



Towards a natural classification of Dothideomycetes 7: The genera *Allosoma*, *Austropleospora*, *Dangeardiella*, *Griggsia* and *Karschia* (Dothideomycetes *incertae sedis*)

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Abstract

This is the seventh of a series of papers in which we report on re-examination of herbarium types of Dothideomycetes genera, *incertae sedis*. By examining and re-describing the generic types which are not previously illustrated or are poorly described, we attempt to propose their familial and higher placement according to the morphology based on modern taxonomic concepts. In this paper the type specimens of *Allosoma*, *Austropleospora*, *Dangeardiella*, *Griggsia* and *Karschia* were re-examined and are illustrated. An overview of the history and descriptions and illustrations of these genera are provided. Based on morphological similarities, *Allosoma* is placed in Englerulaceae, while *Austropleospora* and *Karschia* are transferred to Pleosporaceae, and Lichenotheliaceae, respectively. *Dangeardiella* is classified in Pleosporales, genera *incertae sedis*, while *Griggsia* is placed in Sordariomycetes, genera *incertae sedis* as it is not typical of any existing family of Dothideomycetes as it has unitunicate asci. Recollection, epitypification and multi-gene molecular analyses are needed for all type species of these genera in order to resolve their familial status. By illustrating and re-describing the type species, we expect to stimulate interest for these fungi to be recollected, sequenced and placed in a natural taxonomic framework in the Ascomycota.

Key words: Ascomycota, Dothideomycetes, Englerulaceae, Lichenotheliaceae, Pleosporaceae, morphology

Introduction

Dothideomycetes, the most diverse class in the Phylum Ascomycota include saprobes, phytopathogens, endophytes, epiphytes, fungicolous, lichenized, or lichenicolous fungi that occur in terrestrial, freshwater and marine habitats (Kirk *et al.* 2008, Hyde *et al.* 2013). Lumbsch & Huhndorf (2010) included two subclasses as well as numerous families under eleven orders within the Dothideomycetes and 34 unclassified families with over 175 genera in Dothideomycetes *incertae sedis*. Hyde *et al.* (2013) accepted 22 orders and 105 families within the Dothideomycetes and included 26 families under Dothideomycetes *incertae sedis*.

We are studying the genera placed in Dothideomycetes, genera *incertae sedis* (Ariyawansa *et al.* 2013, Ariyawansa *et al.* 2014, Dai *et al.* 2014b, Li *et al.* 2014, Tian *et al.* 2014, Thambugala *et al.* 2014). These genera have generally been poorly described, often not previously illustrated and are poorly known. In order to stimulate interest in recollection and sequencing of these genera we have re-examined, illustrated and re-described the types. In this study we treat the poorly known genera *Allosoma*, *Austropleospora*, *Dangeardiella*, *Griggsia* and *Karschia* and place them in a natural taxonomic framework in the Ascomycota. *Allosoma* is placed in Englerulaceae, while *Austropleospora* and *Karschia* are transferred to Pleosporaceae and Lichenotheliaceae respectively. *Dangeardiella* is classified in Pleosporales, genera *incertae sedis*, while *Griggsia* is included in Sordariomycetes *incertae sedis* as it is not typical of any existing family of Dothideomycetes due to its unitunicate asci.

Materials and Methods

Examination of herbarium material

The type specimens of *Allosoma*, *Austropleospora*, *Dangeardiella*, *Griggsia* and *Karschia* were loaned from GZU, BRIP, NY and S. Ascomata were rehydrated in 5% KOH prior to examination and sectioning. Specimens were examined under a stereo microscope (Motic SMZ -168) and fine forceps were used to remove one or two ascomata, which were mounted in water. Hand sections were cut with a sharp razor blade and thin (8–12 µm) sections were cut using a LEICA CM1850 freezing microtome. The sections were transferred to a drop of water or a drop of cotton blue for examination. Observations and photomicrographs were made from material mounted in water using a Nikon ECLIPSE 80i light microscope with a Cannon 450D digital camera. Indian ink was added to water mounts to detect the presence of gelatinous sheaths or ascospore appendages. Measurements were made with Tarosoft (R) Image Frame Work (Liu *et al.* 2012).

Results and Discussion

Taxonomy

Genus and type species descriptions are given unless the genus is monotypic when only the species description is given.

Englerulaceae Henn., Hedwigia 43: 353 (1904)

MycoBank: MB 80736

The family Englerulaceae was introduced by Hennings (1904) and typified with *Englerula macaranga*. Lumbsch & Huhndorf (2010) included Englerulaceae in Dothideomycetes, families *incertae sedis* with seven genera, while Hyde *et al.* (2013) treated this family with eleven genera. The family is characterized by septate, irregularly to reticulately branched hyphae, ellipsoid to globose, cupulate, non-ostiolate ascomata, bitunicate, asci and 1-septate ascospores (Hyde *et al.* 2013, Dai *et al.* 2014a). Putative asexual states are coelomycetous or hyphomycetous and reported in the genera *Digitosarcinella*, *Krishnamyces*, *Mitteriella* and *Questieriella* (Hyde *et al.* 2013).

Allosoma Syd., Anns mycol. 24(5/6): 353 (1926)

MycoBank: MB 143

Parasitic or saprobic on leaves and wood in terrestrial habitats. Sexual state: *Ascomata* superficial, sub-circular, uni or multi-loculate, appressed hyphal peridium, branched, septate, dark brown to black, with papillae-like outgrowth in the central region. *Hamathecium* lacking pseudoparaphyses. *Asci* 8-spored, bitunicate, globose-subglobose, thick-walled, apedicellate, without a well-developed ocular chamber. *Ascospores* multi-seriate, broadly ellipsoid, ends rounded, brown to dark brown, 1-septate, constricted at the septum, smooth-walled. Asexual state: hyphomycetous, “*Acrodesmis*”. *Conidiophores* formed on sexual ascoma, erect, straight or flexuous, elongate, dark brown, some branched at the apex, septate, thick-walled, smooth-walled. *Conidiogenous cells* polyblastic, integrated, terminal, sympodial, oblong, brown to dark brown and rough. *Conidia* ellipsoid to oblong, rounded at the apex, slightly tapered at the base, aseptate, hyaline and smooth-walled.

Type species:—*Allosoma cestri* Syd., Anns mycol. 24(5/6): 353 (1926) MycoBank: MB 260358. FIG. 1 a–q.

≡ *Acrodesmis cestri* Syd., Anns mycol. 24(5/6): 424 (1926), Index Fungorum number: IF 260357

≡ *Periconiella cestri* (Syd.) M.B. Ellis, Mycol. Pap. 111: 29 (1967), Index Fungorum number: IF 335847

Epiphytic on leaves. *Superficial hyphae* irregularly branched, anastomosing, septate. Sexual state: *Ascomata* 123–166 µm diam, superficial, sub-circular, subglobose, appressed hyphal peridium composed of few layers of polygonal cells, branched, septate, brown to dark brown. *Hamathecium* lacking pseudoparaphyses. *Asci* (32–)53–70 × (34–)41–51 µm (\bar{x} = 54 × 45 µm, n=10), 8-spored, bitunicate, globose-subglobose, thick-walled, apedicellate, without a well-developed ocular chamber. *Ascospores* 26–29 × 12–18 µm (\bar{x} = 28 × 14 µm, n=20), multi-seriate, conglobose, brown to dark brown, 1-septate, constricted at the septum, smooth-walled. Asexual state: hyphomycetous, *Acrodesmis cestri*. *Conidiophores* (59–)189–206 × 5–9 µm (\bar{x} = 178 × 9 µm, n=10), formed on sexual ascoma, erect, straight or flexuous, elongated, dark brown, some branched at the apex, septate, thick-walled, smooth. *Conidiogenous cells* polyblastic, integrated, terminal, sympodial, oblong, brown to dark brown and rough. *Conidia* 11–15 × 4–6 µm (\bar{x} = 13 × 5 µm, n=20), cylindrical to ovoid, elliptical or fusiform, rounded at the apex, slightly tapered at the base, aseptate, hyaline and smooth-walled (Figs. 1 o–q).

