ON *CAMPTYLONEMA INDICUM* SCHMIDLE AND *CAMPTYLONEMOPSIS* gen. nov.*

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Camptylonema indicum was first described by Schmidle from Bombay in 1900. Since then the alga has not been recorded again anywhere. An alga which agrees in all respects with *C. indicum* Schmidle was recently collected in Cochin by Prof. K. G. Krishna Rao and sent to Prof. M. O. P. Iyengar, who has kindly placed the material at the disposal of the writer.

This alga was growing among moss plants on the moist walls of a house at Ernakulam in Cochin State, South India, forming an expanded brownish stratum. The filaments are attached to the substratum by their middle portion with the two end-portions growing freely bent upwards (Text-Figs. 1 and 2). These free portions of the filaments were growing densely forming a sort of a felt.

The trichome has a sheath throughout. The portion of the sheath covering the middle region is slightly brownish, while the portions covering the free ends are dark brownish. The sheath is often divergently stratified, but occasionally the layers are nearly parallel. The outermost portions of the sheath is often slightly gelatinized and hyaline.

The filament is broadest in the attached middle portion and is somewhat narrower in the erect portions. In the middle region it is 13·1–15·7 μ broad, occasionally up to 19·7 μ broad, and in the remaining portions (7·9–) 9·2–11·8 μ broad. The trichome in the attached middle region is torulose and constricted at the cross-walls, while in the free erect portion it is not constricted or only very slightly constricted. The cells in the attached middle portion are spherical to subspherical and are 7·9–11·8 μ broad and about 3·9–9·2 μ long, and in the free erect portions are cylindrical and are 3·9–6·6 μ broad and 7·9–18·3 μ long. Often the extremities of the trichome are slightly broader and the cells are generally as long as or shorter than broad (Text-Fig. 3). The cell-contents are bluish-green in colour.

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As a rule, a single median heterocyst is found roughly in the middle of the prostrate portion (Text-Fig. 1). This median heterocyst is subspherical or vertically elliptic and generally shorter than broad. Occasionally two heterocysts are found side by side in the middle region (Text-Fig. 2). Heterocysts are also found in the free portions of the trichome (Text-Figs. 3 and 15). In these portions they are cylindrical and up to twice as long as broad. Heterocysts in the prostrate portion are 7·9–10·5 μ broad and 3·9–5·2 μ long and in the erect portions about 6–7 μ broad and 7–10·5 μ long.

Branching.—Branching is generally not very common. But both true and false branches are present. True branches are generally given off from the prostrate middle portion of the filaments, though occasionally they are formed in the erect portions also, while the false branches usually occur in the free erect portions. The writer was able to observe in a single long filament both true and false branches.

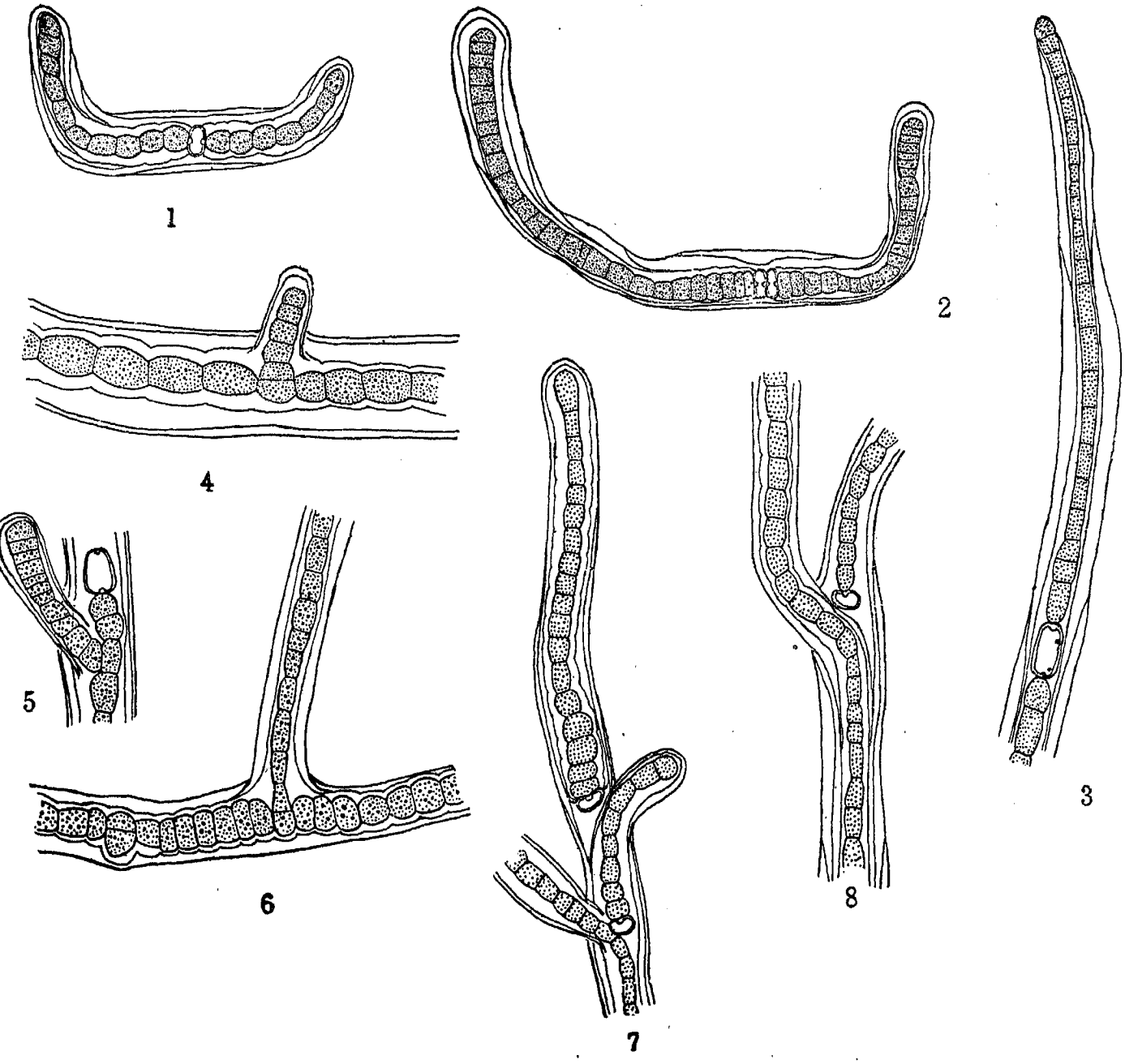
True branches are formed in the following manner. A cell of the prostrate portion enlarges and cuts off a small cell on one side at right angles to the longitudinal axis of the trichome (Text-Fig. 6). This cell by further divisions forms a short lateral branch which pierces through the parent sheath and comes out (Text-Fig. 4). As it grows out it secretes its own sheath (Text-Figs. 4–6).

