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Towards a natural classification of Dothideomycetes 4: The genera *Bryopelta*, *Bryorella*, *Bryosphaeria*, *Lophiosphaerella* and *Maireella* (Dothideomycetes *incertae sedis*)

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Abstract

In the latest classification of Ascomycota with 365 genera in the Dothideomycetes, most taxa are poorly known. In this paper we re-examine the type species of *Bryopelta*, *Bryorella*, *Bryosphaeria*, *Lophiosphaerella* and *Maireella*. By studying the generic types we suggest higher level placement and better understanding of morphology of these genera. It is hoped that this will stimulate fresh collections and sequence data for these genera so that we can place the taxa in a natural classification system.

Key words: illustrations, new descriptions, taxa

Introduction

Dothideomycetes (previously known as Loculoascomycetes; Nannfeldt 1932, Luttrell 1955, 1973, Barr 1987) is the largest class of Ascomycota, with an estimated 19,000 species (Kirk *et al*. 2008, Hyde *et al*. 2013). This class is ecologically diverse, occurring as endophytes, pathogens or epiphytes of living plants and saprobes on dead plant parts. Some are coprophilous and others lichenized or lichenicolous (Schoch *et al*. 2006, Ruibal 2009, Hyde *et al*. 2013). Members of Dothideomycetes are characterized by functionally bitunicate (fissitunicate) asci with a thick extensible inner layer (endotunica) and a thin inextensible outer layer (ectotunica) and ascolocular ascoma development (Schoch *et al*. 2009, Hyde *et al*. 2013). Another typical character is the hamathecium or centrum which is defined as the tissues and cells occupying the cavity of ascomata; these characters can delineate ordinal classification in Dothideomycetes, such as Pleosporales, Dothideales, and Myriangiales (Luttrell 1955, Kirk *et al*. 2001, Schoch *et al*. 2009). There have now been several studies using multigene phylogeny providing groundwork towards a natural classification in Dothideomycetes (Boonmee *et al*. 2011, 2012, Chomnunti *et al*. 2011, Liu *et al*. 2011, 2012, Schoch *et al*. 2009, Nelsen *et al*. 2009, 2011, Zhang *et al*. 2011a, 2012, Hyde *et al*. 2013).

One hundred and sixteen genera were placed in Dothideomycetes *incertae sedis* by Huhndorf & Lumbsch (2010), as these could not be placed in any family or order with certainty. The main goal of this paper is to re-examine the generic types of *Bryopelta*, *Bryorella*, *Bryosphaeria*, *Lophiosphaerella* and *Maireella* which are poorly understood in the Dothideomycetes, genera *incertae sedis*. The type species of each genus is re-examined, described, illustrated and placed in a family or order, based on morphology but using modern taxonomic concepts. By doing this, we hope to stimulate interest in making fresh collections, culturing and sequence data analyses for these genera.

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Materials and methods

Specimen examination

Type specimens were borrowed from GZU, M and S. The type specimen of *Bryorella acrogena* was in poor condition and very little information could be obtained. In order to generate more information for this taxon, we relied on the original publication. Ascomata were rehydrated in water and 5% KOH prior to examination and sectioning. Sectioning of the fruiting structures was carried out by hand. The samples were mounted in water for microscopic study and photomicrography. Ascomata, asci and ascospores were examined in a Nikon ECLIPSE 80i compound microscope and photographed by a Canon 550D digital camera fitted to the microscope. Measurements were made with the Tarosoft (R) Image Frame Work program and images used for figures were processed with Adobe Photoshop CS3 Extended version 10.0 software (Adobe Systems, USA).

Results and discussion

Taxonomy

Mycosphaerellaceae Lindau

Typified by the genus *Mycosphaerella*, family Mycosphaerellaceae was introduced by Lindau in 1897 (Hyde *et al*. 2013). Most members of this family are parasitic or saprobic on vascular plants or possibly lichens. Many, especially the asexual states, cause serious disease in commercial crops worldwide, with species inflicting leaf spots, leaf blotches and stem cankers on host plants (Crous *et al*. 2011, Hyde *et al*. 2013). Hawksworth *et al*. (1995) placed Mycosphaerellaceae in the order Dothideales, while Kirk *et al*. (2001) erected a new order, Mycosphaerellales, for the family. Subsequently, based on phylogenetic analyses it was placed in the order Capnodiales (Schoch *et al*. 2006, Crous *et al*. 2009, Hyde *et al*. 2013). The family Mycosphaerellaceae is characterized by bitunicate asci, without pseudoparaphyses and with hyaline to slightly pigmented, 1-septate, sometimes 3-septate ascospores. Currently, the Mycosphaerellaceae contains 14 sexual morph-typified genera and numerous asexual morph-typified genera (Lumbsch & Huhndorf 2010, Hyde *et al*. 2013). Our study adds *Lophiosphaerella* and *Bryopelta* to this family.

Lophiosphaerella Hara, Byogaichu-Hoten (Manual of Pests and Diseases): 778 (1948) MycoBank: MB 2932

Parasitic on terrestrial plants, forming conspicuous small, rounded, pale grey leaf spots on both sides of the leaf. Sexual state: *Ascomata* solitary, scattered, gregarious or confluent, globose or subglobose, semi-immersed or immersed, ostiolate. *Ostiole* centrally located. *Peridium* composed of brown to black, thick-walled cells arranged as *textura angularis*. *Pseudoparaphyses* absent. *Asci* 8-spored, bitunicate, fissitunicate, clavate, oblong or elongate, with an ocular chamber. *Ascospores* multi-seriate or crowded, irregularly arranged in the asci, oblong to fusiform or clavate, 1-septate, slightly constricted at the septum, hyaline, smooth-walled. Asexual state: Unknown.