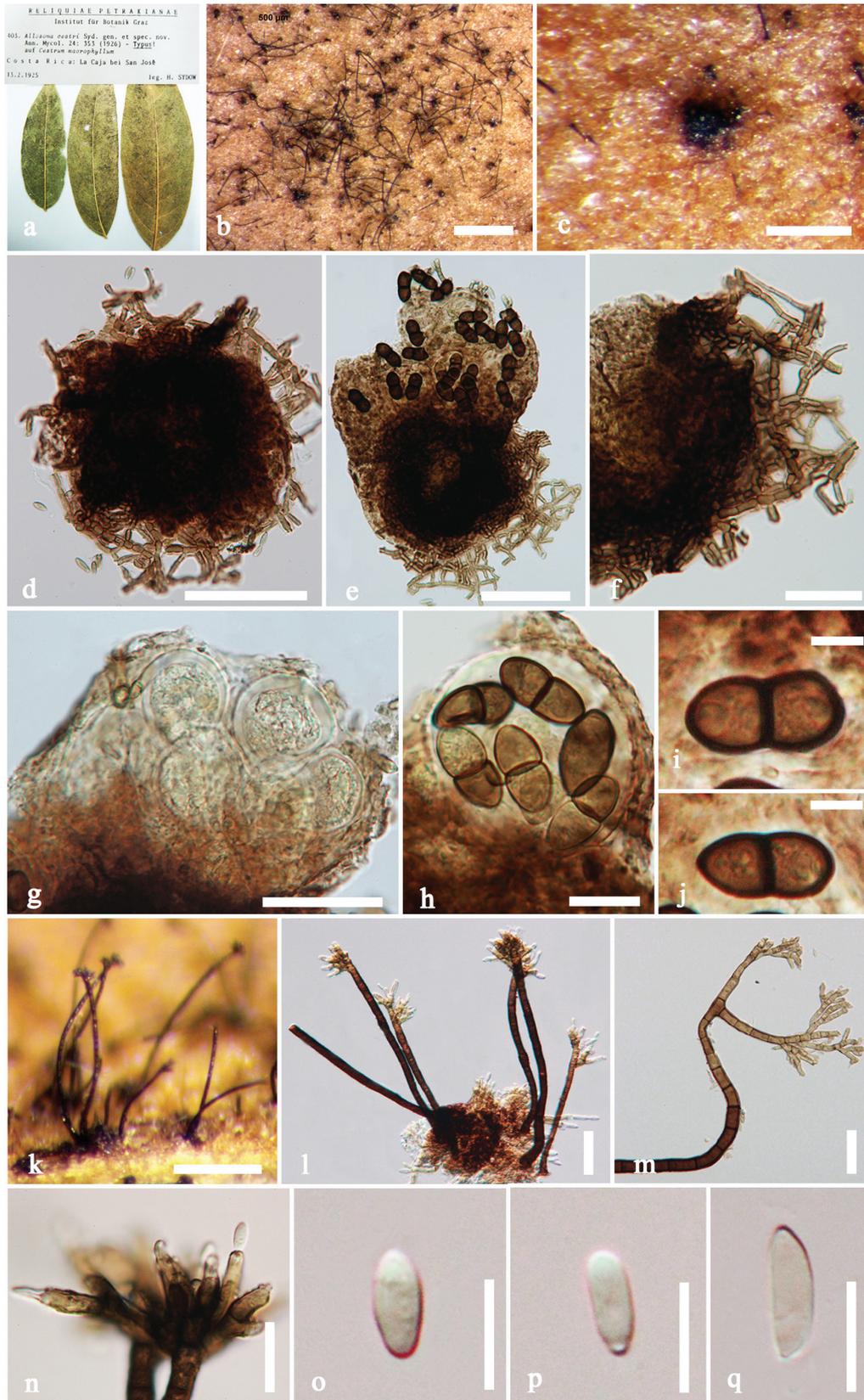


FIGURE 1. *Allosoma cestri* (= *Acrodesmis cestri*) (GZU157-80, holotype). a. Herbarium material. b. Appearance of sexual and asexual states on leaf. c. Close-up of ascoma. d–f. Squash mount of ascomata. g–h. Immature and mature asci. i–j. Ascospores. k–m. Conidiophores with apical conidia. n. Conidiogenous cells. o–q. Conidia. **Scale bars:** b = 500 µm. c, k = 200 µm. d, e, g = 100 µm. f, l, m = 50 µm. h, n = 20 µm. i–j = 10 µm. o–q = 5 µm.

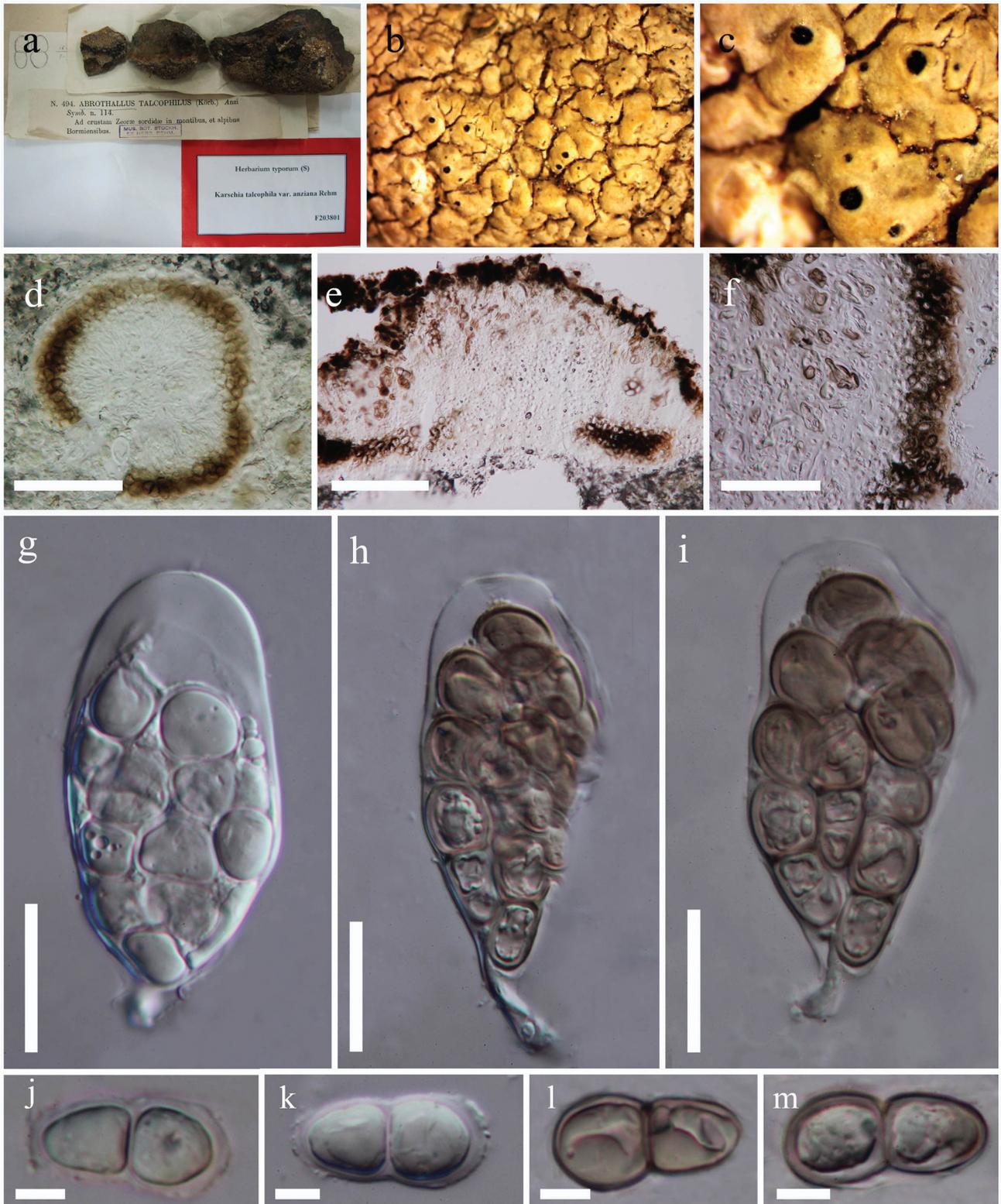


FIGURE 2. *Karschia talcophila* (S- F203801, holotype). A. Herbarium material. b–c. Ascostromata on substrate. d–e. Sections through ascomata. f. Peridium. g–i Bitunicate asci. j–m. Ascospores. **Scale bars:** d = 50 μ m, e = 100 μ m, f = 50 μ m, g–h = 20 μ m, j–m = 5 μ m.