False branches are generally given off singly as in *Tolypothrix* (Text-Figs. 7 and 8). In these cases, usually the cell by the side of the false branch becomes converted into a single-pored heterocyst. Geminate false-branches were not observed by the author.

Hormocysts.—From the terminal free portions of the filaments are cut off small portions of the trichome, which are completely surrounded by a thick lamellated sheath. These short portions are described by Schmidle as 'pseudohormogonia', and correspond to Borzi's 'hormocysts'.* These pseudohormogonia (hormocysts) are formed in the following manner. The apical portion of a trichome (about 4–12 cells long) increases slightly in breadth. This portion soon shows distinct constrictions at the cross-walls. This end portion gets cut off from the main trichome by the formation of a biconcave disc of intercellular substance or through the degeneration of an intercalary cell (Text-Figs. 9 and 10). It then secretes a thick lamellated, brownish sheath all round itself (Text-Fig. 11). The pseudohormogonium

* Fritsch (1927, p. 447) gives the following definition for *hormocysts* : " In some Scytonemataceæ and Stigonemataceæ short hormogonia, which are completely enclosed in a thick-walled and stratified sheath, are formed (Borzi's *hormocysts*)." In the present paper, Schmidle's term *e udohormogonia* is used to avoid confusion.

(hormocyst) gets finally liberated by the disintegration of the parent sheath. Usually a single pseudohormogonium is formed at a time, but occasionally two pseudohormogonia may be formed one behind the other.

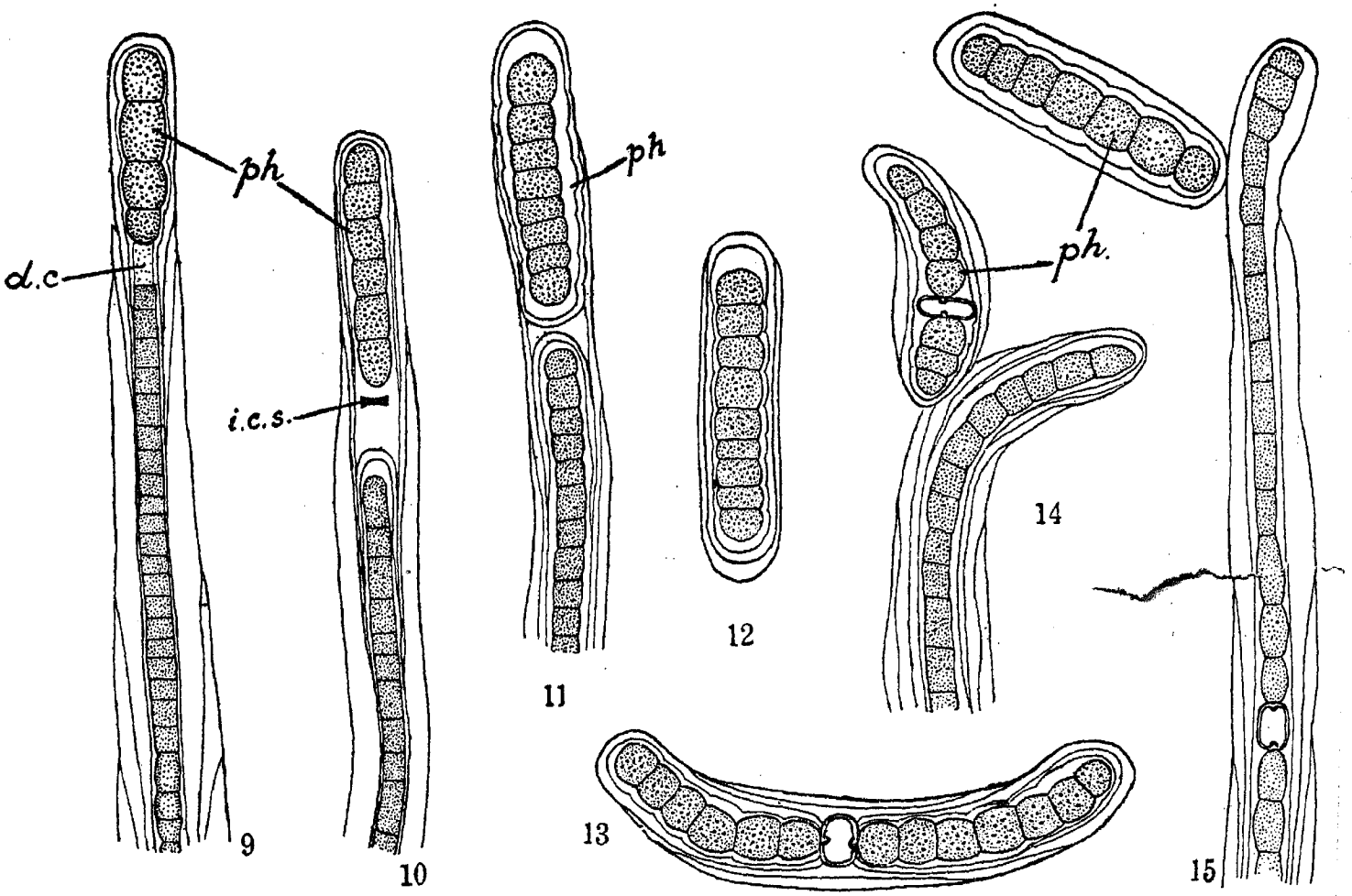


TEXT-FIGS. 1–8.—*Camptylonema indicum* Schmidle.—Fig. 1. An young filament showing the characteristic crescent-shaped habit with a single median heterocyst. Fig. 2. An young filament showing the characteristic crescent-shaped habit with two median heterocysts side by side. Fig. 3. End portion of a filament with an intercalary heterocyst. Figs. 4–6. Portions of filaments showing true branches. Figs. 7–8. Portions of filaments showing single false-branches by the side of one-pored heterocysts. Figs. 1–8 × 475.

