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TWO NEW SPECIES OF PLECTOSPIRA ISOLATED FROM DISCOLORED ROOTLETS

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Only a few members of the Saprolegniaceae have become known as causal agents of damping-off, root rot, and stem rot in phanerogamic crop plants growing in garden or field under ordinary conditions of cultivation. The family was considered almost wholly of aquatic habitat when Peters (1906, 1911) disclosed a saprolegniaceous fungus as a destructive field pathogen in setting forth a species of *Aphanomyces* that he held identical with *A. levis* DeBary as one of the 3 fungi mainly responsible for the black-root disease (Wurzelbrand) widely affecting sugar-beet (*Beta vulgaris* L.) seedlings in Germany. Soon afterwards Barrett (1912) reported that black-root of radish (*Raphanus sativus* L.), a disease he found widely distributed in the United States, was likewise caused by *A. levis*. The radish parasite, which Kendrick (1927) later described as a separate species under the binomial *A. raphani,* has since been found severely attacking many varieties of radish also in Europe (Böning 1932–1933, 1935–1936). The sugar-beet parasite, which from studies on cultures isolated from diseased seedlings in Michigan I presented (Drechsler 1929) as a distinct species under the binomial *A. cochlioides,* has in recent years become troublesome in our humid Middle West not only because of its attack on seedlings but also because of its continued injury to the root system of the host in later stages of growth (Coons, Kotila, and Bockstahler 1946). Very extensive softening of cortical tissues is characteristic of the serious root rot of canning peas (*Pisum sativum* L.) caused in wet seasons by *A. euteiches* (Jones and Drechsler 1925), a fungus Linford (1927) found capable, besides, of severely injuring young seedlings of certain species of *Vicia* and *Lathyrus*. *A. camptostylus* Drechsler (1929), originally described from a culture isolated from an oat (*Avena sativa* L.) root, was found by Sprague (1950) to occur also on diseased roots of *A. byzantina* K. Koch, *Festuca elatior* L., *F. rubra* L., *Setaria viridis* (L.) Beauv., and *Stipa viridula* Trin. Although the cultures on which my description of *A. cladogamus* was based came from tomato (*Lycopersicon esculentum* Mill.) rootlets (Drechsler 1927, 1929), this species seems far more injurious to the pansy (*Viola tricolor* L.) as it causes on that host a severe root rot and crown rot often resulting in death of affected plants (Drechsler 1934). It apparently occurs widely, too, on discolored roots of spinach (*Spinacia oleracea* Mill.) and has

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been isolated (Drechsler 1935) from discolored flax (*Linum usitatissimum* L.) roots. In Canada it has recently been reported (McKeen 1952) as a cause of damping-off in pepper (*Capsicum annuum* L.) seedlings and as being capable of bringing about considerable damping-off in tomatoes, radish, and eggplant (*Solanum melongena* L.). The *Aphanomyces* root rot of eggplant, lettuce (*Lactuca sativa* L.), and pepper seedlings earlier observed by Mix (1945) in New Jersey may have been caused by the same fungus.

Apart from the 5 species of *Aphanomyces* just enumerated 2 root-inhabiting saprolegniaceous fungi, one isolated from discolored tomato rootlets and the other from sugar-cane (*Saccharum officinarum* L.) roots, have been described under the binomials *Plectospora myriandra* Drechsler (1927) and *P. gemmifera* Drechsler (1929), respectively. In these two fungi the zoosporangia are not formed directly from outwardly unmodified portions of mycelium, as in *Aphanomyces,* but consists of irregularly distended hyphal branches which sometimes are compounded into massive clews visible to the naked eye. While in all root-inhabiting species of *Aphanomyces* the oogonia are supplied with antheridia in numbers ranging usually from 1 to 5, in *P. myriandra* these organs either develop without any antheridia whatever or, as always in *P. gemmifera,* are beset with dozen of antheridial elements. Similar association of distended zoosporangia with oogonia either wholly parthenogenetic or very abundantly mated—an association without a counterpart among species of *Pythium* having sporangia of lobulate type—is found also in two delicate saprolegniaceous fungi that came to light in a varied assortment of cultures isolated from roots of herbaceous plants near Beltsville, Maryland, early in the autumn of 1950, after liberal rains and prolonged cloudiness had provided conditions favorable for root disease. As these two fungi differ from both *P. myriandra* and *P. gemmifera* they are described herein as new members of the same genus.

1. **Plectospira agama** Drechsler sp. nov. Mycelium incoloratum, mediocriter ramosum, in materiis alibilibus mollibus tepidis (25° C.) circa 18 mm. radiatim in die crescens; hyphis sterilibus vulgo 1.5–6 μ latis; zoosporangiis incoloratis, simplicibus vel ramosis, 5–20 μ latis, ubi simplicibus vel parum ramosis ibi vulgo pansis, ubi copiose ramosis ibi saepe valde glomeratis, tubo exinanitionis vulgo 50–500 μ longo apice 2–5 μ lato praeditis, plerumque 25–300 zoosporas gignentibus; zoosporis in statu immobili globosis, saepius 8–11 μ crassis, protoplasma eorum per tubulum circa 2.3 μ latum et 0.6 μ longum saepe emittentibus, in statu agili reniformibus, latere 2 ciliis instructis; chlamydosporis globosis, saepius 25–40 μ crassis; oogoniis in apice ramulorum lateralium singulatim oriundis, globosis, plerumque 19.5–26.5 μ (saepe circa 22.8 μ) crassis, sine antheridiis, unam parthenosporam gignentibus; ramulis oogonialibus rectis vel flexuosis 5–100 μ (plerumque 5–40 μ) longis, basi saepe 1.5–3 μ latis, apice 2.5–5 μ latis; parthenosporis incoloratis, globosis, plerumque 16.3–23.4 μ (saepius circa 20.3 μ) crassis, membrana plerumque 1.1–1.6 μ crassa praeditis, unam pilulam oleosam plerumque

9.5–13.5 μ (saepius circa 11.5 μ) crassam et unum corpusculum nitidum applanato-ellipsoideum continentibus.

Habitat in radicibus *Prunellae vulgaris* putrescentibus prope Beltsville, Maryland.