Type species:—*Lophiosphaerella euryae* (Syd.) Hara, Byogaichu-Hoten (Manual of Pests and Diseases): 345 (1948) MycoBank: MB 33345(Fig. 1)
≡ *Aulographum euryae* Syd. 1900 MycoBank: MB 167145

Parasitic on leaves of *Eurya chinensis* forming numerous, conspicuous, small, rounded, pale grey leaf spots on both sides of the leaf. Sexual state: *Ascomata* 120–200 µm diam., 110–150 µm high, numerous, solitary, gregarious or confluent, conspicuous, immersed to semi-immersed, globose to subglobose, black, erumpent at maturity, ostiolate. *Ostiole* well-developed, conspicuous, centrally located. *Peridium* 25–60 µm wide, composed of brown, thick-walled cells of *textura angularis*, with upper wall broadly thick. *Pseudoparaphyses* absent. *Asci* 45–75 × 12–22 µm ($\overline{x}$ = 62.5 × 15 µm; n = 20), 8-spored, bitunicate, fissitunicate, clavate, oblong or elongate, obtuse at the apex, narrow at the base, with an inconspicuous ocular chamber. *Ascospores* 17.5–19.5 × 3.5–5 µm ($\overline{x}$ = 19 × 4 µm; n = 10), multi-seriate, irregularly arranged in the asci, oblong to fusiform, slender, rounded at both ends, slightly wider at the apex, 1-septate, slightly constricted at the septum, hyaline, smooth-walled. Asexual state: Unknown.

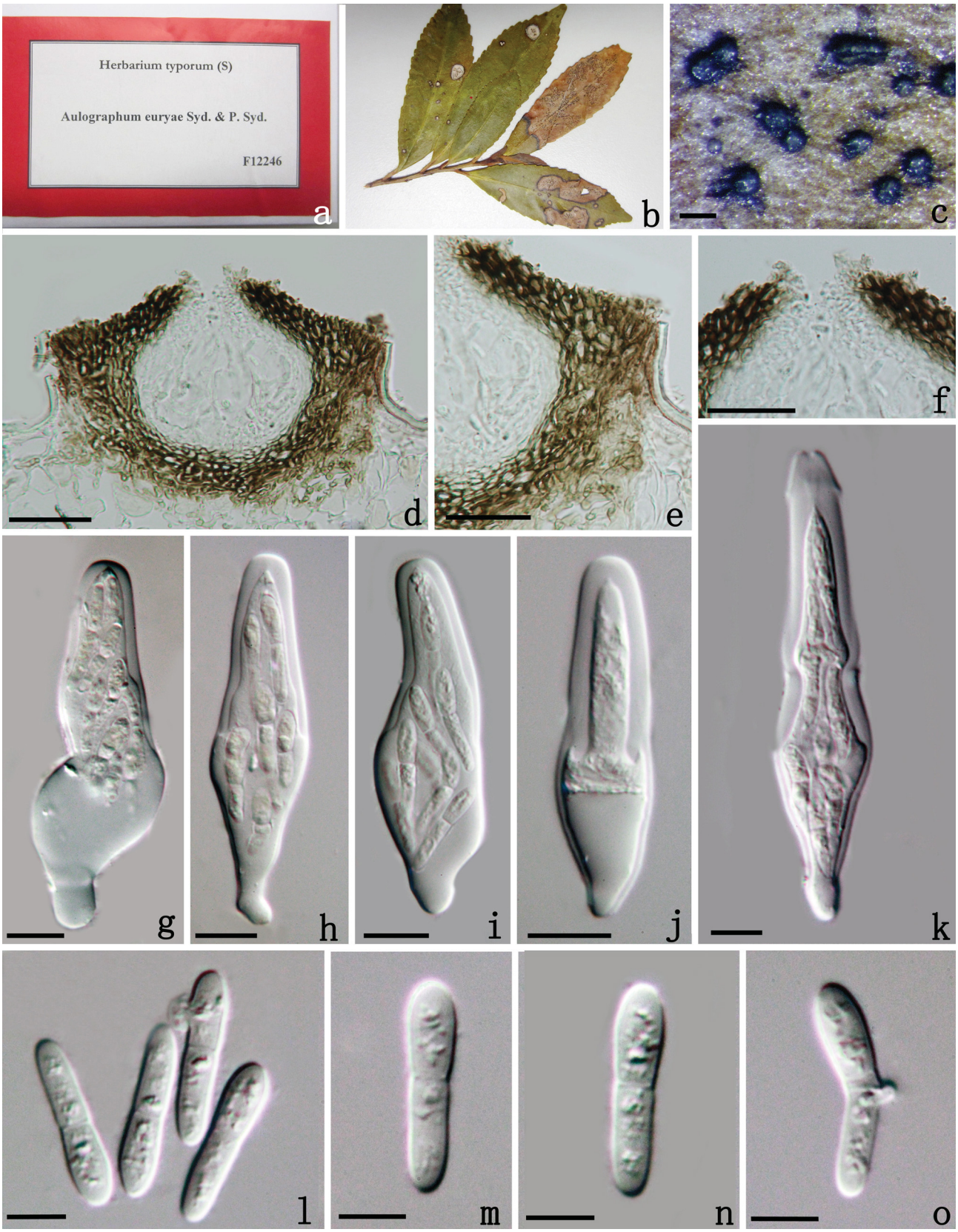

FIGURE 1. *Lophiosphaerella euryae* (F12246, isotype) a, b. Herbarium material. c. Black ascomata on host. d. Section of ascomata with asci. e. Peridium. f. Ostiole. g–k. Asci. l–o. Ascospores. Scale bars: c = 200 µm, d–f = 50 µm, g–k = 10 µm, l–o = 5 µm.

Material examined:—JAPAN. Tokyo, on the leaf of *Eurya chinensis* R.Br. (Pentaphylacaceae), June 1899, *M. Shirai* (S, F12246! isotype).

Notes:—*Lophiosphaerella*, typified by *L. euryae*, was introduced by Hara (1948) as a monotypic genus. It is characterized by globose, dark brown ascomata, with an ellipsoidal, erumpent ostiole, lacking pseudoparaphyses and with 2-celled, hyaline, ovoid to ellipsoidal ascospores (Hara 1948). Lumbsch & Huhndorf (2010) placed the genus in Dothideomycetes genera *incertae sedis* while Index Fungorum (2013) places the genus in family *incertae sedis*. The genus is placed in the order Dothideales in MycoBank (2013). *Lophiosphaerella,* however, shows similarities with Mycosphaerellaceae. Both *Lophiosphaerella* and *Mycosphaerella* share similar characters in placement on host, shape and colour of the ascomata (solitary, scattered or sometimes gregarious, globose to subglobose, dark brown to black), septation and colour of the ascospores (1-septate, hyaline) and hamathecium lacking pseudoparaphyses which is in accord with the general family concept (Hyde *et al*. 2013). The difference between *Lophiosphaerella* and *Mycosphaerella* is only in the shape of the ascospores (oblong to clavate, rounded at both ends, broadly thickened at the base versus clavate, oblong to cylindrical, slightly acute at the apex) and thickness of the peridium (thick-walled versus thin-walled). Furthermore, the type species *L. euryae* resembles *Mycosphaerella euryae* Theiss. in shape of ascomata, ostiole, peridium wall, ascus and ascospore form and habit (parasitic on the leaf of *Eurya chinensis*) (Theissen 1918). Based on above characters we place *Lophiosphaerella* in Mycosphaerellaceae. Because the family has numerous genera which are morphologically similar and can only be placed in a natural classification using molecular sequence data (Hyde *et al*. 2013), and because the asexual state is important (Crous *et al*. 2009, Zhang *et al*. 2009, 2011, Liu *et al*. 2011, Hyde *et al*. 2013), we refrain from synonymizing this genus under *Mycosphaerella* until fresh collections are made and sequence data becomes available for advanced study.

