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Schizothyriaceae

Phookamsak R^{1, 2, 3, 4} Boonmee S² Norphanphoun C^{1, 2} Wanasinghe DN^{1, 2} de Silva NI^{1, 3, 4, 5} Dayarathne MC^{1, 2, 3, 4} Hongsanan S^{1, 2} Bhat DJ⁶ and Hyde KD^{1, 2, 3, 4*}

¹ School of Science, Mae Fah Luang University, Chiang Rai, 57100, Thailand

² Center of Excellence in Fungal Research, Mae Fah Luang University, Chiang Rai, 57100 Thailand

³ Key Laboratory for Plant Diversity and Biogeography of East Asia, Kunming Institute of Botany, Chinese Academy of Science, Kunming 650201, Yunnan, China

⁴ World Agroforestry Centre East and Central Asia Office, 132 Lanhei Road, Kunming, 650201, Yunnan, China

⁵ Department of Biology, Faculty of Science, Chiang Mai University, Chiang Mai, 50200 Thailand

⁶ Formerly Department of Botany, Goa University, Goa, India; No. 128/1–J, Azad Housing Society, Curca, Goa Velha, India

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Abstract

Schizothyriaceae is a poorly understood family which was introduced to accommodate epiphytes belonging to the class Dothideomycetes. Sixteen sexual and asexual genera have at various times been accommodated in *Schizothyriaceae*. However, modern taxonomic descriptions, molecular data and phylogenetic investigation of the genera in this family are limited. We therefore revisit the genera in *Schizothyriaceae* by loaning and examining the type and other specimens from herbaria worldwide. Circumscriptions of the genera previously placed in *Schizothyriaceae* are provided with illustrations and their higher level placements are determined based on modern descriptions. Based on morphology, we currently accept *Hexagonella*, *Lecideopsella*, *Mycerema*, *Plochmopeltis* and *Schizothyrium* in *Schizothyriaceae*. *Kerniomyces*, *Metathyriella* and *Myriangiella* are treated in *Schizothyriaceae*, *genera incertae sedis*, while *Chaetoplaca* is transferred to Ascomycetes, *genera incertae sedis*. *Neopeltella* is excluded from *Schizothyriaceae*, based on its thyriothecial ascomata and tentatively placed in *Micropeltidaceae*. *Henningsiella* is placed in *Saccardiaceae* due to its discoid ascomata. *Linopeltis* and *Orthobellus* are tentatively treated in Dothideomycetes, *genera incertae sedis*. *Hysteropeltella* which has elongate apothecial or hypothecia-like ascomata, is placed in *Patellariaceae* due to its similar morphology with *Baggea*. *Mendogia* is transferred to the family *Myriangiaceae* based on a morphologically similar specimen which is phylogenetically placed in *Myriangiaceae*. The hyphomycetous, *Zygophiala* is reported as the asexual morph of *Schizothyrium*. Hence, the genus is currently treated as a synonym of *Schizothyrium*. Nevertheless, representative species of the genera in *Schizothyriaceae*, including the type species, need to be recollected and sequenced to clarify the natural placement in *Schizothyriaceae*.

Keywords – asexual morph – epifoliar fungi – epiphytic fungi – *Schizothyrium*– taxonomy

Introduction

Schizothyriaceae is a poorly understood family in the class Dothideomycetes, which comprises 16 genera and approximately 94 species (von Arx & Müller 1975, Eriksson 1981, Batzer et al. 2008, Kirk et al. 2008, Crous et al. 2009, Hyde et al. 2013, Wijayawardene et al. 2014, Index Fungorum 2016). The family contains various sexual genera with ambiguous morphological characters, comprising two types of ascomata, viz. membranous and thyriothecial (Hyde et al. 2013). The genera in *Schizothyriaceae* have been reported as epiphytic, pathogenic or saprobic on various plants (von Arx & Müller 1975, Batzer et al. 2008, Crous et al. 2009, Hyde et al. 2013, Farr & Rossman 2015). Some genera cause disease on economic crops, such as *Zygophiala*, the putative asexual morph of *Schizothyrium*. These taxa cause the sooty blotch and flyspeck (SBFS) of apple and pear fruits (Batzer et al. 2005, 2008, Gao et al. 2014).

Schizothyriaceae was introduced by Saccardo (1928) as “*Schizothyriaceae*” based on von Höhnel (1917) to accommodate epiphytic fungi and was originally described as “exciple depressed on cuticle, superficial, membranous, irregular fringed when mature” (Saccardo 1928). Five genera were initially included viz. *Clypeolum*, *Mycrothyriella*, *Polyclypeolum*, *Phragmothyriella* and the generic type *Schizothyrium* (Saccardo 1928, Hyde et al. 2013). Müller and von Arx (1962) circumscribed the taxonomy of didymosporous pyrenomycetes and treated 10 genera in *Schizothyriaceae* viz. *Allosoma*, *Chaetoplaca*, *Chaetoscutula*, *Henningsiella*, *Johansonia*, *Leptophyma*, *Phillipsiella*, *Plochmopeltis*, *Pseudodiscus* and *Schizothyrium*. Later, Müller and Farr (1971) included a new genus *Cyanodiscus* in *Schizothyriaceae*, however, the genus was recently placed in *Saccardiaceae* (Index Fungorum 2016).

Von Arx and Müller (1975) reassembled the classification of bitunicate ascomycetes and described *Schizothyriaceae* as being “saprobic fungi, mostly forming mycelia, with flattened, light or brownish, often inconspicuous hyphae, invading the cuticle, with superficial, scutate to dimidiate ascomata, lacking ostioles, bitunicate asci, parallel in a single layer, clavate, sphaerical to obovoid, paraphyses-like structures surrounded by a slimy mass and hyaline or brownish, septate ascospores” (von Arx & Müller 1975, Hyde et al. 2013). Von Arx and Müller (1975) accepted 12 genera in *Schizothyriaceae* viz. *Chaetoplaca*, *Henningsiella*, *Hexagonella*, *Leptophyma*, *Linopeltis*, *Mendogia*, *Metathyriella*, *Myriangiella*, *Neopeltella*, *Petrakina*, *Plochmopeltis* and *Schizothyrium*. *Allosoma*, *Chaetoscutula*, *Johansonia*, *Phillipsiella* and *Pseudodiscus*, which were classified in *Schizothyriaceae* by Müller and von Arx (1962) have been transferred to the family *Saccardiaceae*. *Clypeolum* is currently placed in Dothideomycetes, *genera incertae sedis*, *Polyclypeolum* was treated as a synonym of *Schizothyrium*, while *Phragmothyriella* was synonymized under *Myriangiella* (von Arx & Müller 1975, Index Fungorum 2016).

Barr (1979) accepted only five genera in *Schizothyriaceae* based on their superficial ascomata, with peridium cells not arranged in radiating rows, viz. *Aulographum*, *Chaetoplaca*, *Linopeltis*, *Neopeltella* and *Schizothyrium*. Eriksson (1981) described more clearly morphology of *Schizothyriaceae* based on *Schizothyrium pomi* which was treated as a synonym of the type species, *S. acerinum*. Eriksson (1981) mentioned that there was inconspicuous, superficial or subcuticular vegetative mycelium on the host and ascomata lacking radiating cells, lacked ostioles, and opened by several cracks. Additionally, Eriksson (1981) treated the family as a separate clade from *Asterinales*, the family had previously been placed in *Asterinales* by Barr (1979). Kirk et al. (2008) listed 16 genera in *Schizothyriaceae*, while Lumbsch and Huhndorf (2010) accepted only 15 genera and this was followed by Hyde et al. (2013). Ariyawansa et al. (2013) re-circumscribed the genera *Dermatodothella*, *Dothideopsella*, *Grandigallia*, *Hysteropeltella* and *Gloeodiscus* in the Dothideomycetes, *genera incertae sedis* and mentioned that *Hysteropeltella* was similar to the genera in *Schizothyriaceae*. Therefore, Ariyawansa et al. (2013) tentatively placed *Hysteropeltella* in *Schizothyriaceae* and this was followed by Wijayawardene et al. (2014).

The asexual morph of *Schizothyriaceae* has been reported as hyphomycetous and includes the genus *Zygophiala* (Batzer et al. 2005, 2008). Batzer et al. (2005) isolated the fungus from sooty blotch and flyspeck (SBFS) disease on apple and stated that *Zygophiala* was the asexual morph of *Schizothyrium pomi* based on its morphological characters and molecular support. Batzer et al.

(2008) confused *Schizothyrium* as congeneric with *Zygophiala*. Therefore, Rossman et al. (2015) proposed to use *Schizothyrium* rather than *Zygophiala*, as it was the older name.

Recently, 16 genera were accommodated in *Schizothyriaceae* viz. *Amazonotheca*, *Chaetoplaca*, *Henningsiella*, *Hexagonella*, *Hysteropeltella*, *Kerniomyces*, *Lecideopsella*, *Linopeltis*, *Mendogia*, *Metathyriella*, *Mycerema*, *Myriangiella*, *Neopeltella*, *Orthobellus*, *Plochmopeltis* and *Schizothyrium* (= *Zygophiala*) (Wijayawardene et al. 2014, Rossman et al. 2015). *Leptophyma* was treated as a synonym of *Microstroma* in *Microstromataceae*, *Microstromatales* (Index Fungorum 2016).

The purpose of this study is to revisit the genera in *Schizothyriaceae* based on the morphological examination. Type or other specimens were loaned from herbaria worldwide to clarify the understanding of the family.

Material and Methods

Types or other specimens of genera in *Schizothyriaceae* were loaned from herbaria worldwide i.e. repositories of U.S. National Fungus Collections (BPI), the Botanic Garden Meise (BR), the Muséum National d'Histoire Naturelle (PC), the Swedish Museum of Natural History (S), the Universidade Federal de Pernambuco (URM), the Naturhistorisches Museum Wien (W) and the Yamaguchi University (YAM). Morphological characters were examined and re-described as in Hyde et al. (2013) and Phookamsak et al. (2014, 2015a, b).

Ascomata on herbarium material was observed under an Olympus SZH10 stereo microscope and cut as small pieces from the specimens. The ascomata were initially rehydrated in water or adding 3–5 % KOH for 5–10 minutes and the ascomata and peridium structures were studied from free hand sections. Squash mounts were obtained to determine the micro-morphological characters such as asci, ascospores and hamathecium. Macro- and micro-morphology were examined under the compound microscope (Phookamsak et al. 2014, 2015a, b).

Macro-morphological characters were captured using a Sony DSC-T110 digital camera under an Olympus SZH10 stereo microscope, while micro-morphological characters were captured using a Nikon ECLIPSE 80i compound microscope with DIC microscopy using a Cannon 550D digital camera or a Carl Zeiss microscope. Photographic plates were edited and combined using Adobe Photoshop version CS5 (Adobe Systems Inc., The United States). Morphological measurements were obtained using a Tarosoft (R) Image Frame Work version 0.9.7 and the software of Micro Imaging GmbH. AxioVs40 V 4.8.2.0 (2006-2010). Permanent slides were made by adding lactoglycerol and sealing with clear nail polish (Phookamsak et al. 2014, 2015a, b). Facesoffungi and Index Fungorum numbers are provided as described in Jayasiri et al. (2015) and Index Fungorum (2016).

Results and discussion

Many genera of *Schizothyriaceae* are doubtful and lack modern taxonomic study. In this study, the types and other specimens of the genera in the *Schizothyriaceae* were requested from herbaria worldwide and have been re-examined and are re-described. Morphological examination of the generic types and the representative specimens did not reveal superficial or subcuticular vegetative mycelia on the host, which differs from that reported by von Arx and Müller (1975) and Eriksson (1981). Only *Linopeltis* had vegetative hyphae surrounding the ascomata on the host. Some type specimens could not be located such as *Kerniomyces*, *Metathyriella* and *Myriangiella* and therefore morphological characters were obtained from the taxonomic literature, while *Kerniomyces* lacks a taxonomic description. Therefore, these three genera are treated in *Schizothyriaceae*, *genera incertae sedis*.

The type of *Chaetoplaca* was observed and examined. The sexual morph could not be clarified in this study, as there was only the asexual morph visible on the host. Therefore, the genus is tentatively placed in the Ascomycetes, *genera incertae sedis*. *Henningsiella* is similar to genera in the family *Saccardiaceae* in having discoid ascomata, composed of isodiametrical or radiating

cells, while the peridium is thick at the base. Therefore, *Henningsiella* is transferred to *Saccardiaceae*. *Hysteropeltella* formed elongate, apothecial ascomata, similar to the genus *Baggea* in *Patellariaceae* (Yacharoen et al. 2015). Based on the ascomatal structures, we tentatively place the genus in *Patellariaceae*. *Mendogia* is transferred to the family *Myriangiaceae*, *Myriangiales* based on phylogenetic analyses (Dai et al. 2016).

Linopeltis is similar to genera in the family *Aulographaceae* in having elongate, thyriothecial ascomata with slit-like openings, but differs in having multi-septate ascospores. Therefore, we tentatively place this genus in Dothideomycetes, *genera incertae sedis* until the representative species is recollected and sequence data is obtained to clarify its placement. *Neopeltella* is excluded from *Schizothyriaceae* based on its thyriothecial ascomata.

Orthobellus differs from other genera in *Schizothyriaceae* in having narrowly anastomosing pseudoparaphyses and developed peridia at base of the setose ascomata, in dark mycelia colonies on the host. The morphological characters of the genus are unique and seem distinct from other epifoliar taxa. We therefore place the genus in Dothideomycetes, *genera incertae sedis* until the type is recollected and sequence data is obtained to clarify its placement.

Therefore, we accept five genera in *Schizothyriaceae* viz. *Hexagonella*, *Lecideopsella*, *Mycerema*, *Plochmopeltis* and *Schizothyrium*. These genera have a unique character in forming membranous, multi-loculate ascostromata, with each ascus forming in a locule, which is a “cell” in a network-like structure and in lacking ostioles. Descriptions and illustrations are provided in this manuscript.

Taxonomy

Schizothyriaceae Höhn. ex Trotter, Sacc., D. Sacc. & Traverso [as '*Schizothyriaceae*'], in Saccardo, Syll. fung. (Abellini) 24(2): 1254 (1928)
FoF 01932

Epiphytic, pathogenic or saprobic, upper and/or lower surface of leaves of various plants, visible as dark brown or dark grey to black dots on the host surface. **Sexual morph:** *Ascostromata* scattered, solitary to gregarious, superficial, flattened, circular to ellipsoid, light brown or dark brown to black, transparent to opaque, scutate to dimidiate, or orbicular, glabrous, multi-loculate, with each ascus forming in a locule, which is a “cell” in a network-like structure, membranous, lacking ostioles, or opening by splitting of the upper wall. *Peridium* thin-walled, poorly-developed at the base, composed of light brown to dark brown, or black, of pseudoparenchymatous, or membranous cells, arranged in *textura angularis* to *textura globulosa*. *Asci* 4–8-spored, bitunicate, globose to subglobose, obovoid to clavate, sessile to subsessile, or short pedicellate, apically rounded, with an ocular chamber. *Ascospores* overlapping tri- to tetra-seriate, hyaline to subhyaline, oblong to ellipsoidal, or claviform, septate, constricted at the septum, thin- to thick-walled, smooth to rough, with small guttules. **Asexual morph:** Undetermined.

Generic type – *Schizothyrium* Desm.

Notes – *Schizothyriaceae* is a poorly understood family which comprises various ambiguous genera, mostly confused with the genera in *Micropeltidaceae* (Müller & von Arx 1962, von Arx & Müller 1975). The natural placement of the family has been discussed and treated in various orders (von Arx & Müller 1975, Barr 1979, 1987, Batzer et al. 2008, Crous et al. 2009, Hyde et al. 2013, Wijayawardene et al. 2014). Saccardo (1928) accommodated the family in *Phacidiales* when the family was introduced. Whereas, von Arx and Müller (1975) treated the family as a member of the then broadly treated *Dothideales*. Barr (1979) assigned *Schizothyriaceae* to *Asterinales*, while Eriksson (1981) disagreed with Barr (1979) and treated the family as a separate clade. Later, Barr (1987) removed *Schizothyriaceae* from *Asterinales* and reassigned the family in the order *Myriangiales*.

Phylogenetic analyses of *Schizothyriaceae* have been carried out by Batzer et al. (2005, 2008) and Crous et al. (2007, 2009) based on *Schizothyrium pomi* and its asexual morph (*Zygophiala*). Based on their analyses, *Schizothyriaceae* was accommodated in the order

Capnodiales and has shown to be allied to *Mycosphaerellaceae* (Batzer et al. 2005, 2008, Crous et al. 2007, 2009, Yang et al. 2010). Hyde et al. (2013) and Wijayawardene et al. (2014) however, treated the family in Dothideomycetes, families *incertae sedis*.

The geographic distribution of *Schizothyriaceae* is widespread, having been reported from both temperate and tropical regions (Barr 1987, Farr & Rossman 2015). Members of the family are described from Brazil, China, Hong Kong, India, Japan, Philippines, Puerto Rico and USA (Farr & Rossman 2015). Species in *Schizothyriaceae* are mostly epiphytic on dicotyledons (e.g. *Acer*, *Quercus* and *Prunus*) and they have also been found on monocotyledons such as bamboo (Farr & Rossman 2015).

