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TAXONOMY AND ANAMORPHS OF THE HERPOTRICHIELLACEAE WITH NOTES ON GENERIC SYNONYMY

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The genera *Capronia* and *Acanthostigmella* are accepted in the Herpotrichiellaceae. Teleomorph–anamorph connexions are discussed. Four new species are described: *Capronia acutiseta*, *C. villosa*, *C. coronata* and *C. pinicola*. A key to the species is provided.

The Herpotrichiellaceae Munk (1953) is a well-defined ascomycete family. Ascomata are typically setose and ostiolate. Sterile filaments are not found among the asci, but the ostiolar canal is lined with short periphyses that often extend over the top of the locule. The asci are bitunicate, saccate to ovoid and have a thickened apex wherein the endoascus appears to form a long tube. Ascospores are pale grey to brown and may be didymosporous, phragmosporous or dictyosporous. Known anamorphs are dematiaceous (black yeasts); conidia are produced holoblastically from minute pegs or denticles; the conidiogenous locus may proliferate percurrently, thus appearing annellate. Conidia are unicellular and often held in chains, or they may fuse and bend in chains, thus having a helicoid aspect. The species are saprobes and are found on decaying wood and bark, leaves or decaying ascomata or basidiomata.

Six genera are currently accepted in the family, *Acanthostigmella* Höhnel, *Berlesiella* Saccardo, *Capronia* Saccardo, *Dictyotrichiella* Munk, *Herpotrichiella* Petrak and *Polytrichiella* Barr (von Arx & Müller, 1975; Barr, 1979). The genera are distinguished on the basis of ascomatal colour, ascospore septation and the number of ascospores in the ascus, and on the presence or absence of a stroma. For a discussion of the family see Barr (1972, 1977) and Eriksson (1981).

In the present paper anamorphs are reported for seven species. Four species are described as new. The relationships among the genera in the family are discussed and new synonymy is proposed. A key to the accepted species in the family is provided.

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MATERIALS AND METHODS

In most cases the cultures were derived from single ascospore isolates according to the method described by Samuels (1979). *Capronia pinicola* was isolated directly from wood of *Pinus* on to 0·1% malt extract agar (MA) supplemented with a mixture of streptomycin and penicillin (250 mg/l). The fungi were grown on one or more of the following media: cornmeal dextrose agar (CMD, Difco), potato dextrose agar (PDA, Difco), oatmeal agar (OA, Difco), malt extract agar containing either 0·1% or 2% malt extract and 2% agar. Material was mounted in water or lactic acid for microscopic examination; all measurements were made from mounts in lactic acid.

DESCRIPTIONS

Capronia acutiseta G. J. Samuels, sp.nov. (Figs 5A, 6A)

Anamorph: *Exophiala* sp.

Ascomata superficialia, solitaria vel gregaria, globosa, ostiolata, ostiolo papillis non praedito, nigra, 190–220 μm, rigidis, erectis, simplicibus nigris setis praedita e tota superficie ascomatis orientibus; ostiolum periphysatum,

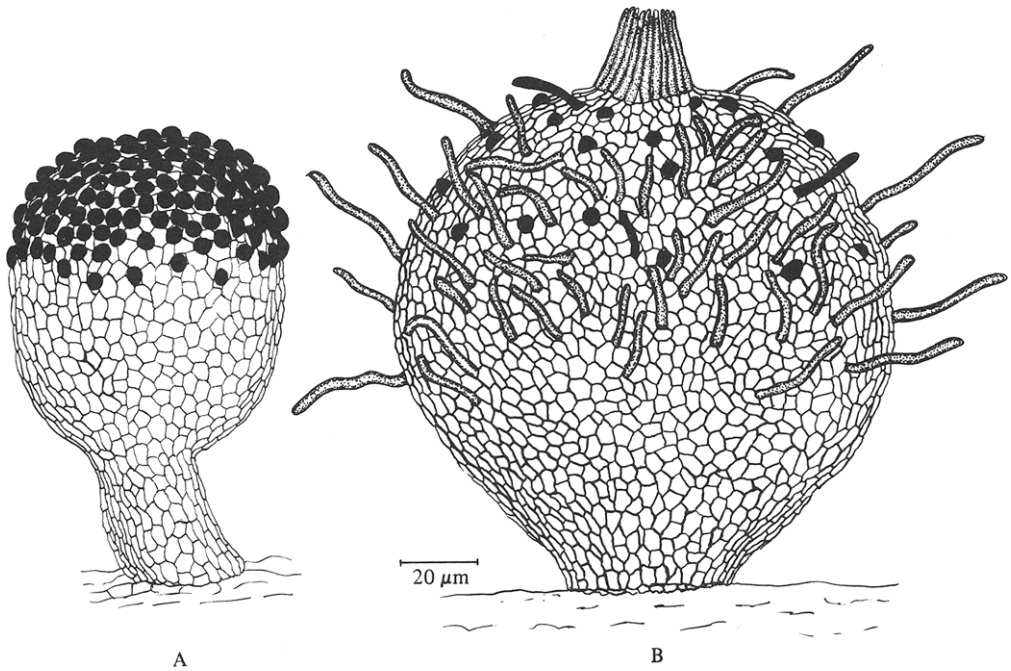

Fig. 1. (A) *Capronia parasitica*, entire ascoma, setae reduced to dark protruding cells; (B) *C. pilosella*, entire ascoma, setae comparatively short.

corona nigris simplicibus setis ad 25–45 × 4–5 μm ornatum. Paries ascomatis 20–25 μm crassa, strato singulo cellularum coloratarum composita. Asci clavati vel subglobosi, bitunicati, 3–8 spori, (61–) 72–84 (–90) × (22–) 27–33 (–35) μm. Ascosporae ellipticae, 4–5 transversalibus, 1–2 longitudinalibus septis praeditae, pallide olivaceae, (14–) 17–25 (–27) × (11–) 11·5–13 (–14) μm.

Status anamorphosis ad *Exophialam* pertinens.

Ad lignum sine cortice *Dacridii cupressini*, Nova Zelandia, in regione dicta Westland County, in silva Saltwater State (SF 40), 2 vel 3 maio 1974, G. J. Samuels (74–59), PDD 34068, holotypus.

Ascomata solitary or scattered to gregarious in small groups, superficial, globose, non-papillate, fleshy, not collapsing when dry, black, not changing colour in 3% KOH, 190–220 μm diam, with stiff, erect, unbranched, acute, black setae arising from around the ostiolar opening; setae 25–45 μm long × 4–5 μm wide at base, unbranched, aseptate, wall 1–2 μm thick. Cells at surface of ascomatal wall angular, 7–10 μm across, wall less than 0·5 μm thick. Ascomatal wall 20–25 μm wide, comprising a single layer of brick-like cells 7–10 × 4–5 μm, walls less than 0·5 μm thick, pigmented. Periphysoidal elements arising from a meristem in the upper third of the inner ascomatal wall and ostiolar canal; cells of meristem angular, *ca* 5 μm long × *ca* 2 μm wide, longer near the top of the ostiolar canal and merging with setae at the ostiolar opening. *Asci* clavate to subglobose, (61–) 72–84 (–90) × (22–) 27–33 (–35) μm, bitunicate, wall thicker above than below, 3- to 8-spored, ascospores completely filling each ascus. *Ascospores* ellipsoidal, (14–) 17–25 (–27) × (11–) 11·5–13 (–14) μm, with 4–5 transverse and 1–2 longitudinal septa, smooth, pale olivaceous. Interthecial filaments lacking.