Bryopelta Döbbeler & Poelt, in Döbbeler, Mitt. bot. StSamml., Münch. 14: 126 (1978) MycoBank: MB 665

Colonies superficial on the upper superface of lichens. *Mycelium* composed of 1–2 µm wide, septate, hyaline hyphae branched within the host cells. Sexual state: *Ascomata* solitary, glabrous, semi-immersed or immersed, globose to subglobose, black, thick-walled, centrally ostiolate, papillate. *Ostiole* 20 µm wide, filled with periphyses, hyaline to dark brown. *Peridium* 10–25 µm wide, up to 40 µm wide in the apical region, composed of thick-walled hyaline to dark brown cells of *textura angularis* to *textura porrecta*. *Hamathecium* of dense, filamentous, hyaline, septate, unbranched, anastomosing pseudoparaphyses. *Asci* 8-spored, bitunicate, fissitunicate, cylindrical to fusiform, obtuse at the tip, slightly widened at base or sometimes with short pedicel, slightly curved. *Ascospores* multi-seriate, crowded, ellipsoidal, generally 1-septate, asymmetrical, sometimes 1–3-septate (Döbbeler *et al*. 1978), constricted at septa, with a smooth or rough epispore. Asexual state: hyphomycetous.

Type species:—*Bryopelta variabilis* Döbbeler & Poelt, Mitt. bot. StSamml., Münch. 14: 126 (1978) MycoBank: MB 309973 (Fig. 2)

Colonies superficial on upper superface of lichen. Sexual state: *Ascomata* 100–120 µm diam., 100–130 µm high, pseudothecium solitary, gregarious or confluent, immersed or semi-immersed, globose to subglobose, thick-walled, centrally ostiolate, papillate. *Ostiole* 20 µm wide, well-developed, filled with periphyses, hyaline to dark brown. *Peridium* 16–25 µm wide, comprising 10–15 layers, with outer 6–9 layers of reddish-brown cells, inner 2–3 layers comprising hyaline, thick-walled cells of *textura angularis* to *textura porrecta*. *Hamathecium* of dense 1–1.5 µm wide, filamentous, hyaline, septate, unbranched, anastomosing pseudoparaphyses. *Asci* 30–45 × 7–10.5 µm ($\overline{x}$ = 37 × 9 µm; n = 10), 8-spored, bitunicate, fissitunicate, cylindrical to fusiform, obtuse at the tip, narrow and short-pedicillate at the base, with an ocular chamber, slightly curved. *Ascospores* 9–12.5 × 2–4 µm ($\overline{x}$ = 11 × 3 µm; n = 10), multi-seriate, crowded, ellipsoid to ovoid, 1-septate, sometimes 1–3-septate (Döbbeler *et al*. 1978), slightly constricted at the septum, hyaline, smooth-walled. Asexual state: hyphomycetous, forming 40–120 × 15–20 µm, black synnemata, with conidiophores directly arising from the basal layers, brown. *Conidia* hyaline, narrow-ellipsoid (Döbbeler *et al*. 1978).

Material examined:—SWEDEN. Torne: on the moor of Nw-Ufer, Rens jön track to train station, about 50 km, 480 m, 22 August 1972, *J. Poelt & P. Döbbeler* (GZU 000302175!, holotype).

Notes:—*Bryopelta* was introduced by Döbbeler & Poelt (1978) as a monotypic genus, and is typified by *Bryopelta variabilis*. The genus was assigned to *Pleosporaceae* (Döbbeler 1978). Subsequently, Lumbsch &

