

A TAXONOMIC MONOGRAPH OF 19 FAMILES OF HELOTIALES INCORPORATING NEW COLLECTIONS

LE LUO

DOCTOR OF PHILOSOPHY
IN
BIOLOGICAL SCIENCE

SCHOOL OF SCIENCE
MAE FAH LUANG UNIVERSITY
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THIS DISSERTATION IS A PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN BIOLOGICAL SCIENCE

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Dissertation Title: A Taxonomic Monograph of 19 Familes of Helotiales Incorporating New Collections

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Le Luo

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ABSTRACT

Helotiales is one of the largest and most morphologically diverse lineages within Ascomycota, comprising approximately 5,000–6,000 species in more than 40 families and 500 genera. Their ascomata are typically small, cupulate or discoid, less than 2 mm in diameter, with colors ranging from dark brown to bright red, orange, and occasionally blue-green. Members exhibit saprobic, pathogenic, and endophytic lifestyles, and play crucial roles in forest ecosystems. Although Helotiales has been the subject of considerable taxonomic and phylogenetic research, most previous studies have focused on temperate regions of Europe and North America, relying largely on herbarium specimens or limited molecular datasets. Consequently, many genera remain insufficiently revised, family boundaries are still unclear, and only a small fraction of type specimens has been critically re-examined. In contrast, biodiversity hotspots such as southwestern China and northern Thailand—characterized by unique karst and montane ecosystems—have received little systematic investigation. These gaps hinder our understanding of the evolutionary relationships, ecological roles, and distribution patterns of Helotiales in Asia. To address these issues, the present study aims to comprehensively document the diversity of Helotiales in these regions, clarify their phylogenetic relationships using multi-gene analyses, re-evaluate type specimens, and provide an updated taxonomic framework. In this monograph, we review 19 families and 231 genera of Helotiales based on 40 fresh collections from southwestern China and northern Thailand, together with herbarium specimens loaned from worldwide

herbaria. By integrating morphological observations with multi-gene phylogenetic analyses (ITS, LSU, *RPB2*, *TEF1-α*), we describe 22 new species, document 18 new records, and expand the geographical distribution of three taxa. In total, requests were sent to 193 herbaria, from which 27 specimens were successfully obtained. Among these, 13 specimens had sufficiently preserved features for detailed morphological examination. Eight type specimens were re-examined through detailed morphological study, including microscopic observations of apothecia, asci, and ascospores, and updated descriptions were prepared. In addition, detailed notes were compiled for 19 families and 137 genera, providing a comprehensive framework for comparative taxonomy. Furthermore, based on the order-level phylogenetic tree reconstructed from multi-gene datasets, several traditionally broad families were redefined, and their monophyly was supported.

In the order-level phylogenetic analyses, DNA sequence data clarified the placements of several of the 94 genera formerly considered as *incertae sedis*. Seventeen of these genera resolved into well-supported clades corresponding to known families, recealing their true phylogenetic affinities. However, most of the remaining genera are still unresolved, largely due to the absence of adequate or incomplete molecular datasets.

This study refines the taxonomic framework of Helotiales, enriches global molecular datasets with newly generated sequences, and highlights Asian montane regions as important centers of fungal diversity. Collectively, these contributions provide a robust foundation for future research on the systematics, ecology, and biogeography of Helotiales, and open new opportunities for applied studies in biotechnology and ecosystem services.

Keywords: Helotiales, Taxonomy, Morphology Diversity, Ecosystem Roles

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ABBREVIATIONS AND SYMBOLS

cm	centimeter
diam.	diameter
e.g.	for example
et al.	and others
gen.	genus (singular) and genera (plural)
i.e.	that is
mm	millimeter
nov.	novum (Latin for new thing)
sp.	species
spp.	species (plural)
$\bar{x}$	average
$°C$	degree centigrade
µm	micrometer
ml	milliliter
L	Liter
$\%$	percent

CHAPTER 1

INTRODUCTION

1.1 Historical Background on Helotiales

Helotiales, the largest order in Ascomycota, belongs to Leotiomycetes (Korf, 1973; Baral, 2016). Members are typically characterized by small apothecia, usually less than 2 mm in diameter, which may be cupulate, discoid, funnel-shaped, or clavate, and contain inoperculate asci that discharge ascospores through an apical pore. Their asexual morphs include phialophora-like, chalara-like, and aquatic hyphomycetes (Cannon & Kirk, 2007). These morphological and reproductive traits underpin their diverse ecological roles. Ecologically, most taxa are saprobes decomposing litter, wood, and herbaceous debris, while others are significant pathogens, such as *Botrytis cinerea* (Williamson et al., 2007), *Sclerotinia sclerotiorum* (Bolton et al., 2006), and *Monilinia fructicola* (Holb, 2008). Symbiotic taxa, including *Rhizoscyphus ericae* and *Oidiodendron maius*, form ericoid mycorrhizae essential for plant health (Cairney & Meharg, 2003). Species of Helotiales are cosmopolitan, especially abundant in forest ecosystems (Tedersoo et al., 2014), where they play key roles in nutrient cycling.

Economically, some Helotiales produce bioactive metabolites with promising applications in biotechnology and pharmaceuticals. For instance, *Botrytis cinerea* synthesizes the sesquiterpenoid botrydial and botcinins, which exhibit phytotoxic and antimicrobial activities (Williamson et al., 2007; Moraga et al., 2016; Dalmais et al., 2011), and *Sclerotinia sclerotiorum* secretes oxalic acid as a key virulence factor with potential biotechnological relevance (Guimarães et al., 2004; Davidson et al., 2016).

First established by Nannfeldt (1932), the order was renamed “Leotiales” by Carpenter (1988) but only formally validated in 2000 by Korf and Lizon. Nannfeldt’s system originally recognized six families—Ascobolaceae, Dermateaceae, Geoglossaceae, Helotiaceae, Orbiliaceae, and Sclerotiniaceae—which formed the standard framework for decades, with only minor revisions by subsequent authors (Carpenter, 1988; Spooner, 1987). Morphology-based classifications during this period

relied mainly on apothecial and ascus morphology, excipulum features, and host association. Dennis (1968) provided important revisions and keys, while Korf (1973, 1976) published the influential *Keys to the genera of the discomycetes*, which became the principal reference for generic delimitation. Many taxa were recognized primarily from their asexual states, particularly pathogenic genera such as *Sclerotinia*, *Botrytis*, *Monilinia*, and *Pezicula*. Frequent taxonomic misplacements were observed: For example, *Connersia* and *Pleuroascus* were long treated as members of Pseudeurotiaceae (Thelebolales) but are now placed in Pleuroascaceae within Helotiales (Johnston et al., 2019); Myxotrichaceae was historically assigned to Onygenales before being transferred to Helotiales; and *Bicornispora* was once placed in Coryneliales but is now recognized as helotialean. In addition, several non-apothecial lineages, such as phialophora-like *Cadophora* and the root endophyte *Oidiodendron*, were subsequently recognized as helotialean. Such misclassifications, together with convergent traits and poorly defined boundaries, underscored the limitations of morphology in delimiting the order. These challenges underscored the necessity of molecular approaches, which have since reshaped the taxonomy and phylogeny of Helotiales.

The advent of DNA-based phylogenetics fundamentally reshaped our understanding of Helotiales. Early molecular studies based on nuclear ribosomal sequences, including ITS, LSU, and SSU, revealed that the characteristic cup-shaped apothecia of inoperculate discomycetes had evolved multiple times independently (Tehler et al., 2000; Wang et al., 2006b). Subsequent analyses demonstrated that families such as Orbiliaceae and Geoglossaceae, which were previously included in Helotiales, in fact belong to distantly related lineages (Sugiyama, 1998; Tehler et al., 2000; Wang et al., 2006b). Consequently, Orbiliaceae was transferred to Orbiliomycetes (Eriksson et al., 2003), and Geoglossaceae to Lichinomycetes (Díaz-Escandón et al., 2022). Order-level phylogenies of Helotiales, initially reconstructed using ribosomal genes (ITS, LSU, SSU) and later supplemented by protein-coding markers such as *RPB2*, *RPB1*, *TEF1-α*, and mtSSU, consistently indicated that the order is not strictly monophyletic. Indeed, some studies have suggested that Helotiales may be polyphyletic or paraphyletic (Wang et al., 2006; Hibbett et al., 2007; Han et al., 2014). Conversely, molecular evidence also revealed that taxa lacking cup-shaped

fruiting bodies, such as Erysiphaceae (powdery mildews), are closely related to Helotiales, and their recognition as a separate order (Erysiphales) rendered Helotiales paraphyletic.

Further phylogenetic work expanded the scope of Helotiales by integrating numerous asexual fungi into Helotiales, including *Cadophora*, root endophytes such as *Oidiodendron*, and aquatic hyphomycetes with branched conidia (Johnston & Baschien, 2020). However, many aquatic genera remain polyphyletic, and their connection to type species is unresolved (Johnston & Baschien, 2020). With the development of multi-gene phylogenetics, Johnston et al. (2019) produced the first genome-based phylogeny of Leotiomycetes using a 15-gene dataset. Despite incomplete taxon sampling, this study provided a robust backbone for Helotiales and clarified several deep relationships. Ekanayaka et al. (2019) subsequently supplied family names for these lineages based on a combined ITS, LSU, SSU, *TEF1-α*, and *RPB2* phylogeny, while Haelewaters et al. (2021) further reduced taxonomic instability by synonymizing Cyttariales and Erysiphales with Helotiales based on multi-locus analyses (ITS, LSU, SSU, *RPB2*). Yet, the placement of the enigmatic monotypic order Medeolariales remains unresolved (Johnston et al., 2019).

The integration of morphological and molecular approaches to clarify the taxonomy of Helotiales has also been critical (Ekanayaka et al., 2019; Johnston & Baschien, 2020; Wijayawardene et al., 2022; Hyde et al., 2024). Detailed morphological descriptions obtained through advanced microscopy, combined with DNA sequence data (e.g. ITS, LSU, *RPB2*, and *β-tubulin*), have significantly improved the accuracy of species identification and the resolution of phylogenetic relationships (Wortley & Scotland, 2006; Tekpınar & Kalmer, 2019). These combined approaches have allowed researchers to revisit historical genera through the examination of original descriptions and type specimens, reassess earlier taxonomic frameworks, and correct long-standing misclassifications. For example, molecular evidence has further expanded Helotiales to include chalara-like fungi, aquatic hyphomycetes, and mycorrhizal taxa such as *Gamarada* and *Oidiodendron* (ref). Currently, Helotiales is estimated to comprise about 5148 species distributed across 41 families and 476 genera, of which 142 genera remain *incertae sedis* (Kirk et al., 2008; Wijayawardene et al., 2022; Hyde et al., 2024). Therefore, the application of molecular methods in

conjunction with morphology has been essential for refining generic and family-level boundaries within Helotiales.

Despite these advances, substantial gaps remain in the study of Helotiales. Many taxa still lack molecular data, particularly protein-coding regions, and several genera are polyphyletic, making their systematic placement uncertain (Johnston et al., 2019; Quandt & Haelewaters, 2021).

A considerable number of species remain undescribed, especially in regions that have not yet been comprehensively surveyed. Traditional morphological classifications often conflict with molecular evidence, and the absence of type-linked sequences continues to impede the development of a stable and universally accepted phylogenetic framework. Moreover, no comprehensive study has yet incorporated all genera of Helotiales introduced to date, leaving the overall classification of the order incomplete.

To address these limitations, researchers have increasingly emphasized the need for broader regional surveys to uncover hidden diversity and fill distributional gaps. International collaborations are crucial for integrating datasets, sharing expertise, and ensuring comprehensive sampling across diverse ecological habitats. Generating and depositing molecular data in public repositories such as GenBank will further improve transparency, reproducibility, and accessibility. Linking taxonomy to ecological and functional studies is also an important direction, as understanding the ecological roles of Helotiales fungi may reveal their significance in forest ecosystems and provide insights into their potential biotechnological applications (Hyde et al., 2020; Johnston & Baschien, 2020; Wijayawardene et al., 2022; Hyde et al., 2024).

Altogether, previous research has laid a valuable foundation for understanding the diversity, taxonomy, and ecology of Helotiales. However, a systematic integration of morphological, molecular, ecological, and functional data is still required to resolve existing ambiguities and to establish a more robust and informed framework for studying this diverse order of fungi.

1.2 HelotialesDiversity in Northern Thailand and Southwest China

China has a long history of research on Helotiales, with approximately 400 species reported to date (Teng, 1963; Tai, 1979; Wang & Zang, 1983; Korf & Zhuang, 1985; Xiang & Song, 1988; Zhuang & Korf, 1989; Wu et al., 1996; Zang et al., 1996; Song et al., 1997; Wang et al., 1999; Lu et al., 2000; Zhuang, 1998a, 1998b, 2001, 2003, 2004; Zhang & Zhuang, 2002a, 2002b, 2004; Zheng & Zhuang, 2011, 2013–2016; Liu & Zhuang, 2015; Ren & Zhuang, 2014, 2016; Zhuang et al., 2016). Two volumes of *Flora Fungorum Sinicorum* have been devoted to Helotiales families: Hyaloscyphaceae and Sclerotiniaceae (Zhuang, 1998b, 2004). Much of this research has focused on families such as Chlorociboriaceae, Dermateaceae, Godroniaceae, Helotiaceae, Hemiphacidiaceae, Lachnaceae, Leotiaceae, Rutstroemiaceae, and Sclerotiniaceae (Zhuang et al., 2020). Many important genera, including *Ascocoryne*, *Chlorociboria*, *Encoelia*, *Godronia*, *Mitrula*, *Pezicula*, *Rutstroemia*, and *Sclerotinia*, have been described and revised, with *Hymenoscyphus* receiving particular attention; 41 taxa have been recorded for this genus alone (Zheng & Zhuang, 2015). Recent work has introduced *Chlorencoelia macrospora* (Ren & Zhuang, 2014), two novel *Pezicula* species (Zheng & Zhuang, 2022), several new taxa in *Dicephalospora* (Luo et al., 2024), and newly described genera within Hyphodiscaceae (Li et al., 2024). In addition, fieldwork has expanded the known distribution of *Chlorovibrissea* (Zheng & Zhuang, 2017). Notably, several genera appear to be endemic to China, including *Cenangiopsis* (Ren & Zhuang, 2014), *Dicephalospora* (Luo et al., 2024), and lineages in Hyphodiscaceae (Li et al., 2024), highlighting the unique Helotiales diversity of the country.

In contrast, studies on Helotiales in Thailand remain relatively limited. Early records focused mainly on *Hymenoscyphus* (Sivichai et al., 2000). More recent efforts have described new taxa in Helotiaceae, Rutstroemiaceae, and Patellariopsidaceae (Li et al., 2024; Phutthacharoen et al., 2022; Lestari et al., 2024; Sun et al., 2024). In addition, Ekanayaka et al. (2019) reported several Helotiales genera from Thailand, including *Erioscyphella* (e.g., *E. aseptata*, a species endemic to Thailand, and *E. fusiforme*, originally established from Thai material), *Terriera* (e.g., *T. elliptica*), and *Bisporella*

(e.g., *B. discedens*). These findings demonstrate that Thailand harbors unique Helotiales lineages, some of which are currently known only from this region. Nevertheless, research on Helotiales in Thailand remains preliminary, with many genera still unexamined since their original morphological descriptions (Sivichai et al., 2000; Ekanayaka et al., 2019; Phutthacharoen et al., 2022; Lestari et al., 2024; Sun et al., 2024; Li et al., 2024).

The scarcity of molecular data further hinders taxonomic clarity, emphasizing the need for more comprehensive surveys and integrative studies to advance our understanding of Helotiales diversity in southwest China and northern Thailand. Therefore, the aim of this study is to refine the taxonomy and phylogeny of Helotiales by employing polyphasic approaches, integrating morphological and molecular data from both fresh collections and herbarium specimens.

1.3 Research Objectives

1.3.1 To examine and describe loaned and herbarium specimens, providing updated morphological descriptions and new illustrations.

1.3.2 To reconstruct and update the phylogeny of Helotiales at the ordinal and family levels based on multi-gene datasets.

1.3.3 To collect, describe, and analyze newly obtained specimens from southwest China and northern Thailand.

1.3.4 To investigate and characterize new species within Helotiales using integrative taxonomy.

1.4 Research Contents

This thesis focuses on the taxonomy, phylogeny, and updated knowledge of Helotiales, particularly based on fresh collections from northern Thailand and southwest China. It is organized into four main chapters.

Chapter 1 provides a general introduction, including a historical background of Helotiales, and a review of its diversity in northern Thailand and southwest China. The objectives and contents of the present study are also outlined.

Chapter 2 describes the research methods employed, including field sampling, herbarium sample observations, fungal isolations, DNA extractions, PCR amplifications, sequencing, and phylogenetic analyses.

Chapter 3 presents a monograph of selected families in Helotiales with updates from fresh collections. This includes detailed morphological descriptions, molecular data, multi-gene phylogenetic analyses, and herbarium studies. A comprehensive discussion addresses taxonomic updates, species diversity, phylogenetic relationships, and broader evolutionary implications.

Chapter 4 summarizes the overall conclusions, highlighting the major findings, research advantages, and directions for future research. The academic contributions of this work, including resulting publications, are also emphasized.

CHAPTER 2

MATERIALS AND METHODS

2.1 Sample Collections and Morphological Examination

Fresh fungal specimens were collected from decaying wood and fallen leaves in natural broadleaf forests of Yunnan and Guizhou Provinces, China, and Chiang Rai and Chiang Mai Provinces, northern Thailand.

All samples were obtained from humid and relatively undisturbed habitats, mainly in protected areas. Each specimen was divided into two portions: one was used for fungal isolation, and the other was dried at 25–30°C using a dehydrator for DNA extraction and long-term preservation as voucher specimens in herbaria.

After morphological examination and DNA extraction, voucher specimens were deposited at the Cryptogamic Herbarium of the Kunming Institute of Botany, Chinese Academy of Sciences (KUN-HKAS) and the cultures were deposited at the Kunming Institute of Botany Culture Collection (KUNCC). Faces of Fungi and Index Fungorum numbers were assigned to all described species in this study following Jayasiri et al. (2015) and Index Fungorum (2025), and morphological descriptions were submitted to the Greater Mekong Subregion database (Chaiwan et al., 2021). In addition to the freshly collected specimens, type and reference specimens of Helotiales taxa were also loaned and examined from major international and regional herbaria, including KUN-HKAS, MFLU, PDD, FH, NY.

Dried specimens were studied using a Nikon stereomicroscope (C-PSN, Japan) and photographed with a Canon EOS 70D digital camera attached to the stereomicroscope. Free-hand sections of apothecia were mounted in water for microscopic examination of the excipulum, paraphyses, asci, and ascospores using a Nikon compound microscope (Nikon, Japan) equipped with a DS-Ri2 camera. Sections were also stained with Melzer's reagent to test amyloidity of asci and apical rings (Tochihara & Hosoya, 2022). Measurements were taken with Tarosoft® Image Frame Work v.0.97 (Tarosoft, Thailand) and are presented as (a–) b–c (–d), where a =

minimum, d = maximum, and b–c = 90% confidence interval. All images were processed with Adobe Photoshop CS6 (Adobe Systems, USA).

2.2 Fungal Isolation

Fresh apothecia and tissue fragments from collected specimens were surface-sterilized with 75% ethanol for 30–60 s, rinsed in sterile distilled water, and placed on potato dextrose agar (PDA) and malt extract agar (MEA) plates supplemented with 50 mg/L streptomycin to inhibit bacterial growth. Plates were incubated at 20–25°C in the dark and checked periodically for fungal growth. Hyphal tips emerging from the inoculated tissues were transferred to fresh PDA to obtain pure cultures.

Due to the fragile nature of many apothecia and the scarcity of living tissues, only a limited number of isolates were successfully established. For samples that failed to yield pure cultures, dried apothecia were used directly for DNA extraction and morphological observation.

2.3 DNA Extraction, PCR Amplification, and Sequencing

Genomic DNA was extracted from dried apothecia using a TSP101 DNA extraction kit (TSINGKE, China). The LSU, ITS, mtSSU and *RPB*2 regions were used for PCR amplification, using the primers LR0R/LR5 (Vilgalys & Hester, 1990), ITS1F/ITS4 (White et al., 1990; Gardes & Bruns, 1993), mrSSU1/mrSSU3R (Zoller et al., 1999) and fRPB2-5F/fRPB2-7cR (Liu et al., 1999), respectively, following Su et al. (2023) and Luo et al. (2024). The PCR reactions were conducted in a total volume of 25 μL, containing 12.5 μL 2×PCR G013 Taq MasterMix with Dye (Applied Biological Materials, Canada), 1 μL of each primer (10 μM), 2 μL genomic DNA, and 8.5 μL sterile distilled water. Amplification conditions were: pre-denaturation at 95°C for 5 min; 35 cycles of denaturation at 95°C for 20 s, annealing at 56°C (LSU) / 53°C (ITS) for 10 s, and extension at 72°C for 20 s, and a final extension at 72°C for 7 min. PCR products were verified by 1% TAE gel electrophoresis, followed by staining with GoldView (TSINGKE, China) and sequenced at Tsingke Biotechnology Co., Ltd.

(Kunming, China). Newly obtained sequences were deposited in GenBank.

2.4 Phylogenetic Analyses

Forward and reverse sequences were assembled into consensus sequences using BioEdit v.7.2.5 (Hall, 1999) after the manual inspection of chromatograms. Closest relatives were determined by BLAST searches in NCBI (Johnson et al., 2008). Newly generated sequences, together with reference sequences from GenBank, were aligned using MAFFT v.7 (Katoh & Standley, 2013) with the "auto" option and further refined with TrimAl v.1.3 (Capella-Gutiérrez et al., 2009) under the "gappyout" setting. Concatenated datasets were constructed following recent studies (Lestari & Chethana, 2022; Senanayake et al., 2023; Wu & Diao, 2023). Partitioning schemes and best-fit evolutionary models were selected using ModelFinder (Kalyaanamoorthy et al., 2017).

Maximum likelihood (ML) analyses were performed in IQ-TREE v.2.0 (Nguyen et al., 2015) with 1,000 ultrafast bootstrap replicates (Hoang et al., 2018) and SH-aLRT support (Guindon et al., 2010). The best-fit nucleotide substitution models were determined using ModelFinder (Kalyaanamoorthy et al., 2017) under the Bayesian Information Criterion (BIC). Bayesian inference (BI) was conducted in MrBayes v.3.2.7a (Ronquist et al., 2012) through the CIPRES Science Gateway v.3.3 (Miller et al., 2010). Four independent runs, each with four chains, were executed for 3,000,000 generations, sampling at every 300^{th} generations. Convergence was assessed by monitoring the average standard deviation of split frequencies (< 0.01), and the first 25% of trees were discarded as burn-in, while the remaining 75% were used for calculating the posterior probabilities.

Resulting phylograms were visualized in FigTree v.1.4.4 and edited in Adobe Photoshop CS6 (Adobe Systems, USA). Species identifications followed the polyphasic approach recommended by Chethana et al. (2021), integrating both morphological and molecular evidence.

2.5 Literature Review for Monograph

For the preparation of this monograph, all generic types of Helotiales were carefully reviewed through an examination of both classical and recent literature. The nomenclatural status of each genus was verified using Index Fungorum and Species Fungorum, while information on type specimens and protologues was obtained from original descriptions (Nannfeldt, 1932; Korf, 1971; Zhuang, 1998, 2004; Johnston et al., 2019).

Whenever possible, type specimens deposited in major herbaria (e.g., KUN-HKAS, MFLU, HMAS, Herb. K, Herb. NY) were examined directly or accessed through their digitized online images. Where type material was inaccessible, data were compiled from detailed morphological descriptions and published illustrations (Table 2.1, Table 2.2).

To provide updated species counts and current taxonomic placements, databases such as Faces of Fungi (Jayasiri et al., 2015), the Outline of Fungi (Hyde et al., 2024), and GenBank were consulted, particularly for sequences associared to type or reference specimens. These resources ensured that the generic accounts compiled in this monograph are based on accurate nomenclature, reliable type information, and the integration of both morphological taxonomy and molecular phylogenetics, while also highlighting ecological roles and distribution patterns.

Table 2.1 Details of examined, loaned, and requested specimens used for the monograph

No.	Type species	Herbarium / Accession No.	Location	Notes
1	*Amicodisca virella*	PRM 842732	Herbarium Mycological Department National Museum Václavské námestí 68 Praha 1 CZ-115 85 Czech Republic	Able to loan and study the herbarium specimens
2	*Parachnopeziza miniopsis*	FH-v.H.5335	Farlow Reference Library and Herbarium of Cryptogamic Botany Harvard University, 22 Divinity Ave. Cambridge, Massachusetts 02138, U.S.A.	Responded to the email but unable to loan specimens
3	*Bloxamia truncata*	Holotype K(M)	Herbarium Science Royal Botanic Gardens Kew, Richmond, Surrey, England TW9 3AE U.K.	No responses from herbaria
4	*Aivenia tantula*	Holotype PRM 802651	Herbarium Mycological Department National Museum Václavské námestí 68 Praha 1 CZ-115 86 Czech Republic	Able to loan and study the herbarium specimens
5	*Naeviella paradoxa*	Krkonose Mts., Snezka (loc. 3), 5 June 2002, PRM	Herbarium Mycological Department National Museum Václavské námestí 68 Praha 1 CZ-115 85 Czech Republic	No responses from herbaria
6	*Mycosphaerangium tetrasporum*	Lectotype GZU 000335639	Walter Obermayer, Curator of Lichens and Bryophytes, walter.obermayer@uni-graz.at	No responses from herbaria

Table 2.1 (continued)

No.	Type species	Herbarium / Accession No.	Location	Notes
7	*Chrysodisca peziculoides*	Holotype M 0281037	Botanische Staatssammlung München Staatliche Naturwissenschaftliche Sammlungen Bayerns (SNSB) Menzinger Straße 67 München D-80638 Germany	Able to loan and study the herbarium specimens
8	*Cochlearomyces eucalypti*	Holotype CBS H-23076	Westerdijk Fungal Biodiversity Institute Netherlands, Utrecht	Herbarium does not ship specimens internationally
9	*Annabella australiensis*	Holotype AD 283531	State Herbarium of South Australia Australia, South Australia, Adelaide	Unable to loan specimens. Australian Scientific Exchange Program (loan, donation or exchange) for herbarium specimens or samples, the scientific exchange of all CITES-listed taxa between Australian and overseas institutions requires that both organisations be CITES-registered.
10	*Diplolaeviopsis ranula*	Holotype BCC (lich.) 4120	National Science and Technology Development Agency (NSTDA), Thailand, Pathum thani. Khlong Nueng/Khlong Luang	Available for loaning specimens

Table 2.1 (continued)

No.	Type species	Herbarium / Accession No.	Location	Notes
11	*Lawreyella lobariella*	Holotype BM, Dennis 1913	The Natural History Museum, U.K. England. London.	Unable to loan specimens. BM timber collections have been transferred to LIV. BM retains responsibility for bryophytes, algae, and lichens, while K is responsible for non-lichenised fungi. Accordingly, non-lichenised fungi from BM have been transferred to K. Myxogastria are excluded from this agreement and are maintained at both institutions. The program is government-funded and administered by the Board of Trustees.
12	*Macroskyttea parmotrematis*	Holotype UGDA, Kukwa, 10 Oct. 2012	Herbarium Department of Plant Taxonomy and Nature Conservation Faculty of Biology Gdansk University Wita Stwosza 59 Gdansk PL-80-308 Poland	No responses from herbaria
13	*Neobaryopsis andensis*	Holotype KRAM, Flakus 25967	Herbarium W. Szafer Institute of Botany, Polish Academy of Sciences Lubicz 46 Kraków PL-31-512 Poland	No responses from herbaria
14	*Sabahriopsis eucalypti*	Holotype CBS H-22235	Westerdijk Fungal Biodiversity Institute Netherlands, Utrecht	Herbarium does not ship specimens internationally

Table 2.1 (continued)

No.	Type species	Herbarium / Accession No.	Location	Notes
15	*Davidhawksworthia ilicicola*	CBS H-22479	Westerdijk Fungal Biodiversity Institute Netherlands, Utrecht	Herbarium does not ship specimens internationally
16	*Gelatinoamylaria thimphuensis*	Holotype PAN 24080	Herbarium Botany Department Panjab University Chandigarh, Punjab 160 016 India	The email address of the PAN collection could not be found.
17	*Neofabraea malicorticis*	CBS H-22219	Westerdijk Fungal Biodiversity Institute Netherlands, Utrecht	Herbarium does not ship specimens internationally
18	*Pseudofabraea citricarpa*	Holotype CBS H-20689	Westerdijk Fungal Biodiversity Institute Netherlands, Utrecht	Herbarium does not ship specimens internationally
19	*Rhizodermea veluwensis*	Holotype CBS 110605	Westerdijk Fungal Biodiversity Institute Netherlands, Utrecht	Herbarium does not ship specimens internationally
20	*Cladochasiella divergens*	Holotype PRM 842967	Herbarium Mycological Department National Museum Václavské námestí 68 Praha 1 CZ-115 81 Czech Republic	Able to loan and study the herbarium specimens
21	*Fontanospora eccentrica*	Holotype NY, Petersen s.n.	William and Lynda Steere Herbarium The New York Botanical Garden 2900 Southern Blvd. Bronx, New York 10458-5126 U.S.A.	No responses from herbaria

Table 2.1 (continued)

No.	Type species	Herbarium / Accession No.	Location	Notes
22	*Pseudopezicula tetraspora Korf, R.C. Pearson & W.Y. Zhuang, in Korf, Pearson, Zhuang & Dubos, Mycotaxon 26: 465 (1986)*	Holotype CUP 61765	Plant Pathology Herbarium Dept. of Plant Pathology and Plant-Microbe Biology, Cornell University 334 Plant Science Building Ithaca, New York 14855	No responses from herbaria
23	*Spilopodiella arxii*	Holotype ZT, Müller, 14 Aug. 1962	Institut for Integrative Biology Plant Ecological Genetics Herbarium der Eidgenössische Technische Hochschule Zürich Universitätstrasse 16 Zürich CH-8092 Switzerland	Unable to loan specimens. Specimens are not in good condition
24	*Brasiliomyces malvastri*	Holotype IACM 3719	Herbário Micológico IACM Centro de Pesquisa e Desenvolvimento de Fitossanidade – IAC Fitopatologia Instituto Agronômico Caixa Postal 28 Campinas, São Paulo 13020-902 Brazil	No responses from herbaria
25	*Bulbomicroidium bauhiniicola*	Holotype HAL (Fungi) 1874	HAL: Herbarium Institut für Biologie, Bereich Geobotanik und Botanischer Garten Martin-Luther-Universität Neuwerk 21 Halle (Saale) 06108 Germany	Able to loan and study the herbarium specimens

Table 2.1 (continued)

No.	Type species	Herbarium / Accession No.	Location	Notes
26	*Golovinomyces cichoracearum*	Lectotype G 00298360；Epitype VPRI 20383	G: Herbarium Conservatoire et Jardin botaniques de la Ville de Genève Case postale 71 Chambésy/Genève CH-1292 Switzerland; VPRI: Victorian Plant Pathology Herbarium, Department of Energy, Environment and Climate Action Agriculture Victoria, Victorian State Government, Australia AgriBio, 5 Ring Road, La Trobe University Bundoora, Victoria 3083 Australia	G：Able to loan and study the herbarium specimens VPRI：No responses from herbaria
27	*Neoerysiphe galeopsidis*	Lectotype G 00122104；Epitype HAL 1206F	G: Herbarium Conservatoire et Jardin botaniques de la Ville de Genève Case postale 71 Chambésy/Genève CH-1292 Switzerland; HAL: Herbarium Institut für Biologie, Bereich Geobotanik und Botanischer Garten Martin-Luther-Universität, Neuwerk 21 Halle (Saale) 06108 Germany	HAL:Able to loan and study the herbarium specimens G：Able to loan and study the herbarium specimens
28	*Caespitotheca forestalis*	Holotype LIL 11343	Herbario Fundación Miguel Lillo Miguel Lillo 251 San Miguel de Tucumán, Tucumán T4000JFE Argentina	No responses from herbaria

