New taxa and combinations of aquatic hyphomycetes

Enrique Descals, Ludmila Marvanová, and John Webster

Abstract: ***Actinosporella*** nom.nov. is proposed for *Actinospora*, a homonym of a plant genus. ***Anguillospora furtiva*** sp.nov. and ***Anguillospora rosea*** sp.nov. are described with their teleomorphs, respectively in *Pezoloma* and *Orbilia* (Leotiales). ***Gemmulina*** gen.nov. is erected for *Tricellula botryosa*, ***Variocladium*** gen.nov. for *Scorpiosporium rangiferinum* and *Tricladium giganteum*, and ***Ypsilina*** gen.nov. for *Volucrispora graminea*.

Key words: aquatic hyphomycetes, conidial fungi, taxonomy, nomenclature.

Résumé : On propose ***Actinosporella*** nom.nov. pour *Actinospora*, homonyme d'un genre de plante. On décrit l'***Anguillospora furtiva*** sp.nov et l'***Anguillospora rosea*** sp.nov. avec leurs téléomorphes, un *Pezoloma* et un *Orbilia* (Léotiales), respectivement. On définit les genres ***Gemmulina*** gen.nov. pour recevoir le *Tricellula botryosa*, ***Variocladium*** gen.nov. pour les *Scorpiosporium rangiferinum* et *Tricladium giganteum*, et ***Ypsilina*** gen.nov. pour le *Volucrispora graminea*.

Mots clés : hyphomycètes aquatiques, champignons à conidies, taxonomie, nomenclature.

[Traduit par la rédaction]

Introduction

Decaying organic matter submerged in continental lotic systems is colonized by many species of fungi, among which the so-called aquatic hyphomycetes seem to be dominant. These organisms share a common feature: the production of highly modified, either branched or elongated (sigmoid) conidia, which seems to be an adaptation to anchorage onto submerged substrates in running waters (Webster 1987) and to film dispersal (Bandoni 1974). The aquatic hyphomycetes include an ever-growing number of species for which teleomorphs amongst the Asco- and Basidiomycetes are being found (Webster 1992).

The aquatic hyphomycetes are known to be important agents of decomposition, and some are also intermediaries in the energy flow of streams, as their biomass is a source of nutrition for various detritivorous invetebrates (see Bärlocher 1992).

The present paper includes some taxonomic and nomenclatural changes that are needed prior to the publication of a monograph by E. Descals, L. Marvanová, and J. Webster (in preparation).

Materials and methods

The techniques used here (detailed in Descals 1997*a*), may be summarized as follows. Pure cultures are monosporic (either from conidia or ascospores) or from single asci. In *Anguillospora rosea*, culture-derived apothecia were obtained from tiny portions of hymenium because ascospores were scanty or else did not germinate readily. Isolations were made on 0.1% malt agar (MA) supplemented with antibiotics (streptomycin and penicillin or chloramphenicol) and then subcultured onto 2% MA. The anamorphs were induced by submersion of colony pieces in standing or aerated sterile distilled water and microscope preparations stained and mounted in acid fuchsin or cotton blue in lactic acid. In A*nguillospora furtiva*, sporulation was also directly observed in water constantly renewed in an observation chamber. The teleomorphs were induced by moist incubation under cool white and (or) NUV illumination. Sections (mostly 20 μm thick) were made with a freezing microtome and mounted as above. Voucher specimens are kept in CCM or Herb. E. Descals. Microtechniques and microscopic observations were performed respectively with a Wild dissecting microscope and with Leica Laborlux S or Olympus BX50 compound microscopes equipped with phase contrast and DIC optics. Line drawings were made with a binocular drawing tube.

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Taxonomy

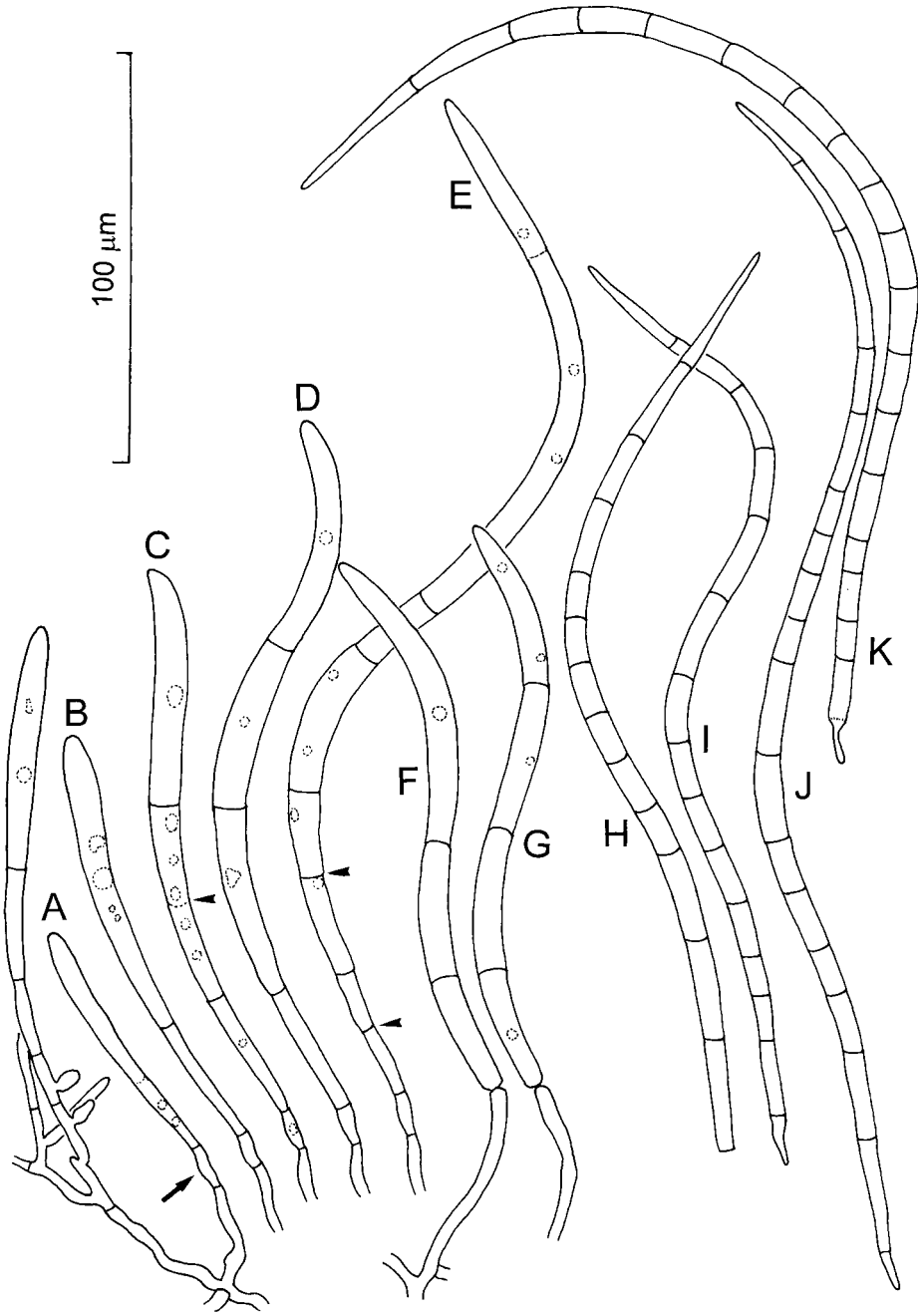
Actinosporella Descals, Marvanová & Webster nom.nov.
≡*Actinospora* Ingold, Trans. Br. Mycol. Soc. 35: 66. l952. nom.illeg. (Art. 64.1), non *Actinospora* Turczaninov in F.E.L. Fischer and C.A. Meyer: Index Seminum Hortus Bot. Petropolit. B, 1: 21, January l835 (Ranunculaceae).
TYPUS GENERIS: *Actinosporella megalospora* (Ingold) Descals, Marvanová & Webster comb.nov.
≡*Actinospora megalospora* Ingold, Trans. Br. Mycol. Soc. 35: 66. l952. nom. illeg. (Art. 64.l). (Basionym)

Anguillospora furtiva Webster & Descals sp.nov. Figs. 1–3.

ETYMOLOGY: *furtiva* (L.), referring to the resemblance of its conidia, especially with those of *Anguillospora longissima* (Sacc. & Sydow) Ingold and *Anguillospora crassa* Ingold.