The pseudohormogonium after liberation germinates. During germination, one of its central cells becomes transformed into a heterocyst (Text-

Fig. 13). Then the filament grows further, and its two ends bend upwards and grow erect.

Very occasionally, the pseudohormogonium is not liberated from the parent filament. In such cases, the portion of the parent filament below the pseudohormogonium grows past it bending sideways, while the pseudohormogonium germinates attached to one side of the parent filament (Text-Figs. 14, 15).



TEXT-FIGS. 9–15.—*Camptylonema indicum* Schmidle.—Fig. 9. End portion of a filament showing the pseudo-hormogonium (hormocyst) (*ph*) being cut off by a dead cell (*d.c.*). Fig. 10. End portion of a filament showing the pseudohormogonium (hormocyst) being cut off by a biconcave disc of intercellular substance (*i.c.s.*). Fig. 11. End portion of a filament showing a pseudohormogonium which has secreted a sheath all round. Fig. 12. A liberated pseudohormogonium. Fig. 13. A young germinating pseudohormogonium with a median heterocyst. Figs. 14–15. End portions of filaments showingpseudohormogonia germinating attached to the parent filament. Figs. 9–15 × 725.

No spores have been observed in the alga.

SYSTEMATIC POSITION

According to Schmidle's diagnosis, *Camptylonema indicum* has crescent-shaped filaments which are attached to the substratum by their middle por-

tion with the two end-portions of the filament growing freely upwards and possesses both true and false-branches. Pseudohormogonia (hormocysts) are formed at the apices of the filaments. The present alga has all these features. Its filaments are crescent-shaped and are attached to the substratum by the middle portion. It has both true and false branches. And pseudohormogonia (hormocysts) are formed at the ends of the filaments. In dimensions also it agrees fully with Schmidle's *Camptylonema indicum.* The writer, therefore, considers that the present alga is the same as Schmidle's *Camptylonema indicum.*

Schmidle places the genus *Camptylonema* under the Stigonemaceæ. This he does evidently on account of the presence of true branches in the alga. But Forti (in De Toni, *Sylloge Algarum,* 1907, p. 540) placed it under the Scytonemaceæ, though he retained in the generic description, the occurrence of true branches in addition to false branches. Ghose (1920) described an alga from Lahore which possessed crescent-shaped filaments like those of *Camptylonema indicum* Schmidle and false-branches. Though true branches were not found in this alga, he described it as a new species of *Camptylonema, Camptylonema lahorense.* He, like Forti, referred the genus *Camptylonema* to the Scytonemaceæ. Geitler (1932, p. 705), doubting the presence of true branches in the genus, modified Schmidle's original diagnosis of the genus by deleting the occurrence of true branching in his description of the genus. He, however, adds finally that, in case true branching should be found in *C. indicum,* then it should be included under the Stigonemataceæ and that under *Fischerella* (with a query). Now that clear cases of true branches have been observed by the writer in *C. indicum,* the genus *Camptylonema* should now be retransferred to the Stigonemataceæ as suggested by Geitler. The writer, however, does not agree with Geitler's suggestion that it should be included under *Fischerella.* The writer considers it best to retain the genus, *Camptylonema* as defined by Schmidle (1900).

In this connection, Geitler (1932) states again, that in case true branching should be found in *Camptylonema indicum* then Ghose's alga, *Camptylonema lahorense,* (which shows only false branching, but no true branching), should be placed in a new genus. This is a most reasonable suggestion. Ghose's alga may therefore now be placed in a new genus which may be called *Camptylonemopsis.* This genus may be included under Microchætaceæ. In case true branching should later on be found in Ghose's Lahore alga, it may then be retransferred to *Camptylonema.*

Hollerbach (1934) described an alga from Russia which he called *Camptylonema Danilovii.* It resembles Ghose's Lahore alga in having the

crescent-shaped filaments with occasional false-branching but without any true branching. This alga also may be placed under *Camptylonemopsis.*

Three new algæ resembling Ghose's Lahore alga were collected by Prof. Iyengar from South India and have been placed by him at the writer's disposal. The writer proposes to include these three algæ also under *Camptylonemopsis.* A brief account of the three new algæ is given below.

Camptylonemopsis pulneyensis sp. nov.

This alga was found in a collection of algæ from one of the pools at the side of the lake at Kodaikanal in the Pulneys, in South India.

The plant mass is somewhat gelatinous and consists of a large number of filaments growing densely aggregated. These filaments show the characteristic crescent-shaped growth of the genus with a prostrate middle portion and the free end portions growing bent upwards (Text-Fig. 16). The filaments are fairly long and are 7·9–11·8 (–13·1) μ broad.