In this study, we examined the generic type, *Schizothyrium acerinum* from Desmazières's collections (deposited in BR and PC) and designated the specimen from BR as a lectotype. Based on morphological examination of *Schizothyrium*, we conclude that *Schizothyriaceae* may belong in the order *Myriangiales* as suggested by Barr (1987). The arrangement of the asci in the ascostromata of *Schizothyrium acerinum* and other genera of *Schizothyriaceae* can be interpreted in two ways. Either, it can be considered as multi-loculate, with each ascus forming within a "cell", which is a component of a thin network-like structure and that fills the ascostromata, and each "cell" can be considered as an individual locule. This is somewhat similar to species of *Myriangiales*. Alternatively, the ascostromata can. We use the first interpretation here and therefore do not describe the hamathecium. However, genera in *Schizothyriaceae* mostly lack molecular data and phylogenetic investigation. There are 34 sequences for *Schizothyrium pomi* and 217 sequences of *Zygothiala* spp., the asexual morph of *Schizothyrium*, available in GenBank. Whereas, other genera in *Schizothyriaceae* lack molecular data. Therefore, representative species need to be recollected and epitypified (*sensu* Ariyawansa et al. 2014) as molecular data are required to resolve the natural placement of genera.

Key to genera of *Schizothyriaceae*

1. Ascostromata membranous..... 2
 1. Ascostromata lacking covered layers, forming brown hyphae, branching at the apex, which are associated among the asci..... *Plochrompeltis*
 2. Ascospores 1-septate 3
 2. Ascospores 2-septate, asci forming in hexagonal cell meshes *Hexagonella*
 3. Ascostromata composed of pseudoparenchymatous cells 4
 3. Ascostromata composed of delicate, light brown, to grey-brown membranous cells, ascospores smooth-walled..... *Lecideopsella*
 4. Ascostromata composed of hyaline to subhyaline, pseudoparenchymatous cells, ascospores smooth-walled, associated only on *Vochysiaceae* sp. *Mycerema*
 4. Ascostromata composed of dark brown to black pseudoparenchymatous cells, ascospores rough-walled, with small guttules, associated on a wide range of hosts..... *Schizothyrium*

Schizothyrium Desm., *Annl. Sci. Nat., Bot.*, sér. 3 11: 360 (1849)

FoF 01933

Epiphytic, or saprobic on leaves or branches of various flowering plants. **Sexual morph:** *Ascostromata* scattered, solitary to gregarious, superficial or subcuticular, flattened, dark, circular to ellipsoid, hemispherical, glabrous, multi-loculate, with each ascus forming in a locule, which is a "cell" in a network-like structure, opening by splitting of the upper wall. *Peridium* thin-walled, poorly-developed at the base, composed of dark brown to black pseudoparenchymatous cells, arranged in a *textura angularis* to *textura globulosa*. *Asci* 8-spored, bitunicate, subglobose to ovoid, sessile, apically rounded with indistinct ocular chamber, thick-walled at the apex, each ascus resting in a space between the mycelial networks. *Ascospores* overlapping bi- to tri-seriate, hyaline, ellipsoidal or oblong, 1-septate, slightly constricted at the septum, wider in upper cell, thick and rough-walled with small guttules. **Asexual morph:** Undetermined, but see notes.

Notes – *Schizothyrium* was introduced by Desmazières (1849) and is typified by *Schizothyrium acerinum* Desm. The generic type was originally described as “ascomata perithecial, sessile, solitary, subfleshy, rounded to ovoid, plane to low convex, minute, punctiform, longitudinal rim opening, with ovoid ascospores” and was collected from *Acer negundo* L. (Desmazières 1849). Von Arx and Müller (1975) synonymized many genera under *Schizothyrium* viz. *Microsticta* Desm., *Agyronella* Höhnelt, *Microthyriella* Höhnelt, *Epipeltis* Theiss., *Polyclypeolum* Theiss., *Eremotheca* Theiss. & Syd., *Endocycla* Syd., *Gyrothyrium* v. Arx, *Myiocoprailoa* Ciferri, *Didymopeltis* Batista & Lima, *Schizopeltis* Batista & Lima, *Schizothyrina* Batista & Lima, *Paraphysotheca* Batista [as *P. brosimi* = *S. rufulum* (Berk. & Curt.) v. Arx], *Schizonthopeltis* Batista & Maia, *Mycerema* Batista et al. and *Vanudenia* Batista & Maia [as *V. nectandrae* = *S. longisporum* (Pat.) v. Arx] and these should be restudied. Eriksson (1981) re-circumscribed the genus based on *Schizothyrium pomi* (Mont. & Fr.) Arx and mentioned that *Schizothyrium* formed inconspicuous vegetative mycelium, with ascomata opening by several cracks. Eriksson (1981) described more clearly the morphological details of *Schizothyrium*, however, he could not find the longitudinal opening which was mentioned in Desmazières (1849). Hyde et al. (2013) examined a representative specimens which were collected from Desmazières (1863) and mentioned that *Schizothyrium* did not form superficial or subcuticular vegetative mycelium and ascomata have pore-like openings based on horizontal sections.

Schizothyrium occurs on leaves, stems, or other parts of various vascular plants such as *Acer*, *Artocarpus*, *Bambusa*, *Crataegus*, *Gaultheria*, *Ilex*, *Malus*, *Phyllostachys*, *Pinus* and *Quercus* and has been found in several countries in both temperate and tropical regions (Eriksson 1981, Farr & Rossman 2015). There are 59 epithets for *Schizothyrium* in Index Fungorum (2016). However, most species lack modern taxonomic descriptions and molecular data to confirm the natural placements. Molecular data is only available in GenBank for *S. pomi* and its asexual morph. Therefore, the type species needs recollecting to obtain molecular data for determining the placement of *Schizothyrium sensu stricto*.

The asexual morph of *Schizothyrium* has been reported as hyphomycetous in the genus *Zygophiala* E.W. Mason for *S. pomi* (Batzer et al. 2005, 2008, Kirk et al. 2008, Ma et al. 2010, Hyde et al. 2013, Wijayawardene et al. 2012, 2014). The species has been reported from a wide range of hosts and a wide geographic distribution, mostly causing fly speck on apple and pear fruits (Batzer et al. 2005, 2008). The connection between *Schizothyrium pomi* and *Zygophiala jamaicensis* was initially reported by Durbin et al (1953) when they inoculated apple fruit with ascospores, and obtained both sexual and asexual morphs. Batzer et al. (2005) had also opined that the type species of *Zygophiala*, *Z. jamaicensis* was the asexual morph of *S. pomi*. Although, Batzer et al. (2008) later considered *Z. jamaicensis* as distinct from *S. pomi*, these genera have been shown to be congeneric in phylogenetic studies (Ma et al. 2010, Gao et al. 2014). Therefore, Rossman et al. (2015) choose the name *Schizothyrium* over *Zygophiala* as it was the older name. Additionally, Rossman et al. (2015) combined nine species in *Schizothyrium* which were previously named *Zygophiala*. *Schizothyrium pomi* is similar to *S. acerinum* in some aspects, but in other is unrelated and this will be the subject of a later paper.

Type species – *Schizothyrium acerinum* Desm.

Schizothyrium acerinum Desm., Anns Sci. Nat., Bot., sér. 3 11: 360 (1849)
FoF 01934

Fig. 1

Epiphytic, or saprobic on branches of *Acer*. **Sexual morph**: *Ascostromata* 30–70 µm high, 160–330 µm diam., scattered, solitary to gregarious, superficial, flattened, dark brown to black, circular to ellipsoid, hemispherical, glabrous, multi-loculate, with each ascus forming in a locule, which is a “cell” in a network-like structure, opening by slit-like cracking of the upper wall. *Peridium* 7–15 µm wide, thin-walled, poorly-developed at the base, composed of 1–3 layers of dark brown to black pseudoparenchymatous cells, arranged in a *textura angularis* to *textura globulosa*



Fig. 1 – *Schizothyrium acerinum* (PC0084488, author's specimen and BR5020103861716, lectotype). a. Label and specimens from PC. b, c. Appearance of ascostromata on the host surface (b: from PC, c: from BR). d. Squash of ascostroma visualized under the compound microscope (from BR). e. Section through ascostroma (BR). f. Section through peridium (BR). Network-like structure in horizontal section (BR). h–l. Asci stained in lactoglycerol (h–j = from BR, k, l = from PC). m–o. Ascospores stained in lacto glycerol (BR). p, q. Ascospores (PC). r. Ascospore stained with cotton blue (PC). Scale bars: d = 100 μ m, e = 50 μ m, f, g = 20 μ m, h–l, m–v = 5 μ m.

Asci 20–27 \times 13–16.5 μ m (\bar{x} = 23.9 \times 15 μ m, n = 15), 8-spored, bitunicate, subglobose to ovoid, sessile, apically rounded with indistinct ocular chamber, thick-walled at the apex, each ascus arranged in angular mycelial network. *Ascospores* (12.5–)13–15 \times 5–6 μ m (\bar{x} = 14.4 \times 5.9 μ m, n = 20), overlapping irregularly seriate, hyaline, ellipsoidal or oblong, 1-septate, slightly constricted at the septum, wider in upper cell, thick and rough-walled, with small guttules. *Asexual morph*: Undetermined.

Material examined – FRANCE, Paris, dead branch of *Acer negundo* L. (*Sapindaceae*), 1863, Desmazières, PC0084488; *ibid.* on dry twigs of *Acer negundo* L, Desmazières, BR5020103861716, **lectotype is designated here**).

Notes – *Schizothyrium acerinum* is a poorly understood species, and subsequently authors often choose *S. pomi* to represent the morphological characters of the genus *Schizothyrium*. *Schizothyrium pomi* was treated as a synonym of *S. acerinum* by Eriksson (1981). The former is well-known to cause sooty blotch and flyspeck (SBFS) disease on apples and pears (von Arx 1959a, Eriksson 1981, Batzer et al. 2005, 2008). *Schizothyrium acerinum* is similar to *S. pomi* in having ovoid to subglobose, or ellipsoid to clavate asci with hyaline, fusoid to ellipsoidal guttulate, thick-walled, 1-septate ascospores. However, *S. pomi* differs from *S. acerinum* in having larger ascomata and asci and lacking ostioles, and having a peridium composed of an irregular meandering arrangement of compact hyphae and being associated with apples and pears. *Schizothyrium pomi* forms pseudoparaphysoid-like filaments among the asci, while in *S. acerinum* there is a network-like structure, and each ascus is arranged in an angular mycelial “cell”. The latter species has only been reported from *Acer*. Fresh collections of *S. acerinum* are needed to establish the placement of the genus in the Dothideomycetes and whether *S. pomi* is related to *S. acerinum*.

Hexagonella F. Stevens & Guba ex F. Stevens, Bulletin of the Bernice P. Bishop Museum, Honolulu, Hawaii 19: 89 (1925) Fig. 2
FoF 01935

Epiphytic on upper surface of leaves of *Pelea rotundifolia*. **Sexual morph:** Mycelium superficial, branched, forming a flattened, net-like thallus. *Ascstromata* scattered, solitary, superficial, with little cuticular connection, dark brown, rounded, plane, cushion-like, glabrous, multi-loculate, with each ascus forming in a locule, which is a “cell” in a network-like structure, comprising a disk, with dense, woven mycelium, the central disk surrounded by irregular periphery of sparsely interwoven, loosely, branched, spreading hyphae, lacking ostioles. *Peridium* composed of a thick, hexagonal, mesh-like structure, with standing hyphae. *Asci* 8-spored, solitary, scattered in hexagonal cell-meshes, not covered by perithecia, each ascus resting in a space between the sterile cells. *Ascospores* overlapping, brown, ellipsoidal to oblong, 2-septate, constricted at the septum, broadest at the lowest cell, thick and smooth-walled. **Asexual morph:** Undetermined (description from Stevens 1925).

Type species – *Hexagonella peleae* F. Stevens & Guba ex F. Stevens

Notes – *Hexagonella* was introduced by Stevens (1925) and is typified by *Hexagonella peleae* F. Stevens & Guba ex F. Stevens. The genus was introduced to accommodate a single species which was collected on leaves of *Pelea rotundifolia* from Hawaii. Stevens (1925) mentioned that the genus was similar to various genera in the families *Ascocorticiaceae*, *Hemisphaeriaceae*, *Myriangiaceae* and *Saccardiaceae*. However, *Hexagonella* differs from *Ascocorticiaceae* in having asci arranged in hexagonal cells, with each ascus separated by sterile hyphae (Stevens 1925). The genus differs from *Myriangiaceae* and *Saccardiaceae* in forming rounded, plane, cushion-like ascostromata and asci arranged in a single-layered thallus (Stevens 1925). While, *Myriangiaceae* often formed sphaerical, pulvinate, discoid, scutate ascostromata and *Saccardiaceae* forms discoid ascomata, composed of isodiametrical or irregular cells (von Arx & Müller 1975). Based on the naked and solitary asci with flat, thin, soft ascomata, *Hexagonella* was placed in the family *Gymnopeltineae* by Stevens (1925). Von Arx and Müller (1975) treated the genus in *Schizothyriaceae* and this was subsequently followed (Kirk et al. 2008, Lumbsch & Huhndorf 2010, Hyde et al. 2013, Wijayawardene et al. 2014).

Hexagonella is a poorly known genus. The type specimen is located in ILLS and BPI (only micro-slide of ascomata available in BPI). We examined the micro-slide of ascomata from BPI, although the ascomata on the micro-slide differ from the original description and iconotype. Therefore, the representative species need to be recollected to clarifying the natural placement and a modern taxonomic description provided. Nevertheless, we tentatively place the genus in *Schizothyriaceae* as it has typical characters.

Lecideopsella Höhn., Sber. Akad. Wiss. Wien, Math.-naturw. Kl., Abt. 1 118: 1229 [73 repr.] (1909)

FoF 01936

Epiphytic on upper and lower surfaces of leaves on various flowering plants. **Sexual morph:** *Ascostromata* scattered, gregarious, superficial, easily dispersed, visible as flattened, dark grey spots on the host surface, plane-scutate, uni-loculate, which is a “cell” in a network-like structure, glabrous, membranous, lacking ostioles. *Peridium* thin-walled, delicate, thinner towards the apex, poorly-developed at the base, composed of light brown, membranous cells. *Asci* 8-spored, bitunicate, globose to obovoid, with slightly short-curved pedicel or sessile, apically rounded, thick-walled at the apex. *Ascospores* overlapping, lying parallel, irregularly-seriate, hyaline to pale yellowish, oblong, 1-septate, slightly constricted at the septum, smooth-walled. **Asexual morph:** Undetermined (description from Höhnel 1909b).

Type species – *Lecideopsella gelatinosa* Höhn.

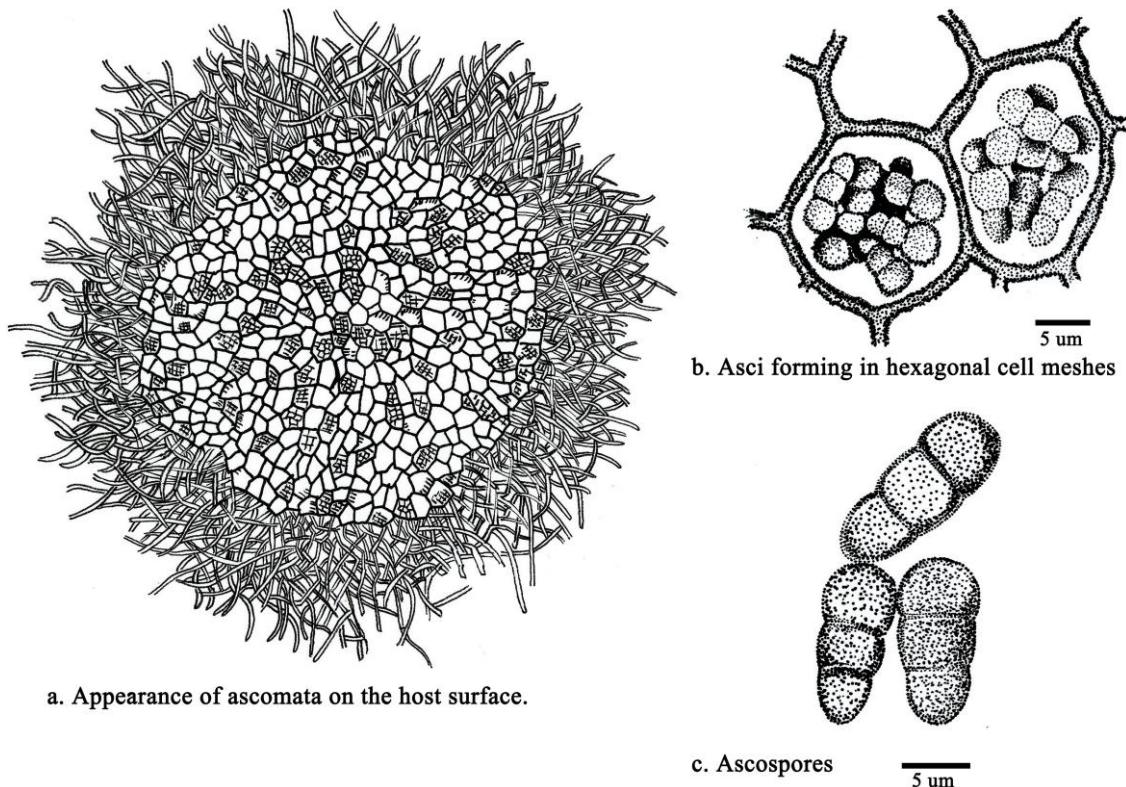


Fig. 2 – *Hexagonella peleae* (redrawn from Stevens F.L. 1925, iconotype).