Hyphomycetes. Coloniae (2% MA) obscure olivaceae, cinereae vel atrae, compactae, mycelium aerium humile,

Fig. 1. *Anguillospora furtiva* (ex type, on 2% MA). A–G: conidiogenesis as seen in a constant-flow chamber. Drawn in water. A: portion of fertile mycelium. A–E: development of a conidium (A: 23:15 h; B: 08:10 h; C: 14:30 h: D: 20:25 h; E: 10:00 h). Cell at base (arrow in A) is not a separating cell. Secondary septation may take place during development (arrowheads). F and G: another conidium undergoing schizolysis (F: 14:40 h; G: 20:15 h). H–K: detached conidia. Drawn in lactofuchsin; observe somewhat reduced diameter due to shrinkage in mounting medium. I–K: conidia with basal percurrent extension.

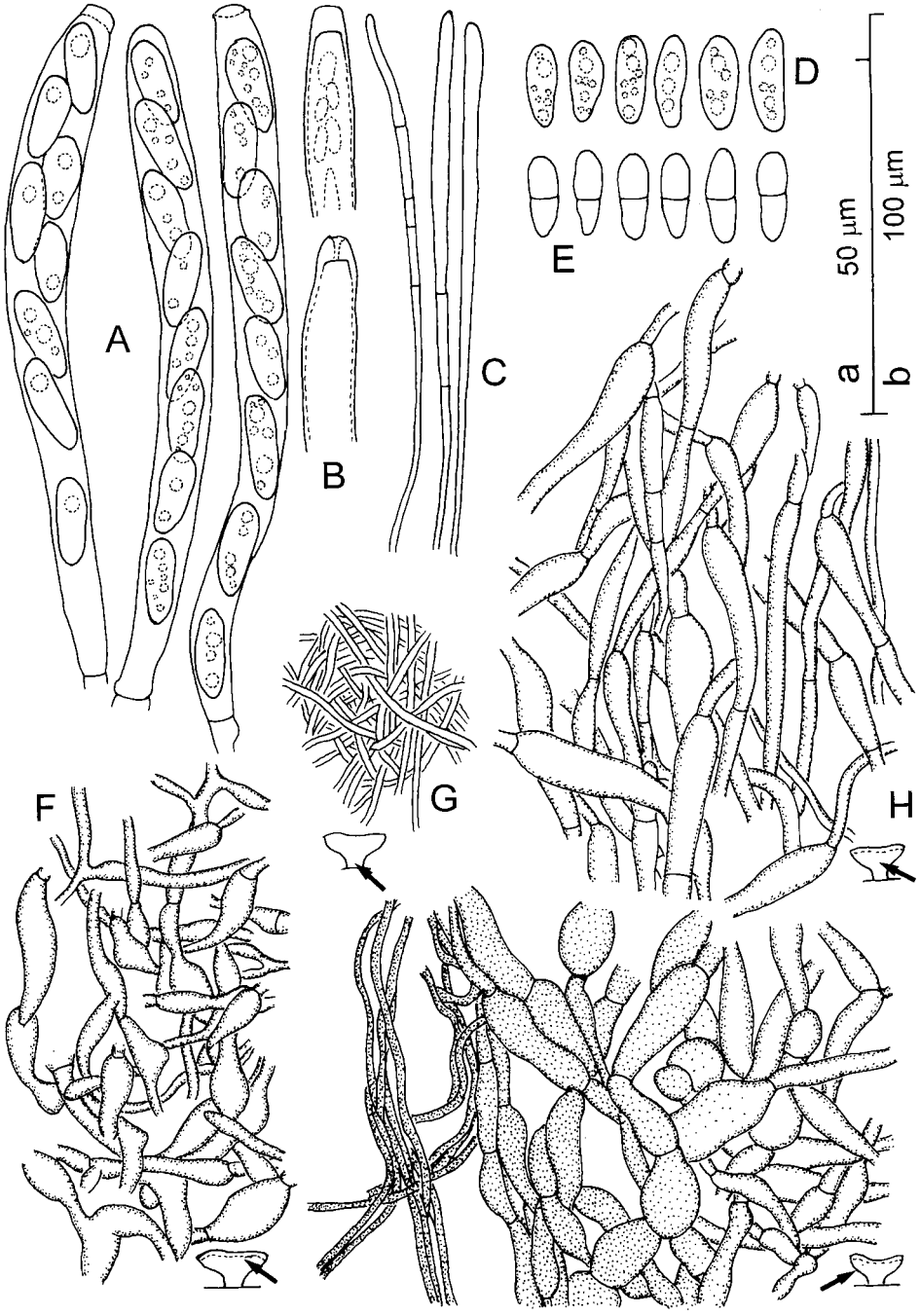


sparsum vel abundans, pallide cinereum. Sporulatio typice aquatica (15°C). Conidiophora semimacronematosa, mononematosa, solitaria vel gregaria, plerumque terminalia, usque ad l80 × 3–4 μm, septata, hyalina, simplicia vel laxe bracchiata. Cellulae conidiogenae terminales, solitariae, incorporatae, subclavatae, 10–20 × 4 μm, monoblasticae, elongationibus percurrentibus. Conidia terminalia, hyalina, solitaria, longifusoidea, typice sinuosa, raro subrecta, aliquando cum extenuationibus intercalaribus, (60–)150–300(–590) × 4.5–9.5 μm (typice 6 μm), 10–23 septata, basi truncata, postea interdum cum appendice basali, percurrente, subulata; conidia vetusta cum cellulis plerumque inflatis. Secessio conidiorum schizolytica.

TELEOMORPHOSIS: *Pezoloma* sp. (Leotiales).

HOLOTYPUS: MA-Fungi-38568, e cultura monoconidiali, e spuma in rivo, Becka Falls, Dartmoor National Park, Devon,

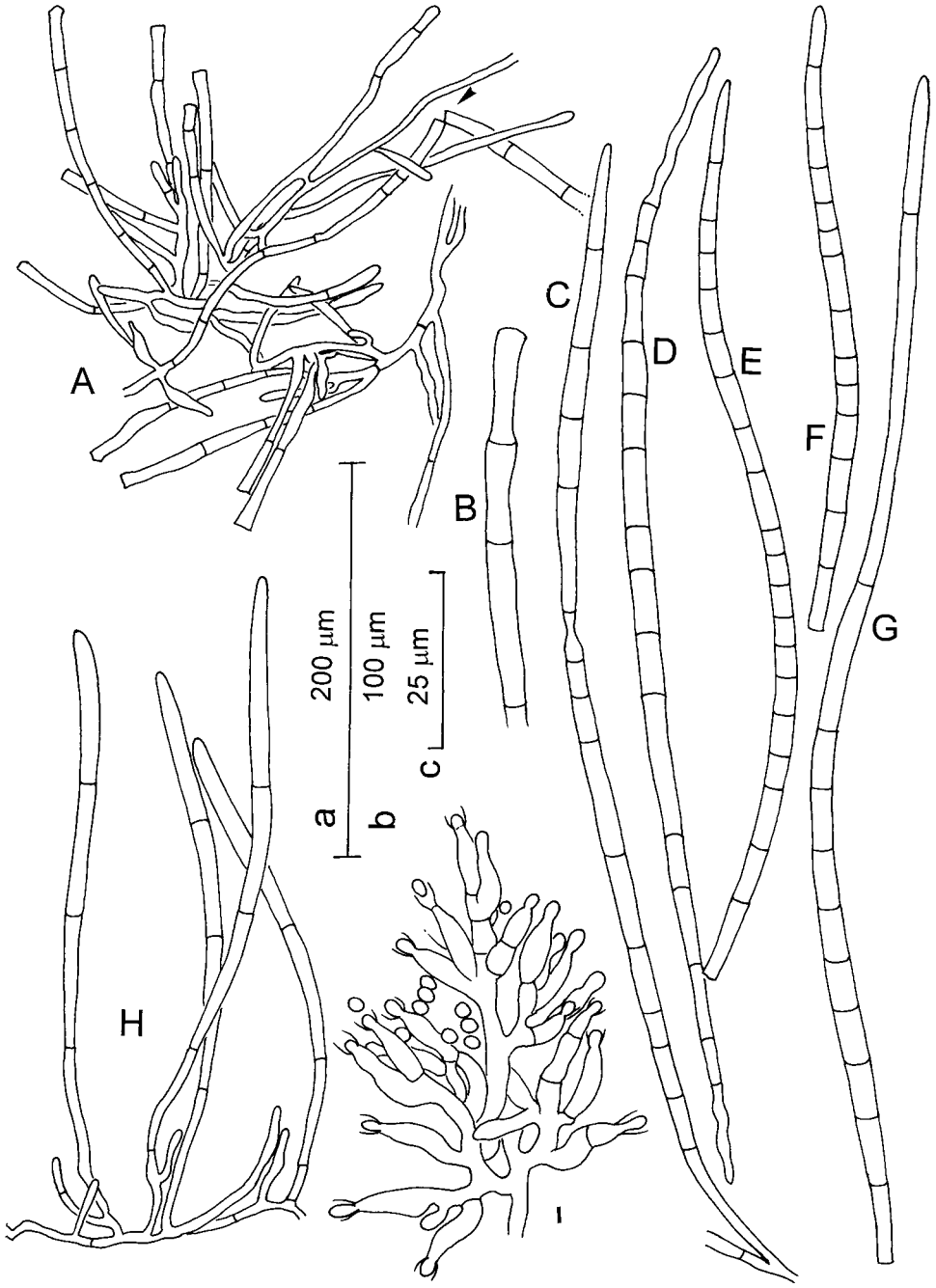
Fig. 2. Teleomorph of *Anguillospora furtiva* (ex type, on 2% MA). A: mature asci. B: details of two immature asci showing ascospore initials and apical apparatus. C: paraphyses. D and E: ascospores (uniseptate with age). F–I: details of various types of textura prosenchymatosa in apothecium (arrows on habit sketches show areas drawn). F: subhymenium. G: base of apothecium. H: inner excipulum. I: outer, somewhat darker excipulum with hyphoid hairs. A–E to scale *a*; F–I to scale *b*. Drawn in lactic cotton blue.



