A revision of *Linodochium, Pseudocenangium, Septopatella,* and *Siroscyphella*

B. J. DYKO AND B. C. SUTTON

Commonwealth Mycological Institute, Kew, Surrey, England

Received May 30, 1978

DYKO, B. J., and B. C. SUTTON. 1979. A revision of *Linodochium*, *Pseudocenangium*, *Septopatella*, and *Siroscyphella*. Can. J. Bot. **57**: 370–385.

Pseudocenangium Karst. is redescribed and illustrated, and *Siroscyphella* Höhn. is reduced to synonymy with it. Two species, *P. pinastri* and *P. succineum*, are accepted. *Septopatella* Petrak, based on *P. septatum*, is confirmed as a distinct form genus. *Pseudocenangium hartigianum* and *P. umense* are made the types of the new form genera ***Gelatinopycnis*** and ***Pocillopycnis*** respectively. *Pseudocenangium laricinum* is excluded. The related form genus *Linodochium hyalinum* (Lib.) Höhn. is redescribed and illustrated.

DYKO, B. J., et B. C. SUTTON. 1979. A revision of *Linodochium*, *Pseudocenangium*, *Septopatella*, and *Siroscyphella*. Can. J. Bot. **57**: 370–385.

Les auteurs redécrivent et illustrent le genre *Pseudocenangium* Karst. et réduisent *Siroscyphella* Höhn. à la synonymie de ce genre. Deux espèces sont acceptées: *P. pinastri* et *P. succineum*. *Septopatella* Petrak, basé sur le *P. septatum*, est accepté comme genre de formes distinct. *Pseudocenangium hartigianum* et *P. umense* sont désignés comme les espèces-types de deux nouveaux genres de formes, respectivement ***Gelatinopycnis*** et ***Pocillopycnis***. *Pseudocenangium laricinum* est exclus du genre. Le genre de formes apparenté *Lindochium hyalinum* (Lib.) Höhn. est redécrit et illustré.

[Traduit par le journal]

The name *Pseudocenangium* (Coelomycetes, Deuteromycotina) was proposed by Karsten (1886) for a single species, *P. pinastri* Karst., which occurs on pine needles. The short generic diagnosis was emended by Petrak (1953), who supplied a more detailed description. A modern generic description has been presented by Morgan-Jones et al. (1972) who noted the presence of annellidic conidiogenous cells in the type species. Knapp (1924), unaware that this name had prior use, proposed the later homonym *Pseudocenangium* Knapp to accommodate *Peziza purpurea* Fr. (Discomycetes).

Pseudocenangium Karst. is characterized by small, yellow to dark brown, gelatinous, cupulate conidiomata, holoblastic conidial production, and filiform conidia. An ascomatal state is known for one taxon and is referable to *Phialea* Gillet (but see Dumont and Korf 1977); it has a similar appearance to the conidiomata.

Six species have been ascribed to *Pseudocenangium*, all occurring on coniferous hosts. Although *Pseudocenangium septatum* Jaap has been made the type species of *Septopatella* Petrak (1925), examination of the remaining five taxa showed the genus to be still heterogeneous. The taxa vary considerably in structure of conidiomata, conidiogenesis, and conidial morphology.

As part of another study (Dyko 1977), *Linodochium hyalinum* (Lib.) Höhnel was obtained in culture. Although it is sporodochial on its natural substrate, it produces yellow cupulate conidiomata in culture and filiform conidia superficially similar to those seen in *Pseudocenangium*. Because of this similarity, we are including a redescription of *L. hyalinum* here.

KEY TO SPECIES ON NATURAL SUBSTRATA

1. Conidiomata sporodochial, mucoid to horny, irregular in shape ..... *Linodochium hyalinum*
1. Conidiomata cupulate or pycnidial, well defined 2

2. Conidial ontogeny phialidic; conidiomata pycnidioid 3
2. Conidial ontogeny holoblastic; conidiomata cupulate 4

3. Conidiomata composed of textura porrecta and textura oblita; conidiophores present ..... *Gelatinopycnis hartigiana*
3. Conidiomata composed of textura angularis; conidiophores absent ..... *Pocillopycnis umensis*

4. Conidial ontogeny predominantly sympodial; conidiomata dark brown to black with cream to grey centre, sessile ..... *Septopatella septata*
4. Conidial ontogeny predominantly annellidic; conidiomata yellow to dark brown, often stipitate 5

5. Conidia over 20 μm in length with acute apices ..... *Pseudocenangium pinastri*
5. Conidia less than 20 μm in length with obtuse apices ..... *Pseudocenangium succineum*

0008-4026/79/040370-16$01.00/0

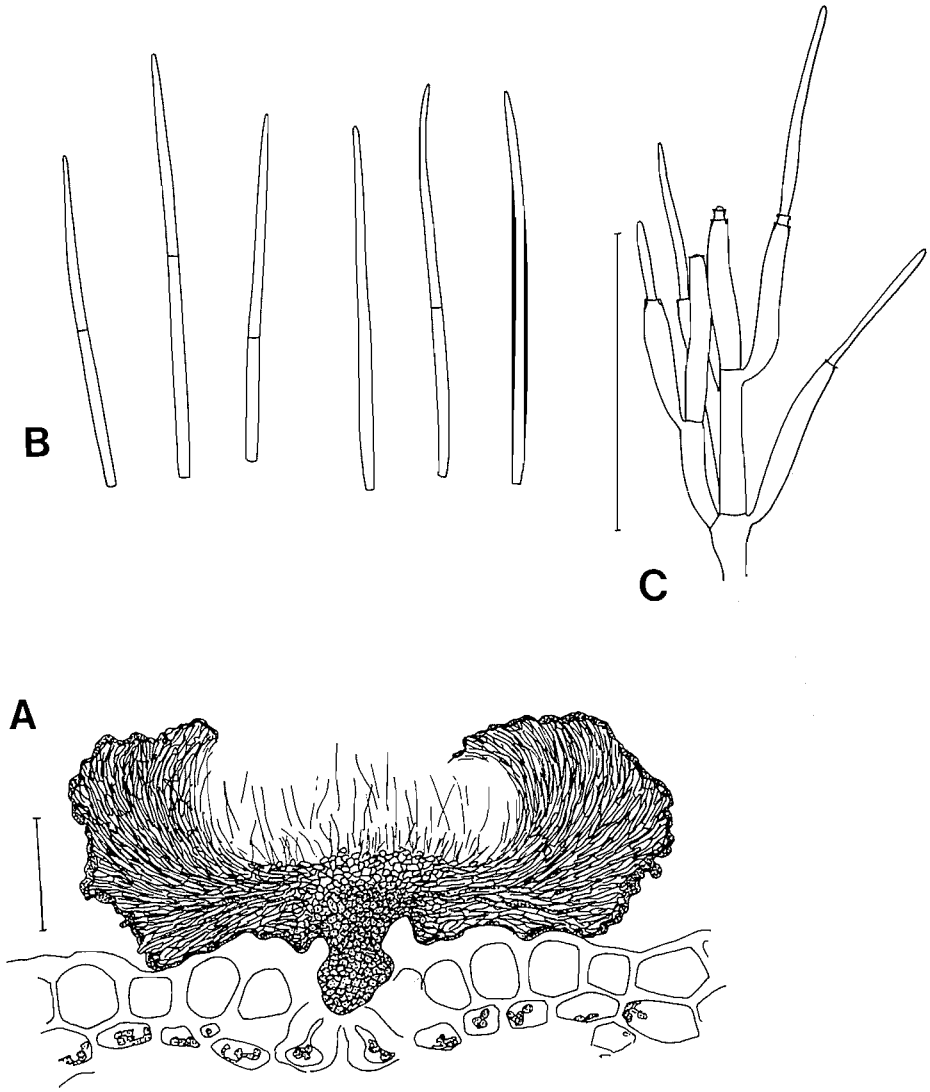


FIG. 1. *Pseudocenangium pinastri*. (A) Vertical section of a conidioma (scale = 50 μm). (B) Conidia. (C) Conidiogenous cells with developing conidia (scale = 25 μm).

Pseudocenangium Karsten. Medd. Soc. Fauna Fl. Fenn. 13: 163. 1886. (non *Pseudocenangium* Knapp. Schweiz. Z. Pilzkd. 2: 52. 1924.)
= *Siroscyphella* Höhnel. Sitzungsber. Akad. Wiss. Wien Math. Naturwiss. Kl. Abt. 1, 119: 650. 1910.

Conidiomata cupulate, superficial, separate, at first closed, walls consisting of textura angularis and textura intricata. Ostiole absent. Conidiophores branched, septate. Conidiogenous cells integrated, percurrently proliferating. Conidia holoblastic, filiform to bacillar, septate, hyaline.

TYPE SPECIES: *Pseudocenangium pinastri* Karsten.