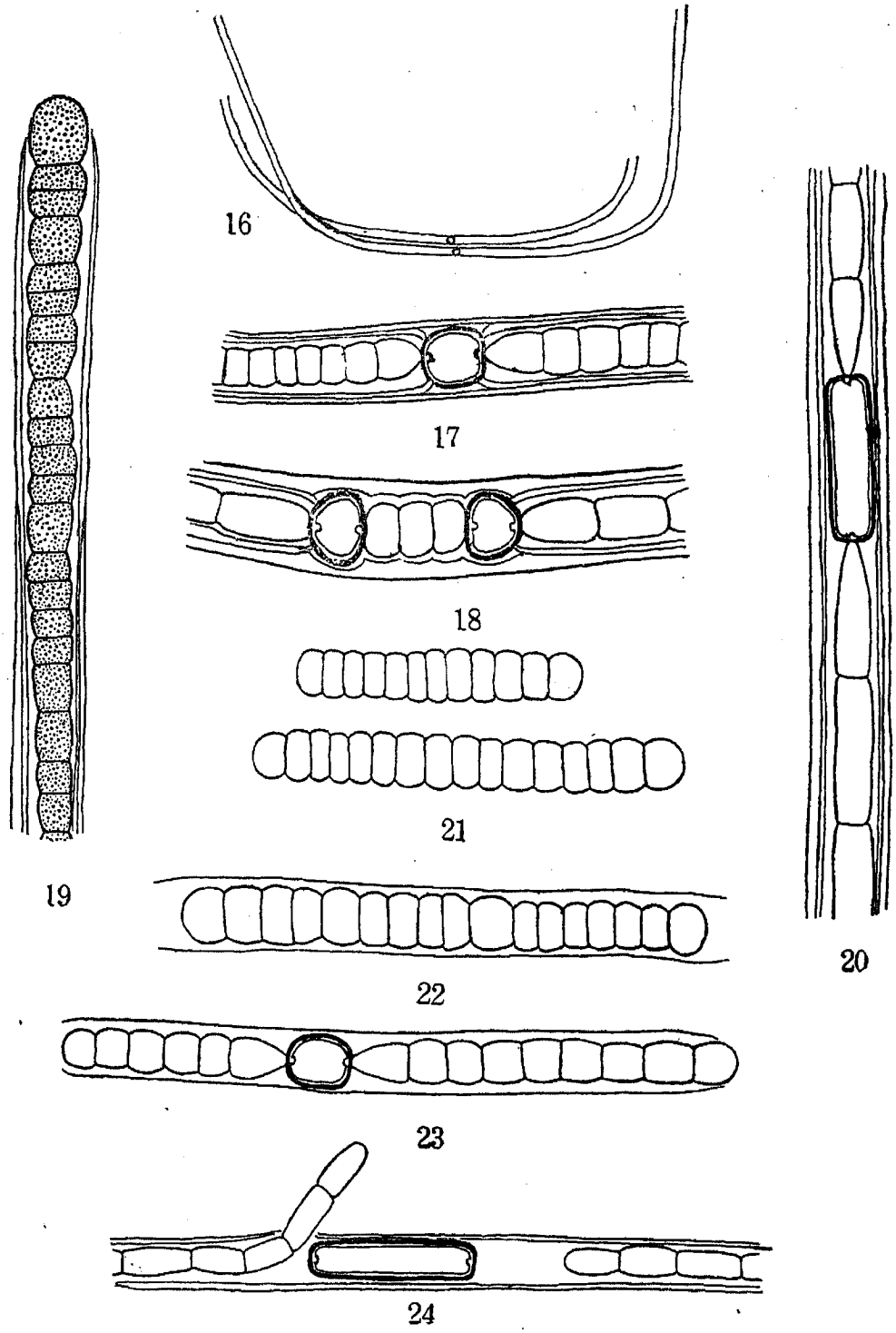
The filament is provided with a thick sheath which is hyaline and is somewhat lamellated. The trichome in the middle portion is slightly broader than in the side portions. And the cells of the middle regions are spherical, subspherical or barrel-shaped and measure 5·2–9·2 μ broad while in the remaining side portions they are cylindrical and longer than broad and measure 3·9–6·6 μ in breadth and up to 20 μ in length. At the extreme ends of the trichome the cells are generally broader and are slightly shorter than broad (Text-Fig. 19).

Usually a single heterocyst is present in the middle of the filament. The heterocyst is spherical to subspherical and measures 7·9–10·5 μ in breadth. Sometimes two such spherical heterocysts are found in the middle region separated by a few vegetative cells (Text-Fig. 18). Intercalary heterocysts are found throughout the length of the filament. These are slightly cylindrical and are 5·2–7·9 μ broad and 7·9–19·65 μ long (Text-Fig. 20).

False-branching appears to be extremely rare. Only in one case, a small false branch was seen arising by the side of a dead two-pored heterocyst (Text-Fig. 24).

Hormogones are often cut off from the ends of filaments. These hormogones, when they are liberated, are devoid of any sheath (Text-Figs. 21–22). Usually one of the middle cells of the hormogone becomes a heterocyst (Text-Fig. 23). When the hormogone grows, its ends grow curving upwards in crescent-shaped manner.

No spores were observed in the alga.



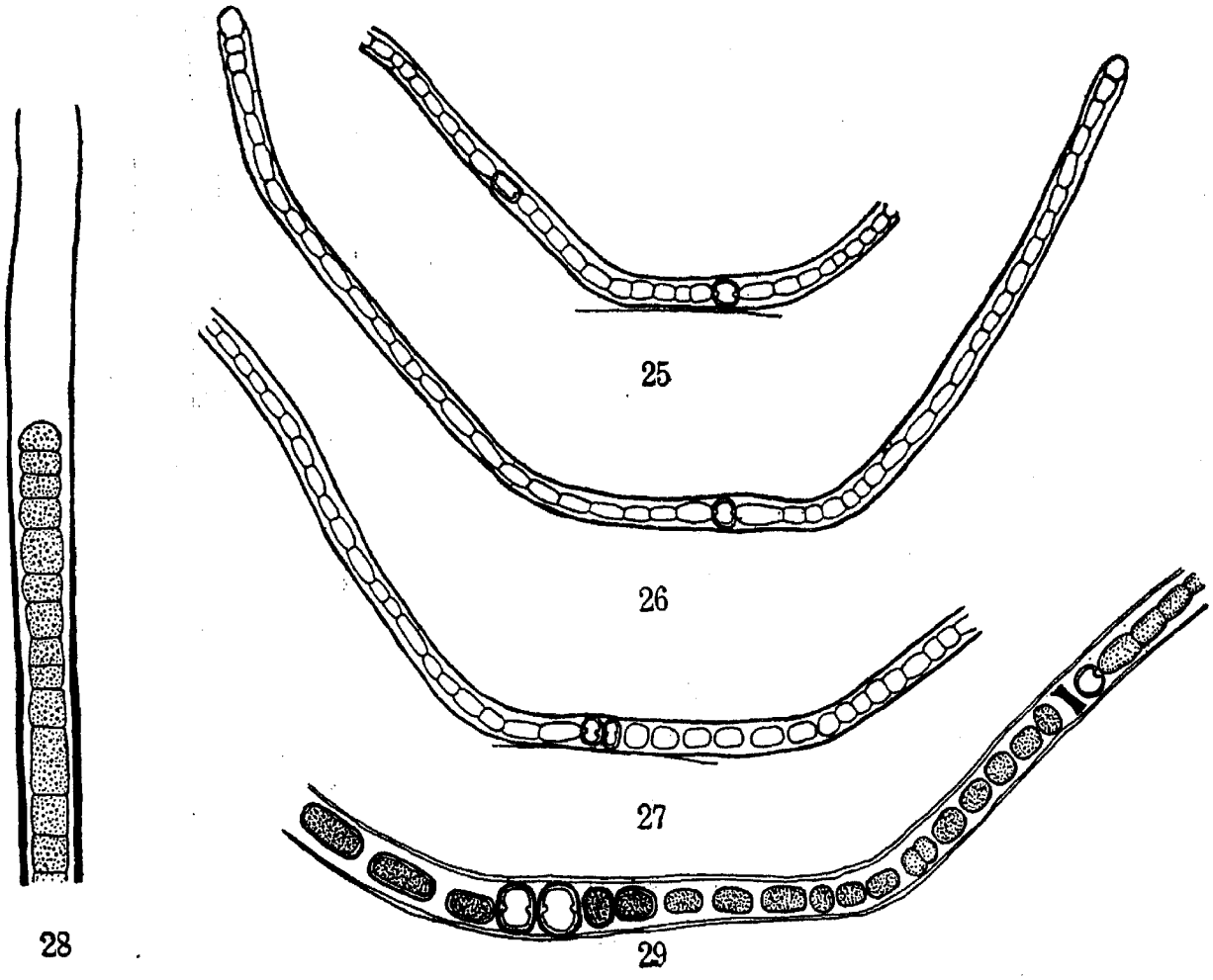
TEXT-FIGS. 16–24.—*Camptylonemopsis pulneyensis* sp. nov. Fig. 16. Crescent-shaped filaments (diagrammatic). Fig. 17. Portion of a filament showing median heterocyst. Fig. 18. Portion of a filament showing two median heterocysts separated by three vegetative cells. Fig. 19. End portion of a filament. Fig. 20. Portion of a filament with an intercalary heterocyst. Fig. 21. Hormogones. Fig. 22. Hormogone with a thin sheath. Fig. 23. A germinating hormogone with a single median heterocyst. Fig. 24. Portion of a filament showing a false-branch by the side of an intercalary heterocyst. Fig. 16 × 75; Figs. 17–23 × 725; Fig. 24 × 475.