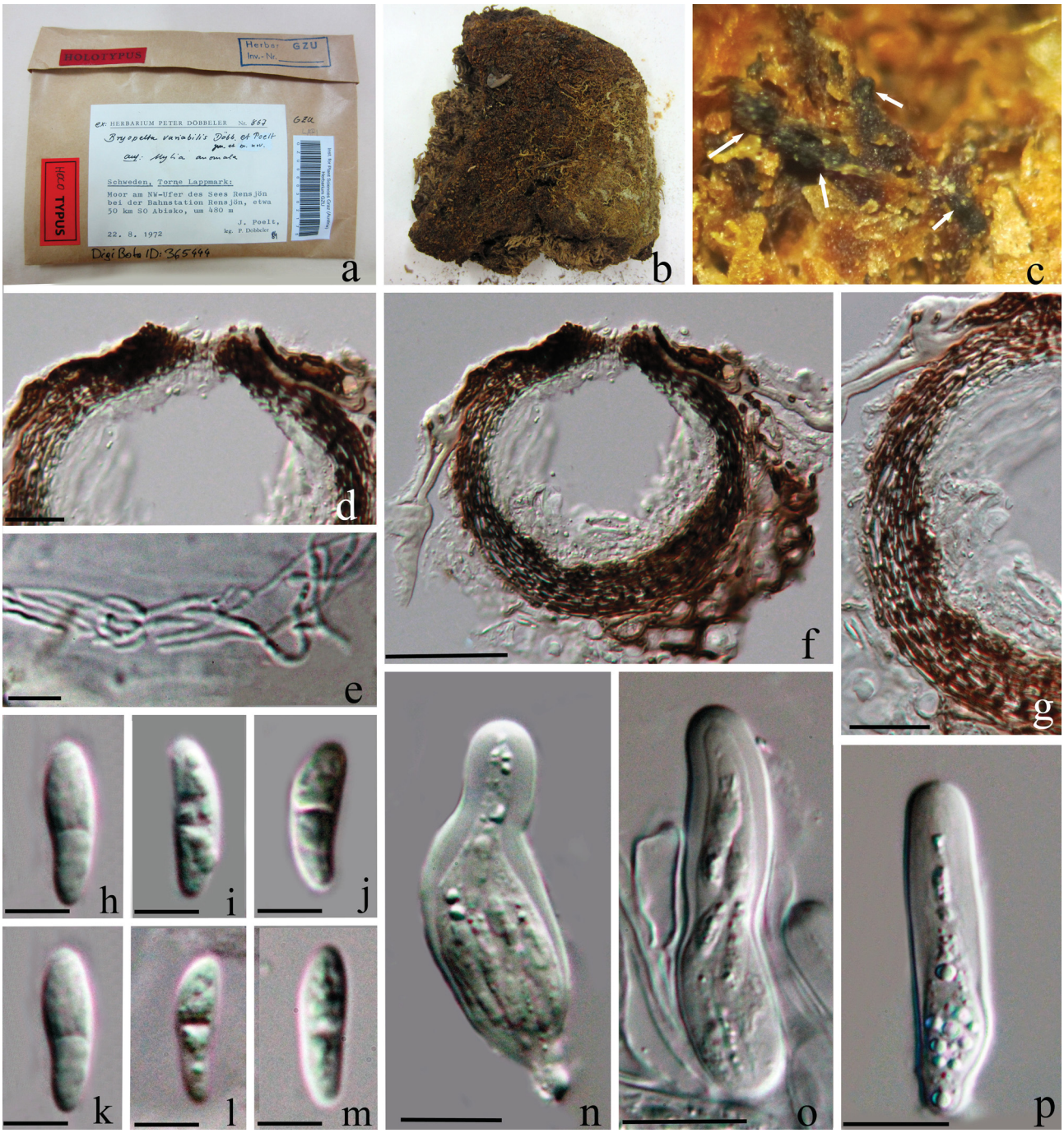

FIGURE 2. *Bryopelta variabilis* (GZU, 000302175, holotype). a, b. Herbarium material. c. Black ascomata on the host (arrows). d. Ostiole. e. Pesudoparaphyses. f. Vertical section of ascoma. g. Peridium. h–m. Ascospores. n–p. Asci. Scale bars: d, g = 20 µm, f = 50 µm, e, h–m = 5 µm, n–p = 10 µm.

Huhndorf (2010) referred this genus to Dothideomycetes genera *incertae sedis*. It is placed in *Dothideomycetes*, genera *incertae sedis* in Index Fungrum (2014). In MycoBank (2014) it is accommodated in the order Dothideales. Typically, the genus is characterized by erumpent ascomata at maturity, with peridium cells of *textura angularis* to *textura porrecta*, and ascospores generally 1-septate and rarely 1–3-septate (Döbbeler *et al*. 1978). Döbbeler & Poelt (1978) introduced and described the asexual stage of *Bryopelta variabilis* as an hyphomycete.

The genus resembles Mycosphaerellaceae in ascus and ascospore form but the peridium is thicker than other genera in the family (Hyde *et al*. 2013). Examination of the genus *Bryopelta* revealed the presence of interthecial filaments between asci, which are also unusual, confusing and leading conflict with the general family concept. *Bryopelta*, however, shares similarities with *Sphaerellothecium*, a lichenicolous ascomycete, which is usually

considered a member of the Mycosphaerellaceae (Lumbsch & Huhndorf 2010, Hyde *et al*. 2013). *Bryopelta* and *Sphaerellothecium* both have solitary, scattered, papillate ascomata, bitunicate, cylindrical to fusiform asci, 1-septate, hyaline, asymmetrical, fusiform ascospores and hamathecium comprising filamentous pseudoparaphyses between asci. However, *Bryopelta* differs from *Sphaerellothecium* in peridium structure (red-brown, thick-walled cells arranged as *textura angularis* to *textura porrecta* in *Bryopelta* versus brown, thin-walled cells arranged as *textura angularis* in *Sphaerellothecium*). The family has numerous lichenicolous genera which are morphologically similar in the presence of pseudoparaphyses between asci (Hyde *et al*. 2013), Based on the combination of the above characters, we add genus *Bryopelta* in the family Mycosphaerellaceae, *incertae sedes*. Presently there are no molecular data available for *Bryopelta*. By providing a detailed description and illustration we hope the genus will be recognised in future studies.

We did not observe the asexual state and its description is based on the original (Döbbeler & Poelt 1978).

Venturiaceae E. Müll. & Arx ex M.E. Barr

The family Venturiaceae was introduced by Müller & von Arx (1950) and later a systematic key to the genera of this family was provided (von Arx 1952). The generic type of Venturiaceae is *Venturia inaequalis* (Cooke) G. Winter. (asexual state *Fusicladium pomi*) (Fr.) Lind) (Hyde *et al*. 2013). Barr (1968) included 13 genera with 80 species in *Venturiaceae*. Subsequently, Barr (1979) reduced the genera to 12 viz. *Acantharia*, *Apiosporin*, *Coleroa*, *Dibotryon*, *Gibbera*, *Metacoleroa*, *Phaeocryptopus*, *Platychora*, *Protoventuria*, *Pyrenobotrys*, *Venturia* and *Xenomeris* and provided a detailed description with important diagnostic characters. Barr (1989) provided notes and revised keys to species and genera in Venturiaceae in North America. However, the genera *Phaeocryptopus*, *Platychora*, *Xenomeris* were excluded by Winton (2001) based on phylogenic analyses of nuclear rDNA (SSU, LSU) sequence data. Lumbsch & Huhndorf (2010) included 27 genera in *Venturiaceae*, but Zhang *et al*. (2011) included only eight genera viz. *Acantharia*, *Apiosporina* (incl. *Dibotryon*), *Caproventuria*, *Coleroa*, *Metacoleroa, Pseudoparodiella, Tyrannosorus* and *Venturia* based on morphological, ecological and molecular phylogenetic data. The Venturiaceae is characterized by spherical ascomata that are completely superficial or erumpent, or innate with a hypostroma, elongated or oblong or nearly cylindrical, bitunicate, 8-spored asci and 2-celled, symmetric or asymmetric ascospores, which are constricted at the septum, hyaline or pale green when young, olive-brown or greyish green, or rarely dark brown at maturity (Radha 1956, Müller *et al*. 1979). Our study adds *Maireella* to this family.