Table 2.1 (continued)

No.	Type species	Herbarium / Accession No.	Location	Notes
29	*Cystotheca wrightii*	Holotype K(M), Wright s.n.	Herbarium Science Royal Botanic Gardens Kew, Richmond, Surrey, England TW9 20AE U.K.	No responses from herbaria
30	*Parauncinula septata*	Lectotype TNS F-214605; Epitype TSU-MUMH 4868	TNS: Herbarium Department of Botany National Museum of Nature and Science Amakubo 4-1-1 Tsukuba, Ibaraki 305-0005 Japan TSU: Herbarium Graduate school of Bioresources, Mie University Kurima-machiya 1577 Tsu, Mie 514-8507 Japan	No responses from herbaria
31	*Gelatinodiscus flavidus*	Holotype MICH, Smith 14488	Herbarium University of Michigan 3600 Varsity Drive Ann Arbor, Michigan 48108-2228 U.S.A.	Responded to the email but unable to loan specimens, as the apothecia are quite small and in poor condition.
32	*Skyathea hederae*	Holotype K(M) 32267	Herbarium Science Royal Botanic Gardens Kew, Richmond, Surrey, England TW9 9AE U.K.	No responses from herbaria
33	*Xerombrophila crystallifera*	Holotype M, M-0190819	Botanische Staatssammlung München Staatliche Naturwissenschaftliche Sammlungen Bayerns (SNSB) Menzinger Straße 67 München D-80641 Germany	Able to loan and study the herbarium specimens

Table 2.1 (continued)

No.	Type species	Herbarium / Accession No.	Location	Notes
34	*Cylindrochalara hyalocuspica*	Holotype PRM 922274	Herbarium Mycological Department National Museum Václavské námestí 68 Praha 1 CZ-115 85 Czech Republic	No responses from herbaria
35	*Hyalodendriella betulae*	Holotype CBS H-19895	Westerdijk Fungal Biodiversity Institute Netherlands, Utrecht	Herbarium does not ship specimens internationally
36	*Infundichalara microchona*	Holotype CBS 175.74	Westerdijk Fungal Biodiversity Institute Netherlands, Utrecht	Herbarium does not ship specimens internationally
37	*Xenochalara juniperi*	Holotype PREM 56210	National Collection of Fungi Biosystematics Division, Mycology Unit Agricultural Research Council Plant Protection Research Institute Private Bag X134, Queenswood Pretoria, Gauteng Province 0121 Republic of South Africa	No responses from herbaria
38	*Xenopolyscytalum pinea*	Holotype CBS H-20488	Westerdijk Fungal Biodiversity Institute Netherlands, Utrecht	Herbarium does not ship specimens internationally
39	*Bisporella monilifera*	Lectotype G 00127695/ SIB 321906/1	G: Herbarium Conservatoire et Jardin botaniques de la Ville de Genève Case postale 71 Chambésy/Genève CH-1292 Switzerland; SIB: Ghizela Vonica, Curator, ashizela@yahoo.com	G: Able to loan and study the herbarium specimens SIB: No responses from herbaria

Table 2.1 (continued)

No.	Type species	Herbarium / Accession No.	Location	Notes
40	*Calycina neesii*	Holotype K(M), Gardner 65	Herbarium Science Royal Botanic Gardens Kew, Richmond, Surrey, England TW9 17AE U.K.	No responses from herbaria
41	*Filosporella aquatica*	IMI 177454	Herbarium CABI Bioscience UK Centre Bakeham Lane Egham, Surrey, England TW20 16TY U.K.	No responses from herbaria
42	*Glarea lozoyensis*	Holotype BPI, MF5171	U.S. National Fungus Collections, USDA-ARS USA, Maryland, Beltsville	BPI unable to ship specimens outside the USA
43	*Phaeohelotium flavum*	Holotype MSC 31-895	Michigan State University Herbarium Plant Biology Laboratories Michigan State University 612 Wilson Rd., Room 166 East Lansing, Michigan 48824 U.S.A.	No responses from herbaria
44	*Symphyosirinia galii*	Holotype K(M) 30723	Herbarium Science Royal Botanic Gardens Kew, Richmond, Surrey, England TW9 7AE U.K.	No responses from herbaria
45	*Bryoscyphus conocephali*	Holotype K(M) 30727	Herbarium Science Royal Botanic Gardens Kew, Richmond, Surrey, England TW9 8AE U.K.	No responses from herbaria

Table 2.1 (continued)

No.	Type species	Herbarium / Accession No.	Location	Notes
46	*Chaetoscypha nidulans*	Holotype PDD 1024	New Zealand Fungarium (PDD) Te Kohinga Hekaheka o Aotearoa Manaaki Whenua - Landcare Research Private Bag 92170 Auckland 1142 New Zealand	No responses from herbaria
47	*Endoscypha perforans*	Holotype PDD 1022	New Zealand Fungarium (PDD) Te Kohinga Hekaheka o Aotearoa Manaaki Whenua - Landcare Research Private Bag 92170 Auckland 1142 New Zealand	No responses from herbaria
48	*Hispidula pounamu*	Holotype PDD 70960	New Zealand Fungarium (PDD) Te Kohinga Hekaheka o Aotearoa Manaaki Whenua - Landcare Research Private Bag 92170 Auckland 1142 New Zealand	No responses from herbaria
49	*Mytilodiscus alnicola*	Holotype OSC 41244	Herbarium Botany and Plant Pathology Department, Oregon State University 2701 SW Campus Way Corvallis, Oregon 97331 U.S.A.	No responses from herbaria
50	*Neocrinula xanthorrhoeae*	Holotype CBS H-22859	Westerdijk Fungal Biodiversity Institute Netherlands, Utrecht	Herbarium does not ship specimens internationally

Table 2.1 (continued)

No.	Type species	Herbarium / Accession No.	Location	Notes
51	*Aphanodesmium gabretae*	Holotype PRM 915691	Herbarium Mycological Department National Museum Václavské námestí 68 Praha 1 CZ-115 82 Czech Republic	Able to loan and study the herbarium specimens
52	*Banksiamyces macrocarpus*	Holotype MELU, Beaton, 26 Apr. 1981	Herbarium School of BioSciences University of Melbourne BioSciences 4 Parkville, Victoria 3010 Australia	No responses from herbaria
53	*Brefeldochium pruinosum*	Holotype CBS H-11004	Westerdijk Fungal Biodiversity Institute Netherlands, Utrecht	Herbarium does not ship specimens internationally
54	*Capillipes cavorum*	Holotype UPS, Santesson, 9 Aug. 1945	Uppsala University Botany Museum of Evolution Norbyvägen 16 Uppsala SE-752 38 Sweden	Responded to the email but unable to loan specimens
55	*Cenangiumella rattanicola*	Holotype HKU (M), Fröhlich 488	Herbarium (room 3S-17) School of Biological Sciences The University of Hong Kong Pokfulam Road Hong Kong People's Republic of China	No responses from herbaria

Table 2.1 (continued)

No.	Type species	Herbarium / Accession No.	Location	Notes
56	*Chlorovibrissea bicolor*	Holotype MELU, Beaton 389	Herbarium School of BioSciences University of Melbourne BioSciences 4 Parkville, Victoria 3010 Australia	No responses from herbaria
57	*Clathrosphaerina zalewskii*	Holotype CBS, Beverwijk, May 1948	Westerdijk Fungal Biodiversity Institute Netherlands, Utrecht	Herbarium does not ship specimens internationally
58	*Clathrosporium intricatum*	Holotype IMI 312389	Herbarium CABI Bioscience UK Centre Bakeham Lane Egham, Surrey, England TW20 10TY U.K.	No responses from herbaria
59	*Coleosperma lacustre*	Holotype IMI 51536	Herbarium CABI Bioscience UK Centre Bakeham Lane Egham, Surrey, England TW20 15TY U.K.	No responses from herbaria
60	*Colipila masduguana*	Holotype M, M-0140887	Botanische Staatssammlung München Staatliche Naturwissenschaftliche Sammlungen Bayerns (SNSB) Menzinger Straße 67 München D-80640 Germany	No responses from herbaria

Table 2.1 (continued)

No.	Type species	Herbarium / Accession No.	Location	Notes
61	*Cryptohymenium pycnidiophorum*	Holotype PDD 46964	New Zealand Fungarium (PDD) Te Kohinga Hekaheka o Aotearoa Manaaki Whenua - Landcare Research Private Bag 92170 Auckland 1146 New Zealand	No responses from herbaria
62	*Dematioscypha dematiicola*	Holotype K(M) 173615	Herbarium Science Royal Botanic Gardens Kew, Richmond, Surrey, England TW9 5AE U.K.	No responses from herbaria
63	*Grimmicola parasiticus*	Holotype M, Hertel 24.565a	Botanische Staatssammlung München Staatliche Naturwissenschaftliche Sammlungen Bayerns (SNSB) Menzinger Straße 67 München D-80639 Germany	Able to loan and study the herbarium specimens
64	*Hydrocina chaetocladia*	Holotype IMI 339224	Herbarium CABI Bioscience UK Centre Bakeham Lane Egham, Surrey, England TW20 11TY U.K.	No responses from herbaria
65	*Korfia tsugae*	Holotype BPI 72022	U.S. National Fungus Collections, USDA-ARS USA, Maryland, Beltsville	BPI unable to ship specimens outside the USA
66	*Mycoarthris corallina*	Holotype IMI 385400	Herbarium CABI Bioscience UK Centre Bakeham Lane Egham, Surrey, England TW20 13TY U.K.	No responses from herbaria

Table 2.1 (continued)

No.	Type species	Herbarium / Accession No.	Location	Notes
67	*Otwaya verruculospora*	Holotype MELU, Beaton 64.1983	Herbarium School of BioSciences University of Melbourne BioSciences 4 Parkville, Victoria 3010 Australia	No responses from herbaria
68	*Pestalopezia brunneopruinosa*	Holotype OSC 8096	Herbarium Botany and Plant Pathology Department, Oregon State University 2701 SW Campus Way Corvallis, Oregon 97333 U.S.A.	No responses from herbaria
69	*Polyphilus sieberi*	Holotype BP 109051	Hungarian Natural History Museum Baross u. 13. Budapest 1088 Hungary	No responses from herbaria
70	*Populomyces zwinianus*	Holotype CBS H-24737	Westerdijk Fungal Biodiversity Institute Netherlands, Utrecht	Herbarium does not ship specimens internationally
71	*Pseudomitrula horakii*	Holotype LPS 38412	Universidad Nacional de La Plata, Argentina, Buenos Aires, La Plata	LPS does not ship TYPE materials as several previous loans to institutions outside the country have not been returned
72	*Pseudopeltis filicum*	Holotype UPS, Holm 854b	Uppsala University Botany Museum of Evolution Norbyvägen 16 Uppsala SE-752 36 Sweden	Responded to the email but unable to loan specimens
73	*Radotinea caudata*	Holotype PRM 151698	Herbarium Mycological Department National Museum Václavské námestí 68 Praha 1 CZ-115 80 Czech Republic	Specimen not in good condition

Table 2.1 (continued)

No.	Type species	Herbarium / Accession No.	Location	Notes
74	*Rommelaarsia flavovirens*	Holotype M, M-0276613	Botanische Staatssammlung München Staatliche Naturwissenschaftliche Sammlungen Bayerns (SNSB) Menzinger Straße 67 München D-80642 Germany	Able to loan and study the herbarium specimens
75	*Sclerocrana atra*	Holotype PDD 46958	New Zealand Fungarium (PDD) Te Kohinga Hekaheka o Aotearoa Manaaki Whenua - Landcare Research Private Bag 92170 Auckland 1145 New Zealand	No responses from herbaria
76	*Sorokina microspora*	K(M), anon. s.n.	Herbarium Science Royal Botanic Gardens Kew, Richmond, Surrey, England TW9 21AE U.K.	No responses from herbaria
77	*Sorokinella appendicospora*	Holotype HKU (M),Fröhlich 401	Herbarium (room 3S-17) School of Biological Sciences The University of Hong Kong Pokfulam Road, Hong Kong People's Republic of China	No responses from herbaria

Table 2.1 (continued)

No.	Type species	Herbarium / Accession No.	Location	Notes
78	*Stilbopeziza yerbae*	Typification: LPS, Spegazzini s.n.	Universidad Nacional de La Plata, Argentina, Buenos Aires, La Plata	LPS does not ship TYPE materials as several previous loans to institutions outside the country have not been returned.
79	*Vandijckella johannae*	Holotype CBS H-23223	Westerdijk Fungal Biodiversity Institute Netherlands, Utrecht	Herbarium does not ship specimens internationally
80	*Xeromedulla leptospora*	Holotype CUP SA952	Plant Pathology Herbarium Dept. of Plant Pathology and Plant-Microbe Biology, Cornell University 334 Plant Science Building Ithaca, New York 14857	No responses from herbaria
81	*Acidea extrema*	Holotype PRM 922617	Herbarium Mycological Department National Museum Václavské námestí 68 Praha 1 CZ-115 83 Czech Republic	Able to loan and study the herbarium specimens
82	*Acidomelania panicicola*	Holotype RUTPP 61R8	Herbarium Plant Pathology Department Cook College, Rutgers University Foran Hall, 59 Dudley Rd. New Brunswick, New Jersey 08903-0231 U.S.A.	Responded to the email but unable to loan specimens

Table 2.1 (continued)

No.	Type species	Herbarium / Accession No.	Location	Notes
83	*Angelina conglomerata*	Holotype PH, Schweinitz s.n.	Herbarium Botany Department Academy of Natural Sciences 1900 Benjamin Franklin Parkway Philadelphia, Pennsylvania 19103 U.S.A.	No responses from herbaria
84	*Apiculospora spartii*	Holotype NNW IT 844	Herbarium Austroitalicum Department of Environmental, Biological and Pharmaceutical Sciences and Technologies University of Campania Luigi Vanvitelli Via Vivaldi 43 Caserta, Caserta 81100 Italy	No responses from herbaria
85	*Aquapoterium pinicola*	Holotype ILL 40117	Herbarium Department of Plant Biology School of Integrative Biology University of Illinois at Urbana-Champaign 1816 S. Oak St. Champaign, Illinois 61820 U.S.A.	Able to loan and study the herbarium specimens
86	*Brachyalara straminea*	Holotype CBS H-1723	Westerdijk Fungal Biodiversity Institute Netherlands, Utrecht	Herbarium does not ship specimens internationally
87	*Fulvoflamma eucalypti*	Holotype CBS H-18045	Westerdijk Fungal Biodiversity Institute Netherlands, Utrecht	Herbarium does not ship specimens internationally

Table 2.1 (continued)

No.	Type species	Herbarium / Accession No.	Location	Notes
88	*Larissia pyrolae*	Holotype TAA 182408	Herbarium Estonian University of Life Sciences 5 Kreutzwaldi Street Tartu EE 51016 Estonia	Able to loan and study the herbarium specimens
89	*Polydesmia pruinosa*	Holotype K(M), Gardner 81	Herbarium Science Royal Botanic Gardens Kew, Richmond, Surrey, England TW9 18AE U.K.	No responses from herbaria
90	*Potridiscus polymorphus*	Holotype M, Rambold 3269	Botanische Staatssammlung München Staatliche Naturwissenschaftliche Sammlungen Bayerns (SNSB) Menzinger Straße 67 München D-80643 Germany	Able to loan and study the herbarium specimens
91	*Zugazaea agyrioides*	Holotype CUP (MM) 2844	Plant Pathology Herbarium Dept. of Plant Pathology and Plant-Microbe Biology, Cornell University 334 Plant Science Building Ithaca, New York 14853	No responses from herbaria
92	*Sarcomyces vinosus*	Holotype K(M) 35499	Herbarium Science Royal Botanic Gardens Kew, Richmond, Surrey, England TW9 12AE U.K.	No responses from herbaria

Table 2.1 (continued)

No.	Type species	Herbarium / Accession No.	Location	Notes
93	*Amicodisca brdensis*	Holotype PRM 149947	Herbarium Mycological Department National Museum Václavské námestí 68 Praha 1 CZ-115 79 Czech Republic	Able to loan and study the herbarium specimens
94	*Graddonidiscus coruscatus*	Holotype K(M) 32585	Herbarium Science Royal Botanic Gardens Kew, Richmond, Surrey, England TW9 11AE U.K.	No responses from herbaria
95	*Hyphopeziza pygmaea*	Holotype BR, Mouton 473	Herbarium Herbarium & Library Meise Botanic Garden Nieuwelaan 38 Meise, Belgium 1860 Belgium	Available for loaning specimens
96	*Ambrodiscus pseudotsugae*	Holotype OSC 46720	Herbarium Botany and Plant Pathology Department, Oregon State University 2701 SW Campus Way Corvallis, Oregon 97332 U.S.A.	No responses from herbaria
97	*Arbusculina irregularis*	NY, anon. s.n.; Fig. 4 (loc. cit.)	William and Lynda Steere Herbarium The New York Botanical Garden 2900 Southern Blvd. Bronx, New York 10458-5128 U.S.A.	No responses from herbaria

Table 2.1 (continued)

No.	Type species	Herbarium / Accession No.	Location	Notes
98	*Crucellisporiopsis gelatinosa*	Holotype PDD 41405	New Zealand Fungarium (PDD) Te Kohinga Hekaheka o Aotearoa Manaaki Whenua - Landcare Research Private Bag 92170 Auckland 1144 New Zealand	No responses from herbaria
99	*Echinula asteriadiformis*	Holotype K(M) 32513	Herbarium Science Royal Botanic Gardens Kew, Richmond, Surrey, England TW9 10AE U.K.	No responses from herbaria
100	*Grahamiella dryadis*	Holotype UPS, Nannfeldt 8564a	Uppsala University Botany Museum of Evolution Norbyvägen 16 Uppsala SE-752 37 Sweden	Responded to the email but unable to loan specimens
101	*Meliniomyces variabilis*	Holotype UAMH 8861	Microfungus Collection and Herbarium UAMH Centre for Global Microfungal Biodiversity 223 College Street Toronto, Ontario M5T 1R4 Canada	No responses from herbaria
102	*Mimicoscypha lacrimiformis*	Holotype TNS (F) 181594	Herbarium Department of Botany National Museum of Nature and Science Amakubo 4-1-1 Tsukuba, Ibaraki 305-0005 Japan	No responses from herbaria

Table 2.1 (continued)

No.	Type species	Herbarium / Accession No.	Location	Notes
103	*Rhizoscyphus ericae*	Holotype IMI 182065	Herbarium CABI Bioscience UK Centre Bakeham Lane Egham, Surrey, England TW20 9TY U.K.	No responses from herbaria
104	*Thindiomyces epiphyllus*	Holotype PAN 17589	Herbarium Botany Department Panjab University Chandigarh, Punjab 160 014 India	The email address of the PAN collection could not be found.
105	*Unguiculariella bhutanica*	Holotype PAN 24081	Herbarium Botany Department Panjab University Chandigarh, Punjab 160 017 India	The email address of the PAN collection could not be found.
106	*Glutinomyces brunneus*	Holotype JCM 32230		No herbarium information available
107	*Gamarada debralockiae*	Holotype FRR 6190		No herbarium information available
108	*Soosiella minima*	Holotype PRM 922619	Herbarium Mycological Department National Museum Václavské námestí 68 Praha 1 CZ-115 84 Czech Republic	Able to loan and study the herbarium specimens
109	*Lasiobelonium subflavidum*	Holotype NY, Suksdorf 489	William and Lynda Steere Herbarium The New York Botanical Garden 2900 Southern Blvd. Bronx, New York 10458-5127 U.S.A.	No responses from herbaria

Table 2.1 (continued)

No.	Type species	Herbarium / Accession No.	Location	Notes
110	*Proliferodiscus inspersus*	Holotype K(M) 41943	Herbarium Science Royal Botanic Gardens Kew, Richmond, Surrey, England TW9 13AE U.K.	No responses from herbaria
111	*Asperopilum juncicola*	Holotype K(M) 173616	Herbarium Science Royal Botanic Gardens Kew, Richmond, Surrey, England TW9 6AE U.K.	No responses from herbaria
112	*Obtectodiscus aquaticus*	Holotype ZT 0066978, Müller, Petrini & Samuels, 22 Aug. 1978	Institut for Integrative Biology Plant Ecological Genetics Herbarium der Eidgenössische Technische Hochschule Zürich Universitätstrasse 16 Zürich CH-8093 Switzerland	Able to loan and study the herbarium specimens
113	*Barrenia panici*	Holotype RUTPP WSF1R37	Herbarium Plant Pathology Department Cook College, Rutgers University Foran Hall, 59 Dudley Rd. New Brunswick, New Jersey 08903-0232 U.S.A.	Responded to the email but unable to loan specimens
114	*Bulbomollisia radiata*	Holotype K(M) 45898	Herbarium Science Royal Botanic Gardens Kew, Richmond, Surrey, England TW9 3AE U.K.	No responses from herbaria

Table 2.1 (continued)

No.	Type species	Herbarium / Accession No.	Location	Notes
115	*Fuscosclera lignicola*	Holotype CBS H-22996	Westerdijk Fungal Biodiversity Institute Netherlands, Utrecht	Herbarium does not ship specimens internationally
116	*Loramyces juncicola*	Holotype FH, Weston s.n.	Farlow Reference Library and Herbarium of Cryptogamic Botany, Harvard University 22 Divinity Ave. Cambridge, Massachusetts 02139 U.S.A.	Responded to the email but unable to loan specimens
117	*Pseudonaevia caricina*	Holotype K(M) 15817	Herbarium Science Royal Botanic Gardens Kew, Richmond, Surrey, England TW9 4AE U.K.	No responses from herbaria
118	*Sarconiptera vinacea*	Holotype TAA 137803	Herbarium Estonian University of Life Sciences 5 Kreutzwaldi Street Tartu EE 51015 Estonia	Able to loan and study the herbarium specimens
119	*Scutobelonium amorilens*	Holotype K(M) 45402	Herbarium Science Royal Botanic Gardens Kew, Richmond, Surrey, England TW9 14AE U.K.	No responses from herbaria
120	*Variocladium rangiferinum*	Typification: IMI 254852	Herbarium CABI Bioscience UK Centre Bakeham Lane Egham, Surrey, England TW20 16TY U.K.	No responses from herbaria
121	*Mycosylva clarkii*	Holotype IMI 163345	Herbarium CABI Bioscience UK Centre Bakeham Lane Egham, Surrey, England TW20 14TY U.K.	No responses from herbaria

Table 2.1 (continued)

No.	Type species	Herbarium / Accession No.	Location	Notes
122	*Lareunionomyces syzygii*	Holotype CBS H-22623	Westerdijk Fungal Biodiversity Institute Netherlands, Utrecht	Herbarium does not ship specimens internationally
123	*Neolauriomyces eucalypti*	Holotype CBS H-23577	Westerdijk Fungal Biodiversity Institute Netherlands, Utrecht	Herbarium does not ship specimens internationally
124	*Patellariopsis clavispora*	Holotype K(M) 57687	Herbarium Science Royal Botanic Gardens Kew, Richmond, Surrey, England TW9 15AE U.K.	No responses from herbaria
125	*Austropezia samuelsii*	Holotype CUP 57031	Plant Pathology Herbarium Dept. of Plant Pathology and Plant-Microbe Biology, Cornell University 334 Plant Science Building Ithaca, New York 14854	No responses from herbaria
126	*Curviclavula anemophila*	Holotype BPI 892883	U.S. National Fungus Collections, USDA-ARS USA, Maryland, Beltsville	BPI unable to ship specimens outside the USA
127	*Endoradiciella communis*	Holotype CBS 148863	Westerdijk Fungal Biodiversity Institute Netherlands, Utrecht	Herbarium does not ship specimens internationally
128	*Mollisinopsis filicis*	Holotype PAN 17819	Herbarium Botany Department Panjab University Chandigarh, Punjab 160 015 India	The email address of the PAN collection could not be found.
129	*Neochalara spiraeae*	Holotype CBS H-24865	Westerdijk Fungal Biodiversity Institute Netherlands, Utrecht	Herbarium does not ship specimens internationally

Table 2.1 (continued)

No.	Type species	Herbarium / Accession No.	Location	Notes
130	*Newbrunswickomyces abietophilus*	Holotype CBS H-24961	Westerdijk Fungal Biodiversity Institute Netherlands, Utrecht	Herbarium does not ship specimens internationally
131	*Porodiplodia livistonae*	Holotype CBS H-23574	Westerdijk Fungal Biodiversity Institute Netherlands, Utrecht	Herbarium does not ship specimens internationally
132	*Scleropezicula alnicola*	Holotype TRTS 8414	Herbarium Botany Department Scarborough College, University of Toronto West Hill Toronto, Ontario M1C 1A4 Canada	TRTS no longer exists.
133	*Heterosphaeria patella*	Neotype ZT, 0066980	Institut for Integrative Biology Plant Ecological Genetics Herbarium der Eidgenössische Technische Hochschule Zürich Universitätstrasse 16 Zürich CH-8096 Switzerland	Able to loan and study the herbarium specimens
134	*Entimomentora hyalina*	Holotype CBS 130.74	Westerdijk Fungal Biodiversity Institute Netherlands, Utrecht	Herbarium does not ship specimens internationally
135	*Pleuroascus nicholsonii*	Holotype K(M), Nicholson, Jan. 1900	Herbarium Science Royal Botanic Gardens Kew, Richmond, Surrey, England TW9 19AE U.K.	No responses from herbaria
136	*Venustampulla parva*	Holotype CBS, s.n.	Westerdijk Fungal Biodiversity Institute Netherlands, Utrecht	Herbarium does not ship specimens internationally

Table 2.1 (continued)

No.	Type species	Herbarium / Accession No.	Location	Notes
137	*Mastigosporium album*	Lectotype HAL, Klotzsch, Herb. Viv. mycol. no. 1758; Epitype CBS 138013	HAL：Herbarium Institut für Biologie, Bereich Geobotanik und Botanischer Garten Martin-Luther-Universität Neuwerk 21 Halle (Saale) 06109 Germany; CBS: Westerdijk Fungal Biodiversity Institute Netherlands, Utrecht	HAL: Specimen not in good condition CBS: Herbarium does not ship specimens internationally
138	*Neospermospora avenae*	BPI, Sprague, Feb. 1932; BPI, Sprague, Feb. 1934	U.S. National Fungus Collections, USDA-ARS USA, Maryland, Beltsville	BPI unable to ship specimens to outside the USA
139	*Rhynchosporium graminicola*	Lectotype Frank 1897: 519, unnumbered drawing; Epitype ZT Myc2338	Institut for Integrative Biology Plant Ecological Genetics Herbarium der Eidgenössische Technische Hochschule Zürich Universitätstrasse 16 Zürich CH-8095 Switzerland	Specimen not in good condition
140	*Collembolispora barbata*	Holotype IMI 389661	Herbarium CABI Bioscience UK Centre Bakeham Lane Egham, Surrey, England TW20 14TY U.K.	No responses from herbaria
141	*Pyrenopeziza brassicae*	Lectotype IMI 101696	Herbarium CABI Bioscience UK Centre Bakeham Lane Egham, Surrey, England TW20 14TY U.K.	No responses from herbaria

Table 2.1 (continued)

No.	Type species	Herbarium / Accession No.	Location	Notes
142	*Pseudolanzia piceetorum*	Holotype M 0281046	Botanische Staatssammlung München Staatliche Naturwissenschaftliche Sammlungen Bayerns (SNSB) Menzinger Straße 67 München D-80644 Germany	Able to loan and study the herbarium specimens
143	*Bicornispora exophiala*	Holotype MA (Fungi) 32825	Herbario Real Jardín Botánico Plaza de Murillo 2 Madrid, Madrid 28014 Spain	No responses from herbaria
144	*Clarireedia homoeocarpa*	Neotype BPI 892697； Epitype BPI 910612	U.S. National Fungus Collections, USDA-ARS USA, Maryland, Beltsville	BPI unable to ship specimens outside the USA
145	*Dencoeliopsis johnstonii*	Holotype K(M) 99798	Herbarium Science Royal Botanic Gardens Kew, Richmond, Surrey, England TW9 16AE U.K.	No responses from herbaria
146	*Grovesinia pyramidalis*	Holotype ILLS 43169	Herbarium Prairie Research Institute Illinois Natural History Survey, Illinois Department of Natural Resources 1816 South Oak St. Champaign, Illinois 61820 U.S.A.	Able to loan and study the herbarium specimens

Table 2.1 (continued)

No.	Type species	Herbarium / Accession No.	Location	Notes
147	*Haradamyces foliicola*	Holotype TFM FPH7930	Herbarium of Forest Mycology and Pathology Forest Biology Division Forestry and Forest Products Research Institute 1 Matsunosato, Tsukuba, Ibaraki 305-8688 Japan	Able to loan and study the herbarium specimens
148	*Pseudociboria umbrina*	Lectotype MICH 14415	Herbarium University of Michigan 3600 Varsity Drive Ann Arbor, Michigan 48108-2229 U.S.A.	Responded to the email but unable to loan specimens.Quite small and in poor condition
149	*Amphobotrys ricini*	‘-Holotype BPI 573856 ‘-Epitype CBS H-24230	Westerdijk Fungal Biodiversity Institute Netherlands, Utrecht	BPI unable to ship specimens outside the USA
150	*Kohninia linnaeicola*	Holotype O ARON 2000/058	Herbarium O Natural History Museum University of Oslo (O) P.O. Box 1172, Blindern Oslo NO-0318 Norway	No responses from herbaria
151	*Martininia panamaensis*	Holotype CUP 27040	Plant Pathology Herbarium Dept. of Plant Pathology and Plant-Microbe Biology, Cornell University 334 Plant Science Building Ithaca, New York 14854	No responses from herbaria

Table 2.1 (continued)

No.	Type species	Herbarium / Accession No.	Location	Notes
152	*Microstrobilinia castrans*	Holotype ZT Myc-66340	Institut for Integrative Biology Plant Ecological Genetics Herbarium der Eidgenössische Technische Hochschule Zürich Universitätstrasse 16 Zürich CH-8092 Switzerland	Specimen not in good condition
153	*Redheadia quercus*	Holotype TFM FPH7752	Herbarium of Forest Mycology and Pathology, Forest Biology Division Forestry and Forest Products Research Institute 1 Matsunosato, Tsukuba, Ibaraki 305-8687 Japan	Able to loan and study the herbarium specimens
154	*Streptotinia arisaematis*	Holotype CUP 8377	Plant Pathology Herbarium Dept. of Plant Pathology and Plant-Microbe Biology, Cornell University 334 Plant Science Building Ithaca, New York 14856	No responses from herbaria
155	*Mycofalcella calcarata*	Holotype IMI 351879	Herbarium CABI Bioscience UK Centre Bakeham Lane Egham, Surrey, England TW20 12TY U.K.	No responses from herbaria

Table 2.1 (continued)

