with the heterocysts, barrel-shaped, in series, 7-9 (-11) µm broad, 8-14 µm long, epispore smooth, or with fine needles, colourless or yellowish brown.

Locality: Yevateshwar hills.

A. ambigua Rao, C. B.

Plate: IX fig-8

Cyanophyta: T. V. Desikachary, 1959, P-400

Trichome free or completely enclosed in a mucilaginous envelope or sheath; in the latter case occurring singly or in group; trichome without sheaths free floating, ensheathed trichomes free floating or attached to host by one end, generally occurring single, but occasionally in dense clusters; sheath usually firm, hyaline, with smooth or rough outline; usually 300-500 µm (rarely up to 1mm) long, 10-50 µm broad; trichomes straight, or bent usually slightly tapering at the ends, with end cells having rounded apices; usually 250-300 µm long, sometimes longer; cells barrel shaped with deep constrictions at the joints, septa indistinct, 4.9-6.6 µm broad, 3.5-5 µm long, cell

contents deep blue-green, and coarsely granular; heterocyst at intervals. almost spherical, sometimes with slightly flattened ends, usually broader than the cells, 6.4-9 µm (rarely up to 10 µm) in diameter; spores formed in free trichomes as well as in those enclosed in a sheath one on each side of the heterocyst, usually ellipsoidal, sometimes cylindrical, with rounded ends or occasionally flattened ends, 8.4-10.9 µm broad and 13.3-16.2 µm long, exospore thick and hyaline, endospore thin and transparent.

Locality: Nune

General characters of *Nostoc* Vaucher

Thallus mucilaginous, gelatinous or coriaceous, first globose to oblong, later globose, foliose, filiform, bullose, solid or hollow, free or attached, the periphery dense and darkly colored; filaments flexuous, curved or entangled; sheath sometimes distinct, generally diffluent; trichome torulose; cells depressed; spherical, barrel-shaped or cylindrical; heterocysts intercalary, and in young condition terminal; spores spherical, or oblong, formed centrifugally in series in between the heterocysts.

Key to the species of *Nostoc*

1. Thallus not maculiform 2

    2. Thallus without a firm outer layer, more or less soft and formless 3

    2. Thallus with a firm layer 12

3. Trichomes very densely coiled, hardly seen 2.4-4.4 µm broad .....*N. punctiforme*

3. Trichomes less densely coiled, mostly clearly visible 4

    4. Thallus macroscopic 5

5. Aquatic 6

5. Subaerial 9

    6. Trichomes not densely arranged 7

7. Spores longer than broad 8

    8. Cells little longer than broad .....*N. rivulare*

9. Cells barrel-shaped, shorter or a little longer than broad 10

    10. Trichomes 2.2-3 µm broad 11

11. Spores spherical .....*N. calcicola*

12. Subaerial 13

12. Aquatic 14

13. Thallus very large, flat, membranous .....*N. commune*

13. Thallus small 1 mm or reaching a maximum of 1 cm, more or less spherical, trichome 5-8 µm broad .....*N. microscopium*

14. Trichomes radially arranged 15

15. Thallus attached, discoid, or ligulate .....*N. parmelioides*

N. punctiforme (Kutz.) Hariot

Plate: VII fig-1

Cyanophyta: T. V. Desikachary, 1959, P-374

Thallus sub-globose, up to 2 mm diameter scattered or confluent, attached; filaments flexuous, densely entangled; sheath delicate, hyaline, mucous; trichome 3-4 µm broad, cells short barrel shaped or ellipsoidal, blue-green; heterocysts 4-6.5 µm broad; spores subspherical or oblong, 5-6 µm broad and 5-8 µm long, epispore thick and smooth.

Locality: Pateghar.

N. rivulare Kutzing ex. Born. Et. Flah

Plate: VII fig-8

Cyanophyta: T. V. Desikachary, 1959, P-379

Thallus at first globose, size variable, up to 2-3 mm diameter later bullose-tuberculate, hollow irregularly torn and perforate, lobed, fragile, young ones light pale green, older ones yellowish or variously coloured, filaments loosely entangled, flexuous; sheath distinct at the periphery of the thallus, yellowish at the surface, inside hyaline and diffluent; trichome 4-4.2 µm broad; cells spherical to oblong, longer than broad; heterocysts oblong, 5-6 µm broad; spores oblong or barrel-shaped, 6-8 µm broad, 7-10 µm long, contiguous when mature, epispore smooth hyaline or brownish.

Locality: Yevateshwar hills

N. calcicola Brebisson ex. Born. et Flah.

Plate: VII fig-4, Plate: XIV

Cyanophyta: T. V. Desikachary, 1959, P-384

Thallus mucilaginous, slightly diffluent, expanded, olive-gray or blue-green, often up to 5 cm in diameter; filament loosely entangled; sheath mostly indistinct, or distinct only at the periphery of the thallus, colourless or yellowish brown; trichome 2.5 µm broad, pale blue-green; cells barrel shaped, subspherical, rarely longer than broad; heterocysts subspherical, 4 (-5) µm broad; spores subspherical, 4-5 µm broad, with smooth yellowish membrane.

Locality: Kas

N. commune vaucher ex Born. et. Flah

Plate: VII fig-2, 3

Cyanophyta: T. V. Desikachary, 1959, P-387

Thallus firm gelatinous, at first globose, later flattened, expanding, undulated, membranous or leathery, sometimes irregularly torn, often perforated, many centimeters diameter blue-green, olivacious, or brown; filaments flexuous, entangled; sheath mostly distinct only at the periphery, thick, yellowish-brown, often lamellated, inside the thallus more or less distinct, but hyaline; trichome 4.5-6 µm broad, cells short barrel shaped or nearly spherical, mostly shorter or little longer than broad, 5 µm long; heterocysts nearly spherical, about 7 µm broad; spore only once observed, as big as the vegetative cells epispore smooth colourless.

Locality: Pateghar.

N. microscopium carm.ex Born. Et. Flah.

Plate: VII fig-6, 7

Cyanophyta: T. V. Desikachary, 1959, P387

Thallus spherical or ellipsoidal about 1cm diameter or only very seldom larger, soft, but with a firm outer surface, first glistening later olivaceous or brown; filaments loosely entangled; sheath more or less distinct, yellowish; trichome 5-8 µm broad, blue-green or olive-green; cells subspherical or barrel shaped; heterocyst nearly spherical 7 µm broad; spores oval, 6-7 µm broad, 9-15 µm long, olivacious, epispore smooth.

Locality: Ajinkyatara hill, Kas, Kurneshwar

N. parmelioides kutz.ex Born. Et. Flah.

Plate: VII fig-5

Cyanophyta: T. V. Desikachary, 1959, P-389

Thallus discoid, or ligulate, hard, attached at one stage, sometimes subspherical with a firm outer layer, up to 3 cm diameter filaments radiating from a centre, nearly parallel in the middle, densely entangled at the periphery, yellow, inside hyaline and diffluent, trichome 4-4.5 µm broad; cells short, barrel-shaped, subspherical; heterocysts spherical, 6 µm broad; spores oval 4-5 µm broad, 7-8 µm long, epispore smooth and yellowish.

Locality: Kas

General characters of *Pseudoanabaena* Lauterborn

Trichome single, not forming a thallus; with cells distinctly placed from one another, with brisk creeping movements, without sheath; cells cylindrical and at the ends rounded or oval.

Pseudoanabaena schmidlei Jaag. O

Plate: VII fig-9

Cyanophyta: T. V. Desikachary, 1959, P-419

Trichomes 6-7 µm broad, up to 300 µm long; cells more or less as long as broad, after division about ½ diameters.

Locality: Pond near collector office

General characters of *Aulosira* Kirchner

Filaments free, sparse or in fascicles, generally uniformly broad, without differentiation of base and apex; trichomes with sheath, indefinite; heterocysts intercalary; spores often in series, formed near a heterocyst or away from it, cylindrical.