Mycelium colorless, moderately branched, in soft nutrient materials at temperatures near 25° C. growing radially about 18 mm. in 24 hours, composed of hyphae mostly 1.5 to 6 μ wide; zoosporangia colorless, 5 to 20 μ wide, simple or unbranched, when simple or only meagerly branched most often fully extended, when copiously branched more frequently gathered into a somewhat massive clew, in either case provided with a tapering evacuation tube commonly 50 to 500 μ long and 2–5 μ wide at the tip, producing 25 to 300 zoospores; encysted zoospores globose, mostly 8 to 11 μ in diameter, often discharging their protoplasm through an evacuation tube about 2.3 μ wide and 0.6 μ long to give rise individually to a reniform, laterally bicilliate, motile swarm-spore; chlamydospores globose, often 25 to 40 μ in diameter; oogonial branches straight or somewhat curved, 5 to 100 μ (mostly 5 to 40 μ) long, often 1.5 to 3 μ wide at the proximal end and 2.5 to 5 μ wide distally; oogonia formed terminally, colorless, globose (though often including a cylindrical proximal part up to 10 μ in length), mostly 19.5 to 26.5 μ (average 22.8 μ) in diameter, developing without antheridia in forming a single parthenospore; parthenospores colorless, globose, mostly 16.3 to 23.4 μ (average 20.3 μ) in diameter, provided with a wall 1.1 to 1.6 μ thick, containing a single reserve globule mostly 9.5 to 13.5 μ (average 11.5 μ) in diameter, and having imbedded in the parietal layer a single refringent body frequently of oblate ellipsoidal shape, about 4.2 μ wide and 2 μ thick.

Isolated from decaying roots of *Prunella vulgaris* L. collected near Beltsville, Maryland, on September 26, 1950.

As separate cultures of *Plectospira agama* were isolated from the roots of several selfheal plants that were taken up in scattered positions in open woods on well drained upland, the fungus may occur more or less habitually on that familiar herb. Growing in maizemeal-agar plate cultures its mycelium has a radiating appearance not markedly different from the appearance of *Plectospira myriandra* and *P. gemmifera*. Asexual reproduction can usually be obtained in some measure by transferring sizable slabs of maizemeal agar well permeated with young mycelium to a shallow layer of distilled water. More copious development of zoosporangia generally ensues when slabs excised from young Lima-bean agar cultures are judiciously irrigated. On the richer substratum numerous zoosporangia (fig. 1, A–F) are formed in 36 hours, their production being especially abundant along the margins of the slabs. In the formative stages of their development they are filled throughout with granular protoplasm, but after they have been delimited proximally by a cross-wall and are extending a long evacuation tube (fig. 1, F, t) they become conspicuously vacuolate. The granular material is rearranged into chains of young zoospores which soon are rapidly discharged through the open tip of the evacuation tube. They encyst immediately, thus forming a cluster near the orifice. A little later their

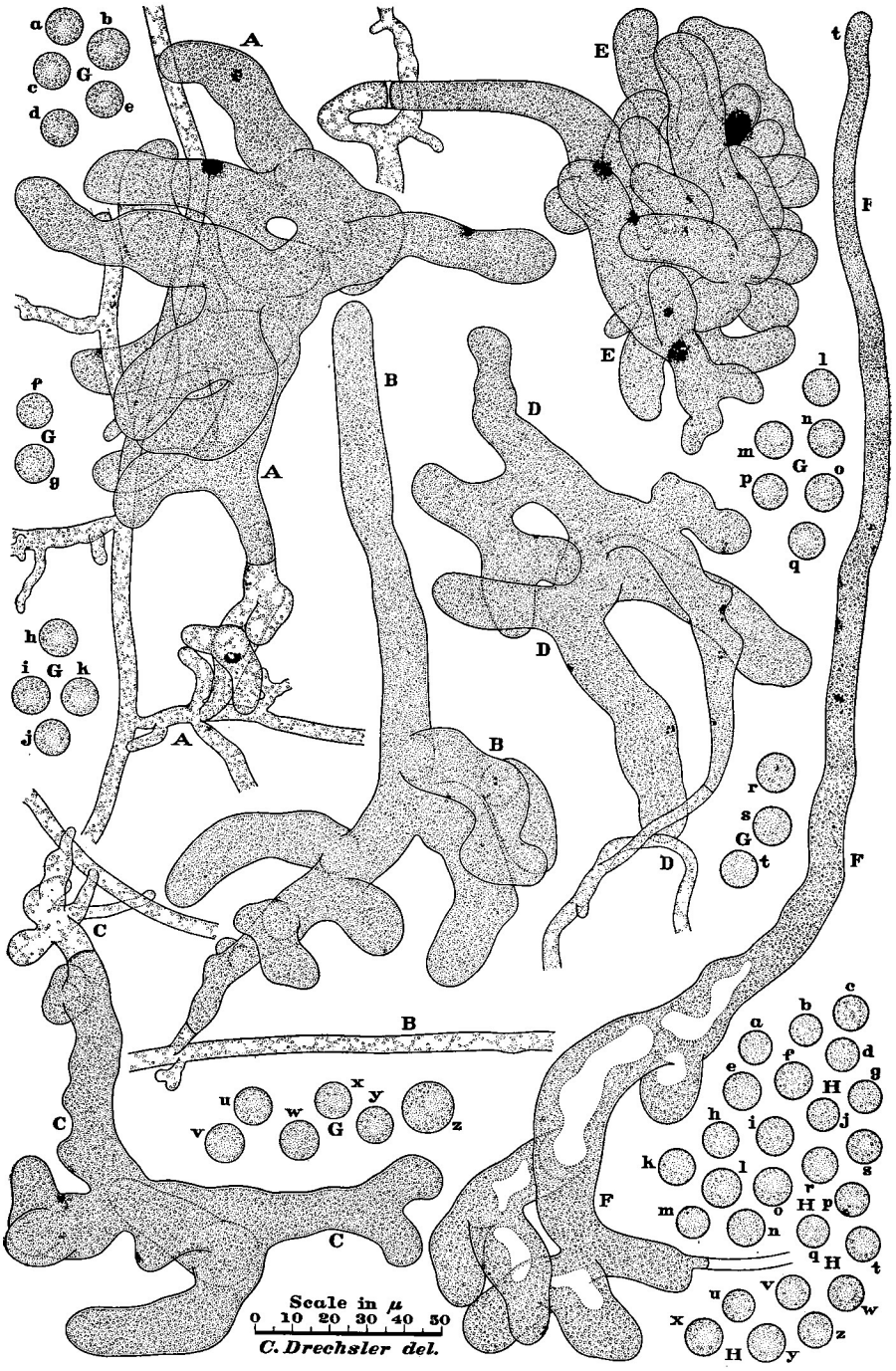


FIG. 1. *Plectospira agama*, as found developing on slabs excised from a Lima-bean agar plate culture and transferred to a shallow layer of water; ×500 throughout. A-E, Young zoosporangia delimited from mycelium. F, Zoosporangium with evacuation tube, t. G (a-z), H (a-z), Encysted zoospores.