This alga, while resembling *Camptylonemopsis lahorense* (Ghose) comb. nov. in having crescent-shaped filaments, differs from it in dimensions and also in the fact that it is an aquatic form, while the Lahore alga is a terrestrial one. Again, false-branching in the present alga is extremely rare or nearly absent. The alga may, therefore, be described as a new species and called *Camptylonemposis pulneyensis* sp. nov.

Camptylonemopsis minor sp. nov.

This alga was found growing epiphytically on the filaments of the previous form, *Camptylonemopsis pulneyensis*, in the same pool at Kodaikanal.

The filaments of this alga show the characteristic crescent-shaped growth (Text-Figs. 25–27), but are much shorter than *Camptylonemopsis*



TEXT-FIGS. 25–29. *Camptylonemopsis minor* sp. nov.—Fig. 25. Portion of a filament showing the characteristic crescent-shaped habit showing a single median heterocyst and another heterocyst in the side portion. Fig. 26. A full filament showing the crescent-shaped habit with a single median heterocyst. Fig. 27. A portion of filament showing the crescent-shaped habit with two median heterocysts. Fig. 28. End portion of a filament. Fig. 29. Portion of a filament with a series of spores. Figs. 25–27 × 475; Figs. 28–29 × 725.

pulneyensis. The filament is 3·9–7·8 μ broad and is throughout constricted at the cross-walls. The cells are spherical to subspherical near the median heterocyst, but, in the remaining portions, the cells are barrel-shaped and are 3·9–9·2 μ long. At the ends of filaments, however, the cells are slightly broader and shorter than broad (Text-Fig. 28).

Generally a single median heterocyst is found in the middle of the filament (Text-Figs. 25–26). This median heterocyst is 3·9–6·6 μ broad. Sometimes two such spherical heterocysts are seen together in the middle region (Text-Figs. 27 and 29). Intercalary heterocysts are present in the other portions of the filament also (Text-Fig. 25). These intercalary heterocysts are cylindrical and are up to twice as long as broad and measure 3·9–6·6 μ broad and (3·9) 5·2–10·5 (–13·1) μ long.

No branching was found in the alga.

Plenty of spores are formed in this alga. Spore-formation begins close to a heterocyst on either side of it and extends further outwards. These spores are quadrate to cylindrical in shape and are generally found in series which may be often interrupted by vegetative cells (Text-Fig. 29). The spores have a brownish outer wall and are 3·9–6·5 μ broad and 5·2–10·5 μ long.

This alga differs from *Camptylonemopsis lahorensis* (Ghose) comb. nov. in dimensions and also in its aquatic habit. It agrees, however, with *Camptylonemopsis lahorensis* in forming spores in series. This alga appears to be a new species and may be called *Camptylonemopsis minor* sp. nov.

Camptylonemopsis Iyengarii sp. nov.

This alga grows epiphytically on the filaments of *Sirogonium* sp., growing in water which was trickling over the soil at the foot of the hill at Vandalur, a place twenty miles south of Madras.