Material examined:—COSTA RICA. La Caja bei San Jose, on leaves of *Cestrum macrophyllum* (Solanaceae), with its asexual morph: *Acrodesmis cestri* Syd., 13 February 1925, *H. Sydow* (GZU157-80!, holotype).

Notes:—*Allosoma* was introduced by Sydow (1926) as a monotypic genus to accommodate *Allosoma cestri* found on leaves of *Cestrum macrophyllum*. Thereafter, *A. quercifoliae* Bat. & Nascim, *A. arrabidaeeae* Bat. & J.L. Bezerra and *A. indicum* Tilak, S.B. Kale & S.V.S. Kale have been assigned to the genus (Index Fungorum 2013). *Allosoma indicum* occurs on dead stems (Tilak and Kale 1969), while other species are found on leaves. von Arx (1963)

placed *Allosoma* in Myriangiales, while Sivanesan (1984) categorized this genus under Englerulaceae, Capnodiales. Lumbsch & Huhndorf (2010) included *Allosoma* under Dothideomycetes, genera *incertae sedis*.

We examined and illustrated the type specimen of *Allosoma* and it shares common morphological characters with the generic type of Englerulaceae in having septate, irregularly to reticulately branched, hyphae, non-ostiolate ascomata, a hamathecium without pseudoparaphyses, obovoid to subclavate, globose to subglobose asci and fusiform, broadly ellipsoid to subobovoid, 1-septate, ascospores which are constricted at the septum. Therefore in this study we refer *Allosoma* in the family Englerulaceae based on morphological similarities with the generic type of Englerulaceae. Sydow (1926) also described the asexual state of *Allosoma cestri* (*Acrodesmis cestri*) which was found on the same leaves of *Cestrum macrophyllum*, but later Ellis (1967) accommodated it in Mycosphaerellaceae as *Periconiella cestri*. In our study we also observed the *Acrodesmis cestri* state (*Periconiella cestri*) on the herbarium material in close association with the sexual (*Allosoma cestri*) state. Although we cannot unequivocally show that these are the same fungus we believe it is highly likely (see Fig. 1b, c) and therefore we synonymise *Acrodesmis cestri* (*Periconiella cestri*) under *Allosoma cestri*.

Lichenotheliaceae Henssen, Syst. Ascom. 5: 137 (1986)

Mycobank: MB 81652

Henssen (in Eriksson & Hawksworth 1986) introduced Lichenotheliaceae for *Lichenothelia* and *Lichenostigma* and typified this family with *Lichenothelia scopularia*. The family is characterized as endolithic or epilithic when saxicolous, episubstratic or endokapyllic when lichenicolous, perithecioid ascomata with interascal filaments without an ostiole, globose to broadly clavate, asci and 1-septate to muriform ascospores (Hyde *et al.* 2013). Lumbsch & Huhndorf (2010) listed this family under Dothideomycetes, families *incertae sedis*, while Hyde *et al.* (2013) placed this family in a new order Lichenotheliales of the Dothideomycetes. Asexual states consist of black macroconidia, originating from the surface of superficial hyphae, immersed pycnidia in vegetative stromata and hyaline, non-septate and rod-shaped conidia (Hyde *et al.* 2013).

Karschia Körb., Parerga lichenol. (Breslau): 459 (1865)

Mycobank: MB 2545

Lichenicolous. Occurring on calcareous and non-calcareous rocks or loosely associated with algae. Sexual state: *Ascomata* solitary, scattered, immersed, cleistothecial, \pm globose or slightly flattened, black, coriaceous or carbonaceous, lacking ostioles, sometimes with interascal filaments. *Peridium* wide, generally several layers of lightly pigmented, dark brown to black, thick-walled cells of *textura globulosa*. *Asci* 8-spored, ascospores, clavate, sessile or short pedicellate. *Ascospores* crowded, overlapping, hyaline when immature, becoming brown at maturity, oblong to obovate with broadly rounded ends, 1-septate, the upper cells often slightly larger than the lower cells, constricted at the septum. Asexual state: Unknown.

Type species:—*Karschia talcophila* (Ach.) Körb., Parerga lichenol. (Breslau): 460 (1865) Mycobank: MB 237207. FIG. 2 a–m.

\equiv *Lecidea talcophila* Ach., Lich. Univ.: 183 (1810)

Lichenicolous. Occurring on calcareous and non-calcareous rocks. Sexual state: *Ascomata* 170–330 μm high, 200–480 μm wide (\bar{x} = 217 \times 360 μm , n=10), solitary, scattered, immersed, cleistothecial, \pm globose or slightly flattened, black, carbonaceous, lacking ostioles. *Peridium* 20–60 μm (\bar{x} = 33 μm , n=20), wide, generally several layers of lightly pigmented, dark brown to black, thick-walled cells of *textura globulosa*. interascal filaments not observed. *Asci* 40–80 \times 20–28 μm (\bar{x} = 57 \times 24 μm , n=20), 8-spored, ascospores, clavate, sessile or short pedicellate. *Ascospores* 17–22 \times 5.6–7.5 μm (\bar{x} = 18.5 \times 6.2 μm , n=30), crowded, overlapping, oblong to obovate with broadly rounded ends, hyaline when immature, becoming brown at maturity, 1-septate, the upper cells often slightly larger than the lower cells, constricted at the septum. Asexual state: Unknown.

Material examined:—ITALY. Lombardia, In alpinis Bormiensibus (S-F203801! holotype).