Notes – *Lecideopsella* was introduced by Höhnel (1909b) to accommodate an epifoliar fungus on *Paratropia* sp. in Indonesia, which was typified by *L. gelatinosa* Höhn. Höhnel (1909b) mentioned that the genus was related to *Henningsiella* Rehm, *Lecideopsis* (Almq.) Rehm., *Leptophyma* Sacc. and *Phillipsiella* Cooke. However, *Lecideopsella* differ from these genera due to its ascostromata and in having network-like structure while *Henningsiella* lacks pseudoparaphyses. *Lecideopsis* formed apothecial ascomata, erumpent through host epidermis, which turns red or blue when stained in iodine, while *Lecideopsella* forms plane-scutate ascomata, typically superficial on the host and does not turn blue when stained in iodine, (Rehm 1895, Höhnel 1909b). *Leptophyma* differs from *Lecideopsella* in having loose pseudoparaphyses, forming a colorless epithecium, and is articulariella-like (Höhnel 1909b), whereas, *Phillipsiella* has pseudoparaphyses, with short, black, branches and a loose filamentous hypothecia (Höhnel 1909b).

Lecideopsella is a poorly known genus which accommodates 12 species in Index Fungorum (2016) and lacks molecular data. The genus has been collected from various flowering plants, mostly in tropical regions, such as India, Indonesia and Uganda (Farr & Rossman 2015). Hansford (1944, 1945, 1946, 1947) introduced *L. gelatinosa*, using the same name with the type species (on *Jasminum dichotomum* Vahl), *L. brideliae* (on *Bridelia micrantha* (Hochst.) Baill.), *L. landolphiae* (on *Landolphia florida* Benth.) and *L. ugandensis* (on *Artabotrys nitidus* Engl.) to the genus *Lecideopsella*. Nevertheless, Müller and von Arx (1962) transferred *L. brideliae* and *L. ugandensis* to the genus *Leptophyma*. Pande (2008) circumscribed the ascomycetes of Peninsular in India and accommodated eight species in *Lecideopsella* viz. *L. atra* A. Pande, *L. atra* var. *atra* A. Pande, *L. atra* var. *eugeniae* A.B. Pawarn & M.S. Patil ex A. Pande, *L. aurantiaca* (Ellis & G. Martin) A. Pande, *L. bakeri* (Syd. & P. Syd.) A. Pande, *L. gelatinosa* var. *longispora* (A.B. Pawar & M.S. Patil) A. Pande, *L. hyalina* A. Pande and *L. trinidadensis* (F. Stevens) A. Pande.

Lecideopsella was treated as a synonym of *Leptophyma* and accommodated in *Schizothyriaceae* by von Arx and Müller (1975) and this was followed by Hawksworth et al. (1983) and Eriksson and Hawksworth (1985). Nevertheless, Eriksson and Hawksworth (1987) reinstated the genus and treated it in *Schizothyriaceae*. Subsequently, *Lecideopsella* was accommodated in *Schizothyriaceae* by various mycologists following Eriksson and Hawksworth's agreement (1985) (Eriksson & Hawksworth 1987, Kirk et al. 2001, 2008, Lumbsch & Huhndorf 2010, Hyde et al. 2013, Wijayawardene et al. 2014).

Lecideopsella gelatinosa Höhn., Sber. Akad. Wiss. Wien, Math.-naturw. Kl., Abt. 1 118: 1230 [74 repr.] (1909) Fig. 3
FoF 01937

Epiphytic on lower surface of leaves of *Paratropia* sp. **Sexual morph:** *Ascostromata* 400–1000 µm diam. superficial, scattered, roundish, thinner towards the edge, delicate membranous, hyphae with membrane merging, gelatinous, brown-grey. *Asci* 32–35 × 28 µm, 8-spored, bitunicate, globose-ovoid, short pedicellate, thick-walled at the apex, with each ascus forming in a locule, which is a “cell” in a network-like structure. *Ascospores* 16 × 7 µm, pale yellowish, ovate-oblong, rounded at both ends, 1-septate, upper cell shorter and wider than lower cell, smooth-walled (description from von Höhnelt 1909b)

Notes – Von Höhnelt (1909b) compared the species with *Agyronella lagunculariae* (G. Winter) Höhn and considered that these two species are different in *A. lagunculariae* having a rather thick, dark, large cell hypothecium [a thin upper layer of the apothecial tissue on which the asci rest (Ulloa & Hanlin 2000)], peculiar paraphyses and multi-septate ascospores.

The type specimen was located in the Harvard University Herbaria (FH, 00274523). However, the specimen is in poor condition and we could not observe the ascomata on the host. Therefore, the genus needs to be recollected and sequence data obtained to clarify its placement.

Lecideopsella paragelatinosa Phookamsak & KD Hyde, **nom. nov.** Fig. 4
IF 551990
FoF 01938

Replaced synonym – *Lecideopsella gelatinosa* Hansf., Proc. Linn. Soc. London 157: 38 (1945) [1944-45]

Etymology – Para- (Gr.: beside, next to, resemble, towards), the epithet “*paragelatinosa*” refers to the resembling the species *Lecideopsella gelatinosa*.

Annotation – *Lecideopsella paragelatinosa* is introduced to replace *Lecideopsella gelatinosa* Hansf. which is an illegitimate name.

Epiphytic on lower surface of leaves of *Jasminum dichotomum* Vahl. **Sexual morph:** *Ascostromata* 18–40 µm high, 400–630 µm diam., scattered, gregarious, superficial, easily to remove, flattened, as dark grey spots on the host surface, plane-scutate, glabrous, multi-loculate, with each ascus forming in a locule, which is a “cell” in a network-like structure, membranous, lacking ostioles. *Peridium* 3–8.5 µm wide, thin-walled, poorly-developed at the base, composed of

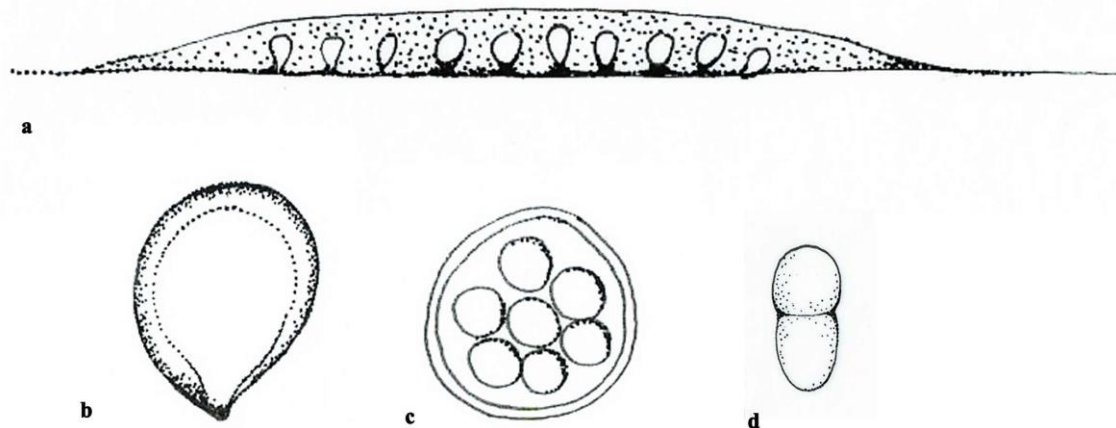


Fig. 3 – *Lecideopsella gelatinosa* (redrawn from Höhnelt's herbarium package in FH, **iconotype**). a. Appearance of ascostroma on the host surface. b. Ascus. c Arrangement of ascospores in asci. d. Ascospore.

light brown, membranous cells *Asci* (19.5–)20–30(–33.5) × (12.5–)13–15(–20) μm (\bar{x} = 27 × 14.8 μm, n = 20), 8-spored, bitunicate, globose to obovoid, with slightly short, curved pedicel or sessile, apically rounded, thick-walled at the apex. *Ascospores* (9–)10–12(–15) × 3–4.5 μm (\bar{x} = 11.3 × 3.4 μm, n = 30), overlapping tri- to tetra-seriate, hyaline, oblong-clavate, 1-septate, constricted at the septum, smooth-walled, with long, germ tubes (15–45 μm long) at both ends. **Asexual morph:** Undetermined.

Material examined – UGANDA, on living leaves of *Jasminum dichotomum* Vahl (*Oleaceae*), November 1943, C. G. Hansford, BPI 667226 (**type** of *Lecideopsella gelatinosa* Hansf.)

Notes – Hansford (1945) introduced the epifoliar fungus on *Jasminum dichotomum* from Uganda, namely *Lecideopsella gelatinosa* Hansf., which had the same name as the type species and thus a homonym. However, the species differs from the type species in having smaller ascomata, asci and ascospores and has hyaline ascospores, while the type species has pale yellowish ascospores. Therefore, we rename the species as *L. paragelatinosa* (Hansf.) Phookamsak & KD Hyde, the type material has germinated.

Mycerema Batista et al., in Batista et al., *Publicações Inst. Micol. Recife* 392: 5 (1963) Fig. 5
FoF 01939

Epiphytic on upper surface of leaves of *Vochysiaceae* sp. **Sexual morph:** *Mycelium* free, superficial, brown, glabrous, reticular, septate, non-hyphopodiate. *Ascostromata* scattered, solitary, superficial, brown, plane, orbicular, dimidiate, glabrous, membranous, lacking ostioles, with irregular dehiscence. *Peridium* thin-walled, poorly-developed at the base, composed of hyaline to subhyaline, reticular, pseudoparenchymatous cells. *Asci* 8-spored, bitunicate, oblong to globose, sessile, apically rounded. *Ascospores* overlapping irregular seriate, hyaline, claviform, 1-septate, slightly constricted at the septum, smooth-walled. **Asexual morph:** Undetermined (description from Batista et al. 1963)

Type species – *Mycerema vochysiacearum* Batista et al.

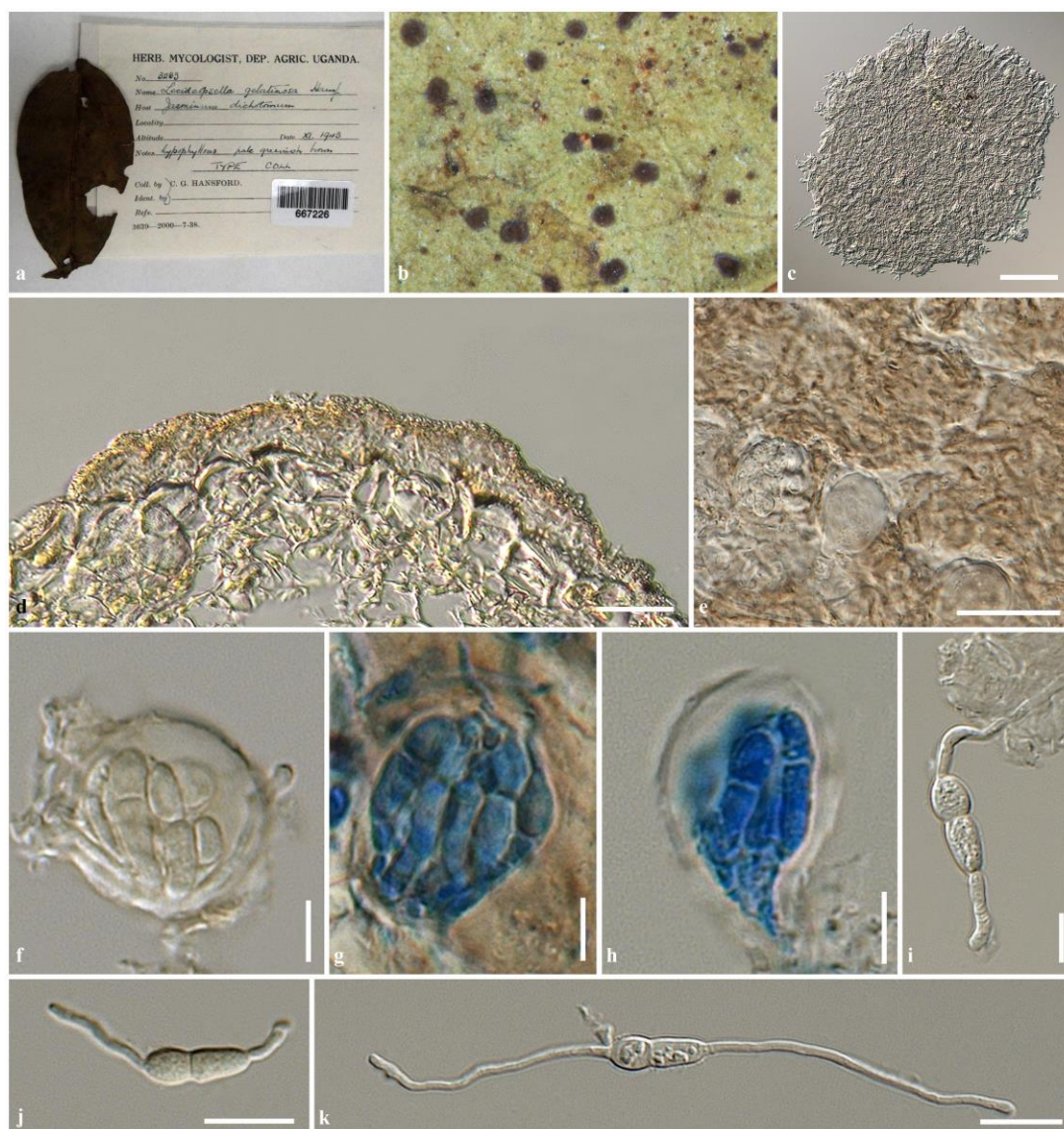


Fig. 4 – *Lecideopsella paragelatinosa* (BPI 667226, holotype of *Lecideopsella gelatinosa* Hansf.). a. Herbarium specimen from BPI. b. Appearance of ascomata on the host surface. c. Squash mount of ascoma visible under the compound microscope. d. Section through ascostroma. e. Peridium structure visualized from above. f. Ascus. g, h. Asci stained in cotton blue. i–k. Ascospores which have germinated. Scale bars: c = 100 µm, d, e = 20 µm, j, k = 10 µm, f–i = 5 µm.

Notes – *Mycerema* was introduced by Batista et al. (1963) to accommodate a single species *M. vochysiacearum*. The type species was found on leaves of *Vochysiacea* sp. in Brazil. Batista et al. (1963) mentioned that *Mycerema vochysiacearum* was associated with *Vizella bingervilliana* C. Moreau & M. Moreau and *Plenotrichaius hiloensis* Bat. & J.L. Bezerra. Hyde et al. (2013) examined the type of *M. vochysiacearum* and transferred it to the genus *Vizella* (*Vizellaceae*).

We therefore examined the same specimens as Hyde et al. (2013) (Brazil, Ponta Negra, Manaus, Amazonas, on *Vochysiacea* sp., 18 September 1961, J.M. Carvalho (Leg.), A.C. Batista and W. Cavalcanti (Det.), URM 25844), and found that the type specimen is in poor condition and lacked ascomata of *Mycerema vochysiacearum*. *Vizella bingervilliana* was found and examined and is same taxon that Hyde et al. (2013) had examined and treated as *Vizella vochysiacearum*. Additionally, we observed the protologue and iconotype of *Mycerema vochysiacearum* and found that the protologue did not match with the taxon that we found on the host. Therefore, we consider that the taxon on the host is *Vizella bingervilliana* following Batista et al. (1963). Hence, we reinstate *M. vochysiacearum* as the type of *Mycerema*.