No.	Type species	Herbarium / Accession No.	Location	Notes
156	*Basingstokeomyces allii*	Holotype CBS H-25210	Westerdijk Fungal Biodiversity Institute Netherlands, Utrecht	Herbarium does not ship specimens internationally
157	*Cryonesomyces dreyfussii*	Holotype UAMH 12041	Microfungus Collection and Herbarium UAMH Centre for Global Microfungal Biodiversity 223 College Street Toronto, Ontario M5T 1R4 Canada	No responses from herbaria
158	*Acephala applanata*	Holotype ZT, Sieber, 17 Sept. 1992	Institut for Integrative Biology Plant Ecological Genetics Herbarium der Eidgenössische Technische Hochschule Zürich Universitätstrasse 16 Zürich CH-8094 Switzerland	Specimen not in good condition
159	*Srinivasanomyces kangrensis*	Holotype AMH 10175	Agharkar Research Institute India, Maharashtra, Pune	No responses from AMH collection. Unable to obtain fungal specimens from this herbarium

Table 2.2 Newly collected specimens and sequences generated in this study

No.	Species name	Voucher No.	Collection site	Date	Substrate	Type status	Notes
1	*Chlorencoelia torta*	HKAS 145839	China, Yunnan Province, Puer City, Jingdong County, Ailao Mountain	24 August 2022	on the decayed unknown wood	-	new record
2	*Crumenulopsis laojunshanensis*	HKAS 145853	China, Yunnan Province, Laojun Mountain	22 July 2022	on decayed unidentified bark	holotype	new species
3	*Crumenulopsis laojunshanensis*	HKAS 145854	China, Yunnan Province, Laojun Mountain	22 July 2022	on decayed unidentified bark	paratype	new species
4	*Chlorociboria daliensis*	HKAS 145844	China, Yunnan Province, Laojun Mountain	24 July 2022	on the decayed unknown wood	-	new collection
5	*Chlorociboria poutoensis*	HKAS 145841	China, Yunnan Province, Xishuangbanna, Gelanghe	9 October 2022	on the decayed unidentified wood	-	new record
6	*Dicephalospora irregularis*	HKAS 145832	China, Yunnan Province, Xishuangbanna	1 September 2022	on the decayed unidentified twigs	-	new species
7	*Dicephalospora rufocornea*	MFLU ***	1Ban Pha Deng, T.Papae, MaeTaeng, Chiang Mai, Thailand	18 August 2023	on the decayed unidentified twigs	-	new collection
8	*Dicephalospora tengyueica*	HKAS 145821	China, Yunnan Province, Tengchong City	18 August 2022	on the decayed unknown wood	-	new collection
9	*Dicephalospora albolutea*	HKAS 145819	China, Yunnan Province, Tengchong City	18 August 2022	on the decayed unknown leaf	-	new collection
10	*Hymenoscyphus microserotinus*	HKAS 145833	China, Yunnan Province, Cang Mountain	25 July 2022	on decayed unidentified leaf	-	new record
11	*Hymenoscyphus kunmingensis*	HKAS145829	China, Yunnan Province, Panlong District, Kunming City	22 October 2022	on the soil	holotype	new species
12	*Hymenoscyphus kunmingensis*	HKAS145830	China, Yunnan Province, Panlong District, Kunming City	22 October 2022	on the soil	paratype	new species
13	*Phaeohelotium ailaoense*	HKAS 145859	China, Yunnan Province, Ailao Mountain	24 August 2022	on the decayed unidentified wood	holotype	new species
14	*Phaeohelotium ailaoense*	HKAS 145860	China, Yunnan Province, Ailao Mountain	24 August 2022	on the decayed unidentified wood	paratype	new species
15	*Erioscyphella xizangensis*	HKAS 144369	China, Yadong County, Xigaze City, Tibet Autonomous Region	2 July 2022	on the decayed unidentified twig	holotype	new species
16	*Erioscyphella xizangensis*	HKAS 144370	China, Yadong County, Xigaze City, Tibet Autonomous Region	2 July 2022	on the decayed unidentified twig	paratype	new species
17	*Proliferodiscus foliicola*	HKAS 145864	China, Yunnan Province, Ailao Mountain	23 August 2022	on the decayed unidentified leaf	holotype	new species

Table 2.2 (continued)

No.	Species name	Voucher No.	Collection site	Date	Substrate	Type status	Notes
18	*Proliferodiscus foliicola*	HKAS 145863	China, Yunnan Province, Ailao Mountain	23 August 2022	on the decayed unidentified leaf	paratype	new species
19	*Bloxamia elegans*	HKAS 145764	China, Yunnan Province, Xishan District	11 November 2022	on the decayed unidentified twig	-	new record
20	*Bloxamia discedens*	HKAS 145785	China, Yunnan Province, Heilongtan	30 July 2022	on the decayed unidentified twig	-	new record
21	*Bloxamia elongata*	HKAS 145773	China, Yunnan Province, Xishuangbanna	1 September 2022,	on the decayed unidentified twig	-	new record
22	*Bloxamia leucophthalma*	HKAS 145855	China, Yunnan Province, Xishuangbanna	6 September 2022	on the decayed unidentified twig	-	new record
23	*Calycina claroflava*	HKAS 145813	China, Yunnan Province, Changchong Mountain	15 August 2022	on the decayed unidentified twig	-	new record
24	*Calycina eucalypticola*	HKAS 145857	China, Yunnan Province, Tengchong City	20 August 2022	on the decayed unidentified twig	-	new record
25	*Calycina citrina*	HKAS 145777	China, Yunnan Province, Ailao Mountain	26 August 2022	on the decayed unidentified twig	-	new record
26	*Calycina shangrilana*	HKAS 145791	China, Yunnan Province, Laojun Mountain	22 July 2022	on the decayed unidentified twig	-	new record
27	*Calycellina populina*	HKAS 145766	China, Yunnan Province, Kunming City, Panlong District	22 October 2022	on the decayed unidentified leaf	-	new record
28	*Nagrajchalara morganjonesii*	HKAS 145793	China, Yunnan Province, Tengchong City	20 August 2022	on the decayed unidentified leaf	-	new record
29	*Nagrajchalara laojunshanensis*	HKAS 145783	China, Yunnan Province, Laojun Mountain	17 August 2022	on the decayed unidentified leaf	holotype	new species
30	*Nagrajchalara laojunshanensis*	HKAS 145784	China, Yunnan Province, Laojun Mountain	17 August 2022	on the decayed unidentified leaf	paratype	new species
31	*Nagrajchalara guangcaii*	HKAS 145827	China, Yunnan Province, Tengchong City	18 Auguet 2022	on the decayed unidentified leaf	-	new record
32	*Nagrajchalara nawawii*	HKAS 145779	China, Yunnan Province, Ailao Mountain	25 August 2022	on the decayed unidentified leaf	-	new record
33	*Nagrajchalara ailaoensis*	HKAS 145809	China, Yunnan Province, Ailao Mountain	23 August 2022	on the decayed unidentified leaf	holotype	new species
34	*Nagrajchalara ailaoensis*	HKAS 145861	China, Yunnan Province, Ailao Mountain	23 August 2022	on the decayed unidentified leaf	paratype	new species
35	*Nagrajchalara unicolor*	HKAS 145775	China, Yunnan Province, Xishuangbanna	5 September 2022	on the decayed unidentified twig	-	new record
36	*Rodwayella xishuangbannaensis*	HKAS 145767	China, Yunnan Province, Xishuangbanna	5 September 2022	on the decayed unidentified twig	holotype	new species
37	*Rodwayella xishuangbannaensis*	HKAS 145768	China, Yunnan Province, Xishuangbanna	5 September 2022	on the decayed unidentified twig	paratype	new species
38	*Rodwayella lignicola*	HKAS 145811	China, Yunnan Province, Xishuangbanna	5 September 2022	on the decayed unidentified wood	holotype	new species
39	*Rodwayella lignicola*	HKAS 145812	China, Yunnan Province, Xishuangbanna	5 September 2022	on the decayed unidentified wood	paratype	new species

CHAPTER 3

MONOGRAPH ON HELOTIALES, WITH FRESH UPDATES FROM FRESH COLLECTIONS

3.1 Introduction to The Morphology and Molecular Characteristics of Helotiales

Helotiales exhibits remarkable morphological heterogeneity across both sexual and asexual morphs (Karunarathna et al., 2020; Luo et al., 2025). In their sexual states, species typically form small apothecia that are cupulate or discoid, generally less than 2 mm in diameter. These fruiting bodies may be sessile or short-stipitate and display a wide spectrum of colors ranging from pale yellow and orange to deep brown and even greenish tones. The hymenium is exposed, bearing unitunicate asci with an apical pore surrounded by an amyloid ring (Johnston & Baschien, 2020; Hosoya, 2021; Baral et al., 2024). However, not all members of the order fit this conventional morphology (Karunarathna et al., 2020; Hosoya, 2021). Some taxa produce closed or semi-closed fruiting bodies, while others are more frequently recognized through their asexual morphs. Well-known pathogenic genera such as *Sclerotinia*, *Botrytis*, and *Pezicula* rarely produce apothecia under natural conditions, instead being identified by their characteristic conidial states (Jarvis, 1977; Chen, 2016). Additional diversity is expressed in phialophora-like morphs (*Cadophora*), chalara-like taxa, and aquatic hyphomycetes with multi-branched conidia (Johnston et al., 2019; Wu & Diao, 2023). These variations highlight the limitations of morphology alone in defining generic and familial boundaries within Helotiales.

The molecular approaches to Helotiales and Leotiomycetes have evolved from early single-gene rDNA phylogenies (e.g., SSU, LSU) to multi-locus analyses incorporating protein-coding genes (e.g., *RPB1*, *RPB2*, *TEF1-α*), and more recently to phylogenomic frameworks using thousands of single-copy orthologs (Johnston et al., 2019). This progression has greatly improved phylogenetic resolution and reshaped higher-level classification within the class. In particular, multi-locus datasets

combining ITS, LSU, *RPB2*, *TEF1-α*, and *β-tubulin* have provided higher phylogenetic resolution and revealed hidden diversity (Pärtel et al., 2017; Ekanayaka et al., 2019; Quijada et al., 2020; Haelewaters et al., 2021). These markers have clarified relationships among morphologically similar genera, uncovered cryptic lineages, and identified polyphyly in several groups of aquatic hyphomycetes and root-associated taxa (Pärtel et al., 2017; Fehrer et al., 2019; Franco-Duarte et al., 2022). In the present study, 40 fresh collections from southwestern China and northern Thailand were incorporated into multi-gene analyses, which resolved their placement within well-supported lineages and facilitated the recognition of new taxa.

Overall, Helotiales represents a taxonomically challenging but biologically diverse order (Hosoya, 2021; Rissi et al., 2024; Johnston et al., 2019). The integration of fresh morphological data with molecular phylogenetics not only resolves ambiguities at the genus and family levels but also contributes to the discovery of novel taxa. This polyphasic framework, combining field collections, microscopic examination, and DNA-based analyses, provides a solid foundation for updating the taxonomy of Helotiales and understanding their ecological roles in forest ecosystems.

3.2 Results

Outline of the families and genera of Helotiales.

We follow Hyde et al. (2024) for the outline of Helotiales and Helotiale*s* genera *incertae sedis*. Use an asterisk "*" to indicate references that could not be found.

Ascomycota Nannf.

Pezizomycotina O.E. Erikss. & Winka, Myconet 1(1): 9 (1997)

Leotiomycetes O.E. Erikss. & Winka, Myconet 1(1): 7 (1997)

Helotiales Nannf. ex Korf & Lizoň

Amicodiscaceae Ekanayaka & K.D. Hyde

Amicodisca Svrcek

Amorphothecaceae Parbery

Amorphotheca Parbery

Arachnopezizaceae Hosoya, J.G. Han & Baral

Arachnopeziza Fuckel

Clathrosphaerina Beverw.

Eriopezia (Sacc.) Rehm

Leochalara W.P. Wu

Parachnopeziza Korf

Thamnochortomyces Crous

Cenangiaceae Rehm (= Hemiphacidiaceae Korf)

Cenangiopsis Rehm

Cenangium Fr.

Chlorencoelia J.R. Dixon

Chlorencoelia torta (Schwein.) J.R. Dixon

Crumenulopsis J.W. Groves (= Digitosporium Gremmen)

Crumenulopsis laojunshanensis L. Luo & K.D. Hyde

Didymascella Maire & Sacc.

Encoelia (Fr.) P. Karst.

Fabrella Kirschst.

Heyderia Link

Hymenobolus Durieu & Mont.

Mycosphaerangium Verkley

Neomelanconium Petr.

Rhabdocline Syd. (= *Hartigiella* Syd. & P. Syd.; = Meria Vuill.; = *Rhabdogloeum* Syd.)

Sarcotrochila Höhn. (= *Hemiphacidium* Korf; = *Rhabdogloeopsis* Petr.*Coel)

Trochila Fr.

Velutarina Korf

Chlorociboriaceae Baral & P.R. Johnst.

Brahmaculus P.R. Johnst.

Chlorociboria Seaver ex C.S. Ramamurthi, Korf & L.R. Batra (= Dothiorina Höhn.)

Dermateaceae Fr.

Ascluella DiCosmo, Nag Raj & W.B. Kendr.

Coleophoma Höhn. (= *Parafabraea* Chen Chen, Verkley & Crous; = *Xenodomus* Petr.)

Corniculariella P. Karst.

Davidhawksworthia Crous

Dermea Fr.

Gelatinoamylaria Prasher & R. Sharma

Hysteropezizella Hohn

Hysterostegiella Höhn.

Larissia Raitv.

Neodermea W.J. Li, D.J. Bhat & K.D. Hyde

Neofabraea H.S. Jacks.

Neogloeosporidina W.J. Li, Camporesi & K.D. Hyde

Pezicula Tul. & C. Tul.

Pezolepis Syd.

Pseudofabraea Chen Chen, Verkley & Crous

Rhizodermea Verkley & J.D. Zijlstra

Schizothyrioma Höhn.

Sorokinella J. Frohl. & K.D. Hyde

Verkleyomyces Y. Marín & Crous

Discinellaceae Ekanayaka & K.D. Hyde

Cladochasiella Marvanová

Discinella Boud.

Fontanospora Dyko

Gyoerffyella Kol

Lemonniera De Wild.

Margaritispora Ingold (= *Goniopila* Marvanová & Descals)

Naevala B. Hein

Pezoloma Clem.

Pseudopezicula Korf

Tetrachaetum Ingold

Varicosporium W. Kegel

Drepanopezizaceae Baral

Blumeriella Arx (= *Microgloeum* Petr.; = *Phloeosporella* Höhn.)

Diplocarpon F.A. Wolf (fide Johnston et al. 2014: = *Bostrichonema* Ces.; = *Entomosporium* Lév.;

Drepanopeziza (Kleb.) Höhn. (= *Gloeosporium* Desm. & Mont.)

Felisbertia Viégas

Filosporella Nawawi

Leptotrochila P. Karst

Pseudopeziza Fuckel

Spilopodia Boud

Spilopodiella E. Müll.

Thedgonia B. Sutton

Erysiphaceae Tul. & C. Tul.

Arthrocladiella Vassilkov

Blumeria Golovin ex Speer

Brasiliomyces Viégas

Bulbomicroidium Marm., Siahaan, S. Takam. & U. Braun

Caespitotheca S. Takam. & U. Braun

Cystotheca Berk. & M.A. Curtis

Erysiphe R. Hedw. ex DC. (= *Typhulochaeta* Ito & Hara)

Golovinomyces (U. Braun) V.P. Heluta (= *Euoidium* Y.S. Paul & J.N. Kapoor)

Leveillula G. Arnaud

Microidium (To-anun & S. Takam.) To-anun & S. Takam.

Neoerysiphe U. Braun

Parauncinula S. Takam. & U. Braun

Phyllactinia Lév.

Pleochaeta Sacc. & Speg.

Podosphaera Kunze

Salmonomyces Chidd.

Sawadaea Miyabe

Takamatsuella U. Braun & A.N. Shi

Godroniaceae Baral

Ascocalyx Naumov

Godronia Moug. & Lév.

Gremmeniella M. Morelet (= *Brunchorstia* Erikss.)

Grovesiella M. Morelet

Hamatocanthoscyphaceae Ekanayaka & K.D. Hyde

Ciliolarina Svrček

Constrictochalara W.P. Wu & Y.Z. Diao

Curviclavula G. Delgado, F.A. Fernández & A.N. Mill.

Cylindrochalara W.P. Wu & Y.Z. Diao

Hamatocanthoscypha Svrček

Hyalodendriella Crous

Infundichalara Réblová & W. Gams

Psilachnum Höhn.

Stipitochalara W.P. Wu & Y.Z. Diao

Xenochalara M.J. Wingf. & Crous

Xenopolyscytalum Crous

Helotiaceae Rehm [as 'Helotieae']

Dicephalospora Spooner

Dicephalospora irregularis Lestari, Pasouvang & K.D. Hyde

Dicephalospora rufocornea (Berk. & Broome) Spooner

Dicephalospora tengyueica L. Luo & K.D. Hyde

Dicephalospora albolutea H.D. Zheng & W.Y. Zhuang

Hymenoscyphus Gray

Hymenoscyphus microserotinus (W.Y. Zhuang) W.Y. Zhuang

Hymenoscyphus kunmingensis L. Luo & K.D. Hyde

Phaeohelotium Kanouse

Phaeohelotium ailaoense L. Luo & K.D. Hyde

Hyaloscyphaceae Nannf.

Aeruginoscyphus Dougoud,

Ambrodiscus S.E. Carp.

Arbusculina Marvanová & Descals

Dematioscypha Svrček

Dimorphotricha Spooner (*)

Echinula Graddon

Eupezizella Höhn.

Graddonidiscus Raitv. & R. Galán

Grahamiella Spooner

Hegermila Raitv.

Hyalopeziza Fuckel

Hyaloscypha Boud.

Incrupila Raitv.

Isthmosporiella Crous

Mimicoscypha T. Kosonen, Huhtinen & K. Hansen

Polaroscyphus Huhtinen *

Proprioscypha Spooner

Pseudoclathrosphaerina Voglmayr

Psilocistella Svrček

Resinoscypha T. Kosonen, Huhtinen & K. Hansen

Unguicularia Hohn.

Unguiculariella K.S. Thind & R. Sharma

Unguiculella Höhn. (= *Globulina* Speg.*Doth)

Lachnaceae

Erioscyphella Kirschst.

Erioscyphella xizangensis L. Luo & K.D. Hyde

Proliferodiscus J.H. Haines & Dumont

Proliferodiscus foliicola L. Luo & K.D. Hyde

Mitrulaceae Rchb.

Mitrula Fr.

Myxotrichaceae Locq. ex Currah

Byssoascus Arx

Mycosylva M.C. Tulloch

Myxotrichum Kunze

Oidiodendron Robak

Skoua A.A. Wynns

Neolauriomycetaceae Crous

Exochalara W. Gams & Hol.-Jech.

Lareunionomyces Crous & M.J. Wingf.

Minichalara W.P. Wu & Y.Z. Diao

Neolauriomyces Crous

Patellariopsidaceae Karun., Camporesi & K.D. Hyde

Patellariopsis Dennis

Velutinus N. Wu & Jian K. Liu

Pezizellaceae Velen.

Bloxamia Berk. & Broome

Bloxamia elegans W.P. Wu & Y.Z. Diao

Bloxamia discedens W.P. Wu & Y.Z. Diao

Bloxamia elongata W.P. Wu & Y.Z. Diao

Bloxamia leucophthalma (Lév.) Höhn.

Calycina Nees ex Gray

Calycina claroflava (Grev.) Kuntze [as 'clariflava']

Calycina eucalypticola (Crous) W.P. Wu,

Calycina citrina (Hedw.) Gray

Calycina shangrilana (W.Y. Zhuang & H.D. Zheng) J.K. Mitch.

Calycellina Höhn.

Calycellina populina (Fuckel) Höhn.

Nagrajchalara W.P. Wu & Y.Z. Diao

Nagrajchalara morganjonesii W.P. Wu & Y.Z. Diao

Nagrajchalara laojunshanensis L. Luo & K.D

Nagrajchalara guangcaii W.P. Wu & Y.Z. Diao

Nagrajchalara nawawii W.P. Wu & Y.Z. Diao

Nagrajchalara ailaoensis. L. Luo & K.D

Nagrajchalara unicolor (S. Hughes & Nag Raj) W.P. Wu & Y.Z. Diao

Rodwayella Spooner, in Dennis

Rodwayella xishuangbannaensis L. Luo & K.D. Hyde

Rodwayella lignicola L. Luo & K.D. Hyde

Tricladiaceae P.R. Johnst. & Baschien

Cudoniella Sacc.

Geniculospora Sv. Nilsson ex Marvanová & Sv. Nilsson

Graddonia Dennis

Halenospora E.B.G. Jones

Mycofalcella Marvanová, Om-Kalth. & J. Webster

Spirosphaera Beverw.

Tricladium Ingold

Vandijckellaceae Sand.-Den.

Basingstokeomyces Crous & Denman

Cryonesomyces Unter. & Réblová

Vandijckella Sand.-Den.

Vibrisseaceae Korf

Cheirospora Moug. & Fr.

Chlorovibrissea L.M. Kohn

Leucovibrissea (A. Sánchez) Korf

Srinivasanomyces S. Rana & S.K. Singh

Vibrissea Fr. (= *Pocillum* De Not.)

Helotiales genera *incertae sedis*

Acidea Hujslova & M. Kolarık

Algincola Velen.

Aphanodesmium Réblová & Hern.-Restr.

Aquadiscula Shearer & J.L. Crane

Aquapoterium Raja & Shearer

Arboricolonus S. Bien & Damm

Ascoclavulina Otani *

Asterocalycella Höhn. ex R. Kirschne

Banksiamyces G. Beaton

Belonioscyphella Höhn.

Benguetia Syd. & P. Syd.

Bioscypha Syd.

Blastosporium Z.F. Yu & H. Zheng

Brachyalara Réblová & W. Gams

Brefeldochium Verkley

Bulgariella P. Karst.

Bulgariopsis Henn.

Caesiodiscus Holien & Suija

Cairneyella D.J. Midgley & N. Tran-Dinh

Capillipes R. Sant. *

Capricola Velen. *

Cashiella Petr.

Cejpia Velen.

Cenangiumella J. Fröhl. & K.D. Hyde

Chloroepilichen Etayo *

Chlorospleniella P. Karst.

Chondroderris Maire *

Ciliella Sacc. & P. Syd.

Cistella Quél.

Clathrosporium Nawawi & Kuthub.

Coleosperma Ingold

Colipila Baral & Guy García

Comesia Sacc. *

Cornuntum Velen. *

Coronellaria (P. Karst.) P. Karst.

Criserosphaeria Speg.

Crocicreas Fr.

Crucellisporium M.L. Farr

Crumenella P. Karst. (= *Obscurodiscus* Raitv., nom. inval.) *

Cryptohymenium Samuels & L.M. Kohn

Cryptopezia Höhn.

Dactylaria Sacc.

Dawsicola Döbbeler

Dermateopsis Nannf. *

Didonia Velen.

Discomycella Höhn.

Encoeliopsis Nannf.

Episclerotium L.M. Kohn *

Erikssonopsis M. Morelet *

Gloeopeziza Zukal

Godroniopsis Diehl & E.K. Cash

Gorgoniceps (P. Karst.) P. Karst.

Grimmicola Döbbeler & Hertel

Grovesia Dennis

Helicocentralis Sri-indr., Chuaseehar., Boonyuen, K. Yamag., Suetrong & C.K.M. Tsui

Hemiglossum Pat.

Hysteronaevia Nannf.

Involucroscypha Raitv.

Jacobsonia Boedijn *

Korfia J. Reid & Cain

Lasseria Dennis *

Lemalis Fr.

Leohumicola N.L. Nickersen, Hambleton & Seifert

Leptodophora Koukol & Maciá-Vicente

Libartania Nag Raj

Livia Velen. *

Masseea Sacc.

Melanopeziza Velen. *

Merodontis Clem. *

Microdiscus Sacc. *

Miricatena Punith. & Spooner

Mitrulinia Spooner

Monochaetiellopsis B. Sutton & DiCosmo (= *Hypnotheca* Tommerup, fide Johnston et al. 2014)

Natara Kovalova

Neobelonopsis Itagaki & Hosoya

Neonematogonum Crous & Akulov

Neosatchmopsis Crous, M.A. Delgado & R.K. Schumach.

Obconicum Velen. *

Orbiliopsis (Sacc. & D. Sacc.) Syd. & P. Syd.

Otwaya G.W. Beaton

Pachydisca Boud.

Parencoelia Petr.

Patinellaria H. Karst.

Peltigeromyces Möller.

Pezomela Syd.

Phaeofabraea Rehm

Podophacidium Niessl

Polyphilus D.G. Knapp, Ashrafi, W. Maier & Kovács

Populomyces Hern.-Restr.

Potridiscus Döbbeler & Triebel

Pseudolachnum Velen.

Pseudopeltis L. Holm & K. Holm

Pseudotryblidium Rehm

Psilophana Syd.

Pteromyces E. Bommer, M. Rousseau & Sacc.

Pubigera Baral, Gminder & Svrček

Radotinea Velen.

Rhizocladosporium Crous & U. Braun

Rhizothyrium Naumov

Rommelaarsia Baral & Haelew.

Sambucina Velen. *

Sarcomyces Massee

Sclerocrana Samuels & L.M. Kohn

Scutulopsis Velen.

Scytalidium Pesante

Sorokina Sacc. *

Stamnaria Fuckel

Stilbopeziza Speg. *

Tetracladium De Wild.

Themisia Velen. *

Tovariella Syd.

Trichohelotium Killerm. *

Triposporium Corda. *

Urceolella Boud.

Waltonia Saho, Trans.

Woodiella Sacc. & P. Syd.

Xeromedulla Korf & W.Y. Zhuang

Zugazaea Korf, Iturr. & Lizoň

Order Helotiales Nannf. ex Korf & Lizoň Figure 3.1

Index Fungorum number: IF90476; Facesoffungi number: FoF13859.

Type Family – Helotiaceae Rehm [as 'Helotieae']

Helotiales was introduced by Nannfeldt (1932) to accommodate taxa within the class Leotiomycetes, phylum Ascomycota. The order was later validated by Korf and Lizon (2000). Helotiales is currently the largest order in Leotiomycetes, comprising more than 6000 species distributed in over 50 families and several hundred genera (Hosoya, 2021; Rissi et al., 2024). Members of this order are cosmopolitan, occurring in temperate, tropical and boreal regions worldwide. They display diverse ecological strategies including saprobic, pathogenic, endophytic, mycorrhizal, and aquatic lifestyles, and thus play important roles in decomposition, nutrient cycling, plant disease, and symbiotic interactions in forest and agricultural ecosystems.

The sexual morph is typically characterised by apothecial, cupulate to discoid ascomata that are sessile or short-stipitate, with margins sometimes covered in hairs or hyphal outgrowths. The ectal excipulum is composed of *textura angularis*, *prismatica* or *intricata*, while the medullary excipulum consists of loosely arranged, hyaline hyphae. Paraphyses are generally filiform, cylindrical, septate and unbranched, often exceeding the asci. Asci are unitunicate, inoperculate, mostly 8-spored, with an apical pore surrounded by an amyloid ring, and frequently arise from croziers. Ascospores are hyaline, smooth, ellipsoid to fusoid, aseptate or occasionally septate, and variable in size. Some taxa produce closed or semi-closed fruiting bodies, while others are more frequently recognised through their asexual morphs.

The asexual morphs are diverse, including phialophora-like (Cadophora), chalara-like taxa, and aquatic hyphomycetes with multibranched or tetraradiate conidia, as well as root-associated fungi such as Oidiodendron. Molecular data are available for a wide range of loci (ITS, LSU, SSU, *RPB1*, *RPB2*, *TEF1-α*, *β-tubulin*), and recent phylogenomic analyses using thousands of single-copy orthologs (Johnston et al., 2019) have substantially improved phylogenetic resolution. These studies have revealed cryptic lineages, clarified relationships among morphologically similar genera, and demonstrated polyphyly in several aquatic and root-associated groups, while supporting the monophyly of Helotiales within Leotiomycetes.

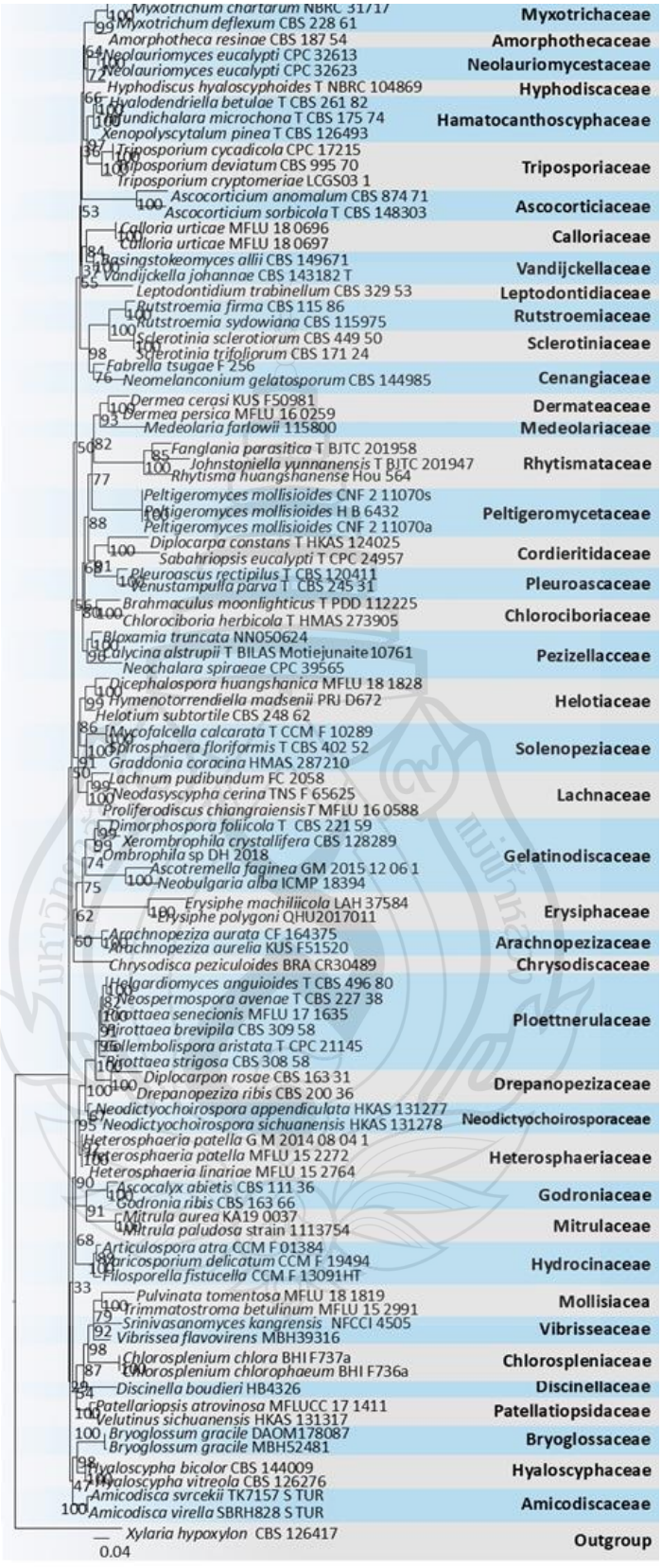


Figure 3.1 Maximum likelihood tree based on the combined ITS and LSU dataset of Helotiales

Figure 3.1 Bootstrap support values (MLBP ≥ 70%) and Bayesian posterior probabilities (BPP ≥ 0.90) are shown at nodes as MLBP/BPP. Values below these thresholds are indicated with a hyphen ("–"). Type strains are shown in bold.