Colonies grown for 2 weeks at 20 °C, in 12 h darkness and 12 h near uv + cool white fluorescent light on CMD, 5 mm diam, scanty aerial mycelium; dark green; nearly black on PDA, 7–10 mm diam, velvety, aerial mycelium consisting of individual, erect hyphae, hyphae sometimes united into acute, hyphal, rope-like strands; dark-green, nearly black. Conidia forming abundantly on CMD from aerial, repent and submerged hyphae, forming less well on PDA. *Conidiophores* mononematous, macronematous or micronematous as branches of hyphae, 15–60 μm long, branched or unbranched, cells of conidiophore at first cylindrical, becoming swollen and moniliform, 5–8 × 3–5 μm. Each cell of conidiophore producing near its apex a conspicuous peg, or conidiogenous pegs arising directly from hyphal cells. Conidia arising holoblastically, conidiogenous locus proliferating sympodially to a distance of

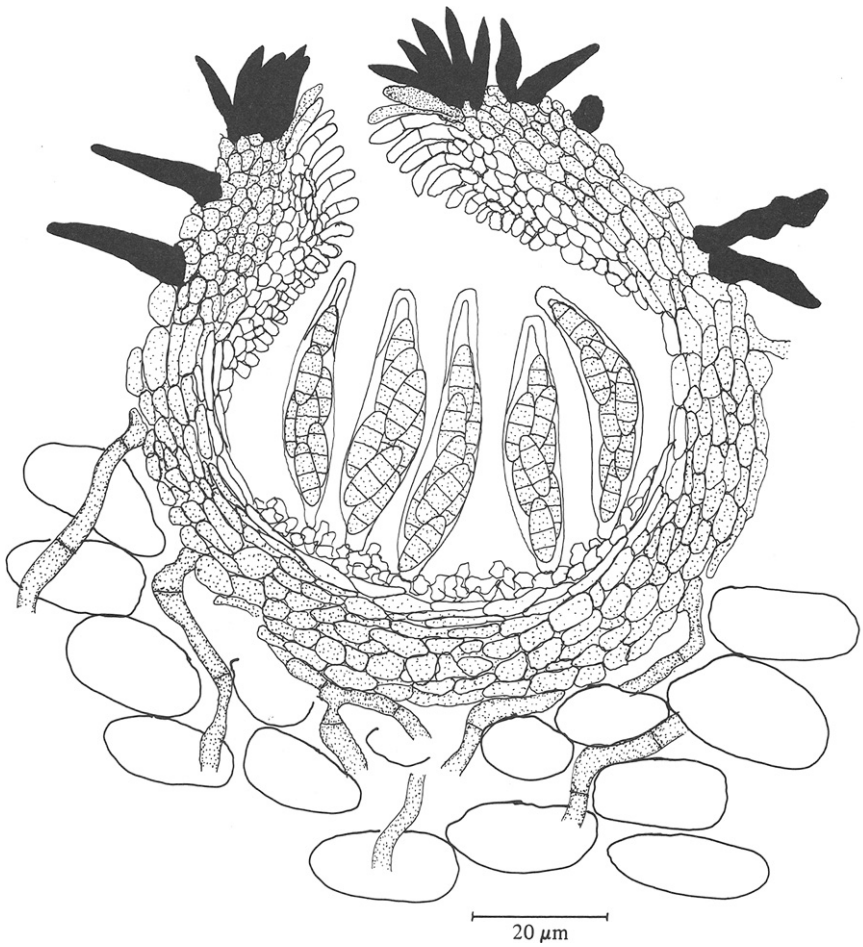

Fig. 2. *Capronia coronata*: section through ascoma, with periphysoidal cells within ostiolar canal and upper portion of the inner ascomatal wall.

5 μm, annellations not seen. *Conidia* allantoid to clavate to subglobose, (2–) 3–5 (–6) × (1–) 1·2–2 (–2·5) μm, unicellular, lacking a basal abscission scar.

Capronia coronata G. J. Samuels, sp.nov. (Figs 2, 4I, 6B)

Anamorph: *Exophiala* sp.

Ascomata solitaria vel gregaria, primum immersa dein erumpentia ac basi tantum immersa, pyriformia ad globosa, nigra, ostiolata, papillis ostiolo non praedito sed periphysato, rigidis, erectis, simplicibus, acutis nigris (10–) 30–65 × 4–5 μm magnitudine setis praedita e tota superficie ascomatis orientibus. Ascomatis paries 10–15 μm crassa, singulo strato cellularum coloratarum composita. Asci clavati, bitunicati, 47·5–55·5 (–57) × (7–) 7·6–9·6 (– 10) μm). Ascosporae primum in parte inferiori tantum asci locatae, demum totum ascum occupantes. Paraphyses desunt. Ascosporae ellipticae vel fusiformes, loculo secundo inflato, apicibus rotundatis, (1–) 3 transversis septis praedita, ad septum tenuiter vel haud constrictae, pallide olivaceae, (10–) 11·5–13·5 (–15·5) × (2–) 3·6–4·7 (–5) μm.
Status anamorphosis ad *Exophialam* pertinens.

Ad lignum sine cortice, Nova Zelandia, in regione dicta Westland County, in silva Nemona State, 5 maio 1974, G. J. Samuels, PDD 35308, holotypus.