Pseudocenangium pinastri Karst. Medd. Soc. Fauna Fl. Fenn. 13: 164. 1886. (Fig. 1)

Mycelium composed of immersed, branched, septate, hyaline to pale brown hyphae. Conidiomata cupulate, superficial, separate to gregarious, pale to dark brown, at first closed, later opening widely up to 50 μm diameter; basal wall with central mass of brown textura angularis, merging into textura intricata in gelatine beneath the conidiogenous region and the periclinal wall, the outer walls of which are sclerotioid. Ostiole absent. Conidiophores hyaline, repeatedly branched penicillately or irregularly throughout their length, septate, smooth, cylindrical, arising from loose,

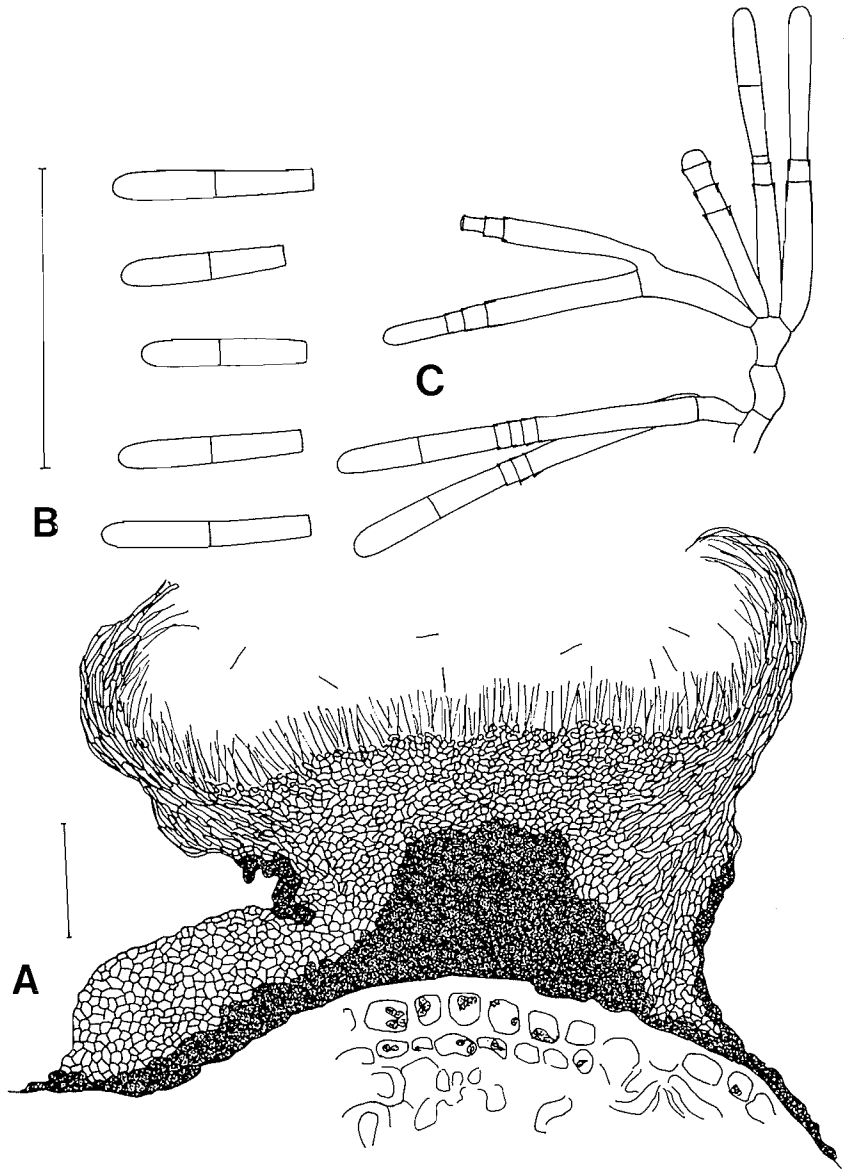


FIG. 2. *Pseudocenangium succineum*. (A) Vertical section of conidioma (scale = 50 μm). (B) Conidia (scale = 25 μm). (C) Conidiogenous cells with developing conidia.

irregularly branched cells at the base and sides of the conidiomata. Conidiogenous cells annellidic, with up to three indistinct percurrent proliferations, hyaline, integrated, cylindrical, terminal. Conidia holoblastic, hyaline, subulate, straight, zero to one euseptate, truncate at the base, acute at the apex, 26–33 × 1 μm.

SPECIMEN EXAMINED: From needles of *Pinus sylvestris*, Tammela, Mustiala Prov., Finland, leg. et det. P. A. Karsten No. 1000, 19 May 1866, holotype H.

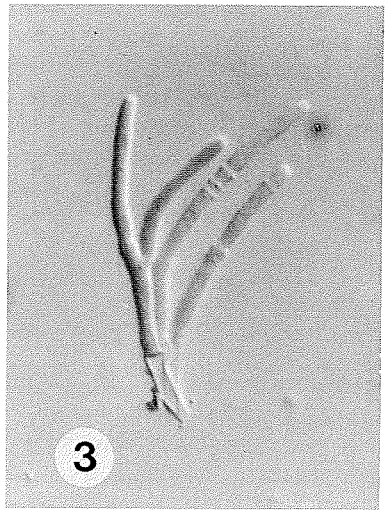
These measurements are slightly larger than those of Karsten (1886) but fall well within the range cited by Petrak (1953).

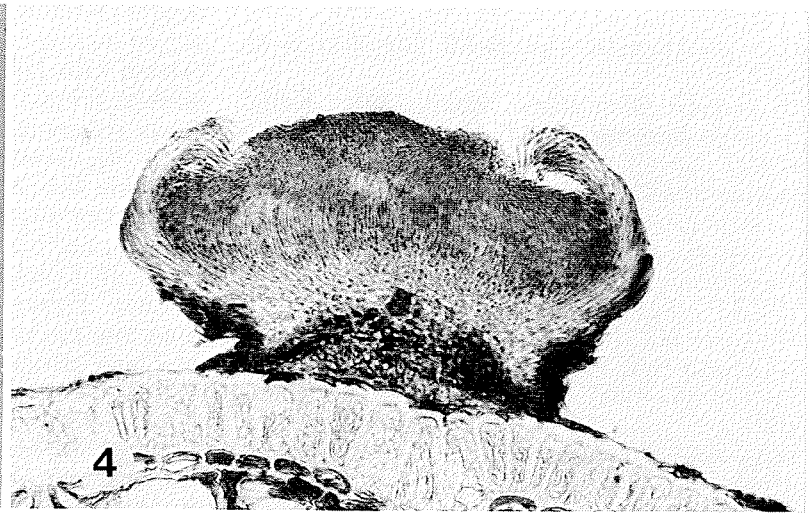
Pseudocenangium succineum (Sprée) Dyko & Sutton comb.nov. (Figs. 2–4)

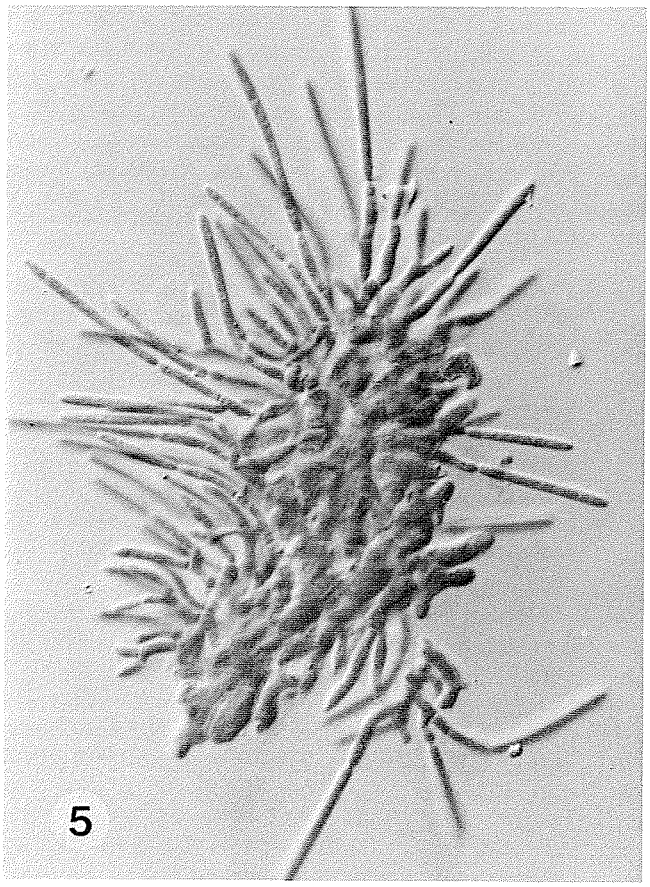
Basionym: *Dacrymyces succineus* Sprée. Bot. Zeitung (Berlin), 22: 175. 1864.

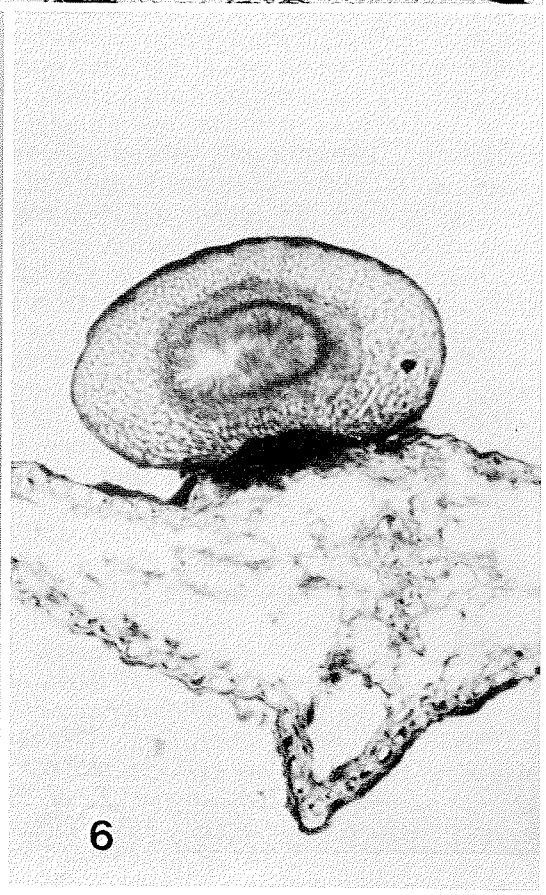
= ?*Calloria succinea* Fr. Summa Veg. Scand. 359. 1849.

= *Siroscyphella succinea* (Fr.) Höhn. Sitzungsber. Akad. Wiss. Wien Math. Naturwiss. Kl. Abt. 1, 127: 374. 1918.









FIGS. 3 and 4. *Pseudocenangium succineum*. Fig. 3. Detail showing annellations on conidiogenous cell. × 980. Fig. 4. Vertical section of conidioma. × 245. FIGS. 5 and 6. *Gelatinopycnis hartigana*. Fig. 5. Conidiogenous cells with developing conidia. × 980. Fig. 6. Vertical section of a conidioma. × 196.

≡ *Dacrymyces succineus* Fr. Hymen. Eur. 699. 1874.