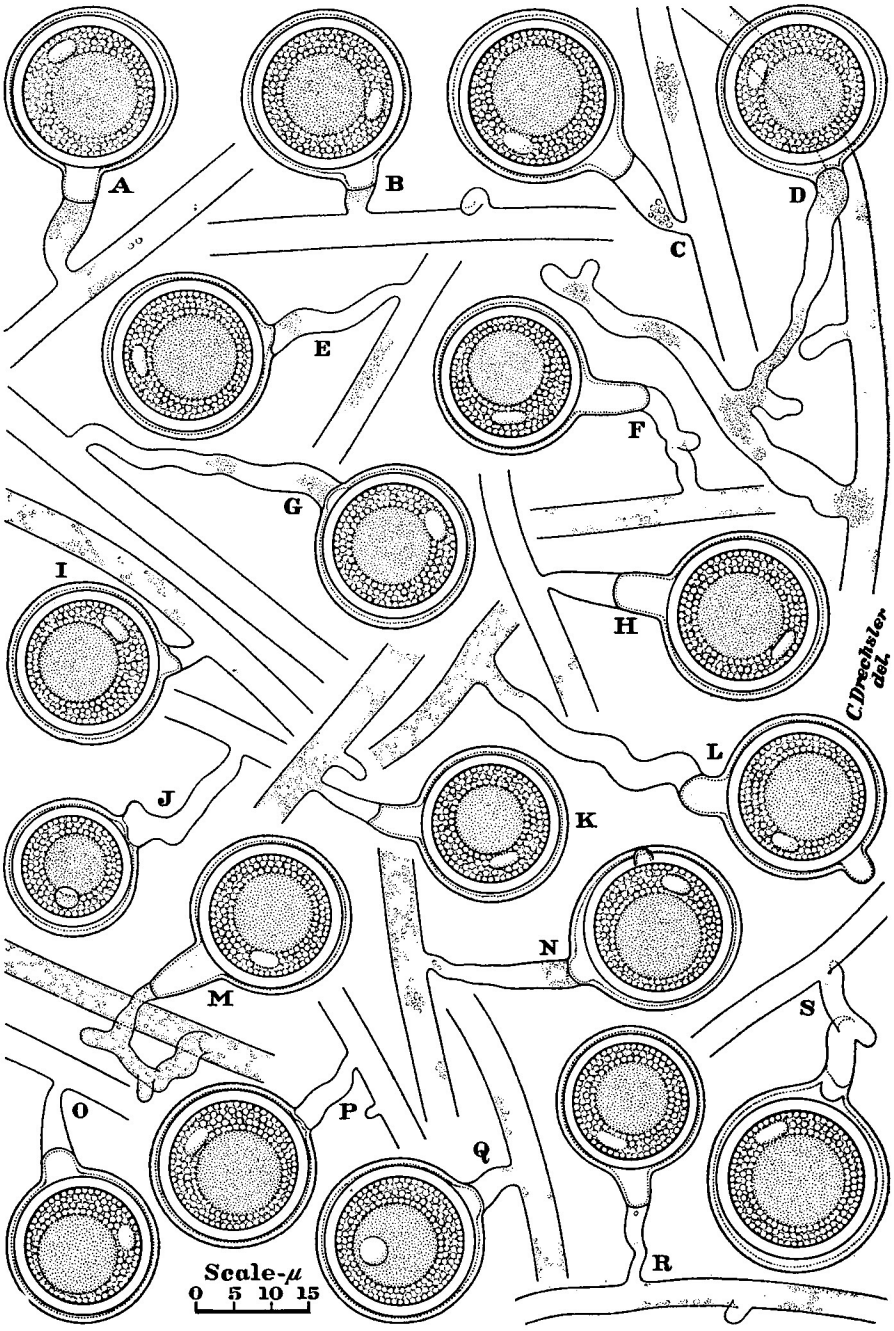
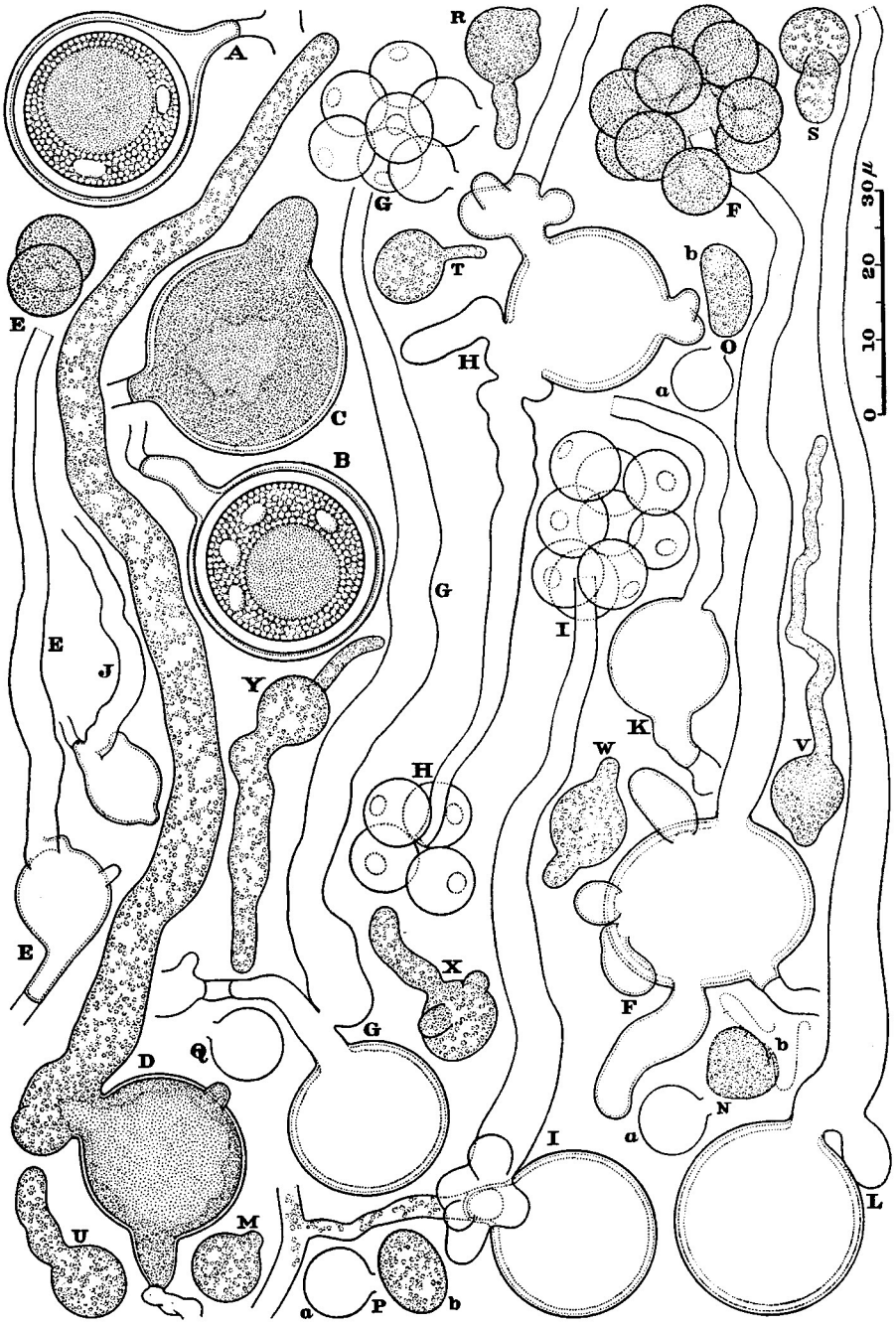