Ascomata solitary and scattered to gregarious, at first immersed in wood, becoming partially erumpent with only the base immersed, pyriform with an acute apex to globose and non-papillate, fleshy, collapsing by lateral pinching or not collapsing when dry, black, not changing colour in 3% KOH, with stiff, erect, unbranched, acute, black setae scattered over the surface of the ascomatal wall,

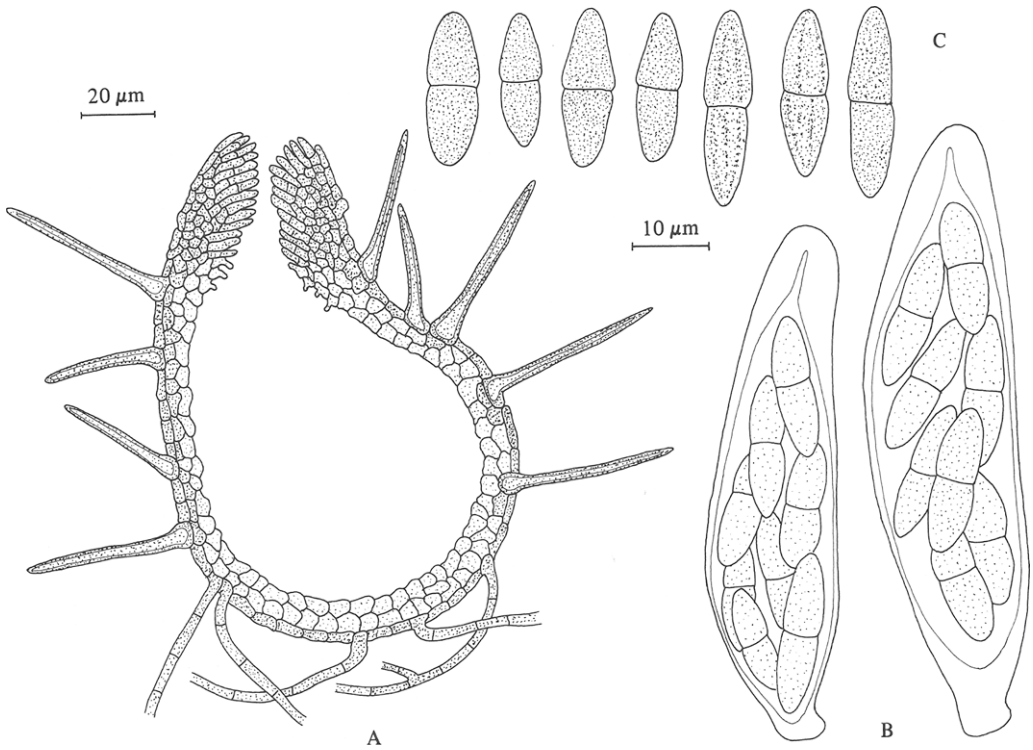

Fig. 3. *Capronia pinicola*. (A) section through ascoma, (B) asci; (C) ascospores.

with a crown of shorter setae around the ostiolar opening; setae (10) 30–65 μm long × 4–5 μm wide at base, aseptate wall 1·0–1·5 μm thick. Cells at the surface of the ascomatal wall angular in outline, 5–10 μm across, wall less than 0·5 μm thick. Ascomatal wall 10–15 μm wide, comprising a single region of cells; cells more or less bricklike, 5–7 μm long × 2–3 μm wide, walls less than 0·5 μm thick, pigmented. Periphysoidal elements arising from a meristem in the upper third of the inner ascomatal wall and the ostiolar canal; cells of the meristem angular, thin-walled, non-pigmented, *ca* 5 μm across; periphysoidal elements *ca* 5 μm long × *ca* 2 μm wide, longer in the ostiolar canal, merging at the ostiolar opening with setae. *Asci* clavate, 47·5–55·5 (–57) × (7·0–) 7·6–9·6 (–10) μm, bitunicate, ascal wall thicker above than below, 8-spored, ascospores at first clustered in the lower end of the ascus, eventually entirely filling each ascus. Interthecial filaments lacking. *Ascospores* ellipsoid to fusiform, widest at the second cell from the apex, with rounded ends (10–) 11·5–13·5 (–15·5) μm long and (2–) 3·6–4·7 (–5) μm wide, with (1–) 3 transverse septa, slightly constricted or not constricted at septa, smooth, pale olivaceous.

Colonies grown for 3 weeks at 20°, 12 h darkness and 12 h in near uv + cool white fluorescent light on CMD, PDA, OA: 7 mm diam, velvety with short, erect hyphae, aerial hyphae black to cinereous, immersed hyphae black; colonies on CMD and OA flat, colonies on PDA slightly raised. Conidia forming in abundance on all 3 media within 7 days. *Conidiophores* mononematous, macronematous or micronematous; conidiogenous cells integrated or terminal, ampulliform to cylindrical, 6–18 × 2–4 μm, sometimes integrated within hyphae; conidia apparently produced holoblastically, conidiogenous cells proliferating percurrently, an annellation appearing at each point of proliferation. *Conidia* oblong to elliptical to dacryoid, base flat or round, lacking an obvious basal abscission scar, (3·5–) 3·9–5·2 (–6) μm, unicellular, pale olivaceous.

Additional specimen examined: New Zealand: South Island, Buller, Nelson Lakes National Park, Lake Rotora, on decorticated wood of *Nothofagus* sp., G. J. Samuels (83–98), T. Matsushima & A. Y. Rossman, 25 May 1983 (PDD 44137).

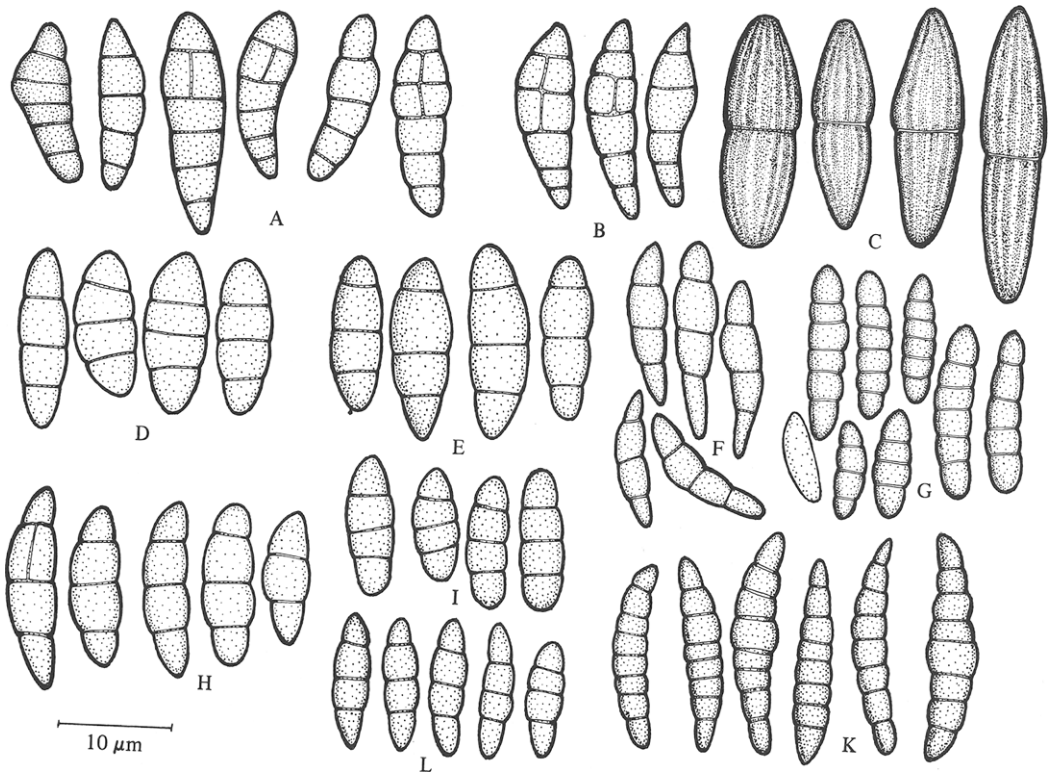

Fig. 4. Ascospores of some *Capronia* species. (A) *C. nigerrima*; (B) *C. nigerrima* with solitary non-stromatic ascomata (Sufers, Switzerland); (C) *C. pinicola*; (D) *C. pilosella* (Zweidlen, Switzerland); (E) *C. pilosella* (New Zealand); (F) *C. parasitica*; (G) *C. villosa*; (H) *C. pilosella* (Piora, Switzerland); (I) *C. coronata*; (K) *C. fungicola*; (L) *C. spinifera*.