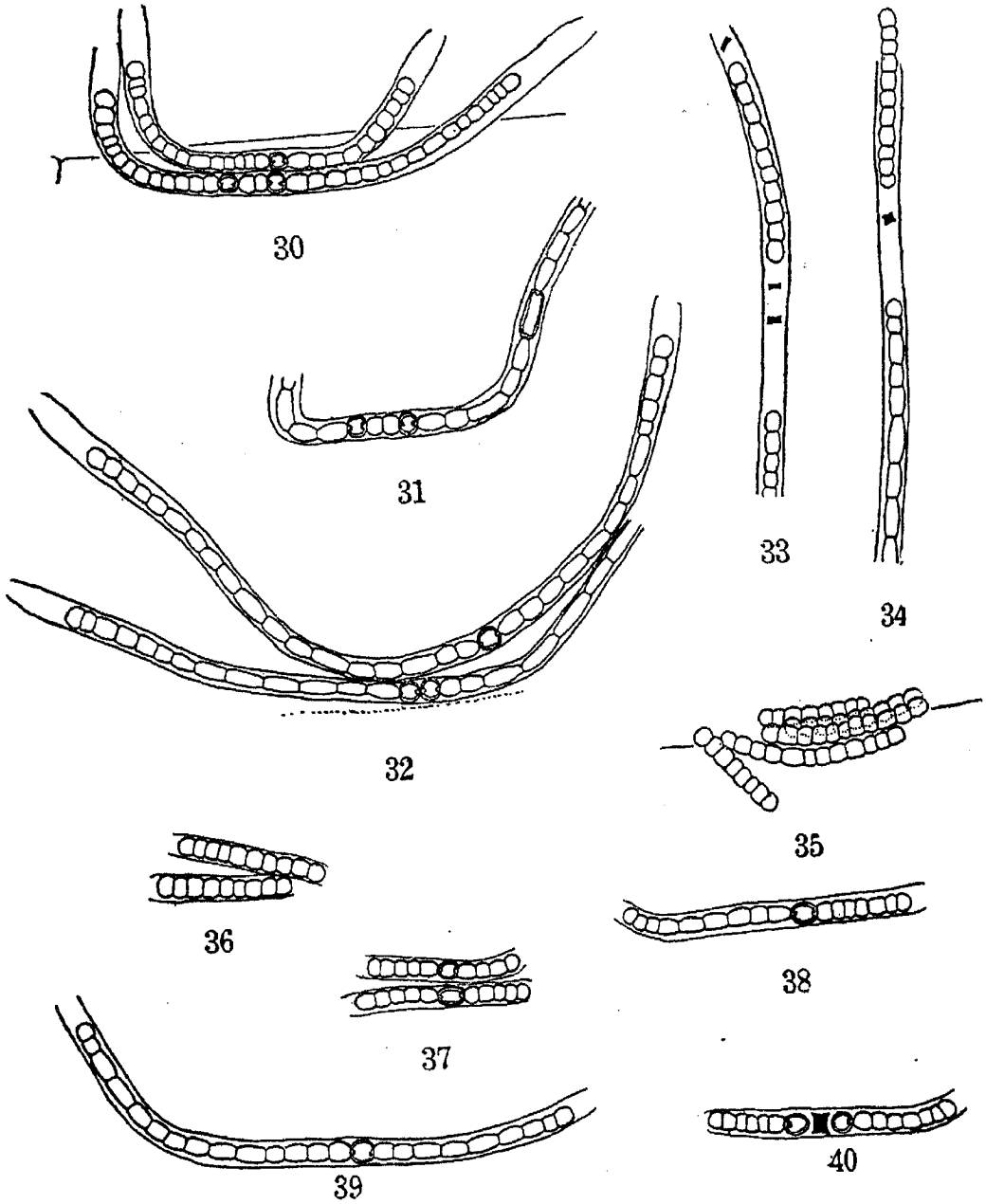
The filaments of the alga showed the characteristic crescent-shaped bending of *Camptylonemopsis* and were attached to the host alga by their middle portion with the two side portions growing freely upwards (Text-Fig. 30). The filaments are 5·2–6·6 μ broad and have a thin hyaline and homogeneous sheath.

The filaments are unbranched. No case of branching was observed though numerous specimens were examined.

The trichome is deeply constricted at the cross-walls and is broadest in the attached middle portion and narrower in the side portions. The extreme ends, however, are slightly broader. The cells in the middle region are roughly spherical and are 3·9–5·2 μ broad. The cells in the side

portions are barrel-shaped and are longer than broad and measure 2·6–3·9 μ broad and 5·2–10·5 μ long.

Heterocysts are formed both in the middle and in the side portions. The heterocysts formed in the middle portion are generally spherical (Text-Fig. 30) and are 3·9–6·6 μ broad; but the heterocysts in the side



TEXT-FIGS. 30–40. *Camptylonemopsis Iyengarii* sp. nov.—Fig. 30. Two young filaments showing the characteristic crescent-shaped habit, one of them with a single median heterocyst and the other with two median heterocysts separated by two vegetative cells. Fig. 31. Portion of a filament with two median heterocysts separated by two vegetative cells and also showing an intercalary heterocyst in the erect portion. Fig. 32. Portions of filaments, one with a single median heterocyst and the other with two median heterocysts side by side. Figs. 33–34. End portions of filaments showing hormogones. Figs. 35–40. Stages in the germination of the hormogones. Figs. 30–40 × 475.

portions are generally cylindrical and up to two to three times as long as broad (Text-Fig. 31). These latter are 3·9–5·2 μ broad and up to 15·7 μ long.

Hormogones are formed terminally and are cut off from the main trichome by the formation of biconcave discs of intercellular substance (Text-Figs. 33 and 34). They are liberated from the ends of the filament. Several of these young hormogones were found growing on the host filaments. They at first possess no sheath (Text-Fig. 35). In the later stages, a definite sheath is seen round each one of them (Text-Fig. 36). These young hormogones grow horizontally attached to the host plant for some time and soon their end portions bend and grow upwards. All the stages from the young hormogones to the fully-formed crescent-shaped filaments were found on the host alga.

In the young hormogones all the cells are vegetative but soon one of the middle cells becomes a heterocyst (Text-Figs. 37–39). In the fully developed filament sometimes two heterocysts are seen side by side in the middle (Text-Fig. 32). These two heterocysts are two-pored, suggesting that two adjacent cells in the middle of the trichome have become converted into heterocysts. In some cases, both the heterocysts are one-pored, the single pore being found on the side away from the intercellular disc (Text-Fig. 40). This suggests that the trichome was broken up into two portions by a disc of intercellular substance and that the cells on either side of the disc become a heterocyst, the pore being formed only on the side on which the heterocyst was in contact with the remaining portion of the trichome (*cf.* *Camptylonemopsis lahorensis*, Text-Fig. 44). Sometimes two heterocysts are found in the middle of the filament separated by one or more cells (Text-Figs. 30, 31) In these cases both the heterocysts are two-pored suggesting that two separate cells in the middle of the filament have developed into two intercalary heterocysts.

No spores were found in the alga.

This alga shows a certain amount of resemblance to Hollerbach's *Camptylonemopsis Danilovii* (Hollerbach) comb. nov. (= *Campylonema Danilovii* Hollerbach), but differs from it in dimensions and in general appearance. It differs from the previously known species in its growing nearly always on *Sirogonium* and in its semi-aquatic habitat. This alga appears to be new. The writer has much pleasure in naming this new alga *Camptylonemopsis Iyengarii* sp. nov., after Professor M. O. P. Iyengar, his revered Professor.