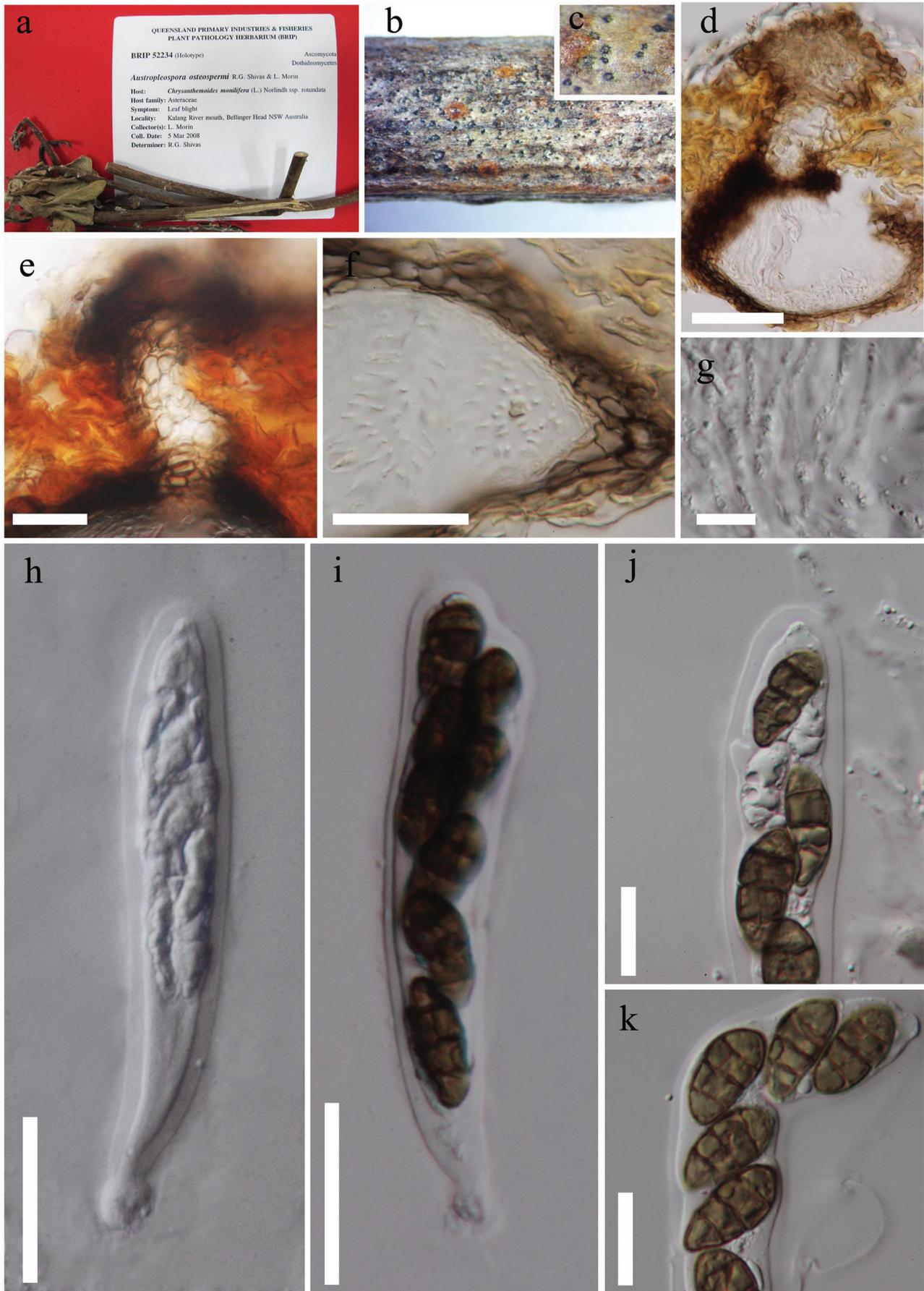


FIGURE 3. *Austropleospora osteospermi* (BRIP 52234, holotype) a. Herbarium material b–c. Ascomata on host surface d. Section through ascoma. e Section through ostiole. f. Peridium. g. Pseudoparaphyses h. Immature ascus. i. Mature bitunicate asci. j. Apex of ascus k.. Ascospores. Scale bars: d = 50 μ m, e–f = 25 μ m, g = 10 μ m, h–i = 25 μ m, j–k = 15 μ m.

Notes:—*Karschia* was introduced by Körber (1865) and is typified by *Karschia talcophila*. Various authors have placed this genus under Patellariaceae. Clements (1909) introduced a new genus *Epilichen* to accommodate the parasitic species which had been assigned to *Karschia* and the species with definite or evanescent thallus have been placed under *Buellia* (Butler 1940). Hafellner (1979) introduced *Colenioniella*, *Heterosphaeriopsis*, *Rhizodiscina*, *Schrakia* (Dothideales) and *Stratisporella* in order to accommodate several *Karschia* species and accepted only *K. talcophila* and newly described *K. santessonii* in *Karschia*. According to Hafellner (1979), *K. talcophila* shows similarities with *K. santessonii* in having stromatic development of pseudothecia, reticular paraphysoids, bitunicate asci and brown ascospores without a germ slit and differs in the size and the wall thickness of the spores. He transferred most *Karschia* species to *Buelliella*, *Cycloshizon*, *Dothidea*, *Eutrybliidiella*, *Gibbera*, *Poetschia*, *Pseudodiscus* and *Rhizogene* in the order Dothideales, and others described under *Buellia*, *Epilichen*, *Rhizocarpon*, *Rinodina* and *Dactylospora* in the order Lecanorales. Hawksworth *et al.* (1995) and Courtecuisse *et al.* (1996) included *Karschia* in Dothideales genera *incertae sedis*, while Kirk *et al.* 2008 and Lumbsch & Huhndorf (2010) classified this genus under Dothideomycetes, genera *incertae sedis*. Hawksworth *et al.* (1995) accepted two species in *Karschia*, while Kirk *et al.* (2008) included four. *Karschia* shows similar characters with Lichenotheliaceae in processing lichenicolous, episubstratic or endokaprylic, areolate thallus, fertile stromata of various shapes, lacking an ostiole, globose to broadly clavate asci and hyaline to brown, 1-septate ascospores (Hyde *et al.* 2013). Therefore we tentatively refer *Karschia* in Lichenotheliaceae pending a molecular investigation.

Pleosporaceae Nitschke, Verh. naturh. Ver. preuss. Rheinl. 26: 74 (1869)
MycoBank: MB 81188

The family Pleosporaceae was introduced by Nitschke (1869) based on the immersed ascomata and presence of pseudoparaphyses, which was assigned to Sphaeriales. Luttrell (1955) placed Pleosporaceae in the order Pleosporales. Multi-gene phylogenetic studies (Zhang *et al.* 2012, Hyde *et al.* 2013) has shown that the familial placement of Pleosporaceae in the order Pleosporales. Hyde *et al.* (2013) accepted 11 genera in Pleosporaceae. Pleosporaceae species are generally pathogens or saprobes on wood and dead herbaceous stems or leaves. This family is characterized by immersed to erumpent to nearly superficial, ostiolate ascomata, septate, cellular pseudoparaphyses, bitunicate, cylindrical asci and phragmosporous or muriform, brown or pale brown ascospores. Asexual states of Pleosporaceae are reported as coelomycetous or hyphomycetous, with phialidic, annellidic or sympodial blastic conidiogenous cells (Hyde *et al.* 2013).

Austropleospora R.G. Shivas & L. Morin, in Morin, Shivas, Piper & Tan, Fungal Diversity 40(1): 70 (2010)
MycoBank: MB 512742

Type species:—*Austropleospora osteospermi* R.G. Shivas & L. Morin, in Morin, Shivas, Piper & Tan, Fungal Diversity 40(1): 70 (2010)
MycoBank: MB513237. FIG. 3–4 a–q.
≡ *Hendersonia osteospermi* Wakef., Bull. Misc. Inf., Kew(5): 165 (1922)

Parasitic on stem and leaves of *Chrysanthemoides monilifera* (Asteraceae). Sexual state: *Ascomata* 75–110 µm high, 130–200 µm wide (\bar{x} = 100 × 146 µm, n=10), subglobose, sometimes slightly flattened, solitary or in groups, scattered, immersed immediately below the stem epidermis, ostiole 60–90 µm long, with a protruding neck. *Peridium* 8–18 µm (\bar{x} = 12 µm, n=10) composed of dark brown to black cells of *textura angularis*. *Hamathecium* of 2–3 µm wide, dense, filamentous, anastomosing, aseptate, hyaline pseudoparaphyses. *Asci* 75–120 × 13–18 µm (\bar{x} = 92 × 16 µm, n=20) bitunicate, fissitunicate, 6–8-spored, cylindrical to clavate, rounded at the apex and minute ocular chamber with a short, broad, pedicel. *Ascospores* 16.5–21 × 6–8.4 µm (\bar{x} = 18 × 7.7 µm, n=25) biseriate to overlapping uniseriate, ellipsoidal, yellowish brown, muriform, mostly 3 transverse septa, 0–2 longitudinal septa, slightly constricted at median septum, not or very slightly constricted at other septa, apex rounded to slightly tapered, base tapered to rounded, smooth. Asexual state: *Conidiomata* 75–110 µm high, 100–130 µm wide (\bar{x} = 88 × 115 µm, n=10) pycnidial, globose, superficial on stem, immersed in the host tissue and becoming erumpent at maturity, globose, dark brown in the erumpent part, with a single ostiole. *Conidiomata* wall 9–16 wide, brown to reddish brown, thin-walled, comprising several layers with cells of *textura angularis*. *Conidiophores* reduced to Conidiogenous cells. *Conidiogenous cells* 10–12 × 2.5–3.5 µm (\bar{x} = 11 × 2 µm, n=15), inconspicuously annellidic, discrete, cylindrical. *Conidia* 14–18 × 4.8–6.5 µm (\bar{x} = 15.8 × 5.7 µm, n=25), cylindrical to narrowly ellipsoidal, initially hyaline and aseptate, becoming yellowish brown at maturity, mostly transversely 1–3-septate, ends rounded.

Material examined:—AUSTRALIA, Bellinger Head NSW, Kalang river mouth, on stem and leaves of *Chrysanthemoides monilifera* ssp. *rotundata* (Asteraceae). 5 March 2008, L. Morin (BRIP 52234!, holotype).