= *Hymenula fumosa* Cke. & Ell. Grevillea, 6: 87. 1878.

= *Hymenula fumosellina* Starb. Bih. Kongl. Svenska Vetensk. Akad. Handl. 21(3): 35–36. 1895.

≡ *Siroscyphella fumosellina* (Starb.) Höhn. Sitzungsber. Akad. Wiss. Wien Math. Naturwiss. Kl. Abt. 1, 119: 650. 1910.

= *Pseudocenangium alpinum* Pet. Ann. Mycol. 23: 124–125. 1925.

TELEOMORPHOSIS: *Phialea fumosella* (Cke. & Ell.) Sacc. Syll. Fung. 8: 269. 1889.

For full synonymy see Dennis (1956) and Höhnel (1918).

Mycelium on needles and cones of *Pinus* spp. and *Picea* sp. composed of immersed, branched, septate, hyaline to pale brown hyphae. Conidiomata cupulate, superficial, separate, pale yellow to medium brown, at first closed but later opening widely, stipitate, up to 800 μm diameter; basal wall with a central mass of brown textura angularis merging into textura intricata in gelatine beneath the conidiogenous region and the periclinal wall, the outer cells of which are brown and thick walled. Ostiole absent. Conidiophores hyaline, repeatedly branching penicillately or irregularly throughout their length, septate, smooth, arising from the base and sides of the conidiomata. Conidiogenous cells annellidic, with up to three apical percurrent proliferations, hyaline, integrated, cylindrical, terminal, 10–53 × 2–2.5 μm. Conidia holoblastic, hyaline, cylindrical, straight, zero to one euseptate, truncate at the base, obtuse at the apex, 12–18 × 2–2.5 μm.

SPECIMENS EXAMINED: On needles of *Pinus pumilio*, Hochschar, Hochgensenk leg. F. Petrak, 18 October 1924, Flora Bohemiae et Moraviae exsiccata No. 1950 *Pseudocenangium alpinum* Pet. isotype, K, BR; on *Pinus* needles, Forres, New Brunswick, C.B. Plowright, No. 187 *Peziza electrina* Phil., isotype, K; on needles of *Pinus sylvestris*, Boekhurst, Pr. Lochem, leg. Th. Sprée, Rabenhorst Fungi europaei exsiccati No. 680 *Dacrymyces succineus* Sprée, isotype, K; on *Pinus* needles, Newfield, New Jersey, J.B. Ellis, Nos. 2780, 2782, isotype of *Hymenula fumosa* Cke. & Ell. K; on needles of *Pinus sylvestris*, Kolmarden, Tyrstorp, Sweden, leg. E. Haglund, 3 September 1892, authentic specimen of *Hymenula fumosellina* Starb., IMI 16645, K, S; on needles of *Pinus sylvestris*, Budenheim, Fuckels Fungi Rhenani No. 1600 *Dacrymyces succineus* Sprée, K; on needles of *Pinus sylvestris*, Bundenheim, Herbier Barbey-Boissier, No. 1196 *Orbilia succinea* (Fr.) Sacc. fungus conidiophorus *Dacrymyces succineus* Fr., K; on needles of *Pinus rigida*, Newfield, New Jersey, Ellis North American Fungi No. 362 *Hymenula fumosa* Cke. & Ell., K; on needles of *Pinus sylvestris*, Silwood Park, Berkshire, U.K., R. W. G. Dennis, 4 October 1968, K; on *Pinus*, Loch Morlich, Aviemore, Invernesshire, U.K., R. W. G. Dennis, 28 September 1950, K; on *Pinus* needles, Ockham Common, Surrey, U.K., D. A. Reid, 18 October 1962, K; on *Pinus sylvestris* needles, Pickering Forest, Yorkshire, U.K., G. Simpson, 18 October 1963, IMI 102895; on needles of *Pinus sylvestris*, Brandon, Suffolk, U.K., D. Minter, 24 March 1978, IMI 227158; on needles of *Pinus sylvestris*, Victoria BR, Loch Tulla, Argyll, U.K., D. W. Minter, 2 January 1978, IMI 227157; on *Pinus sylvestris*, Dronfield, Sheffield, U.K., D. W. Minter, 23 October 1977, IMI 227264; on *Pinus* needles, Yellow Springs, Ohio, U.S.A., W. B. & V. C. Cooke No. 41918, 28 November 1969, K; on *Pinus* needles, Newfield, New Jersey, U.S.A., J. B. Ellis, No. 2781, K; on *Pinus* needles, Forres, N. B. Keith No. 84, as *Hymenula* (*Fusarium*) *pezizoides* Phil., K; on *Picea* needles, Bellever Forest, Devon, U.K., D. L. Hawksworth, Det., D. W. Minter, 6 September 1978, IMI 231760.

Conidial production in this fungus is primarily annellidic, but in occasional young specimens, production of conidia from sympodial loci has also been seen. The percurrent proliferations on the apex of the conidiogenous cells can be best seen with the use of 1% erythrosin stain in NH_4OH (Sutton 1961) or differential interference contrast optics. Conidial septa are frequently difficult to ascertain in immature conidia except with the use of erythrosin stain or phase contrast optics. The septum does not develop until after release of the conidium.

Höhnel (1910) first proposed *Hymenula fumosellina* Starback as the type species of his new genus *Siroscyphella*. Later (Höhnel 1918) he thought *Calloria succinea* Fries provided an earlier name for *S. fumosellina* and made the new combination *S. succinea* (Fr.) Höhn. on this basis. He did not, however, describe having seen any Fries specimens of *C. succinea*. We were unable to locate any Fries material of this taxon in UPS and prefer to take up the name *Dacrymyces succineus* Sprée. The isotype for this name has been examined and it continues to maintain the taxon in the sense that Höhnel intended.

The fungus has also been described as *P. alpinum* by Petrak (1925) and although conidia in most collections develop a single median septum

after release from the conidiogenous cell, there is some variability in this feature among the specimens examined. Petrak's material of *P. alpinum* showed fewer septate conidia but as no other difference could be correlated with this character there appears to be no reason for keeping this taxon separate.

A specimen of *Hymenula* (*Fusarium*) *pezizoides* Phil. (K) was found to be the same as *P. succineum*. This specimen was cited by Cooke (1888) in his paper on British Hyphomycetes as a *Hymenula* but apparently was never described either as a *Hymenula* or a *Fusarium* by Phillips. Wakefield and Bisby (1941) list the name as a nomen nudum.

Saccardo (1901) lists *Dacrymyces acuum* Lasch and *D. hyalinus* Lib. as varieties of *D. succineus* (Lib.) Hohn. *Dacrymyces microsporus* Karst. was listed as a synonym of *D. succineus* Fr. but clearly is a Basidiomycete (Saccardo 1891).

Petch (1943) suggested that *Patellina caesia* Ell. & Stane. was a synonym of *Siroscyphella succinea*, but examination of the holotype material of *P. caesia* (K) which was collected by Elliott shows it to be distinct and not congeneric. Until a revision of *Patellina* Speg. and *Patellina* Grove ex Petch is undertaken the status of *P. caesia* is uncertain.

Gelatinopycnis Dyko & Sutton, gen.nov.

Conidiomata pycnidialia, superficialia, separata, inaperta; parietes extra ex texturis porrectis et intra ex texturis oblitis constantibus. Ostiolum absens. Conidiophora ramosa, septata. Cellulae conidiogenae phialidicae, cylindricae, terminales vel intercalares. Conidia enteroblastica, hyalina, filiformia, septata.

SPECIES TYPICA: *G. hartigiana* (Allesch.) Dyko & Sutton.

Conidiomata pycnidial, superficial, separate, closed, consisting of an outer wall of textura porrecta and an inner wall of textura oblita. Ostiole absent. Conidiophores branched, septate. Conidiogenous cells phialidic, cylindrical, terminal, and intercalary. Conidia enteroblastic, hyaline, filiform, septate.

Gelatinopycnis is distinguished from apparently similar genera by the complex structure of the conidiomata and the method of conidial ontogeny. Morphology of conidia is similar in *Linodochium*, *Septopatella*, *Pseudocenangium pinastri*, and *G. hartigiana* and these taxa with acicular conidia can be separated from *Pseudocenangium succineum* which has comparatively short, cylindrical, one-septate conidia.

Whereas conidiomata in *Pseudocenangium* and *Septopatella* are distinctly cupulate at maturity and *Linodochium* becomes cupulate in culture (but effusely sporodochial on the natural substrate), in *Gelatinopycnis* the globose conidiomata appear to be entirely closed. Presumably they split open at maturity to release conidia, but no distinct ostiole or raphe has been seen in the type. In addition there are three distinct tissue layers in the conidiomatal wall. The outer layer is one or two cells thick, of brown textura porrecta; the median layer is much wider and of hyaline textura oblita which progressively grades into the inner layer consisting of much smaller celled textura oblita with slightly less gelatinized walls. In *Pseudocenangium* and *Septopatella* the main basal region of the conidioma is of textura angularis with the periclinal walls of pale brown textura porrecta to textura intricata. In *Linodochium* the sporodochia are a mixture of textura angularis and textura porrecta, while in culture only textura angularis develops in the cupulate conidiomata.

Gelatinopycnis hartigiana (Allesch.) Dyko & Sutton, comb.nov. (Figs. 5–7)

Basionym: *Pseudocenangium hartigianum* Allescher. Ber. Bayr. Bot. Ges. Erforsch. Heim. Flora, IV: 36. 1896.

Mycelium composed of immersed, branched, septate, hyaline to brown hyphae. Conidiomata pycnidial, superficial, separate, globose to ovoid, pale to dark brown, appearing to remain closed but dimpled in the centre when dry, 150–250 μm diameter; outer wall one cell thick, of dark brown textura porrecta; median wall hyaline, very thick, of textura oblita. Ostiole absent. Conidiophores hyaline, branched, septate, smooth, cylindrical, short, arising from cells lining the walls of the cavity. Conidiogenous cells phialidic, hyaline, integrated, cylindrical, terminal, and intercalary, arising in mucus. Conidia enteroblastic, hyaline, filiform, straight, eventually one to three euseptate, rounded at the base, tapered to an obtuse apex, 29–46 × 2 μm.