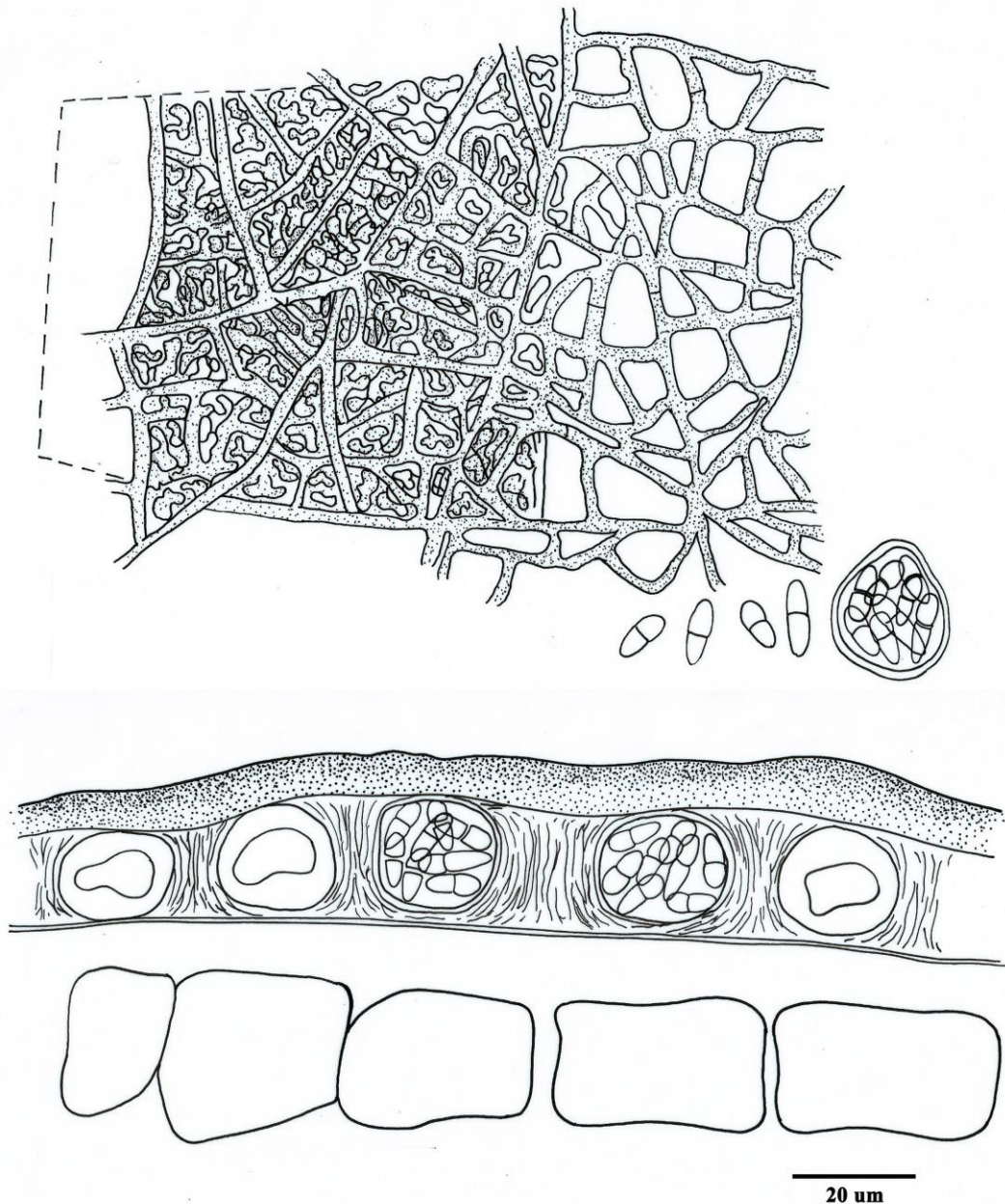


Fig. 5 – *Mycerema vochysiacearum* (redrawn from Batista et al. 1963, **iconotype**).

Mycerema is a poorly known genus which lacks modern taxonomic description and molecular data is needed to resolve its natural placement. There are only two epithets available in Index Fungorum (2016). *Mycerema vochysiacearum* had been transferred to the genus *Vizella* by Hyde et al. (2013). However, we reinstate this species as *Mycerema* in this study. *Mycerema chandleri* (Hansf.) M.L. Farr has currently been treated as *Bonaria chandleri* (Hansf.) Bat. in the family *Micropeltidaceae* (Index Fungorum 2016). Hyde et al (2011) and Wijayawardene et al. (2012) reported the asexual morph of *Mycerema* as the coelomycetous genus *Plenotrichaius*. However, Wijayawardene et al. (2014) treated the genus in Dothideomycetes, *genera incertae sedis*.

We tentatively placed *Mycerema* in *Schizothyriaceae* based on its morphological characters. Recollection of the representative species, with sequence data is needed to clarify the taxonomic placement.

Plochmopeltis Theiss., Brotéria, sér. bot. 12: 87 (1914)

FoF 01940

Epiphytic on lower surface of leaves of *Quercus* spp. and some flowering plants. **Sexual morph:** *Ascstromata* scattered, solitarily, flattened, brown to dark brown, superficial, dimidiate to scutate, or crustaceous, multi-loculate, without walls, lacking peridia, covering by reddish brown hyphae, septate, roughly coarse, with brown to reddish brown mycelium clumps at the top, or membranous, composed of subhyaline to light brown, mycelial networks, with each ascus forming in a locule, which is a “cell” in a network-like structure. *Asci* 8-spored, bitunicate, fissitunicate, globose to subglobose, or clavate, short to long pedicellate, apically rounded with obtuse ocular chamber and thick apex. *Ascospores* overlapping irregular tri- to penta-seriate, hyaline, ellipsoidal to oblong or clavate, septate, slightly constricted at the septum, smooth-walled. **Asexual morph:** Undetermined.

Type species – *Plochmopeltis intricata* (Ellis & G. Martin) Theiss.

Notes – *Plochmopeltis* was introduced by Theissen (1914) to accommodate the epiphytic taxon, forming hypophyllous, superficial ascomata on leaves of *Quercus arenaria* Borbás in Florida, USA. The genus was typified by *Plochmopeltis intricata* (Ellis & G. Martin) Theiss., which was previously identified as *Asterina intricata* Ellis & G. Martin.

Several epiphytic collections from Florida, with flattened, sessile, superficial ascomata on the host cuticle, were mostly classified as “*Asterelia*” by Saccardo (1891). However, Theissen (1912) re-classified these taxa and accommodated them in different genera such as *Calothyrium* Theiss., *Microthyriella* Höhn., *Microthyrium* Desm. and *Stomiopeltis* Theiss. (von Arx 1959b). The relevant species described on *Quercus laurifolia* Michx. were initially classified as *Microthyriella* by Theissen (1912) and Petrak (1929). Later, Theissen (1914) placed it in the genus *Plochmopeltis*. Theissen (1914) and Petrak (1929) mentioned that *Plochmopeltis* formed peridia with small plectenchymatous cells (von Arx 1959b). Von Arx (1959b) re-circumscribed the genus *Plochmopeltis* based on the type specimen of *Asterina intricata* and mentioned that *Plochmopeltis* did not form peridia, but had confluent mycelium with clumps at the apex, covering the asci. Additionally, von Arx (1959b) introduced a new species, *Plochmopeltis ellisii* Arx. Müller and von Arx (1962), included two other species, *Plochmopeltis roupalae* (Syd.) Arx (\equiv *Microthyriella roupalae* Syd.) and *Plochmopeltis graminicola* (Höhn.) Arx (\equiv *Microphyma graminicola* Höhn.). Gómez (1998) introduced a new species *Plochmopeltis rodriguezii* from leaves of *Eugenia axillaris* from Cuba.

Recently, five species are accommodated in the genus (Index Fungorum 2016), but they lack molecular data and phylogenetic investigation. Species of *Plochmopeltis* occur on various hosts and are distributed in tropical to subtropical regions, such as Brazil, Cuba, Ecuador, Florida (USA), and the West Indies (Arx 1959b, Müller & von Arx 1962, Farr & Rossman 2015).

Based on examination of the type, we agree with von Arx (1959b) that the genus *Plochmopeltis* forms superficial ascomata on the host, lacks a peridium, but forms confluent mycelium, with brown hyphae clumps at the apex covering the asci and indistinct network-like structure. *Plochmopeltis* differs from other genera in *Schizothyriaceae* in forming confluent mycelium with brown hyphae clumps at the apex covering the asci, and in lacking a peridium. Therefore, we place the genus in *Schizothyriaceae* until representative species are recollected and molecular data is obtained to clarify the natural placement.

Plochmopeltis intricata (Ellis & G. Martin) Theiss., Brotéria, sér. bot. (1914)

Fig. 6

FoF 01941

\equiv *Asterina intricata* Ellis & G. Martin, Am. Nat. 18: 69 (1884)

Epiphytic on lower surface of leaves of *Quercus arenaria* Borbás. **Sexual morph:** *Ascstromata* 280–430 μ m diam., scattered, solitary, dense, flattened, of brown to dark brown hyphae, superficial, dimidiate to scutate or crustaceous, multi-loculate, with each ascus forming in a locule, which is a “cell” in a network-like structure, forming confluent mycelium with brown hyphae clumps at the apex covering the asci, without a distinct wall, lacking ostioles. *Mycelium* 1–3

µm wide, brown to reddish brown, septate, roughly coarse, branching, botryose elements, straight or curved. *Asci* 17.5–35 × 15–17 µm (\bar{x} = 26.4 × 16.5 µm, n = 20), 8-spored, bitunicate, fissitunicate, globose to subglobose, or clavate, short to long pedicellate (2.5–10 µm long), apically rounded, with obtuse ocular chamber and thickened apex. *Ascospores* 12.5–15 × 2.5 µm (\bar{x} = 13.3 × 2.5 µm, n = 20), overlapping irregular tri- to penta-seriate, hyaline, ellipsoidal to oblong or clavate, 1-septate, slightly constricted at the septum, larger in the upper cell, smooth-walled. **Asexual morph:** Undetermined.

Material examined – USA, Florida — 29.99°/-81.68°, on leaves of *Quercus arenaria* (*Fagaceae*), 13 March 1883, Martin, no. 176 (W Krypto 1978-0015085, **type** of *Asterina intricata*).

Notes – When Theissen (1914) introduced a new genus *Plochmopeltis*, he designated *P. intricata* as the type species, which is based on *Asterina intricata*. *Plochmopeltis intricata* was collected on leaves of *Quercus arenaria* from Florida. The species is most similar to *P. ellisii*, but differs in having dark brown, dense mycelium, with more highly branched of mycelium clumps. *Ascospores* of *P. ellisii* are more rounded than *P. intricata*, while *P. ellisii* has a brighter and sparse, superficial mycelium.

Plochmopeltis roupalae (Syd.) Arx, in Müller & von Arx, Beitr. Kryptfl. Schweiz 11(no. 2): 209 (1962) Fig. 7

FoF 01942

≡ *Microthyriella roupalae* Syd., Anns mycol. 25(1/2): 95 (1927)

Epiphytic on lower surface of leaves of *Roupala veraguensis* Klotszch. **Sexual morph:** *Ascstromata* 20–35 µm high, 130–250 µm diam., scattered, solitary, flattened, brown to dark brown, circular or ellipsoidal, superficial, crustaceous to quadrilateral, multi-loculate, with each ascus forming in a locule, which is a “cell” in a network-like structure, forming branching hyphae, terminated in dark brown, botryose elements, membranous, lacking ostioles. *Mycelium* 1–3 µm wide, hyaline, septate, smooth, with brown to dark brown, flower-like tufting apices. *Pseudoepithecium* 1–5.5 µm thick, botryose elements, with loose mycelia merging with thin membranous covering the fungal contents. *Asci* (15–)17–23(–25) × 9–12(–13) µm (\bar{x} = 21.4 × 11 µm, n = 30), 8-spored, bitunicate, globose to subglobose, or clavate, short to long pedicellate (3–8 µm long), apically rounded with plane and thick apex. *Ascospores* 6–7(–8) × 2–3 µm (\bar{x} = 7.1 × 2.9 µm, n = 30), overlapping, irregularly tri- to penta-seriate, hyaline, ellipsoidal to oblong or clavate, 1-septate, slightly constricted at the septum, smooth-walled. **Asexual morph:** Undetermined.

Material examined – COSTA RICA, Alajuela, Mondongo pr. San Ramon, on leaves of *Roupala veraguensis* (*Proteaceae*), 3 February 1925, H. Sydow, no. 229c (S-F61524, **syntype** of *Microthyriella roupalae* Syd.).

Notes – *Plochmopeltis roupalae* differs from *P. intricata* in having loose mycelia merging with membranous cells covering ascomata and less botryose elements than *P. intricata*. *Plochmopeltis roupalae* also has smaller ascomata, asci and ascospores, as compared to *P. intricata*.

Schizothyriaceae, genera incertae sedis

Kerniomyces Toro, J. Agric. Univ. Puerto Rico 22: 452 (1939)

Type species – *Kerniomyces costi* Toro, J. Agric. Univ. Puerto Rico 22: 453 (1939)

Notes – *Kerniomyces costi* was collected on *Costus macrostachys* (*Costaceae*) from Venezuela. Petrak (1950a) treated the genus in *Myriangiales*, while Eriksson and Hawksworth (1985) placed *Kerniomyces* in *Schizothyriaceae* and this was followed by subsequent authors (Eriksson & Hawksworth 1987, Kirk et al. 2001, 2008, Lumbsch & Huhndorf 2010, Hyde et al. 2013, Wijayawardene et al. 2014). We therefore, treat the genus in *Schizothyriaceae, genera incertae sedis* as the type material of the genus could not be located and lacks taxonomic description.

Metathyriella Syd., Annls mycol. 25(1/2): 96 (1927)

Epiphytic on Crataegus crenulata (D. Don) M. Roem and *Roupala veraguensis* Klotszch.

Sexual morph: *Ascomata* thyriothecial, scattered, scutate or hemisphaerical, with indistinct basal membrane, plane-convex, completely closed, irregularly lumpy at the maturity, transparent, yellowish-brown or olive-brown. *Hamathecium* composed of dense, filiform, branched, reticulate paraphyses. *Asci* 8-spored, bitunicate, broadly ellipsoid to ovoid, sessile. *Ascospores* overlapping parallel uni-seriate, hyaline, oblong-clavate, 2-septate, moderate. **Asexual morph:** Undetermined (description from Sydow 1927).

Type species – *Metathyriella roupalae* Syd.

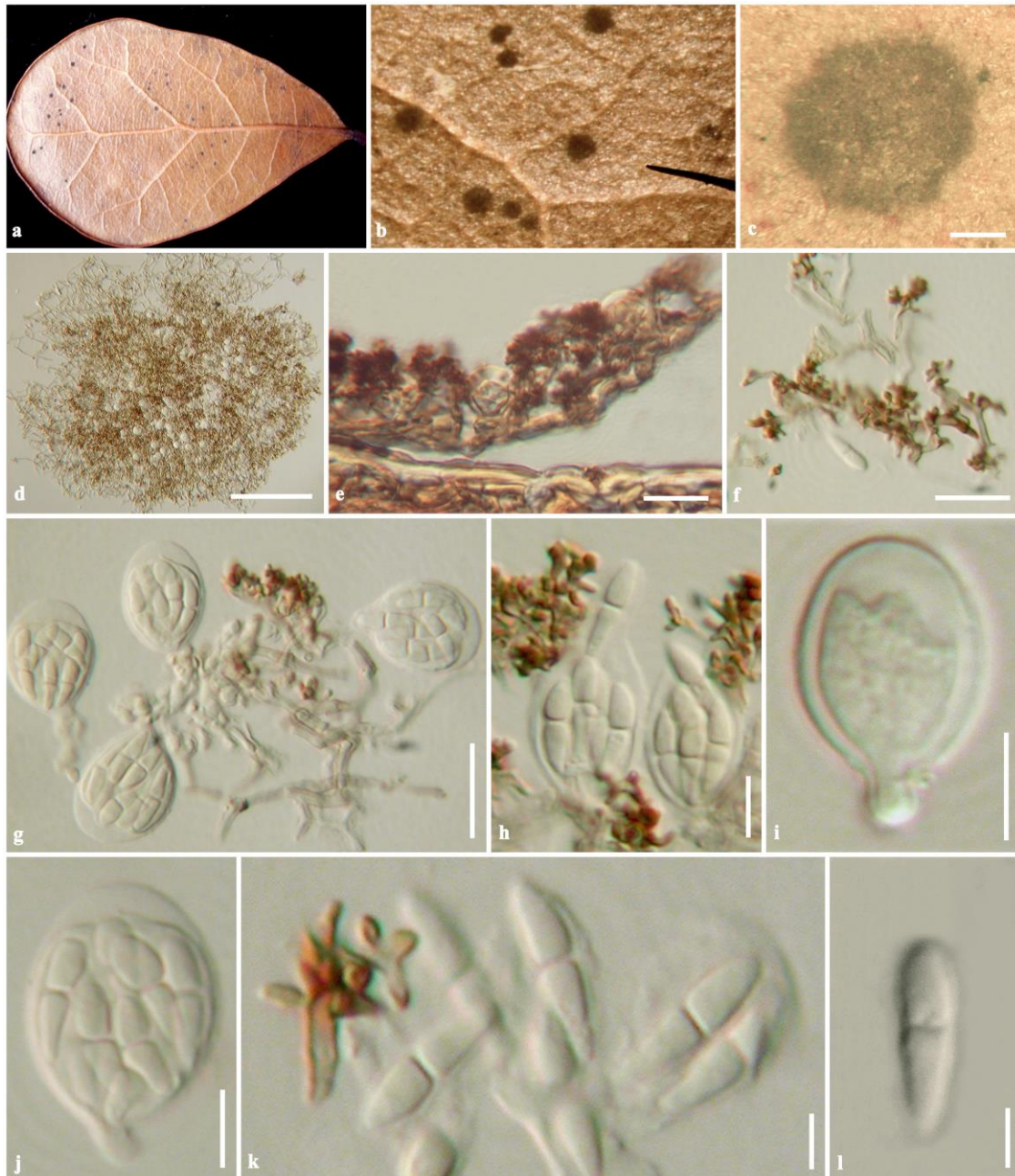


Fig. 6 – *Plochmopeltis intricata* (W Krypto 1978-0015085, **type** of *Asterina intricata* Ellis & G. Martin). a. Herbarium specimen from W. b, c. Appearance of ascostromata on the host surface. d. Squash mount of ascostroma visualized under the compound microscope. e. Section through ascostroma. f. The confluent mycelium with botryose elements at the apex. g. Asci merging with a network-like structure. h–j. Asci. k, l. Ascospores. Scale bars: c, d = 100 μ m, e, g = 20 μ m, f, h–j = 10 μ m, k, l = 5 μ m.