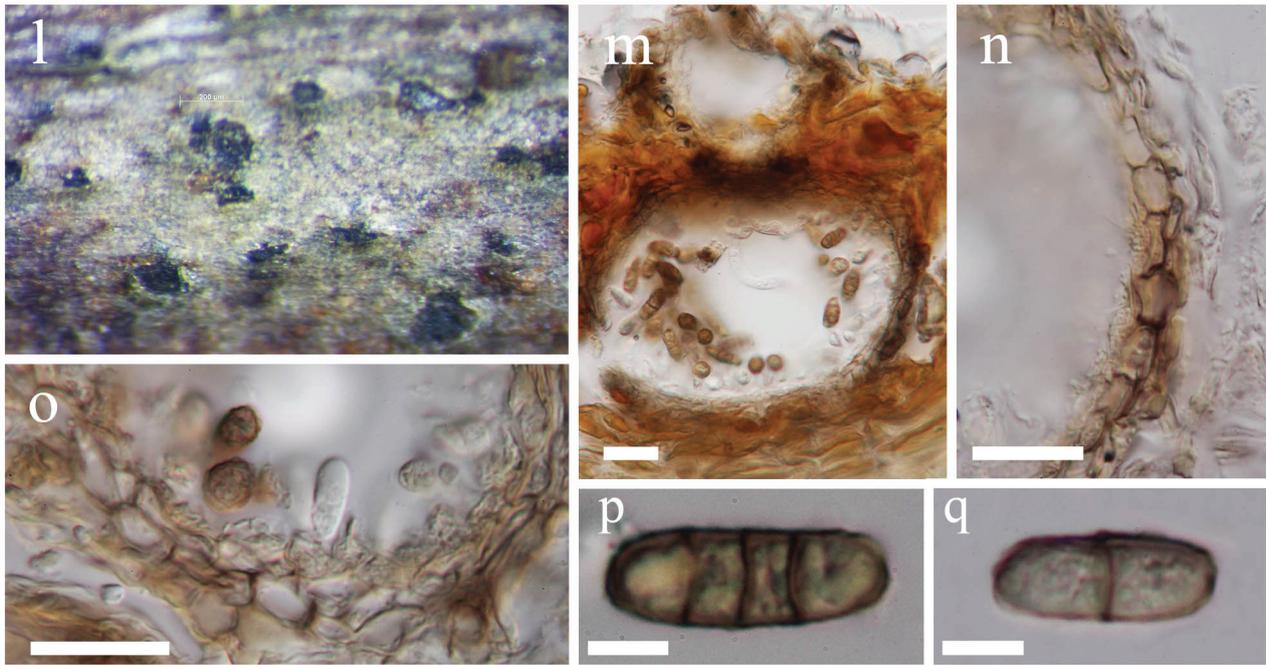


FIGURE 4. *Austropleospora osteospermi* (BRIP 52234, holotype). l. Pycnidia on host. m. Section of pycnidium. n. Pycnidial wall. o. Conidiogenous cells and developing conidia. p–q. Brown 3-septate conidia. **Scale bars:** m–o = 20 µm, p–q = 5 µm.

Notes:—*Austropleospora* was introduced by Shivas & Morin (in Morin *et al.* 2010) in order to accommodate *Austropleospora osteospermi* on *Chrysanthemoides monilifera* ssp. *rotundata* (Asteraceae). They found *Hendersonia osteospermi* Wakef. on the same host and identified it as the asexual state of *A. osteospermi* both in culture and by DNA sequence analysis. Based on ITS sequence analysis Morin *et al.* (2010) placed *Austropleospora* under Pleosporales without assigning to any family. *Austropleospora* is referred to Dothideomycetes genera *incertae sedis* in Index fungorum (2014). We re-examined and illustrate the type specimen of *Austropleospora*. Immersed ostiolate ascomata, hyaline anastomosing pseudoparaphyses, cylindrical to clavate asci and yellowish-brown, muriform ascospores suggest that *Austropleospora* belong to Pleosporaceae. Therefore we tentatively transfer *Austropleospora* to Pleosporaceae. Multi-gene phylogenetic analysis is needed in order to clarify the familial placement of *Austropleospora* in Pleosporales. We synonymize *Hendersonia osteospermi* under *Austropleospora osteospermi* based on sexual and asexual state link.

Pleosporales, genera *incertae sedis*

Pleosporales is considered as the largest order of Dothideomycetes (Kirk *et al.* 2008) and is characterised by perithecioid ascomata, usually with a papillate apex, ostioles with or without periphyses, cellular pseudoparaphyses, bitunicate asci, and ascospores of various shapes, pigmentation and septation (Hyde *et al.* 2013). Pleosporales was formally established by Barr (1987) based on the family Pleosporaceae with the type species *Pleospora herbarum*. The asexual stages of Pleosporales are mostly coelomycetous and rarely hyphomycetous, including *Phoma* or phoma-like asexual stages (Zhang *et al.* 2012, Hyde *et al.* 2013). Lumbsch & Huhndorf (2010) included 12 genera under Pleosporales, genera *incertae sedis*, while Hyde *et al.* (2013) included six.

Dangeardiella Sacc. & P. Syd., Syll. fung. (Abellini) 14(2): 683 (1899)
 MycoBank: MB 1410

Saprobic on stalks and petioles of ferns. Sexual state: *Ascomata* black, clustered or loosely scattered, immersed to erumpent, subglobose or elliptical, uni loculate or sometimes multiloculate with very reduced partition walls, forming indistinct slit-like ostiole. *Peridium* thin, comprising a few layers of dark brown cells arranged in a *textura angularis*. *Hamathecium* composed of hyaline, hyphae-like, numerous, aseptate pseudoparaphyses. *Asci* 8-spored, bitunicate, cylindrical, short pedicellate with rounded ends. *Ascospores* overlapping biseriate, hyaline, straight, narrowly fusoid with sharp to narrowly rounded ends, 5–10 septate, constricted at the primary septum. Asexual state: Unknown.