Capronia parasitica (Ell. et Everh.) comb.nov. (Figs 1A, 4F, 6E)

Melanomma parasiticum Ell. & Everh., *Proc. Acad. Philadelphia*: 240 (1890).

Herpotrichiella parasitica (Ell. & Everh.) Barr, *A Preliminary Study on the Dothideales in Temperate North America*: 615 (1972).

Anamorph: *Rhinocladiella* cf. *spinifera* (Neilsen & Conant) de Hoog

Description: Barr (1972).

Characteristics in culture. *Colonies* very slow growing, up to 5 mm on MA at 17° within 14 days, aerial mycelium almost lacking, colony reverse brown to grey-olivaceous, black in older parts. *Conidiophores* forming in an almost continuous, yellow-brown lawn with some grey tinges, thus giving the colony a cottony appearance. Odour and exudates absent. Production of conidia starting very early; conidiophores mononematous, macronematous, branched or unbranched, up to 70–90 μm long, pale brown, with a very long rachis, almost *Geniculosporium*-like. *Conidia* produced sympodially, obovate to subglobose, hyaline to pale brown, or brown, smooth, unicellular, with a truncate base and barely distinguishable frill, 2–3 × 1·5–2·5 μm.

Hypersaprobic on old ascomycetes.

Specimens examined: France: St Blaise 64, Bois de l'Hôpital, on old *Hypoxylon cohaerens* (Pers.: Fr.) Fr. var. *microsporum* J. D. Rogers & F. Candoussau, on *Quercus*, F. Candoussau, 28 Mar. 1982 (ZT9190); Tardets, (Mauléon) 64, on *Hypoxylon cohaerens* on *Fagus sylvatica*, F. Candoussau, 28 Mar. 1982 (FC 95, ZT); Lourdes 65, Bois de Lourdes, on *H. cohaerens* var. *microsporum*, on *Quercus* sp., F. Candoussau, 18 Mar. 1982 (FC 97, ZT); Chiroulet 64, Vallée de Lesponne, on *H. cohaerens*, L. Petrini & F. Candousau, 14 Oct. 1981 (ZT).

The description and the drawings by Barr (1972) agree well with our observations. However, we have sometimes observed the formation of a short, stromatic stalk at the base of the ascomata (Fig. 1A).

The anamorph of *B. parasitica* is very close to

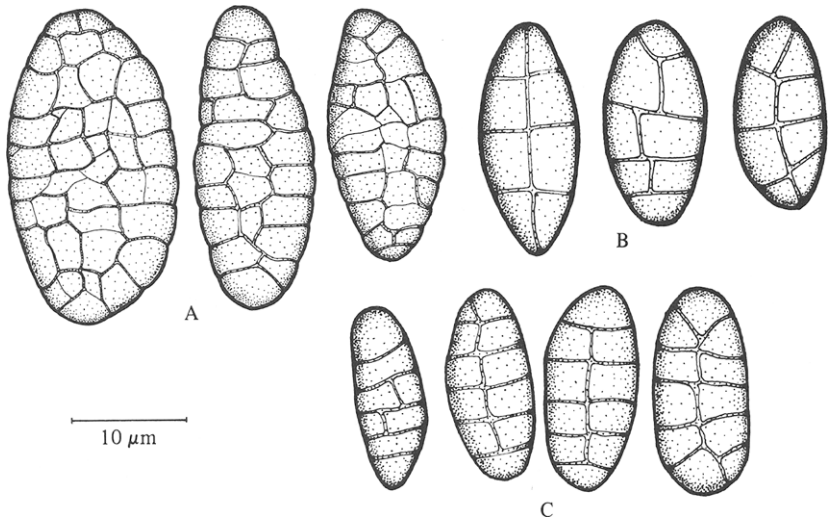

Fig. 5. Ascospores of some *Capronia* species. (A) *C. acutiseta*; (B) *C. potentillae*; (C) *C. mansonii*.

Rhinocladiella spinifera (Nielsen & Conant) de Hoog, but the conidia are somewhat smaller and the *Exophiala* state has not been observed.

Capronia pilosella (Karst.) comb.nov. (Figs 1B, 4D, E, H, 7B)

Sphaeria pilosella Karst., *Mycol. Fenn.* **2**: 96 (1873).
Melanomma pilosella (Karst.) Karst. apud Saccardo, *Syll. Fung.* **2**: 114 (1883).
Herpotrichiella pilosella (Karst.) Munk, *Dansk Bot. Ark.* **17** (1): 438 (1957).
Anamorph: *Cladosporium*-like, cf. *Heteroconium chaetospira* (Grove) M. B. Ellis
Description: see Munk (1957) and Barr (1972).

Characteristics of cultures. *Colonies* grown for 2 weeks on CMD and PDA at 15–18° or an MA at room temperature (18–22°) in diffuse daylight. Barely growing away from the original inoculum, velvety, aerial hyphae very short, erect, olivaceous. *Conidiophores* forming a continuous lawn, mononematous and macronematous, sparingly branched or unbranched, up to 750 μm long, producing conidia at irregularly spaced intervals. Conidia forming in acropetal succession, held in long, dry, branching chains of sometimes more than 50, ellipsoidal to fusiform, 7·5–17 × 2·5–4 μm, unicellular, occasionally bicellular, with a cicatrized basal abscission scar and 1–2 cicatrized apical scars.

On decorticated wood of various plants, including *Alnus*, *Betula*, *Carpinus*, *Nothofagus*, *Salix*, *Quercus*.

Specimens examined: Switzerland: Kt, Zürich, Zweidlen, on rotting wood of *Carpinus* and *Quercus*, 10 May 1979, June 1980, June 1982, E. Müller, O. Petrini (ZT); Kt. Ticino, Piora, Orello, *ca* 2000 m.a.s., on rotting wood of *Alnus viridis*, 19 July 1983, L. Petrini (ZT). New Zealand: South Island, Buller, Nelson Lakes National Park, Lake Rotoiti, on decorticated wood of *Nothofagus* sp., 24 May 1983, G. J. Samuels, T. Matsushima & A. Y. Rossman (PDD 44136, BPI).