FIG. 2. *Plectospira agama*, as found in a maizemeal-agar plate culture 7 days old; ×1000 throughout. A-S, Portions of mycelium, each with an oogonium containing a mature parthenospore.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protoplasts flow out and are converted externally into motile swarm-spores. After swimming about for some time the swarm-spores encyst again. In irrigated preparations 2 days old encysted zoospores (fig. 1, G, a–z; H, a–z) are usually present in countless numbers.

Chlamydospores of globose or prolate ellipsoidal shape are sometimes produced rather sparingly in aging maizemeal agar cultures. Though possibly homologous with the chlamydospores or gemmae of *Plectospira gemmifera*, they seem to represent only a subsidiary phase in the development of the fungus.

Reproduction equivalent to sexual reproduction takes place promptly and abundantly in maizemeal agar containing some finely divided maizemeal in suspension. Oogonia are soon formed in large numbers. As is suggested in the specific epithet, they have never been found supplied with antheridia. Their consistently parthenogenetic development contrasts strongly with sexual development in *Plectospira gemmifera*, where oogonia have always been found supplied with numerous antheridia. Since the parthenogenetic apparatus produced copiously in maizemeal agar cultures shows a relatively high degree of uniformity with respect to shape, dimensions, and internal organization (fig. 2, A–S), it may be considered fairly typical of the species. Accordingly, 100 units of such apparatus, taken at random, were measured to obtain the metric data on oogonium and parthenospore given in the diagnosis. The 100 oogonia gave measurements for diameter which when expressed in the nearest integral number of microns were distributed as follows: 20 μ, 4; 21 μ, 8; 22 μ, 26; 23 μ, 30; 24 μ, 24; 25 μ, 5; 26 μ, 2; 27 μ, 1; while the parthenospores in them gave measurements for diameter distributed thus: 16 μ, 1; 18 μ, 1; 19 μ, 20; 20 μ, 35; 21 μ, 28; 22 μ, 11; 23 μ, 4. By searching for specimens of unusually small and unusually large dimensions some oogonia only 16 μ and others fully 30 μ in diameter were found; the parthenospores in the former measuring about 14 μ in diameter, and those in the latter about 27 μ. Smaller dimensions are usual in irrigated material, where oospores only about 10 μ in diameter can often be found with little search.

FIG. 3. Parthenospore germination in *Plectospira agama*, as found in irrigated preparations of material taken from a maizemeal agar culture 3 months old; ×1000 throughout. A, B, Parthenospores that show after-ripening in their plural refringent bodies—a condition reached before transfer to water. C, Parthenospore with short germ hypha. D, Parthenospore with long germ hypha. E, F, Empty parthenospores from which 2 and 12 zoospores, respectively, have been discharged. G-I, Empty parthenospores, each with empty globose zoospore envelopes clustered at the mouth of its evacuation tube. J-L, Empty parthenospores, each with empty evacuation tube. M, Encysted zoospore with papilla of dehiscense. N, Empty zoospore envelope, a, and the motile zoospore, b, that emerged from it. O, P, Empty zoospore envelopes, a, each with a secondary zoospore, b, that has encysted near the open evacuation tube. Q, Evacuated zoospore envelope. R-Y, Encysted zoospores germinating by emission of 1 to 3 germ tubes.