Aulosira pseudoramosa Bharadwaja

Plate: VII fig-10

Cyanophyta: T. V. Desikachary, 1959, P-430

Thallus a flat compact system with an uneven surface ordinarily made of unbranched filaments, 9.5-14.7 µm broad, up to 2 mm long, generally irregularly

bent, densely entangled; sheath thick, hyaline, parallel, stratified with outer surface uneven, firm, 0.75-2.6 µm thick, when old becoming deep yellow or golden yellow in colour, hard thick and brittle; trichome constricted at the cross-walls, cells cylindrical, rarely barrel-shaped, usually slightly longer than broad, sometimes as long as broad, rarely shorter, 6.3-10.5 µm broad; cell contents blue-green, and finely granular, heterocysts absent in young trichomes, intercalary occurring single, rarely in pairs, terminal ones present, as broad as the trichomes, 6.3-10.5 µm broad and 6.3-18.9 µm long; spore not seen; hormogones one, two or three cells lying dormant in the thick yellowish brown sheath, the filament often breaking into bits or pieces, enclosing one or more hormogones, on germination secreting a thin hyaline sheath, often germinating in situ by piercing through the sheath simulating branching in *Tolypothrix*.

Locality: Kas

Family: Scytonemataceae

Filaments with a thick, firm sheath; sheath often lamellated; parallel, divergent or funnel-shaped lamellation; false branched, branches single or geminate; trichomes with a single row of cells; heterocysts intercalary generally and two-pored or basal or terminal and one pored situated next to a single false branch; hormogones present; pseudohormogonia present; spores seen in some.

Key to the genera

1. Heterocysts absent 2
1. Heterocysts present 3
    2. Apices of trichomes as broad as rest .....*Plectonema*
3. Single trichome in a sheath 4
    4. Apex not tapering 5
5. Sheath mostly with parallel lamellation 6
    6. False branches common, filaments not cresent shaped 7
7. False branches usually geminate .....*Scytonema*
7. Fales branches usually single and often arising next to the terminal heterocyst .....*Tolypothrix*

General characters of *Plectonema* Thuret

Trichomes variously bent, with a thin, firm sheath; false branched, branches single or geminate; heterocysts absent; hormogones present; spores not known.

Plectonema radiosum (Schiederm.) Gomont.

Plate: VI fig-1, Plate: XIII

Cyanophyta: T. V. Desikachary, 1959, P-437

Filaments irregularly curved, more or less radially arranged in a thallus, thallus caespitose, cushion like, rounded or spherical, about ½ cm long, dull green, or reddish brown; richly false branching, single or geminate; sheath in the lower part of the filament, thick lamellated, outside uneven, golden yellow, in the upper part thin, hyaline, coloured blue by chlor-zink-iodide; cells mostly only in the upper parts of trichome distinctly constricted at the cross-walls, 11-22 µm broad, 3-10 µm long, blue-green, cross walls seldom granulated; end cell rounded.

Locality: Yevateshwar hills.

General characters of *Scytonema* Ag.

Filaments false branched, false branches single or geminate, formed laterally generally in between heterocysts; trichomes single in each sheath, straight; hormogones terminal, solitary; pseudo-hormogonia present; spores known only in a few species, spherical or ovate, exospore thin and smooth.

Scytonema cincinnatum Thuret ex. Born. et. Flah

Plate: VI fig-2, Plate: XIII

Cyanophyta: T. V. Desikachary, 1959, P-453

Stratum caespitose, intricate, woolly, olivaceous, to brownish green ; filaments 16-36 µm mostly 18-30 µm broad, 3 cm or more long, crisp; false branches mostly geminate, sometimes very sparsely false branched; sheath firm, membranaceous, hyaline, rarely brownish; trichome 14-30 µm broad, blue-green or olive or brownish violet, distinctly or very little constricted at the cross-walls; cells ⅓ as short as broad, in old filaments nearly as long as broad; heterocysts depressed or quadrate, short cylindrical, or elliptical single or many.

Locality: Yevateshwar hills, Pond near collector office

General characters of *Tolypothrix* Kutzing

Filaments with a generally firm, thin or thick sheath with a single trichome in a sheath; false branched, mostly free, prostate or erect; false branches single mostly subtending a heterocyst, occasionally geminate as in *Scytonema*; hormogonia formed from the tips; trichome with apical growth, apices often broader with shorter cells; spores known in some species.

Key to the species of *Tolypothrix*

1. Not associated with animals 2

2. Sheath thick 3

3. Aquatic 6

3. Terrestrial 4

4. Sheath lamellated 5

5. Filaments 14.5-18 µm broad .....*T. arenophila*

6. Filaments 10-15 µm broad, sheath not so thick or ocreate .....*T. limbata*

Tolypothrix arenophila West et West

Plate: VI fig-3, Plate XIII

Cyanophyta: T. V. Desikachary, 1959, P-504

Thallus thin, somewhat membranous, yellowish; filaments densely entangled, flexuous, attenuated at the ends, 14.5-15 (-18) µm broad; false branches sparse, short, lying close to the main filaments; sheath thick, firm, lamellated, yellow to brown; cells 5.5 µm broad, 1¼ - 2¼ times as long as broad, blue-green; heterocysts single, rectangular.

Locality: Mahabaleshwar (on bark of tree)

T. limbata Thuret

Plate: VI fig-4

Cyanophyta: T. V. Desikachary, 1959, P-505

Thallus floccose, caespitose, blue-green; filament 2-3 mm long, 10-15 μm broad, repeatedly false branched; false branches erect; sheath colourless, or yellowish brown, thick, lamellated, at the apices ocreate outside slimy; trichomes 6-9 μm broad, torulose; cells barrel shaped, as long as broad or somewhat longer; heterocysts single or in twos.

Locality: Kas (on bark of tree among other myxophyceae)

Family: Rivulariaceae Rabenhorst

Trichomes with a single row of cells, apices generally attenuated or tapering in a hair, unbranched or false branched, sometimes with a distinct intercalary meristimatic region and trichothallic growth; hair with elongated more or less vacuolated cells; heterocysts present or absent, when present basal, intercalary heterocysts also present in some; hormogones present spores present or absent, when present single or in series.

Key to the genera

1. With heterocysts 2

    2. Filaments in a spherical or hemispherical thallus 4

    2. Filaments free, simple or forming dichotomously branched corymbose thallus 3

3. Trichomes single in a sheath, simple or distinctly false branched, false branches free .....*Calothrix*

4. Spores commonly formed, single, large .....*Gloeotrichia*

General characters of *Calothrix* Ag.

Filaments single or in small bundles, caespitose, tomentose, pulvinate, or penicillate; filaments arranged more or less parallel, mostly erect, unbranched or seldom false branched; sheath mostly firm, sometimes seen only at the base; heterocysts mostly basal, seldom intercalary; spores when formed single or in series, next to the basal heterocyst.

Key to the species of *Calothrix*

1. Freshwater 2

2. Spores present 3

2. Spores not known 5

3. Spores single 4

4. Spores 6.3-8.4 µm broad .....*C. bharadwajae*

5. Filaments distinctly swollen at the base 6

6. Filaments 10 µm or more thick at the base 7

7. Trichome above 8 µm broad 8

8. Trichome 7-8 µm broad .....*C. fusca*

Calothrix bharadwajae De Toni, J.

Plate: X fig-3

Cyanophyta: T. V. Desikachary, 1959, P-526

Filaments generally in groups of 3-7, straight or slightly bent, up tc 420 µm long; sheath very distinct, thin, hyaline, closely depressed to the trichome; trichome constricted at the joints, and tapering into a long hair the terminal portion of the hair without sheath, up to 6.3 µm broad, septa distinct; cells barrel shaped as long as broad or slightly longer (or sometimes slightly shorter than broad); cells of the hair very much elongated and almost rectangular; heterocysts 4.2-6.3 µm broad, basal and intercalary, basal heterocysts single, spherical or subspherical, intercalary heterocysts single or in pairs, spherical, quadratic, or cylindrical, adjoining the basal spore or occasionally separated from it by a short disintegrated cell; spores single adjoining the basal heterocyst, cylindrical or sometimes somewhat conical with rounded end walls, outer wall smooth, and hyaline, 6.3-8.4 µm broad and 21-42 µm long.

Locality: Kas, Yevateshwar hills, Pond near collector office (On dead leaves of stagnant water)

C. fusca (Kutz.) Bornet et Flahault

Plate: X fig-1, 2

Cyanophyta: T.V. Desikachary, 1959, P-527

Filaments single, seldom gregarious, in the gelatinous thallus of other algae, 200-300 µm high, 10-12 µm broad, bent at the base and inflated, up to 15 µm broad,

at the base; sheath broad, colourless, at the apices diffluent; trichome 7-8 µm broad, ending in a long thin hair; cells often discoid shorter than broad; heterocysts basal, hemispherical, single or double, smaller than the basal cell of the trichome.