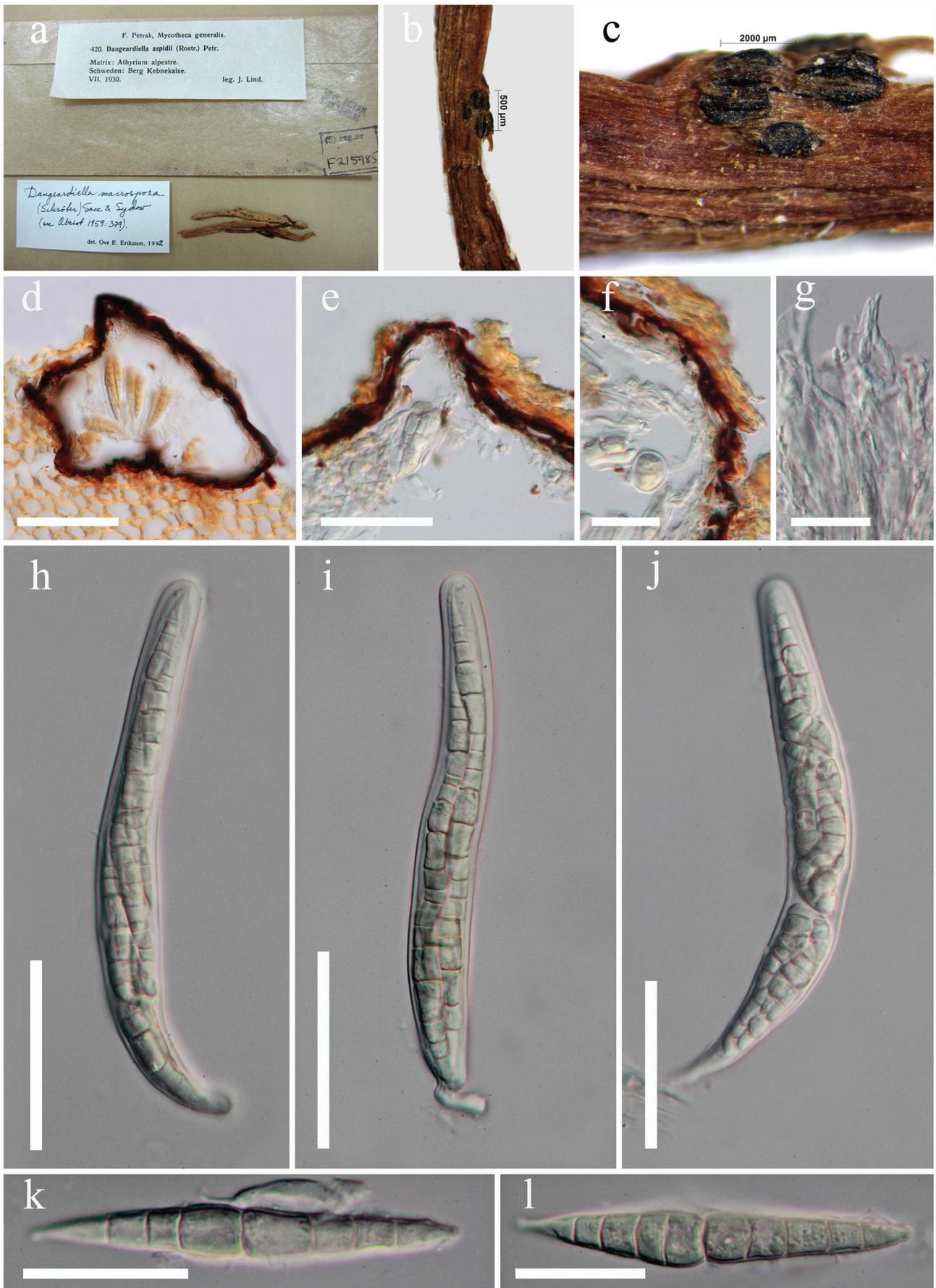


FIGURE 5. *Dangeardiella macrospora* (S-F215985). a. Herbarium material. b–c. Ascomata on host surface. d. Section through ascoma. e. Section of the papilla. f. Peridium. g. Pseudoparaphyses. h–j. Bitunicate asci. k–l. Ascospores. **Scale bars:** d = 100 µm, e = 50 µm, f–g = 25 µm, h–j = 50 µm, k–l = 20 µm.

Type species:—*Dangeardiella macrospora* (J. Schröt.) Sacc. & P. Syd., in Saccardo, Syll. fung. (Abellini) 14(2): 683 (1899) MycoBank: MB 242089. FIG. 5 a–l.

≡ *Monographus macrosporus* J. Schröt., in Cohn, Krypt.-Fl. Schlesien (Breslau) 3.2(4): 477 (1897) [1908]

Saprobic on stalks of ferns. Sexual state: *Ascomata* 160–270 µm high, 225–315 µm wide (\bar{x} = 206 × 276 µm, n=10), black, clustered or loosely scattered, immersed to erumpent, subglobose or elliptical, with slit-like ostiole. *Peridium* 7–10.7 µm (\bar{x} = 8.8 µm, n=15), thin, comprising a few layers, of dark brown cells arranged in a *textura angularis*. *Hamathecium* composed of numerous, 1–3 µm wide, hyaline, hypha-like, pseudoparaphyses. *Asci* 140–160 × 14–17 µm (\bar{x} = 146 × 15 µm, n=20), 8-spored, bitunicate, cylindrical, short pedicellate with rounded ends and inconspicuous ocular chamber. *Ascospores* 55–63 × 6.7–8.7 µm (\bar{x} = 60 × 7.8 µm, n=30), overlapping biseriate, narrowly fusoid with acute to narrowly rounded ends, hyaline, straight, 7–9 septate, constricted at the primary septum. Asexual state: Unknown.

Material examined:—SWEDEN. Torne lappmark, Schweden, Berg Kebnekaise, on dead stalk of *Athyrium alpestre* (Athriaceae), July 1930, *J. Lind* (S-F215985!).

Notes:—*Dangeardiella* was introduced by Saccardo & Sydow (1899) as a monotypic genus to accommodate *Dangeardiella macrospora*, while Obrist (1959) introduced a new species *Dangeardiella fusiformis*. Barr (1987) placed *Massarina* in the Lophiostomataceae and proposed Lophiostomataceae, *sensu stricto* to accommodate *Dangeardiella* along with *Massarina*, *Lophiostoma* and four other morphologically similar genera (Liew *et al.* 2000, Hyde *et al.* 2013). Hawksworth *et al.* (1995) included *Dangeardiella* in Dothideales, genera *incertae sedis*. According to the SSU gene phylogenetic analysis in Liew *et al.* (2000), a putative strain of *Dangeardiella* clustered in a separate clade in Pleosporales along with *Melanomma pulvis-pyrius*, *Herpotrichia diffusa* and *Pleomassaria siparia*. However, Liew *et al.* (2000) did not conclude any taxonomic placement for the genus as their study did not support the monophyly of Melanommataceae as described by either Barr (1987, 1990) or Hawksworth *et al.* (1995). Therefore they suggested further work was needed in order to resolve the taxonomy of the genus. Kirk *et al.* (2008) placed this genus in Melanommataceae, while Lumbsch & Huhndorf (2010) included *Dangeardiella* under Dothideomycetes, genera *incertae sedis*.

Dangeardiella comprises two species, *D. macrospora* and *D. fusiformis* Obrist (Holm & Holm 1978, Hawksworth *et al.* 1995, Kirk *et al.* 2008). The ascomata of *D. macrospora* are larger and more conspicuous than those of *D. fusiformis* (Holm & Holm 1978). *Dangeardiella* shares some similar characters with Lophiostomataceae such as having superficial to semi-immersed, carbonaceous, ascomata, with slot-like ostioles, cylindrical asci and narrowly fusiform ascospores. We are unable to examine type material of *D. macrospora* as PAD will not loan specimens and thus therefore examined a collection by Lind in Petrak's herbarium. Therefore we tentatively refer *Dangeardiella* to Pleosporales, genera *incertae sedis* mainly based on its similarities with Pleosporales and SSU phylogeny.

Sordariomycetes, genera *incertae sedis*

The class Sordariomycetes is one of the largest classes in the Ascomycota with more than ten thousand species (Kirk *et al.* 2008). Members are characterized by perithecial or less frequently cleistothecial ascomata and inoperculate unitunicate or prototunicate asci (Alexopoulos *et al.* 1996, Zhang *et al.* 2006). Lumbsch & Huhndorf (2010) classified over 100 genera under Sordariomycetes *incertae sedis* in the Outline of Ascomycota-2009.

Griggsia F.L. Stevens & N. Dalbey, Bot. Gaz. 68(3): 222–224 (1919)
MycoBank: MB 2137

Type species:—*Griggsia cyathea* F.L. Stevens & N. Dalbey, Bot. Gaz. 68(3): 222–224 (1919) MycoBank: MB 228343. FIG. 6 a–u.

Epiphytic on leaves of *Cyathea arborea* (Cyatheaceae). Sexual state: *Ascomata* 132–198 µm high × 204–261 µm diam. (\bar{x} = 132 × 243 µm, n=5), superficial, stromatic on epidermis, gregarious, thick-walled, dimidiate, dark brown to black, without ostiole, opening by irregular cleavage of internal vegetative mycelium at the apex. *Peridium* 34–62 µm diam, thick-walled, comprising cells forming a *textura angularis*, brown to dark brown at the outer layer, hyaline at inner layer. *Hamathecium* comprising of thick-walled, cylindrical, hyaline, long, filamentous, septate, branched, apically free paraphyses. *Asci* 59–81 long × 17–35 µm wide (\bar{x} = 76 × 24 µm, n=10), 8-spored, unitunicate, broadly obovoid, short-pedicellate, apically rounded. *Ascospores* 26–36 × 10–13 µm (\bar{x} = 36 × 12 µm, n=15), overlapping,

broadly to elongate-oval, with rounded ends, hyaline, 1-celled and rough. Asexual state: *Conidiomata* 90–119 μm high \times 193–236 μm diam. (\bar{x} = 104 \times 213 μm , n=5), pycnidium, superficial, epidermal, dimidiate, circular, black, closely reticulate and numerous, opening by a rugged cleft. *Conidiomata wall* 21–32 μm wide, comprising thick-walled cells forming a *textura angularis*, brown to dark brown outside, with hyaline inner layer of cells. *Conidiogenous cells* 11–15 \times 6–8 μm (\bar{x} = 12 \times 7 μm , n=5 μm , n=10), phialidic, short, cylindrical, integrated, hyaline, with a short collarette at the tip. *Conidia* 26–34 μm high \times 8–15 μm diam. (\bar{x} = 28 \times 13 μm , n=20), broadly obovoid to pyriform, truncate at the base, rounded at the tip.