U.K., E. Descals, 21 Feb. 1974 (ex Herb. E. Descals A52-3-25: isotypus).

Colonies (2% MA) dark olive grey to blackish, compact, aerial mycelium low, sparse to abundant, hairy, whitish to pale grey. Sporulation typically underwater (15°C). Conidiophores semimacronematous, mononematous, single or gregarious, mostly terminal, up to 180 × 3–4 µm, septate, hyaline, simple or diffusely branched. Conidiogenous cells terminal, single, integrated, subclavate, 10–20 × 4 µm, monoblastic, apex truncate after conidial release; proliferations or elongations few, percurrent. Conidia terminal, hyaline, single, integrated with the conidiophore, long-fusoid (sometimes rostrate, Fig. 3G), typically sinuous, occasionally with intercalary attenuations, (60–)l50–300(–590) × 4.5–9.5 µm (typically 6 µm), 10–23 septate (including secondary septa), base truncate or with a subulate, percurrent, basal extension;

Fig. 3. *Anguillospora furtiva* (ex B122-1-7, on 2% MA). A–H: macroconidial anamorph. A: habit drawing of portion of fertile mycelium. Arrowhead shows schizolytic conidial secession almost completed. B: conidiophore with percurrent proliferation, and scar left by second conidium. C: intercalary constriction, somewhat deeper than on detached conidia. D: bipolar germination. E and F: detached conidia. G: long-rostrate conidium. I: microconidial anamorph with phialides. A to scale *a*; B–H to scale *b*; I to scale *c*. Drawn in lactic acid fuchsin.



old conidia often with cells swollen. Conidial secession schizolytic. Germination polar and (or) lateral.

TELEOMORPH: *Pezoloma* sp. (Leotiales).

A hyphomycetous microconidial synanamorph was observed in strains B35-B-1, B122-1-7 (Fig. 3), B122-1-11, B124-1-5, and B124-2-6 but not in the type material, and it is thus described independently below.

Conidiophores produced underwater, lateral, single or gregarious, short, penicillate, septate. Conidiogenous cells phialidic, single or grouped, apical or lateral, long-ellipsoid to lageniform, 7–l2 × 3–4 µm, collarette when present cupulate. Conidia globose to shortly ellipsoid, 1.5–3.5 × 1.5–2 µm, hyaline, base sometimes subtruncate. Germination not seen.

Figure 3 represents a strain with often less sinuous conidia, but that we believe is conspecific.

OTHER SPECIMENS EXAMINED: Descals isolates: A52-3-21:

ex conidium from the same foam sample as the type (with teleomorph); A424-1-18: ex conidium in foam, R. Teign, Steps Bridge, Devon, U.K., 3 April 1976; A430-17-1: ex conidium from foam, Smooth Beck, Esthwaite, Cumbria, U.K., 23 April 1976 (with teleomorph); B35-B-1: ex conidium in foam from small stream near Bettws-y-Coed, Snowdonia Natl. Park, Wales, U.K., 21 May 1979 (with synanamorph); B79-10-1-1: ex ascospore from apothecium on twig in stream, Mens Wood, Surrey, U.K., 10 September 1979 (with teleomorph); B122-1-7: ex conidium from foam, Birks Burn, Benachie Forest, Scotland, 12 November 1979 (with synanamorph); B122-1-11: ex conidium from same collection (with synanamorph); B123-1-2: ex conidium from stream near pond, Haddo House, Aberdeenshire, Scotland, 12 November; B124-1-5, B124-2-6: ex single conidia from foam, Falls of Logie, River Contin, near Strathpeffer, N. Scotland, 13 November 1979 (with synanamorph); B237-1-8: ex conidium from foam, left hand tributary of River Teign at Fingle Bridge, Devon, U.K., April 1981; B241-1-6: ex conidium from foam, stream at Cannop, Forest of Dean, Wales (OS 613131), 22 May 1981; L14A21 (in Descals 1997*b*). There are many other records from foam in Iberian and other streams (E. Descals, unpublished). L. Marvanová isolates: CCM F-20483: ex conidium from foam, Little Carpathians, stream near Pernek, Slovakian Rep., 6 April 1983; CCM F-13686: ex conidium from foam, Horčanský potok stream, Považský Inovec, Slovakian Rep., 1 March 1986; CCM F-11476: ex conidium from foam, stream at the foot of Malý Javorník, Little Carpathians, Slovakian Rep., 18 March 1976.

Webster and Descals (1979) informally described and illustrated *A. furtiva* and its unclassified teleomorph. The sources of the materials were not given, but that of the teleomorph, in their fig. 18.3, was A52-3-25 (now designated as type). It is here reproduced in Fig. 2, with further details on the texture of the apothecial tissues. Our Figs. 1A–1E show a sequence in conidial development, as seen in a continuous-flow observation chamber (Descals 1997*a*). A hypha gradually elongates and differentiates distally into a conidium. There is no clearly defined conidiogenous cell (at least until secession of this first conidium), primary septation is progressive, and secondary septation is initiated early and apparently starting from the lower cells. In a different sequence (Figs. 1F and 1G), we observe conidial secession by schizolysis. This distinguishes this anamorph from *Anguillospora longissima* (Sacc. & Sydow) Ingold, where secession is rhexolytic.

Conidial dimensions overlap with those of some other *Anguillospora* species, e.g., *A. longissima*, *Anguillospora fustiformis* Marvanová & Descals (1996), and especially some strains of *Anguillospora crassa* Ingold, where conidial width is 7.5–14 μm, although typically approximately 9 μm. The striking attenuations along the conidia of *A. furtiva* (seen in Webster and Descals 1979) cannot yet be explained. Although conidial repetition was suggested in the original report, we have not yet seen conidia with both apical and basal secession scars (i.e., primary conidia after apical proliferation).

The teleomorph was provisionally classified in *Rutstroemia* P. Karsten (Leotiales) by R.W.G. Dennis (in litt.1976). However, R. Korf (in litt. 1978) examined authentic material from pure culture and noticed a weak positive reaction to iodine at the base of the apothecia as well as at the ascus pore apparatus. He recognized the fungus as "an old friend of mine, so far as I know without a name, but very possibly described early by Berkeley or someone else...and long since forgotten. I have what I take to be the same thing in many collections in my herbarium under the tentative herbarium name *Sphagnicola iodopedis* n.sp. There may even be a few under what I now think is the correct name for *Sphagnicola*, *Pezoloma*." Korf mentions the presence of a "pad of hyphae" at the base of the apothecia, somewhat cemented by gel. W.D.Graddon (in litt. 1976), having also examined authentic material, suggested the name *Sphagnicola iodocyanescens* "or near relative thereof." He also noticed that the lower cortex on the apothecium stained blue in Melzer's reagent but did not report any cementing gel.