As mentioned by Barr (1972), the fusoid to clavate-fusoid ascospores of *Capronia pilosella* may occasionally form vertical septa in mid-segments, the length of the ascospore may vary considerably within a single collection; similarly, the number of transverse septa varies from one to three.

Dictyotrichiella semiimmersa Candoussau & Sulmont (Candoussau & Sulmont, 1971) is likely to be a synonym of *C. pilosella*; however, cultural work is necessary to confirm this.

Capronia pinicola O. Petrini & P. J. Fisher, sp.nov. (Figs 3, 4C, 7A)

Anamorph: *Helicodendron pinicola* Goos, Abdullah, Fisher & Webster (1985).
Ascomata solitaria, ovoidea vel piriformia, ostiolo praedita, aetate provecta brunnea vel nigra, 100–150 × 80–100 μm, rigidis, brunneis, usque ad 30 μm longis setis praedita. Ostiolum periphysato. Paries ascomatis 8–15 μm crassa, duobus stratis composita, exteriori cellulis applanatis, interiori cellulis texturam prismaticam generantibus. Asci bitunicati, saccati, octospori, 65–80 × 17–21 μm. Ascosporae brunneae, fusiformes, uniseptatae, ad septum constrictae, crassitunicatae, 17–26 × 6–8 μm; paries ascosporarum interdum sulcis ornata. Paraphyses desunt.

Status anamorphosis ad *Helicodendron* pertinens. Ad lignum sine cortice *Pini* in flumine immersum, Pakistan, Lahore, IMI 308599 holotypus.

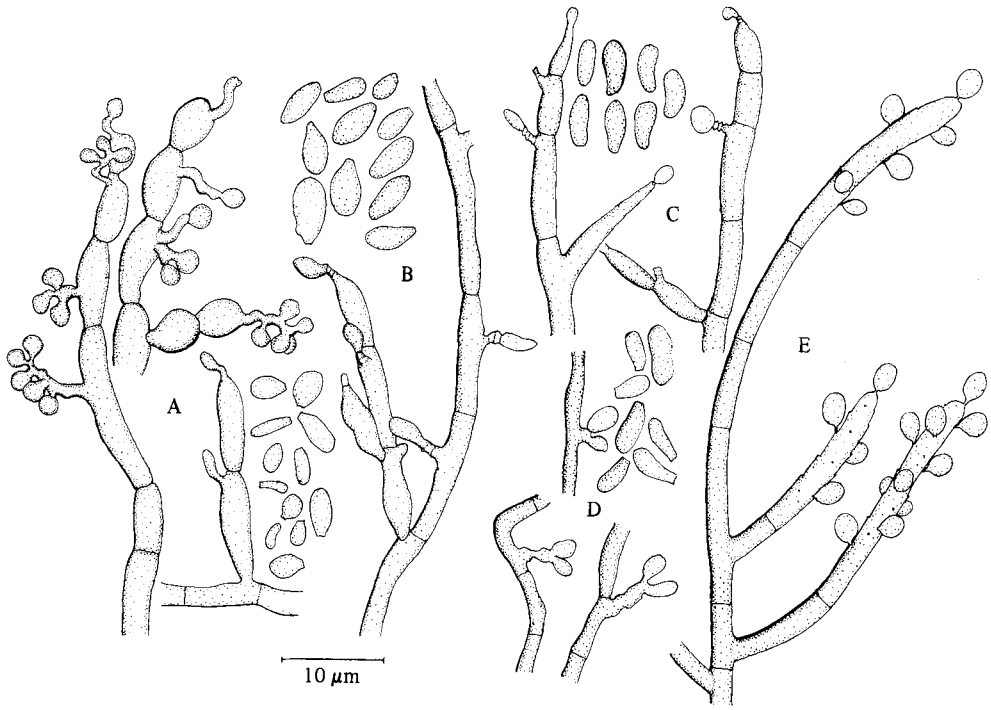

Fig. 6. (A) *Exophiala* anamorph of *Capronia acutiseta*; (B) *Exophiala* anamorph of *C. coronata*; (C) *Exophiala* anamorph of *C. spinifera*; (D) *Exophiala* anamorph of *C. villosa*; (E) *Rhinocladiella* anamorph of *C. parasitica*.

Ascomata solitary, scattered, ovate to piriform, brown to black when ripe, not changing colour in 3% KOH, 100–150 × 80–100 μm, with stiff, erect, acute, brown, up to 30 μm long setae arising from almost the entire surface of the ascomatal wall, ostiolate, the ostiolum beset with periphysis-like, hyaline bristles. Cells at surface of the ascomatal wall angular. Peridium thin, 8–15 μm, the outer region composed of flattened cells, the inner layer of cells forming textura prismatica, subhyaline. *Asci* saccate, bitunicate, with a thick, elongated endoascus, 8-spored, 65–80 × 17–21 μm. *Ascospores* brown, fusoid, 2-celled, constricted at the septum, sometimes wall slightly ridged, thick-walled, 17–26 × 6–8 μm. Interthecial filaments lacking.

Colonies slow-growing, up to 40 mm in 2 weeks on 2% MA at 17°, at the beginning white, grey-olive to brown when old, anamorph sporulating abundantly on 0·1% MA after about 1 month. After 2–3 months the teleomorph was also formed in culture. *Conidiophores* mononematous, macronematous, usually short, or sometimes longer, then seceding readily when mature, pale brown. *Conidia* formed in acropetal chains, readily deciduous, slightly brown, coiled in a 3-dimensional helix (Goos, Abdullah, Fisher & Webster, 1985), up to 5–6 spirals, or straight, branching.

Capronia spinifera (Ell. & Everh.) comb.nov. (Figs 4L, 6C)

Melanomma spiniferum Ell. & Everh., *North American Pyrenomycetes*: 184 (1895).

Herpotrichiella spinifera (Ell. & Everh.) Barr, *Rhodora* **65**: 300 (1963).

Anamorph: *Exophiala* sp.

Description: Bigelow & Barr (1963).

Characteristics in culture. *Colonies* slow-growing, barely growing away from original inoculum in 14 d at 17° on 2% MA, olive-green to black, with almost no aerial mycelium, colony reverse olive-black. Odour and exudates absent. *Conidiophores* mononematous; micronematous or macronematous, pale brown, sparingly branched, or unbranched; conidiogenous cells integrated or terminal, cylindrical, 5–10 × 2–3 μm, sometimes integrated within the hyphae; conidia apparently produced holoblastically; conidiogenous cells proliferating percurrently, with up to 3–4 annellations. *Conidia* ellipsoidal to dacryoid, base truncate, unicellular, hyaline to pale olivaceous, 3–5 × 1·5–2·5 μm.

Known to grow hypersaprobically on old resupinate basidiomycetes, Europe, North America.