SPECIMEN EXAMINED: On needles of *Larix europaea*, Germany, R. Hartig, Det. Allescher, spring 1895, holotype, M.

Conidial ontogeny is difficult to discern in this taxon but with differential interference phase contrast optics a small amount of periclinal thickening and a small collarette can be seen, which indicates a functional phialide. Measurements of conidia based on the holotype are somewhat smaller than those cited by Allescher (1896) of 40–60 μm.

Septopatella Petrak. Ann. Mycol. 23: 128. 1925.

Conidiomata cupulate, superficial, separate, occasionally aggregated, consisting of textura an-

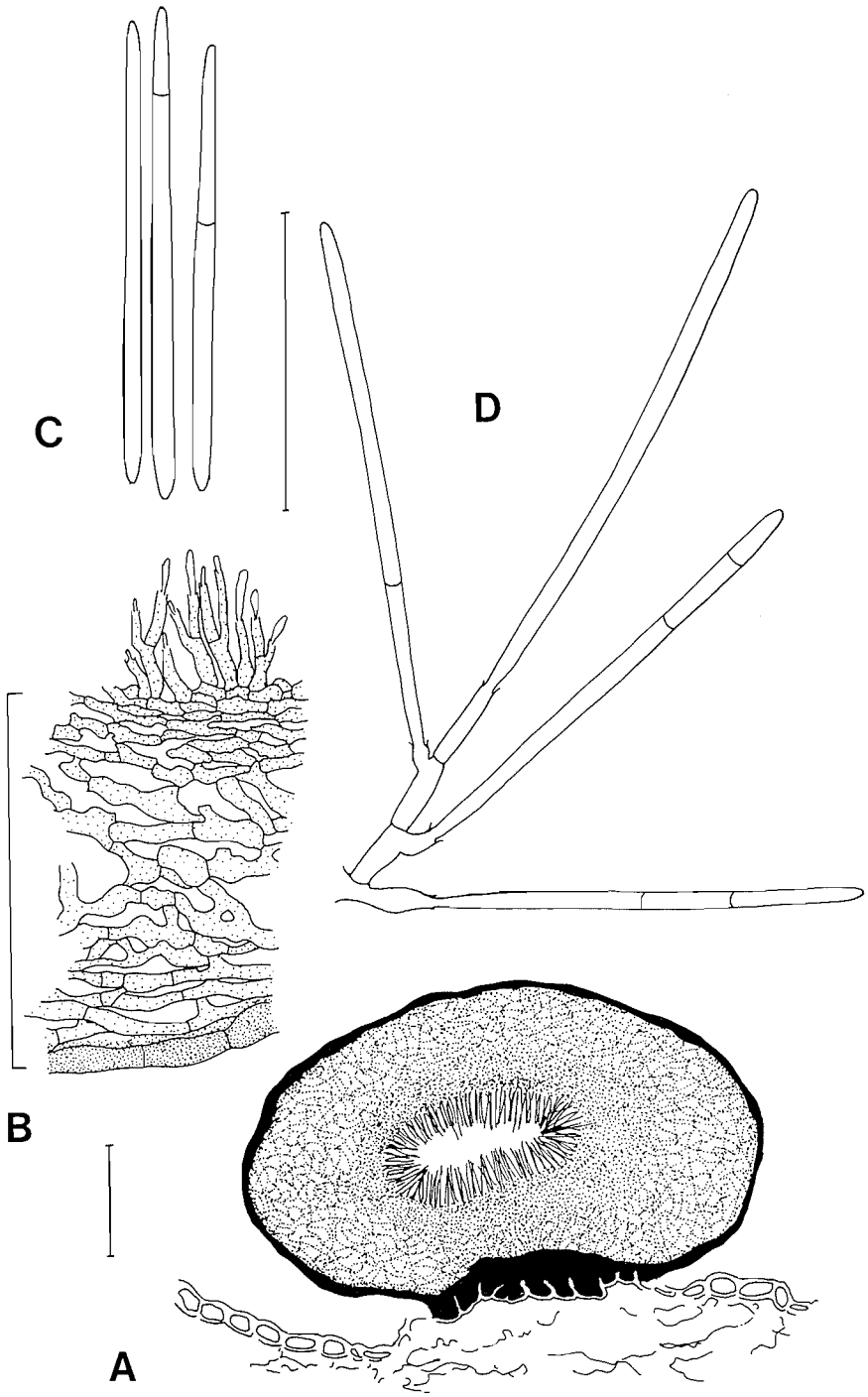


FIG. 7. *Gelatinopycnis hartigana*. (A) Vertical section of a conidioma (scale = 50 μm). (B) Detail of wall tissue structure of conidioma (scale = 50 μm). (C) Conidia. (D) Conidiogenous cells with developing conidia (scale = 50 μm).

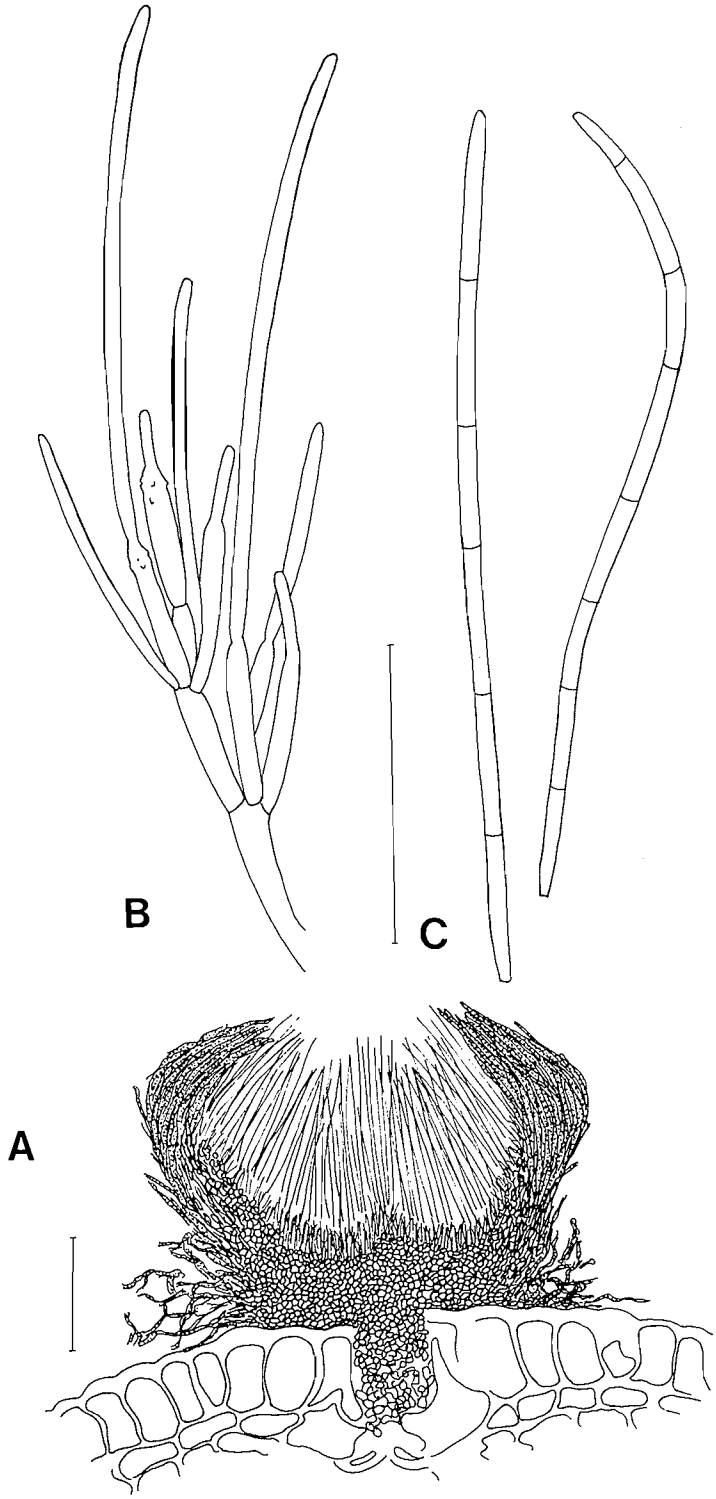


FIG. 8. *Septopatella septata*. (A) Vertical section of a conidioma (scale = 50 μm). (B) Conidiophores and conidiogenous cells. (C) Conidia (scale = 25 μm).

gularis at the base and merging with textura porrecta in the periclinal wall. Conidiophores branched, septate. Conidiogenous cells sympodially proliferating, integrated. Conidia holoblastic, filiform, hyaline, septate.

TYPE SPECIES: *Septopatella septata* (Jaap) Petrak.

Septopatella septata (Jaap) Petrak. Ann. Mycol. 23: 129. 1925. (Figs. 8–10)

≡ *Pseudocenangium septatum* Jaap. Ann. Mycol. 6: 219. 1908.

Mycelium composed of immersed, branched, septate, pale brown hyphae. Conidiomata cupulate, superficial, separate to gregarious, sessile, dark brown to black, at first closed, later opening widely, exposing a mass of hyaline to light yellow conidia, oval to roundish often irregular in shape, up to 1 mm diameter; base of slightly modified textura angularis, dark brown, becoming textura porrecta as it merges into the periclinal walls, hypostroma extending into stomata of host. Ostiole absent. Conidiophores hyaline, branched at the base, septate, smooth, arising from hyaline, gelatinized hyphae from the base of the conidioma, 27–65 × 2.5–3 μm. Conidiogenous cells sympodially proliferating, hyaline, integrated, cylindrical, terminal, 8.5–28 × 1.5–3 μm. Conidia holoblastic, hyaline, filiform, straight to sigmoid, two to seven euseptate, truncate at base, acute at apex, 47–75 × 1.5–2 μm.