Amicodiscaceae Ekanayaka & K.D. Hyde, in Ekanayaka, Hyde, Gentekaki, McKenzie, Zhao, Bulgakov & Camporesi, Mycosphere 10(1): 376 (2019)

Index Fungorum number: IF556288; Facesoffungi number: FoF05895.

Type genus: *Amicodisca*.

Amicodiscaceae was introduced by Ekanayaka et al., (2019) to accommodate taxa within the order Helotiales (Leotiomycetes, Ascomycota). The family currently comprises of a single genus, *Amicodisca*, and is mainly known from temperate regions of Asia and Europe (Ekanayaka et al., 2019). Species in *Amicodiscaceae* are saprobic, occurring on plant material in terrestrial habitats. They contribute to the decomposition of organic matter and play a role in nutrient cycling within forest ecosystems (Ekanayaka et al., 2019; Hyde et al., 2020). No species of known economic importance have been reported to date. The sexual morph is characterised by apothecial, cupulate ascomata that are sessile or substipitate, with margins typically covered in hairs. The ectal excipulum consists of *textura angularis* or *textura prismatica* cells, while the medullary excipulum comprises loosely arranged hyphae. Paraphyses are filiform, cylindrical, septate and unbranched. Asci are 8-spored, amyloid, and may arise from croziers. Ascospores are ellipsoid to fusoid, aseptate, guttulate, and often exhibit a distinct lemon-yellow pigmentation (Ekanayaka et al., 2019; Hyde et al., 2020). The asexual morph remains unknown. Molecular data are available for several loci including LSU, SSU, ITS, *TEF*1-α and *RPB*2, which support the monophyly of the family and its placement within Helotiales (Figure 3.2).

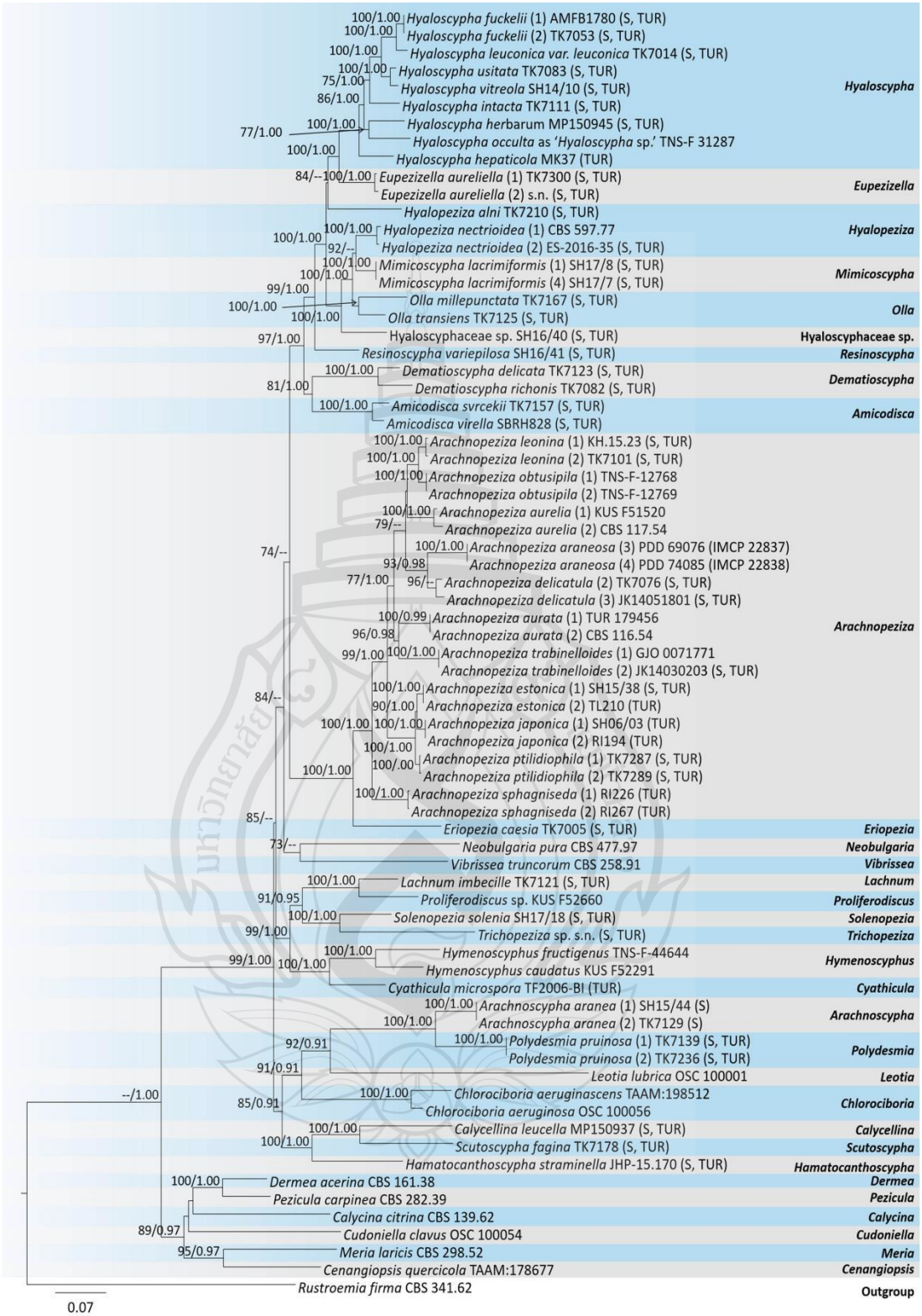


Figure 3.2 Maximum likelihood tree based on the combined ITS, LSU, mtSSU, *TEF*-1α, *RPB*1 and *RPB*2 dataset of *Amicodiscaceae*

Figure 3.2 Bootstrap support values (MLBP ≥ 70%) and Bayesian posterior probabilities (BPP ≥ 0.90) are shown at nodes as MLBP/BPP. Values below these thresholds are indicated with a hyphen ("–"). Type strains are shown in bold.

Amicodisca Svrček, Česká Mykol. 41(1): 16 (1987)

Index Fungorum number: IF25409; Facesoffungi number: FoF 18200, 3 morphological species (Species Fungorum, 2025), 2 species with molecular data.

Saprobic on decaying plant material. Sexual morph: Huhtinen (1994) and Han et al. (2011). Asexual morph: Unknown.

Type species – *Amicodisca virella* (P. Karst.) Huhtinen

Notes – *Amicodisca* was introduced by Svrček (1987) with *A. brdensis* (≡ *Dasyscyphus brdensis* Velen.) as the type species. Members of *Amicodisca* are characterized by sessile apothecia covered with yellowish to olivaceous hairs, an ectal excipulum composed of *textura angularis* to *textura prismatica*, asci with fimbriate dehiscence, and ascospores containing lemon-yellow pigment that dissolves in NH_4OH or KOH (Han et al., 2011).

Huhtinen (1994) demonstrated that *A. brdensis* is conspecific with *Peziza virella* P. Karst., an earlier name based on Finnish material, and accordingly made the new combination *A. virella*. Phylogenetically, *Amicodisca* belongs in Hyaloscyphaceae, although its exact relationships remain uncertain due to limited molecular data. In our phylogenetic analysis (Figure 3.2), *Amicodisca* forms a well-supported clade distinct from *Hyaloscyphaceae*, confirming its familial placement in *Amicodiscaceae*.

The lectotype of *A. virella* was designated by Huhtinen (1994) from material collected by P.A. Karsten in June 1867 on decorticated wood of *Alnus* in Mustiala, Finland, preserved in H (FFE 627). Additional original collections by Karsten (nos. 3469, 3470, 1866) from the same locality are also in H. Svrček's neotype of *A. brdensis* (PRM 842732, on *Salix cinerea*, Trebon, Czech Republic, 1980) is no longer considered the valid type because of the priority of *Peziza. virella* (the previous name) and its lectotype.

Amicodisca virella (P. Karst.) Huhtinen, Karstenia 34(1): 5 (1994) Figure 3.3

Index Fungorum number: IF362258; Facesoffungi number: FoF 18201

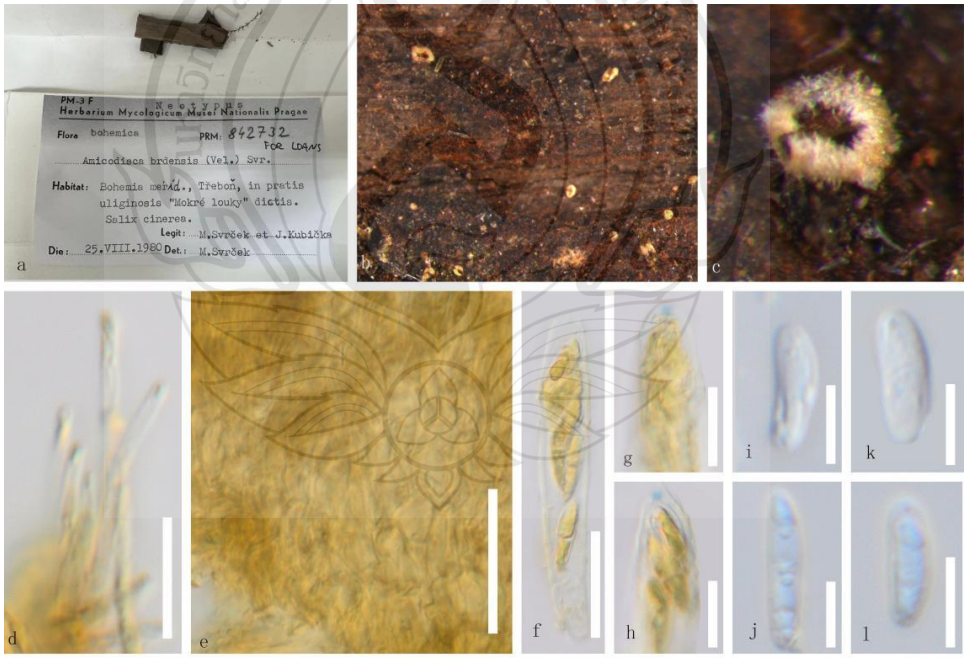
Basionym: *Peziza virella* P. Karst.

Description – Saprobic on the trunk of *Salix cinerea* (grey willow). Sexual morph: *Apothecia* sessile, sparsely clustered, disc pallid olivaceous, sunken to cupulate, cream to greyish yellow; margin with thin-walled, cylindric hairs. *Ectal excipulum* of thin-walled, hyaline to yellowish, gelatinized *textura angularis* to *textura globulosa*. *Asci* clavate to cylindric-clavate, with a non-amyloid (J–) apical apparatus. Paraphyses not observed. *Ascospores* ellipsoid, aseptate, hyaline, multiguttulate. Asexual morph: Unknown.

Material examined – Czech Republic, South Bohemia, Trebon in the so-called "Mokte Louky" meadows, August 1980, M. Svreek & J.KubiCka. (PRM:842732), neotype.

Distribution, ecological and economical importance

Saprobic on decaying wood and bark, contributing to lignocellulose decomposition in temperate forest ecosystems. Known from Europe (Finland, Czech Republic), East Asia (Japan, Korea), and possibly other temperate regions. Substrates include decorticated hardwoods and chestnut burs (*Castanea crenata*). No economic used are known; and the species has not been reported as edible or pathogenic.



Note a Details of herbarium material. b, c Fruiting body growing on host. d Marginal hairs. e Ectal excipulum. f Asci. g-h Asci apices in Melzer's reagent. i-l Ascospores. Scale bars: d = 10µm, e, f = 20µm; g, h = 10µm, i–l = 5µm.

Figure 3.3 *Amicodisca virella* (PRM:842732, neotype)

Amorphothecaceae Parbery, Aust. J. Bot. 17: 345 (1969)

Index Fungorum number: IF80449; Facesoffungi number: FoF 05857

Type genus: *Amorphotheca*

Amorphothecaceae was established by Parbery (1969) to accommodate the monospcific genus *Amorphotheca*, with *A. resinae* designated as the type species. The family was originally classified within Eurotiales based on ascocarp morphology, but later morphological re-evaluations and limited molecular evidence led to its provisional placement in Helotiales (Leotiomycetes, Ascomycota). Nevertheless, its precise phylogenetic position remains uncertain (Seifert et al., 2007).

In the present study, a phylogenetic tree based on ITS sequence data (Figure 3.4) was constructed to evaluate the placement of the family. The results revealed that *Amorphotheca resinae* isolates (ATCC200942, CBS406.68, KUC3009) form a distinct, well-supported monophyletic clade (MLBP = 77%, BPP = 1.00), which is clearly separated from *Oidiodendron* and *Myxotrichum* lineages. This supports the recognition of Amorphothecaceae as an independent lineage within Helotiales.

Members of Amorphothecaceae are characterized by irregularly spherical to subspherical, mostly immersed ascomata with a tough, melanized peridial wall that often incorporates adjacent hyphal tips. Asci are unitunicate, evanescent, broadly pyriform to globose, and develop from croziers. Each ascus contains eight unicellular, hyaline, biguttulate ascospores that become light to dark brown and thick-walled at maturity. As the ascus walls dissolve, the ascomatal cavity becomes filled with free spores.

The asexual morph of *A. resinae* has been described under several names, including *Cladosporium resinae* and *Hormodendrum resinae*, and is currently accepted as *Hormoconis resinae* (Seifert et al., 2007). It produces lightly pigmented, verrucose conidiophores that bear branched, acropetally developing chains of ameroconidia. The conidial morphology is somewhat variable, occasionally resembling *Cladosporium* or *Septonema*, although the developmental pattern remains consistent.

Ecologically and economically, *A. resinae* is well known for its ability to degrade hydrocarbons, partcularly in aviation fuels, where it contributes to biodeterioration and microbial corrosion of storage systems (Parbery, 1969; Seifert et

al., 2007). It is also common in petroleum-contaminated soils and industrial environments, where it may play a potential role in biodegradation and bioremediation.

Taken together, the morphological, ecological, and ITS phylogenetic evidence indicates that Amorphothecaceae represents a single, monophyletic, and ecologically specialized lineage within Helotiales, distinct from other known hyaloscyphaceous and myxotrichaceous taxa.

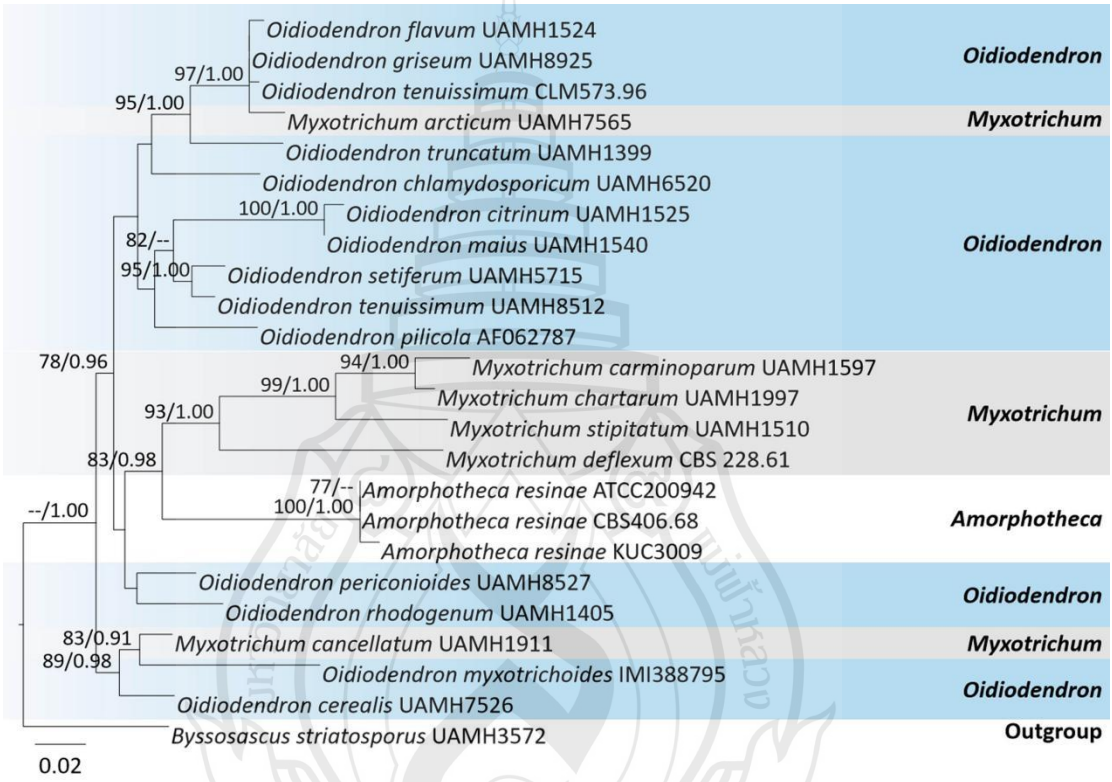


Figure 3.4 Maximum likelihood tree based on the ITS dataset of Amorphothecaceae

Figure 3.4 Bootstrap support values (MLBP ≥ 70%) and Bayesian posterior probabilities (BPP ≥ 0.90) are shown at nodes as MLBP/BPP. Values below these thresholds are indicated with a hyphen ("–"). Type strains are shown in bold.

Amorphotheca Parbery, Aust. J. Bot. 17: 340 (1969)

Index Fungorum number: IF161; Facesoffungi number: FoF 18205, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic and hydrocarbon-degrading, isolated from diverse habitats including soil, fuel-contaminated substrates, air, and wood. Sexual morph: see Parbery (1969). Asexual morph: see Seifert et al. (2007).

Type species – *Amorphotheca resinae* Parbery

Notes – *Amorphotheca* was established by Parbery (1969) to accommodate *A. resinae*, a hydrocarbon-degrading fungus first isolated from aviation fuel–contaminated soil near Richmond RAAF base, New South Wales, Australia. The sexual morph characterizes by cleistothecial ascomata, small (50–250 µm diam.), black, globose to subglobose, often immersed in the substrate or agar medium; peridium tough, melanized, amorphous, lacking a defined *textura*, sometimes incorporating adjacent hyphal elements. Asci are globose to broadly ellipsoidal, unitunicate, evanescent, and arise from croziers, containing eight unicellular, ellipsoidal to subglobose, biguttulate ascospores (3.5–5 × 2–3 µm), which are initially hyaline, but become light to dark brown and thick-walled at maturity. The asexual morph, *Hormoconis resinae* (≡ *Cladosporium resinae*, ≡ *Hormodendrum resinae*), produces lightly pigmented, verrucose conidiophores, bearing branched, acropetally developing chains of ameroconidia, Conidia are thick-walled, and occasionally 1–2-septate, sometimes resembling ramoconidia (Seifert et al., 2007).

Molecular data available for the LSU and ITS rDNA regions provide limited phylogenetic resolution. Based on the combined morphological and molecular evidence, the genus is currently placed in Helotiales (Leotiomycetes, Ascomycota); however, its precise phylogenetic position remains unresolved due to insufficient sequence data.

Holotype – *Amorphotheca resinae* Parbery, isolated from aviation fuel–contaminated soil near Richmond RAAF base, New South Wales, Australia, on Czapek agar, 9 Oct. 1964, D.G. Parbery (K, IMI 136756, holotype designated by Parbery 1969).

Amorphotheca resinae Parbery, Aust. J. Bot. 17: 340 (1969). Figure 3.5

Index Fungorum number: IF326157; Facesoffungi number: FoF 18206

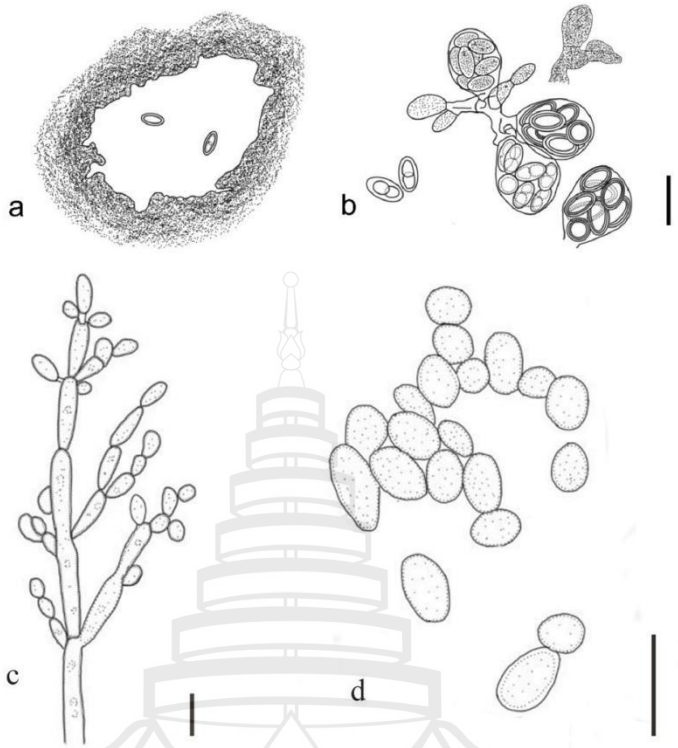
Description – Sexual morph: *Ascomata* cleistothecial, 50–250 µm diam., black, globose, mostly immersed; peridium tough, melanized, amorphous, incorporating

hyphal tips. Asci globose to broadly ellipsoidal, unitunicate, evanescent, from croziers, 8-spored; ascospores ellipsoidal to subglobose, 3.5–5 × 2–3 µm, biguttulate, hyaline when young, becoming brown and thick-walled at maturity. Asexual morph: conidiophores verrucose, branched, producing acropetal chains of thick-walled conidia, sometimes 1–2-septate, ramoconidia-like, pale brown.

Material considered – see Parbery (1969).

Distribution, ecological and economical importance

Commonly known as the "kerosene fungus," *A. resinae* is notorious for contaminating and degrading hydrocarbon-based fuels such as aviation fuel and diesel, producing biomass and acidic byproducts that cause microbial corrosion, clog fuel filters, and deteriorate fuel quality (Shariat et al., 2024). It also occurs naturally in nutrient-poor soils and freshwater environments, which can serve as reservoirs for fuel system contamination (David & Kelley, 1995). Beyond biodeterioration, certain strains produce melanin with antioxidant and metal ion adsorption properties, offering potential applications in biotechnology and materials science (Oh et al., 2021). The species has a cosmopolitan distribution, reported from Africa, the Americas, Europe, Australasia, and even extreme environments such as Antarctica (Rafin & Veignie, 2018; Oh et al., 2021).



Source Redrawn from Parbery (1969)

Note a Sexual morph of ascoma. b Sexual morph of asci and ascospores. c Asexual morph of conidiophores, showing acropetal conidial chains, ramoconidia, and conidia. d Asexual morph of conidia. Scale bar = 10μm.

Figure 3.5 *Amorphotheca resinae*

Arachnopezizaceae Hosoya, J.G. Han & Baral, in Baral, Index Fungorum 225: 1 (2015)

Index Fungorum number: IF551075; Facesoffungi number: FoF 05863

Type genus: *Arachnopeziza*

Arachnopezizaceae was first introduced by Hosoya (2004) and later validly published by Hosoya, J.G. Han & Baral in Baral (2015), with *Arachnopeziza aurata* (Pers.) Fuckel as the type species. Members of the family are characterized by minute, sessile to short-stipitate apothecia that develop on a conspicuous arachnoid subiculum composed of interwoven hyphae. The apothecial surface is usually covered with erect, multiseptate hairs that are smooth to slightly verrucose, thin- to thick-walled, and sometimes encrusted. The ectal excipulum is composed of *textura angularis* to *textura*

prismatica with thick-walled, pigmented cells. Asci are unitunicate, evanescent, cylindrical to clavate, arising from croziers, and contain eight hyaline, fusoid to filiform ascospores, 0–multi-septate, occasionally tapering or apiculate at the ends. Paraphyses are filiform, sometimes apically enlarged and often with refractive vacuolar bodies.

Currently accepted genera in the family include *Arachnopeziza*, *Eriopezia*, *Parachnopeziza*, *Leochalara*, and *Thamnochortomyces*, although the latter two require further phylogenetic confirmation due to limited molecular data (Johnston et al., 2019; Ekanayaka et al., 2019). Species are mainly saprobic on bryophytes, decorticated wood, bark, fallen twigs, and leaf litter, occurring primarily in moist temperate forests of the Northern Hemisphere, with some extending into Southern Hemisphere temperate regions. They contribute to wood and litter decomposition.

Clathrosphaerina Beverw. was traditionally classified in Hyaloscyphaceae based on its hyaline, hairy apothecia and aero-aquatic habitat (Descals & Webster, 1976; Voglmayr, 2001). However, in our phylogenetic analyses based on ITS and LSU sequences, Clathrosphaerina zalewskii formed a strongly supported sister clade (100% MLBP) to Arachnopezizaceae (Figure 3.6). It also shares key morphological features with the family, including multiseptate hairs, a *textura prismatica* ectal excipulum, and unitunicate asci with croziers. These congruent traits suggest that Clathrosphaerina may represent an aquatic derivative lineage of Arachnopezizaceae, though this hypothesis awaits confirmation from multigene datasets.

Our ITS + LSU phylogenetic analysis (Figure 3.6) confirms that Arachnopezizaceae forms a highly supported, single monophyletic lineage within Helotiales, distinct from Hyaloscyphaceae and other morphologically similar families. This result is congruent with previous multigene studies (Johnston et al., 2019; Han et al., 2023), which also recovered Arachnopezizaceae as a cohesive clade with internal sublineages potentially correlated with substrate preference. Although it exhibits certain morphological overlap with Hyaloscyphaceae, particularly in hair and excipular anatomy, Arachnopezizaceae is clearly differentiated by its persistent arachnoid subiculum, thick-walled multiseptate hairs, and ecological specialization on bryophilous and lignicolous substrates (Hosoya, 2004; Baral, 2015).

Taken together, both morphological and molecular data consistently support Arachnopezizaceae as a distinct and monophyletic family within Helotiales, comprising

a coherent group of subiculum-forming, filamentous fungi that bridge the ecological spectrum between terrestrial and aero-aquatic habitats.

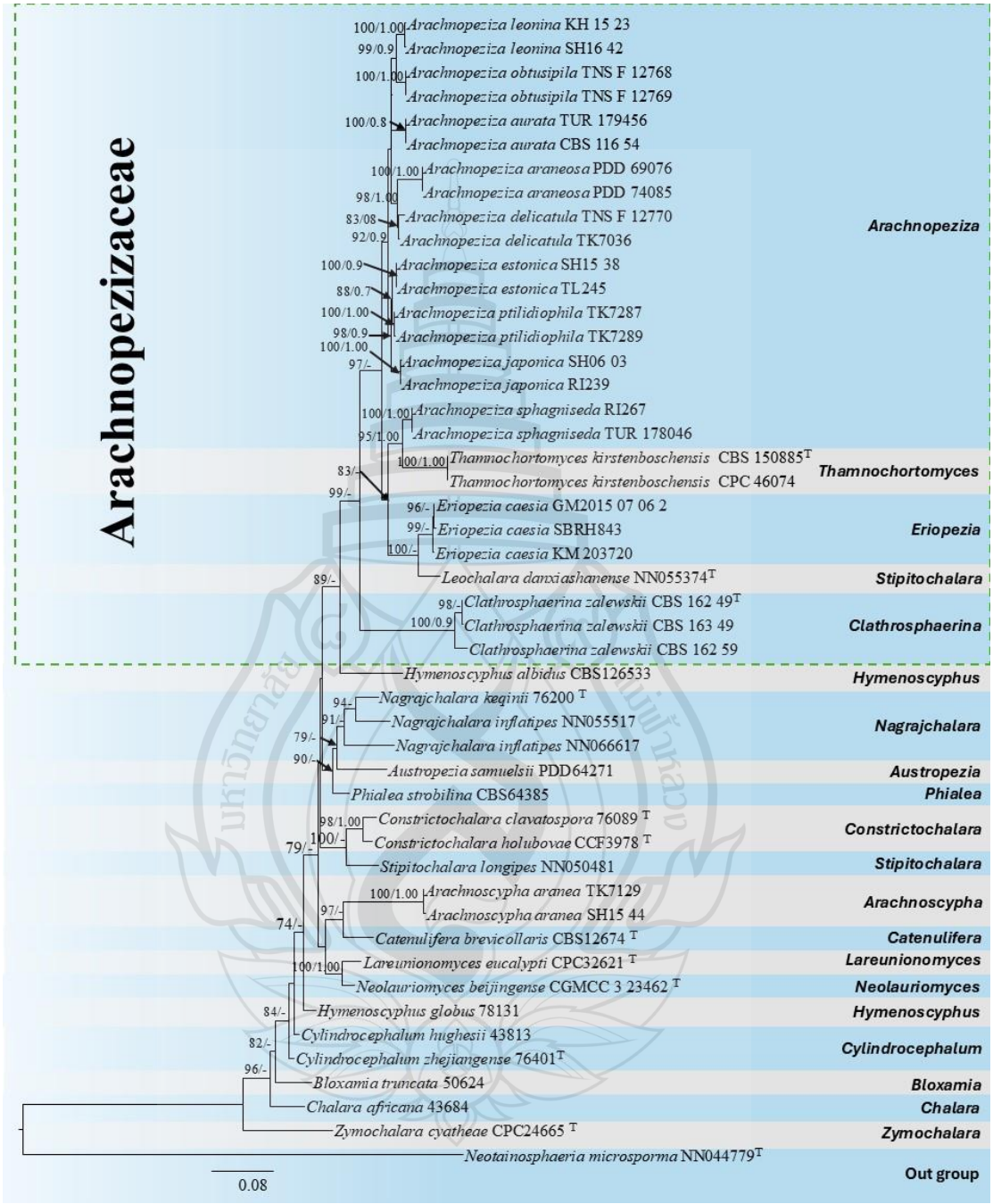


Figure 3.6 Maximum likelihood tree based on the combined ITS and LSU dataset of Arachnopezizaceae

Figure 3.6 Bootstrap support values (MLBP ≥ 70%) and Bayesian posterior probabilities (BPP ≥ 0.90) are shown at nodes as MLBP/BPP. Values below these thresholds are indicated with a hyphen ("–"). Type strains are shown in bold.

Arachnopeziza Fuckel, Jb. nassau. Ver. Naturk. 23-24: 303 (1870) [1869-70]

Index Fungorum number: IF294; Facesoffungi number: FoF18208, 37 morphological species (Species Fungorum, 2025), 14 species with molecular data.

Saprobic on decaying leaves, twigs, and wood. Sexual morph: see Kosonen et al. (2021). Asexual morph: Unknown.

Type species – *Arachnopeziza aurelia* (Pers.) Fuckel(= *Peziza aurata* Pers.).

Notes – Arachnopeziza is characterized by minute, sessile to short-stipitate apothecia developing on a conspicuous, arachnoid subiculum composed of interwoven hyphae. Apothecia are typically hyaline to pale orange and covered with erect, multiseptate hairs, which are thin- to thick-walled and often form marginal fascicles. The ectal excipulum consists of *textura angularis* to *textura prismatica*, composed of somewhat thick-walled, hyaline to pale brown cells. Asci arise from croziers, are unitunicate, evanescent, cylindrical to clavate, and typically contain eight hyaline, multiseptate ascospores, which are fusoid to filiform and often slightly curved. Paraphyses are filiform, sometimes slightly widened at the apex or containing vacuolar bodies.

The genus was established by Fuckel (1870), who designated *A. aurata* as the type species (originally described as *Peziza aurata* by Persoon in 1794). The lectotype of *P. aurata* was designated by Saccardo (1884) based on Persoon's original material, preserved in the Persoon Herbarium (L). Material referable to *A. aurata* has been studied from central and northern Europe, typically on decaying twigs and leaves of broadleaf trees.