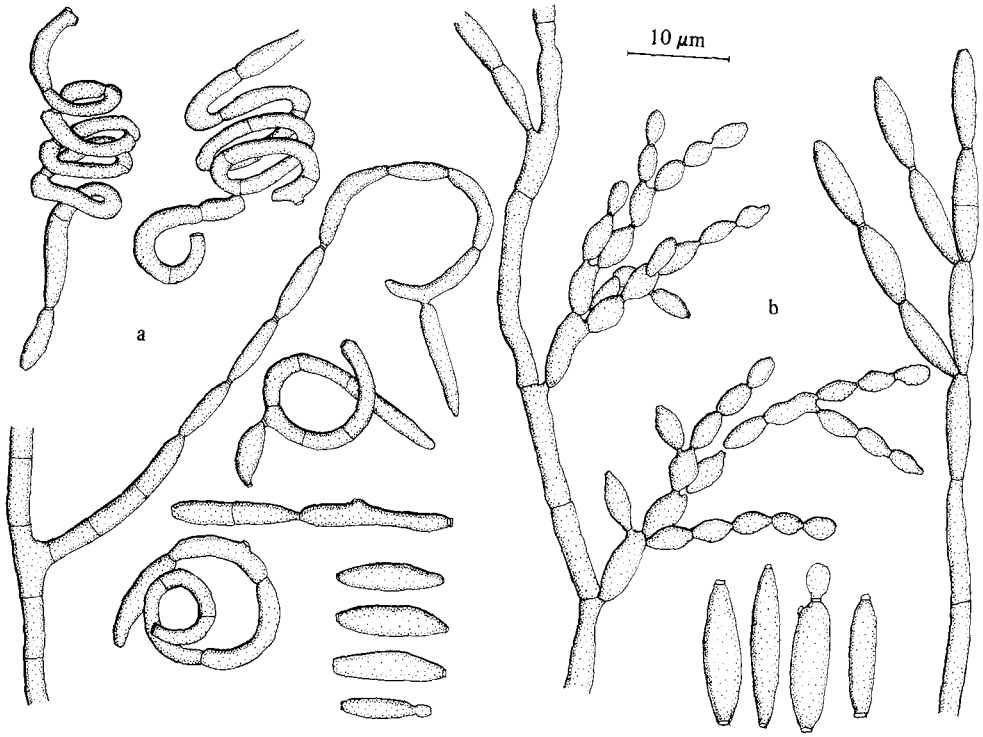

Fig. 7. (A) *Helicodendron* anamorph of *Capronia pinicola*; (B) *Cladosporium*-like anamorph of *C. pilosella*.

Specimen examined: France: Orthez 64, Loubieng, près de la ferme Carnaval, on *Stereum fuscum*, J. Vivant, 24 Aug 1984 (ZT).

Herpotrichiella porothelia (Berk. & Curt.) Barr (*Rhodora* **78**: 57 1976), is likely to be a synonym of *C. spinifera*. However, cultural work is necessary to confirm this.

Capronia villosa G. J. Samuels, sp.nov. (Figs 4G, 6D)

Anamorph: *Exophiala*

Ascomata solitaria, partim immersa vel superficialia, globosa, 160–300 μm diam, nigra ostiolata, papillis ostiolo non praedito sed periphysato, rigidis, erectis, apice obtusis, simplicibus, valde brunneis setis 15–40 μm longis alque 3 μm crassis praedita. Paries ascomatis ad 20 μm crassa, singulo strato cellularum angularium composita. Asci clavati, bitunicati, polyspori, (35–) 37–53 (–65) × 10–14 (–15) μm. Ascosporae fusiformes ad cylindraceae, (1–) 3–5 transversalibus septis praeditae, tenuiter vel haud ad septa constrictae, (8·5–) 11–15·5 (–19) × (2·5–) 3–3·5 (–4) μm.

Conidiophora mononematosa, micronematosa, cellulae conidiogenae in hyphis integratae, lateraliter conidiogenum locum ferentes. Conidia sympodialiter holoblasticeque generata, elliptica vel elongata, interdum curvata, pallide olivacea, basi truncata.

Ad lignum sine cortice, Nova Zelandia, in regione dicta Westland, in silva Central Granville State (SF47), 7 vel 8 maio 1974, G. J. Samuels (74–66), PDD 36629, holotypus.

Ascomata solitary, scattered, partially immersed to superficial, globose, non-papillate, fleshy, not collapsed when dry, black, not changing colour in 3% KOH, 160–300 μm diam, with stiff, erect, unbranched, dark brown setae arising from upper half of ascomatal wall; setae 15–40 mm long and *ca* 3 μm wide, cylindrical, tip round, unbranched, septate, wall 0·5–1 μm thick. Cells at surface of ascomatal wall angular, 5–7 μm across, wall less than 0·5 μm thick. Ascomatal wall *ca* 20 μm wide, comprising a single region of angular cells, 5–7 × 3–5 μm, walls less than 0·5 μm thick, pigmented, ascomatal apex composed of a palisade of narrow hyphal elements, merging with periphysoidal elements within. Periphysoidal elements arising from a meristem in the upper half of the inner ascomatal wall and ostiolar canal; cells of meristem angular, *ca* 3 μm across, thin-walled, non-pigmented; periphysoidal elements short and stout below, becoming longer and 1 μm wide in the ostiolar canal. *Asci* clavate, (35–) 37–53 (–65) × 10–14 (–15) μm, bitunicate, wall thicker above than below, polysporous, ascospores completey filling each ascus. *Ascospores* narrowly fusi-

form to cylindrical, (8·5–) 11–15·5 (–19) × (2·5–) 3–3·5 (–4) μm with (1–) 3–5 transverse septa, slightly or not constricted at the septa; eguttulate or with a single, large guttule in most cells, smooth, pale olivaceous.

Colonies grown for 3 weeks at 20°, 12 h darkness and 12 h near + cool white fluorescent light on CMD, PDA and OA, 7 mm diam, flat opaque olivaceous, black in reverse, aerial mycelium as short, acute hyphal rope-like strands. Conidia forming abundantly on OA and CMD, less well on PDA; conidiophores mononematous, micronematous; conidiogenous cells integrated within hyphae. Each conidiogenous cell consisting of a hyphal cell with a cylindrical, lateral, conidiogenous outgrowth, 2–10 μm long × 1–1·5 μm wide. *Conidia* arising holoblastically, conidiogenous cell proliferating sympodially, conidia readily dislodged, elliptical to oblong, sometimes curved, with a flat, 1 μm wide base, unicellular, smooth, pale olivaceous, (3·0–) 3·3–4·7 (–6·0) × (1·0–) 1·3–1·9 (–2·0) μm.