SPECIMENS EXAMINED: On needles of *Pinus montana*, Tschechischen Hutte, Karawanken, Austria, O. Jaap, holotype HBG; on needles of *Pinus pumilo*, Hochschar, Hochgesenke, Czechoslovakia, leg. F. Petrak, 10 August 1924, Flora Bohemiae et Moraviae exsiccata Ser. 2. Abt. 1, No. 1965 *Septopatella septatum* (Jaap) Pat., BM, HBG, S; on needles of *Pinus ponderosa*, Fender Flat, North Warner mountains, Modoc County, California, 1 August 1967, D. R. Miller, California fungi det. L. Bonar 1318, *Trichosperma griseocandidum*, K; on *Pinus nigra*, Kephalobruse, Parnassus, Greece, 28 April 1978, S. Diamandis, IMI 228411.

The holotype (HBG) is part of a mixed collection and conidiomata of *P. septata* are scarce. Petrak's exsiccati (BM, HBG, S), however, are far more ample.

Conidial production in this fungus has previously been reported as phialidic (Morgan-Jones and Kendrick 1972; Morgan-Jones 1975). Examination of the material showed ontogeny to be holoblastic with sympodially proliferating conidiogenous cells. After conidiogenesis at one level, the conidiogenous cells percurrently proliferate through the conidial scar before resuming sympodial production of additional conidia. This type of ontogeny is reminiscent of that seen in *Polyscytalum truncatum* Sutton & Hodges (Sutton and Hodges 1976) and *Articulospora tetracladia* Ingold (Dyko 1977). Occasionally simple annellations on the apex of the conidiogenous cells of *S. septatum* may also be seen.

Petrak (1925) proposed a new genus for this taxon on the basis of the long filiform conidia and the structure of the conidiomata. These characters in addition to that of conidiogenesis serve to delimit it from *Pseudocenangium*. This taxon, like *Linodochium* Höhn., exhibits sympodially proliferating conidiogenous cells and septate, filiform conidia but differs from the latter taxon in the type of conidiomata produced.

Pseudocenangium laricinum Sacc. Ann. Mycol. 1:27. 1903.

The holotype of this taxon consists of several pieces of bark from *Larix* with *Tympanis laricina* (Fckl) Sacc. in various stages of development. We were unable to find filiform conidia such as those described by either Saccardo (1903) or Fuckel (1870). The structures described by these two authors could either be developing conidiophores of the *Sirodothis* state of the *Tympanis* or developing paraphyses of the ascomatal state. Since conidiophores invariably show lateral conidiogenous loci and this specimen did not show them, we incline to the latter interpretation.

SPECIMENS EXAMINED: On bark of *Larix*, Cadore, D. Saccardo No. 1075, autumn 1900, holotype, PAD; on twigs of *Larix europaea*, Valdobra Orb. Carestia No. 1015, spring, 1869, PAD.

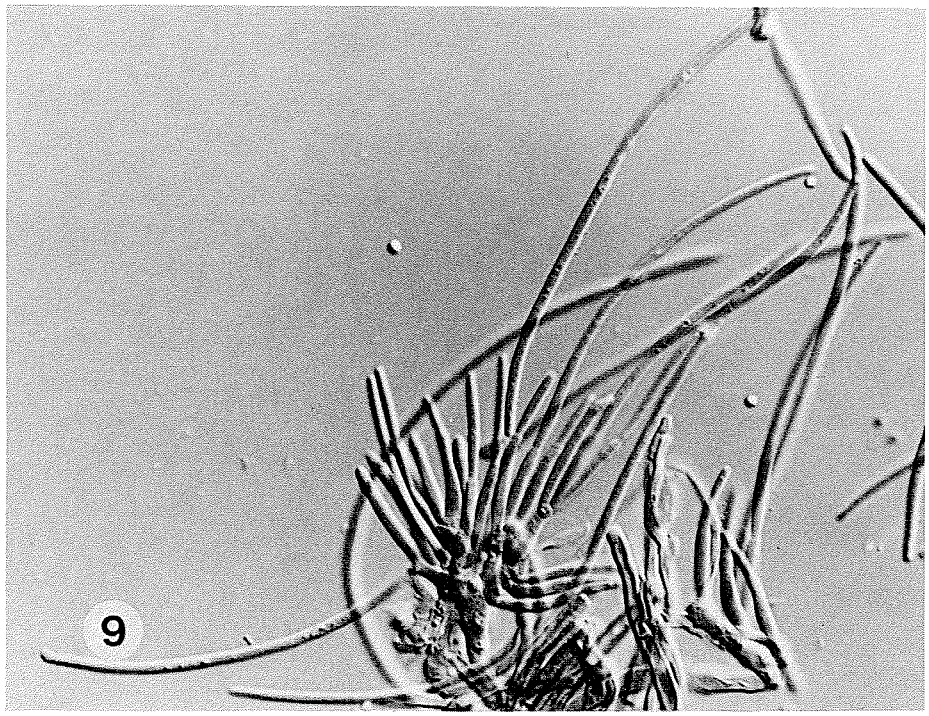
Pocillopycnis Dyko & Sutton, gen.nov.

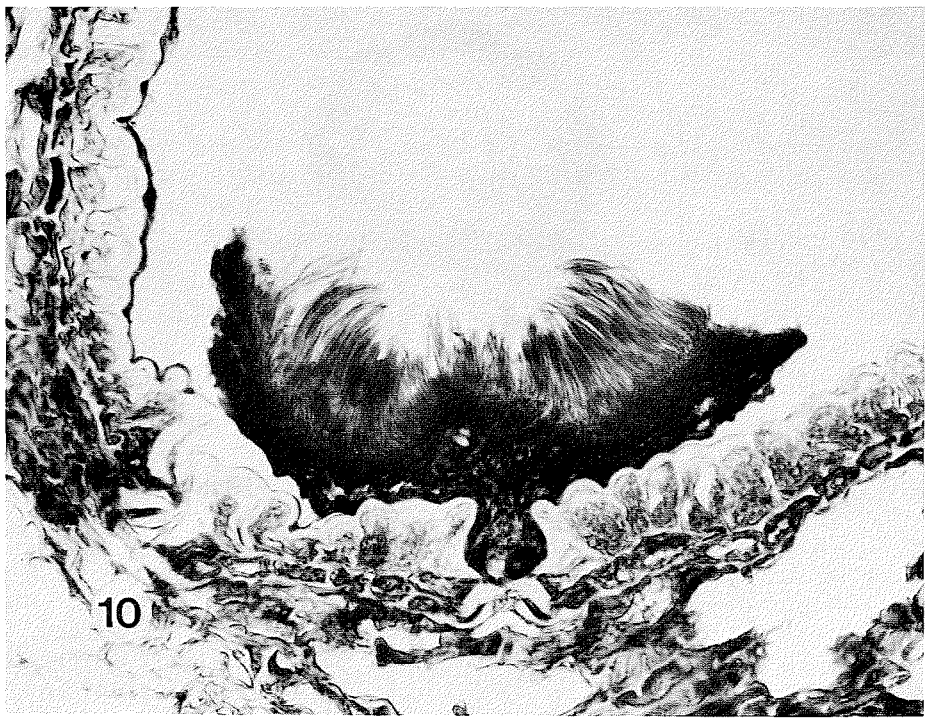
Conidiomata pycnidialia deinde cupulata, superficialia, separata, ex textura angulari composita. Ostiolum absens. Cellulae conidiogenae phialidicae, hyalinae, discretae ex cellulis in parietibus basalibus conidiomatorum orientes. Conidia enteroblastica, hyalina, lunata, euseptata.

SPECIES TYPICA: *P. umensis* (Bubák & Vleugel) Dyko & Sutton.

Conidiomata pycnidial becoming cupulate, superficial, separate, composed of textura angularis. Ostiole absent. Conidiophores absent. Conidiogenous cells phialidic, hyaline, discrete, arising directly from the inner wall on the lower half of the conidiomata. Conidia enteroblastic, hyaline, lunate, euseptate.

Because of the lack of textura intricata in the conidiomata and the presence of phialidic conidial ontogeny and the large falcate conidia, *Pseudo-*





FIGS. 9 and 10. *Septopatella septata*. Fig. 9. Conidiogenous cells with developing conidia. × 1000. Fig. 10. Vertical section of conidioma. × 125.

cenangium umense can not be comfortably accommodated in the genus *Pseudocenangium*. Its phialidic conidium ontogeny excludes it from *Septopatella* and the absence of conidiophores and of textura porrecta and textura oblita in the conidiomata exclude it from *Gelatinopycnis*. *Pocillopycnis* bears some resemblance to *Foveostroma* DiCosmo (1978), a nom.nov. for *Micropera* Lév. It