Arachnopeziza species are saprobic, occurring on bryophytic or lignicolous substrates such as decaying wood, bark, leaves, or mosses. Several species show strong substrate preferences and can serve as indicators of microhabitat conditions in temperate forest ecosystems.

Arachnopeziza aurelia (Pers.) Fuckel, Jb. nassau. Ver. Naturk. 23-24: 303 (1870) [1869-70] Figure 3.7

Index Fungorum number: IF175992; Facesoffungi number: FoF18209

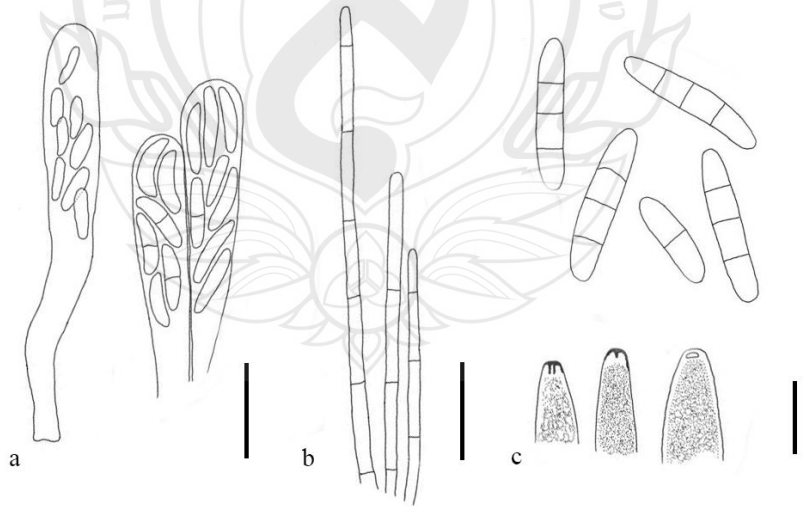
Description – Kosonen et al., (2021)

Material considered – Kosonen et al., (2021)

Distribution, ecological and economical importance

Arachnopeziza species are saprobic fungi that play a key role in decomposing plant-derived organic matter, particularly in forest ecosystems. They colonize substrates such as decaying leaves, twigs, bark, and mosses, and are often associated with bryophytic or lignicolous habitats. Some species also occur in intermittently submerged or moist environments (Morozova et al., 2014).

The genus is cosmopolitan, with a concentration in temperate and boreal regions, and occurrences in subtropical areas. *Arachnopeziza aurata*, the type species, is widespread in Europe and East Asia, including Korea (Han et al., 2014). *Arachnopeziza trabinelloides* has been collected from North America (Quebec, Canada), and other species are known from Russia, Scandinavia, Japan, and the United Kingdom. Their frequent presence on bryophyte-covered substrates reflects their niche specialization and ecological importance.



Source Redrawn from Işık and Türkekul (2018)

Note a Asci with spores. b Hairs. c Spores and partly asci with IKI B. Scale bar: a = 4 mm; b = 15 μm; c = 10 μm.

Figure 3.7 *Arachnopeziza aurelia*

Clathrosphaerina Beverw., Trans. Br. mycol. Soc. 34(3): 289 (1951)

Index Fungorum number: IF7689; Facesoffungi number: FoF 18631, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprophytic on decaying plant substrates in freshwater habitats. Sexual morph: see Descals and Webster (1976). Asexual morph: see van Beverwijk (1951).

Type species – *Clathrosphaerina zalewskii* Beverw.

Notes – *Clathrosphaerina* was introduced by van Beverwijk (1951) with C. zalewskii as the type species, originally described as Clathrosphaera spirifera Zalewski from submerged plant debris in Poland. The genus is easily recognized by its hyaline, septate, branched mycelium forming distinctive spherical conidia (10–35 μm diam.) composed of a dichotomously branched hyphal network, in which the tips anastomose to form polygonal meshes (usually triangular to quadrangular, 1.5–3 μm wide). Each mesh cell may germinate by producing a germ tube, typically from the junction points. The conidial networks float on the water surface, facilitating dispersal in aero-aquatic environments.

The sexual morph was identified by Descals and Webster (1976) as Hyaloscypha zalewskii, producing minute, white, hairy apothecia with cylindrical to clavate, 8-spored asci and hyaline, ellipsoidal, mostly 1-septate ascospores (9–12 × 2.5–3 μm). Paraphyses are filiform and exceed the asci, while the ectal excipulum is composed of *textura prismatica*.

Based on ITS and LSU sequence data, Voglmayr (2001) initially placed C. zalewskii within Hyaloscyphaceae, closely allied to Hyaloscypha. However, our phylogenetic analysis (Figure 3.6) based on combined ITS and LSU sequences reveals that *Clathrosphaerina* zalewskii forms a strongly supported sister clade (MLBP = 100%) to the Arachnopezizaceae, indicating a close evolutionary relationship. Both lineages share key diagnostic features, including minute, hairy apothecia with multiseptate hairs, a *textura prismatica* ectal excipulum, and unitunicate asci with croziers and hyaline, septate ascospores.

These congruent morphological and molecular characteristics suggest that *Clathrosphaerina* represents an aero-aquatic derivative lineage within Arachnopezizaceae. We therefore provisionally transfer *Clathrosphaerina* to

Arachnopezizaceae, pending further confirmation from multigene analyses and ex-type culture sequencing.

The holotype of C. zalewskii is preserved in the Rijksherbarium, Leiden (Herb. L).

Clathrosphaerina zalewskii Beverw., Trans. Br. mycol. Soc. 34(3): 289 (1951) Figure 3.8

Index Fungorum number: IF294947; Facesoffungi number: FoF 18631

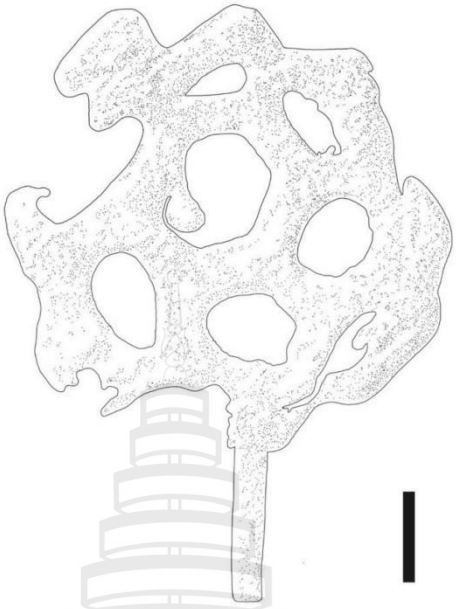
Description – van Beverwijk (1951).

Material considered – van Beverwijk (1951).

Distribution, ecological and economical importance

Clathrosphaerina plays a significant role as an aero-aquatic saprobe, decomposing submerged and floating plant litter, including leaves, catkins, bark, and cupules of *Alnus glutinosa*, *Quercus*, *Castanea sativa*, *Salix*, *Picea*, *Fagus*, and *Betula*. The conidia are adapted to float on the water surface, allowing for passive dispersal by water currents, and germinate when they contact suitable substrates. This genus occurs primarily in temperate freshwater environments, particularly in static or slow-moving waters such as ponds, ditches, and floodplains.

It has been recorded from Europe (Poland, UK, Netherlands, Spain, Austria), Japan, USA (northeast), and with isolated records from South America. Its distribution may be underestimated due to the scarcity of aero-aquatic fungi in routine mycological surveys.



Source Redrawn from Landcare Research (2023)

Note Conidium. Scale bars: 10 µm.

Figure 3.8 *Clathrosphaerina zalewskii*

Eriopezia (Sacc.) Rehm [as 'Eriopeziza'], Rabenh. Krypt. -Fl., Edn 2 (Leipzig) 1.3(lief. 38): 695 (1892) [1896]

Index Fungorum number: IF1888; Facesoffungi number: FoF18224, 20 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on plant debris, mosses, and decaying wood. Sexual morph: see Dennis (1963**)**. Asexual morph: Unknown.

Type species – *Eriopezia caesia* (Pers.) Rehm

Notes – *Eriopezia* was originally described as a subgenus (*Eriopeziza*) within *Tapesia* by Saccardo (1889) and was elevated to generic rank by Rehm (1892), with *E. caesia* (Pers. ex Fr.) Rehm as the type species. The genus is characterised by sessile to shortly stipitate apothecia, dark brown to black, seated on or immersed in a conspicuous, white subiculum of interwoven hyphae. The ectal excipulum is composed of dark brown *textura prismatica*. Marginal hyaline hairs are commonly present, often roughened or with granulate walls.

Asci arise from croziers, are unitunicate, cylindrical, evanescent, and eight-spored, with an amyloid apical ring (IKI+). Ascospores are hyaline, minute, subfusiform, and aseptate. Paraphyses are filiform, hyaline, simple or branched.

Nannfeldt (1932) included *Eriopezia* in the tribe Arachnopezizeae together with *Arachnopeziza* and *Tapesina*. Korf (1951) revised the genus, highlighting the abundant subiculum and distinctive ascospores as diagnostic features. Recent ITS and LSU sequence data support the placement of *Eriopezia* in Arachnopezizaceae as a distinct lineage within Helotiales (Kosonen et al., 2021). The type species *E. caesia* was first described as *Peziza caesia* by Persoon (1783). Type material is preserved in Herb. Fries (UPS) and Herb. Rehm (M); a specimen cited by Korf (1951) is Rehm No. 1030, presumably housed in HBG or M.

Eriopezia caesia (Pers.) Rehm [as 'Eriopeziza'], Rabenh. Krypt. -Fl., Edn 2 (Leipzig) 1.3(lief. 38): 695 (1892) [1896]. Figure 3.9

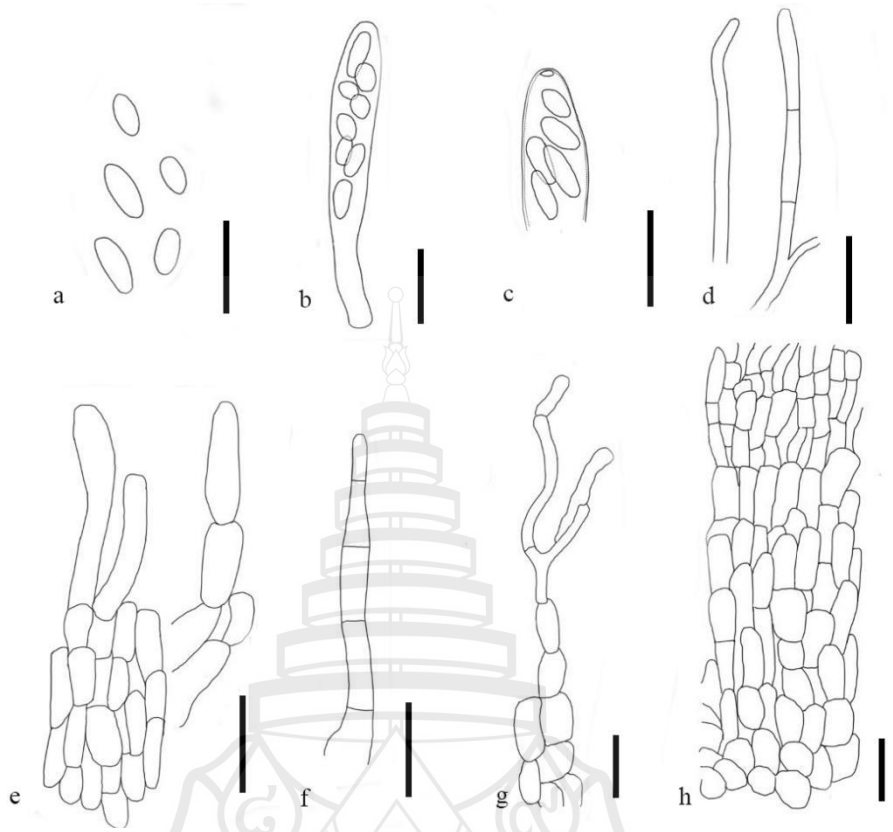
Index Fungorum number: IF232718; Facesoffungi number: FoF18210

Description – Rehm 1892, Korf (1951).

Material considered – Rehm 1892, Korf (1951).

Distribution, ecological and economical importance

Species of *Eriopezia* are saprobic, contributing to the decomposition of plant debris in forest ecosystems. They typically grow in moist, shaded habitats on mossy or decaying wood and leaf litter, often in association with bryophytes. The type species *E. caesia* has been reported from temperate regions of Europe, North America, and Asia (Rehm, 1892; Korf, 1951; Kosonen et al., 2021). Records include central and northern Europe (Sweden, Germany), eastern North America, and East Asia. The species is usually found in late autumn to early spring when moisture levels are high, indicating adaptation to cool and humid environments.



Source Redrawn from Pilzforum (2021)

Note a Spore. b Asci. c Partly asci with IKIB. d Paraphyses. e Marginal cells. f Hair. g Flank hair. h Ectal excipulum. Scale bars: 10 µm.

Figure 3.9 *Eriopezia caesia*

Leochalara W.P. Wu, in Wu & Diao, Fungal Diversity 119: 436 (2023)

Index Fungorum number: IF845261; Facesoffungi number: FoF18211, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on leaf litter. Sexual morph: Unknown. Asexual morph: see Wu and Diao (2023).

Type species – *Leochalara danxiashanensis* W.P. Wu & Y.Z. Diao

Notes – *Leochalara* was introduced by Wu and Diao (2023) with *Leochalara danxiashanensis* as the type species. *Leochalara* is characterized by hyaline to subhyaline, smooth- or slightly rough-walled conidiophores, which are 0–2-septate, straight or slightly curved, and composed of a 1(–2)-celled basal stalk and a terminal phialide. Conidiogenous cells are integrated, determinate, phialidic, erect, and straight, lageniform, with a collarette gradually tapering from the venter toward the apex.

Conidia are endogenous, extruded in long chains, cylindrical, with a truncated or flattened apex and base, hyaline, aseptate, and smooth-walled.

Molecular markers available for *Leochalara* include ITS, LSU (and occasionally SSU) sequence data, which place it within Arachnopezizaceae (Helotiales, Leotiomycetes). Phylogenetically, *Leochalara* is distinct from *Pyxidiophora*, despite their morphological similarities, particularly in the hyaline phialides and aseptate conidia. The holotype of *Leochalara danxiashanensis* (HMAS 252777) was collected from rotten wood in Guangdong Province, China, and is deposited in the Herbarium Mycologicum Academiae Sinicae (HMAS), Beijing.

Leochalara danxiashanensis W.P. Wu & Y.Z. Diao, Fungal Diversity 119: 436 (2023) Figure 3.10

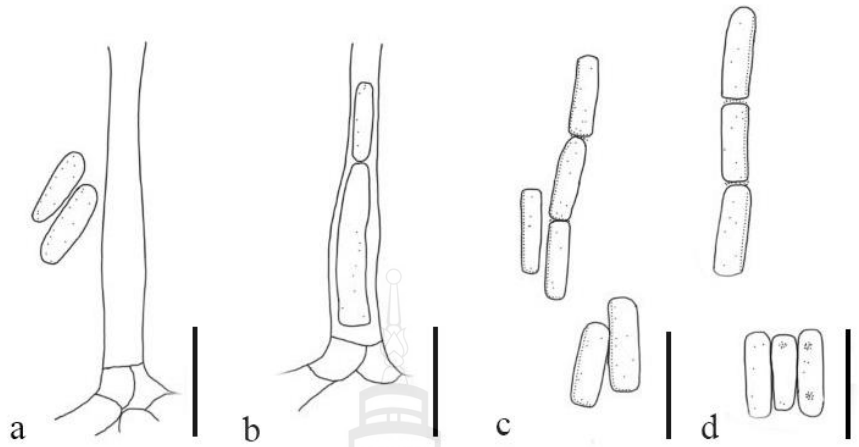
Index Fungorum number: IF845269; Facesoffungi number: FoF18225

Description – Wu and Diao (2023).

Material considered – Wu and Diao (2023).

Distribution, ecological and economical importance

Leochalara is a saprobic genus inhabiting decaying plant material, particularly fallen leaves and wood. It plays an ecological role in the decomposition of leaf litter and contributes to nutrient recycling in forest ecosystems. The genus is currently monotypic, with *L. danxiashanensis* as the only known species. This species was originally isolated from dead leaves of unidentified broadleaf trees in a subtropical forest in Danxiashan National Park, Guangdong Province, China. The known distribution of *Leochalara* is currently limited to South China, and its ecological niche suggests a potential preference for warm, humid forest habitats.



Source Redrawn from Wu and Diao (2023)

Note a, b conidiophores and phialides. c, d Conidia. Scale bars: a–d = 5 μm.

Figure 3.10 *Leochalara danxiashanensis*

Parachnopeziza Korf, Mycotaxon 7(3): 468 (1978)

Index Fungorum number: IF3696; Facesoffungi number: FoF18212, 8 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on fallen leaves, twigs, and decaying wood. Sexual morph: see Korf (1978), Hosoya (2004). Asexual morph: Unknown.

Type species – *Parachnopeziza miniopsis* (Ellis) Korf

Notes – *Parachnopeziza* was introduced by Korf (1978) with *P. miniopsis* as the type species, a recombination from *Peziza miniopsis* Ellis (*J. Mycol.* 1: 147, 1883). This genus is characterized by small, sessile to subsessile apothecia, often seated on a subiculum, with a short stipe sometimes embedded in the substrate. Fresh apothecia are patellate to short turbinate, disc pale orange to yellowish-orange, surrounded by a white, hairy margin. The ectal excipulum is composed of *textura prismatica*, while the medullary excipulum consists of *textura intricata*. Asci are cylindrical-clavate, eight-spored, arising from croziers. Ascospores are filiform, straight to curved, multiseptate. Paraphyses are filiform, simple to branched, embedded in a gelatinous matrix. Marginal hairs are hyaline to whitish, septate, and thin-walled. Molecular markers available for *Parachnopeziza* include LSU and ITS sequence data, currently derived from *P. miniopsis*. Holotype of *P. miniopsis* not specified in Korf (1978); the lectotype

designated by Hosoya (2004) is based on material collected by Ellis from *Carex* leaves in New Jersey, USA, preserved in NY (New York Botanical Garden Herbarium).

Parachnopeziza miniopsis (Ellis) Korf, Mycotaxon 7(3): 469 (1978) Figure 3.11

Index Fungorum number: IF319167; Facesoffungi number: FoF18213

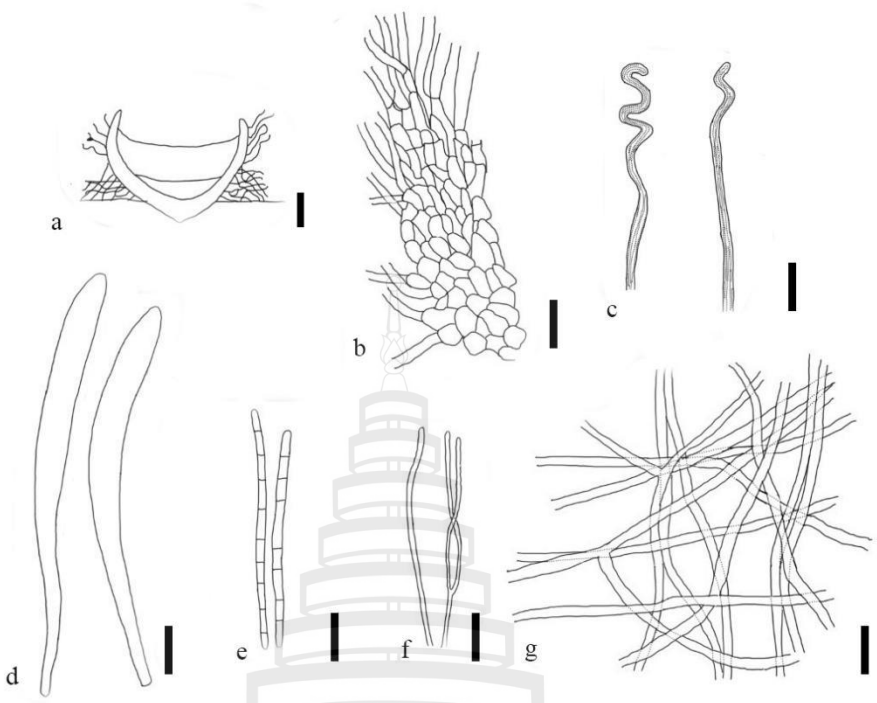
Description – Korf (1978), Hosoya (2004).

Material considered – Korf (1978), Hosoya (2004).

Distribution, ecological and economical importance

Parachnopeziza is saprobic, contributing to forest nutrient cycling by decomposing dead plant matter such as fallen leaves, decaying twigs, and woody debris. The apothecia are often found on bryophytic or herbaceous substrates, sometimes on moss-covered litter, indicating strong saprobic activity in moist microhabitats.

Species of *Parachnopeziza* have been reported from temperate and subtropical regions, including Asia (Japan, China), Europe (the Netherlands), and South America (Brazil). *P. miniopsis*, the type species, was recorded in Japan by Hosoya (2004) on *Carex* leaves and moss-covered litter. Other species have been found on hosts such as *Eupatorium* and unidentified woody debris in Brazil and China. The genus exhibits ecological versatility, colonizing both monocot and dicot leaf litter in forest habitats, often in humid conditions.



Source Redrawn from Hosoya (2004)

Note a Diagrammatic drawing of the apothecial section showing the outline of the structure. b Vertical section of apothecium showing ectal excipulum, hairs, and part of hymenium. c Hairs. d Asci. e Ascospores. f Paraphyses. g Subicular hyphae. Scale bars: a = 100 µm, b–g = 10 µm.

Figure 3.11 *Parachnopeziza miniopsis*

Thamnochortomyces Crous, in Crous et al., Fungal Systematics and Evolution 13: 409 (2024)

Index Fungorum number: IF853808; Facesoffungi number: FoF18214, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on culms of *Thamnochortus fraternus*. Sexual morph: Unknown. Asexual morph: see Crous et al., (2024).

Type species – *Thamnochortomyces kirstenboschensis* Crous

Notes – *Thamnochortomyces* was introduced by Crous et al. (2024) with *Thamnochortomyces kirstenboschensis* as the type species. It is a hyphomycetous morph related to the sexual genus *Arachnopeziza* (Kosonen et al., 2021), which generally does not sporulate in culture. The genus is characterised by macronematous,

smooth, branched, septate conidiophores that are integrated on hyphae, hyaline, subcylindrical, and straight to geniculate-sinuous, branched or not, with 0–3 septa. Conidiogenous cells are integrated, terminal and intercalary, polyblastic, cylindrical, and proliferating sympodially, with conspicuous flattened scars. Conidia are solitary, hyaline, smooth, guttulate, aseptate or 0–1(–3)-septate, subcylindrical, with obtuse apex and truncate base, (10–)12–17(–22) × (2–)2.5–3 µm; with age they may become elongated and swollen, undergoing microcyclic conidiation, reaching up to 40 µm long and 4 µm wide. Molecular markers available for *Thamnochortomyces* include LSU and ITS sequence data, which support its placement within the Arachnopezizaceae. The holotype of *Thamnochortomyces kirstenboschensis* was collected from dead leaves of *Thamnochortus spicigerus* in Kirstenbosch Botanical Gardens, Cape Town, South Africa, and is preserved in the PREM herbarium (PREM 63071); ex-type culture CPC 46074 = CBS 150885.

Thamnochortomyces kirstenboschensis Crous, in Crous et al., Fungal Systematics and Evolution 13: 409(2024) Figure 3.12

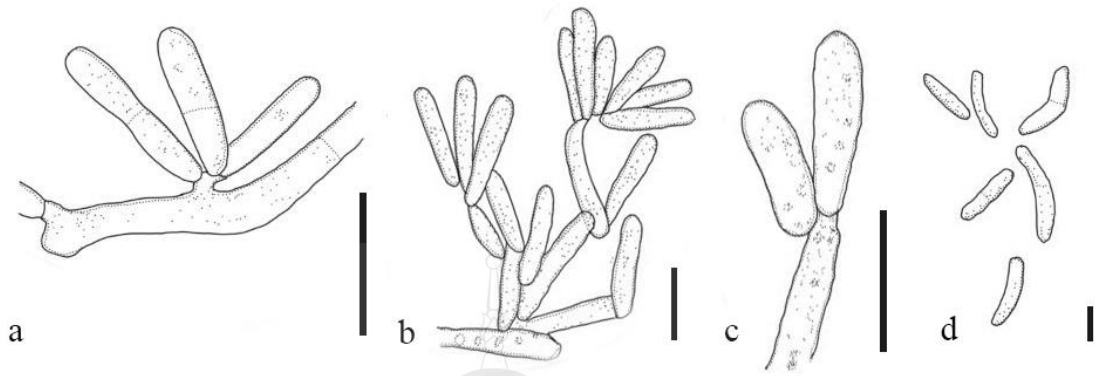
Index Fungorum number: IF853809; Facesoffungi number: FoF18125

Description – Crous et al., (2024).

Material considered – Crous et al., (2024).

Distribution, ecological and economical importance

Thamnochortus fraternus (*Restionaceae*), indicating a role in nutrient cycling within the fynbos ecosystem. The species forms sporodochial asexual morphs, producing conidia that undergo microcyclic conidiation, which may enhance survival and dispersal under natural conditions. *T. kirstenboschensis* is currently known only from its type locality in Kirstenbosch, South Africa, suggesting possible host specificity or a restricted ecological range within the fynbos biome.



Source Redrawn from Crous et al. (2024)

Note a-d Conidiophores and conidiogenous cells. Scale bars: 10 μm.

Figure 3.12 *Thamnochortomyces kirstenboschensis*

Cenangiaceae Rehm, Rabenh. Krypt.-Fl., Edn 2 (Leipzig) 1.3(lief. 31): 213 (1889) [1896]

Index Fungorum number: IF80563; Facesoffungi number: FoF05955

Cenangiaceae was established by Rehm (1889) to accommodate genera with erumpent, leathery apothecia that are initially closed and later open via a rounded or stellate pore. The type genus is *Cenangium*, with *C. ferruginosum* designated as the type species. Rehm (1889) originally included five genera: *Cenangium*, *Cenangella*, *Crumenula* (≡ *Crumenulopsis*), *Godronia*, and *Tryblidiella*. Later revisions reallocated several of these taxa: *Cenangella* was synonymized with *Dermea* (Dermateaceae; Rehm, 1912), *Godronia* was transferred to Godroniaceae (Baral, 2015), and *Tryblidiella* was placed in Patellariaceae within Dothideomycetes (Kutorga & Hawksworth, 1997), while *Crumenulopsis* and *Cenangium* s. str. remain in *Cenangiaceae*.

Molecular studies (Baral et al., 2014; Pärtel et al., 2017; Perić et al., 2019, 2020) have clarified *Cenangiaceae* as a distinct clade within Helotiales, incorporating taxa formerly assigned to Helotiaceae subfam. Encoelioideae and Hemiphacidiaceae. Members of the family are characterized by leathery to waxy apothecia that are initially sunken and closed, later becoming erumpent and expanding into bowl- or cup-shaped structures. The excipulum typically has a thickened, darkened outer layer, while the medullary excipulum consists of *textura intricata*. Asci are inoperculate, 8-spored, and

frequently arise from croziers. Ascospores are hyaline, ellipsoid to fusoid, and often guttulate. Paraphyses are filiform and frequently encrusted.

Asexual morphs are diverse, including acervular, sporodochial, and stromatic conidiomata. Conidia vary from unicellular allantoid and cylindrical forms to staurosporous types, although the asexual stage remains unknown for many genera. Phylogenetic analyses commonly employ ITS and LSU rDNA markers, supplemented by *RPB1*, *RPB2*, *TEF1-α*, and mtSSU sequences. In this study, we constructed a phylogenetic tree (Figure 3.13) to evaluate the placement of the family. In our phylogeny, *Didymascella* (ITS; *D. thujina*) forms a strongly supported sister lineage (MLBP = 100%) to the Rhabdocline–Meria clade within the Cenangiaceae s.l. backbone (Figure 3.12). Morphologically, Didymascella shares with Rhabdocline a subepidermal, later erumpent apothecial development on conifer needles, inoperculate asci and pigmented, pitted to foveolate ascospore walls at maturity, all diagnostic for this lineage. The frequent occurrence of functionally 4-spored asci in *Didymascella* is interpreted as a derived condition within Helotiales and does not outweigh the overall molecular–morphological congruence. We therefore provisionally place Didymascella in Cenangiaceae.

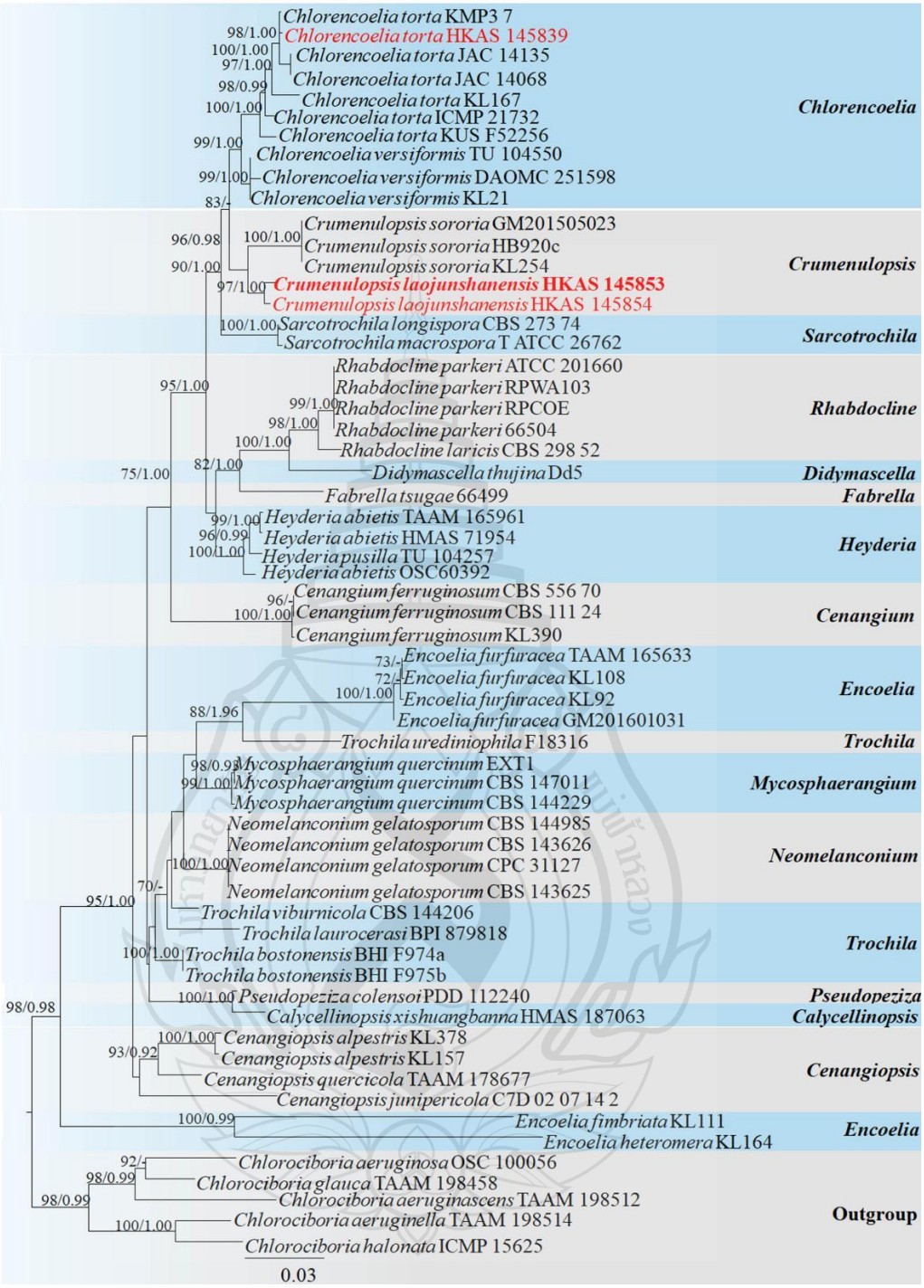


Figure 3.13 Maximum likelihood tree based on the combined ITS dataset of Cenangiaceae

Figure 3.13 Bootstrap support values (MLBP ≥ 70%) and Bayesian posterior probabilities (BPP ≥ 0.90) are shown at nodes as MLBP/BPP. Values below these thresholds are indicated with a hyphen ("–"). Type strains are shown in bold.