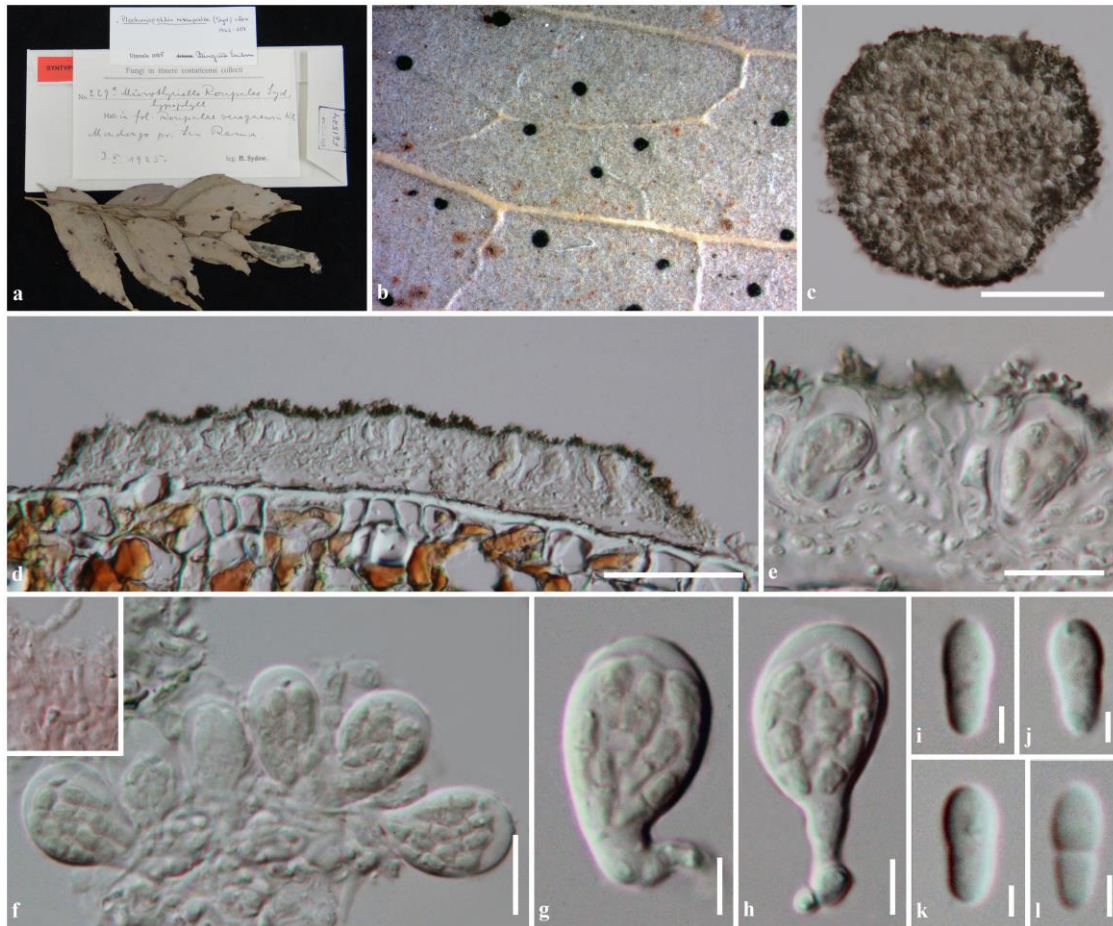


Fig. 7 – *Plochmopeltis roupalae* (S-F61524, **syntype** of *Microthyriella roupalae* Syd.). a. Herbarium label and specimen from S. b. Appearance of ascomata on the host surface. c. Squash mount of ascoma visualized under the compound microscope. d. Section through ascostroma. e. Appearance of the loose mycelium with botryose elements at the apex. f. Asci with paraphysoid-like filaments. g, h. Asci. i–l. Ascospores. Scale bars: c = 100 μm , d = 50 μm , e, f = 10 μm , g, h = 5 μm , i–l = 2 μm .

Notes – *Metathyriella* was introduced by Sydow (1927) and is typified by *M. roupalae* Syd. which was collected from leaves of *Roupala veraguensis* Klotszch (*Proteaceae*). The type species was originally described as “ascomata 20–25 μm high, 200–350 μm diam., epiphyllous, thyriothecial, with irregular loose margin, solitary, superficial, dimidiate-scutate, or orbicular, with indistinct basal membrane, the membrane covered by flattened, soft convex layer, softest towards the center, completely closed, irregularly lumpy at maturity, yellowish-brown to olive-brown, later more or less intense, periphery in a subhyaline membrane matrix; hamathecium comprising numerous, filiform, branched, anastomosing, paraphyses; asci 20–28 \times 17–20 μm , 8-spored, bitunicate, ellipsoidal, or broadly ovoid to subglobose, sessile to short pedicellate, apically broadly rounded, with an indistinctly attenuate base; ascospores amalgamated, rarely indistinct tri- to tetra-seriate, oblong-clavate, gradually tapering towards the base, with obtuse ends, straight or curved, 2-septate, distinctly septate at the upper cell, indistinct at the lower cell, or barely constricted, 12–16 μm long, upper cell 5–6 μm wide, subglobose, median cell 5 μm wide, subcuboid, obtuse-conoid at the lower cell, and 4–5 μm wide” (Sydow 1927). Sydow (1927) mentioned that the genus was probably related to *Clypeolum* Speg., but *Clypeolum* differed from *Metathyriella* in having multi-septate ascospores.

Sydow (1927) treated the genus in *Hemisphaeriaceae*, but von Arx and Müller (1975) accommodated the genus in *Schizothyriaceae*. Various mycologists followed von Arx and Müller (1975) and accommodated *Metathyriella* in *Schizothyriaceae* (Eriksson & Hawksworth 1985, 1987,

Kirk et al. 2001, 2008, Lumbsch & Huhndorf 2010, Hyde et al. 2013, Wijayawardene et al. 2014). However, *Metathyriella* is a poorly studied genus and the type specimen could not be located. Three species are listed in Index Fungorum (2016) and lack molecular data. Hence, the genus needs to be recollected and studied.

Myriangiella Zimm., Centbl. Bakt. ParasitKde, Abt. I 8: 183 (1902)

Epiphytic on various flowering plants. **Sexual morph:** *Ascostromata* flattened, circular, disciform. *Asci* 8-spored, bitunicate, ovoid, short pedicellate. *Ascospores* phragmosporous, hyaline, oblong, septate. **Asexual morph:** Undetermined (description from Saccardo 1906).

Type species – *Myriangiella orbicularis* Zimm.

Notes – *Myriangiella* was introduced by Zimmermann (1902) and is typified by *M. orbicularis* Zimm. which was collected from leaves of coffee (Saccardo 1906). Toro (1927) introduced a new species *Myriangiella arcuata* Toro from *Casearia arculeata* Jacq. and was associated with *Scolecopeltis micropeltiformis* Toro. *Myriangiella* was treated as a synonym of *Micropeltis*, named as *Micropeltis orbicularis* (Zimm.) v. Höhn by von Höhn (1909a). Later, von Höhn (1912) excluded the species from *Micropeltis* in his revision of *Micropeltis* and treated it in a new genus, *Phragmothyriella* Höhn. Toro (1927) disagreed with von Höhn (1909a) as the genus *Myriangiella* was originally introduced to accommodate this taxon. Hence, Toro (1927) reinstated *Myriangiella* to accommodate *M. orbicularis* and synonymized *Phragmothyriella moelleriana* (Sacc.) Höhn. under *Myriangiella*. *Myriangiella moelleriana* was treated as *Schizothyrium moellerianum* (Sacc.) Arx [as 'mollerianum'] by Müller and von Arx (1962).

Limber and Jenkins (1949) transferred *Myriangium sabaleos* Weedon to *Myriangiella* as *M. sabaleos* (Weedon) Limber & Jenkins. However, *M. sabaleos* has muriform ascospores and does not match with *Myriangiella*, which has phragmosporous ascospores (Saccardo 1906). Therefore, *M. sabaleos* need to be recollected to clarify its natural placement. Additionally, von Arx and Müller (1975) transferred *Protopeltis roupalae* Syd. to the genus *Myriangiella* in their re-evaluation of bitunicate ascomycetes.

Saccardo (1906) treated *Myriangiella* in the family *Myriangiaceae*, while Toro (1927) placed the genus in *Hemisphaeriaceae*, and von Arx and Müller (1975) accommodated it in *Schizothyriaceae*. *Myriangiella* is a poorly studied genus which lacks a modern taxonomic treatment or molecular data to clarify its natural placement. There are only six species reported in Index Fungorum (2016). *Myriangiella costaricensis* is named *Myrianginella costaricensis* F. Stevens. which it is mistakenly listed under *Myriangiella* in Index Fungorum (2016). A type specimen and taxonomic literature for *Myriangiella* could not be found. Therefore, we treat *Myriangiella* in *Schizothyriaceae*, *genera incertae sedis*.

Genera excluded from *Schizothyriaceae*

Amazonotheca Bat. & H. Maia, in Batista, Publicações Inst. Micol. Recife 56: 408 (1959) Fig. 8 FoF 01943

Epiphytic on leaves of *Santiria nitida* Merr. and *Neea madeirana* Standl. **Sexual morph:** *Mycelium* lacking. *Ascomata* scattered, solitary, superficial, dark brown, plane, shield-shaped, orbicular, glabrous, uni-loculate, translucent, membranous, lacking ostioles. *Peridium* thin-walled, poorly-developed at the base, composed of hyaline, prosenchymatous cells. *Hamathecium* forming cellular, paraphyses-like filaments, filiform, branched, septate. *Asci* 4–8-spored, bitunicate, subglobose to ovoid, sessile, apically rounded. *Ascospores* overlapping, brown, subcylindrical, 2-septate, constricted at the septum, smooth-walled. **Asexual morph:** Undetermined (description from Batista 1959).

Type species – *Amazonotheca santiriae* Bat. & H. Maia.

Notes – *Amazonotheca* was introduced by Batista and Maia, in Batista (1959) to accommodate epiphytic species, having brown, 2-septate ascospores and is typified by *Amazonotheca santiriae* Bat. & H. Maia. The type species was collected on leaves of *Santiria*

nitida from Brazil which was originally described as “ascomata 25–30 µm high, 420–450 µm diam., sparse on the host, occurred on the top of leaves, dispersed, brown-yellowish, translucent in structure, membranous; peridium 1–5.5 µm wide, comprising hyaline, prosenchymatous cells in the upper walls, margins not fimbriate, poorly-developed at the base; hamathecium 0.5–1 µm wide, filiform, branched, septate; asci 13.5–16.5 × 11–13.5 µm, 4–8-spored, bitunicate, subglobose to ovoid, sessile; ascospores 11–13.5 × 3–5.5 µm, brown, subcylindrical, 2-septate, constricted at the septum, smooth walls” (Fig. 8) (Batista 1959). Batista et al. (1967) accommodated a second species, *Amazonotheca olivacea* Batista et al. that was collected on leaves of *Neea madeirana* in Brazil.

Amazonotheca is a poorly known genus that lacks a modern taxonomic treatment and molecular data to resolve its natural placement. There are only two epithets in Index Fungorum (2016) and no sequence data available in GenBank. The type specimen was deposited in the Universidade Federal de Pernambuco (URM), Brazil and could not be loaned. We examined the specimen from Dr. Lima’s collection (P-4. Serra do Veado-Serra do Navio, 24 August 1961, Lima J.A.(Leg.), A.C. Batista A.C. & Xavier Filho L. (det.), URM 28927) and found that the specimen is in poor condition. There are no ascomata of *A. santiriae* on the host surface.

Amazonotheca differs from the generic type, *Schizothyrium* in forming anastomosing, cellular pseudoparaphyses and has a peridium of prosenchymatous cells. *Schizothyrium* forms network-like filaments and has a peridium composed of pseudoparenchymatous cells, arranged in *textura angularis* to *textura globulosa*. *Amazonotheca* is similar to *Hexagonella* in having brown, 2-septate ascospores. However, *Amazonotheca* differs from *Hexagonella* in having brown-yellowish, translucent, membranous ascomata, with asci forming among pseudoparaphyses from the base, while *Hexagonella* has naked ascomata, comprising loose, branched, spreading hyphae and asci formed in a space between the hexagonal, mesh-like structure. We therefore, exclude *Amazonotheca* from *Schizothyriaceae* and place the genus in Dothideomycetes, *genera incertae sedis*. Nevertheless, recollection and molecular data of *Amazonotheca* is needed to resolve its natural placement of the genus.

Chaetoplaca Syd. & P. Syd., *Annls mycol.* 15(3/4): 232 (1917)

FoF 01944

≡ *Acanthoderma* Syd. & P. Syd., *Annls mycol.* 15(3/4): 234 (1917)

Epiphytic, on lower surface of leaves of *Memecylon* sp. **Sexual morph:** Undetermined.

Asexual morph: *Conidiomata* acervular, scattered to clustered, solitary to gregarious, superficial, dark brown to black, circular or irregular in shape, producing orangish-brown areas around the conidiomata on its host tissue, plane, with a single stratum, uni-loculate, setose, membranous, lacking ostioles. *Peridium* thin-walled, composed of light brown to brown, irregular meandering arrangement of compact cells. *Setae* reddish-brown to dark brown, erect, aseptate. *Conidiophores* reduced to conidiogenous cells. *Conidiogenous cells* phialidic, holoblastic, determinate, short, indistinct to ampulliform, hyaline, smooth-walled, restricted to the base. *Conidia* solitary, clavate to falcate, hyaline to subhyaline, initially aseptate, becoming 2-septate at maturity, base truncate, rough and thick-walled.

Type species – *Chaetoplaca memecyli* Syd. & P. Syd.

Notes – *Chaetoplaca* was introduced as a monotypic genus by Sydow and Sydow (1917) to accommodate *C. memecyli* Syd. & P. Syd. which was collected on leaves of *Memecylon* sp. in the Philippines. The genus is poorly known, has a single species and lacks sequence data. Sydow and Sydow (1917) found both the sexual and asexual morph associated with the host and described the sexual morph of *C. memecyli* as “ascomata 1–2 mm diam., on lower surface of leaves, depressed, superficial, orbicular, pale brown to black, subhyaline at the margin, with a single stratum, membranous, composed of radiating cells, lacking paraphyses; asci 50–65 × 16–19 µm, 8-spored, bitunicate, clavate, subsessile to short pedicellate, apically rounded; ascospores 16–18 × 7–8 µm, initially hyaline, becoming brown at maturity, obovoid-ellipsoidal to ovoid-oblong, apically rounded, with rounded to attenuated at the base, 1-septate, slightly constricted at the septum”.

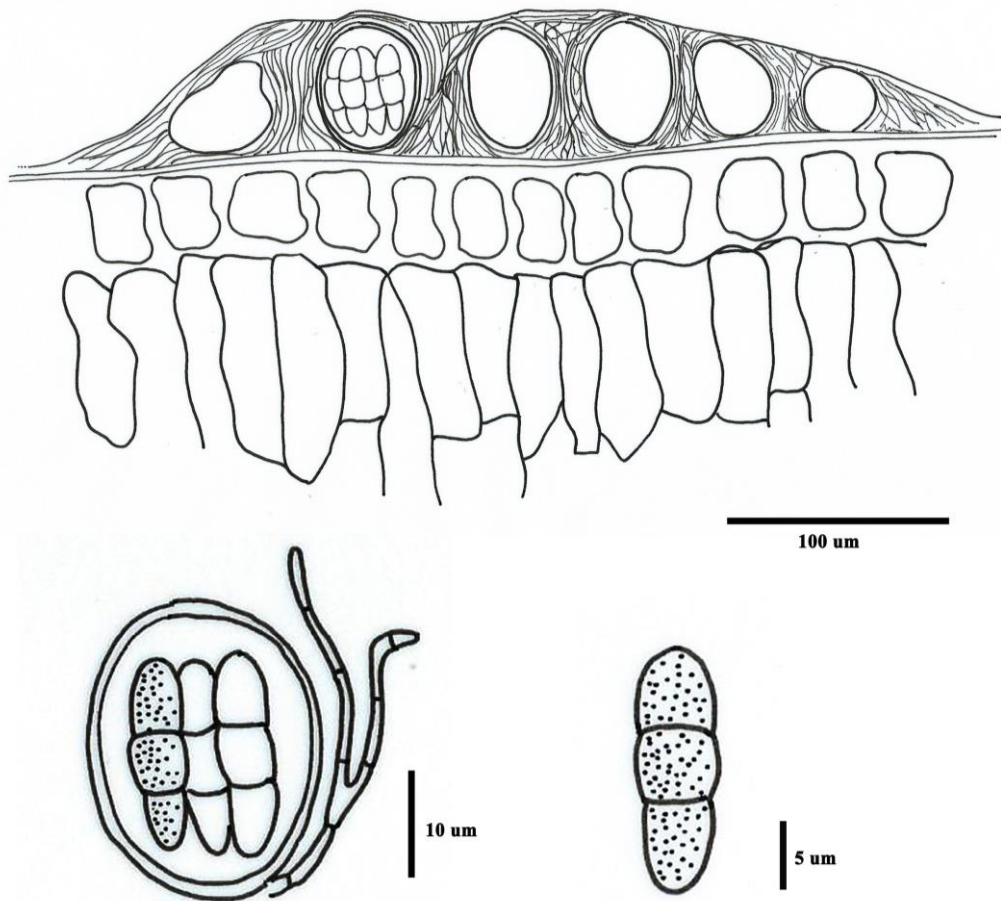


Fig. 8 – *Amazonotheca santiriae* (redrawn from Batista A.C. (1959), **iconotype**). a. Section through ascomata b. Ascus with pseudoparaphyses. c. Ascospore. Scale bars: a = 100 µm, b = 10 µm, c = 5 µm.