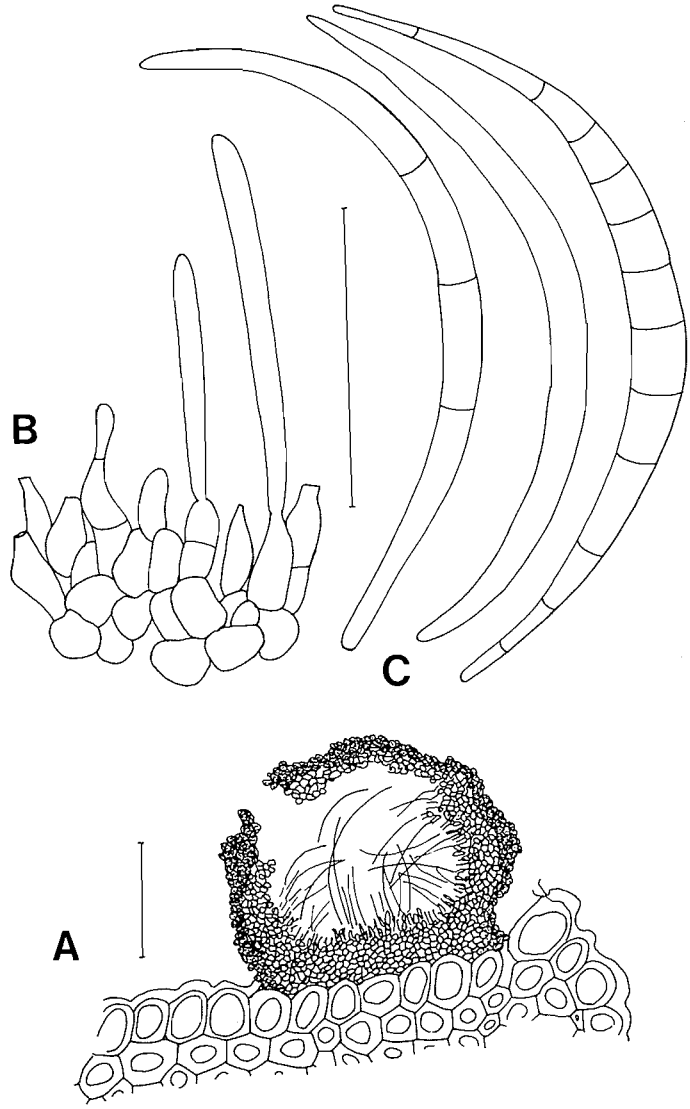


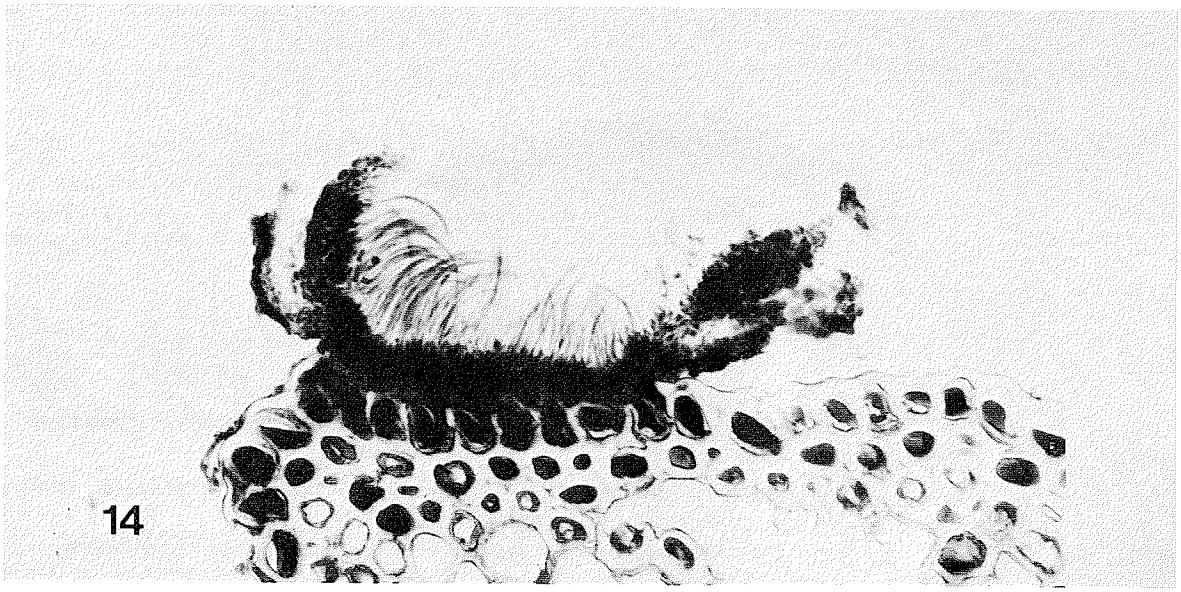
FIG. 11. *Pocillopycnis umensis*. (A) Vertical section of a conidioma (scale = 50 μm). (B) Conidiogenous cells and developing conidia. (C) Conidia (scale = 25 μm).

may, however, be readily distinguished from *Foveostroma* by the conidiomatal type and the conidiogenous structures. *Foveostroma* produces uni- to multi-loculate stromatic conidiomata. The conidiomata are erumpent from the host periderm, whereas in *Pocillopycnis* the conidiomata are produced superficially. The conidiogenous cells of *Foveostroma* are borne on well-developed conidiophores and, although phialidic, are percurrently proliferating. To our knowledge, percurrent proliferations are lacking in *Pocillopycnis*.

Pocillopycnis umensis (Bubák & Vleugel) Dyko & Sutton, comb.nov. (Figs. 11–14)

Basionym: *Pseudocenangium umense* Bubák & Vleugel in Vleugel. Sven. Bot. Tidskr. 11: 321. 1917.

Mycelium composed of immersed, branched, septate, hyaline to pale brown hyphae. Conidiomata cupulate, superficial, separate, dark brown to black, at first closed, later opening widely, 100–150 μm diameter; outer wall three cells thick of thick-walled, dark brown textura angularis; inner wall two to four cells thick of hyaline to pale brown textura angularis. Ostiole absent. Conidiophores absent. Conidiogenous cells phialidic, hyaline, discrete, ampuliform to lageniform, with little or no collarette and scant periclinal thickening, arising directly from inner wall on lower half of the conidiomata, 5–10 × 2.5–3 μm. Conidia entero-



FIGS. 12–14. *Pocillopycnis umensis*. Fig. 12. Conidiogenous cells with developing conidia. × 650. Fig. 13. Detail of conidiogenous cells with developing conidia. × 1600. Fig. 14. Vertical section of a conidioma. × 310.

blastic, hyaline, lunate, 3–10 euseptate, truncate at the base, tapered to an acute apex, 60–81 × 3–4 μm.

SPECIMEN EXAMINED: On twig tips of *Picea excelsa*, Holmon, Umea Prov., Sweden, J. Vleugel, det. Bubák & Vleugel, July 1911, holotype of *Pseudocenangium umense*, BPI.

Only a small amount of periclinal thickening can be seen on the phialides. The phialide collarette consists of a ridge at the apex of the conidiogenous

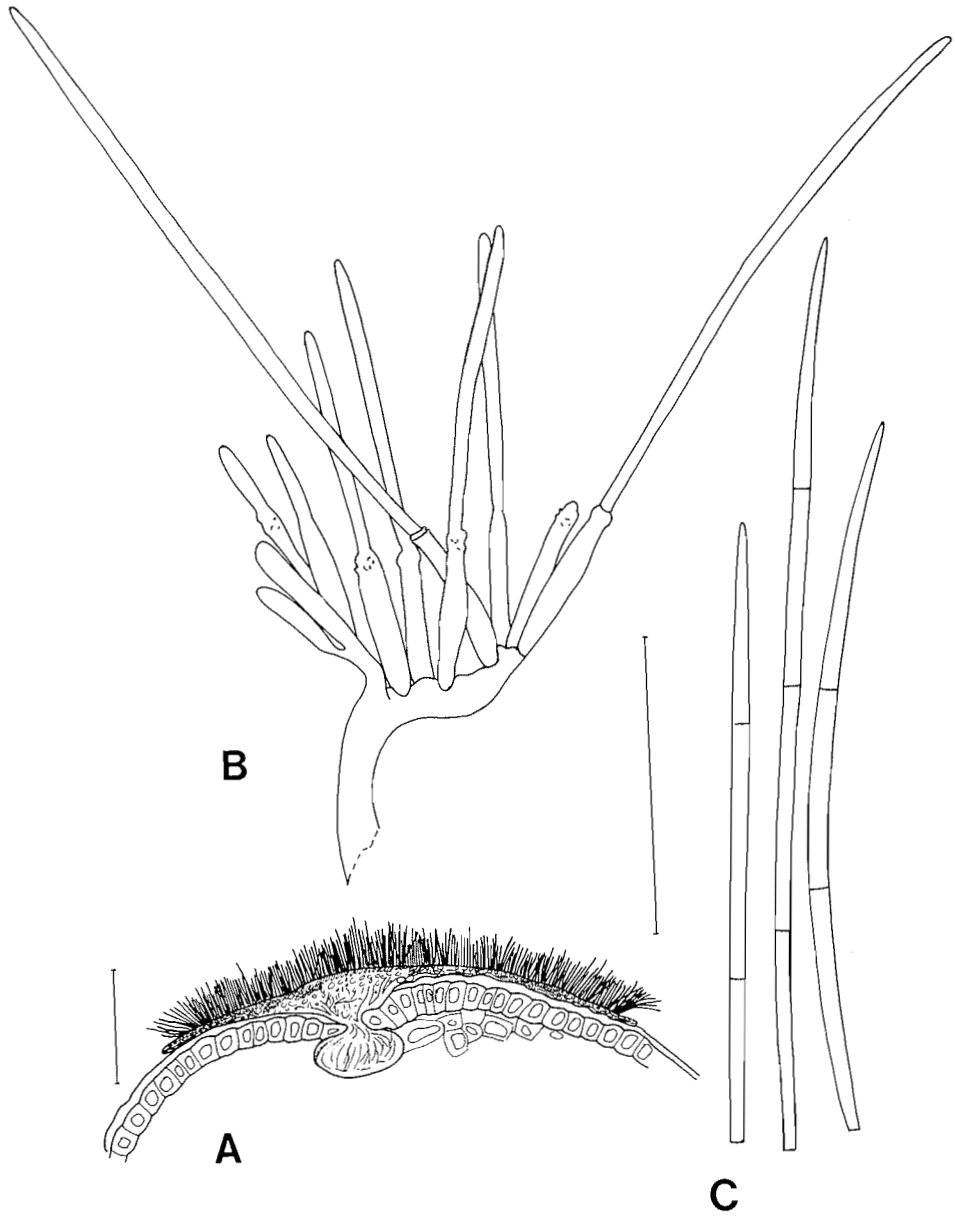


FIG. 15. *Linodochium hyalinum*. (A) Vertical section of a conidioma (scale = 100 μm). (B) Conidiophores and conidiogenous cells. (C) Conidia (scale = 25 μm).

cell and conidia appear to be exogenously produced at the very apex of the phialide. Measurements of conidia are slightly smaller than those listed by Vleugel (1917) of 55–130 × 3–4 μm.