Systematic Position of *Camptylonemopsis*

The genus *Camptylonemopsis* shows a resemblance to *Aulosira* in being unbranched though occasionally having false-branches and in forming spores

in series. It differs from *Aulosira* in its being attached by its middle portions with its two side portions growing bent upwards.

It shows a certain amount of resemblance to *Microchæte* also in its growing attached to a substratum though it differs from it in the mode of attachment. In *Microchæte* one end of the filament is attached to the substratum while the other end grows freely upwards, while in *Camptylonemopsis* the middle portion of the filament is attached to the substratum, while the two end-portions grow freely upwards. It also resembles *Microchæte* in the formation of spores in series. In *Microchæte* the terminal cell of the short attached prostrate portion becomes a heterocyst, while in *Camptylonemopsis* a cell in the middle of the attached prostrate portion becomes a heterocyst. The *Microchæte*-condition could easily be derived from *Camptylonemopsis* by the suppression of the free upward growth on one side of the germinating hormogone through its end-cell on that side becoming converted into a heterocyst instead of one of the middle cells becoming converted into a heterocyst as in *Camptylonemopsis*. In this connection it may be mentioned that in *Camptylonemopsis* frequently two heterocysts are often seen side by side separated by an intercalary disc in the prostrate portion (Figs. 40 and 44). In this condition the alga has the appearance of two *Microchæte* filaments facing each other and growing in opposite directions.

Camptylonemopsis would, thus, appear to be related to both *Aulosira* on the one hand and *Microchæte* on the other and to form a natural connecting link between the two genera. The genus may be placed in the Microchætaceæ between *Aulosira* and *Microchæte*.

Diagnosis of the Genus *Camptylonemopsis* gen. nov.

Filaments bent more or less like a crescent, with a median heterocyst and with two ends of filaments growing upwards, simple or rarely false-branched; true branches absent. Trichome forming a single row of cells. Heterocysts intercalary or at the base of a false-branch. Hormogonia present. Hormocysts not known. Spores formed in series.

Key to the species of *Camptylonemopsis* gen. nov.

1. Aquatic
   - A. Filament 7·9–13·1 μ broad .. .. *C. pulneyensis*
   - B. Filament 3·9–7·9 μ broad .. .. *C. minor*
2. Semi-aquatic or on wet soil
   - A. Epiphytic
     Filament 5·2–6·6 μ broad .. .. *C. Iyengarii*
   - B. Not epiphytic
     - i. Trichome 6–9 μ broad .. .. *C. lahorensis*
     - ii. Trichome 2–3·3 (–3·7) μ broad .. *C. Danilovii*

Description of the Species

1. *Camtpylonemopsis pulneyensis* sp. nov.

(Text-Figs. 16–24)

Plant mass small, light blue-green in colour; filaments bent into a crescent-shape, 7·9–13·1 μ broad; sheath firm, thick, lamellated, and hyaline; unbranched or rarely with false-branches; true branches absent; trichome in the middle region 5·24–9·2 μ broad, narrower in older portions (rarely even 3·9 μ broad), and in the side portions 3·9–6·6 μ broad; apices slightly broader than the portion below and rounded; trichome generally constricted at the cross-walls; cells shorter or longer than broad, 5·2–20 μ long; heterocysts intercalary, median heterocysts spherical and 7·9–10·5 μ broad, in the other portions cylindrical, 5·2–7·9 μ broad and 7·9–19·6 μ long; hormogones present.

Hab.—Among other algæ in a pool near lake, Kodaikanal.

2. *Camptylonemopsis minor* sp. nov.

(Text-Figs. 25–29)

Filaments short, flexuous, 3·9–7·9 μ broad; sheath thin, hyaline, firm without any distinct lamellation; branching not seen; trichome with one or two median heterocysts, constricted at the cross-walls, 2·6–5·2 μ broad; apices of trichome slightly broader, rounded; cells spherical or barrel-shaped, 3·9–9·2 μ long; heterocysts usually intercalary nearly spherical when median, 3·9–6·6 μ broad, in other portions cylindrical and up to twice as long as broad; spores formed in series close to the heterocysts, 3·9–6·6 μ broad and 5·2–10·5 μ long.

Hab.—Epiphytic on *Camptylonemopsis pulneyensis* in a pool near lake, Kodaikanal.

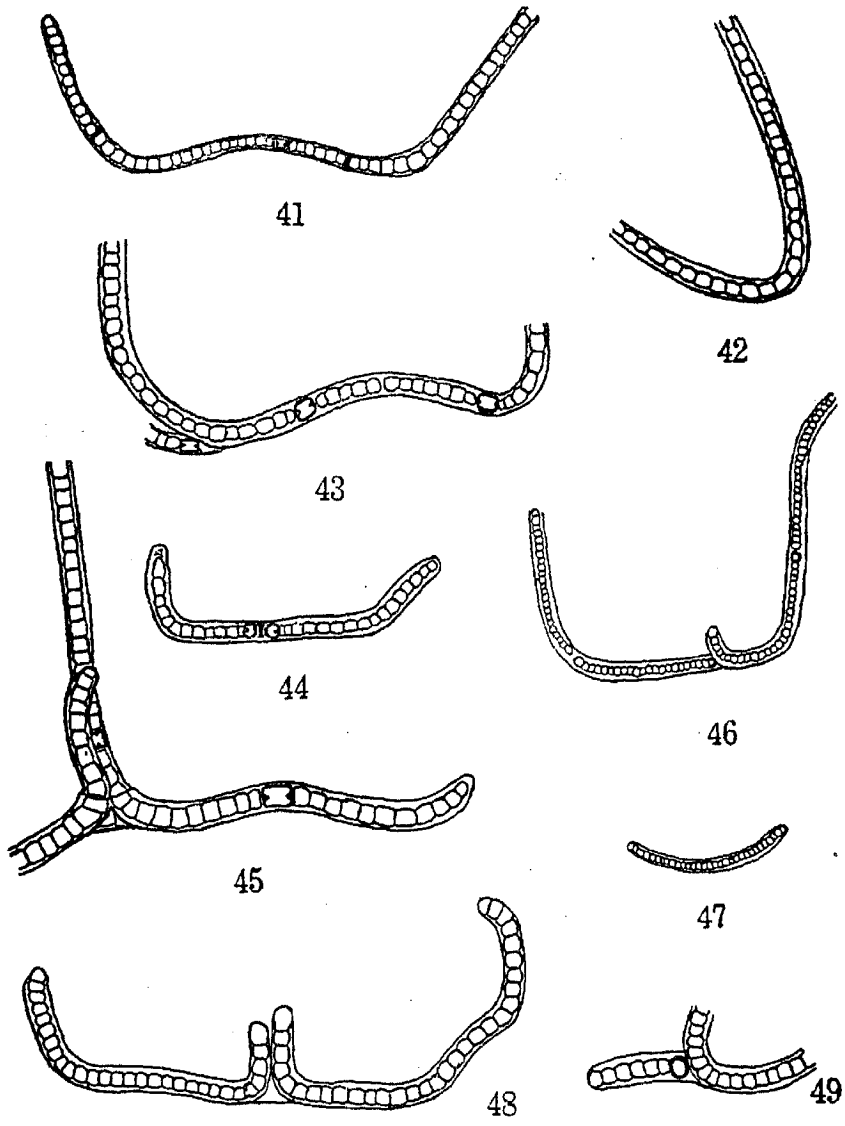
3. *Camptylonemopsis Iyengarii* sp. nov.