Maireella Syd. ex Maire, Annls mycol. 6(2): 145 (1908) MycoBank: MB 2981

Parasitic on leaves in terrestrial habitats. sexual state: *Ascomata* superficial, solitary, gregarious, scattered or confluent, globose or subglobose, centrally papillate, with a wide porate ostiole. *Peridium* composed of dark brown, thick-walled cells of *textura angularis*. *Hamathecium* composed of dense, filamentous, branched, septate, hyaline, anastomosing pseudoparaphyses. *Asci* 8-spored, bitunicate, saccate, cylindrical to fusiform, ocular chamber not obvious. *Ascospores* 1–2-seriate, ellipsoidal, 1-septate, constricted at the septum, symmetric or asymmetric, yellowish or olive brown, smooth-walled. Asexual state: Unknown.

Type species:—*Maireella maculans* Syd. ex Maire, Annls mycol. 6(2): 145 (1908) MycoBank: MB 188609 (Fig. 3)

Parasitic on leaves of *Compositae*. Sexual state: *Ascomata* 220–250 µm diam., 195–210 µm high, superficial, solitary, gregarious, scattered or confluent, globose to subglobose or pyriform, with a centrally papillate ostiole. *Ostiole* conspicuous, usually widely porate, papillate, with a well-developed neck, rounded above, brown, periphysate. *Peridium* 40–60 µm wide, comprising 8–9 layers, with outer 4–5 layers of dark-brown, large cells and inner 2–3 layers of pale brown, small cells of *textura angularis*. *Hamathecium* composed of dense (1–3 µm wide), filamentous, hyaline to pale brown, septate, branched, anastomosing pseudoparaphyses. *Asci* 45–70 × 13–25 µm ($\overline{x}$ = 56 × 17 µm; n = 10), 2–8-spored, bitunicate, saccate, cylindrical to fusiform, broadly rounded above, narrow below, pedicellate, ocular chamber not obvious. *Ascospores* 23.5–30 × 7.5–12 µm ($\overline{x}$ = 27 × 9 µm; n = 20), 1–2-seriate, 1-septate, constricted at the septum, yellowish to dark brown, symmetric or asymmetric, smooth and thick-walled. Asexual state: Unknown.

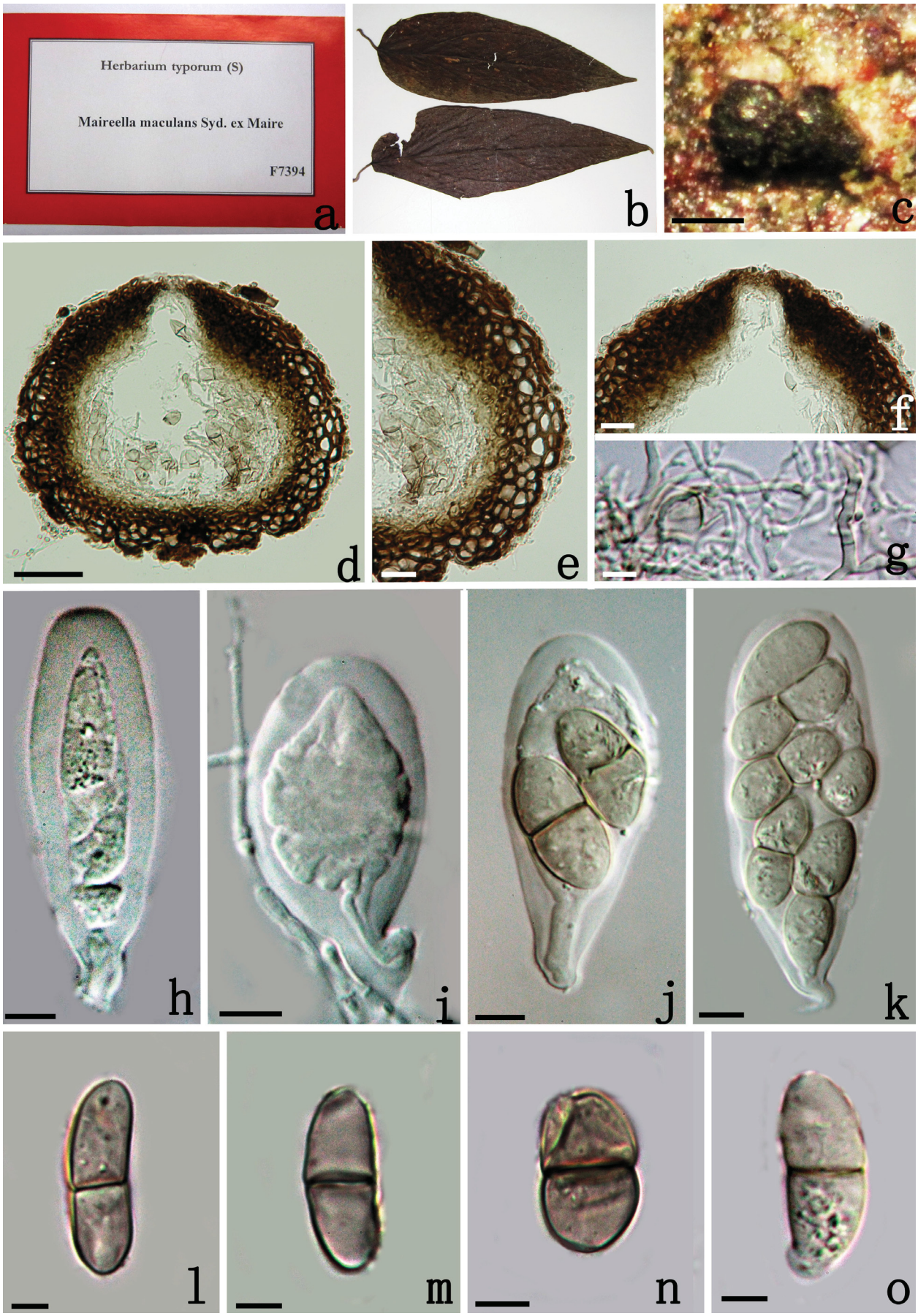

FIGURE 3. *Maireella maculans* (F7394, isotype) a, b. Herbarium material. c. Black ascomata on the host. d. Vertical section of ascoma. e. Peridium. f. Ostiole. g. Pseudoparaphyses. h–k. Asci. l–o. Ascospores. Scale bars: c = 200 µm, d = 50 µm, e, f, h–k = 20 µm, g, l–o = 5 µm.