Examination of fresh material in culture from isolates A52-3-21 and A52-3-25 (type) has yielded the following characters. Apothecia (on 2% MA, under NUV and cool white light, at 15°C) single, broadly obconic, substipitate to sessile, fleshy, cream coloured to white, later reddish brown, positively phototropic, receptacle glabrous but clothed in sticky hairs towards the base; disc entire, convex to undulate, 3–5 mm in diameter; medullary excipulum of loosely woven somewhat modified prosenchyma, cells approximately 44 × 11 μm, thin walled, hyaline; ectal excipulum of similar texture, darker towards the base of the apothecium, cells approximately 22 × 10 μm; subhymenium distinct, texture similar to that of the medullary excipulum but cells saccate to globose, 22–33 × 8–11 μm.; area near the base densely prosenchymatous, hyphae 2–2.5 μm in diameter, hyaline, darker at the cortex; base of apothecium J positive. Asci octosporous, narrowly subclavate, unitunicate, stalk short or absent, apex rounded or slightly flattened, the apical apparatus thinning with age, faintly J positive, 90–120 × 7–9.5 μm. Ascospores obliquely uniseriate or irregularly arranged distally, ellipsoid to soleiform, 12–15 × 3.5–5 μm, hyaline, aseptate or later 1-septate, multiguttulate. Paraphyses simple, filiform to subclavate, level with the asci, 1.5–2 μm wide at the apex, thin walled, obscurely septate, surface roughened with age, strongly J positive.

The Slovakian monoconidial strain CCM F-20483 produced apothecia on conifer sawdust in a glass container exposed to natural daylight but most remained immature. In contrast with those of the British strains A52-3-21 and A52-3-25, they were as a rule only 1–2 mm high and approximately 1 mm broad and distinctly stipitate, but the lower part of the stipes was also dark, and the paraphyses and the few asci and ascospores seen matched those of the British strains.

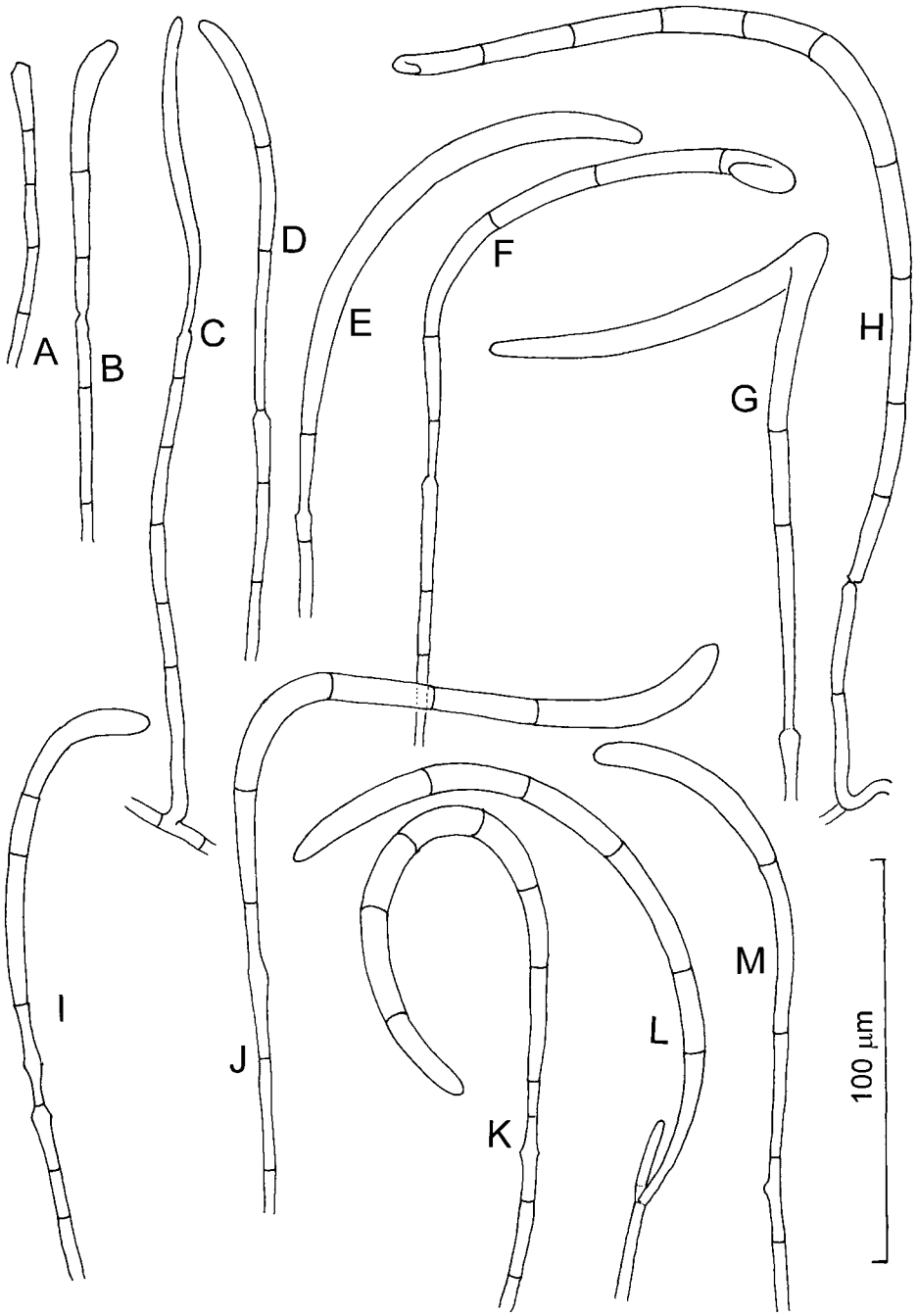
Anguillospora furtiva seems to be widespread in temperate climates, judging from our collections of the anamorphs and teleomorph and from Korf's records of the teleomorph from North America. The Slovakian strains come from waters on limestone bedrock, but some of the British ones were derived from acid waters.

Anguillospora rosea Webster & Descals sp.nov. Figs. 4–9.

ETYMOLOGY: *roseus* (L.): pink, referring to the characteristic colony pigmentation on 2% MA.

Coloniae (2% MA, 20°C) typice roseae, compactae, tegetes, protoplasma hypharum monilioidearum multiguttulatum, oleaceum; mycelium aerium absens. Sporulatio sparsissima in agaro non submerso sed abundans summa et sub aqua

Fig. 4. *Anguillospora rosea* (ex A52-3-15, on 2% MA, after four days of submersion in aerated water). Conidiogenesis, highlighting schizolytic secession and conidiogenous cell proliferation, typically percurrent. Drawn in lactic cotton blue.