Cenangiopsis Rehm, Ber. bayer. bot. Ges. 13: 189 (1912)

Index Fungorum number: IF870; Facesoffungi number: FoF 18226, 10 morphological species (Species Fungorum 2025), 5 species with molecular data.

Saprobic on dead wood and bark. Sexual morph: see Pärtel et al., 2015. Asexual morph: see Perić and Baral (2020)

Type species – *Cenangiopsis quercicola* (Romell) Rehm

Notes – *Cenangiopsis* was introduced by Rehm (1912) with *Cenangiopsis quercicola* as the type species. Members of *Cenangiopsis* are characterized by sessile to slightly erumpent, cupulate apothecia, often with a pustulate or tomentose margin. The apothecia typically occur on the bark of deciduous trees and shrubs, especially in temperate forests. The ectal excipulum is composed of *textura prismatica* to *intricata*, frequently embedded in a gelatinous matrix that may cause apothecia to appear translucent when moist (Perić et al., 2015; Pärtel et al., 2017). The asci are cylindrical to clavate, 8-spored, arising from croziers, and can be inamyloid or weakly amyloid depending on the species (Perić et al., 2015). Ascospores are hyaline, ellipsoid to cylindric-ellipsoid, often becoming septate at maturity or in overmature specimens. Paraphyses are filiform to lanceolate, often slightly enlarged at the apex, and tend to extend beyond the asci. Asexual morphs are rarely observed, but some species, such as *C. quercicola*, have been reported to produce blastoconidia in culture (Perić et al., 2015). Molecular markers available for this genus include LSU and ITS rDNA sequences, which support its placement within Cenangiaceae (Helotiales, Leotiomycetes) (Pärtel et al., 2017; Perić & Baral, 2020). Type: on bark of *Quercus* sp., [Germany, no date cited], leg. Rehm, holotype (herb. Rehm, precise depository unknown; Perić et al., 2015).

Cenangiopsis quercicola (Romell) Rehm, Ber. bayer. bot. Ges. 13: 189 (1912) Figure 3.14

Index Fungorum number: IF121265; Facesoffungi number: FoF 18227

Description – Pärtel et al. (2017), Perić et al. (2015).

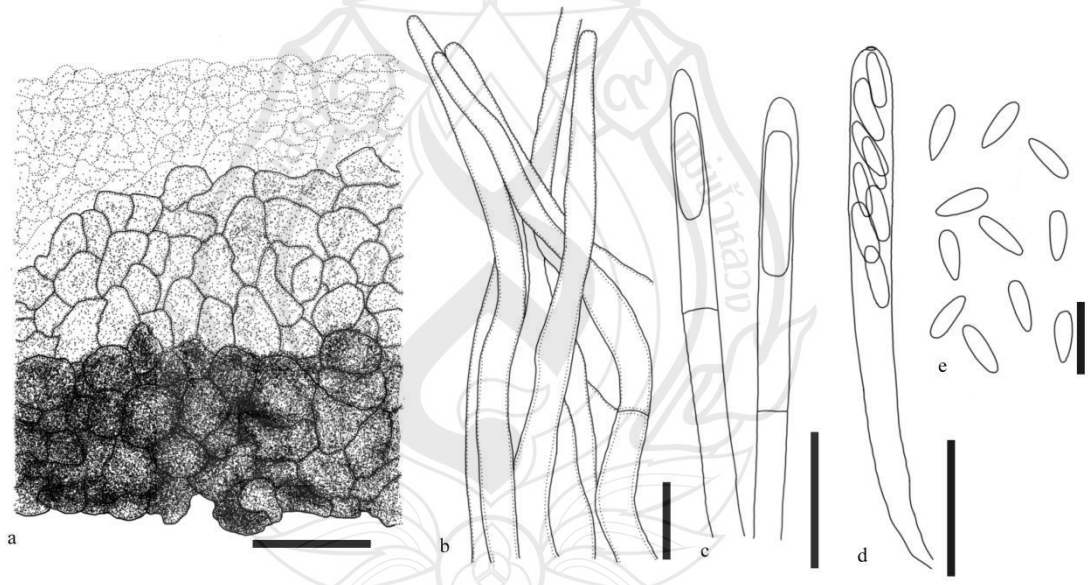
Material considered – Pärtel et al. (2017), Perić et al. (2015).

Distribution, ecological and economical importance

Cenangiopsis is primarily a saprobic genus within Cenangiaceae, typically colonizing dead bark, twigs, and woody debris of deciduous and coniferous trees in temperate and montane ecosystems (Pärtel et al., 2017; Perić & Baral, 2020). Species

play a significant role in forest nutrient cycling through the decomposition of lignocellulosic material. Some taxa, such as Cenangiopsis sambuci and C. quercicola, are adapted to xeric habitats and can tolerate repeated desiccation, resuming development when humidity increases, which suggests an ecological adaptation to fluctuating moisture conditions (Perić et al., 2015).

There is growing evidence that some *Cenangiopsis* species may exhibit an endophytic phase, i.e., asymptomatic colonization of living plant tissues prior to becoming saprobic upon host senescence or damage (Pärtel et al., 2017). Geographic records span across Europe and Asia, particularly in mountain forests (Pärtel et al., 2017; Perić & Baral, 2020). Host plants include species of *Quercus*, *Juniperus, Sambucus*, and *Rosa*, with taxa such as *C. quercicola*, *C. junipericola*, and *C. sambuci* displaying specificity to certain plant genera or ecological niches (Pärtel et al., 2017; Perić & Baral, 2020).



Source Redrawn from Perić et al. (2015)

Note a Ectal excipulum and lower part of medullary excipulum. b Marginal hairs. c Paraphyses containing elongtae contents. d Asci. e Ascospores. Scale bars: a, c, d = 20 µm; b, e = 10 µm.

Figure 3.14 *Cenangiopsis quercicola*

Cenangium Fr., K. svenska Vetensk-Akad. Handl., ser. 3 39: 360 (1818)

Index Fungorum number: IF872; Facesoffungi number: FoF 18228, 46 morphological species (Species Fungorum, 2025), 3 species with molecular data.

Saprobic on dead or weakened branches of conifers. Sexual morph: see Van Vloten and Gremmen (1953). Asexual morph: see Van Vloten and Gremmen (1953).

Type species – *Cenangium ferruginosum* Fr.

Notes – *Cenangium* was introduced by Fries (1818) in *K. svenska Vetensk-Akad. Handl.*, ser. 3 39: 360, with *Cenangium ferruginosum* as the type species. The genus is characterised by leathery, dark brown to black apothecia that develop immersed in host tissues, becoming erumpent to superficial with maturity. Apothecia are initially subepidermal, later expanding into open discs. The excipulum consists of *textura intricata*, with an outer layer of dark brown, thick-walled, angular to rounded cells. The hymenium contains unitunicate asci that arise from croziers, with a small, inconspicuous apical ring (annulus) occupying the apex; the asci are J− in Melzer's or Lugol's iodine. Paraphyses are filiform, septate, and may slightly protrude above the asci. Ascospores are ellipsoidal, aseptate, hyaline, and one-celled at maturity (van Vloten & Gremmen, 1953; Verkley, 1995). The genus is placed within Cenangiaceae (Helotiales, Leotiomycetes). Subsequent molecular studies using LSU and ITS sequence data have contributed to resolving species-level relationships, although only a few species have been sequenced to date. The type species, *Cenangium ferruginosum*, was originally described from apothecia on dead branches of *Pinus sylvestris*. The holotype material collected by Fries is preserved in the herbarium of Uppsala University (UPS, herb. Fries).

Cenangium ferruginosum Fr., K. svenska Vetensk-Akad. Handl., ser. 3 39: 361 (1818) Figure 3.15

Index Fungorum number: IF234580; Facesoffungi number: FoF 18229

Description – van Vloten and Gremmen (1953).

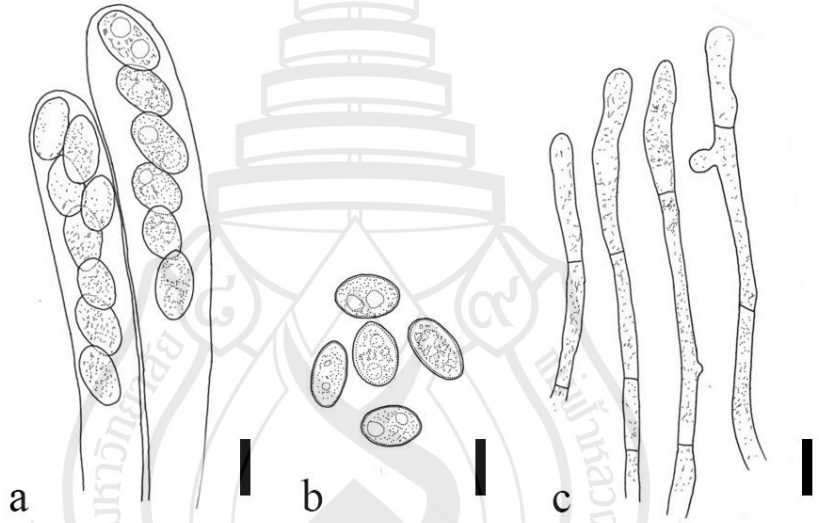
Material considered – van Vloten and Gremmen (1953).

Distribution, ecological and economical importance

Cenangium species are saprobic on dead or weakened branches of conifers, especially *Pinus* spp., where they contribute to the decomposition of lignocellulosic material. Some species, particularly *C. ferruginosum*, may behave as opportunistic

pathogens, causing “Cenangium dieback” in stressed or weakened trees. This disease typically develops following environmental stressors such as drought, frost, heat waves, or other factors that reduce host vigour (van Vloten & Gremmen, 1953; Kim et al., 2009).

The genus is widely distributed in temperate and boreal regions of Europe, North America, and Asia, with *C. ferruginosum* most frequently recorded on *Pinus sylvestris* and occasionally on other pine species. Its presence is strongly associated with coniferous forests in cool to cold climates, and outbreaks of dieback have been reported in plantation forestry as well as natural stands (Kim et al., 2009).



Source Redrawn from Centro de Estudios Micológicos Asturianos (2024)
Note a Part of ascus. b Ascospores. c Paraphyses. Scale bars: a–c = 10 µm.

Figure 3.15 *Cenangium ferruginosum*

Chlorencoelia J.R. Dixon, Mycotaxon 1(3): 223 (1975)

Index Fungorum number: IF1007; Facesoffungi number: FoF 14250, 4 morphological species (Species Fungorum, 2025), 2 species with molecular data.

Saprobic on decaying wood or possibly endophytic within plant tissues. Sexual morph: see Pärtel et al. (2017). Asexual morph: Unknown.

Type species – *Chlorencoelia versiformis* (Pers.) J.R. Dixon

Notes – *Chlorencoelia* was introduced by Dixon (1975) with *C. versiformis* as the type species. Species of *Chlorencoelia* typically form apothecia on hygric, rotten,

decorticated wood, mostly of angiosperms but occasionally gymnosperms. Apothecia are cupulate to plane, leathery to soft, with margins and exteriors that may be tomentose or smooth. *C. versiformis* has subcylindric-allantoid, 2–6-guttulate ascospores, which differentiate it from *C. torta*, having biguttulate, subcylindric-ellipsoidal ascospores. The ectal excipulum is generally composed of *textura prismatica* to *textura angularis*. Molecular phylogenetic analyses (ITS) suggest the genus may not be monophyletic, with some species close to members of Cenangiaceae (Pärtel et al., 2017).

The original type material was not assigned a herbarium number by Dixon (1975), and no lectotype or epitype has been designated.

Chlorencoelia versiformis (Pers.) J.R. Dixon, Mycotaxon 1(3): 224 (1975).

Index Fungorum number: IF311054; Facesoffungi number: FoF 18230

Description – Pärtel et al. (2017).

Material considered – Pärtel et al. (2017).

Distribution, ecological and economical importance

Chlorencoelia species are saprobic in Helotiales, occurring primarily on hygric, decorticated wood of both angiosperms and gymnosperms (Dixon, 1975; Baral & Krieglsteiner, 2006). They contribute to lignocellulosic decomposition in moist forest habitats, facilitating nutrient cycling. Although no experimental confirmation exists, some species may have an endophytic stage prior to saprobic development.

The genus is distributed in temperate and montane regions of Europe (Germany, Estonia, Austria), North America (USA, Canada), and East Asia (Japan, China). Hosts include *Fagus*, *Acer*, *Quercus*, and occasionally *Pinus* and other gymnosperms.

Chlorencoelia torta (Schwein.) J.R. Dixon, Mycotaxon 1(3): 230 (1975)

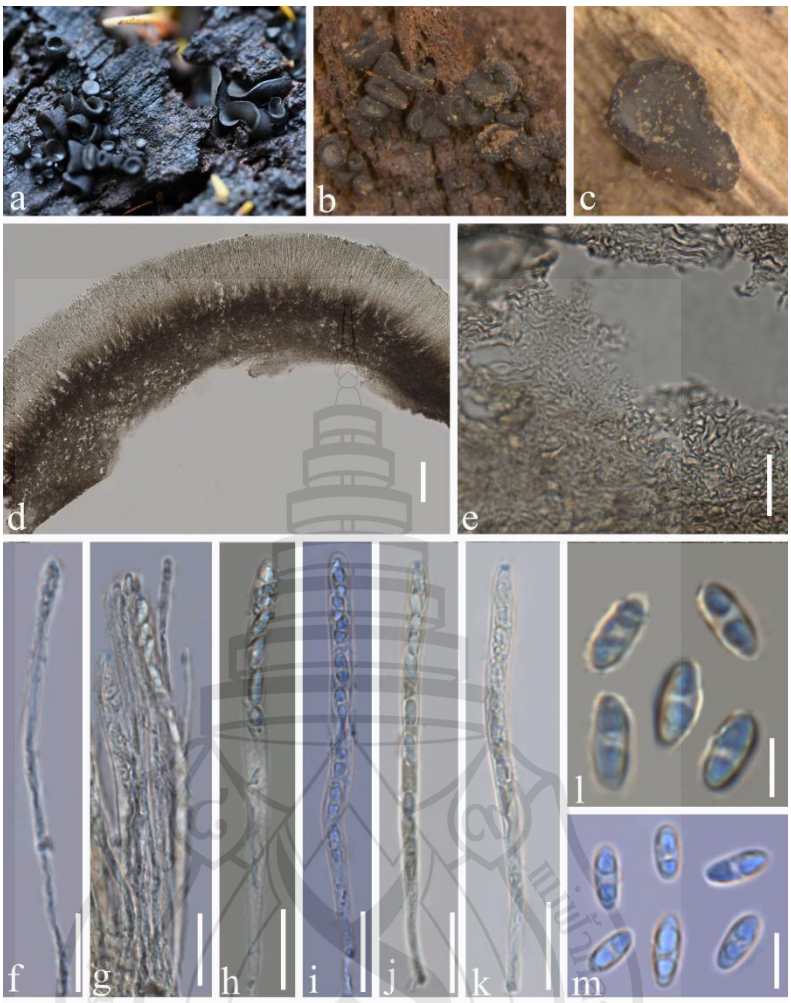
Index Fungorum: IF311053 Facesoffungi Number: FoF13909 Figure 3.16

Description – *Saprobic* on the dead wood. **Sexual morph**: Apothecia scattered to partly gregarious, superficial, 0.5–1.4 mm diam., cupulate, sessile. Disc concave, surface slightly rough, leaden grey to violaceous black when fresh, vinaceous buff to greyish sepia when dry. Margin slightly involute, greyish sepia. Receptacle discoid to cupulate, leaden grey to violaceous black and vinaceous buff to greyish sepia when dry. Hymenium 135–176 µm ($\bar{x}$ = 161 µm, n = 30) high, concave, surface slightly rough, leaden grey when dry. Medullary excipulum 40–65 µm ($\bar{x}$ = 55 µm, n = 25) thick, brown to violaceous buff, thin-walled, hyaline to yellowish cells of *textura intricata*, 1.5–2.6

µm ($\bar{x}$ = 2.2 µm, n = 50) diam. Ectal excipulum 28–53 µm ($\bar{x}$ = 42 µm, n = 20) thick, thin-walled, hyaline to dark brown cells of *textura angularis*, 0.6–1.9 µm ($\bar{x}$ = 1.1 µm, n = 60) diam. Paraphyses 61–130 × 1.0–2.4 µm ($\bar{x}$ = 98 × 1.7 µm, n = 25), longer than asci, filiform, obtuse, enlarged at apex, unbranched, straight to slightly curved, aseptate, hyaline, thin-walled, slightly rough. Asci 84–115 × (3.2–)3.4–5.3(–5.9) µm ($\bar{x}$ = 99 × 4.3 µm, n = 42), 8-spored, unitunicate, clavate, hyaline, straight to slightly curved, rounded to subconical apex, apically thin-walled, smooth, J+ in Melzer's reagent. Ascospores (50/14/2) (4.4–)4.9–7.1(–8.0) × 2.4–4.2(–4.6) µm ($\bar{x}$ = 6.2 × 3.4 µm), uniseriate, ellipsoid, aseptate, thin-walled, hyaline, obtuse at both ends, biguttulate, smooth. **Asexual morph**: Undetermined.

Material examined – China, Yunnan Province, Puer City, Jingdong County, Ailao Mountain, altitude 2451 m, on the decayed unknown wood, 24 August 2022, Le Luo, ly459 (**HKAS 145839**).

Notes – *Chlorencoelia torta* was originally described as *Peziza torta* by Schweinitz (1832) from North Carolina, and later transferred to *Chlorencoelia* by Dixon (1975) in his monograph of the genus. It is distinguished by sessile to shortly stipitate, dark olive-green to violaceous-black apothecia and biguttulate, irregularly ellipsoid ascospores measuring (5.6–)9–11(–12) × 2–4 µm (mean = 9.6 × 3.0 µm) according to Dixon (1975). Paraphyses contain green vacuolar bodies in water, and tomentum hyphae are subglobose to clavate, with yellowish or green pigments. Our collection (HKAS 145839) from Ailao Mountain, Yunnan Province, agrees morphologically and phylogenetically with *C. torta*. The apothecia (0.5–1.4 mm diam.), J+ asci, and ellipsoid, aseptate, biguttulate ascospores measuring (4.4–)4.9–7.1(–8.0) × 2.4–4.2(–4.6) µm ($\bar{x}$ = 6.2 × 3.4 µm) correspond well with the original description. Phylogenetic analyses based on ITS sequences (Figure 3.12) show that our strain clusters with authentic *C. torta* strains (KMP3-7, JAC14135, JAC14068) from North America and New Zealand with strong support. This represents the first record of *C. torta* from China.



Note a-c Apothecia on host surface. d Cross section of apothecium. e Excipular cells. f Paraphyses. g Paraphyses and asci. h-k Asci (in Melzer's reagent). l-m Ascospores. Scale bars: d = 100 µm; e–k = 20 µm; l, m = 5 µm.

Figure 3.16 *Chlorencoelia torta* (HKAS 145839)

Crumenulopsis J.W. Groves, Can. J. Bot. 47: 48 (1969)

Index Fungorum number: IF1304; Facesoffungi number: FoF01466, 3 morphological species (Species Fungorum, 2025), 2 species with molecular data.

Pathogenic fungi cause canker diseases on various *Pinus* species. Sexual morph: see Hanlin et al. (1992). Asexual morph: Unknown.

Type species – *Crumenulopsis pinicola* (Rebent.) J.W. Groves

Notes – *Crumenulopsis* was established by J.W. Groves (1969) with *Crumenulopsis pinicola* (Rebent.) J.W. Groves designated as the type species. Species

of *Crumenulopsis* are characterised by elongate, erumpent apothecia that develop through the host periderm, often in association with perennial cankers on coniferous trees. The apothecia typically have inrolled margins forming a longitudinal furrow and are dark brown to black. The ectal excipulum consists of thick-walled, pigmented cells arranged in *textura angularis* or *prismatica*. Asci are cylindrical, unitunicate, eight-spored, and usually longer than 90 µm. Ascospores are hyaline, ellipsoid to fusoid, and may or may not possess a gelatinous sheath depending on the species; for example, *C. atropurpurea* and *C. lacrimiformis* produce spores with distinct gelatinous sheaths, whereas *C. pinicola* and *C. sororia* lack them. Notably, *C. atropurpurea* produces a purplish pigment in KOH, a diagnostic feature not found in related taxa. Molecular markers available for the genus include ITS and LSU sequence data (Hanlin et al., 1992).

Type specimen – Lectotype: HBG, designated by Dennis (1968) from Rebentisch's material on *Pinus sylvestris* (Germany).

Crumenulopsis pinicola (Rebent.) J.W. Groves, Can. J. Bot. 47: 48 (1969)

Index Fungorum number: IF329351; Facesoffungi number: FoF 18231

Description – Hanlin et al. (1992).

Material considered – Hanlin et al. (1992).

Distribution, ecological and economical importance

Crumenulopsis is a pathogenic genus causing perennial cankers on various *Pinus* species. Infection typically occurs through small wounds, leading to the formation of resin droplets on the bark surface, followed by bark necrosis and progressive tissue death. Cankers expand slowly, and apothecia usually appear around the canker margins 4–5 years after infection. Species such as *C. sororia* exhibit host preferences (e.g., *P. contorta*, *P. nigra* var. *maritima*, *P. sylvestris*), whereas *C. pinicola* occurs on a wider range of pines.

Ascospores are wind-dispersed under humid conditions, with peak discharge in the morning (06:00–12:00 h). Spore release ceases when temperatures exceed ~16°C or relative humidity drops below ~65%, and is triggered by increased humidity, light changes, and rainfall from the previous day. Macroconidial spores may facilitate local spread via water films.

The genus occurs in temperate and boreal forests across Europe (e.g., Scotland, Sweden, Germany, Russia), North America (Canada, USA – including Florida for *C. lacrimiformis*), and parts of Asia (Japan for *C. atropurpurea*). Infections are often associated with stressed hosts exposed to drought, frost, or other environmental stressors, which predispose trees to colonisation and canker development.

Crumenulopsis laojunshanensis L. Luo & K.D. Hyde, sp. nov.

Index Fungorum: IF904291, Facesoffungi Number: FoF 18232, Figure 3.17

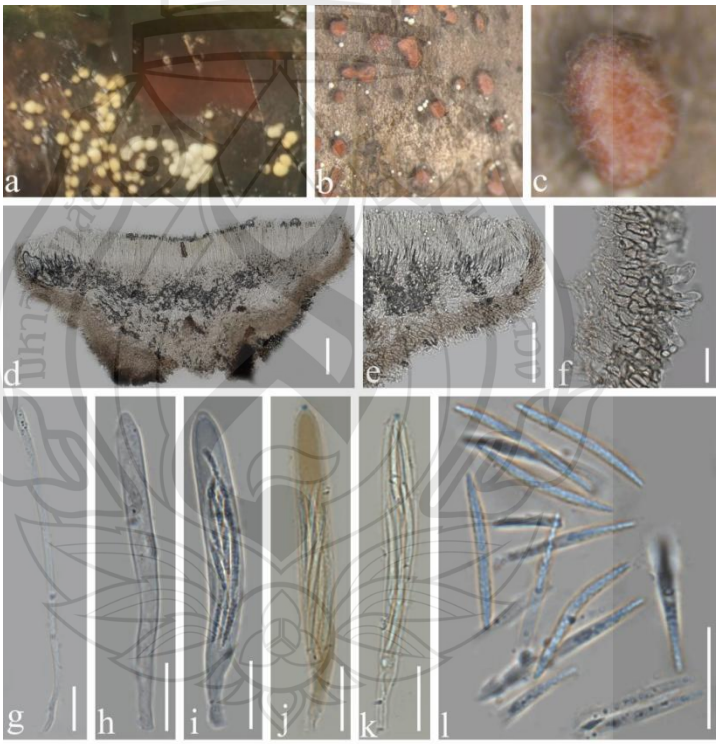
Etymology. The epithet *laojunshanensis* refers to Laojun Mountain, the locality where the holotype specimen was collected.

Holotype. HKAS 145853.

Description: Saprobic on decayed wood barks. Sexual morph: Apothecia superficial, gregarious, 0.25–0.5 mm in diameter when dry, discoid to cupulate, sessile. Disc concave, surface slightly rough, apricot to fulvous when dry. Margin flat, fulvous. Receptacle discoid, white to yellowish when fresh, apricot to fulvous when dry. Hymenium 76–133 µm ($\bar{x}$ = 93 µm, n = 42), concave, surface slightly rough, apricot in dry condition. Medullary excipulum 37–94 µm ($\bar{x}$ = 66 µm, n = 24), thin, hyaline, composed of thin-walled cells of *textura intricata*, 1.8–5.0 µm ($\bar{x}$ = 3.2 µm, n = 50) in diameter. Ectal excipulum 40.5–105 µm ($\bar{x}$ = 68 µm, n = 31), thin, thin-walled, smooth, composed of hyaline to brown cells of textura globulosa, 3.3–8.7 µm ($\bar{x}$ = 6.0 µm, n = 60) in diameter. Paraphyses 73–110 × 1.8–4.2 µm ($\bar{x}$ = 88 × 3.1 µm, n = 25), filiform, straight to slightly curved, aseptate, hyaline, smooth, with slightly obtuse apices. Asci 73–106 × 6.2–11.3 µm ($\bar{x}$ = 88 × 8.6 µm, n = 50), 8-spored, clavate, straight to slightly curved, hyaline, arranged in overlapping fascicles, smooth, with an apical amyloid pore and rounded ends, J+ in MLZ, with a tapered, short, stipitate base. Ascospores (85/7/2) (24–)25–32(–33) × 1–2.9(–3.5) µm ($\bar{x}$ = 29.4 × 2.3 µm, n = 55), multi-seriate, fusoid-clavate with one rounded and one blunt end, curved, aseptate, thin-walled, hyaline, slightly rough, tapering towards the obtuse ends, eguttulate. Asexual morph: Not observed. **Asexual morph**: Not observed.

Material examined. China, Yunnan Province, Laojun Mountain, altitude 3823 m, on decayed bark, 22 July 2022, Le Luo, Ly31 (HKAS 145853, holotype); ibid., on decayed unidentified bark, 22 July 2022, Le Luo, Ly52 (HKAS 145854, paratype).

Notes. Phylogenetic analyses (Figure 3.13) placed our specimens (HKAS 145853 and HKAS 145854) in a distinct clade sister to *C. sororia*, with 84% MLBP and 1.00 BIPP, clustering together with strains GM201505023, HB920c, and KL254. Morphologically, *C. laojunshanensis* differs from *C. sororia* in several aspects: apothecia smaller (0.25–0.5 mm vs. 1–2 mm), apricot to fulvous (vs. black to brownish-black), and glabrous (vs. slightly hairy); ectal excipulum composed of hyaline to brown textura globulosa (3.3–8.7 µm) vs. dark brown *textura angularis* (5–10 µm); asci shorter and narrower (73–106 × 6.2–11.3 µm, J+ in MLZ vs. 100–125 × 11–14 µm, J–); ascospores longer and narrower (25–32 × 1–2.9 µm vs. 18–21 × 3.0–5.0 µm); and paraphyses filiform, aseptate (vs. septate, often branched). These morphological distinctions, together with phylogenetic evidence, support recognition of *Crumenulopsis laojunshanensis* as a novel species.



Note a-c Apothecia on the host. d Cross section of an apothecium. e-f Excipular cells. g Paraphyses. h-k Asci (mounted in Melzer's reagent). l Ascospores. Scale bars: d, e =100 µm, f–l=20 µm.

Figure 3.17 *Crumenulopsis laojunshanensis* (HKAS 145853)

Didymascella Maire & Sacc., Annls mycol. 1(5): 418 (1903)

Index Fungorum number: IF1545; Facesoffungi number: FoF 18655, 5 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Parasitic on leaves of Cupressineae (Pinaceae). Sexual morph: see Pantidou and Darker (1963). Asexual morph: Unknown.

Type species – *Didymascella oxycedri* Maire & Sacc.

Notes – *Didymascella* was established by Maire and Saccardo (1903) with *D. oxycedri* as the type species. Members of the genus are obligate biotrophic pathogens of Cupressaceae, producing dark brown to black apothecia that develop subepidermally and become erumpent at maturity, breaking through the host epidermis in a circumscissile (lid-like) manner. Apothecia may be epiphyllous or hypophyllous depending on the species. The asci are inoperculate, clavate, and arise from croziers, each containing four uniseriate ascospores. Ascospores are initially aseptate and pale green, becoming 1-septate and deep yellow to olive-brown at maturity, with a surface that develops distinct pits or foveolae. Paraphyses are filiform, septate, and slightly enlarged at the apex (Pantidou & Darker, 1963). No asexual morph is known. The genus currently includes five morphologically recognized species, of which only one (*D. thujina*) has molecular data available (ITS; Aldana 2018). *D. oxycedri* occurs on *Juniperus oxycedrus*, while *D. thujina* is an important pathogen of *Thuja plicata*. Other species differ mainly in spore size, septation timing, and apothecial position on the leaf surface. The type species, *D. oxycedri*, was described from material collected on *Juniperus oxycedrus* in Corsica in September 1903 and is preserved in PAD-S (ex herb. Maire, holotype). Our phylogeny recovers Didymascella as a sister lineage to the *Rhabdocline–Meria* clade with maximal support (MLBP = 100%), and we note substantial morphological concordance with that lineage (needle-parasitic ecology; subepidermal to erumpent apothecia; pigmented, pitted ascospores). In light of cumulative evidence and the recent broader concept of Cenangiaceae s.l. encompassing the former Hemiphacidiaceae core, we provisionally place Didymascella in Cenangiaceae, pending confirmation from multi-gene datasets (LSU, *RPB*1/2, *TEF*1, mtSSU) based on ex-type or topotype strains.

Didymascella oxycedri Maire & Sacc., Annls mycol. 1(5): 418 (1903)

Index Fungorum number: IF197830; Facesoffungi number: FoF 18656

Description – Pantidou and Darker (1963).

Material considered – Pantidou and Darker (1963).

Distribution, ecological and economical importance

Species of *Didymascella* are leaf pathogens of Cupressaceae, causing foliar diseases such as cedar leaf blight (*D. thujina*) in *Thuja plicata* and needle blight in *Juniperus* spp. Infected needles typically show chlorosis, browning, and premature abscission, reducing photosynthetic capacity and overall vigor. The impact is most severe in forest nurseries and ornamental plantings, where young or stressed trees are highly susceptible (Aldana, 2018). *Didymascella* species are distributed in temperate regions where Cupressaceae hosts occur, with records from North America, Europe, and Asia. They are most frequently encountered in areas of high humidity that favor prolonged leaf wetness, which promotes infection and disease development.

Figure – No original illustration available.