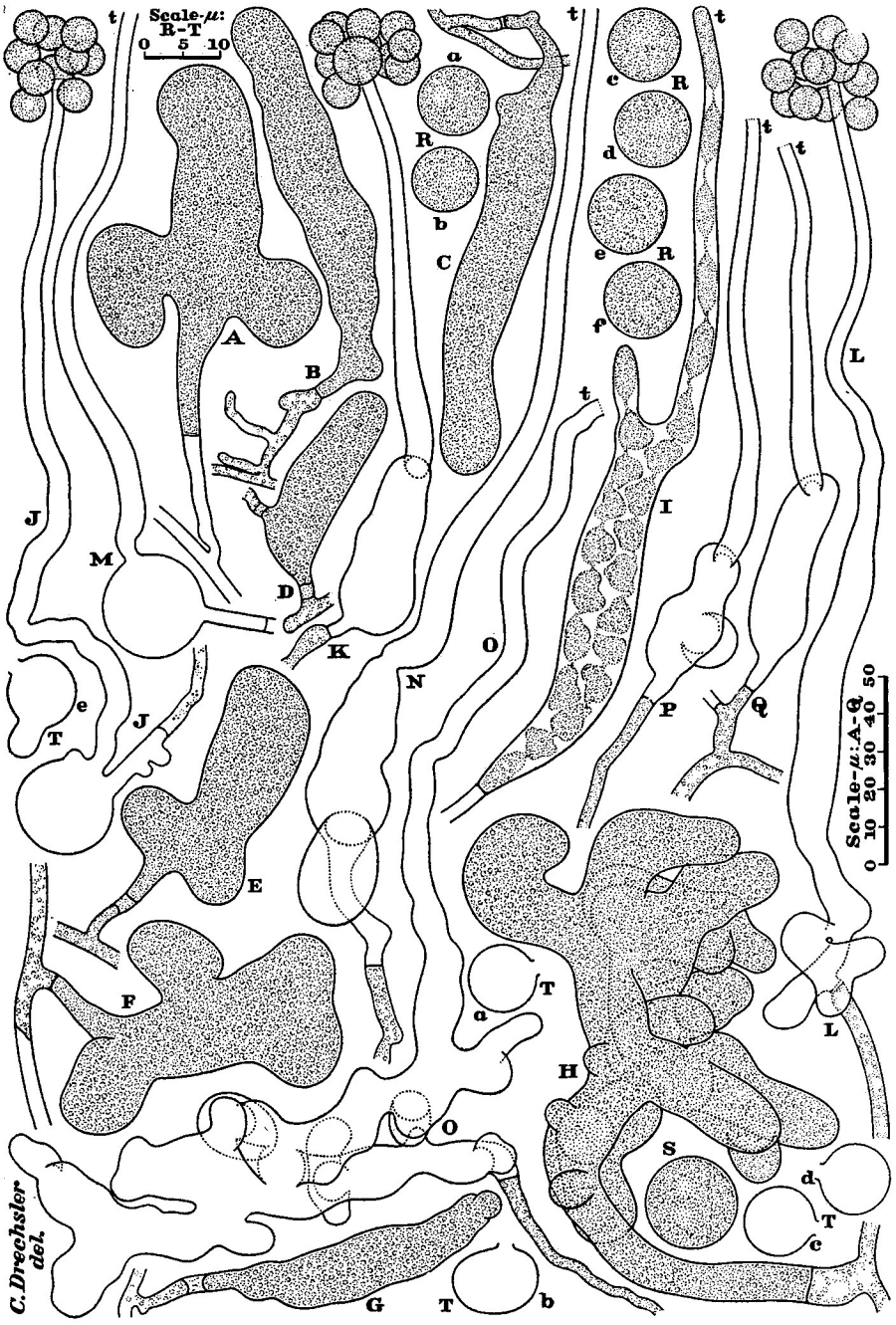
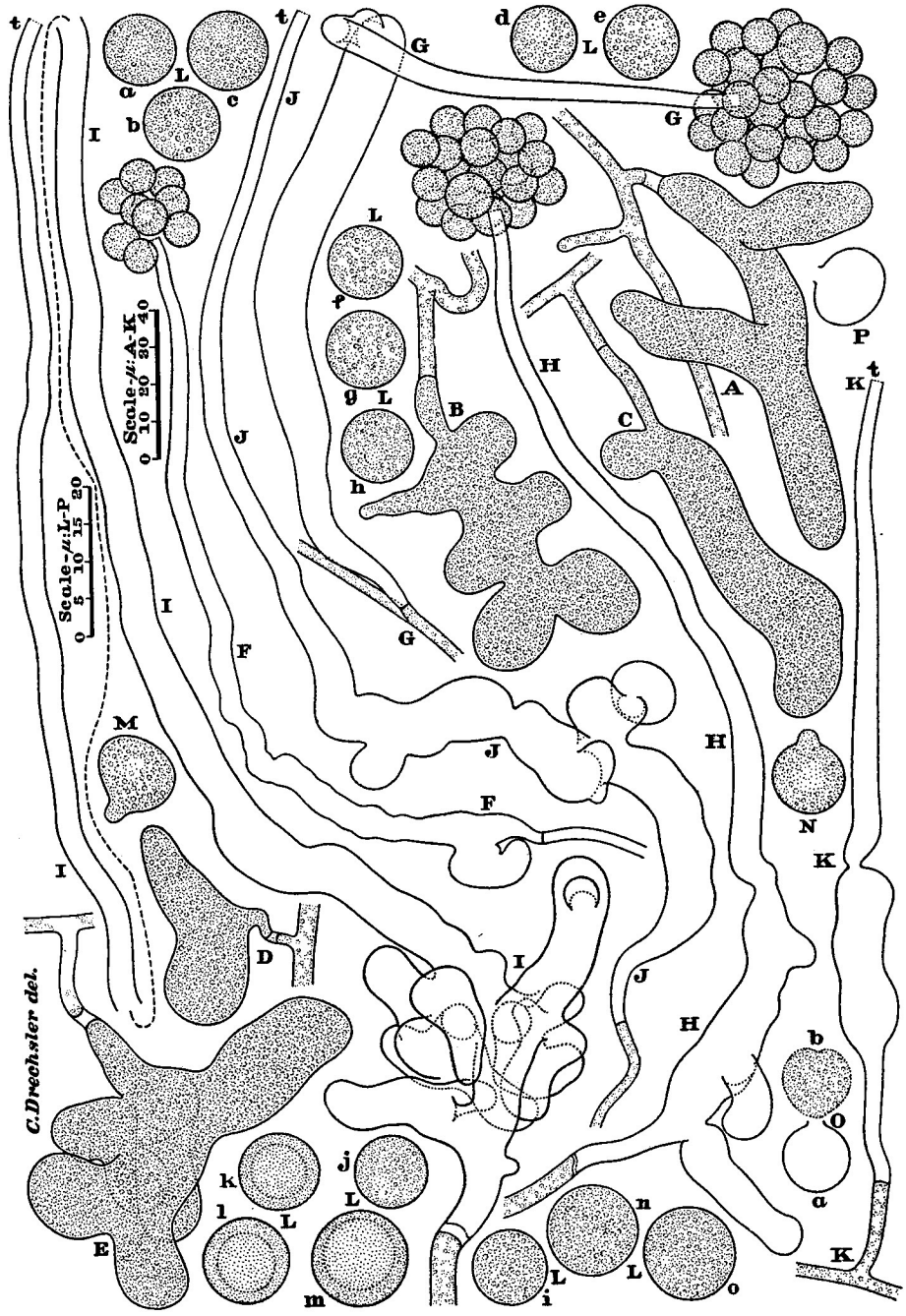


FIG. 4. *Plectospira plagiocaula*, as found developing on slabs excised from a young Lima-bean agar plate culture and then transferred to a shallow layer of water; A-Q, × 500; R-T, × 1000. A-H, Young delimited zoosporangia. I, Zoosporangium with newly individualized zoospores ready to be discharged through the evacuation tube, t. J-L, Empty sporangia, each with its discharged zoospores clustered at the tip of its evacuation tube. M-Q, Empty sporangia, each with empty evacuation tube, t. R, Encysted zoospores a-f, of usual size. S, Unusually large encysted zoospore. T, Evacuated envelopes of zoospores, a-e, left after completion of repetitional development.