DISCUSSION

As more species have become known it has become apparent to us that the genera of the Herpotrichiellaceae as described cannot be reliably separated. It is a case of 'single character taxonomy'. *Berlesiella fungicola* Samuels & Müller (1978) combines the diagnostic characters of *Berlesiella* (as stroma) and *Herpotrichiella* (transversely septate ascospores). In a recent collection of *Berlesiella nigerrima* (Blox.) Sacc. (Fig. 4A, B) we found dictyosporous ascospores, characteristic of *Dictyotrichiella*, in a non-stromatic ascoma (*Berlesiella*); in a second collection the dictyosporous ascospores were associated with a stromatic ascoma. Ascospores of *Herpotrichiella pilosella* (Fig. 4D, E, H) are mostly transversely pluriseptate, but occasionally longitudinal septa occur in one or two of the central segments, thus indicating that the species is intermediate between *Herpotrichiella* and *Dictyotrichiella*. *Herpotrichiella* and *Polytrichiella* are separated by the number of ascospores found in the ascus, eight and sixteen to thirty-two respectively. *Dictyotrichiella* and *Capronia* are separated on the same basis. In other families the ascospore number alone is no longer considered to be a generic determinant, e.g. Sordariaceae, Lundqvist (1972), Dimeriaceae, Döbbeler (1978).

The genus *Acanthostigmella* v. Höhn., included in Herpotriciellaceae by Barr (1977), differs from the other taxa in having lightly coloured ascomata and ascospores and lightly coloured superficial mycelium. Otherwise species of *Acanthostigmella* agree well morphologically with species of *Herpotrichiella*. The anamorph of *Acanthostigmella brevispina* Barr & Rogerson differs from other known anamorphs within Herpotrichiellaceae by the formation of *Cercosporella*-like conidia: we therefore consider *Acanthostigmella* to be a distinct genus.

Most anamorphs of Herpotrichiellaceae belong to the *Rhinocladiella–Ramichloridium–Exophiala* complex. Some of them resemble, or are identical to, known species, others seem to represent new taxa.

Rhinocladiella Nannfeldt, *Ramichloridium* Stahel, *Exophiala* Carmichael, and *Xenosporium* Penz. & Sacc. are separated mainly on the basis of conidiophore differentiation: in *Ramichloridium* the conidiophores are clearly distinct from vegetative hyphae, in *Rhinocladiella* they resemble them closely (de Hoog, 1977). Some species which belong to these two genera form additional spores annellidically (percurrently) through the scars of the previously liberated conidia. For the latter kind of development, which may also occur independently without holoblastic sympodial proliferation, the genus name *Exophiala* is available. For *Dictyotrichiella mansonii* Schol-Schwarz (Schol-Schwarz, 1968) and *Berlesiella fungicola* Samuels & Müller (Samuels & Müller, 1978) with their *Rhinocladiella* or *Ramichloridium* anamorphs a close relationship seems likely. Both have anamorphs with holoblastic-sympodial and percurrent conidiogenesis. *Acanthostigmella brevispina* Barr & Rogerson (Barr & Rogerson, 1983) is said to have a conidial state similar to *Rhinocladiella*. The published illustration, however, suggests a *Cercosporella*-like fungus. For *Acanthostigmella thaxteri* Linder (Linder, 1929) the author tentatively suggested a *Xenosporium* anamorph. As that connexion has never been proved in pure culture, we do not discuss it further.

In a second group of anamorphs, including three strains of *Herpotrichiella pilosella* and one of *C. pinicola* originating from quite different localities, acropetal chains of unicellular conidia are produced. Three of them are similar to *Cladosporium*, the fourth has been placed in *Helicodendron* Peyronel. *Rhinocladiella* species may also form acropetal chains of conidia, a third, pleomorphic state; therefore these anamorphs may have been derived from *Rhinocladiella* by the suppression of the holoblastic-sympodial and the percurrent states, thus showing some relationship to the *Rhinocladiella–Ramichloridium* complex.

Catenate conidial forms have recently been discussed by Goos, Abdullah, Fisher & Webster (1985) and de Hoog, Rahman & Boekhout (1983). Both publications demonstrate that the morphologically similar imperfect forms of these genera are not closely related because some of the species considered represent anamorphs of several unre-

lated ascomycetes. Species of *Helicodendron* are known to be anamorphs of some inoperculate discomycetes in the genera *Mollisia* (Fr.) Karst., *Hymenoscyphus* Gray, and *Lambertella* v. Höhn. besides *Capronia pinicola*. Members of the *Ramichloridium–Rhinocladiella* complex are also known for the Dimeriaceous *Wentiomyces javanicus* Koorders (Joly, 1965).

The *Cladosporium*-like anamorph of *Herpotrichiella pilosella* does not seem closely related to the *Helicodendron*-anamorph of *Capronia pinicola*. However, the disintegration of the conidial chains and the connexions of the very similarly shaped conidia are similar. The only difference is thus manifested by the coiled habitat of the chains of *Capronia pinicola* versus the more or less straight chains produced by *Herpotrichiella pilosella*.

Results from this and previous investigations on teleomorph–anamorph connexions do not support the present taxonomic grouping of the Herpotrichiellaceae, since in some cases clear gaps are lacking or the differentiation is based on inadequate characters. On the basis of these considerations we now propose to include only the genera *Capronia* and *Acanthostigmella* in the Herpotrichiellaceae.

ACANTHOSTIGMELLA v. Höhn., *Annls Mycol.* **3**: 327 (1905).

According to Barr's (1977) description, *Acanthostigmella* includes species with lightly-coloured ascomata and ascospores as well as lightly-coloured mycelium.

CAPRONIA Sacc., *Syll. Fung.* **2**: 288 (1883).

Berlesiella Sacc., *Rev. mycol.* **10**: 7 (1888).
Caproniella Berl., *Icones Fungorum:* 2 (1896).
Dictyotrichiella Munk, *Dansk Bot. Ark.* **15** (2): 132 (1953).
Didymotrichiella Munk, *Dansk Bot. Ark.* **15** (2): 131 (1953).
Herpotrichiella Petrak, *Annls Mycol.* **12**: 472 (1914).
Polytrichiella Barr, *Contr. Mich. Herb.* **9**: 616 (1972).

Type species *Capronia sexdecemspora* (Cooke) Sacc.

Capronia includes species with dark ascomata, occasionally seated on or immersed in a stromatic structure; the ascospores are fusoid, cylindric, or ellipsoidal, one- to pluriseptate, phragmosporous or dictyosporous. The asci are octosporous or plurisporous.