Sydow and Sydow (1917) mentioned that the asexual morph of *C. memecyli* was found on top of the ascomata forming fusarium-like conidia (17–20 × 2.5–3.5 µm) and introduced it as *Acanthoderma memecyli* Syd.

Chaetoplaca was initially accommodated in *Hemisphaeriaceae* by Sydow and Sydow (1917). Later, Müller and von Arx (1962) placed the genus in *Schizothyriaceae* and this was followed by various authors (von Arx & Müller 1975, Barr 1979, Eriksson & Hawksworth 1985, 1987, Kirk et al. 2001, 2008, Lumbsch & Huhndorf 2010, Hyde et al. 2013, Wijayawardene et al. 2014).

We examined the type specimen of *Chaetoplaca memecyli* from BPI and could not find the sexual morph. A vertical section through the conidiomata, *C. memecyli* showed a plane, single stratum, setose conidiomata with falcate conidia and no sexual morph. We therefore accommodate *Chaetoplaca* as coelomycetous in Ascomycetes, *genera incertae sedis*.

Chaetoplaca memecyli Syd. & P. Syd., *Annls mycol.* 15(3/4): 232 (1917)

Fig. 9, 10

FoF 01945

= *Acanthoderma memecyli* Syd. & P. Syd., *Annls mycol.* 15(3/4): 234 (1917)

Epiphytic, occurred on the lower surface of leaves of *Memecylon* sp. **Sexual morph:** Undetermined. **Asexual morph:** *Conidiomata* 1–2 mm diam., acervular, scattered to clustered, solitary to gregarious, superficial, dark brown to black, circular or irregular in shape, producing orangish-brown areas around conidiomata on host tissue, plane, with a single stratum, uni-loculate, setose, membranous, lacking ostioles. *Peridium* 3–10 µm wide, thin, composed of light brown to

brown, irregular meandering arrangement of compact cells. *Setae* 30–50 μm high, reddish-brown to dark brown, erect, aseptate, arising from the basal walls. *Conidiophores* reduced to conidiogenous cells. *Conidiogenous cells* phialidic, holoblastic, determinate, short, indistinct ampulliform, hyaline, smooth-walled, restricted to the base. *Conidia* (15–)18–22 (–25) \times (5–)6–8 μm (\bar{x} = 19.7 \times 4.7 μm , n = 30), solitary, clavate to falcate, hyaline to subhyaline, initially aseptate, becoming 2-septate at maturity, narrow and truncate at the base, with rough and thick-walled.

Material examined – PHILIPPINES, Bataan Prov., Luzon, on leaves of *Memecylon* sp., December 1915, M. Ramos, BPI 619031, **type**.

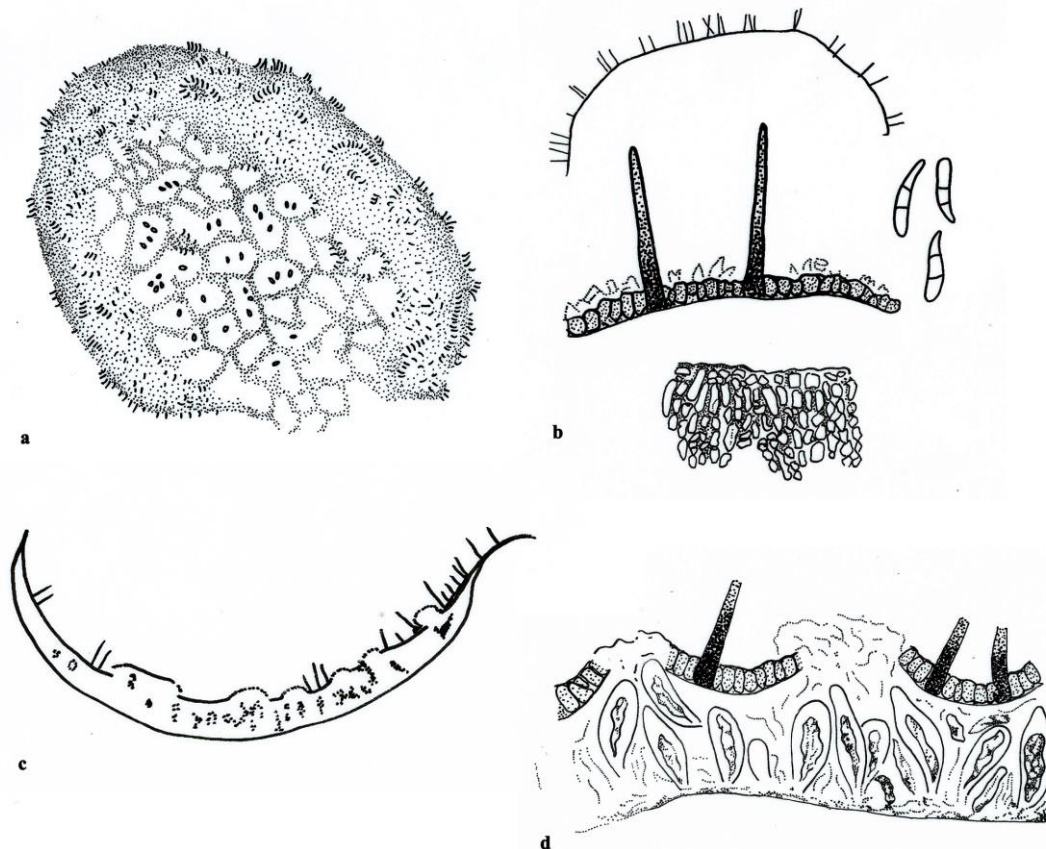


Fig. 9 – *Chaetoplaca memecyli* (redrawn from Sydow and Sydow (1917), **iconotype**). a. Appearance of conidiomata on the host. b. Cross-sections through the conidioma. c. Setae arising from the base of conidioma. d. A part of the membrane bearing conidia. e. Conidia. f. Cross-section through the membrane. g. Asci appearing in conidiomata.

Henningsiella Rehm, Hedwigia 34(Beibl.): (160) (1895)

FoF 01946

Epiphytic, on the upper surface of leaves of *Cordia*, *Cryptomeria* and *Ilex*, or on the rotten wood. **Sexual morph**: *Ascstromata* scattered, solitary to gregarious, superficial, brown to dark brown or black, circular or irregular in shape, rounded, soft or fleshy, discoid, multi-loculate, glabrous, membranous, lacking ostioles. *Peridium* thin-walled, composed of light brown to brown, loose, isodiametrical or radiating cells, arranged in a *textura angularis* to *textura prismatica*. *Asci* 8-spored, bitunicate, fission-tunicate, clavate, sessile to short pedicellate, apically rounded, with a well-developed ocular chamber, embedded on mucilaginous matrix. *Ascospores* overlapping, uni-

to bi-seriate, hyaline, oblong to ellipsoidal, or clavate with rounded ends, septate or aseptate, smooth-walled with small guttules. *Asexual morph*: Undetermined.

Type species – *Henningsiella quitensis* Rehm



Fig. 10 – *Chaetoplasca memecyli* (BPI623579, **type**). a. Herbarium label and specimen of *Chaetoplasca memecyli*. b, c. Appearance of conidiomata on the host surface. d. Sections through conidioma. e. Peridium structure visualized from above. f. Setae covering conidiomata. g. Conidiogenesis cell. h–j. Conidia. Scale bars: d, e = 20 µm, f = 10 µm, g–j = 5 µm.

Notes – *Henningsiella* was introduced as a monotypic genus by Rehm (1895) and typified by *H. quitensis* Rehm. The species was previously identified as *Ascomycetella quitensis* Pat., in Patouillard and de Lagerheim (1895) and accommodated in *Phymatosphaeriaceae* Speg. (1888), because of its apothecial, gregarious, sessile ascomata (Rehm 1895). Rehm (1895) mentioned that *Ascomycetella* has ovate-oblong, multi-septate, muriform ascospores, and is different from *Ascomycetella quitensis* which has 2-celled ascospores. Therefore, Rehm (1895) introduced *Henningsiella* to accommodate *Ascomycetella quitensis*. The original description is “ascostromata apothecial, epiphyllous, gregarious, sessile, initially globose, becoming plane, dish-like to convex, grey-hyaline, with a distinct margin, gelatinous, parenchymatous, lacking paraphyses; asci 8-spored, bitunicate, clavate, apically rounded, embedded in the gelatinous; ascospores cuneiform, 2-celled, hyaline. Subsequently, Rehm (1909) introduced the second species, *H. fairmanii* Rehm. Sawada (1959) also introduced *H. cryptomeriae* which was collected on *Cryptomeria* from Taiwan.

Based on morphological characters, Müller and von Arx (1962) accommodated *Henningsiella* in *Schizothyriaceae* and transferred *Bulgariastrum cordiae* Bat. to *Henningsiella* as *H. cordiae* (Bat.) Arx. Various mycologists followed Müller and von Arx (1962) such as von Arx and Müller (1975), Kirk et al. (2008), Lumbsch and Huhndorf (2010), Hyde et al. (2013), Wijayawardene et al. (2014). Nevertheless, the genus *Henningsiella* is relatively poorly known

genus with four species in Index Fungorum (2016) and these lack molecular data. Hence, the genus needs recollecting.

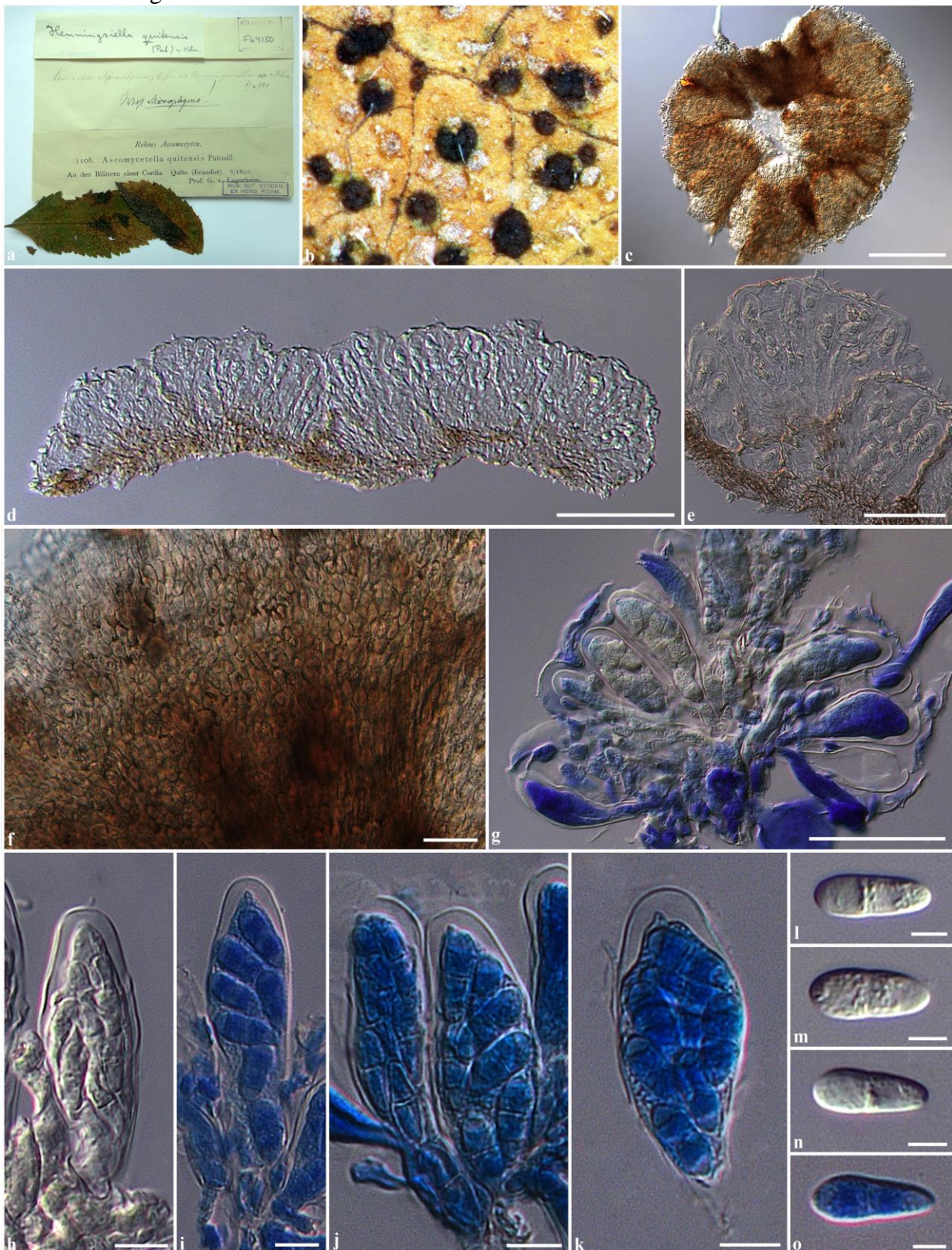


Fig. 11 – *Henningsiella quitensis* (S-F64150, **type** of *Ascomycetella quitensis*). a. Herbarium specimen from S. b. Appearance of ascostromata on the host surface. c. Squash mount of ascostroma visualized under the compound microscope. d. Section through ascostroma. e. Section through peridium. f. Peridium structure visualized from above. g. Asci lacking pseudoparaphyses stained in cotton blue. h. Ascus. i–k. Asci stained in cotton blue. l–n. Ascospores. o. Ascospore

stained in cotton blue. Scale bars: c = 200 µm, d = 100 µm, g = 50 µm, e, f = 20 µm, h–k = 10 µm, l–o = 5 µm.

In this study, we examine the generic type of *Henningsiella* and found that the genus is related to *Saccardiaceae* rather than *Schizothyriaceae* as it has apothecia, with thick walls at the base. Therefore, we exclude the genus from *Schizothyriaceae* and place the genus in *Saccardiaceae*, until the molecular phylogeny is obtained to resolve its natural placement.

Henningsiella quitensis Rehm, Hedwigia 34(Beibl.): (159) (1895)
FoF 01947

Fig. 11

≡ *Ascomycetella quitensis* Pat., in Patouillard & Lagerheim, Bull. Soc. mycol. Fr. 11(4): 231 (1895)

Epiphytic, on the upper surface of leaves of *Cordia*. **Sexual morph:** *Ascostromata* 115–185 µm high, 460–550 µm diam., scattered, solitary to gregarious, superficial, brown to dark brown or black, circular or irregular in shape, rounded, soft or fleshy, discoid, multi-loculate, glabrous, membranous, lacking ostioles. *Locules* 70–160 µm diam., clustered, quadrilateral, flabelliform, or irregular in shape in vertical section, each locule separated by thin, light brown membranous cells. *Peridium* thin-walled, of unequal thickness, poorly-developed at the apex (2–6 µm wide), thicker at the base (15–30 µm wide) composed of light brown to brown, loose, isodiametrical or radiating cells, arranged in a *textura angularis* to *textura prismatica*. *Asci* (32–)45–55(–60) × (13–)14–17(–19) µm (\bar{x} = 50.7 × 15.9 µm, n = 25), 8-spored, bitunicate, fissitunicate, clavate, sessile to short pedicellate, apically rounded with well-developed ocular chamber, embedded on mucilaginous matrix. *Ascospores* 13–15 × (4–)5–7 µm (\bar{x} = 14.3 × 5.8 µm, n = 25), overlapping uni- to bi-seriate, hyaline, oblong to ellipsoidal, or clavate with rounded ends, 1-septate, not constricted at the septum, smooth-walled with small guttules. **Asexual morph:** Undetermined.

Material examined – ECUADOR, Quito on the leaves of *Cordia*, June 1892, von Lagerheim G. in Rehm's exsiccata, Ascomyc. nr. 1108, F64150, **type** of *Ascomycetella quitensis* Pat.

Notes – *Henningsiella quitensis* differs from *H. fairmanii* in lacking pseudoparaphyses which asci embedded in mucilaginous matrix, while *H. fairmanii* has filiform pseudoparaphyses (Rehm 1909). *Henningsiella quitensis* differs from *H. cordiae* due to its larger ascostromata (Müller & von Arx 1962).

Hysteropeltella Petr., Annl. mycol. 21(1/2): 9 (1923)
FoF 01948

Saprobic on stems of *Aspidium filix-mas* (Linn.) Swartz. **Sexual morph:** *Ascomata* elongate apothecial, whitish-grey, superficial, scattered, solitary, elongate ellipsoidal, apothecial or hypothecia-like, glabrous, coriaceous, with longitudinal slit-like opening. *Peridium* thin, composed of two layers of brown to dark brown pseudoparenchymatous cells, arranged in a *textura angularis*. *Asci* 8-spored, bitunicate, fissitunicate, broadly oblong to ellipsoidal, or clavate, sessile to sessile, thick at the apex, apically rounded, with plane apex, asci apex turning blue when stained by Melzer's reagent. *Ascospores* overlapping irregular-seriate, initially hyaline, eventually becoming pale brown, clavate-oblong to fusoid, or ellipsoidal, with slightly rounded ends, 1-septate, slightly constricted at the septum, smooth-walled, surrounded by a thin, distinct mucilaginous sheath. **Asexual morph:** Undetermined (description from Petrak 1923, Ariyawansa et al. 2013).