The parthenospores of *Plectospira agama* germinate readily after a resting period of 3 months. Successive stages in after-ripening are often recognizable earlier as the number of refringent bodies increases first to two (fig. 3, A) and then to four (fig. 3, B). Further multiplication of these bodies is obscured as the parietal layer changes from a minutely globuliferous to a more opaque, promiscuously granular texture. Simultaneously the reserve globule becomes irregular in outline and diminishes in size. The parthenospore wall is reduced in thickness throughout its circumference, owing to resorption of an inner layer. In a restricted area the outer layer, too, is dissolved, permitting the protoplast to push through the opening and then in like manner to break through the oogonial envelope, so that its broad protrusion erupts as a germ hypha (fig. 3, C). If the germ hypha encounters pure water devoid of nutrients it often stops growing on reaching a length of 25 to 200 μ (fig. 3, D) and functions as an evacuation tube, with the discharged zoospores rounding up near its open tip (fig. 3, E, F). After the individual protoplasts have flowed out of the cyst envelopes and have swum away as laterally biciliate swarm-spores, the empty cyst envelopes often remain visible in a cluster near the orifice of the evacuation tube (fig. 3, G–I). Later, when these envelopes have floated away or have evanesced, the distinctive function earlier served by the evacuation tube may be inferred from its open tip (fig. 3, J–L). Encysted zoospores, as in related fungi, always put forth a papilla of dehiscense (fig. 3, M) before discharging their contents to develop externally into a motile swarm-spore (fig. 3, N, b); the proximal portion of the papillary membrane subsequently appearing on the empty cyst envelope as a short evacuation tube (fig. 3, N, a; O, a; P, a; Q). Under somewhat unfavorable conditions liberated protoplasts may encyst directly (fig. 3, O, b; P, b) without intervention of a motile stage. In the presence of nutrients encysted zoospores commonly germinate vegetatively by putting forth a single germ hypha of variable width (fig. 3, R–V), though not infrequently two (fig. 3, W, Y) or even three (fig. 3, X) germ hyphae may be extended.

2. **Plectospira plagiocaula** Drechsler sp. nov. Mycelium incoloratum, mediocriter ramosum, in materiis alibilibus mollibus tepidis (25° C.) circa 17.5 mm. radiatim in die crescens; hyphis sterilibus plerumque 1.5–6.5 μ latis; zoosporangiis incoloratis, 5–25 μ latis, simplicibus vel ramosis, ubi simplicibus vel parum ramosis ibi vulgo pansis, ubi copiose ramosis ibi saepe glomeratis, tubo exinanitionis 50–600 μ longo apice 2.8–4.5 μ lato praeditis, vulgo 10–200 zoosporas gignentibus; zoosporis in statu immobili globosis, plerumque 8.5–11.5 μ crassis, protoplasma per tubulum circa 2.3 μ latum et 0.6 μ longum emittentibus, in statu agili reniformibus et latere 2 ciliis instructis; ramulis oogonialibus rectis vel flexuosis, 5–100 μ (plerumque 5–60 μ) longis, basi saepe 2–3.5 μ latis, apice 3–6 μ latis; oogoniis in apice horum ramulorum singulatim oriundis, saepe in latere aliquid oblique aptis,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interdum sine antheridiis interdum 20–50 antheridiis praeditis, ubi antheridiorum expertibus ibi plerumque 23–29 μ (saepe circa 26 μ) crassis, ubi antheridiis praeditis ibi saepe 24–36 μ crassis, unam parthenosporam vel unam oosporam gignentibus; antheridiis ex ramis aliarum hypharum oriundis, rectis vel saepius curvatis, plerumque 8–20 μ longis, 2.5–7.5 μ latis, saepe cassis; parthenosporis incoloratis, globosis, plerumque 20–27 μ (saepe circa 23.2 μ) crassis, muro 1.3–1.9 μ crasso circumdatis, pilulam oleosam 11.2–15.7 μ crassam et corpus nitidum ellipsoideum circa 4.5 μ latum 2 μ crassum continentibus; oosporis (oogoniorum antheridiis junctorum) globosis, plerumque 21–34 μ crassis, muro 1.4–2 μ crasso circumdatis.

Habitat in radicibus Rumicis acetosellae putrescentibus prope Beltsville, Maryland.

Mycelium colorless, moderately branched, in soft nutrient materials at temperatures near 25° C. growing radially about 17.5 mm. in 24 hours, composed of hyphae mostly 1.5 to 6.5 μ wide; zoosporangia colorless, 5 to 25 μ wide, simple or branched, when simple or meagerly branched most often fully extended, when more richly branched often compacted into an irregular clew, in any case provided with an evacuation tube 50 to 600 μ long and 2.8 to 4.5 μ wide at the tip, commonly producing 10 to 200 zoospores; encysted zoospores globose, mostly 8.5 to 11.5 μ in diameter, their protoplasts often flowing out individually through an evacuation tube about 2.3 μ wide and 0.6 μ long to become converted externally into a laterally biciliate reniform swarmspore; oogonial branches nearly straight or somewhat flexuous, 5 to 100 μ (mostly 5 to 60 μ) long, often 2 to 3.5 μ wide and 3 to 6 μ wide distally, often attached to the single terminal oogonium laterally rather than mesially; oogonia globose (though often including a cylindrical proximal part up to 10 μ in length), sometimes without antheridia and then measuring mostly 23 to 29 μ (average 26 μ) in diameter, at other times supplied with 20 to 50 antheridia and then usually 24 to 36 μ in diameter, producing a single parthenospore or oospore; antheridia borne on branches from hyphae not closely connected with the hypha bearing the oogonial branch, straight or more often curved, mostly 8 to 20 μ long and 2.5 to 7.5 μ wide, often nonfunctional; parthenospores colorless, globose, mostly 20 to 27 μ (average 23.2 μ) in diameter, surrounded by a wall 1.3 to 1.9 μ thick, containing a reserve globule 11.2 to 15.7 μ in diameter, and having imbedded in the parietal layer a refringent body mostly of oblate ellipsoidal shape, about 4.5 μ wide and 2 μ thick; oospores (in oogonia supplied with antheridia) somewhat larger than the parthenospores, mostly 21 to 31 μ in diameter, surrounded by a wall 1.4 to 2 μ thick.

Isolated from softened discolored roots of *Rumex acetosella* L. collected near Beltsville, Maryland, on October 17, 1950.

FIG. 5. *Plectospira plagiocaula*, as found developing on slabs excised from a young Lima-bean agar plate culture and then transferred to a shallow layer of water; A-K, ×500; L-P, ×1000. A-E, Young delimited zoosporangia. F-H, Empty zoosporangia, each with its progeny of zoospores clustered at the tip of its evacuation tube. I-K, Empty zoosporangia, each with empty evacuation tube, t. (Owing to lack of space the evacuation tube in I is shown in 2 parts whose proper connection is indicated by a broken line.) L, Encysted zoospores among which some (a-l) are of usual size, while others (m-o) are of larger than usual size. M, N, Encysted zoospores, each with papilla of dehiscense. O, Empty envelope of encysted zoospore, a, with naked protoplast, b, that emerged from it. P, Evacuated envelope of encysted zoospore remaining after completion of repetitional development.