Locality: Kanher dam

General characters of *Gloeotrichia* Ag.

Thallus spherical or hemispherical, solid sometimes when old inflated and hollow; filaments radial more or less parallel, often with false branches; sheath at the base firm, only gelatinizing on the outside, soft to mostly diffluent; trichomes with a distinct trichothallic growth; heterocyst basal; spores at the base of the trichome, single or a few next to the heterocyst; hormogones present.

Key to the species of *Gloeotrichia*

1. Thallus soft ……2

2. Without gas vacuoles ……3

3. Thallus with many filaments …..4

4. Hairs not protruding out of the colony ……5

5. Spores with smooth outer walls …..6

5. Spores punctuate or granulated ……*Gl. indica*

6. Trichome many celled below the hair ……7

7. Sheath more or less close to the spores not saccate ……*Gl. intermedia*

Gloeotrichia indica Schmidle

Plate: X fig-4, 5, Plate: XV

Cyanophyta: T. V. Desikachary, 1959, P-560

Thallus spherical, soft, 1-2 mm diameter, hollow (or solid), filaments radiating 200-300 µm long; trichome made of 2-3 cells, cells barrel shaped and about 8 µm broad, and a long narrow hair with cylindrical cells; spores nearly cylindrical, 60-70 µm long, without sheath 18-20 µm broad, with sheath 20-26 µm broad, sheath at first hyaline later yellowish brown and close to the trichome.

Locality : Kanher dam

G. intermedia (Lemm.) Geitler.

Plate: X fig-6

Cyanophyta: T. V. Desikachary, 1959, P-560

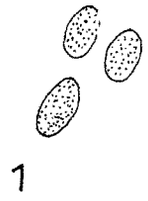
Thallus spherical, soft, 3-7 mm diameter, filaments less densely packed, slightly pressed together; sheath close to the trichome, colourless, trichome ending in a hair which is many times coiled or bent 5.5-8 µm broad; cells longer than broad, seldom quadrate, blue-green; heterocysts spherical or elongate, (8-) 9.5-14 (-16) µm broad, single or two together; spores cylindrical with smooth, colourless outer wall, without sheath (7-) 11-13.5 µm broad, with sheath 14-15 µm broad, 55-135 (-154) long.

Locality: Pateghar

Plate II

1. *Aphanothece microscopia* Nag
2. *A. naegelii* Wartm
3. *A. pallida* (Kutz.) Rabenh.
4. *A. saxicola* Nag.
5. *Aphanocapsa roseana* de Bary
6. *Chroococcus minutus* (Kutz.) Nag.
7. *C. pallidus* Nag.
8. *C. schizodermaticus* West
9. *C. varius* A. Br.
10. *Gloeocapsa atrata* (Turp.) Kutz.
11. *Gl. decorticans* (A. Br.) Richter
12. *Gl. gelatinosa* Kutz.

PLATE II



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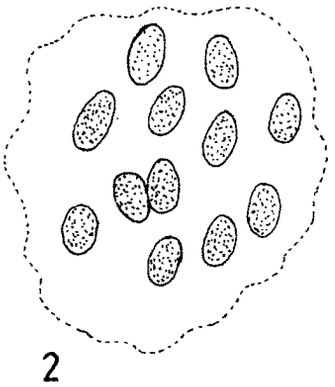

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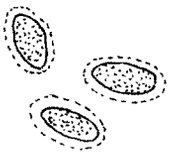

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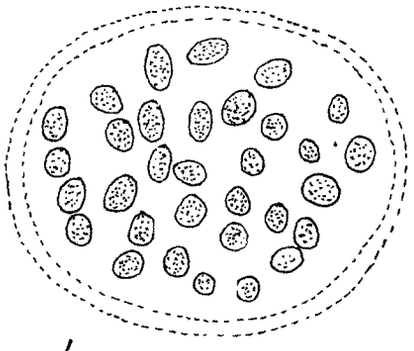

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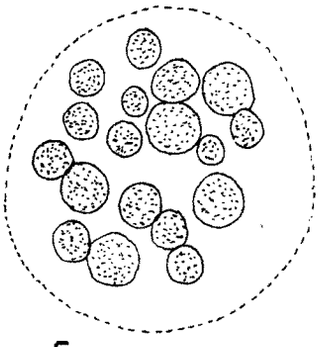

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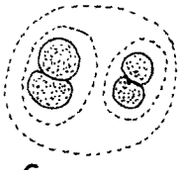

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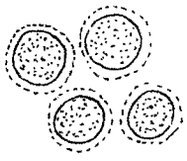

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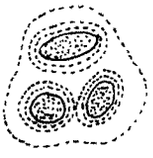

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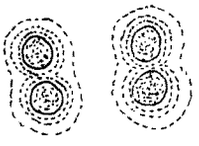

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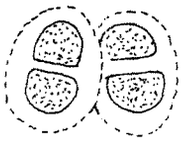

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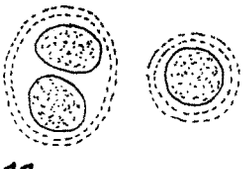


11

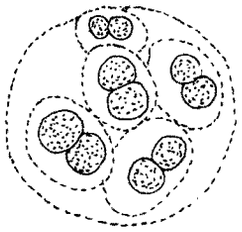
12

20 μ

Plate III

1. *Gl. luteo-fusca* Martens
2. *Gl. polydermatica* Kutz.
3. *Gloeothece palea* (Kutz.) Rabenh.
4. *Merismopedia glauca* (Ehrenb.) Nag.
5. *Microcystis pulverea* (Wood) forti
6. *Synechococcus aeruginosus* Nag.
7. *Synechosystis pevalekii* Ercegovic.
8. *Chlorogloea fritschii* Mitra
9. *Hyella caespitosa* Born. et Flah.

PLATE III



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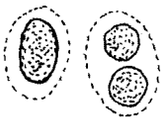

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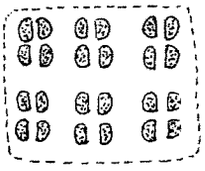

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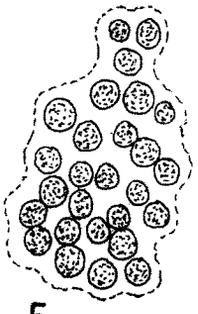

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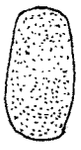

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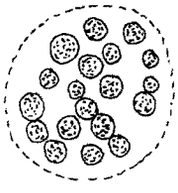

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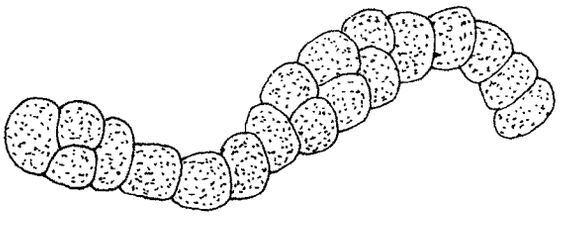

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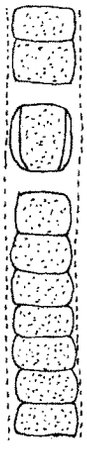

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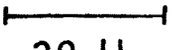
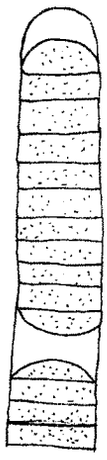


20 μ

Plate IV

1. *Oscillatoria annae* van Goor
2. *O. annae* van Goor
3. *O. subbrevis* Schmidle
4. *O. subbrevis* Schmidle
5. *O. omoena* (Kutz.) Gomont
6. *Microcoleus paludosus* (Kutz.) Gomont

PLATE IV



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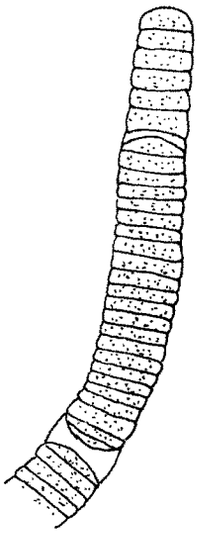

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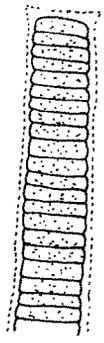

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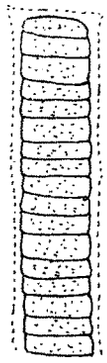