Encoelia (Fr.) P. Karst., Bidr. Känn. Finl. Nat. Folk 19: 217 (1871)

Index Fungorum number: IF1783; Facesoffungi number: FoF 18233, 39 morphological species (Species Fungorum, 2025), 2 species with molecular data.

Saprobic, parasitic, and possibly endophytic**.** Sexual morph: see Pärtel et al. (2017). Asexual morph: see Pärtel et al. (2017).

Type species – *Encoelia furfuracea* (Roth) P. Karst.

Notes – *Encoelia* was established by Karsten (1871), with *E. furfuracea* (Roth) P. Karst. as the type species. Members of the genus are characterized by leathery, brown to blackish apothecia, often with a scurfy surface, typically more than 1 mm in diameter, and borne on a short, simple stipe. Apothecia may open in a prohymenial or mesohymenial phase, with the disc exposed early or late in development (Pärtel et al., 2017). The ectal excipulum is *textura angularis* to *textura prismatica*, composed of outer cells that are thick- to thin-walled, hyaline to pale or dark brown, and sometimes encrusted. Asci are unitunicate, clavate to cylindrical, 8-spored, arising from croziers, and exhibit interspecific variation in apical ultrastructure among species such as *E. furfuracea*, *E. fimbriata*, and *E. tiliacea* (Pärtel et al., 2017; Gamundí, 1976). Ascospores are hyaline, cylindrical to allantoid, aseptate when discharged, and usually

contain several oil drops. Paraphyses are cylindrical-filiform, straight to slightly curved, often widened or hooked at the apex, sometimes with yellow to brown pigmentation. Most species fruit in late winter or early spring in the Northern Hemisphere, often directly after host death, indicating a possible endophytic or latent pathogenic phase prior to sporulation. Molecular phylogenetic analyses based on ITS and LSU rDNA confirm the placement of *Encoelia* within Cenangiaceae, closely related to *Cenangium* (Pärtel et al., 2017).

Type – Finland, Ingria, on decayed wood of *Corylus*, P.A. Karsten (H7004822, H; designated by Karsten 1871, confirmed by Pärtel et al., 2017).

Encoelia furfuracea (Roth) P. Karst., Bidr. Känn. Finl. Nat. Folk 19: 218 (1871) Figure 3.18

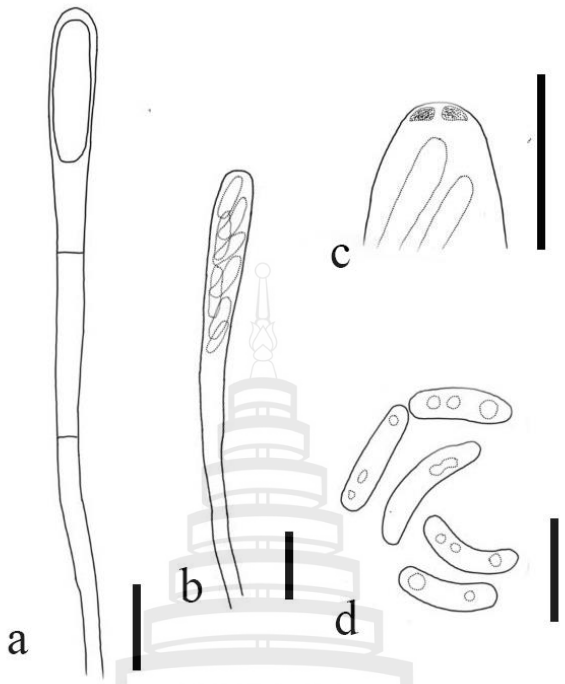
Index Fungorum number: IF202507; Facesoffungi number: FoF 18234

Description – Pärtel et al. (2017).

Material considered – Pärtel et al. (2017).

Distribution, ecological and economical importance

Species of *Encoelia* function primarily as saprotrophs, decomposing wood and bark of deciduous angiosperms, particularly branches and stems of trees including *Betula*, *Populus*, *Quercus*, and *Corylus*. Some species are thought to possess an endophytic or latent pathogenic stage, producing apothecia soon after host death. Fruiting bodies are typically found in moist forest habitats, often in shaded locations, occurring on bark, fallen branches, and standing deadwood. The genus occurs mainly in temperate and boreal regions of Europe, North America, and Asia. Certain species exhibit host specificity, e.g., *E. furfuracea* is most frequently associated with *Corylus*.



Source Redrawn from Pärtel et al. (2017)

Note a Paraphyses with apical refractive vacuole. b Asci. c Ascus apex in MLZ (Melzer's reagent). d Ascospores. Scale bars: a–d = 10 µm.

Figure 3.18 *Encoelia furfuracea*

Fabrella Kirschst., Hedwigia 80: 131 (1941)

Index Fungorum number: IF1970; Facesoffungi number: FoF 18235, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Pathogenic on conifer needles, specifically hemlock (*Tsuga* spp.), causing needle blight. Sexual morph: see Kirschstein 1941. Asexual morph: Unknown.

Type species – *Fabrella tsugae* (Farl.) Kirschst.

Notes – *Fabrella* is a monotypic genus established by Kirschstein (1941), based on *Stictis tsugae* Farl. (Farlow, 1883). It is currently placed in Hemiphacidiaceae, although sometimes treated in Cenangiaceae s. lat. (Helotiales, Leotiomycetes). Apothecia are minute, dark brown, circular, developing hypophyllously on infected needles of *Tsuga* spp., with the epidermis ruptured and turned to one side. Asci are oblong, 55–65 × 11–12 µm, 8-spored (Farlow, 1883). Paraphyses are straight, filiform, clavate, brown at the tips, ca. 3 µm diam. Ascospores are hyaline, ovate, 2-celled, one

cell distinctly larger than the other, constricted at the septum, measuring 13–15 × 6–7.5 µm. The asexual morph is unknown. Molecular data (ITS, LSU rDNA) support the placement of *Fabrella* within Leotiomycetes, but further sampling and sequencing are required to resolve its relationships with other genera in Hemiphacidiaceae. Type – USA, New Hampshire, on needles of *Tsuga canadensis* (recorded as *Abies canadensis*), Aug. 1882, W.G. Farlow (FH 89501, FH, holotype).

Fabrella tsugae (Farl.) Kirschst., Hedwigia 90: 90 (1941) Figure 3.19

≡ *Stictis tsugae* Farl. 1883

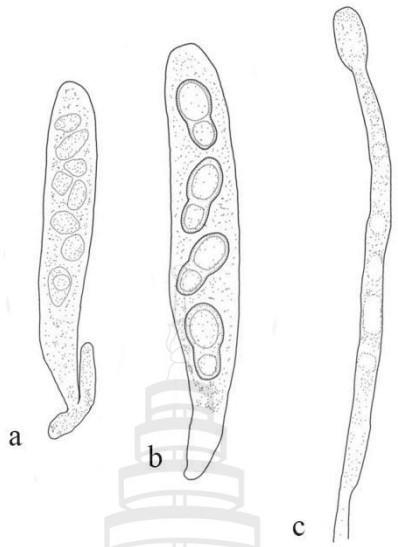
Index Fungorum number: IF286440; Facesoffungi number: FoF 18236

Description – Hypophyllous, scattered, disk minute, circular, dark brown, raised above the epidermis, which is ruptured and turned to one side. Asci oblong, 55–65 × 11–12 µm, 8-spored. Paraphyses straight, filiform, clavate and brown at the tip, about 3 µm in diameter. Ascospores white, ovate, two-celled, one cell being much larger than the other, constricted at the septum, 13–15 × 6–7.5 µm (Farlow, 1883)..

Material considered – Farlow (1883); Kirschstein (1941).

Distribution, ecological and economical importance

Fabrella tsugae is a pathogenic fungus infecting needles of *Tsuga* spp., causing needle blight characterized by browning and premature shedding. Fruiting bodies develop hypophyllously, often on the lower branches. The species was first described from New Hampshire, USA, and has been subsequently reported from parts of North America, Europe, and Asia. It is primarily associated with *Tsuga canadensis*, though related *Tsuga* species may also be susceptible. The severity of infection is often influenced by environmental stresses on the host.



Source Redrawn from Bladmineerders.nl (2022)

Note a, b Asci. c Paraphyses. Scale bars: Original photo no scale bars.

Figure 3.19 *Fabrella tsugae*

Heyderia Link, Handb. Erk. Gew. 3: 311 (1833)

Index Fungorum number: IF851573; Facesoffungi number: FoF 18237, 4 morphological species (Species Fungorum, 2025), 2 species with molecular data.

Endophytic and saprobic. Sexual morph: see Delivorias and Gonou-Zagou (2010). Asexual morph: Unknown.

Type species – *Heyderia abietis* (Fr.) Link

Notes – *Heyderia* was introduced by Link (1833) based on *Mitrula abietis* Fr. (1821), which Fries originally placed in *Mitrula* subgen. *Heyderia* together with *M. pusilla* (Fries, 1821; Malaval, 1989). The genus is characterised by small, stipitate apothecia with a distinct fertile head atop a slender stipe. In *H. abietis*, apothecia are typically 1–2 mm wide, cylindrical to campanulate, yellow to orange, and glabrous, with a reddish-brown to dark stipe often finely pruinose (Delivorias & Gonou-Zagou, 2010). However, colour and stipe ornamentation may vary among species such as *H. cucullata* and *H. pusilla* (Kohn, 1989). Asci are clavate to cylindrical, eight-spored, with an amyloid apical pore turning blue in Melzer's reagent. Ascospores are fusiform-cylindrical, hyaline, smooth, aseptate, containing multiple small oil droplets. Paraphyses are septate, cylindrical with blunt apices, sometimes exceeding the asci in

length (Delivorias & Gonou-Zagou, 2010). Molecular phylogenetic studies using ITS and LSU rDNA place *Heyderia* in Hemiphacidiaceae (sensu Wang et al., 2006), closely allied to other needle-blight fungi in Helotiales. Only two species currently have sequence data available, and broader taxon sampling is needed to clarify infrageneric relationships.

Type specimen – Collected on fallen needles of *Abies* spp. (fir), origin Greece: Mt Parnitha, Attiki, on a dead needle of *Abies cephalonica*, 22 Nov. 2009, coll. Delivorias, herb. ATHU-M 6351 (designated by Delivorias & Gonou-Zagou, 2010), serving as a contemporary reference specimen. The original material by Fries is presumed housed in herb. UPS, though no herbarium number is preserved.

Heyderia abietis (Fr.) Link, Handb. Erk. Gew. 3: 312 (1833) Figure 3.20

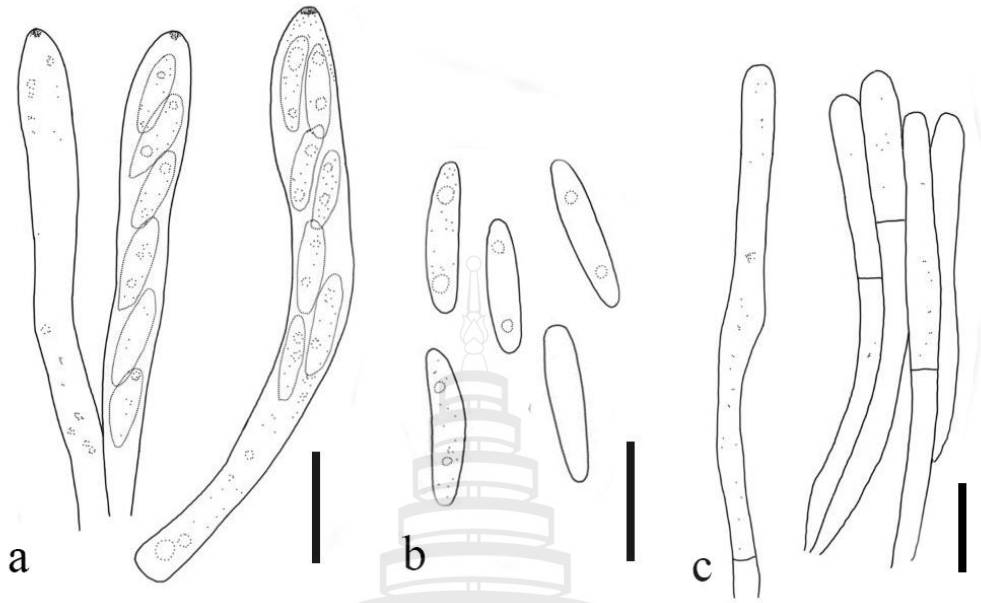
Index Fungorum number: IF118651; Facesoffungi number: FoF 18238

Description – Delivorias and Gonou-Zagou (2010).

Material considered – Delivorias and Gonou-Zagou (2010).

Distribution, ecological and economical importance

Species of *Heyderia* function as endophytes in living conifer needles and later as saprobes on fallen needles, contributing to needle decomposition in temperate coniferous forests. They are reported mainly from Europe (Fries, 1821; Delivorias & Gonou-Zagou, 2010), North America (Wang et al., 2006), and parts of Asia, in association with *Abies*, *Picea*, and *Pinus*. Fruiting typically occurs on fallen needles in moist forest litter, often in late autumn to early winter.



Source Redrawn from Delivorias and Gonou-Zagou (2010)

Note a Asci. b Ascospores. c Paraphyses. Scale bars: a–c = 10 µm.

Figure 3.20 *Heyderia abietis*

Hymenobolus Durieu & Mont., Annls Sci. Nat., Bot., sér. 3 4: 359 (1845)

Index Fungorum number: IF2414; Facesoffungi number: FoF 18239, 2 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Endophytic and pathogenic colonizes the leaves through wounds. Sexual morph: see Ribes et al. (2021). Asexual morph: Unknown.

Type species – *Hymenobolus agaves* Durieu & Mont.

Notes – *Hymenobolus* was introduced by Durieu and Montagne (1845) with *H. agaves* as the type species. It is characterised by erumpent, cupulate apothecia that are initially closed and later open with a stellate aperture. The apothecia are leathery, brownish-black, and 2–4 mm in diameter. The hymenium is blackish-pruinose when young and smooth at maturity, disintegrating as the asci develop, which makes them difficult to observe in old material. Asci are cylindrical, eight-spored, (120–)135–160 × 8–9 µm, with a rounded to obtuse apex. Ascospores are oblong-ellipsoid, aseptate, hyaline when young, turning blackish-brown at maturity, particularly at the poles, (15–) 16–20 × 7–9 µm, often with 1–2 large guttules. Paraphyses are filiform. The ectal excipulum comprises two layers: an outer layer of yellowish, waxy, encrusted hyphae,

and an inner brownish layer of *textura prismatica* to *textura angularis*. No fresh collections are currently available, and there are no ITS or LSU sequences for *Hymenobolus*; its placement in Cenangiaceae (Helotiales, Leotiomycetes) is based solely on morphological features (Ribes et al., 2021).

Type specimen – Algeria, on leaf bases of *Agave americana*, leg. M.C. Durieu; original material Montagne MC4796 and MC4797, PC herbarium (Paris), designated by Durieu and Montagne (1845) and cited in Ribes et al. (2021).

Hymenobolus agaves Durieu & Mont., Annls Sci. Nat., Bot., sér. 3 4: 360 (1845) Figure 3.21

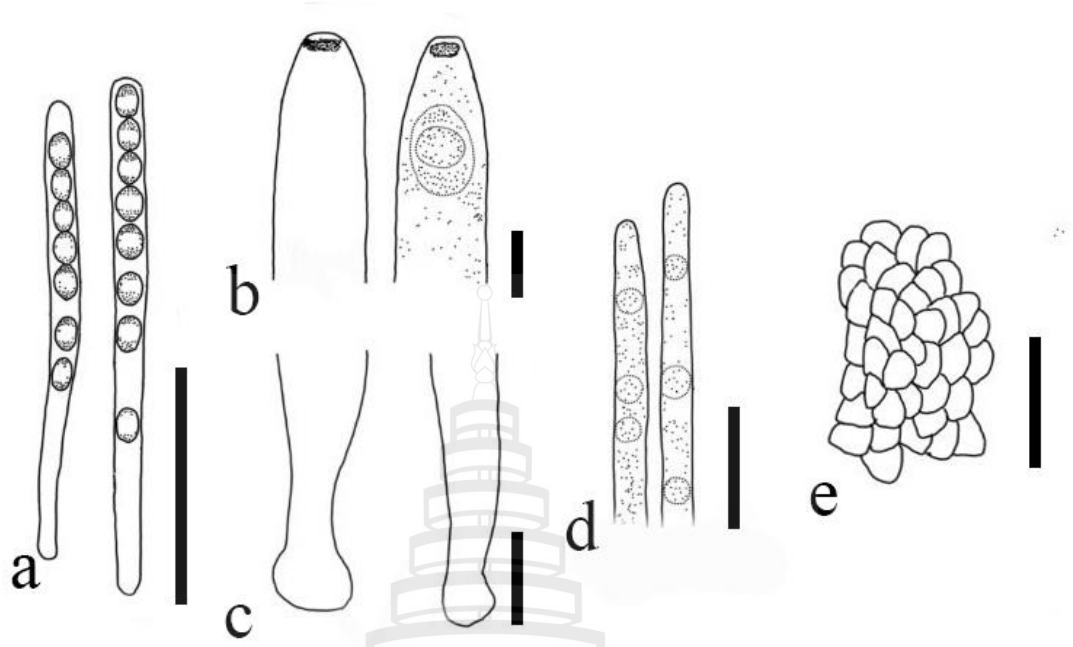
Index Fungorum number: IF184825; Facesoffungi number: FoF 18240

Description – Ribes et al. (2021).

Material considered – Ribes et al. (2021).

Distribution, ecological and economical importance

Hymenobolus agaves is a pathogenic and endophytic fungus associated with *Agave americana*, typically colonizing wounded leaf tissue. It causes necrosis and decay in leaf bases, forming erumpent ascomata in areas where moisture and debris accumulate. It has been recorded in southern Europe and North Africa, especially in the Mediterranean region (Ribes et al., 2021). No reports exist from the native range of *A. americana* in North and Central America.



Source Redrawn from Ribes et al. (2021)

Note a Collapsed asci with mature uniseriate ascospores. b Ascus apical rings in IKI. c Ascus base with croziers. d Paraphyses. e Ectal excipulum. Scale bars: a, e = 100 µm; b, c = 10 µm; d = 20 .

Figure 3.21 *Hymenobolus agaves*

Mycosphaerangium Verkley, Stud. Mycol. 44: 156 (1999)

Index Fungorum number: IF29366; Facesoffungi number: FoF 18241, 4 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Parasitic or necrotrophic remains unresolved. Sexual morph: see Voglmayr et al., (2020). Asexual morph: see Voglmayr et al. (2020).

Type species – *Mycosphaerangium tetrasporum* (Ellis) Verkley

Notes – *Mycosphaerangium* was introduced by Verkley (1999) with *M. tetrasporum* as the type species, based on *Dermatea tetraspora* Ellis (1876).

Ellis (1876) described the fungus as having erumpent, nearly sessile apothecia, solitary or slightly gregarious, about 1 line (≈ 2.1 mm) in diameter, flat or slightly concave, dark brown, roughened, with a thin, lighter margin. The asci are relatively short, clavate-cylindrical, eight-spored in *M. tetrasporum* but with only four ascospores developing to maturity, each ovoid to broadly ellipsoid, 20–25 × 15–20 µm, initially subhyaline with granular contents, becoming clear dark brown with age, and mostly

containing a single large central nucleus. Ascospores are thick-walled, smooth to minutely verrucose, and surrounded by a hyaline, gelatinous sheath. Paraphyses are filiform. The ectal excipulum is composed of *textura angularis* with an outer brownish layer. Modern observations (Voglmayr et al., 2020) show that apothecia develop on bark, often in association with *Coryneum* conidiomata. The asexual morph is acervular, with subperidermal conidiomata producing unicellular, dark brown, globose to ellipsoid conidia, each enclosed in a gelatinous sheath. Conidiogenous cells are percurrent, cylindrical to filiform, hyaline to yellowish-brown, with a single annellation. Molecular data available for *Mycosphaerangium* include LSU, ITS, SSU, *RPB1*, *RPB2*, and *TEF1* sequences (Voglmayr et al., 2020), which confirm its placement within Cenangiaceae (Helotiales, Leotiomycetes).

Type – Lectotype (designated by Voglmayr et al., 2020) from the original *Dermatea tetraspora* Ellis collection, on dead corticated branch of *Quercus coccinea*, March, collected in New Jersey, USA; preserved at GZU (GZU 000335639), with isotypes at WU and FH.

Mycosphaerangium tetrasporum (Ellis) Verkley, Stud. Mycol. 44: 156 (1999)

≡ *Dermatea tetraspora* Ellis, *Amer. Nat.* 10: 224 (1876). Figure 3.22

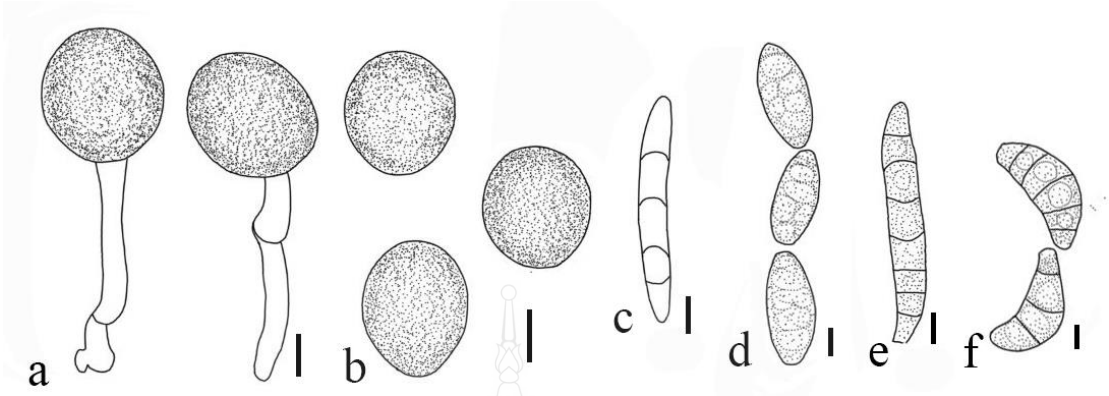
Index Fungorum number: IF460820; Facesoffungi number: FoF 18242

Description – See Ellis (1876); Voglmayr et al. (2020).

Material considered – Voglmayr et al. (2020).

Distribution, ecological and economical importance

Mycosphaerangium is a fungicolous fungus, frequently found on *Coryneum* conidiomata on dead corticated branches of *Quercus* and *Tilia*. Its ecological role is uncertain, possibly saprobic or weakly parasitic, interacting primarily with other fungi rather than directly with plant tissue. It has been reported from North America and Europe, particularly in Austria, Greece, Italy, and Spain.



Source Redrawn from Voglmayr et al. (2020)

Note a Mature conidia on conidiogenous cells. b Conidia. c, d ascospores. e, f conidia. Scale bars: a–f = 10 μm.

Figure 3.22 *Mycosphaerangium tetrasporum*

Neomelanconium Petr., Annls mycol. 38(2/4): 208 (1940)

Index Fungorum number: IF9103; Facesoffungi number: FoF 01543, 2 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on dead corticated branches of various host plants. Sexual morph: Unknown. Asexual morph: see Voglmayr et al. (2020).

Type species – *Neomelanconium gelatosporum* (H. Zimm.) Petr.

Notes – *Neomelanconium* was introduced by Petrak (1940) with *N. gelatosporum* as the type species. Conidiomata are incomplete pycnidia, developing mainly from a basal microparenchymatous layer, often indistinctly or rarely distinctly pale-colored cellulosic, covered only by a peridermal layer that eventually ruptures irregularly. Conidia are broadly ellipsoid to ovoid, rarely subglobose, continuous, dark brown to blackish-brown, enclosed in a hyaline gelatinous sheath, and measure 28 × 18 μm. Conidiophores are cylindrical to clavate, simple, and cover the entire surface of the basal layer. The asexual morph produces acervular conidiomata under the periderm, with conidiophores arising from a fully chambered to lobulate basal layer composed of small-celled subhyaline to pale-colored tissue. Molecular data (nuSSU, ITS, LSU, *RPB1*, *RPB2*, *TEF1*) place *Neomelanconium* within Cenangiaceae (Helotiales, Leotiomycetes) (Voglmayr et al., 2020). *Neomelanconium* is morphologically close to *Melanconiopsis*, *Macrodiplodia*, and *Prosthemium*, but differs in its combination of

dark brown verruculose conidia with a persistent gelatinous sheath and complete basal tissue coverage by conidiophores.

Type specimen – *Melanconium gelatosporum* H. Zimm., on *Tilia* sp., collected in Germany, preserved in NY herbarium (NY 02792207, lectotype designated by Voglmayr et al., 2020 for *Sphaerangium tiliae = N. gelatosporum*), with isotypes at WU and FH.

Neomelanconium gelatosporum (H. Zimm.) Petr., Annls mycol. 38(2/4): 209 (1940)

= *Melanconium gelatosporum* H. Zimm., in Strasser, Verh. nat. Ver. Brünn 52: 111 (1913) Figure 3.23

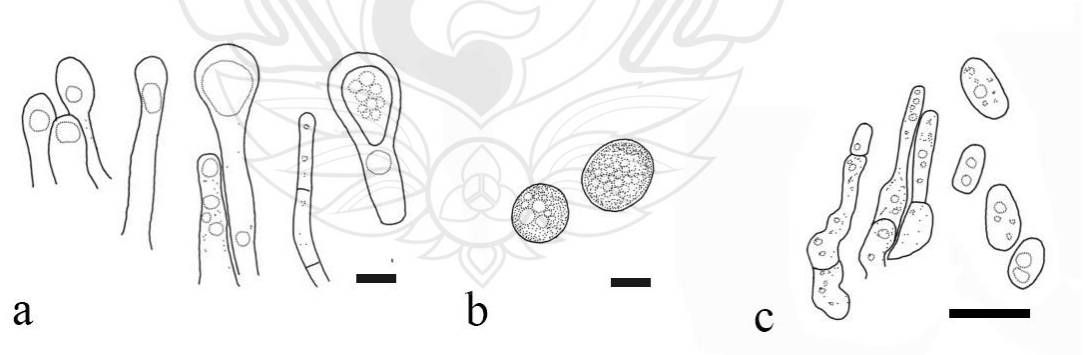
Index Fungorum number: IF288783; Facesoffungi number: FoF 18243

Description – Voglmayr et al. (2020).

Material considered – Voglmayr et al. (2020).

Distribution, ecological and economical importance

Neomelanconium is saprobic on dead corticated branches of deciduous trees, particularly *Tilia* and *Quercus*. It is associated with the breakdown of bark and cortical tissues, facilitating nutrient cycling in temperate forests. The genus has been recorded from several European countries, including Austria, Germany, Greece, Italy, and Spain (Voglmayr et al., 2020). No confirmed records exist outside Europe, and its known distribution appears to be restricted to temperate regions.



Source Redrawn from Crous et al. (2020)

Note a Conidiogenous cells producing macroconidia. b Macroconidia. c Conidiogenous cells producing microconidia. Scale bars: a–c = 10 µm.

Figure 3.23 *Neomelanconium gelatosporum*

Rhabdocline Syd., in Sydow & Petrak, Annls mycol. 20(3/4): 194 (1922)

Index Fungorum number: IF4681; Facesoffungi number: FoF07572, 8 morphological species (Species Fungorum 2025), 3 species with molecular data.

Obligate biotrophic on the host tissues, causing *Rhabdocline* needle cast disease. Sexual morph: see Parker and Reid (1969). Asexual morph: see Sherwood-Pike et al. (1986) and Gernand et al. (1997).

Type species – *Rhabdocline pseudotsugae* Syd.

Notes – *Rhabdocline* was introduced by Sydow and Petrak (1922), with *R. pseudotsugae* as the type species. Members of the genus are obligate biotrophic pathogens of conifers, particularly *Pseudotsuga*, and are well known as the causal agents of Rhabdocline needle cast disease. Apothecia are subepidermal, usually hypophyllous, irregularly circular to elongate or band-like, becoming erumpent as they rupture the epidermis. The hymenium is slightly convex, orange to red-brown, and apothecia lack a distinct margin. Asci are clavate, eight-spored, with or without a distinct apical pore; in some species the pore stains blue in Melzer's reagent, while in others no reaction occurs. Ascospores are hyaline and aseptate when young, becoming two-celled at maturity, with one cell dark brown and finely pitted, the other hyaline or subhyaline. Paraphyses are septate, simple to branched, sometimes with swollen apices, and often surrounded by a mucilaginous layer. The asexual morph (*Rhabdogloeum*) forms acervuli producing hyaline conidia with a filiform distal appendage (Parker & Reid, 1969; Sherwood-Pike et al., 1986; Gernandt et al., 1997). Molecular data (ITS, LSU rDNA) support the placement of *Rhabdocline* within Hemiphacidiaceae (Helotiales, Leotiomycetes).

Recent phylogenetic analyses (Koukol et al., 2024) revealed that *Sarcotrochila alpina*, the former type of *Sarcotrochila*, is conspecific with *Rhabdocline laricis*, and was therefore transferred to *Rhabdocline* as *R. alpina* (Figure 3.24). To maintain nomenclatural stability, *Rhabdocline* has been proposed for conservation against *Sarcotrochila*.

Type – USA, Idaho, Priest River, on *Pseudotsuga menziesii*, 20 May 1915, J.R. Weir (No. 9167) (BPI, Herb. Weir; lectotype designated by Parker & Reid 1969).

Rhabdocline pseudotsugae Syd., Annls mycol. 20(3/4): 194 (1922)

Index Fungorum number: IF275484; Facesoffungi number: FoF 18244

Description – Parker and Reid (1969), Sherwood-Pike et al. (1986) and Gernand et al. (1997).

Material considered – Parker and Reid (1969), Sherwood-Pike et al. (1986) and Gernand et al. (1997)

Rhabdocline alpina (Fuckel) Koukol, in Koukol, Lukáčová & Baral 2024 ≡ *Sarcotrochila alpina* (Fuckel) Höhn., Sber. Akad. Wiss. Wien, Math.-naturw. Kl., Abt. 1 126(4-5): 310 (1917) Figure 3.24

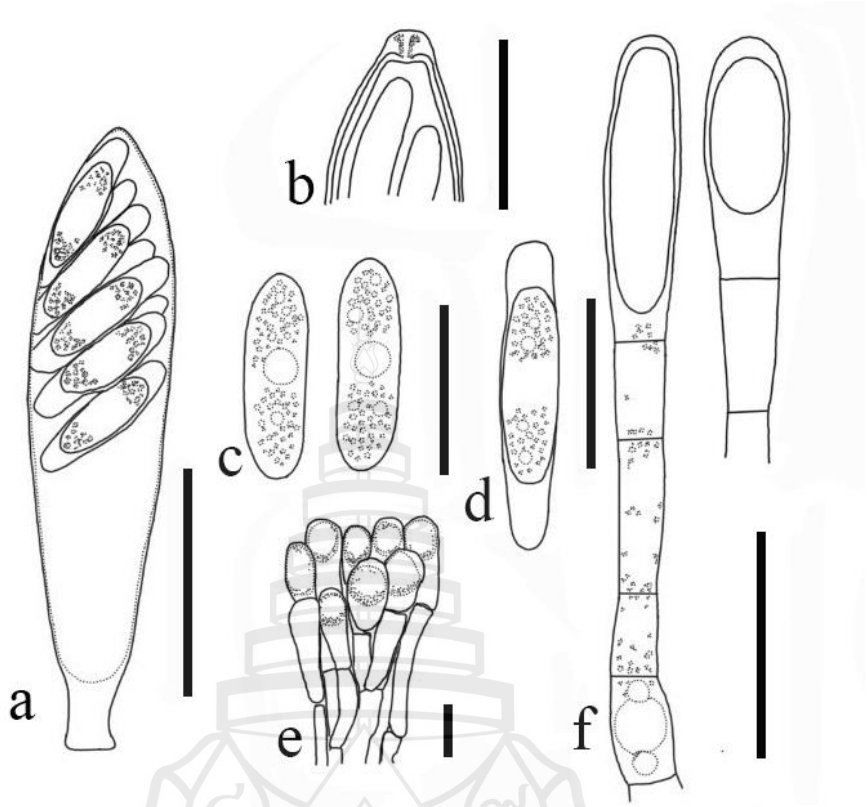
Index Fungorum number: IF118684; Facesoffungi number: FoF 18245

Description – see Koukol et al. (2024).