KEY TO SPECIES OF *CAPRONIA*

1. Ascospores fusoid, clavate-fusoid, or cylindric, relatively narrow (length:width ratio clearly larger than 2), with one to several transverse septa and occasionally with additional longitudinal or oblique septa . . . 2
1. Ascospores ellipsoid, rarely somewhat clavate, relatively broad (length:width ratio close to 2), always dictyosporous 19
2. Asci containing 8 ascospores 3
2. Asci containing more than 8 ascospores 16
3. Ascospores always with one transverse septum 4
3. Ascospores – at least partially – with more than one transverse septum 6
4. Ascospores with a garland of needle-shaped appendages at the ends, 20–28 × 7–10 μm; on wood in sea-water *C. ciliomaris*
4. Ascospores without appendages, ascospores shorter and narrower; on wood but not marine . . . 5
5. Ascospores small, 7–8 × 3–3·5 μm . . . . . *C. inconspicua*
5. Ascospores comparatively large, 17–26 × 6–8 μm, with dark longitudinal stirpes (Fig. 4C) . . *C. pinicola*
6. Ascospores with transverse septa only 7
6. Ascospores with transverse and longitudinal or oblique septa 14
7. Ascospores with 1–3 transverse septa 8
7. Ascospores with more than 3 transverse septa 13
8. Ascomata ornamented with dark protruding cells (Fig. 1A), and sometimes with short, dark setae; ascospores fusoid, 9–16 × 3·5–4 μm; on pyrenomycetes and resupinate basidiomycetes . . *C. parasitica*
8. Ascomata with stiff, acute, black setae (occasionally mixed with some dark protruding cells). . . 9
9. Ascomata with short and stout, sharply pointed setae surrounding the ostiolar pore; ascospores fusoid, 10–15 × 4–4·5 μm; on old resupinate basidiomycetes . . . . . *C. spinifera*
9. Ascomata with long, stiff, black setae at least on the upper half of the ascoma; on wood 10
10. Ascospores comparatively narrow, cylindrical, with broadly rounded ends, 10–14 × 3–4 μm; on wood *C. moravica*
10. Ascospores wider, up to 5–6 μm 11
11. Ascospores 18–21 × 3·5–5 μm; ascomatal setae short and thick (15–27 × 6–7·5 μm); on dead stems of *Saxifraga* *C. setosa*
11. Ascospores shorter; ascomatal setae longer 12

12. Ascospores 10–15·5 × 2–5 μm; on wood . . . . . *C. coronata*
12. Ascospores 12–16 × 4–6 μm; on wood . . . . . *C. pilosella*
13. Ascospores 1–7 septate, 13–33 × 3–5·5 μm, fusoid, straight to curved; on dead leaves of ericaceous plants *C. fusispora*
13. Ascospores 5–7 septate, 17–25 × 3–5 μm; ascomata with short setae surrounding the ostiolar pore, otherwise only with dark, protruding cells; on old pyrenomycetous ascomata . . . . . *C. fungicola*
14. Ascomata closely aggregated to form a compact stroma, rarely also solitary and nonstromatic; ascospores fusoid-clavate, with 3–5 transverse septa and middle cells often longitudinally septate, 15–22 × 5–6 μm; on old pyrenomycetous stromata . . . . . *C. nigerrima*
14. Ascomata non stromatic. 15
15. Ascospores fusoid-clavate, with 5 transverse septa and one longitudinal septum in the middle cell, 10–11 × 3–4 μm; on wood . . . . . *C. pulcherrima*
15. Ascospores fusoid, with 3 transverse septa, occasionally with a longitudinal septum in one of the middle cells, 12–16 × 4–6 μm; on wood . . . . . *C. pilosella*
16. Asci generally 32-spored 17
16. Asci generally 16-spored 18
17. Ascospores with 1–3 septa, less than 18 μm long (6–18 × 2–7 μm); on woody ericaceous shrubs . *C. polyspora*
17. Ascospores with 3–5 septa, longer than 18 μm (8·5–19 × 2·5–4 μm); on wood . . . . . *C. villosa*
18. Ascospores 1-septate, 17·5–27·5 × 1–2·5 μm, fusoid usually curved, upper cell broader than the lower; on overwintered plants . . . . . *C. albimontana*
18. Ascospores with 5–7 (occasionally with 3–5) septa, 40–60 × 2·5 μm; on old stems . . . *C. longispora*
19. Asci with up to 8 ascospores 20
19. Asci with more than 8 ascospores 22
20. Asci always with 8 ascospores 21
20. Asci with 3 to 8 ascospores; ascospores with 4–5 transverse and 1–2 longitudinal septa, 14–27 × 11–14 μm; on decorticated wood . . . . . *C. acutiseta*
21. Ascospores pale grey, with 3–4 transverse and 1–2 longitudinal or oblique septa, 14–17 × 8–10 μm; on old hairy leaves . . . . . *C. potentillae*
21. Ascospores brown, with 4–5 transverse septa and 1 longitudinal septum, 15–26 × 7–11 μm. . *C. mansonii*
22. Majority of asci containing 32 ascospores; ascospores elliptic-fusoid, dull greyish or brown, with 3–7 transverse or oblique septa and with a longitudinal septum in each portion, 15–22 × 5–9 μm. *C. irregularis*
22. Majority of asci containing 16 ascospores 23
23. Ascospores hyaline, with 5 transverse and 1–3 longitudinal septa, 18–20 × 5 μm . . . *C. sexdecemspora*
23. Ascospores distinctly coloured, with fewer than 5 transverse septa 24
24. Ascospores greyish, ovate, with 3–5 transverse septa and a longitudinal septum in some median segments, 15–20 × 7–10 μm . . . . . *C. juniperi*
24. Ascospores brownish, broadly ellipsoidal, somewhat constricted at the septa, 14–18 × 6–8 μm *C. pleiospora*

NEW COMBINATIONS

Capronia albimontana (Barr) comb.nov.

Polytrichiella albimontana Barr, *Contr. Univ. Michigan Herb.* **9**: 617 (1972).

C. ciliomaris (Kohlmeyer) comb.nov.

Herpotrichiella ciliomaris Kohlmeyer, *Nova Hedwigia* **2**: 316 (1960).

C. fusispora (Barr) comb.nov.

Herpotrichiella fusispora Barr, *Contr. Inst. Bot. Univ. Montréal* **73**: 28 (1959).

C. inconspicua (Munk) comb.nov.

Didymotrichiella inconspicua Munk, *Dansk Bot. Ark.* **15** (2): 132 (1953).

C. longispora (Barr) comb.nov.

Polytrichiella longispora, Barr, *Contr. Univ. Michigan Herb.* **9**: 617 (1972).

C. mansonii (Schol-Schwarz) comb.nov. (Fig. 5C)

Dictyotrichiella mansonii Schol-Schwarz, *Anton. van Leeuwenhoek* **34**: 122 (1968).

C. moravica (Petrak) comb.nov.

Herpotrichiella moravica Petrak, *Annls Mycol.* **12**: 472 (1914).

C. polyspora (Barr) comb.nov.

Herpotrichiella polyspora Barr, *Contr. Inst. Univ. Montréal* **73**: 29 (1953).

C. potentillae (E. Müller) comb.nov. (Fig. 5B)

Dictyotrichiella potentillae E. Müller, *Sydowia* **18**: 98 (1965).

C. pulcherrima (Munk) comb.nov.

Dictyotrichiella pulcherrima Munk, *Dansk Bot. Ark.* **15** (2): 132 (1953).

C. setosa (Barr) comb.nov.

Herpotrichiella setosa Barr, *Contr. Inst. Bot. Univ. Montréal* **73**: 28 (1959).

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