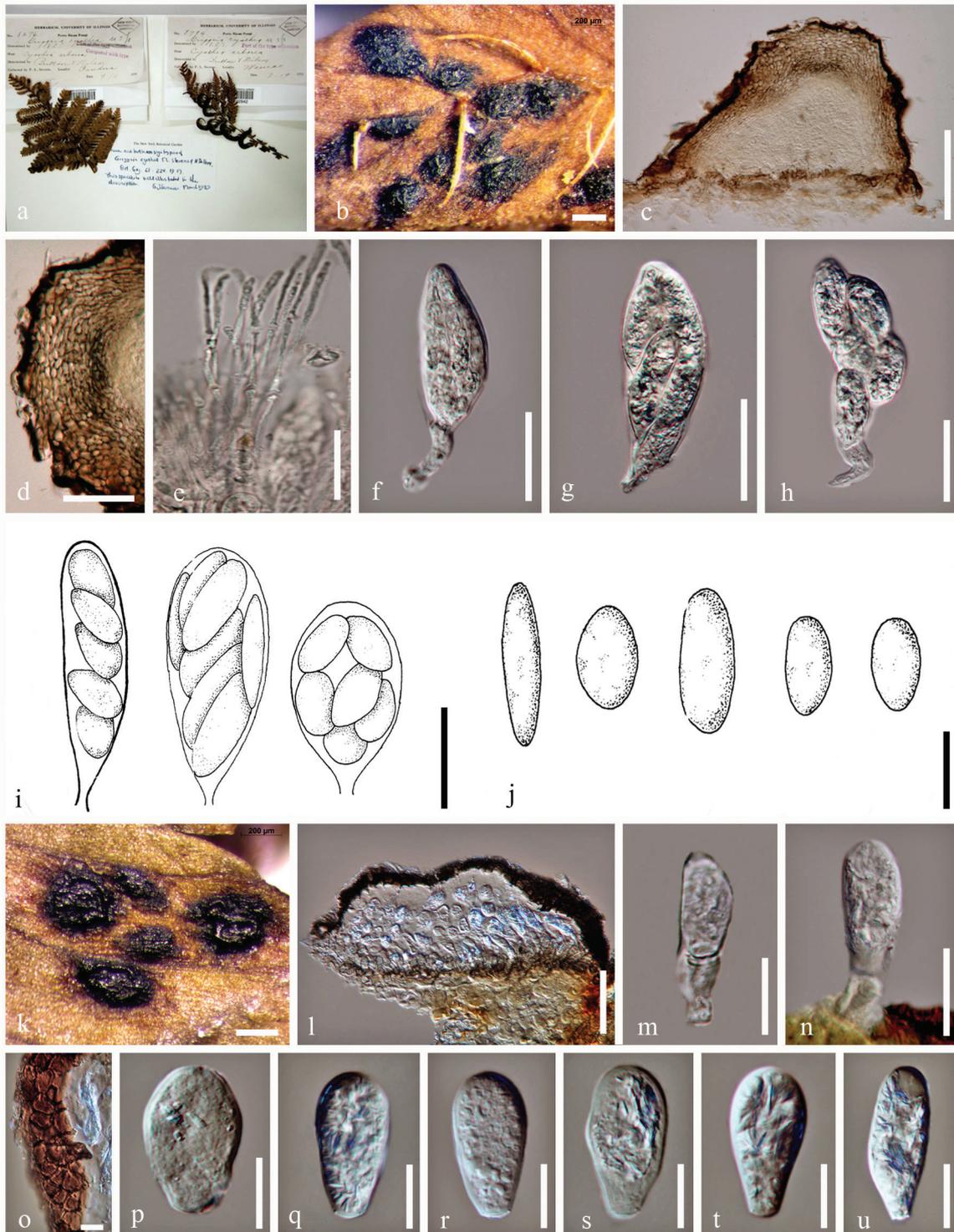


FIGURE 6. *Griggsia cyathea* (NY 01102841, holotype). a. Material label. b. Appearance of sexual state on host. c. Section through ascoma. d. Peridium. e. Paraphyses. f–i. Mature asci. j. Ascospore. k. Appearance of asexual state on host. l. Section through fruiting body m, n. Close up of conidiogenous cell with conidia. o. Peridium. p–u. Conidia. Scale bars: b, k = 200 μm , c = 100 μm , d, l = 50 μm . f–h = 30 μm , e, i, m–n = 20 μm , j, o–u = 10 μm . **i–j. Redrawn from Stevens and Dalbey (1919).

Material examined:—PUERTO RICO. Maricao: Alto de Bandera, on *Cyathea arborea* (Cyatheaceae). 14 & 19 July 1915. *F.L. Stevens*. No. 8276 and 8794. (NY 01102841!, holotype).

Notes:—*Griggsia* was introduced by Stevens & Dalbey (1919) as a monotypic genus and is typified by *Griggsia cyathea*. It is characterized by superficial ascomata, filamentous, unbranched, septate, pseudoparaphyses, unitunicate, broadly obovoid asci and broadly oval, hyaline, 1-celled ascospores. Lumbsch & Huhndorf (2010) included this genus under Dothideomycetes, genera *incertae sedis*. *Griggsia* should be excluded from Dothideomycetes because asci are unitunicate (Schoch *et al.* 2006, Hyde *et al.* 2013). Therefore we place *Griggsia* in Sordariomycetes *incertae sedis* pending molecular investigation. The species needs recollecting, sequencing and epitypifying in order to clarify the familial status.

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References

- Alexopoulos, C.J., Mims, C.W. & Blackwell, M. (1996) *Introductory Mycology*. New York: John Wiley & Sons Inc, 880 pp.
- Ariyawansa, H.A., Kang, J.C., Alias, S.A., Chukeatirote, E. & Hyde, K.D. (2013) Towards a natural classification of Dothideomycetes: The genera *Dermatodothella*, *Dothideopsella*, *Grandigallia*, *Hysteropeltella* and *Gloeodiscus* (Dothideomycetes *incertae sedis*). *Phytotaxa* 147 (2): 35–47.
<http://dx.doi.org/10.11646/phytotaxa.147.2.1>
- Ariyawansa, H.A., Thambugala, K.M., Kang, J.C., Alias, S.A., Chukeatirote, E. & Hyde, K.D. (2014) Towards a natural classification of Dothideomycetes 2: The genera *Cucurbitodithis*, *Heterosphaeriopsis*, *Hyalosphaera*, *Navicella* and *Pleiomastix* (Dothideomycetes *incertae sedis*). *Phytotaxa* 176(1): 7–17.
<http://dx.doi.org/10.11646/phytotaxa.176.1.4>
- Barr, M.E. (1987) Prodomus to class Loculoascomycetes. Publ. by the author, Amherst, Massachusetts.
- Barr, M.E. (1990) Melanommatales (Loculoascomycetes). *North American Flora Ser. II* 13: 1–129.
- Butler, E.T. (1940) Studies in the Patellariaceae. *Mycologia* 32(6): 791–823.
<http://dx.doi.org/10.2307/3754662>
- Cannon, P.F. & Kirk, P.M. (2007) *Fungal families of the world*. CABI Bioscience, Wallingford, 456 pp.
- Clements, F.E. (1909) *The genera of Fungi*. H.W. Wilson, Minneapolis, pp. 1–227.
- Courtecuisse, R., Samuels, G.J., Hoff, M., Rossman, A.Y., Cremers, G., Huhndorf, S.M. & Stephenson, S.L. (1996) Check-list of fungi from French Guiana. *Mycotaxon* 57: 1–85.
- Dai, D.Q., Boonmee, S., Tian Q., Xiao, Y.P., Bhat, D.J., Chukeatirote, E., Alias, S.A., Wang, Y. & Hyde, K.D. (2014a) Englerulaceae (Dothideomycetes) *Phytotaxa* 176(1): 139–155.
<http://dx.doi.org/10.11646/phytotaxa.176.1.14>
- Dai, D.Q., Bahkali A.H., Bhat, D.J., Xiao, Y.P., Chukeatirote, E., Zhao, R.L., McKenzie, E.H.C., Xu, J.C. & Hyde, K.D. (2014b) Towards a natural classification of Dothideomycetes 3: The genera *Muellerites*, *Trematosphaeriopsis*, *Vizellopsis* and *Yoshinagella* (Dothideomycetes *incertae sedis*) *Phytotaxa* 176(1): 18–27.
<http://dx.doi.org/10.11646/phytotaxa.176.1.5>
- Ellis, M.B. (1967) Dematiaceous Hyphomycetes. VIII. *Periconiella*, *Trichodochium*, etc. *Mycological Papers* 111: 1–46
- Eriksson, O.E. & Hawksworth, D.L. (1986) Notes on ascomycete systematics. Nos. 1–224. *Systema Ascomycetum* 5: 113–174.
- Hafellner, J. (1979) Karschia. Revision einer Sammelgattung an der Grenze von lichenisierten und nichtlichenisierten Ascomyceten. *Beihefte zur Nova Hedwigia* 62: 1–248.
<http://dx.doi.org/10.2307/3759305>
- Hawksworth, D.L., Kirk, P.M., Sutton, B.C. & Pegler, D.N. (1995) Ainsworth & Bisby's Dictionary of the Fungi (Eighth Edition). CAB International, 771 pp.
- Hennings, P. (1904) Fungi Amazonici a cl. Ernesto Ule collecti III. *Hedwigia* 43: 351–400.
- Holm, L., & Holm, K. (1978) Some pteridicolous ascomycetes. *Botaniska Notiser* 131: 97–115.
- Hyde, K.D., Jones, E.B.G., Liu, J.K., Ariyawansa, H.A., Boehm, E., Boonmee, S., Braun, U., Chomnunti, P., Crous, P.W., Dai, D.Q., Diederich, P., Dissanayake, A., Doilom, M., Doveri, F., Hongsanan, S., Jayawardena, R., Lawrey, J.D., Li, Y.M., Liu, Y.X., Lücking, R., Monkal, J., Muggia, L., Nelsen, M.P., Pang, K.L., Phookamsak, R., Senanayake, I., Shearer, C.A., Suetrong, S., Tanaka, K., Thambugala, K.M., Wijayawardene, N.N., Wikee, S., Wu, H.X., Zhang, Y., Aguirre-Hudson, B., Alias, S.A., Aptroot, A., Bahkali, A.H., Bezerra, J.L., Bhat, D.J., Camporesi, E., Chukeatirote, E., Gueidan, C., Hawksworth, D.L., Hirayama, K., Hoog, S.D., Kang,