Type species – *Hysteropeltella moravica* Petr.

Notes – *Hysteropeltella* was introduced by Petrak (1923) to accommodate a single species, *H. moravica* Petr. which was collected on a dead stem of *Aspidium filix-mas* (Linn.) Swartz from the Czech Republic. Holm and Holm (1978) revised the genus and mentioned that the asci of *H. moravica* turn blue at the apex, when stained in Melzer's reagent (Ariyawansa et al. 2013). Petrak (1923) mentioned that *Hysteropeltella* formed pseudoparaphyses among the asci. Holm and Holm (1978) however, did not mention this character. Due to the inconspicuous morphology with hysterothecia, lying on the host and opening via a longitudinal slit, Holm and Holm (1978) treated

the genus in the dothideomycetes, while Lumbsch and Huhndorf (2010) placed the genus in Dothideomycetes, *genera incertae sedis*.

Ariyawansa et al. (2013) examined the type specimen of *Hysteropeltella moravica*. In their examination, the ascospores were often hyaline, eventually turning light brown at maturity and asci turned blue when stained in Melzer's reagent. Pseudoparaphyses were observed by Ariyawansa et al. (2013); this may depend on the maturity of ascomata (Ariyawansa et al. 2013). Based on the hysterothecial ascomata with longitudinal slit-like opening, similar to *Linopeltis*, Ariyawansa et al. (2013), therefore, treated *Hysteropeltella* in the family *Schizothyriaceae* and this was followed by Wijayawardene et al. (2014).

Nevertheless, we exclude the genus *Hysteropeltella* from *Schizothyriaceae* due to its ascomatal structures which form elongated apothecial or hypothecia-like ascomata (see Ariyawansa et al. 2013), similar to the genus *Baggea* in *Patellariaceae* (Yacharoen et al. 2015). Therefore, we tentatively place the genus in *Patellariaceae*, however fresh collections are needed to resolve its natural placement.

Linopeltis I. Hino & Katum., J. Jap. Bot. 36: 99 (1961)

FoF 01949

Epiphytic on branches of bamboo. **Sexual morph:** *Ascostromata* scattered, solitary to gregarious, superficial, elongate ellipsoidal or furcate, to triangular, dark brown to black, hemispherical, or shield-shaped, shiny, glabrous, multi-loculate, with slit-like opening. *Locules* clustered, globose to subglobose. *Peridium* thin-walled, poorly-developed at the base, composed of dark brown to black pseudoparenchymatous cells, arranged in a *textura epidermoidea*. *Hamathecium* composed of dense, anastomosing, filamentous, cellular pseudoparaphyses. *Asci* 8-spored, bitunicate, oblong to ellipsoidal, short pedicellate, apically rounded, with indistinct ocular chamber. *Ascospores* overlapping, fasciculate, initially hyaline, becoming brown at maturity, cylindrical to elongated fusoid, with slightly rounded ends, distoseptate, 6–10-septate, thick and smooth-walled. **Asexual morph:** Undetermined.

Type species – *Linopeltis ryukyuensis* I. Hino & Katum.

Notes – *Linopeltis* was introduced by Hino and Katumoto (1961) to accommodate a bambusicolous species forming hysterothecial-like ascomata with slit-like openings, oblong to ellipsoidal asci and elongated fusiform to cylindrical, distoseptate ascospores. The genus is typified by *L. ryukyuensis* I. Hino & Katum. which was collected from Japan. Hino and Katumoto (1961) mentioned that the genus lacked pseudoparaphyses, while these were observed in our examination. Von Arx and Müller (1975) treated the genus in *Schizothyriaceae* and this was subsequently followed (Kirk et al. 2008, Lumbsch & Huhndorf 2010, Hyde et al. 2013, Wijayawardene et al. 2014).

Linopeltis is similar to the genera in *Asterinaceae* and *Aulographaceae* in having elongated hysterothecial-like ascomata with slit-like openings (Hyde et al. 2013, Hongsanan et al. 2014). However, *Linopeltis* differs from *Asterinaceae* in *ascostromata* having pseudoparenchymatous cells, not radiating cells and lacking appressoria. *Linopeltis* differs from *Aulographaceae* in having multi-distoseptate ascospores, while species in *Aulographaceae* having only 1-septate ascospores. Although, *Linopeltis* may belong in *Aulographaceae*, we however, tentatively place the genus in Dothideomycetes, *genera incertae sedis* based on its morphology.

Linopeltis ryukyuensis is a poorly understood species which lacks a modern taxonomic description and molecular data is needed to resolve its natural placement. Recollection is needed, to obtain molecular work to clarify its natural placement.

Linopeltis ryukyuensis I. Hino & Katum., J. Jap. Bot. 36: 100 (1961)

Fig. 12

FoF 01950

Epiphytic on branches of *Sinobambusa tootsik* Makino and *Pleioblastus linearis* (Hack.) Nakai. **Sexual morph:** *Ascostromata* 60–100 µm high, 300–820 µm long, 180–230 µm diam., scattered, solitary to gregarious, superficial, elongate ellipsoidal or furcate, to triangular, dark

brown to black, shiny, glabrous, multi-loculate, with slit-like opening. *Locules* 60–100 μm high, 50–100 μm diam., clustered, immersed on ascostroma, globose to subglobose, discharging asci and

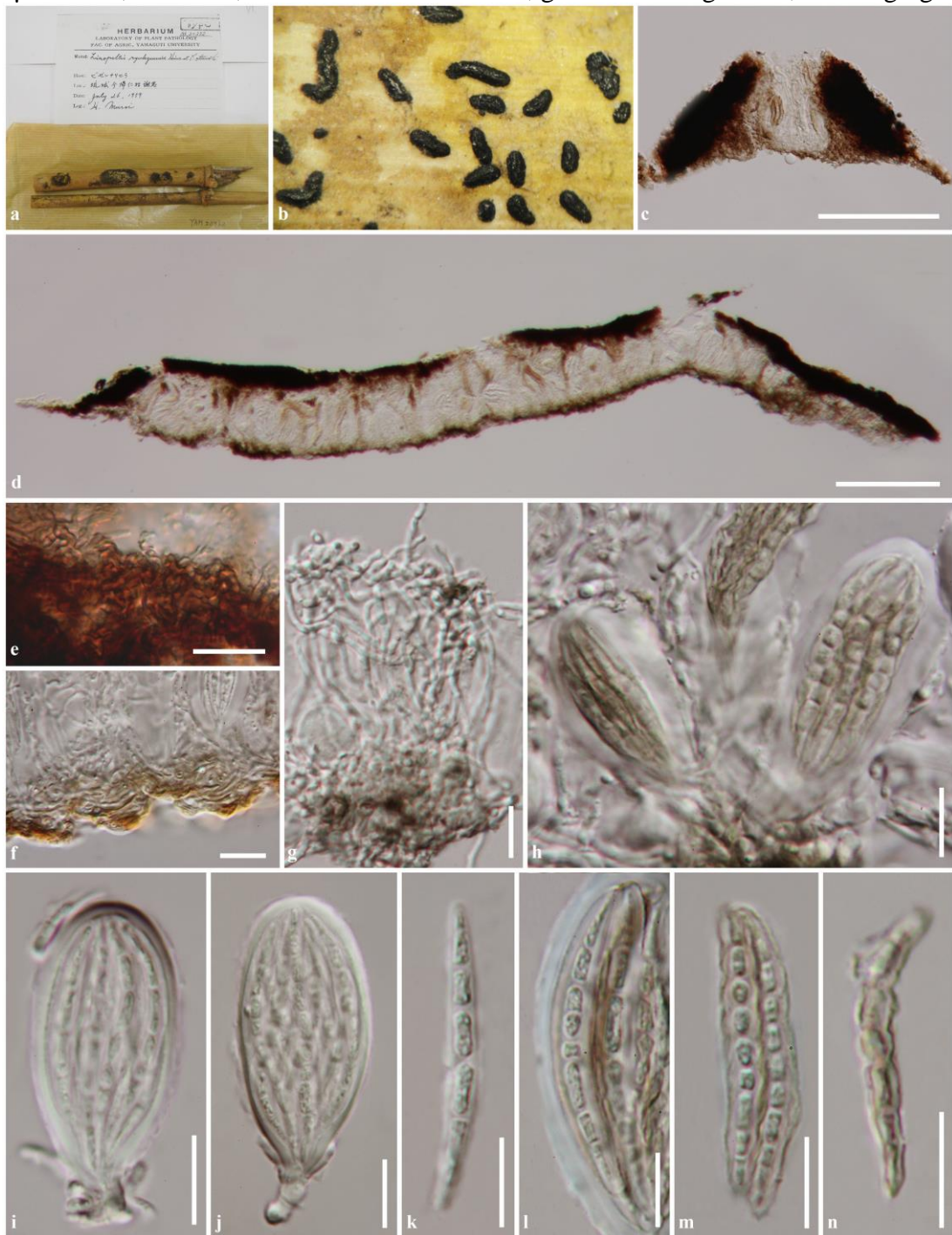


Fig. 12 – *Linopeltis ryukyuensis* (YAM 20332, **holotype**). a. Label and specimens from YAM. b. Appearance of ascostromata on the host surface. c, d. Sections through ascostromata. e, f. Section through peridium. g. Pseudoparaphyses. h. Asci embedded in pseudoparaphyses. i, j. Asci. k–n. Ascospores. Scale bars: c, d = 100 μm , e–m = 10 μm .

ascospores via a longitudinal slit. *Peridium* 9–20 μm wide, thin-walled, poorly-developed at the base, composed of dark brown to black pseudoparenchymatous cells, arranged in a *textura epidermoidea*. *Hamathecium* composed of dense, 1–1.5 μm wide, anastomosing, filamentous, cellular pseudoparaphyses. *Asci* (40–)45–58(–65) \times (19–)20–25 μm (\bar{x} = 53.8 \times 22.5 μm , n = 20), 8-spored, bitunicate, oblong to ellipsoidal, short pedicellate, apically rounded with indistinct ocular

chamber. *Ascospores* (26–)30–40 × 3–4 μm (\bar{x} = 35.1 × 3.6 μm, n = 25), overlapping, fasciculate, initially hyaline, becoming brown at maturity, cylindrical to elongate fusoid, slightly rounded ends, distoseptate, 6–10-septate, thick and smooth-walled. **Asexual morph**: Undetermined.

Material examined – JAPAN, Okinawa, Nakijinson, Jana Kunigamaigun, on branch of *Sinobambusa tootsik* (*Poaceae*), 26 July 1959, H. Muroi, YAM 20332, **holotype**.

Mendogia Racib., Parasit. Alg. Pilze Java's (Jakarta) 3: 31 (1900)

FoF 01951

Epiphytic on living bamboo. **Sexual morph**: *Ascostromata* scattered, solitary to gregarious, superficial on host surface, black, flattened, circular to round with concave edge, easily removed from the host, hemispherical or shield-shaped to rugulose, uni- to multi-loculate, glabrous, walls rough, carbonaceous at the outer surface. *Locules* clustered, immersed in ascostroma, globose to subglobose, or hemispherical, with individual ostioles, or discharging asci and ascospores via the breaking of the outer walls. *Peridium* thick-walled, composed of two layers, outer layer comprising thick, carbonaceous, melanized cells, arranged in a *textura angularis*, inner layer comprising thick, brown to dark brown, pseudoparenchymatous cells, arranged in *textura angularis*. *Hamathecium* composed of dense, anastomosing, septate, paraphysoid-like filaments. *Asci* 8-spored, bitunicate, fissitunicate, cylindric-clavate to clavate, short pedicellate, apically rounded, with an ocular chamber, thick at the apex. *Ascospores* overlapping, uni- to tri-seriate, hyaline, ellipsoidal to clavate, muriform, constricted at the septum, smooth-walled. **Asexual morph**: Undetermined.

Type species – *Mendogia bambusina* Racib.

Notes – *Mendogia* was introduced by Raciborski (1900) and typified by *M. bambusina* which was collected on bamboo in Indonesia. *Mendogia* is a relatively poorly known genus, which was collected on the bamboo, *Dinochloa* and *Schizostachyum* and palms from Indonesia and Philippines in South East Asia (Farr & Rossman 2015). Three species are listed in Index Fungorum (2016) and molecular data is lacking in GenBank. Von Arx and Müller (1975) treated *Mendogia* in the family *Schizothyriaceae* and synonymized *Uleopeltis manaosensis* P. Henn and *Pleiosommella philippinensis* Syd. under the genus *Mendogia*. This was subsequently followed by Kirk et al. (2008), Lumbsch and Huhndorf (2010), Hyde et al. (2013) and Wijayawardene et al. (2014).

Mendogia differs from other genera in *Schizothyriaceae* in having large ascostromata; a thick peridium, carbonaceous at the outer walls, with inner layers comprising pseudoparenchymatous cells, and muriform ascospores. Species of *Schizothyriaceae* have small ascomata, with thin, membranous walls and didymosporous ascospores. *Mendogia* was recently treated in the family *Myriangiaceae*, *Myriangiales* based on its phylogenetic study (see the details in Dai et al. 2016). Therefore, we exclude *Mendogia* from *Schizothyriaceae*.

Neopeltella Petr., Sydowia 4(1–6): 329 (1950)

FoF 01952

Epiphytic on the lower surface of leaves of *Bambusa* spp. **Sexual morph**: *Ascomata* thyrsothecial, scattered, solitary, superficial on host surface, dark brown to black, flattened, black spots on the host surface, easily removed from the host, hemispherical or shield-shaped, uni-loculate, glabrous, ostiolate, with irregular openings. *Peridium* thick-walled, composed of two types of layers, an irregular meandering arrangement of compact hyphae, outer layer comprising thin, brown to dark brown cells, arranged in a *textura intricata*, inner layer comprising thick, hyaline to light brown cells, arranged in *textura prismatica* to *textura porrecta*. *Asci* 8-spored, bitunicate, fissitunicate, ovoid to saccate, or ampulliform, sessile to sessile, apically rounded, with an ocular chamber, embedded in mucilaginous matrix. *Ascospores* overlapping, tetra- to penta-seriate, hyaline to subhyaline, cylindrical, with rounded ends, 11–12-septate, constricted at the septum, rough-walled. **Asexual morph**: Undetermined.

Type species – *Neopeltella aequatoriensis* Petr.

Notes – *Neopeltella* was introduced as a monotypic genus by Petrak (1950b) and is typified by *N. aequatoriensis* Petr. which was collected on bamboo in Ecuador. *Neopeltella* is similar to

Micropeltis Mont. (= *Scolecopeltella* Speg.) in having dimidiate-scutate, orbicular ascomata, with pore-like openings and phragmosporous ascospores (Petraik 1950b). However, *Neopeltella* differs from *Micropeltis* due to its peridium structures comprising dark brown cells and hyaline, cylindrical ascospores (Petraik 1950b). *Micropeltis* often has peridium structures with bluish-green cells, with an irregular meandering arrangement (Petraik 1950b, Wu et al. 2011, Hyde et al. 2013). Petraik (1950b) mentioned that *Neopeltella* lacks pseudoparaphyses, but there are eventually present and strongly shriveled or very slimy when mature.

Neopeltella is a poorly understood, with a single species listed in Index Fungorum (2016) and no sequence data is available in GenBank. Von Arx and Müller (1975) treated the genus in *Schizothyriaceae* according to its epiphytic habitat and this was followed by various mycologists (Barr 1979, Kirk et al. 2008, Lumbsch & Huhndorf 2010, Hyde et al. 2013, Wijayawardene et al. 2014).

Hyde et al. (2013) re-circumscribed the family *Micropeltidaceae* and mentioned that *Micropeltidaceae* differs from *Microthyriaceae* in having bluish-green thyriothecial, comprising cells in a meandering arrangement and long, clavate ascospores with mostly more than two transverse septa. Therefore, *Neopeltella* is placed in *Micropeltidaceae* due to its thyriothecia, with multi-septate ascospores.

Neopeltella aequatoriensis Petr., Sydowia 4(1-6): 329 (1950)
FoF 01953

Fig. 13

Epiphytic on the lower surface of leaves of *Bambusa* sp. **Sexual morph:** Ascomata 300–490 µm, thyriothecial, scattered, solitary, superficial on host surface, dark brown to black, flattened, black spots on the host surface, easily removed from the host, hemispherical or shield-shaped, uni-loculate, glabrous, ostiolate with irregular openings. *Peridium* thick-walled, composed of two types of layers, an irregular meandering arrangement of compact hyphae, outer layer 6–12 µm wide, comprising thin, brown to dark brown cells, arranged in a *textura intricata*, inner layer 20–60 µm wide, comprising thick, hyaline to light brown cells, arranged in *textura prismatica* to *textura porrecta*. *Asci* (48–)50–70 × 30–45(–56) µm (\bar{x} = 62.1 × 39.7 µm, n = 20), 8-spored, bitunicate, fissitunicate, ovoid to saccate, or ampulliform, sessile to subsessile, apically rounded with ocular chamber, embedded mucilaginous sheath. *Ascospores* (48–)50–70(–79) × 5–7(–10) µm (\bar{x} = 58.6 × 7.2 µm, n = 30), overlapping, tetra- to penta-seriate, hyaline to subhyaline, cylindrical, with rounded ends, 11–12-septate, constricted at the septum, rough-walled. **Asexual morph:** Undetermined.

Material examined – ECUADOR, Pichincha, Mindo, on *Bambusa* sp. (*Poaceae*), 24 October 1937, H. Sydow, S-F10295, **type**; *ibid.* W Krypto 1992-0005916, **type**.