Material examined:—BRAZIL. São Paulo, Alto da Serra, on the leaf of *Compositae*, 6 January 1907, *A. Usteri* (S, F7394!, isotype)

Notes:—Typified by *Maireella maculans,* the genus *Maireella* was introduced by Sydow (1908). The genus is characterized by superficial, globose to pyriform, papillate ascomata, bitunicate, oblong to clavate, cylindrical asci and ellipsoidal, hyaline to olive-brown, 2-celled, asymmetric ascospores. Lumbsch & Huhndorf (2010) placed the genus in Dothideomycetes, genera *incertae sedis* (Pleosporales) and Index Fungorum (2014) and MycoBank (2014) placed it in the family *Venturiaceae*. *Maireella* has similarities with Venturiaceae and shares similar characters with the generic type *Venturia,* such as globose or pyriform pseudothecia, saccate to cylindrical, bitunicate asci, hyaline to brown, branched, anastomosing pseudoparaphyses and asymmetric, 2-celled ascospores. However, it differs in the surface feature of the pseudothecium (glabrous in *Maireella* versus setose in *Venturia*) and the position on host (superficial in *Maireella* versus superficial to immersed or semi-immersed in *Venturia*) and ascospores (2–8-spored in *Maireella* versus 8-spored in *Venturia*). Based on the above morphological characters and following the classification of Index Fungorum (2014) and MycoBank (2014), we place *Maireella* in the Venturiaceae (Venturiales).

Trematosphaeriaceae K.D. Hyde, Y. Zhang ter, Suetrong & E.B.G. Jones

Trematosphaeriaceae was formally introduced by Suetrong *et al*. (2011). Three genera were included in this family i.e. *Falciformispora*, *Halomassarina* and *Trematosphaeria*, with the last genus as type. This family is characterized by perithecioid ascomata, usually with papillate apex and wide ostiole, coriaceous peridium, cellular pseudoparaphyses, cylindrical asci and two or many celled, hyaline or dark-brown ascospores. Schoch (2009) included *Falciformispora* (type *Falciformispora lignatilis*), *Halomassarina* (type *Halomassarina thalassiae*), *Trematosphaeria* (type *Trematosphaeria pertusa*) and *Asteromassarina* (type *Asteromassarina pulchra*) in Trematosphaeriaceae. Zhang *et al*. (2009) did not include *Halomassarina thalassiae* in their analysis, while Suetrong *et al*. 2009 did not include *Asteromassarina pulchra.* The studies by Schoch *et al*. (2009), Suetrong *et al*. (2009) and Zhang *et al*. (2009) show the family Trematosphaeriaceae as a well supported clade in their phylogenetic trees. The family name however, was not formally introduced and presently is a *nomen nudem* (Lumbsch & Huhndorf 2010)**.** When five nuclear loci (nucSSU, nucLSU rDNA, TEF1, RPB1and RPB2) were used for analyzing Trematosphaeriaceae, the three genera (*Falciformispora*, *Halomassarina* and *Trematosphaeria*) formed a strongly supported cluster within the Pleosporales (Schoch *et al*. 2009, Suetrong *et al*. 2009, 2011, Zhang *et al*. 2009, 2012). Trematosphaeriaceae was formally introduced in the order Pleosporales (Suetrong *et al*. 2011, Hyde *et al*. 2013) and our study adds *Bryosphaeria* to this family.

Bryosphaeria Döbbeler, Mitt. bot. StSamml., Münch. 14: 151 (1978) MycoBank: MB 671

On leaf in terrestrial habitats, forming small, inconspicuous ascomata. Sexual state: *Ascomata* superficial, solitary, globose or subglobose, black, ostiolate, covered by short setae. *Setae* cylindrical, brown. *Ostiole* recognizable with large, round cap, surrounded by palisade-like, thin-walled cells (Döbbeler 1978). *Peridium* comprising thick-walled, hyaline to brown wall layer cells. *Hamathecium* comprised of dense, filamentous, branched, anastomosing pseudoparaphyses. *Asci* 8-spored, bitunicate, fissitunicate, cylindrical or cylindric-clavate, short-pedicellate. *Ascospores* bi- to triseriate or crowded, oblong or fusiform, 1–5-septate, constricted at septa, hyaline to dark brown, guttulate, verruculose. Asexual state: Unknown.

Type species:—*Bryosphaeria cinclidoti* (Racov.) Döbbeler, Mitt. bot. StSamml., Münch. 14: 158 (1978) MycoBank: MB 309985 (Fig. 4)

≡ *Leptosphaeria cinclidoti* Racov., J. Mus. natn. Hist. nat., Paris, Ser. B, N.S. 10: 150 (1959) MycoBank: MB 316713

On leaf of *Tortula muralis*. Sexual state: *Ascomata* 90–150 µm diam., 100–150 µm high, superficial, solitary, globose or subglobose, black, ostiolate, covered by short setae. *Setae* 3–5 µm wide, cylindrical, with an obtuse apex, brown. *Ostiole* 20–30 µm long × 3–5 µm wide, recognizable with a large, round cap, surrounded by palisade-like, thin-walled, pale brown cells (Döbbeler 1978). *Peridium* 15.5–35 µm wide, hyaline to brown, thick-walled cells arranged as *textura angularis*. *Hamathecium* comprising numerous hyaline, anastomosing, branched, septate, cellular pseudoparaphyses embedded in a gelatinous matrix. *Asci* 50–115 × 13–20 µm ($\overline{x}$ = 83.5 × 16.5 µm; n = 20),