More than a dozen cultures of *Plectospira plagiocaula* were obtained from separate sheep-sorrel plants taken up from scattered positions in a moist grassy field about 2 kilometers from the woods where the selfheal specimens harboring *P. agama* had been obtained earlier. Its prompt and frequent appearance in isolation plate cultures indicated that locally, at least, the fungus was present on the underground parts of the host in considerable quantity.

When *Plectospira plagiocaula* is cultured on maizemeal agar its mycelium grows with about the same rapidity as mycelium of *P. agama*. The two species show little difference either in the dimensions or in the branching habit of their vegetative hyphae. By excising from young plate cultures of *P. plagiocaula* sizable slabs of maizemeal or Lima-bean agar well permeated with mycelium, and transferring them to a shallow layer of water, zoosporangia are obtained, as a rule, in lesser quantity than in similarly treated material of *P. agama*. Although the swollen hyphal branches are sometimes a little wider in *P. plagiocaula* than in *P. agama*, they are frequently shorter and less extensively branched (fig. 4, A–G; fig. 5, A–E). Sporangia with a mulberry-like arrangement of swollen parts (fig. 4, H) are generally less massive and less abundant in *P. plagiocaula* than in *P. agama*, *P. myriandra*, or *P. gemmifera*. Internal development proceeds in *P. plagiocaula* much as in related species, plural chains of young zoospores being formed in the distended parts and a single chain in the narrowing evacuation tube (fig. 4, I, t). After the apex of the evacuation tube has yielded, the naked zoospores are rapidly discharged. They immediately encyst in a cluster near or around the open tip (fig. 4, J–L; fig. 5, F–H). Since discharge here, as also in the 3 congeneric species, takes place exclusively by way of a single terminal orifice the empty evacuation tubes (fig. 4, M–Q: t; fig. 5, I–K: t) never show any supplementary lateral openings like those observable in *Aphanomyces camptostylus* and *A. cladogamus*. The encysted zoospores (fig. 4, R, a–f; fig. 5, L, a–l) mostly differ rather little in size, but as in many other oomycetes scattered individuals of about twice the usual volume (fig. 4, S; fig. 5, L, m–o) give evidence of imperfect cleavage. A papilla of dehiscense put forth by the encysted zoospore (fig. 5, M, N) leaves a short evacuation tube on the empty subspherical membrane (fig. 4, T, a–e; fig. 5, O, a; P) after the protoplasmic contents have streamed out to collect in a globose mass (fig. 5, O, b) ready for transformation into a laterally biciliate motile swarm-spore.

In Petri plate cultures prepared with maizemeal agar containing some finely divided maizemeal in suspension *Plectospira plagiocaula*, like *P. myriandra*, often displays abundantly both types of sexual reproduction known in the genus. Unmated oogonia (fig. 6, A–O) develop more especially in the clearer portions of substratum, at some little distance from the larger

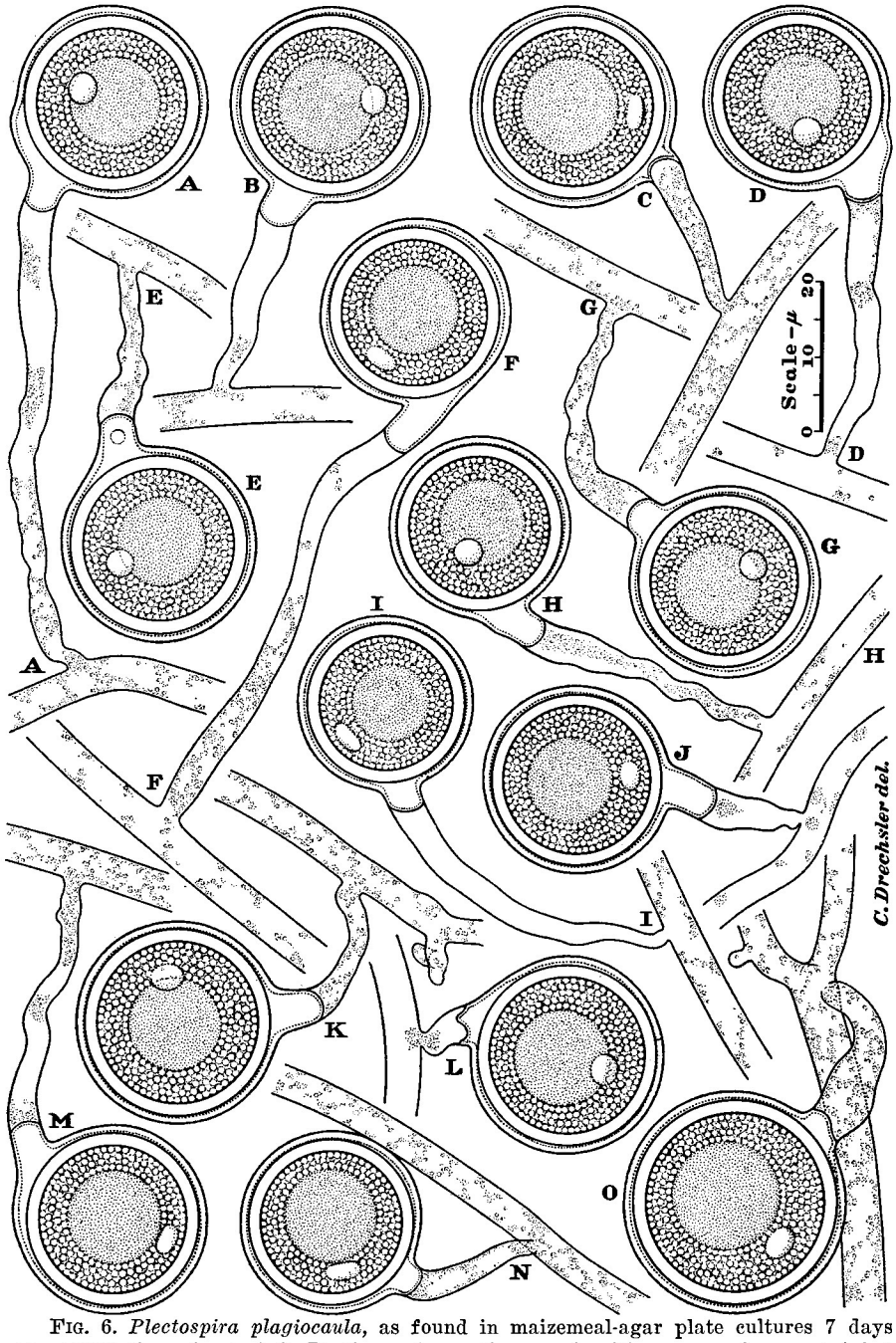

FIG. 6. *Plectospira plagiocaula*, as found in maizemeal-agar plate cultures 7 days old; ×1000 throughout. A-O, Portions of mycelium, each with an oogonium containing a mature parthenospore.