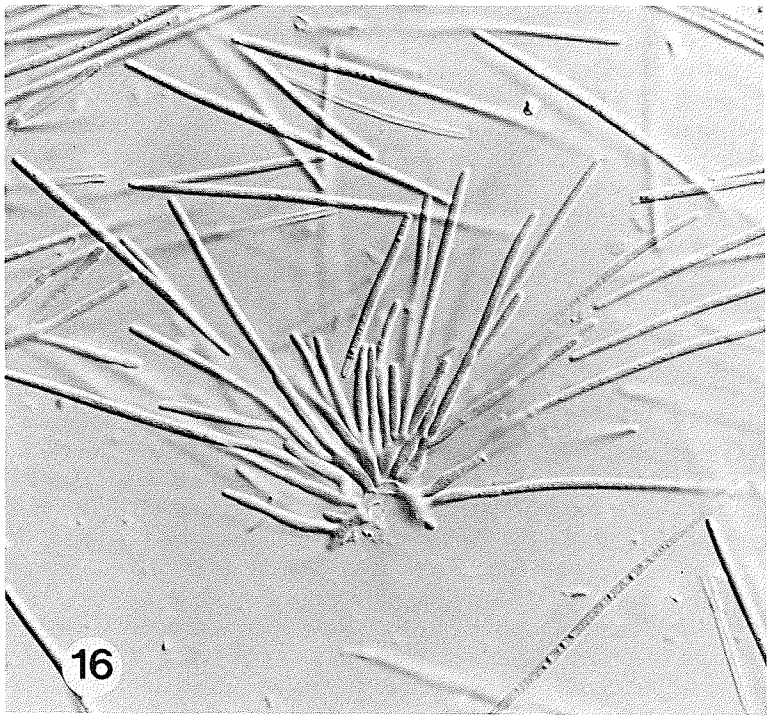
Linodochium Höhnel. Sitzungsber. Akad. Wiss. Wien Math. Naturwiss. Kl. Abt. 1, 118: 1239. 1909.

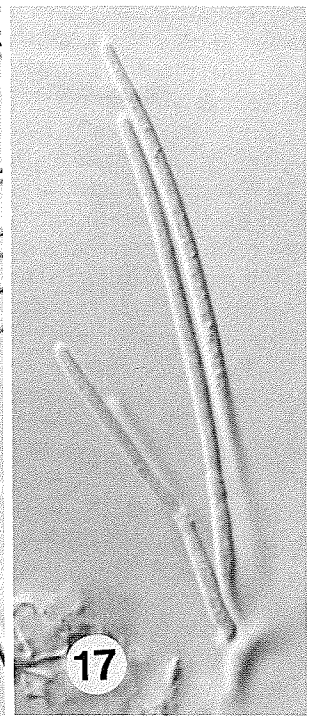
Conidiomata sporodochial, superficial, separate, becoming confluent, composed of textura angularis and textura porrecta. Conidiophores septate, branched. Conidiogenous cells integrated, sympodially proliferating. Conidia holoblastic, filiform, septate, hyaline.

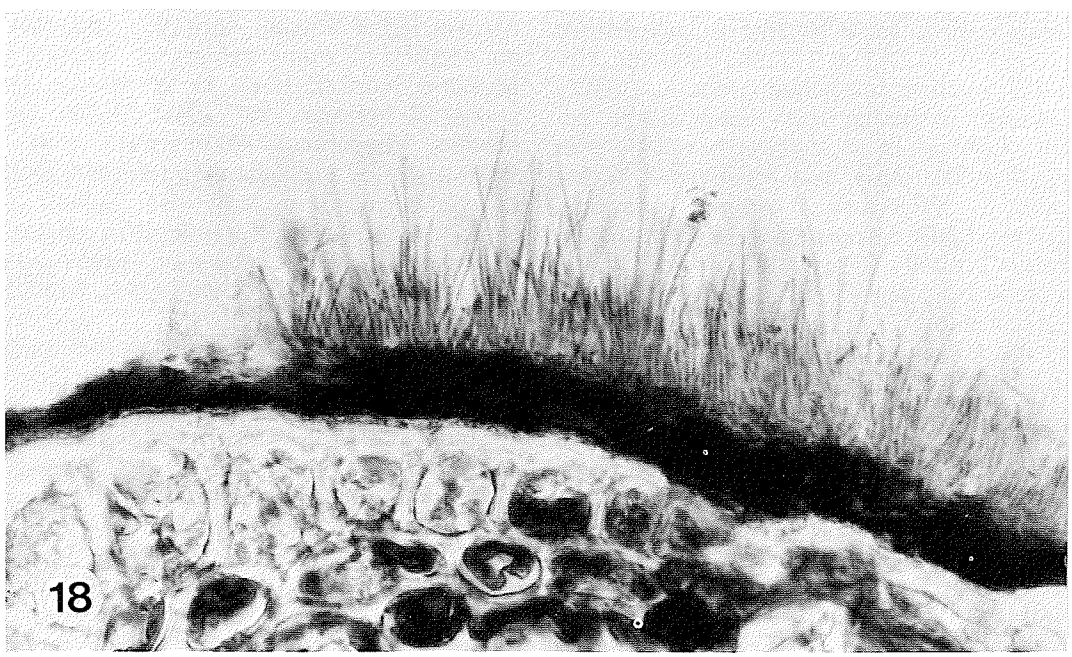
TYPE SPECIES: *Linodochium hyalinum* (Lib.) Höhn.

Linodochium hyalinum (Lib.) Höhnel. Sitzungsber. Akad. Wiss. Wien Math. Naturwiss. Kl. Abt. 1, 118: 1239. 1909. (Figs. 15–18)

≡ *Dacrymyces hyalinus* Lib. in Fr. Hymen. Eur. 100. 1837. (non *Dacrymyces hyalinus* (Pers.) Quél. Fl. Mycol. Fr. 17: 1888. (Basidiomycete, Donk, 1966).)







FIGS. 16–18. *Linodochium hyalinum*. Fig. 16. Conidiogenous cells with developing conidia. × 100. Fig. 17. Detail of conidiogenous cells showing annellations. × 1600. Fig. 18. Vertical section of part of a conidioma. × 200.

= *Dacrymyces acuum* Lasch. in Rabenhorst. Bot. Zeitung (Berlin), 2: 427. 1844.
= *Cylindrosporium acicola* Bresadola (as *acicolum*) Hedwigia, 33: 208. 1894.
= *Dacrymyces acuorum* Fautrey & Roumeguère. Rev. Mycol. 12: 61. 1890.
= *Cylindrocolla pini* Lamb. & Fautrey. Bull. Soc. Mycol. Fr. 15: 153. 1899.

Mycelium composed of immersed, branched, septate, hyaline hyphae. Conidiomata sporodochial, separate, becoming confluent, cream to yellowish, gelatinous, becoming horny when dry,

flat, rarely pulvinate, round to oval with an irregular outline, up to 1.2 mm diameter; consisting of hyaline to pale brown, small-celled irregular textura angularis grading into textura porrecta sometimes slightly gelatinized, hypostromata in stomata of host. Conidiophores hyaline, irregularly branched, septate, smooth, arising from the upper cells of conidiomata, 4–20.5 × 2–3 μm. Conidiogenous cells sympodially proliferating, occasionally annellidic with up to two percurrent proliferations, integrated, cylindrical, terminal, 6.5–14 × 1.5–2 μm. Conidia holoblastic, hyaline, filiform, subulate, straight or slightly curved, two to four euseptate, base truncate, apex acute, 36–88.5 × 1–1.5 μm.

CHARACTERS IN CULTURE: Colonies attaining 3.5 cm diameter on malt yeast soy protein agar in 30 days at 10°C. Superficial mycelium felty to submerged, hyaline to yellowish cream becoming effuse and submerged at margins; immersed hyphae 1–3.5 μm diameter, branched, hyaline, septate, colony reverse yellow; concentric stellate zonation becoming apparent immediately before fructification, light orange in colour. Conidiomata cupulate, yellow, formed at the apices of stellate zonation lines, composed of small hyaline to pale brown textura angularis, 1.5–3 × 2–3 mm diameter. Conidiophores hyaline, branched, septate, tightly packed together, arising from deep in the conidiomata. Conidiogenous cells sympodially proliferating, hyaline, integrated, cylindrical, terminal. Conidia holoblastic, hyaline, subulate, straight, two to three euseptate, base truncate, apex acute, 42–60 × 1.5 μm.