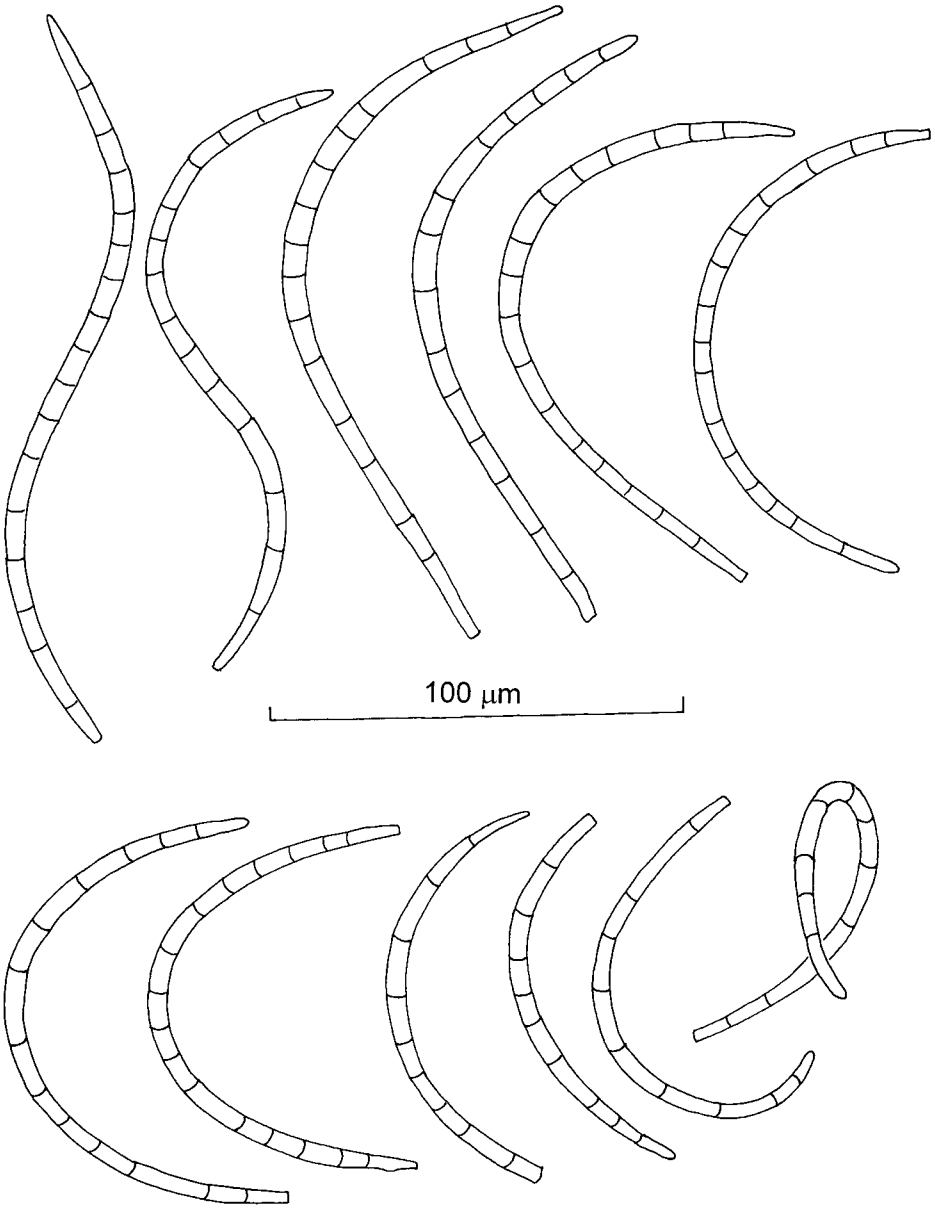
post unum ad nonnulos dies (l5°C). Conidiophora semimacronematosa, mononematosa, solitaria vel gregaria, plerumque terminalia, 50–100 × 2–4 µm, simplicia vel aliquando laxe bracchiata, septata. Cellulae conidiogenae terminales, solitariae, incorporatae, subclavatae, 10–40 µm longae, monoblasticae, proliferationibus elongationibusque typice percurrentibus. Conidia terminalia, solitaria, recta vel valde arcuata vel sinuosa, subcylindracea vel subfusoidea, 120–185(–210) × 3–6 µm, basi truncata, aliquando rotundata usque ad inflata, (0–)9–17 septis perspicuis. Secessio conidiorum schizolytica.

TELEOMORPHOSIS: *Orbilia* sp. (Leotiales).

HOLOTYPUS: MA-Fungi-38569 (ex Descals B1-1-1-1: isotypus), e hymenio apothecii *Orbiliae* in bracchio arboris, in rivulo submerso prope Lindley Wood Reservoir, Bradford, Anglia, leg. J. Webster, 19 Maio 1978.

Colonies (2% MA at 20°C) typically pink (cream coloured on 0.1% MA), immersed in agar, surface mat of monilioid hyphae rich in oily inclusions; aerial mycelium absent. Sporulation very sparse without submersion but abundant above and underwater after one to several days (15°C). Conidiophores semimacronematous, mononematous, single or grouped,

Fig. 5. *Anguillospora rosea* (ex A430-16-3, on 2% MA submerged in standing water). Detached conidia. Drawn in lactic cotton blue.



mostly terminal, 50–100 × 2–4 μm, simple, sometimes loosely branched, septate. Conidiogenous cells monoblastic, single, terminal, integrated, subclavate, 10–40 μm long, typically with percurrent elongations or proliferations. Conidia single, terminal, straight to subcurved when short but more typically strongly arcuate or sigmoid, subcylindrical to subfusoid, 120–185(–210) × 3–6 μm, with (0–)9–16 conspicuous septa (including secondary septa), base truncate, sometimes rounded off or inflated. Conidial secession schizolytic. Germination may be subpolar.

TELEOMORPH: *Orbilia* sp. (Leotiales).

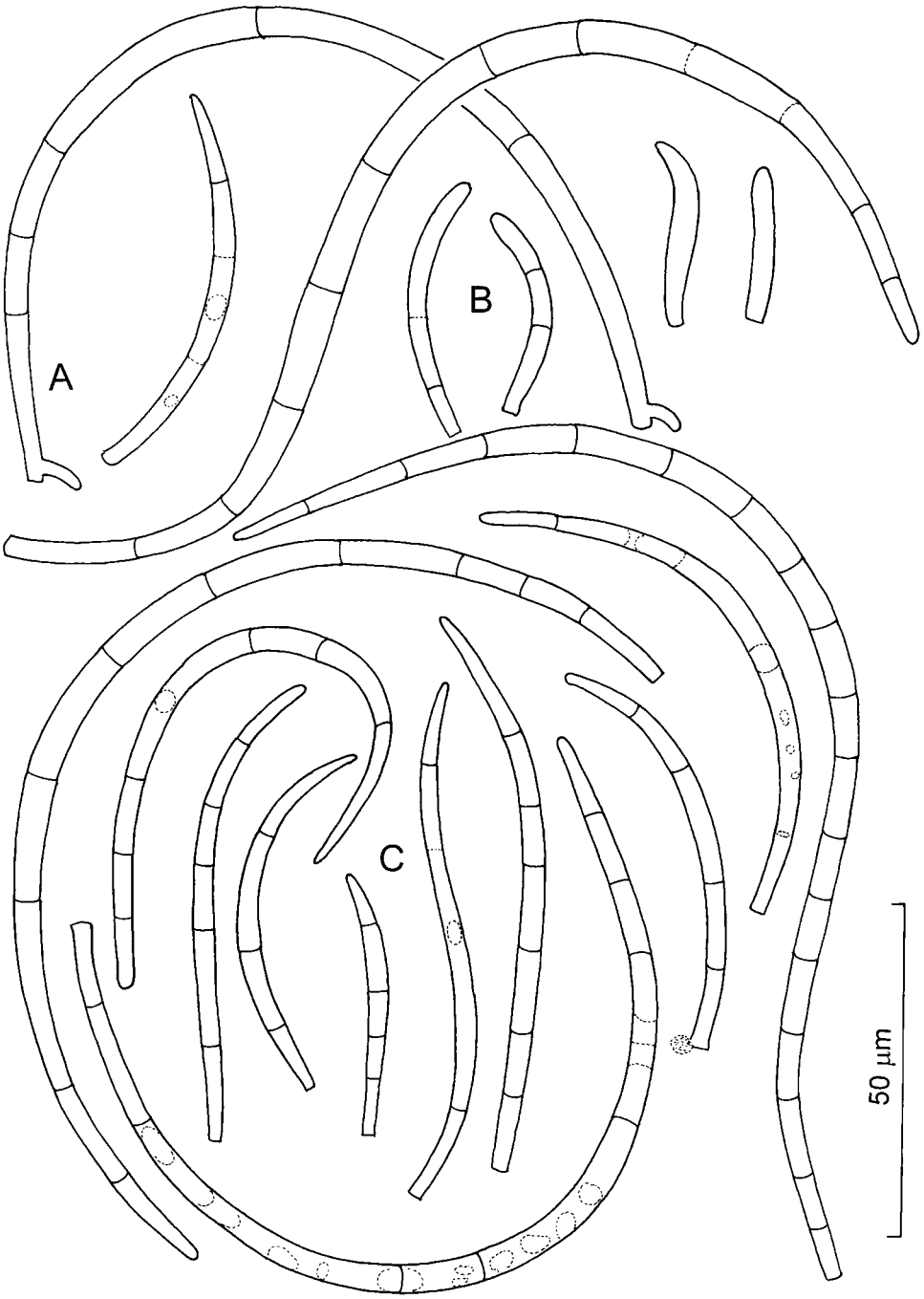
The diagnostic features of conidia are the marked curvature, subcylindrical outline, and truncate base (but see remarks on Pfister1997 below).

Strains B1-1-1-1 (ex type) and B2-1-1-4, as well as the monoconidial A490-2-2, produced a wider range of conidial lengths. In the latter case, the shorter conidia seemed to adopt a spermatial function, fusing with receptive hyphae of the same colony, which coiled around them, eventually yielding apothecial initials (Fig. 9). These, however, did not reach maturity.

Because conidial lengths seem to show a continuum (Fig. 6), and because we could not study conidiogenesis of the smaller forms, a separate microconidial synanamorph cannot yet be described.