- J.C., Knudsen, K., Li, W.J., Li, X.H., Liu, Z.Y., Mapook, A., McKenzie, E.H.C., Miller, A.N., Mortimer, P.E., Phillips, A.J.L., Raja, H.A., Scheuer, C., Schumm, F., Taylor, J.E., Tian, Q., Tibpromma, S., Wanasinghe, D.N., Wang, Y., Xu, J.C., Yan, J.Y., Yacharoen, S. & Zhang, M. (2013) Families of Dothideomycetes. *Fungal Diversity* 63: 1–313.
<http://dx.doi.org/10.1007/s13225-013-0263-4>
- Kale, S.B. & Kale, S.V.S. (1970) Contribution to our knowledge of ascomycetes of India. *Sydowia* 23 (1–6): 11–16.
- Kirk, P.M., Cannon, P.F., Minter, D.W. & Stappers, J.A. (2008) Dictionary of the Fungi 10th edn. CABI Bioscience, UK.
- Körber, G.W. (1865) *Parerga lichenologica. Ergänzungen zum Systema lichenum Germaniae*. E. Trewendt, pp. 385–501.
- Li, W.J., Bhat, J.D., Hyde, K.D. & Wang, Y. (2014) Towards natural classification of Dothideomycetes 4: The genera *Bryopelta*, *Bryorella*, *Bryosphaeria*, *Lophiosphaerella* and *Maireella* (Dothideomycetes *incertae sedis*). *Phytotaxa* 176(1): 28–41.
<http://dx.doi.org/10.11646/phytotaxa.176.1.6>
- Liew, E.C.Y., Aptroot, A. & Hyde, K.D. (2000) Phylogenetic significance of the pseudoparaphyses in Loculoascomycete taxonomy. *Molecular Phylogenetics and Evolution* 16: 392–402.
<http://dx.doi.org/10.1006/mpev.2000.0801>
- Liu, J.K., Phookamsak, R., Doilom, M., Wikee, S., Li, Y.M., Ariyawansa, H., Boonmee, S., Chomnunti, P., Dai, D.Q., Bhat, J.D., Romero, A.I., Zhuang, W.Y., Monkai, J., Jones, E.B.G., Chukeatirote, E., Ko-Ko, W.T., Zhao, Y.C., Wang, Y. & Hyde, K.D. (2012) Towards a natural classification of Botryosphaerales. *Fungal Diversity* 57: 149–210.
- Lumbsch, H.T. & Huhndorf, S.M. (2010) Outline of Ascomycota – 2009. *Fieldiana Life and Earth Sciences* 1: 1–60.
- Luttrell, E.S. (1955) The ascostromatic Ascomycetes. *Mycologia* 47: 511–532
<http://dx.doi.org/10.2307/3755666>
- Morin, L., Shivas, R.G., Piper, M.C. & Tan Y.P. (2010) *Austropleospora osteospermi* gen. et sp. nov. and its host specificity and distribution on *Chrysanthemoides monilifera* ssp. *rotundata* in Australia. *Fungal Diversity* 40: 65–74.
<http://dx.doi.org/10.1007/s13225-009-0007-7>
- Mycobank (2013) <http://www.mycobank.org/Biolomics.aspx?Table=Mycobank&Page=200&ViewMode=Basic>
- Nitschke, T.R.J. (1869) Grundlage eines Systems der Pyrenomyceten. Verhandlungen des Naturhistorischen Vereins der Preussischen Rheinlande. *Westfalen und des Regierungsbezirks Osnabrück* 26: 70–77.
- Obrist, W. (1959) Untersuchungen über einige ‘Dothideale’ Gattungen. *Phytopathologische Zeitschrift* 35: 357–388.
<http://dx.doi.org/10.1111/j.1439-0434.1959.tb01833.x>
- Saccardo, P.A. & Sydow, P. (1899) Supplementum Universale, Pars IV. *Sylloge Fungorum* 14: 1–1316.
- Schoch, C.L., Shoemaker, R.A., Seifert, K.A., Hambleton, S., Spatafora, J.W. & Crous, P.W. (2006) A multigene phylogeny of the Dothideomycetes using four nuclear loci. *Mycologia* 98:1041–1052
- Sivanesan, A. (1984) The bitunicate ascomycetes and their anamorphs. J. Cramer, 701 pp.
- Stevens, F.L. & Dalbey, N. (1919) A parasite of the tree fern (Cyathea). *Botanical Gazette Crawfordsville* 68(3): 222–225.
<http://dx.doi.org/10.1086/332551>
- Sydow, H. (1926) Fungi in itinere costaricensi collecti, pars secunda. *Annales Mycologici* 24(5–6): 283–426.
- Thambugala, K.M., Ariyawansa, H.A., Liu, Z.Y., Chukeatirote, E. & Hyde, K.D. (2014) Towards a natural classification of Dothideomycetes 6: The genera *Dolabra*, *Placostromella*, *Pleosphaerellula*, *Polysporidiella* and *Pseudotrichia* (Dothideomycetes *incertae sedis*). *Phytotaxa* 176(1): 55–67.
<http://dx.doi.org/10.11646/phytotaxa.176.1.8>
- Tian, Q., Chomnunti, P., Bhat, J.D., Alias, S. A., Mortimer, P. E. & Hyde, K.D. (2014) Towards a natural classification of Dothideomycetes 5: The genera *Ascostratum*, *Chaetoscutula*, *Ceratocarpia*, *Cystocoleus* and *Colensoniella* (Dothideomycetes *incertae sedis*). *Phytotaxa* 176(1): 42–54.
<http://dx.doi.org/10.11646/phytotaxa.176.1.7>
- Tilak, S.T. & Kale, S.B. (1969) Contribution to our knowledge of ascomycetes of India - XXIII. *Sydowia* 23 (1–6): 24–28
- von Arx, J.A. (1963) Die Gattungen der Myriangiales. *Persoonia* 2(4): 421–475.
- Zhang, N., Castlebury, L.A. & Miller, A.N., Huhndorf, S.M., Schoch, C.L., Seifert, K.A., Rossman, A.Y., Rogers, J.D., Kohlmeyer, J., Volkmann-Kohlmeyer, B. & Sung, G.H. (2006) An overview of the systematics of the Sordariomycetes based on a four-gene phylogeny. *Mycologia* 98(6): 1076–1087.
- Zhang, Y., Crous, P.W., Schoch, C.L. & Hyde, K.D. (2012) *Pleosporales*. *Fungal Diversity* 52: 1–225.
<http://dx.doi.org/10.1007/s13225-011-0117-x>