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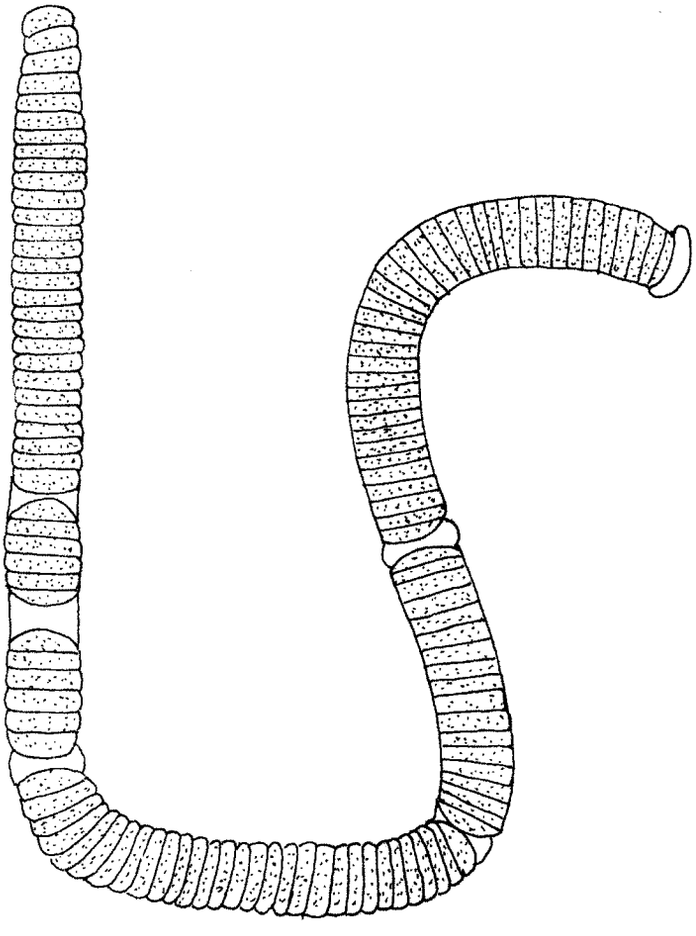

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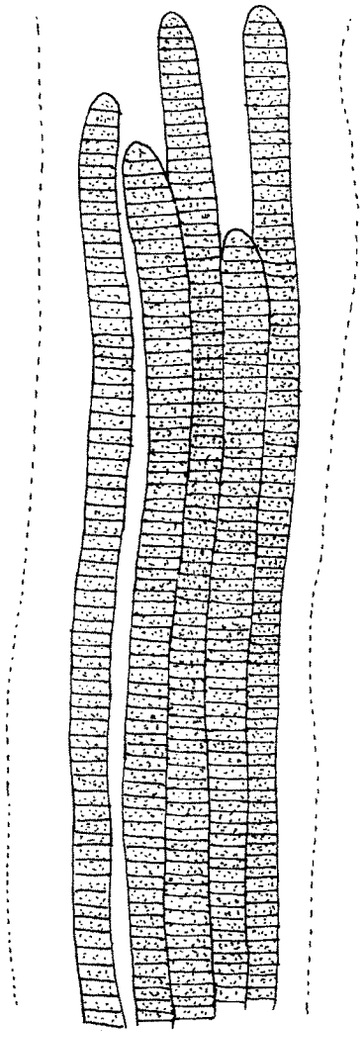


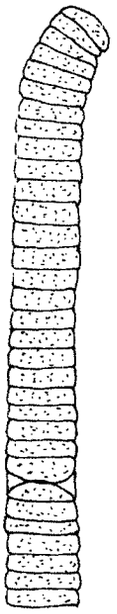
6

20 µ

Plate V

1. *Trichodesmium hildebrantii* Gomont
2. *T. lacustre* Klebahn
3. *Polychlamydum varium* Ghose
4. *Arthrospira platensis* (Nordst). Gomont
5. *Spirulina subsalsa* Oerst. ex Gomont

PLATE V



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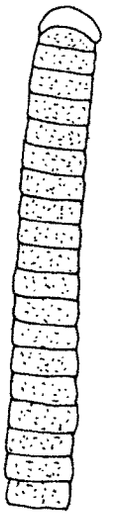

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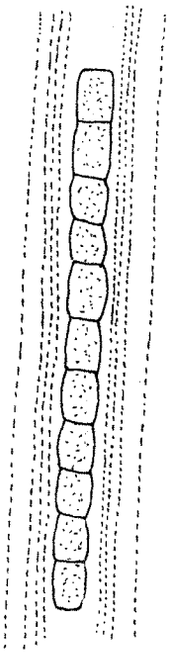

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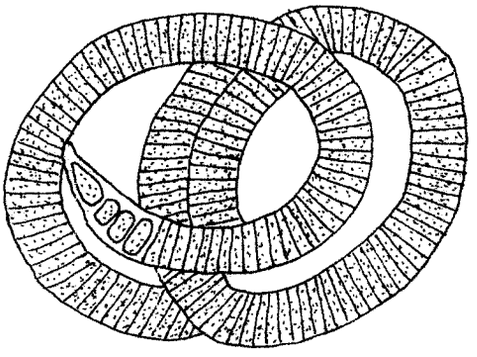


4

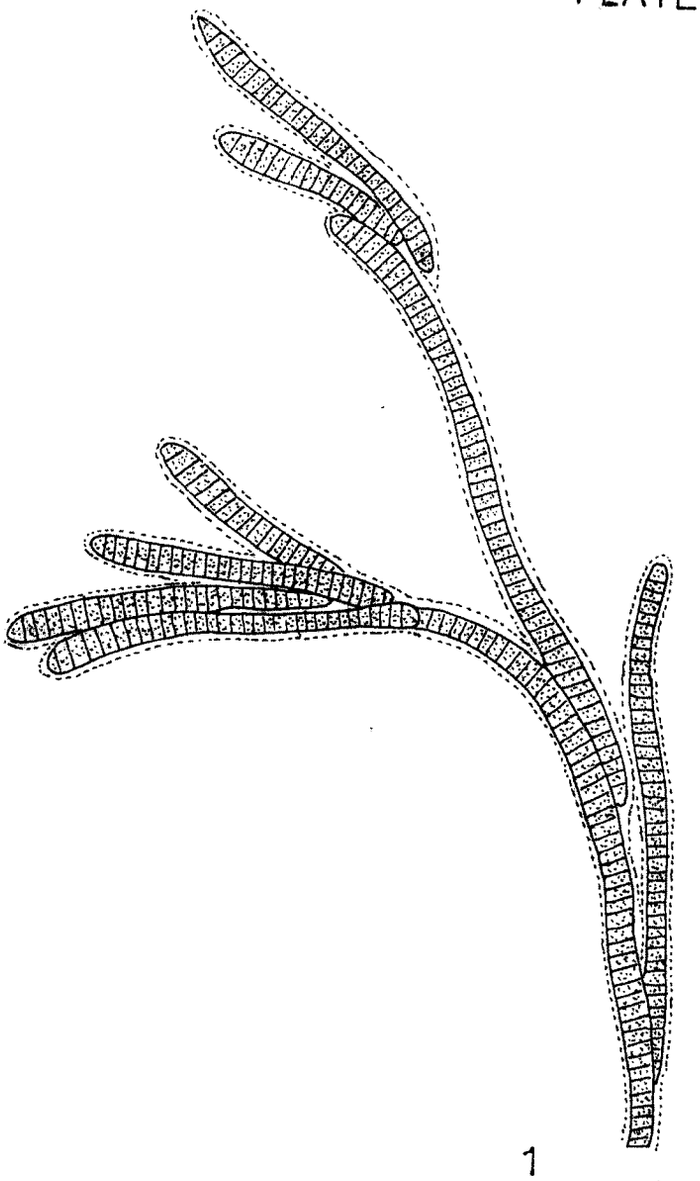
5

20 μ

Plate VI

1. *Plectonema radiosum* (Schiederm.) Gomont
2. *Scytonema cincinnatum* Thuret ex Born. et Flah.
3. *Tolypothrix arenophila* West et West
4. *T. limbata* Thuret