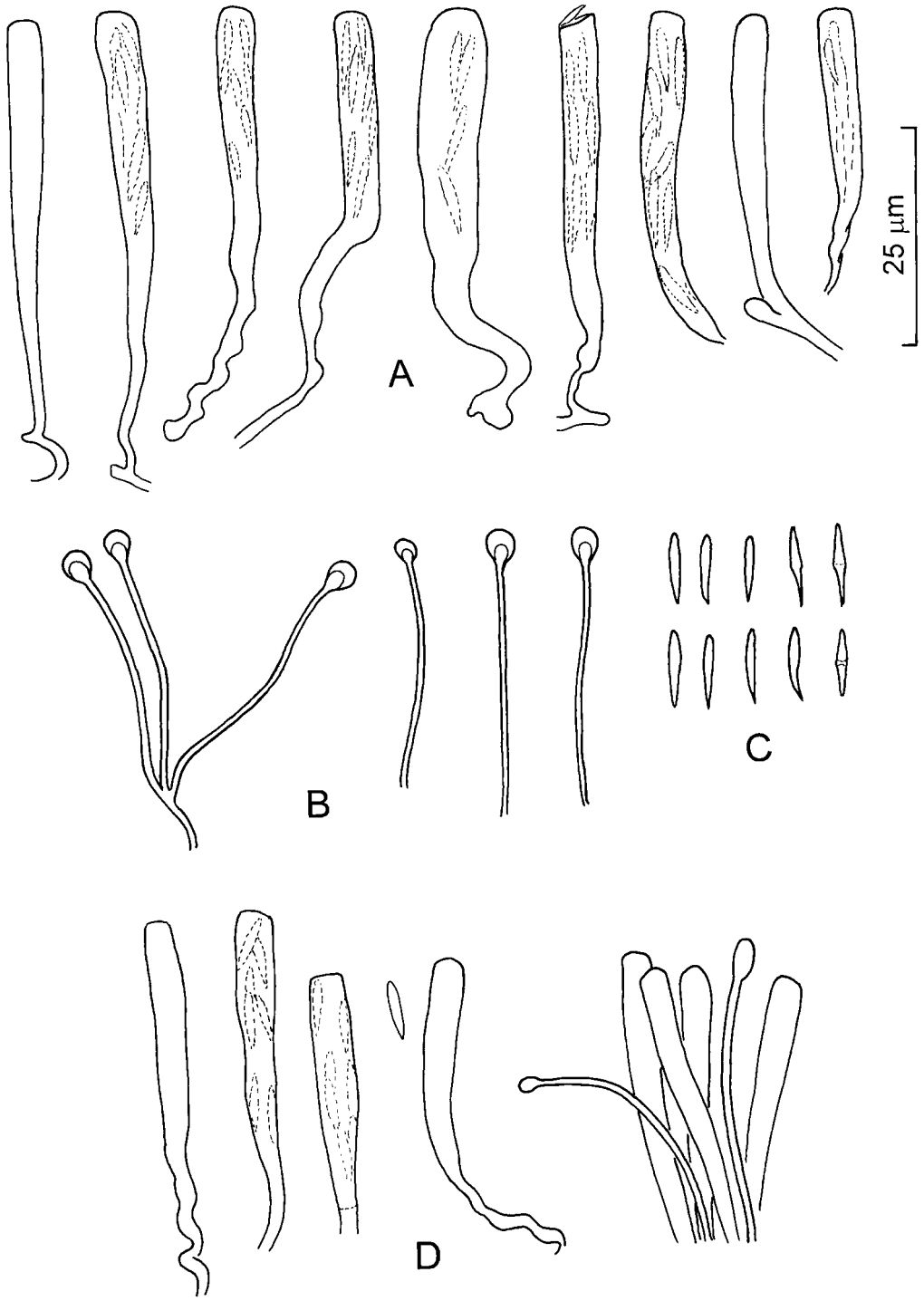
OTHER SPECIMENS EXAMINED: E. Descals strains: A52-3-15: ex conidium from foam, Becka Falls, River Dart, Devon, U.K., 21 February 1974; A430-10B-12, A430-18-8, A430-18-10: ex single conidia from submerged decorticated twigs, Smooth Beck, Esthwaite, near Hawkshead, Cumbria, U.K., 23 April 1976; A430-15-8: ex conidium from submerged *Fraxinus* twig, same site, April 1976; A430-16-3: ex conid-

Fig. 6. *Anguillospora rosea* (on 2% MA. Seven conidia in top row ex type; remaining from B2-1-1-4). A: subpolar germination. B: five microconidia. C: range of conidial types. Drawn in lactic acid fuchsin.



ium from foam, same site; A450-2-5: ex conidium from small stream near Bettws-y-Coed, Snowdonia Natl. Park, N. Wales, 17 May 1976; A487-1-2, A487-1-3, A487-1-4: ex single conidia from foam, Aber Falls, N. Wales, 23 October 1976; A490-2-2: ex conidium from river at Bettws-y-Coed, Snowdonia Natl. Park, N. Wales, 25 October; B2-1-1-4: ex portion of hymenium from *Orbilia* on submerged wood after two weeks of moist incubation, Church Beck, Coniston, Cumbria, U.K., leg. J. Webster, 17 May 1978; B35-A-4: ex conidium from foam, small stream near Bettws-y Coed, Snowdonia Natl. Park, N. Wales, 21 May 1979; B60-A-1: ex conidium from stream foam, Llawryglyn Woods, N. Wales, 28 May 1979; B108-1-1, B108-1-2: ex single conidia from foam, Loch Katrine, N. Scotland, 8 November 1979; B111-1-1: ex conidium from foam, Feardan Burn, on A93 road from Braemar to Ballater, N. Scotland, 10 November 1979; B114-2-9: ex conidium from foam, River Muick, N. Scotland, (OS Map 422, 350930), 10 November 1979; B121-2-4: ex conidium from foam, Birks Burn, Benachie Forest, N. Scotland, 12 November 1979; B124-1-6, B124-1-9: ex single conidia

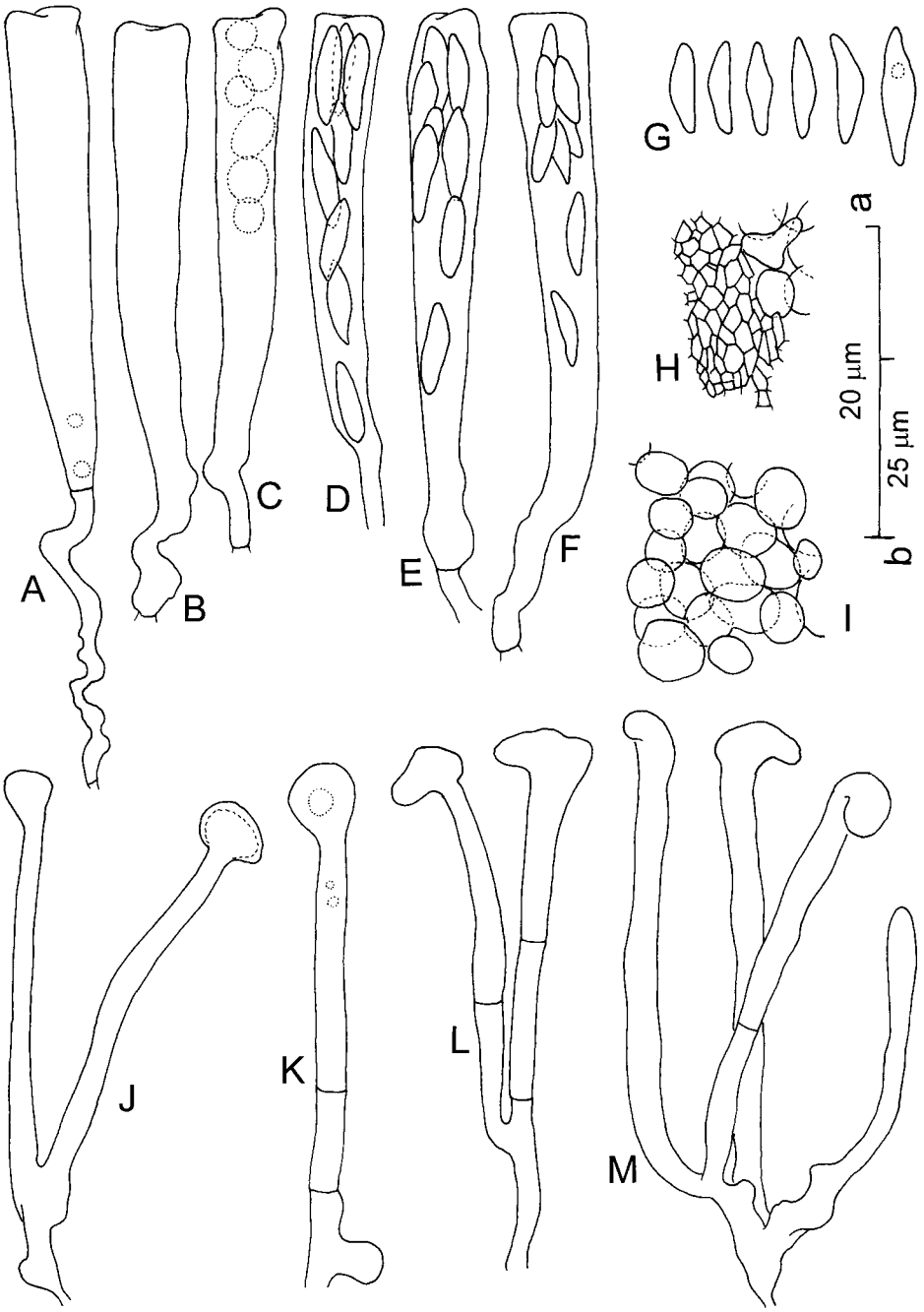
Fig. 7. *Orbilia* teleomorph of *Anguillospora rosea* (A–C ex type; D from B2-1-1, from nature). A: asci. B: capitate paraphyses. C: ascospores. D: asci, mature ascospore, and paraphyses. Drawn in water under 40× dry objective.