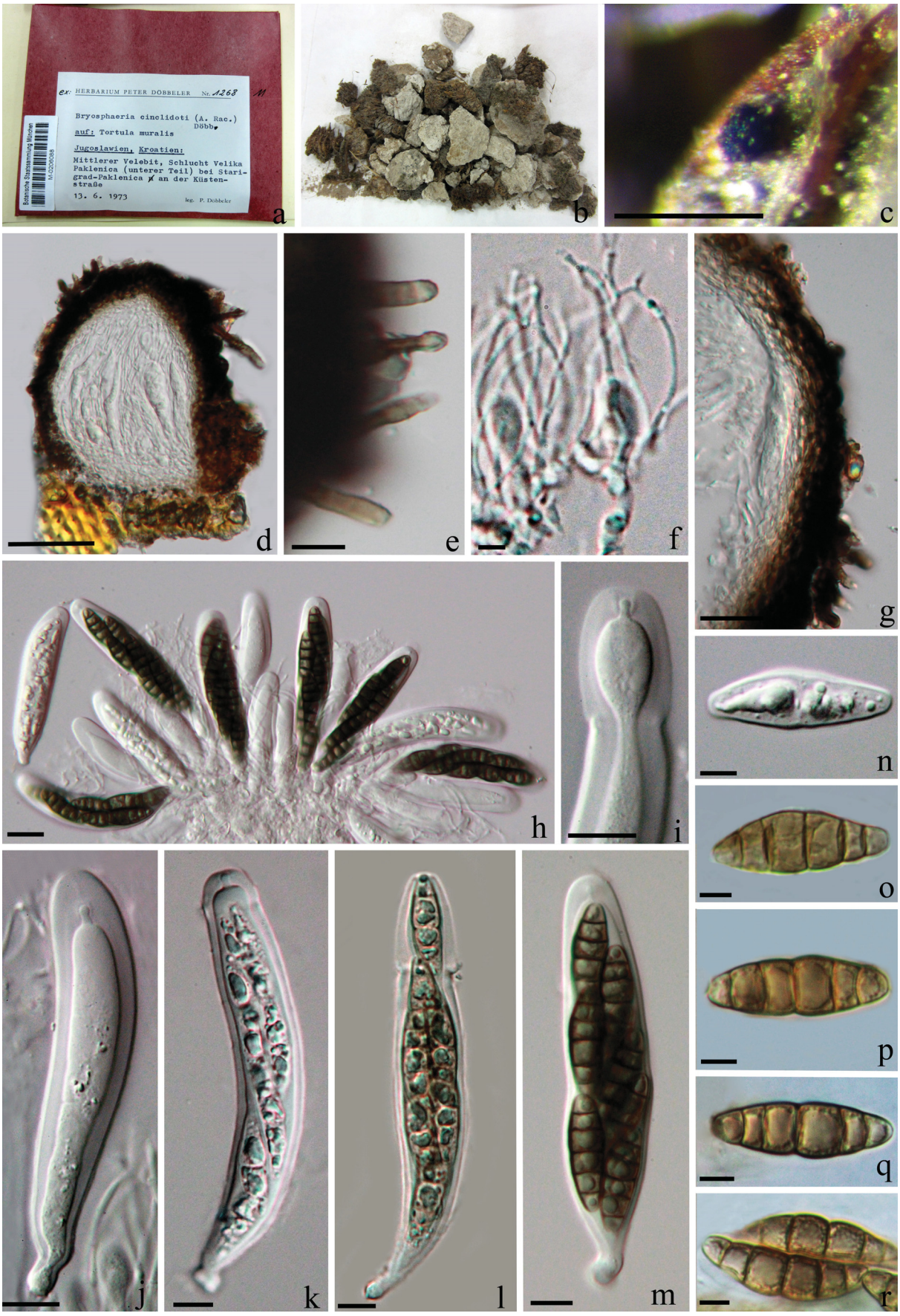

FIGURE 4. *Bryosphaeria cinclidoti* (M, 0206088) a, b. Herbarium material. c. Black ascoma on the host. d. Vertical section of ascoma. e. Setae on the surface of ascoma. f. Pseudoparaphyses. g. Peridium. h. Asci with pesudoparaphyses. i–m. Asci (note i, l fissitunicate). n–r. Ascospores. Scale bars: c = 200 µm, d = 50 µm, e =10 µm, f = 5 µm, g = 20 µm, h = 20 µm. i–m = 10 µm, n–r = 5 µm.

8-spored, bitunicate, fissitunicate, cylindrical to fusiform or cylindric-clavate, rounded above, narrowed below, with short pedicel. *Ascospores* 25–30 × 7–10 µm wide ($\overline{x}$ = 28 × 8.5 µm; n = 10), 2–3-seriate or multi-seriate, fusiform with broadly to narrowly rounded ends wide in the middle, 1–5-septate, constricted at septa, guttulate, hyaline when young, then yellowish to dark brown at maturity, verruculose. Asexual state: Unknown.

Material examined:—YUGOSLAVIA. Croatia: Middle Velebit, lower part of the canyon of Velika Paklenica in Starigrad at the Küstenstraβe, on leaf of *Tortula muralis* (Hedw.) Gaertn., Meyer, & Scherb. (Pottiaceae), 13 June 1973, *P. Döbbeler* (M 0206088!).

Notes:—Racovitza (1959) introduced *Leptosphaeria cinclidoti* (current name *Bryosphaeria cinclidoti*) in the Leptosphaeriaceae. Döbbeler (1978) transferred the species to the genus *Bryosphaeria* which was placed in Dothideomycetes, genera *incertae sedis*. Lumbsch & Huhndorf (2010) followed this classification, while Index Fungorum (2014) places the genus in family *incertae sedis*. The genus was placed in family Leptosphaeriaceae in MycoBank (2014). *Bryosphaeria* is characterized of globose or subglobose ascomata, with the surface being covered by brown, branched setae, bitunicate, fissitunicate asci and hyaline to dark brown, fusiform, 1–5-septate ascospores (Döbbeler 1978). The species was found twice by P. Döbbeler on *Pseudoleskeella catenulate* (Brid. ex Schrad.) Kindb (18 June 1972 and 11 Sep. 1973) and also on other hosts such as *Schistidium apocarpum* (Hedw.) Bruch & Schimp. and *Lescuraea* sp. *Bryosphaeria* has similarities with Trematosphaeriaceae and shares similarities with the generic type *Trematosphaeria*, in having bitunicate, cylindric-clavate asci, a peridium with thick-walled cells of *textura angularis*, with dark brown outer layers and hyaline inner layers, and hyaline to dark brown, fusiform ascospores, but differs in septation of the ascospores (1–5-septate in *Bryosphaeria* versus 3-septate in *Trematosphaeria*) and surface and papillae of the ascomata (setose, rarely with visible papillae in *Bryosphaeria* versus glabrous and with a short papillae in *Trematosphaeria*). Based on above characters we place *Bryosphaeria* in Trematosphaeriaceae. However, placement in a natural classification can only be confirmed with molecular sequence data (Hyde *et al*. 2013). Therefore, further fresh collections and molecular data are required to confirm the natural placement of *Bryosphaeria*.