PLATE VI



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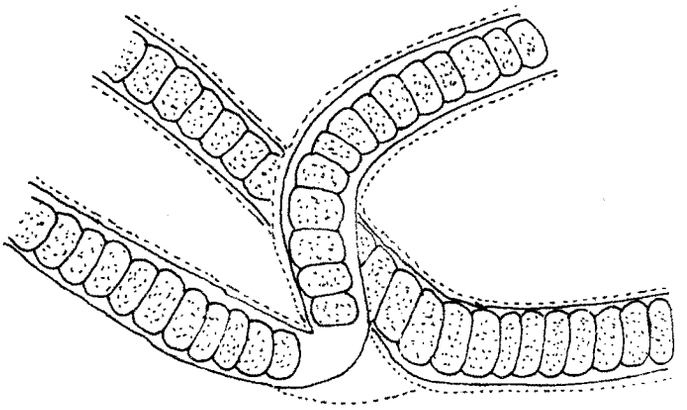

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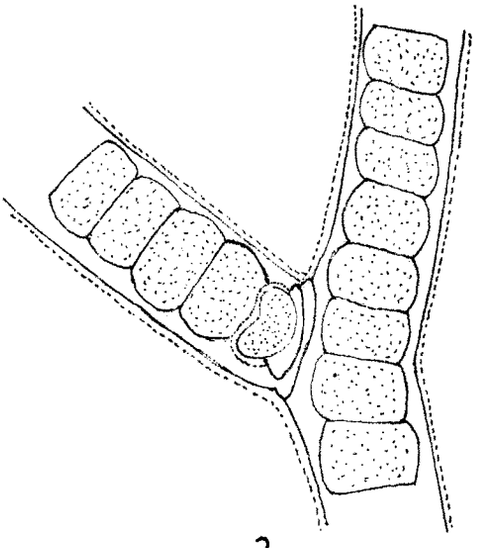

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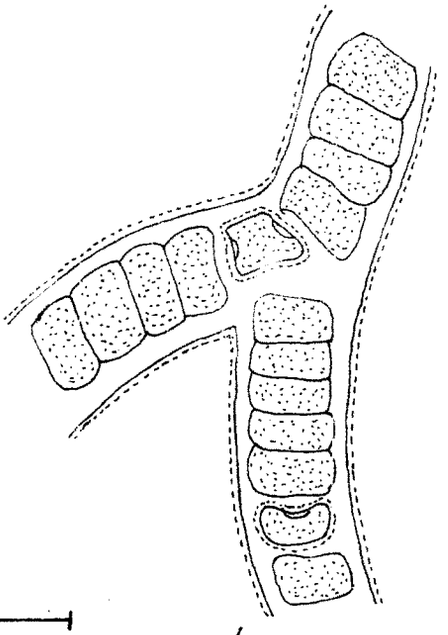


4

20 μ

Plate VII

1. *Nostoc punctiforme* (Kutz.) Hariot
2. *N. commune* Vaucher ex Born et Flah.
3. *N. commune* Vaucher ex Born et Flah.
4. *N. calcicola* Brebisson ex Born. et Flah.
5. *N. parmelioides* Kutz ex Born et Flah.
6. *N. microscopium* Carm. ex. Born.et Flah.
7. *N. microscopium* Carm. ex. Born.et Flah.
8. *N. rivulare* Kutzing ex Born. et Flah.
9. *Pseudoanabaena schmidlei* Jaag. O
10. *Aulosira pseudoramosa* Bharadwaja
11. *Richelia intracellularis* Johs. Schmidt

PLATE VII

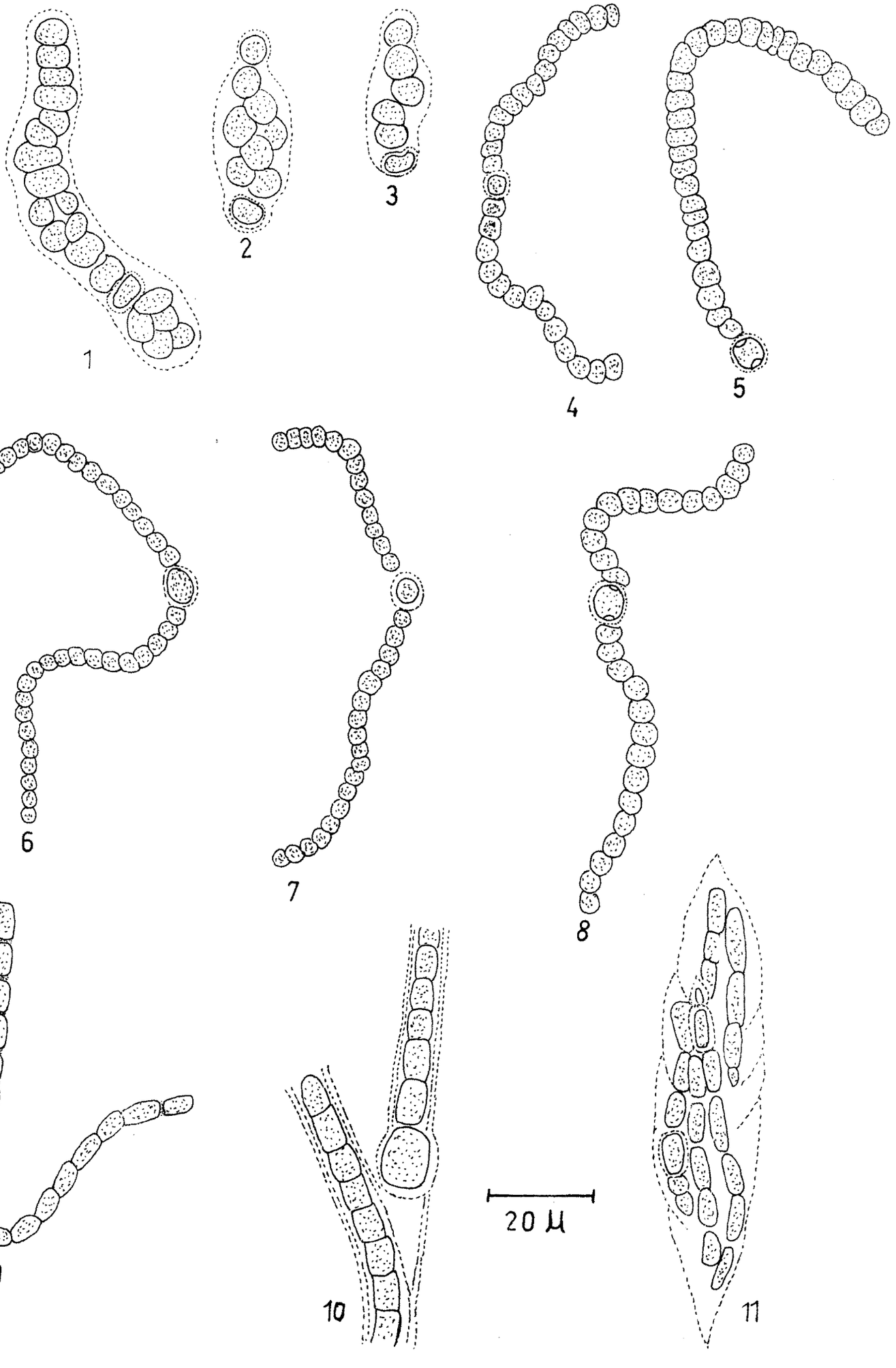


Plate VIII

1. *Microchaete calothrichoides* Hansgirg
2. *M. tenera* Thuret ex Born. et. Flah.
3. *M. aequalis* (Fremy) comb. nov.
4. *Fortia bossei* (Fremy) comb. nov