from foam, Falls of Logie, River Contin, near Strathpeffer, N. Scotland, 13 November 1979; B134-1-12: ex conidium from foam, River Black Water, Criag Braigh, Strath Rusdale, 15 November 1979; B291-1-11: ex conidium from stream foam, Pembrokeshire, Wales, 14 November 1981; A490-2-2: ex conidium from foam, stream near Bettws-y-Coed, Snowdonia Natl. Park, Wales, (OS 280356), October 1976. L. Marvanová strains: CCM F-18083, CCM F-18983: ex single conidia from foam, small stream near Bettws-y-Coed, Snowdonia Natl. Park, N. Wales, April 1983.

The anamorph and teleomorph were informally described in Webster and Descals (1979) as "*Anguillospora* sp. 1", but the sources of the material were unintentionally omitted. Figures representing conidiogenesis were from A52-3-15, and

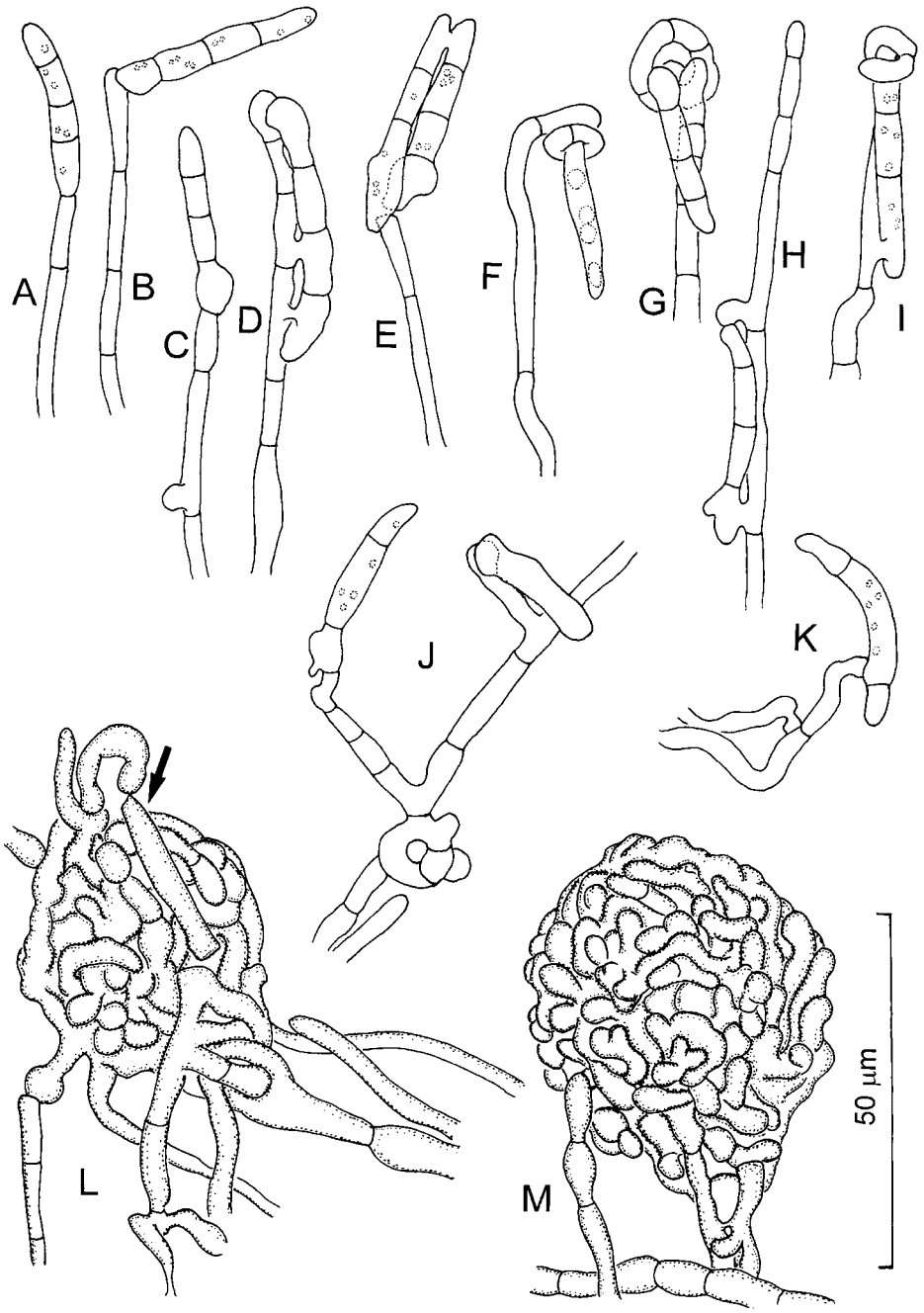
Fig. 8. *Orbilia* teleomorph of *Anguillospora rosea* (ex A430-18-10, on 2% MA, semisubmerged for 2 months, with NUV as sole source of light). A–F: asci. G: ascospores. H: detail of ectal excipulum with textura angularis, merging with inner excipulum. I: detail of textura globulosa in inner excipulum. J–M: capitate paraphyses. A–G and J–M to scale *a*; H and I to scale *b*. Drawn in water under 100× oil immersion objective.



those of detached conidia from A430-16-3. A more complete set of drawings from the same material is shown in Figs. 4 and 5. The apothecia were from A430-18-10, and they are illustrated in more detail in Fig. 8. Drawings from other sources, including the teleomorph associated with the type, are shown in Fig. 7. An extended description of the teleomorph, also based on A430-18-10, and broadly matching that of the type in its hymenial characters, follows.

Apothecia (2% MA, semisubmerged for 2 months at 15°C, under NUV) scattered, minute, discoid, 0.3–0.5 mm in diameter, fleshy or watery-translucent, glabrous. Subiculum of closely intertwined hyaline hyphae. Receptacle of textura globulosa, cells thin-walled, approximately 12 μm in diameter. Ectal excipulum of textura angularis, cells 3–4 μm long. Disc subconvex. Asci octosporous, subclavate, apex laterally flattened and truncate, 27–50 × 4.5–5.5 μm, J negative. Ascospores irregularly arranged, long-ellipsoid to fusoid, straight to subcurved, 6–9 × 1.5–2.5 mm, hyaline, mostly

Fig. 9. Teleomorph of *Anguillospora rosea* (ex A490-2-2, on 2% MA, semisubmerged for four days in standing distilled water). A–K: spermatia fusing with receptive hyphae either end-to-end (C) or laterally (H). F, G, and I: hyphae coiling around spermatia. H: spermatial fusion at two ends. J, L, and M: apothecial initials. A spermatium may still be recognized in L (arrow). Drawn in distilled water.



eguttulate. Paraphyses frequently branched near the base, level with the asci, 21–32 × 0.5–2 µm, subclavate or more typically capitate, the head being up to 6 µm wide.

Pfister (1997) illustrated conidia of an *Anguillospora* sp. in culture that we believe are of *A. rosea*. In his fig. 4, he recognizes macro- and microconidia, all of which match our description, except possibly in the rounded instead of truncate bases, which may have to do with conidial age. He tentatively associated his fungus with *Orbilia luteorubella*, a discomycete often reported for Europe. The anamorph is not fully described, the characteristic pink pigment on 2% MA is not mentioned, and there is no information on the apothecial characters. Therefore, we hesitate to formally link this teleomorph name to *A. rosea* until further work is done.