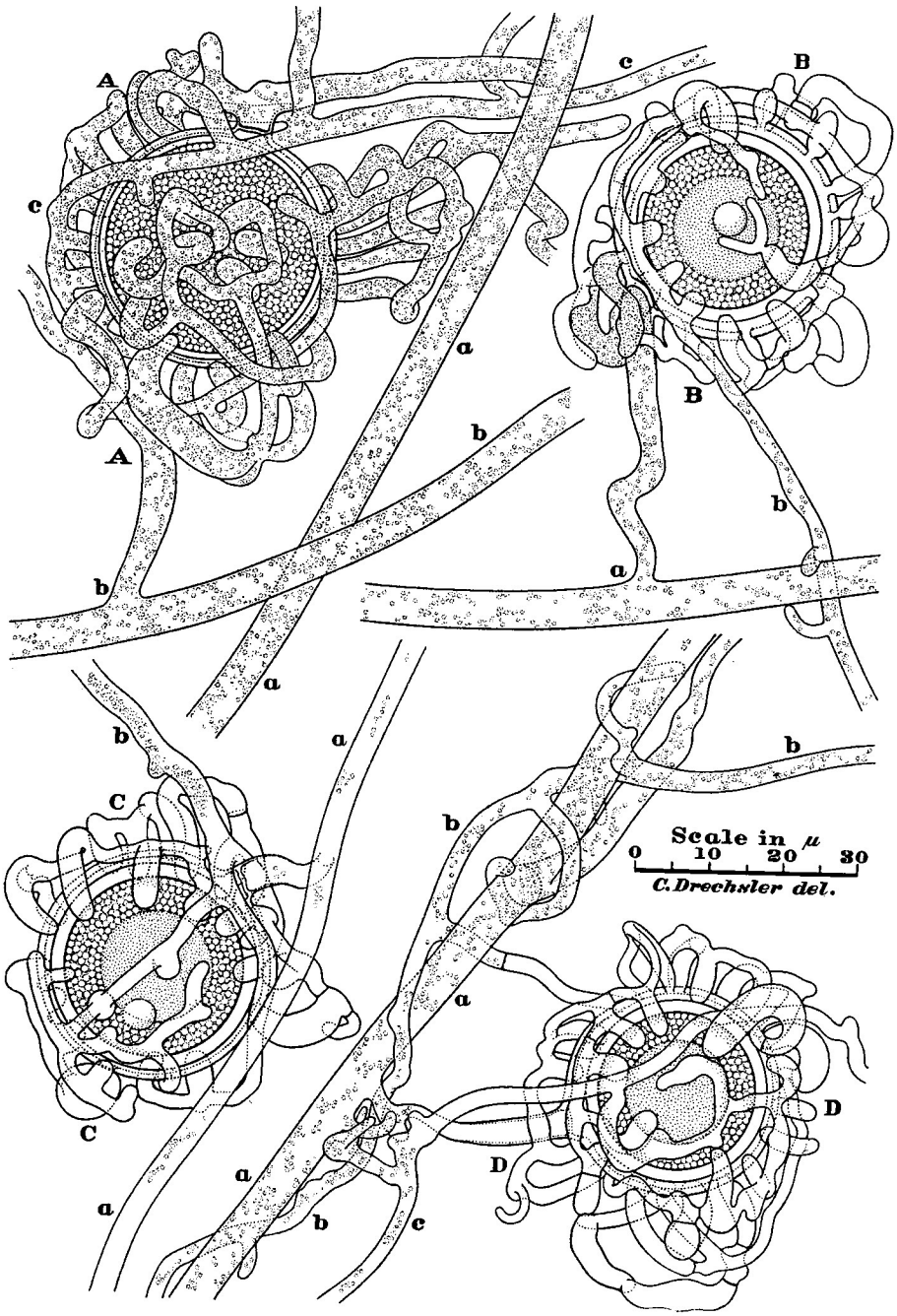

FIG. 7. One immature unit(A) and three mature units (B-D) of sexual apparatus of *Plectospira plagiocaula:* a, hypha bearing oogonial branch; b, c, hyphae bearing antheridial branches; ×1000 throughout.

deposits of maizemeal particles. As they frequently are attached somewhat laterally rather than mesially (fig. 6, A, D, F, H, L, M) they often present a distinctive appearance which it is intended to signalize conveniently in the Theophrastan term used as specific epithet. In maizemeal agar cultures where they develop promptly and abundantly the unmated oogonia and the parthenospores show a high degree of uniformity in their dimensions and exceedingly little departure from correct internal structure. The metric data relating to them in the diagnosis are based on measurements of 100 specimens taken at random in such cultures. The 100 unmated oogonia gave values for diameter, expressed in the nearest integral number of microns, with a frequency distribution as follows: 23 μ, 3; 24 μ, 13; 25 μ, 21; 26 μ, 33; 27 μ, 16; 28 μ, 9; 29 μ, 5; while the parthenospores in them gave values for diameter distributed thus: 20 μ, 2; 21 μ, 5; 22 μ, 19; 23 μ, 33; 24 μ, 24; 25 μ, 9; 26 μ, 7; 27 μ, 1. By searching larger areas of substratum some unmated oogonia were found with a diameter of only 17 μ, and others with a diameter as large as 34 μ; the smallest parthenospores measured about 15 μ across and the largest about 31 μ. Among the relatively small and rather variable oogonia produced haphazardly in irrigated material some contained parthenospores only about 10 μ in diameter. In irrigated material many globose enlargements that manifestly have originated as oogonia are found eventually to develop as zoosporangia (fig. 4, J, M).

In maizemeal agar cultures oogonia abundantly supplied with antheridia commonly develop in very intricate clusters around scattered deposits of maizemeal particles. The filament (fig. 7, A–D: a) that gives off the branch bearing a mated oogonium usually has no close mycelial connection with the hypha (fig. 7, B, b; C, b) or hyphae (fig. 7, A, b, c; D, b, c) bearing the concomitant antheridia. In *Plectospira plagiocaula,* much as in *P. myriandra,* oogonia beset with antheridia are slower in maturing, more subject to internal degeneration, more variable in size, and generally somewhat larger than unmated oogonia. With some little search mated oogonia as much as 39 or 40 μ wide, and containing oospores 35 or 36 μ in diameter, can be found in cultures wherein dimensions, on the whole, may be fairly uniform. Its large oogonia, parthenospores, and oospores distinguish *P. plagiocaula* as the most robust of the 4 known members of the genus.

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