PLATE VIII

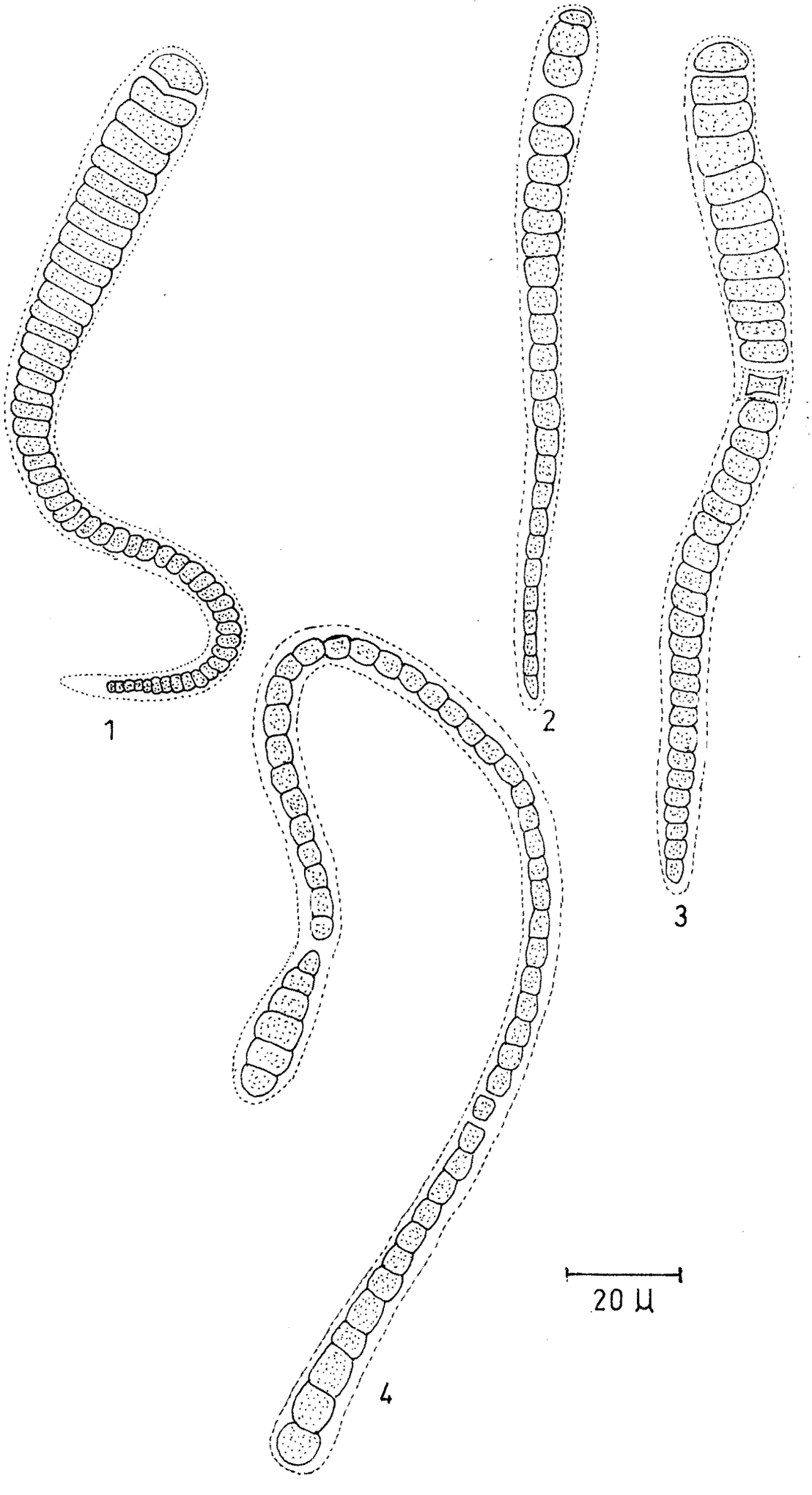


Plate IX

1 *Cylindrospermum stagnale* (Kutz.) Born. et Flah.

2 *C. stagnale* (Kutz.) Born. et Flah.

3 *C. indicum* Rao, C. B., Orth. mut. De Toni

4 *Anabaena variabilis* Kutzing ex Born. et Flah.

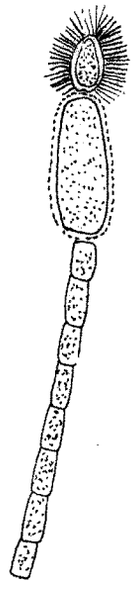
5 *A. fertilissima* Rao, C. B.

6 *A. oryzae* Fritsch

7 *A. spiroides* Klebahn

8 *A. ambigua* Rao, C. B.

PLATE IX.



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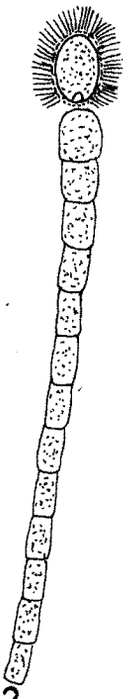

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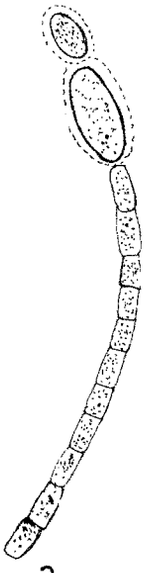

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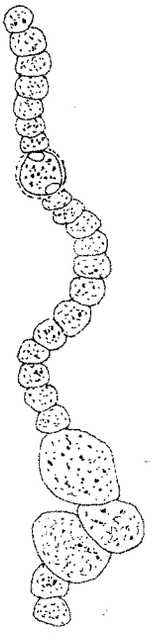

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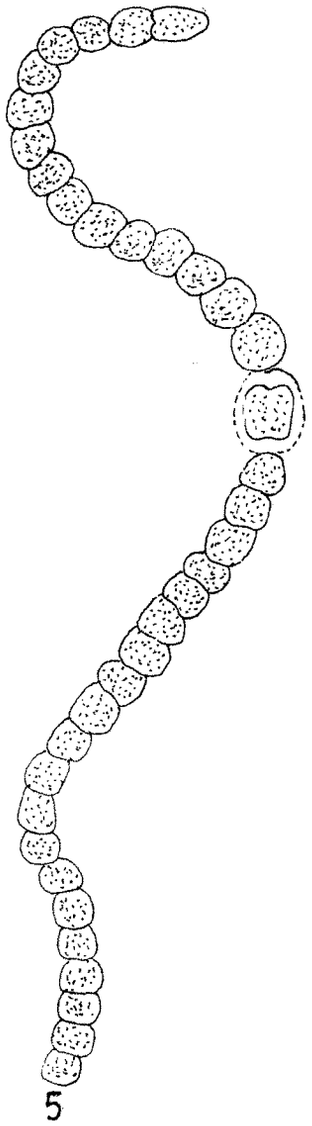

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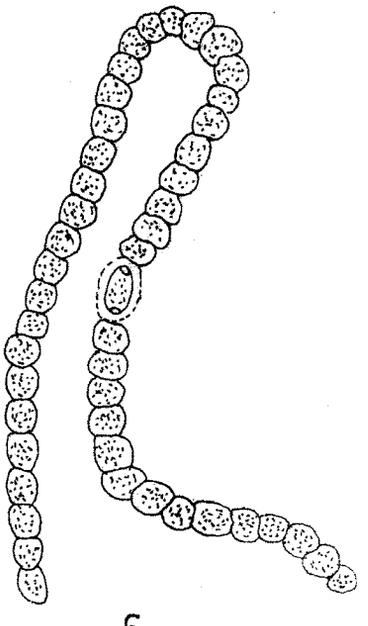

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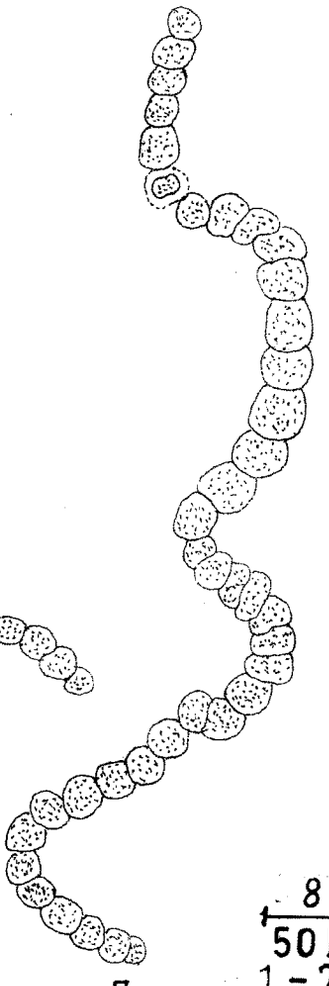

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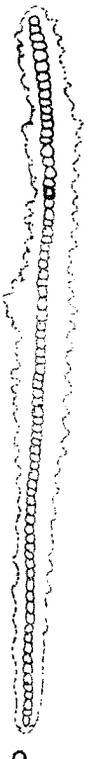


8

8
50 µ
1-7
20 µ

Plate X

1. *Calothrix fusca* (Kutz.) Bornet et Flaha.
2. *C. fusca* (Kutz.) Bornet et Flaha.
3. *C. bharadwajae* De Toni, J.
4. *Gloeotrichia indica* Schmidle
5. *Gl. indica* Schmidle
6. *Gl. intermedia* (Lemm.) Geitler.