Dothideomycetes genera *incertae sedis*

The systematic position of numerous genera placed under Dothideomycetes is uncertain or undefined and these are together categorized as genera *incertae sedis.* The most recent arrangement of Dothideomycetes included 41 families and 116 genera arranged in Dothideomycetes genera *incertae sedis* (Huhndorf & Lumbsch 2010, Hyde *et al*. 2013), as they could not be placed in any family or order with certainty. Below, we retain *Bryorella* in this classification as we cannot establish its taxonomic placement, at this time.

Bryorella Döbbeler, Mitt. bot. StSamml., Münch. 14: 128 (1978) MycoBank: MB 669

Saprobic or *parasitic* on leaves in terrestrial habitats. *Mycelium* composed of long, cylindrical, hyaline to brown hyphae, attached to the surface of host cells or growing within the host cells. Sexual state: *Ascomata* solitary, superficial, globose to subglobose, ostiolate. *Ostiole* rounded, rarely papillate. *Peridium* composed of 1–3 layers of cellular, thick-walled cells of *textura angularis*. *Pseudoparaphyses* absent. *Asci* 8-spored, bitunicate, ellipsoidal to ovoid or oblong to cylindrical, with a short pedicel, sometimes bulbous and expanded below. *Ascospores* uniseriate, elongated, ellipsoidal or rarely spindle-shaped, 1–2-septate, slightly constricted at septa, hyaline, smooth-walled. Asexual state: Unknown.

Type species:—*Bryorella acrogena* Döbbeler, Mitt. bot. StSamml., Münch. 14: 131 (1978) MycoBank: MB 309974 (Fig. 5)

Saprobic or *parasitic* on leaves or the stem of wood moss (Hylocomiaceae) in terrestrial habitats. *Mycelium* composed of long, cylindrical, hyaline to brown hyphae, attached to the surface of host cells or growing intercellular within the host cells. Sexual state: *Ascomata* 230–350 µm diam., 250–300 µm high, solitary, superficial, globose to subglobose, irregular, thick-walled, pale brown, distinctly glabrous. *Ostiole* 10–20 µm wide, rounded, rarely papillate. *Peridium* wall composed of 1–3 layers of cellular, thick-walled cells of *textura angularis*. *Pseudoparaphyses* not observed. *Asci* 30–45 µm long × 13–20 µm wide, bitunicate, 8-spored, ellipsoidal to ovoid or oblong to cylindrical, with a short pedicel, sometimes bulbous and expanded below. *Ascospores* 16–22 µm long

× 5–7 µm wide, uniseriate, elongated ellipsoidal or rarely spindle-shaped, 1–2-septate, slightly constricted at septa, obtuse at the apex, narrow below, hyaline, guttulate, thick-walled, smooth-walled (Döbbeler 1978). Asexual state: Unknown.

FIGURE 5. *Bryorella acrogena* (GZU000302179, holotype) a, b. Herbarium material. c, d, g. Ascomata with hyphea. e, h. Ascomata. f. Hyphae. i. Peridium. j–n. Ascospores. Redrawing of peridium and ascospore based on the original (Döbbeler & Melnik 1998) Scale bars: c–d = 200 µm, e, g–h = 100 µm, f = 50 µm, i–n = 15 µm.

Material examined:—AUSTRIA. Styria, Schladming Tauern, Kleinsölk, upper valley between Breitlahnhütte and Schwarzensee, (about 16 km south Gröbming), 1140 m, on stem of *Hylocomium splendens* (Hedw.) W.P. Schimp. (Hylocomiaceae), 10 July 1973, *J. Poelt & P. Döbbeler* (GZU000302179!, holotype).

Notes:—*Bryorella* was introduced by Döbbeler (1978) with nine species *viz*. *Bryorella acrogena*, *B. compressa* Döbbeler, *B. crassitecta* Döbbeler, *B. cryptocarpa* Döbbeler, *B. erumpens* Döbbeler, *B. gregaria* Döbbeler, *B. punctiformis* Döbbeler & Poelt, *B. retiformis* Döbbeler & Poelt and *B. semi-immersa* Döbbeler, with *B. acrogena* as the type species. Subsequently, the genus was expanded to include two more species (Döbbeler 1981, 1982, 2007) and was placed in family *incertae sedis* in Index Fungorum (2014) and Dothideomycetes, genera *incertae sedis* by Lumbsch & Huhndorf (2010). The genus is characterized by superficial, scattered, glabrous, small, ascomata with a cellular peridium, hyaline ascospores and a hymenium lacking a reaction in iodine, and are saprobic or parasitic on mosses. Döbbeler (1984) added the description of the genus *Bryorella* (type *B. acrogena*), based on the original description, as follows: Hyphae cylindrical, brown to dark brown and with several transverse, deeply constricted septa, hyphae initially attached to the surface of the host cells and then penetrated into the host cells. Subsequently, abundant mycelium will break down the host cell wall. Typically, the infected plants showed bleached zone below the growing point. The type species, *B. acrogena,* has been collected 14 times in Europe (Döbbeler 1984) where it occurs on various hosts (*Hypnum cupressiforme* Hedw., *Hylocomium splendens*, *H. umbratum* (Ehrh. ex Hedw.) Schimp, *Isothecium alopecuroides* (Lam. ex Dubois) Isov., *Lescuraea incurvata* (Hedw.) E. Lawton, *Leucodon sciuroides* (H.A. Crum & L.E. Anderson) W.D. Reese & L.E. Anderson, *Neckera complanata* (Hedw.) Huebener, *Pseudoleskeella catenulate* (Brid. ex Schrad.) Kindb, *P. nervosa* (Brid.) Nyholm and *Pterygynandrum filiforme* Hedw.). The fungus is widely distributed (Italy, Austria, Poland, Sweden, Switzerland) (Döbbeler 1978, 1984). Based on the combination of the above characters, the genus *Bryorella* cannot be placed in any of the well described families in Dothideomycetes and therefore we retain the genus in Dothideomycetes, genera *incertae sedis*.

As well as the holotype, we examined two other herbarium specimens (M-0206086! M-0206085!), but could not find any asci. The description of the asci is based on the original description, as "*Asci* 30–45 µm long × 13–20 µm wide, 8-spored, bitunicate, ellipsoidal to ovoid or oblong to cylindrical, with short pedicel, sometimes bulbous expanded below" (Döbbeler 1978).

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