Gemmulina Descals & Marvanová gen.nov.

ETYMOLOGY: *gemma* (L.): bud, referring to type of conidial branch initiation.

Hyphomycetes. Coloniae (2% MA) varie fuscae, mucosae. Conidiophora semimacronematosa, mononematosa, lateralia,

bracchiata, hyalina, cellulis subinflatis. Cellulae conidiogenae polyblasticae, apicales, laterales vel intercalares, simul cum conidiis crescentes, solitariae vel gregariae. Conidia acropleurogena, gregaria, multiplicia, elementa ellipsoidea, aseptata; bracchia in diversis planis ex elemento centrali gemmantia. Secessio conidiorum schizolytica. Sporulatio in aqua submersa.

TYPUS GENERIS*: Gemmulina botryosa* (Descals) Descals & Marvanová.

Gemmulina botryosa (Descals) Descals & Marvanová comb.nov.

≡*Tricellula botryosa* Descals in Descals and Webster, Trans. Br. Mycol. Soc. 78*:* 435. 1982. (Basionym)

Hyphomycetes. Colonies (2% MA) variously brown, slimy. Conidiophores semimacronematous, mononematous, lateral, branched, hyaline, cells more or less inflated. Conidiogenous cells polyblastic, terminal, lateral or intercalary, single or grouped, concurrent with conidia. Conidia acropleurogenous, gregarious, compound, elements ellipsoid, aseptate; branches budding in different planes from the central body. Conidial secession schizolytic. Sporulation underwater.

Tricellula v. Beverwijk (l954) is characterized by its slimy, often orange colonies, densely branched conidiophores, and relatively small conidia with typically one to two branches budding out from the apical region of the primary element. Descals (in Descals and Webster 1982) added the present, rather discordant species, with botryose conidia (i.e., with ellipsoid elements radiating in all planes from a similar central body) and brown (not orange) colonies on 2% MA. We now believe it should typify a new genus.

Variocladium Descals & Marvanová gen.nov.

ETYMOLOGY: *varius* (L.): changeable; *cladus* (L.): branch; referring to the variable conidial branching pattern.

Hyphomycetes. Coloniae (2% MA) obscurae. Conidiophora semimacronematosa, mononematosa, terminalia, simplicia vel laxe bracchiata, hyalina vel prope basim fuscescentia, septata. Cellulae conidiogenae monoblasticae, terminales, solitariae, incorporatae, determinatae vel cum proliferationibus elongationibusque percurrentibus. Conidia terminalia, solitaria, magna, in diversis planis bracchiata, in una specie plerumque arborescentia, elementa longe conica, septata, apicibus acutis; axis in insertionibus bracchiorum geniculatus, basi truncato vel plerumque cum appendice basale percurrente et subulata; bracchia sequentialia, in uno vel duobus ordinibus, opposita vel alternata vel nonnunquam ternata, dorsifixa, insertionibus latis. Secessio conidiorum schizolytica.

TYPUS GENERIS: *Variocladium rangiferinum* (Descals) Descals & Marvanová.

Hyphomycetes. Colonies (2% MA) dark. Conidiophores semimacronematous, mononematous, terminal, simple or diffusely branched, hyaline, or fuscous towards the base, septate. Conidiogenous cells monoblastic, terminal, single, integrated, determinate or with percurrent proliferations or elongations. Conidia terminal, single, large, branched in various planes, in one species often arborescent, elements longconoid, septate, apices acute; axis geniculate at branch insertions, base truncate or frequently with a percurrent, subulate basal extension; branches sequential, in one or two orders, opposite, alternate, or less often ternate, dorsal, insertions broad. Conidial secession schizolytic. Two species are proposed as follows.

Variocladium rangiferinum (Descals) Descals & Marvanová comb.nov.

≡*Scorpiosporium rangiferinum* Descals in Descals and Webster, Trans. Br. Mycol. Soc. 78: 422 . 1982. (Basionym)

Variocladium giganteum (Iqbal) Descals & Marvanová comb.nov.

≡*Tricladium giganteum* Iqbal, Trans. Br. Mycol. Soc. 56: 347. 1971. (Basionym)

≡*Geniculospora gigantea* (Iqbal) Batko, Zarys Hydromikologii, Warsaw, p. 409. 1975.

Variocladium is created for two hyphomycetes inhabiting mainly acid, submerged habitats in temperate climates. Colonies on 2% MA are dark and produce large, hyaline macroconidia bearing characteristically spiny elements with variable branching patterns. *Scorpiosporium rangiferinum* is included here because the type of *Scorpiosporium* (*Scorpiosporium minutum*) has been recombined in *Tricladium* (Marvanová and Descals 1996). *Tricladium giganteum* closely resembles *S. rangiferinum* morphologically, ontogenetically, and ecologically. We do not follow Batko's recombination in *Geniculospora* S.V. Nilsson ex Marvanová & S.V. Nilsson because both species that we accept here (*Geniculospora inflata* and *Geniculospora grandis*) lack the spiny elements, the branching pattern is more stable, with branches typically opposite, and branch insertions are as a rule constricted to some degree.

Key to species of *Variocladium* (based on macroconidial shape)

1. Conidial axis approximately 200 μm long, branches typically 2–3, paired and (or) alternate ..... *V. giganteum*
1. Conidia normally much larger, axis mostly 400 (210–710) μm long, primary laterals (1–)4(–7) and branching pattern typically arborescent ..... *V. rangiferinum*

Ypsilina Webster, Descals & Marvanová gen.nov.

ETYMOLOGY: Ypsilon (Gk.): Y, referring to the conidial shape.

Hyphomycetes. Coloniae (2% MA) typice pallidae. Conidiophora micro- usque ad semimacronematosa, mononematosa, fere lateralia, pauciseptata. Cellulae conidiogenae terminales vel laterales, polyblasticae, discretae vel incorporatae, aliquando simul cum conidiis crescentes, proliferatio sympodialis. Conidia terminalia, fasciculata, bracchiata, cum uno axe et uno, rare duobus bracchiis lateralibus, binatis vel alternatis; elementa subulata, leviter arcuata, 0- vel pauciseptata, apicibus acutis; axis plerumque cum appendice basale percurrente vel excentrico; ramificatio pleurogena, insertioni-

bus valde et inaequaliter constrictis. Secessio conidiorum schizolytica.

TYPUS GENERIS: *Ypsilina graminea* (Ingold et al.) Descals, Webster & Marvanová

Hyphomycetes. Colonies (2% MA) white, in some isolates cream coloured or brownish after long cultivation, reverse pale, isabelline or brown. Some strains become pale pink when submerged and exposed to daylight. Conidiophores micro- to semimacronematous, mononematous, mostly lateral, few-septate. Conidiogenous cells terminal or lateral, polyblastic, discrete or integrated, sometimes concurrent with conidia, proliferation sympodial. Conidia terminal, fasciculate, compound, with an axis and one or rarely two, paired or alternate, laterals; elements subulate, slightly arcuate, 0- to few-septate, apex acute; axis often with a percurrent or excentric basal extension; branching pleurogenous with insertions strongly and unequally constricted. Conidial secession schizolytic.

Webster (1954) informally described *Upsilon gramineum* on dead culms of *Dactylis glomerata*. Ingold et al. (1968) classified what undoubtedly was the same fungus in *Volucrispora* Haskins (1958). According to von Arx (l974), this is a synonym for *Tricellula* v. Beverwijk (1954), a genus characterized by slimy, brightly pigmented colonies producing tiny conidia with acrotonous branching, the elements being connected by isthmi (Sutton 1984). None of these features appear in *Y. graminea*. We therefore propose a new monotypic genus and recombine its type and only species as follows.

Ypsilina graminea (Ingold et al.) Descals, Webster & Marvanová comb.nov.

≡*Volucrispora graminea* Ingold et al., Trans. Br. Mycol. Soc. 51: 325. 1968. (Basionym)

≡*Tricellula graminea* (Ingold et al.) Arx. The genera of fungi sporulating in pure culture. J. Cramer, Vaduz. 1974.

Lambdasporium Matsushima has similar conidia but borne on micronematous conidiophores with conidial secession scars on short lateral pegs. *Articulospora* Ingold, on the other hand, has a similar (albeit less condensed) branching pattern of the conidiogenous structure, but conidial branching is always apical and verticillate.

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