SPECIMENS EXAMINED: On needles of *Pinus sylvestris*, Koningstein, Germany, leg. W. Krieger, 10 May 1893, Krieger Fungi Saxonici No. 995 *Cylindrosporium acicolum* Bresadola n.sp., isotype, K, BPI; on needles of *Pinus sylvestris* Klotzschii Herb. viv. muc. Ed. 1. cent 6. 1844, No. 521 *Dacrymyces acuum* Lasch, n.sp. isotype, B; on needles of *Pinus sylvestris* M.A. Libert Pl. crypt. Arduennae fasc. IV (1837) No. 333 *Dacrymyces hyalinus* Libert, isotype, BR, K; on needles of *Pinus sylvestris*, France, leg. Fautrey, January 1901, Herbier Crytogamique de la Cote-d'Or. No. 2789 *Cylindrocolla pini* Lamb. & Fautr. isotype, K; on needles of *Pinus nigra*, Giesshubl bei modling, Niederdonau, leg. F. Petrak, April 1939, Mycotheca generalis No. 660 *Linodochium hyalinum*, B, BM, BR, IMI 30560, UPS; on *Pinus sylvestris* needles, Bartelsdorf, Mahren, leg. F. Petrak, April 1936, Mycotheca generalis No. 448 *Linodochium hyalinum*, BM, IMI 30348, UPS; on needles of *Pinus sylvestris*, Turnau, Bohmen, J. E. Kabát, March 1912, Kabát & Bubák, Fungi Imperfecti exsiccati No. 750 *Linodochium hyalinum*, B, BM; on needles of *Pinus sylvestris*, Sonntagsberg, Germany, leg. P. Strasser, Cryptogamae exsiccatae editae a Museo Hist. Natur. Vindobonensi No. 3396 *Linodochium hyalinum*, B, BM, IMI 12978, K; on needles of *Pinus sylvestris*, Brandenburg, Germany, leg. H. Sydow, 9 October 1934, Sydow Mycotheca Germanica No. 2997 *Linodochium hyalinum*, K, BM; on needles of *Pinus*, Gutsbrunnen & Weidhausen in Lichtenfels, H. Engel, 3 March 1973, Flora West Germany No. 221 *Linodochium hyalinum*, K; on needles of *Pinus nigra*, Unterfraken, Germany, A. Adi, April 1931, BM, IMI 15666; on needles of *Pinus sylvestris*, Malmedy, France, Reliquiae Libertianae, C. Roumeguère Fungi Gallici exsiccati No. 2217 *Dacrymyces hyalinus* Libert, K, PC, BR; on needles of *Pinus sylvestris*, Hrabuuka, Mähr-Weisskirchen, leg. F. Petrak, March 1923, Flora Bohemiae et Moraviae exsiccata, Ser. II, Abt. 1 No. 1616 *Linodochium hyalinum*, BM; on needles of *Pinus sylvestris*, West Berkashem, leg. F. Petrak, May 1923, Mycotheca Carpatica No. 307 *Linodochium hyalinum*, BM, K; on needles of *Pinus nigra*, lower Austria, leg. F. Petrak, April 1939, BM, IMI 15665; on needles of *Pinus sylvestris*, Weeting Heath, Brandon, Norfolk, U.K., D. W. Minter, det. B. J. Dyko, 21 February 1977, IMI 226786; on *Pinus* needles, Penparciau, Aberystwyth, U.K., I. M. Wilson, det. S. J. Hughes, March 1948, IMI 28089; on needles of *Pinus sylvestris*, Egham, Surrey, U.K., B. J. Dyko, 1 April 1978 (BJD); from decaying submerged *Quercus* leaves in spring, New York, U.S.A. D. J. Dyko, det. B. C. Sutton, March 1976, IMI 209973.

The conidium length shows a substantial but continuous range. The shorter conidia are produced most often in apparently young conidiomata.

Sutton (1973) showed that conidial ontogeny in *L. hyalinum*, as in *S. septata*, is holoblastic, with sympodially proliferating conidiogenous cells. In addition, annelations from percurrent proliferations may also be seen on the apex of some conidiogenous cells (Fig. 11C). Several major differences exist between these two genera. In *Linodochium*, the conidiomatal hyphae are not well developed into a cupulate fruiting structure and the conidiophores are considerably shorter and less well developed than those seen in *Septopatella*.

Höhnel (1909) listed *Pionnotes pinastri* Karst. as a synonym of *L. hyalinum*. We could not locate a Karsten specimen and therefore suggest the name be considered of dubious application. *Pionnotes* Fr. is currently considered to be a generic synonym

of *Fusarium* (Appel and Wollenweber 1910). Höhnel (1909) also lists *Dendrodochium subtile* Fautr. as a synonym of *L. hyalinum*. Fautrey and le Lambotte (1895) noted in their description of *D. subtile* that they had made a mistake in the measurement of the conidia and conidiogenous structures. They regarded this taxon to be identical with the Roumeguère exsiccata specimen No. 5204 which is the isotype of *Dacrymyces acuorum* Faut. & Roum. Höhnel (1909) accepted Fautrey's conclusions and did not look at an isotype of *D. subtile*. Examination of isotype material of *D. subtile* (UPS) shows it not to be congeneric with *L. hyalinum*.

MISIDENTIFIED SPECIMENS: On needles of *Pinus sylvestris*, Lyon, France, leg. J. Therry No. 6685, December 1881, C. Roumeguère Fungi Gallici exsiccati No. 2112 *Dacrymyces hyalinus* Lib. is *Microthyrium pinophyllum* (Hohn.) Pet., K, PC.

Acknowledgments

We wish to express our appreciation to Dr. P. Lentz (BPI), Dr. H. Merxmüller (M), Dr. T. Ahti (H), Dr. B. Nordenstam (S), Dr. A. Bienfait (BR), Dr. D. Reid (K BM), Dr. I. Friederichsen (HGB), Mme. Jovet (P), Dr. R. Moberg (UPS), Dr. Th. Eckardt (B), and the curator of PAD for loan of material in their keeping. We wish to thank Mr. D. W. Fry for photographic assistance. The senior author acknowledges with thanks support from National Science Foundation predoctoral grant No. DEB 76-07108 and postdoctoral fellowship No. 177-12383.

ALLESCHER, A. 1896. Diagnosen einiger neuer im Jare 1895 gesammelter Arten bayerischer Pilze au der abteilung der fungi imperfecti. Ber. Bayer. Bot. Ges. Erforsch. Heim. Flora, **4**: 31–40.

APPEL, O., and H. W. WOLLENWEBER. 1910. Grundlagen einer Monographie der Gattung *Fusarium* (Link). Kaiserlichen Biologischen Anstalt fur Land- und Forstwirtschaft. Bd.

COOKE, M. C. 1888. British Hyphomycetes. Grevillea, **17**: 8–16.

DENNIS, R. W. G. 1956. A revision of the British Helotiaceae in the herbarium of the Royal Botanic Gardens, Kew, with notes on related European species. Commonw. Mycol. Inst. Mycol. Pap. No. 62.

DICOSMO, F. 1978. A revision of *Corniculariella*. Can. J. Bot. **56**: 1665–1690.

DONK, M. A. 1966. Check list of European Hymenomyceteous Heterobasidiae. Persoonia, **4**: 145–335.

DUMONT, K. P., and R. P. KORF. 1977. The generic name *Phialea*, nomen rejiciendum propositum. Taxon, **26**: 598–600.

DYKO, B. J. 1977. A survey of aquatic and water-borne Hyphomycetes of the Southern Appalachian Mountains with notes on extra-limital taxa. Ph.D. dissertation, University of Tennessee, Knoxville.

FUCKEL, L. 1870. Symbolae mycologicae. Jahrb. Nassau. Ver. Naturkd. **23**(24): 1–459.

FAUTREY, M. F., and M. LE LAMBOTTE. 1895. Especes nouvelles de la Cote-d'Or. Rev. Mycol. **17**: 167–171.

HÖHNEL, F. 1909. Fragmente zur Mykologie. (VIII. Mittelung, Nr. 354 bis 406.) Sitzungsber. Akad. Wiss. Wien Math. Naturwiss. Kl. Abt. 1, **118**: 1157–1246.

——— 1910. Fragmente zur Mykologie. (XL. Mitteilung, Nr. 527 bis 573.) Sitzungsber. Akad. Wiss. Wien Math. Naturwiss. Kl. Abt. 1, **119**: 617–679.

——— 1918. Fragmente zur Mykologie. (XXI. Mitteilung, Nr. 1058 bis 1091.) Sitzungsber. Akad. Wiss. Wien Math. Naturwiss. Kl. Abt. 1, **127**: 329–393.

KARSTEN, P. A. 1886. Symbolae ad Mycologiam Fennicam. Part 17. Medd. Soc. Fauna Fl. Fenn. **13**: 159–165.

KNAPP, A. 1924. *Coryne sarcoides* (Jacq.) und var. *urnalis* Nyl. Schweiz. Z. Pilzkd. **2**: 49–53.

MORGAN-JONES, G. 1975. Notes on Coelomycetes. I. *Cerstopycnis*, *Clypeopycnis*, *Macrodiplodiopsis*, *Mastigosporella*, *Paradiscula* and *Septopatella*. Mycotaxon, **2**: 167–183.

MORGAN-JONES, G., and W. B. KENDRICK. 1972. Icones generum Coelomycetum. Fasc. III. Univ. Waterloo Biol. Ser. No. 5.

MORGAN-JONES, G., T. R. NAY. RAJ., and W. B. KENDRICK. 1972. Icones generum Coelomycetum. Fasc. V. Univ. Waterloo Biol. Ser. No. 7.

PETCH, T. 1943. British Nectrioideae and allied genera. Trans. Br. Mycol. Soc. **26**: 53–70.

PETRAK, F. 1925. Mykologische Notizen VIII. Ann. Mycol. **23**: 1–143.

——— 1953. Ergebnisse einer Revision der Grundtypen verschiedener Gattungen der Askomyzeten and Fungi Imperfecti. Sydowia, **7**: 295–308.

SACCARDO, P. A. 1891. Sylloge Fungorum. Vol. IX. Padova, Italy. Published by the author.

——— 1901. Sylloge Fungorum. Vol. XV. Padova, Italy. Published by the author.

——— 1903. Notae Mycologicae. Ser. III. Ann. Mycol. **1**: 24–29.

SUTTON, B. C. 1961. Coelomycetes I. Commonw. Mycol. Inst. Mycol. Pap. No. 80.

——— 1973. Hyphomycetes from Manitoba and Saskatchewan, Canada. Commonw. Mycol. Inst. Mycol. Pap. No. 132.

SUTTON, B. C., and C. S. HODGES. 1976. *Eucalyptus* Microfungi: miscellaneous Hyphomycetes. Nova Hedwigia, **28**: 487–498.

——— 1977. Coelomycetes VI. Nomenclature of generic names proposed for Coelomycetes. Commw. Mycol. Inst. Mycol. Pap. No. 141.

VLEUGEL, J. 1917. Zur kenntnis der Pilzflora in der umgegend von Umea und Lulea III. Sven. Bot. Tidskr. **11**: 304–325.

WAKEFIELD, E. M., and G. R. BISBY. 1941. List of Hyphomycetes recorded for Britain. Trans. Br. Mycol. Soc. **25**: 49–126.