(Text-Figs. 30–40)

Filaments epiphytic on *Sirogonium* filaments, crescent-shaped with a flat attached middle region and lateral erect portion, 5·2–6·6 μ broad; sheath thin, hyaline, homogeneous; false-branching not seen; trichome torulose (2·6–) 3·9–5·2 μ broad; apex of the trichome slightly broader, rounded; cells spherical, barrel-shaped or sometimes cylindrical, 3·9–5·2 μ broad in the middle region and near the apex, 2·6–3·9 μ broad and 5·2–10·5 μ long in the rest of the trichome; heterocysts intercalary, median heterocysts

nearly spherical, (3·9–) 5·2–6·6 μ broad, in other portions 3·9–5·2 μ broad and up to 15·7 μ long; hormogones present; spores not seen.

Hab.—Epiphytic on filaments of *Sirogonium* sp., on moist soil, Vandalur.



TEXT-FIGS. 41–45. *Camptylonemopsis lahorensis* (Ghose) comb. nov. (after Ghose).—Fig. 41. A typical filament showing the incomplete sheath, median heterocyst and intercellular substance. Fig. 42. A filament showing a chain of spores. Fig. 43. A filament showing many heterocysts and a single false-branch at the base of one of them. Fig. 44. A filament showing two median heterocysts. Fig. 45. An old filament showing the thick sheath and geminate false branches. Fig. 41 × 150; Figs. 42–43 and 45 × 225; Fig. 44 × 210;

TEXT-FIGS. 46–49. *Camptylonemopsis Danilovii* (Hollerbach) comb. nov. (after Hollerbach). —Fig. 46. A filament with a single false-branch and two heterocysts. Fig. 47. An young filament. Fig. 48. A filament with geminate false-branch. Fig. 49. Single false-branch. Figs. 46–47 × 300; Figs. 48–49 × 550.

4. *Camptylonemopsis lahorensis* (Ghose) comb. nov.[1]

(=*Camptylonema lahorense* Ghose, *The New Phytol.*, **19**, 35–39, figs. 1–6, 1920)

(Text-Figs. 41–45)

Thallus woolly, bright bluish-green, or bluish brown, terrestrial, partly embedded in mud and partly above it; sheath inconspicuous, thin and hyaline in the embedded region and firm, thick and lamellose, lightly adhering and brown in the exposed portion; filaments curved in a more or less semicircular manner, up to $1\frac{1}{4}$ mm. in length; the trichome bluish-green, 6–9 μ broad, slightly constricted at the joints; rarely pseudo-branched, pseudobranches given off singly or in pairs; cells isodiametric or a little longer than broad, transverse walls scarcely conspicuous in the older filaments; heterocysts median or found at intervals throughout the length of the filament, rectangular or ellipsoidal, 12–21 μ long and 7–9 μ wide; spores 7–11 μ long and 5–7 μ wide, formed in a chain within the sheath, episporium brown and smooth; cell-contents coarsely granular.

Hab.—On damp lawns and waste grounds at Lahore, India.

5. *Camptylonemopsis Danilovii* (Hollerbach) comb. nov.[2]

(= *Camptylonema Danilovii* Hollerbach, *Acta Inst. Bot. Acad. Sci.*, URSS., Series II, fasc. 2, p. 40, fig. I, 9–12, 1934)

(Text-figs. 46–49)

Filament 3·3–3·7μ broad, solitary or several, constantly semi-circularly curved, ascending; simple or rarely false-branched; branches single or geminate; trichome in the middle 2–3·3 μ broad, at the apices somewhat broadened, 3·3–3·7 μ broad, constricted at the cross-walls; cells barrel-shaped, usually as long as broad, rarely shorter, 2·1–4·2 μ long; contents homogeneous, light blue-green; sheath thin, often diffluent at the apices, in the middle slightly broader; heterocysts rare, intercalary, nearly rectangular or short-oval, 2·8–3·3 μ broad and 2·1–3·3 μ long.

Hab.—In superficial strata of clay soil (pH 6·3).

Summary

The genus *Camptylonema* was established by Schmidle on the type-species, *Camptylonema indicum*, which had been collected from Bombay

[1] This description is adapted from Ghose (1920).

[2] This description is after Hollerbach (1934).

The genus was placed by him under the Stigonemaceæ, since both true and false-branches were found by him in the alga. Forti, Ghose and Geitler, doubting the occurrence of true branching in the alga, transferred the genus to the Scytonemaceæ. The type-species, *C. indicum*, which was not recorded again since Schmidle described it, was recently recorded by the writer from Cochin in South India. Undoubted cases of true branching are found in this alga in addition to false-branches. Since true branches are found in the alga, the genus is now retransferred to the Stigonemataceæ.

A new genus, *Camptylonemopsis*, is created to include species like *Camptylonema lahorense* Ghose and *Camptylonema Danilovii* Hollerbach, which possess crescent-shaped filaments, but do not show true branching. The new genus, *Camptylonemopsis*, is placed under the Michrochætaceæ.

Three new species of *Camptylonemopsis* from South India, *viz.*, *C. pulneyensis* sp. nov., *C. minor* sp. nov. and *C. Iyengarii* sp. nov., are described in the paper.

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