PLATE X

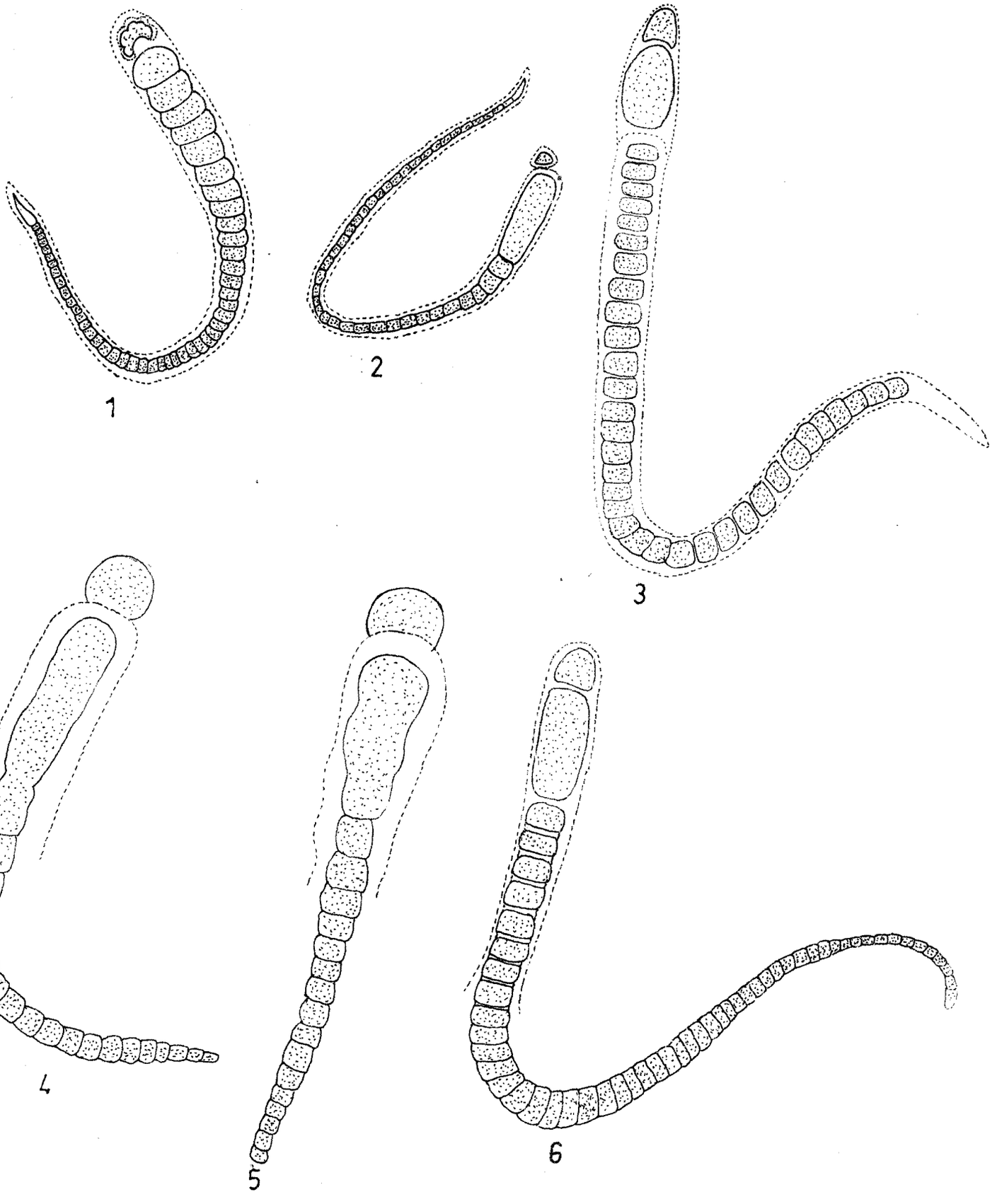
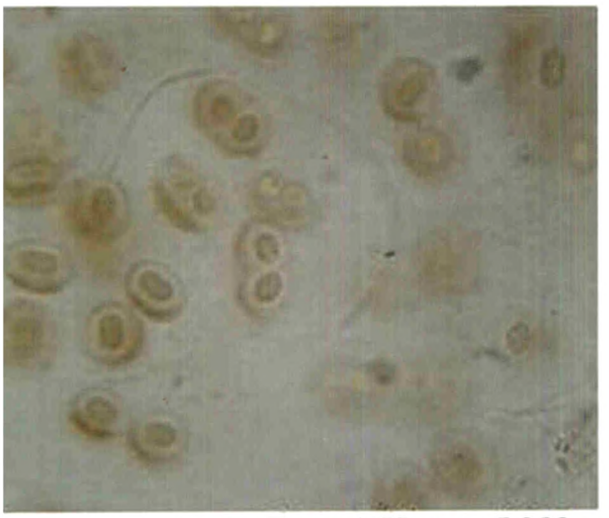
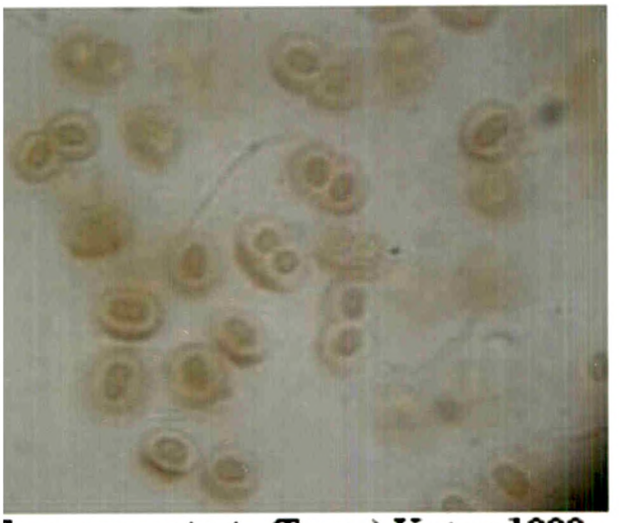