Orthobellus A.A. Silva & Cavalc., in Silva et al., Publicações Inst. Micol. Recife 691: 4 (1973)

Fig. 14

FoF 01954

Epiphytic on the lower surface of leaves of *Leguminosae* and *Lauraceae*. **Sexual morph:** *Mycelium* abundant, superficial, bristles (tufts), not hyphopodiate, with simple setae, straight or curved. *Ascomata* scattered, solitary, flattened, brown, orbicular, superficial, uni-loculate, setose, membranous, lacking ostioles. *Peridium* composed of the meandering arrangement of compact hyphae, thin-walled at the base. *Hamathecium* composed of dense, filamentous, anastomosing, cellular pseudoparaphyses. *Asci* 8-spored, bitunicate, clavate, sessile. *Ascospores* hyaline, clavate, 1-septate, not constricted at the septum, smooth-walled. **Asexual morph:** Undetermined (description from Silva et al. 1973)

Type species – *Orthobellus leguminosarum* A.A. Silva & Cavalc.

Notes – *Orthobellus* was introduced by Silva et al. (1973) and typified by *O. leguminosarum* which was collected on leaves of *Leguminosae* in Brazil. Silva et al. (1973) accommodated two species in this genus viz. *Orthobellus lauracearum* (Bat. & T. Herrera) Cavalc. & A. A. Silva and *O. leguminosarum*. The generic type was originally described as “Colonies 0.3–2

cm diam., hypophyllous; ascomata 92–170 μm diam., orbicular, setose, membranous; asci 22–30 \times 12–17 μm , 8-spored, bitunicate, clavate, sessile, with cellular pseudoparaphyses; ascospores 9.5–12.5 \times 2.5–3.5 μm , hyaline, clavate, 1-septate, smooth-walled” (Silva et al. 1973). Silva et al. (1973) mentioned the *O. leguminosarum* was associated with *Periconiella* sp. and species of *Microthyriaceae* in their diagnosis and treated the genus in *Schizothyriaceae*.

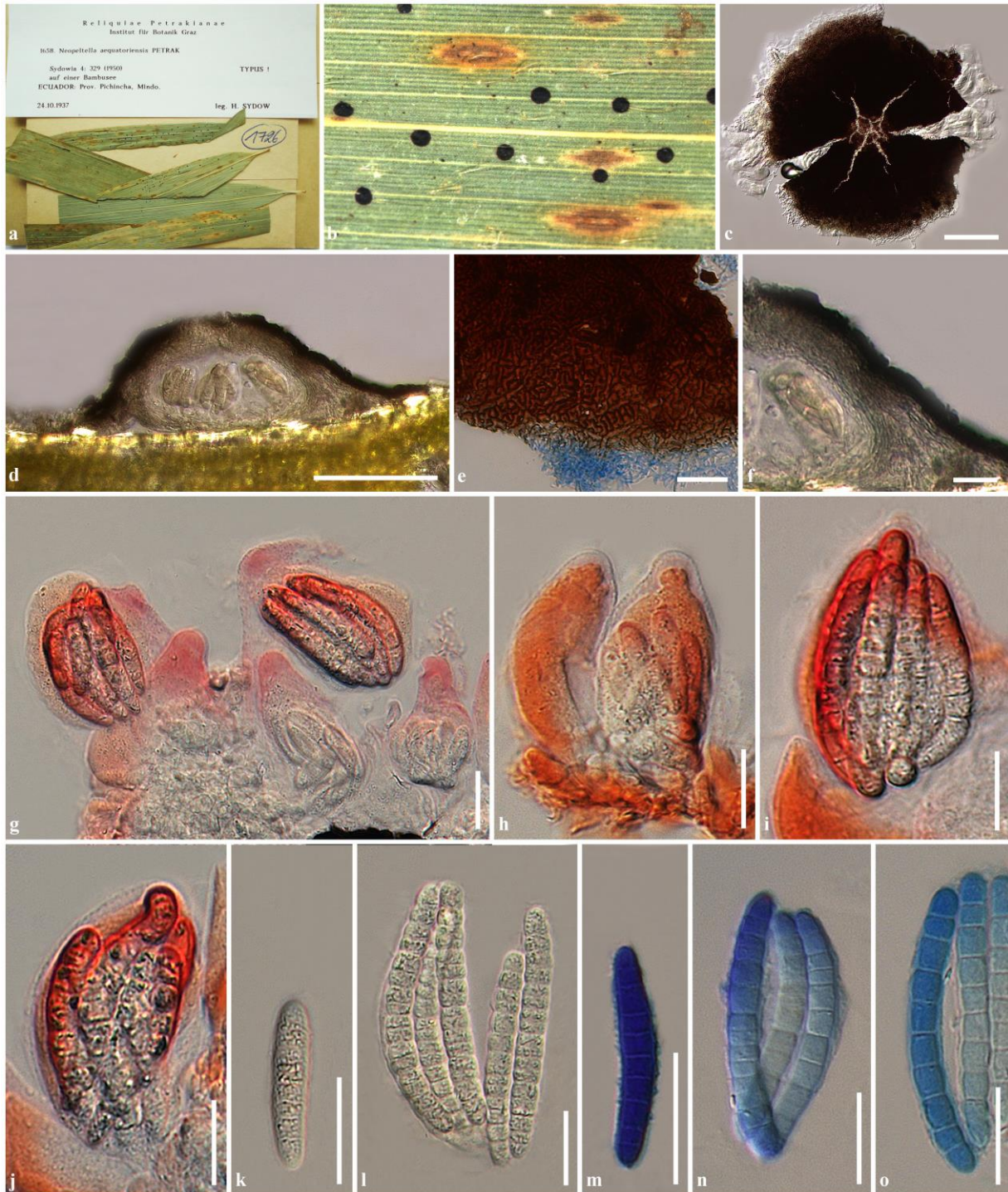


Fig. 13 – *Neopeltella aequatoriensis* (S-F10295, type). a. Label and specimens from S. b. Appearance of ascomata on the host surface. c. Squash of ascoma visualized under the compound microscope. d. Section through ascoma. e. Peridium structure visualized from above. f. Section through peridium. g–j. Asci stained in congo red. k, l. Ascospores. m–o. Ascospores stained in cotton blue. Scale bars: c, d = 100 μm , e–o = 20 μm .

Orthobellus is a poorly understood genus, which lacks modern taxonomic description and molecular data. There are two species listed in Index Fungorum (2016) which lack sequence data in GenBank. Since the genus was introduced in 1973, no mycologist has studied on the genus. Eriksson and Hawksworth (1985, 1987) treated the genus in *Schizothyriaceae* and this was followed by Kirk et al. (2001, 2008), Lumbsch and Huhndorf (2010), Hyde et al. (2013) and Wijayawardene et al. (2014).

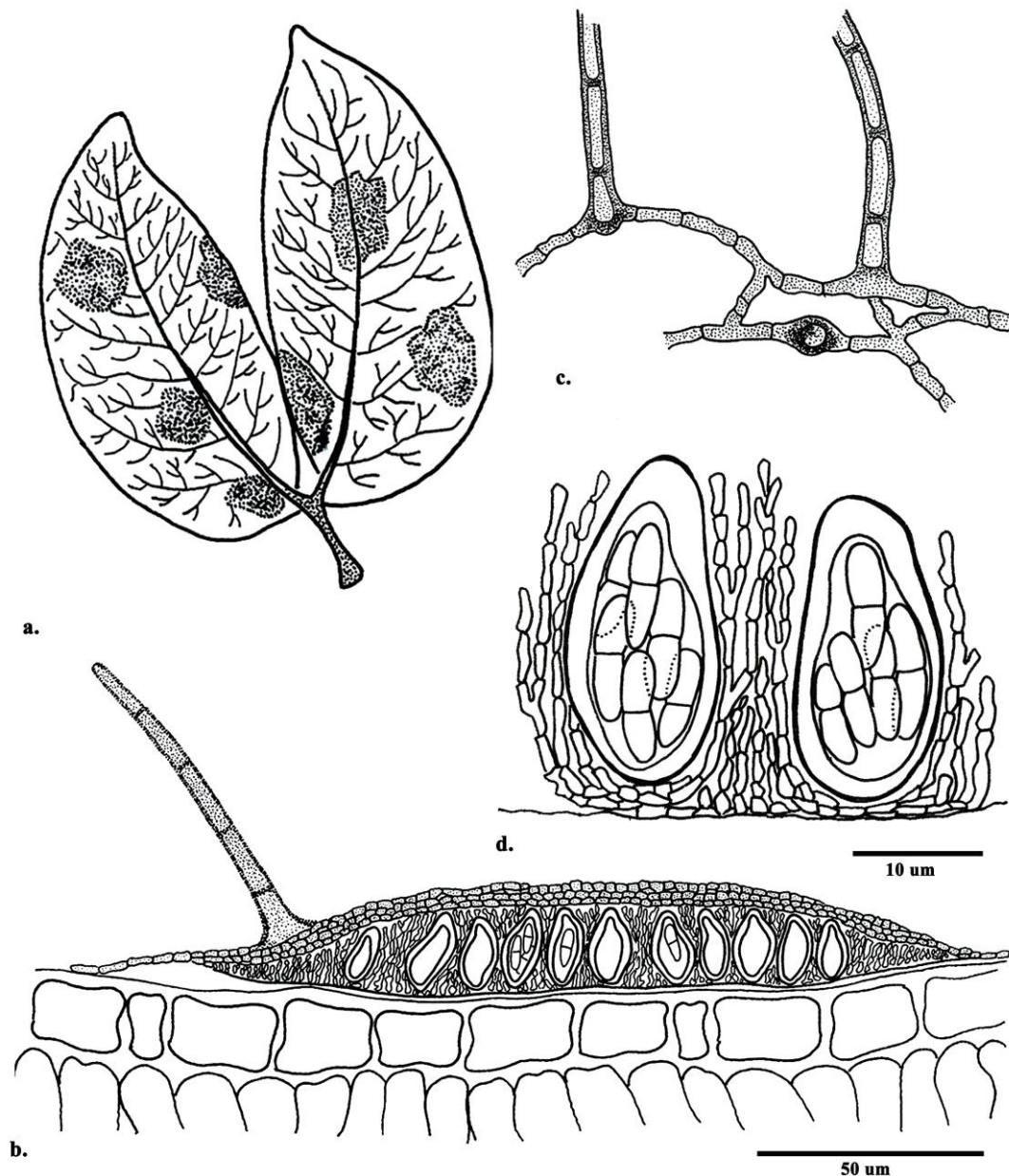


Fig. 14 – *Orthobellus leguminosarum* (redrawn from Silva et al. 1973, **iconotype**).

The type specimen of *Orthobellus leguminosarum* has been examined and is in poor condition. Dark tufting, hypophyllous colonies occurred on the host, but ascomata could not be found. However, we examined another epiphytic species on the host, which was similar to *O. leguminosarum* in having membranous, non-ostiolate ascomata and forming narrowly cellular pseudoparaphyses. Therefore, we introduce a new species, for which an illustration and description is provided.

Orthobellus is similar to other genera in *Schizothyriaceae* in having membranous ascomata, and lacking ostioles, but the genus differs from other species in having narrowly anastomosing pseudoparaphyses and a developed peridium at the base. Genera in *Schizothyriaceae* form net-like, or paraphysoid-like filaments, and have a poorly-developed peridium at the base. *Orthobellus* has unique morphological characters which do not match any other epifoliar Dothideomycete taxa. Therefore, we tentatively place the genus in Dothideomycetes, *genera incertae sedis*, until recollection and molecular data is obtained to clarify its natural placement.

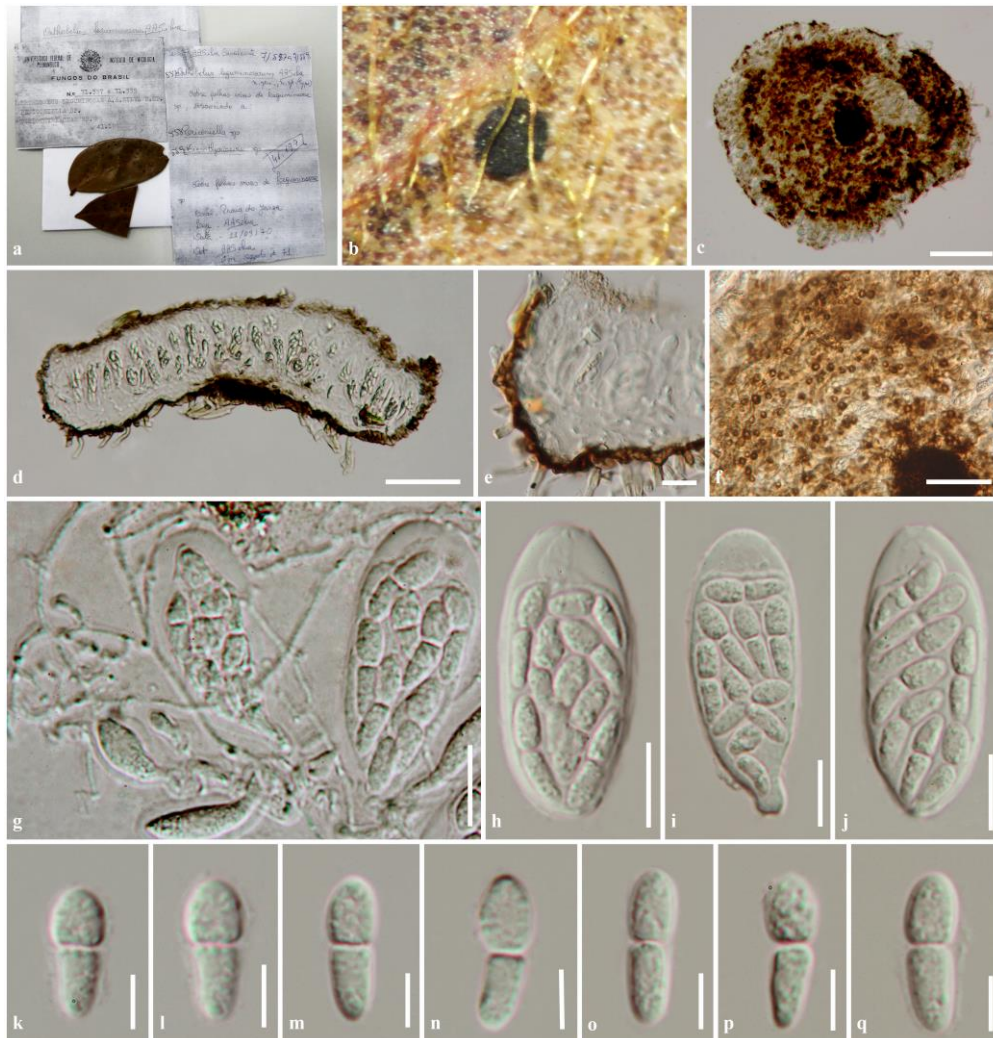


Fig. 15 – *Orthobellus paraleguminosarum* (URM 71557, **type**). a. Herbarium specimen from URM. b. Appearance of ascomata on the host surface. c. Ascoma visible under the compound microscope. d. Sections through ascoma. e. Section through peridium. f. Peridium structure visualize on top. g. Asci embedded in pseudoparaphyses. h–j. Asci. k–q. Ascospores. Scale bars: c, d = 100 μ m, e = 20 μ m, f–j = 10 μ m, k–q = 5 μ m.

Orthobellus paraleguminosarum Phookamsak & Hyde K.D. **sp. nov.**
 IF551985
 FoF 01955

Fig. 15

Etymology: Para- (Gr.: beside, next to, resemble, towards), the epithet “*Paraleguminosarum*” refers to the resemblance to species *Orthobellus leguminosarum*.

Epiphytic on the lower surface of leaves of *Leguminosae*. **Sexual morph:** *Ascomata* 110–150 μ m high, 400–530 μ m diam., scattered, solitary, flattened, black, circular, superficial, quadrilateral, uni-loculate, glabrous, forming short, brown, aseptate hyphae at the base, membranous, with dark brown, dense, dots in hyphae at the central apex, lacking ostioles. *Peridium*

4–12 µm wide, thin-walled, composed 1–2 layers of brown to dark brown cells, arranged in a *textura angularis*. *Hamathecium* composed of dense, 0.5–1.2 µm wide, filamentous, cellular pseudoparaphyses, anastomosing among the asci. Asci (34–)35–43(–47) × (13–)15–17 µm (\bar{x} = 38.9 × 16.4 µm, n = 25), 8-spored, bitunicate, oblong to ellipsoidal, sessile to subsessile, apically rounded with well-developed ocular chamber. *Ascospores* (10.5–)11–13(–15) × 3–5 µm (\bar{x} = 13 × 4.4 µm, n = 30), overlapping irregularly bi- to tetra-seriate, hyaline, oblong to subclavate, 1-septate, deeply constricted at the septum, thick and rough-walled, echinulate. **Asexual morph:** Undetermined.

Material examined – BRAZIL, Praia do Yanga, on leaves of *Leguminosae*, 9 November 1970, A. A. Silva, URM 71557, **type**.

Notes –*Orthobellus paraleguminosarum* differs from *O. leguminosarum* and *O. lauracearum* in having glabrous ascomata while *O. leguminosarum* and *O. lauracearum* having setose ascomata (Batista et al. 1963, Silva et al. 1973).

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