Plate XI

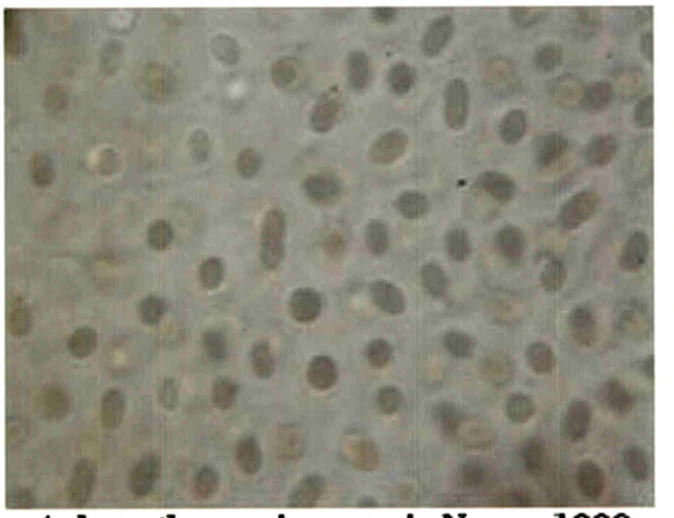


oeocapsa atrata (Tup.) Kutz x 1000

Gloeocapsa atrata (Tup.) Kutz x 1000



loeocapsa atrata (Tup.) Kutz x 1000



Aphanothece microscopia Nag. x 1000

Chlorogloea fritschii Mitra x 1000

Chlorogloea fritschii Mitra x 1000

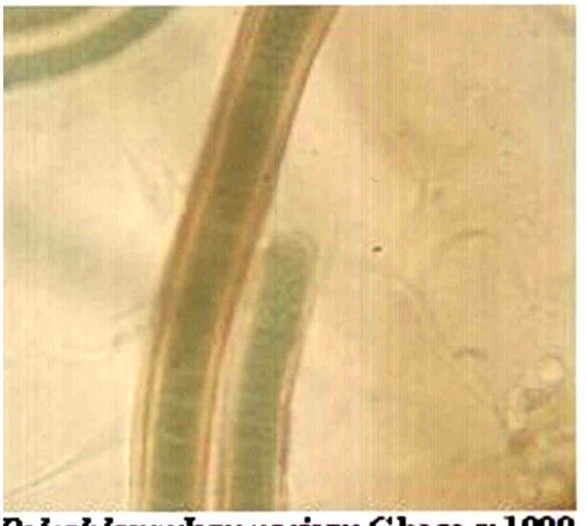
Plate XII

leus paludosus (Kutz.) Gomont x 1000

Microcoleus paludosus (Kutz.)Gomont x1000

pira platensis (Nordst.)Gomont x 1000

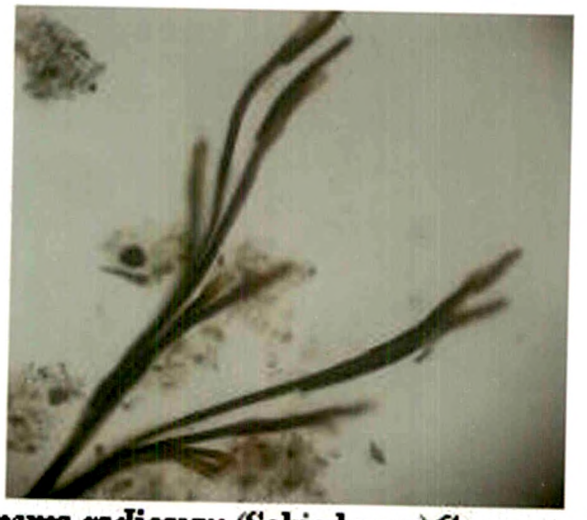
Arthrospira platensis (Nordst.)Gomont x 1000



Polychlamydum varium Ghose x 1000

Polychlamydum varium Ghose x 1000

PlateXIII



Plectonema radiosum **(Schiederm.) Gomont x 200**

ema cincinnatum **Thuret ex Born.et Flah x 1000**

Scytonema cincinnatum **Thuret ex Born.et Flah x 1000**

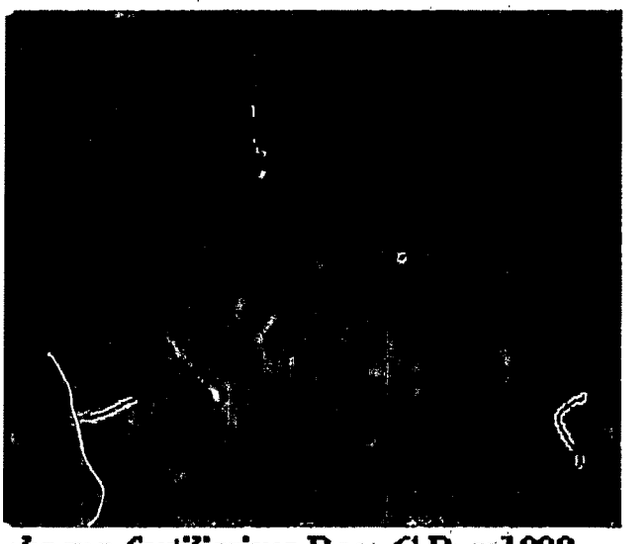
thrix arenophila **West et West x 1000**

Tolypothrix arenophila **West et West x 1000**

Plate XIV

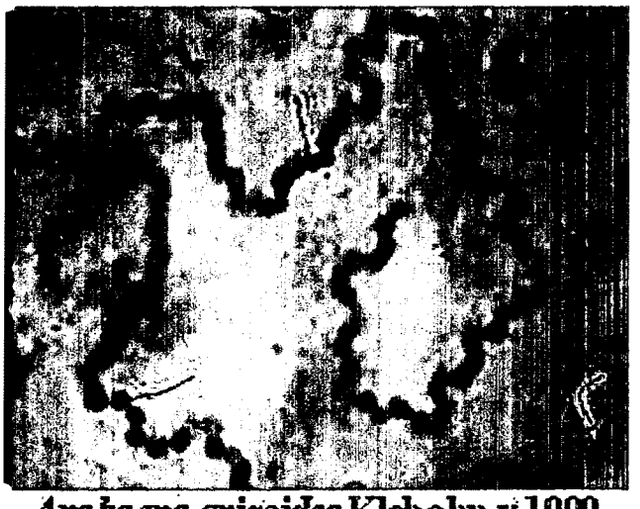
alcicola **Brebisson ex Born. et Flahx1000**

Nostoc calcicola **Brebisson ex Born. et Flahx1000**



baena fertilissima **Rao, C.B. x 1000**

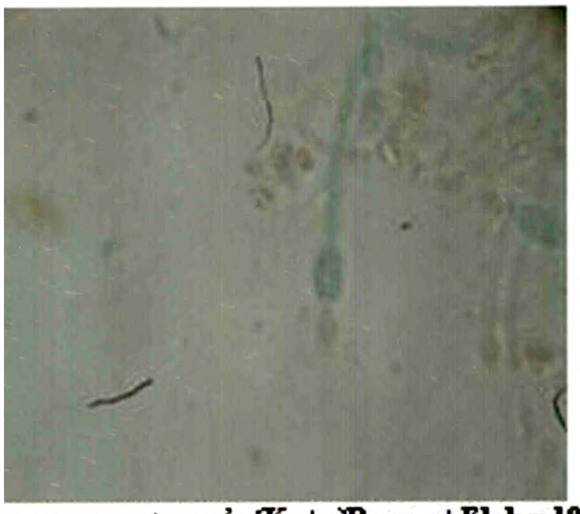
Anabaena fertilissima **Rao, C.B. x 1000**



Anabaena spiroides **Klebahn x 1000**

Anabaena spiroides **Klebahn x 1000**

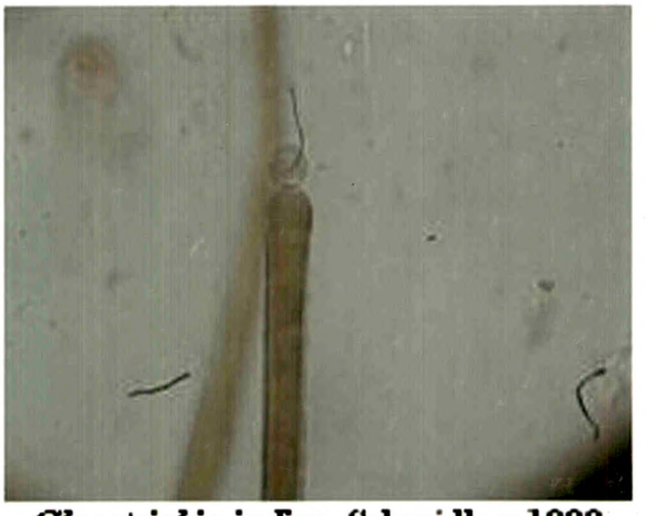
Plate XV



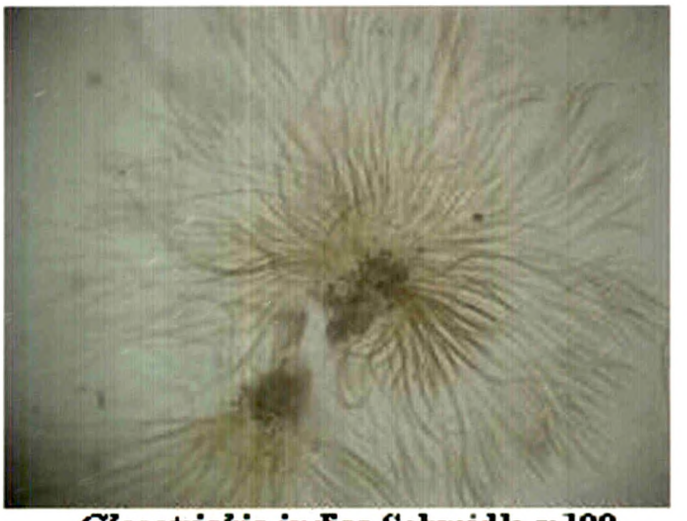
ɔspermum stagnale **(Kutz.)Born. et Flah x 1000**

Cylindrospermum stagnale **(Kutz.)Born. et Flah x1000**

Gloeotrichia indica **Schmidle x 1000**



Gloeotrichia indica **Schmidle x 1000**



Gloeotrichia indica **Schmidle x 100**