Material considered – Koukol et al. (2024).

Distribution, ecological and economical importance

Rhabdocline is an obligate biotrophic pathogen of Douglas fir (*Pseudotsuga menziesii*), causing Rhabdocline needle cast disease. Infection occurs in spring when ascospores are released and dispersed by wind or rain, primarily targeting young needles. The disease results in chlorosis, necrosis, and premature needle drop, leading to reduced tree growth and commercial value. The fungus is recorded from North America and Europe, particularly in regions with cool, moist climates that favour spore dispersal and infection, and is found in natural forests, plantations, and nurseries.



Source Redrawn from Koukol et al. (2024)

Note a Mature ascus. b Apex of mature ascus showing euamyloid apical ring. c Ascospores after ejection, lacking gelatinous sheath, with a visible central nucleus.. d Ascospore inside ascus, with gelatinous sheath. e Marginal excipular cells with ochraceous vacuolar bodies in the apical cells. f Paraphyses. Scale bars: a, f = 20 µm, b–e = 10 µm.

Figure 3.24 – *Rhabdocline alpina*

Sarcotrochila Höhn., Sber. Akad. Wiss. Wien, Math.-naturw. Kl., Abt. 1 126(4-5): 309 (1917)

Index Fungorum number: IF4862; Facesoffungi number: FoF 18246, 6 morphological species (Species Fungorum, 2025), 2 species with molecular data.

Saprobic on fallen or dead needles of conifers (Pinaceae). Sexual morph: see Koukol et al. (2024). Asexual morph: see Koukol et al. (2024).

Type species – *Sarcotrochila alpina* (Fuckel) Höhn.

Notes – Sarcotrochila was introduced by Höhnel (1917) with *S. alpina* as the type species. However, molecular analyses (ITS, LSU, *RPB2*) confirmed that *S. alpina* is

conspecific with *Rhabdocline laricis* and was transferred to *Rhabdocline* as *R. alpina* (Koukol et al., 2024). As a consequence, *Sarcotrochila* lost its type species, and its taxonomic status is unresolved. Other species such as *S. macrospora* and *S. longispora* are phylogenetically distant from *Rhabdocline* and may belong to *Hemiphacidium*. At present, *Sarcotrochila* is treated as a doubtful genus pending revision.

Type – Melanconium gelatosporum H. Zimm. on *Larix decidua* needles, St. Moritz, Switzerland (Fuckel's original material, 1875; typified as *Sarcotrochila alpina* by Höhnel, 1917). Lectotype re-examined by Koukol et al. (2024) and confirmed as conspecific with *Rhabdocline laricis*; material deposited in BPI (Herb. Weir collection).

Distribution, ecological and economical importance

Saprobic on fallen needles of *Larix* spp., occasionally demonstrating pathogenic anamorphs. Recorded in Europe (Austria, Czech Republic, France, Germany, Luxembourg, Switzerland, the UK) and North America. Especially prevalent in montane and subalpine coniferous forests, often appearing after needle senescence and contributing to litter decomposition and nutrient cycling.

Trochila Fr., Summa veg. Scand., Sectio Post. (Stockholm): 367 (1849)

Index Fungorum number: IF5612; Facesoffungi number: FoF 18247, 35 morphological species (Species Fungorum, 2025), 5 species with molecular data.

Saprobic on dead leaves and branches of both herbaceous plants and trees. Sexual morph: see Gómez-Zapata et al. (2021). Asexual morph: see Gómez-Zapata et al. (2021).

Type species – *Trochila craterium* (DC.) Fr.

Notes – *Trochila* is characterised by inoperculate, embedded apothecia developing on leaves of various hosts, including *Ilex*, *Hedera*, and *Prunus*. The covering layer of host tissue opens by a lid or irregular lobes to expose yellowish to greyish discs. Asci are 8-spored, and ascospores are ellipsoid, aseptate, and hyaline. Phylogenetic analyses place *Trochila* in Cenangiaceae (Leotiomycetes, Helotiales) (Gómez-Zapata et al., 2021). More collections and molecular data are required to resolve species boundaries and evaluate intrageneric relationships. Molecular markers available for *Trochila* include ITS, LSU, SSU, *RPB1*, *RPB2*, and *TEF-1* (Gómez-Zapata et al., 2021). The type specimen of *T. craterium* was collected from *Ilex aquifolium* in France and is deposited in the Uppsala University Herbarium (UPS).

Trochila craterium (DC.) Fr., Summa veg. Scand., Sectio Post. (Stockholm): 367 (1849) Figure 3.25

Index Fungorum number: IF176631; Facesoffungi number: FoF 18248

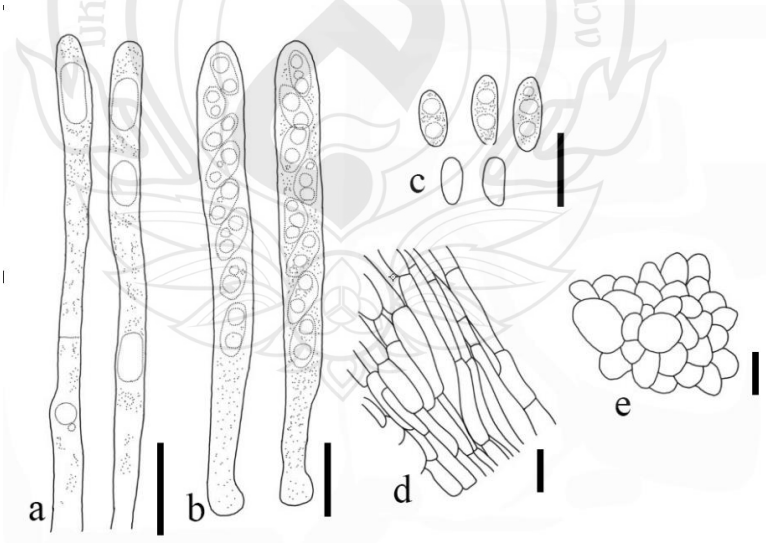
Description – Dimitrova (1997), Stoykov (2019).

Material considered – Dimitrova (1997), Stoykov (2019).

Distribution, ecological and economical importance

Species of *Trochila* occur on a wide range of host plants, from herbaceous to woody species, often on leaves, stems, and other plant parts. Reported hosts include *Andromeda polifolia*, *Astragalus glycyphyllos*, *Carex rigida*, *Asclepias syriaca*, *Lardizabala biternata*, *Cypripedium*, *Phormium*, *Conioselinum*, *Hedera helix*, *Nardus strictus*, *Lapageria rosea*, *Juncus compressus*, *Fagus sylvatica*, *Galium mollugo*, *Olea europaea*, *Vaccinium oxycoccos*, *Hippophae rhamnoides*, *Persea lingue*, *Plantago major*, *Juniperus sabina*, *Ailanthus glandulosa*, *Solidago virgaurea*, *Symplocos japonica*, *Tamus communis*, *Nothofagus dombeyi*, *Ficus maxima*, *Viburnum opulus*, *Drimys winteri*, among others.

The genus is cosmopolitan in temperate regions and has been reported from Sweden, Germany, Iceland, the USA, Chile, China, New Zealand, Norway, France, Belgium, Italy, Luxembourg, Greenland, Trinidad and Tobago, the UK, Finland, Argentina, and Japan.



Source Redrawn from Gómez-Zapata et al. (2021)

Note a Paraphyses. b Asci. c Ascospores. d cells at the base. e cells at the upper and lower flank. Scale bars: a–e = 10 μm.

Figure 3.25 *Trochila craterium*

Velutarina Korf, Phytologia 21(4): 201 (1971)

Index Fungorum number: IF5715; Facesoffungi number: FoF 18249, 3 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on decaying wood, branches, and fern rachises. Sexual morph: see Quijada et al. (2017). Asexual morph: Unknown.

Type species – *Velutarina rufo-olivacea* (Alb. & Schwein.) Korf

Notes – *Velutarina* was introduced by Korf (1971) with *V. rufoolivacea* as the type species. The genus is characterised by cupulate or discoid apothecia, scattered to subgregarious, with discs light olive-brown to medium yellow-brown. The margin is entire to slightly crenulate, sometimes with protruding hyphae-like hairs. Asci are cylindric-clavate, 8-spored, arising from simple septa. Ascospores are ellipsoid, subcylindric, or fusiform, straight to slightly inequilateral, aseptate, hyaline, and thin-walled. Paraphyses are uninflated, cylindric to slightly capitate, and 3–4-septate, with terminal cells containing greyish yellow droplets. The ectal excipulum consists of textura oblita at the base, transitioning to *textura prismatica* or *textura porrecta* at the margin and upper flanks, with deep yellow-brown to deep greyish yellow pigmentation (Korf 1971; Quijada et al., 2017). Molecular markers available for *Velutarina* include LSU and ITS sequence data.

Holotype – USA. New York: Tompkins County, Ellis Hollow, on decorticated wood of *Acer saccharum*, 1895, G.W. Clinton (CUP-33705, holotype; ex-type culture unavailable).

Velutarina rufo-olivacea (Alb. & Schwein.) Korf, Phytologia 21(4): 207 (1971) Figure 3.26

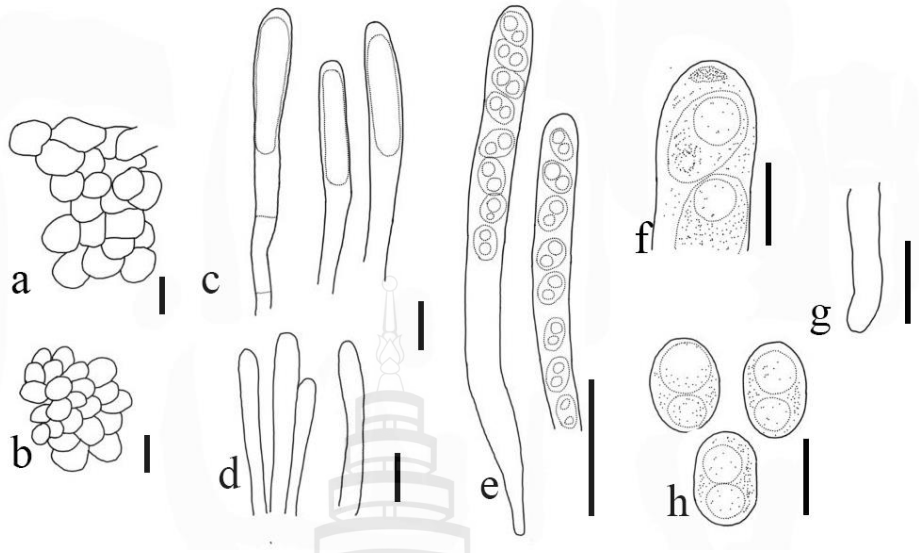
Index Fungorum number: IF472219; Facesoffungi number: FoF 18250

Description – Korf (1971), Quijada et al. (2017).

Material considered – Korf (1971), Quijada et al. (2017).

Distribution, ecological and economical importance

Velutarina species are lignicolous saprobes, decomposing dead wood and plant debris, thus contributing to nutrient cycling in forest ecosystems. They grow on decaying wood, branches, and fern rachises, mostly in humid temperate and subtropical forests. The genus has a wide distribution, with *V. rufo-olivacea* and other species recorded from Austria, Denmark, France, Germany, the United Kingdom, Canada, China, Pakistan, and New Zealand (Korf, 1971; Quijada et al., 2017).



Source Redrawn from Quijada et al. (2017)

Note a Ectal cortical cells at lower flank. b Ectal cells at inner layer. c Living paraphyses. d Dead paraphyses. e Asci. f Ascus apex. g Ascus base. h Ascospores. Scale bars: a–d, f–h = 10 µm, e = 50 µm.

Figure 3.26 *Velutarina rufo-olivacea*

Chlorociboriaceae Baral & P.R. Johnst., in Baral, Index Fungorum 225: 1 (2015)

Index Fungorum number: IF551077; Facesoffungi number: FoF 05957

Chlorociboriaceae is a family within Helotiales, with *Chlorociboria* as the type genus. The family was emended by Johnston et al. (2021) to include a second genus, *Brahmaculus*, thereby broadening its morphological spectrum. Members of the family are characterised by stipitate apothecia that are typically blue-green, olivaceous, yellow, or white, developing on decorticated wood or leaf litter. Many *Chlorociboria* species cause a distinct blue-green staining of woody substrates due to the stable secondary metabolite xylindein.

The apothecia possess a *textura intricata* to *textura prismatica* ectal excipulum, with gelatinised hyaline cells; outer layers may be encrusted with green pigments. Asci are cylindric-clavate, eight-spored, and J+ in Melzer's reagent. Ascospores are hyaline, elliptic to fusiform or allantoid, varying in size and shape among species. Paraphyses are filiform to clavate, sometimes branched or coiled. Asexual morphs are known in

some taxa, with *Dothiorina tulasnei* confirmed as the anamorph of *Chlorociboria aeruginascens* (Johnston et al., 2021; Zheng & Zhuang, 2017; Su et al., 2024).

In this study, we reconstructed a phylogenetic tree (Figure 3.27), which confirmed the placement of Chlorociboriaceae within Helotiales and supported the recognition of both *Chlorociboria* and *Brahmaculus* as distinct but closely related genera.

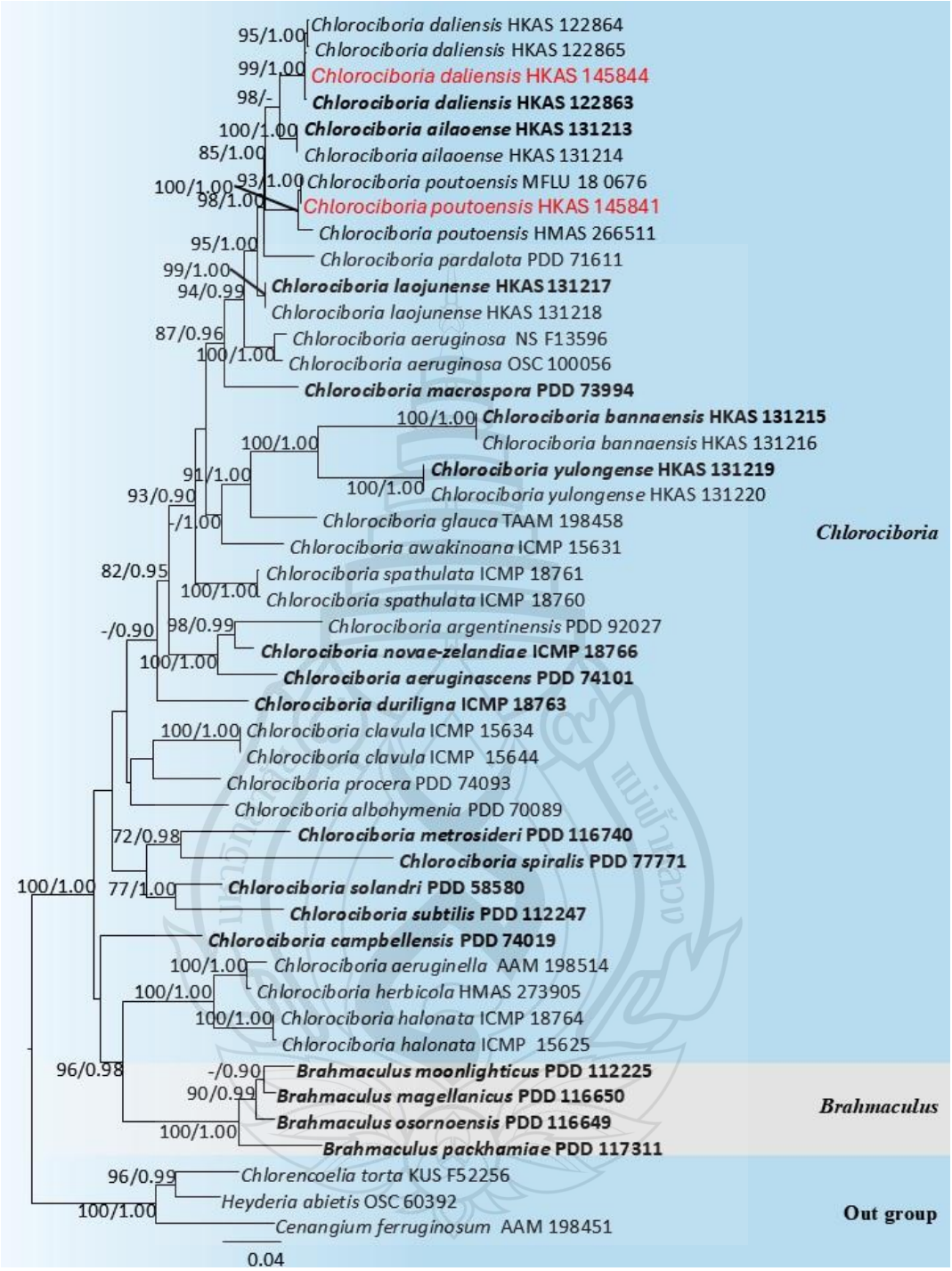


Figure 3.27 Maximum likelihood tree based on the combined ITS dataset of Chlorociboriaceae

Figure 3.27 Bootstrap support values (MLBP ≥ 70%) and Bayesian posterior probabilities (BPP ≥ 0.90) are shown at nodes as MLBP/BPP. Values below these thresholds are indicated with a hyphen ("–"). Type strains are shown in bold.

Brahmaculus P.R. Johnst., in Johnston, Park, Smith, Mujic & May, MycoKeys 80: 23 (2021)

Index Fungorum number: IF838724; Facesoffungi number: FoF 13900, 4 morphological species (Species Fungorum, 2025), 4 species with molecular data.

Saprobic on soil, moss cushions, or decomposing leaf litter in temperate to subantarctic forest habitats. Sexual morph: see Johnston et al. (2021). Asexual morph: Unknown.

Type species – *Brahmaculus moonlighticus* P.R. Johnst.

Notes –*Brahmaculus* was introduced by Johnston et al. (2021) with *Brahmaculus moonlighticus* as the type species. Species in the genus are characterised by bright yellow, stipitate apothecia, with the stipe branched near the apex, each branch terminating in a cupulate apothecial head. The receptacle and stipe are densely hairy, with straight, cylindric, thin-walled hairs encrusted with yellowish crystals. The hymenium within each cup is divided into fertile and sterile zones by fascicles of hair-like elements. Asci are 8-spored, cylindric, with a thickened apex and an amyloid pore, and arise from croziers. Ascospores are oblong-elliptic, aseptate, hyaline, and thin-walled. Molecular markers available for *Brahmaculus* include ITS, LSU, SSU, *RPB1*, *RPB2*, and *MCM7* sequence data (Johnston et al., 2021).

Holotype of *Brahmaculus moonlighticus* – CHILE. Tierra del Fuego, Isla Grande de Tierra del Fuego, Karukinka Natural Park, southern beech (*Nothofagus*) forest, 54°11′58″ S, 68°44′31″ W, elev. 68 m, on moss cushions, 18 Feb 2019, E.H.C. McKenzie, PDD 117837 (holotype) (Johnston et al., 2021).

Brahmaculus moonlighticus P.R. Johnst. , in Johnston, Park, Smith, Mujic & May, MycoKeys 80: 28 (2021) Figure 3.28

Index Fungorum number: IF838733; Facesoffungi number: FoF 13899

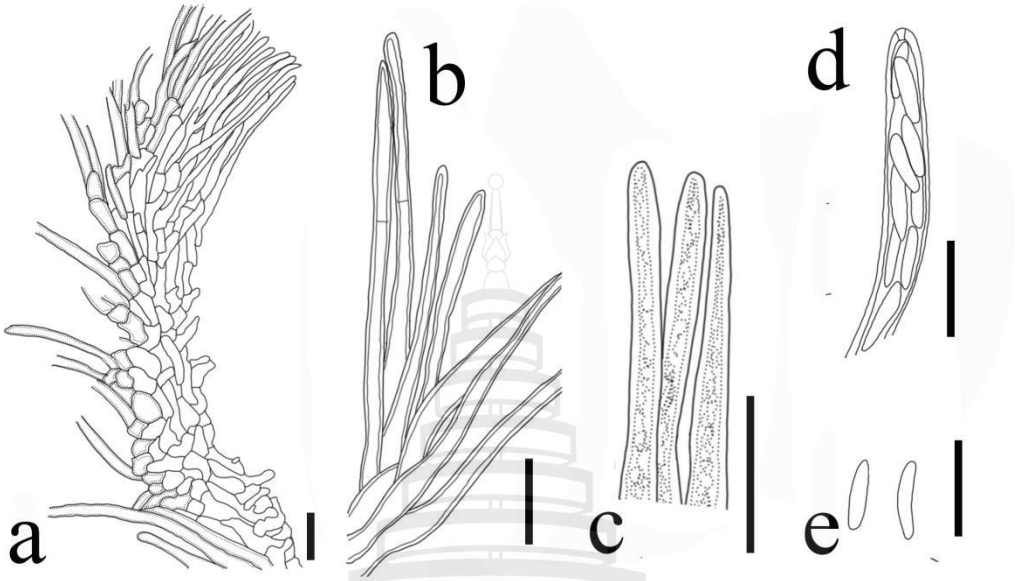
Description – see Johnston et al. (2021).

Material considered – see Johnston et al. (2021).

Distribution, ecological and economical importance

Species of *Brahmaculus* are terrestrial saprobes contributing to nutrient cycling in temperate rainforest and subantarctic ecosystems by decomposing organic matter on soil, moss cushions, or leaf litter. They are recorded from New Zealand, Chile, and

Australia, typically in humid forest environments, often associated with *Nothofagus* forest floors or moss-covered substrates.



Source Redrawn from Pertet et al. (2021)

Note a ascoma in vertical section showing excipular tissue and hairs. b hairs c paraphyses. d asci. e ascospores. Scale bar: a–e = 10μm.

Figure 3.28 *Brahmaculus moonlighticus*

Chlorociboria Seaver ex C.S. Ramamurthi, Korf & L.R. Batra, Mycologia 49(6): 857 (1958) [1957]

Index Fungorum number: IF1009; Facesoffungi number: FoF 09189, 29 morphological species (Species Fungorum, 2025), 23 species with molecular data.

Saprobic on dead wood and occasionally on herbaceous stems. Sexual morph: see Zheng and Zhuang (2017). Asexual morph: see Johnston and Park (2005).

Type species – *Chlorociboria aeruginascens* (Nyl.) Kanouse

Notes – The genus *Chlorociboria* was validated by Ramamurthi, Korf and Batra (1957) with *Chlorociboria aeruginascens* as the type species. Historically, the name *C. aeruginosa* was often used, but molecular and morphological evidence (Johnston & Park, 2005; Zheng & Zhuang, 2017) support its synonymy with *C. aeruginascens*. Species are easily recognized by their cupulate, infundibuliform, or discoid apothecia, typically stipitate and displaying blue-green to dark blue-green coloration caused by the pigment **xylindein**, which also stains the substrate wood. The ectal excipulum is

composed of angular, subglobose to elongate cells; the medullary excipulum is of interwoven hyphae. Asci are cylindric-clavate with an amyloid (J^+) apical ring, arising from croziers. Ascospores are hyaline, ellipsoid to fusiform, sometimes enclosed in a gelatinous sheath, and aseptate. Molecular markers available for *Chlorociboria* mainly include ITS and LSU, with additional loci such as SSU and *RPB2* used in some phylogenetic studies to delimit species and resolve intrageneric relationships. The genus is placed in Chlorociboriaceae (Helotiales). Lectotype of *Chlorociboria aeruginascens*: Germany, on decaying wood, Persoon material, designated by Ramamurthi et al. (1957), preserved at Botanische Staatssammlung München (M-0160976) (Zheng & Zhuang, 2017).

Chlorociboria aeruginascens (Nyl.) Kanouse, Mycologia 39(6): 641 (1948) [1947]

Index Fungorum number: IF285166; Facesoffungi number: FoF 18273

Description – see Ramamurthi et al. (1957).

Material considered – see Ramamurthi et al. (1957).

Distribution, ecological and economical importance

Chlorociboria species are lignicolous saprobes that decompose wood, contributing to nutrient cycling in forest ecosystems. The pigment xylindein is persistent and historically valued for decorative woodworking, with usage recorded since the 15th century. While most species inhabit decaying woody substrates, some (e.g. *C. herbicola*) grow on dead herbaceous stems. Colonization often follows white-rot fungi, with some species preferring soft, decayed wood and others harder substrates.

The genus has a cosmopolitan distribution, occurring in temperate and subtropical forests worldwide, with records from Europe, North America, Asia, Australasia, and South America. Notable diversity exists in New Zealand, East Asia, and parts of South America.

Chlorociboria daliensis C.J.Y. Li, K.D. Hyde & Q. Zhao, in Li, Chethana, Hyde & Zhao, Phytotaxa 554(2): 127 (2022)

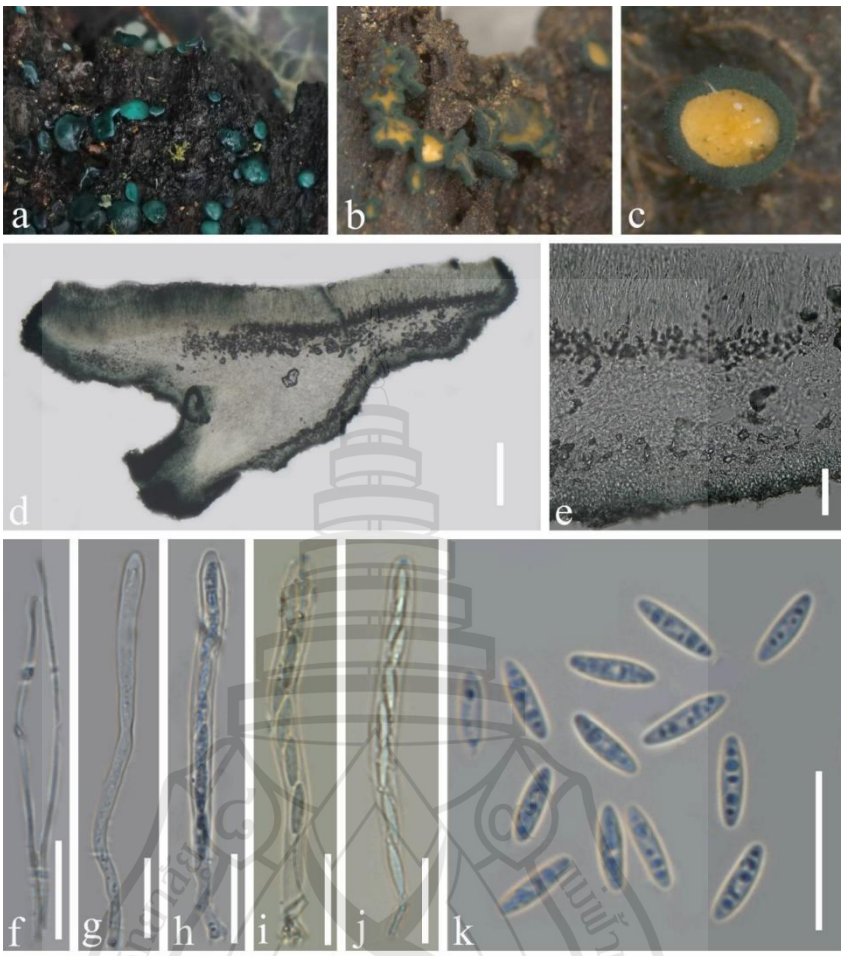
Index Fungorum number: IF559487; Facesoffungi number: FoF10695, Figure 3.29

Description. Saprobic on dead, decorticated wood. Sexual morph: Apothecia superficial, gregarious, 0.4−0.8 mm in diameter, 0.3−0.6 mm high when dry, discoid to

cupulate, short-stipitate. Disc concave, surface smooth, bluish-green or faience blue when fresh, yellowish-green when dry. Margin slightly curled inward, concolorous with the receptacle. Receptacle wider than the stipe, dark green when fresh, bluish-green when dry, glabrous. Stipe 0.1−0.3 mm in diameter, 0.2−0.4 mm long, short and broad, dark green. Hymenium 72–193 µm ($\bar{x}$ = 133 µm, n = 42) thick, concave, smooth, bluish-green when fresh, yellowish when dry. Ectal excipulum 30–55 µm ($\bar{x}$ = 46 µm, n = 31) thick, thin-walled, smooth, hyaline cells of *textura angularis* to *textura prismatica*, 2.3–5.8 µm ($\bar{x}$ = 3.9 µm, n = 60) diam. Medullary excipulum 45–92 µm ($\bar{x}$ = 76 µm, n = 31) thick, hyaline, thin-walled cells of *textura intricata*, 1.5–5.1 µm ($\bar{x}$ = 2.7 µm, n = 60) diam., non-gelatinous. Paraphyses 55–96 × 0.8–1.4 µm ($\bar{x}$ = 79 × 1.1 µm, n = 25), filiform, straight to slightly curved, septate, hyaline, smooth, with slightly obtuse apex. Asci 67.8–101.3 × 3.9–6.8 µm ($\bar{x}$ = 84.3 × 5.4 µm, n = 50), 8-spored, clavate, straight to slightly curved, inoperculate, hyaline, apex thick-walled, J+ in MLZ, with a tapering to subtruncate base. Ascospores (85/7/2) (7.8–)8.2–12.3 (–12.8) × 1.9–3.5 (–3.6) µm ($\bar{x}$ = 11.2 × 3.0 µm, n = 55), overlapping uniseriate, elongate to ellipsoidal, hyaline, slightly flattened on one side in lateral view, tapering to obtuse ends, fusiform, thin-walled, smooth, aseptate, multi-guttulate. Asexual morph: not observed.

Material examined: China, Yunnan Province, Laojun Mountain, altitude 3823 m, on the decayed unidentified wood, 24 July 2022, Le Luo, ly98 (HKAS 145844).

Notes. Phylogenetic analyses (Figure 3.27) showed that our collection ly98 (HKAS 145844) clustered with *Chlorociboria daliensis* strains (HKAS 122863, HKAS 122864, HKAS 122865) with strong support. Morphologically, it agrees well with the type description, including bluish-green to yellowish-green apothecia with a short stipe, ectal excipulum of hyaline *textura angularis* to *prismatica*, clavate asci (67.8–101.3 × 3.9–6.8 µm), and multi-guttulate fusiform ascospores (8.2–12.3 × 1.9–3.5 µm). Based on molecular and morphological evidence, our specimen is confirmed as *C. daliensis*. This represents a new collection from the type locality (Laojun Mountain, Yunnan), but not a new record for China.



Note a-c Apothecia on the host. d Cross section of an apothecium d Cross section of an apothecium e Excipular cells. f Paraphyses. g-j Asci (mounted in Meltzer agent). k Ascospores. Scale bar: d = 200, e = 50, f–k = 20 μm.

Figure 3.29 *Chlorociboria daliensis* (HKAS 145844)

Chlorociboria poutoensis P.R. Johnst., in Johnston & Park, N.Z. Jl Bot. 43(3): 709 (2005)

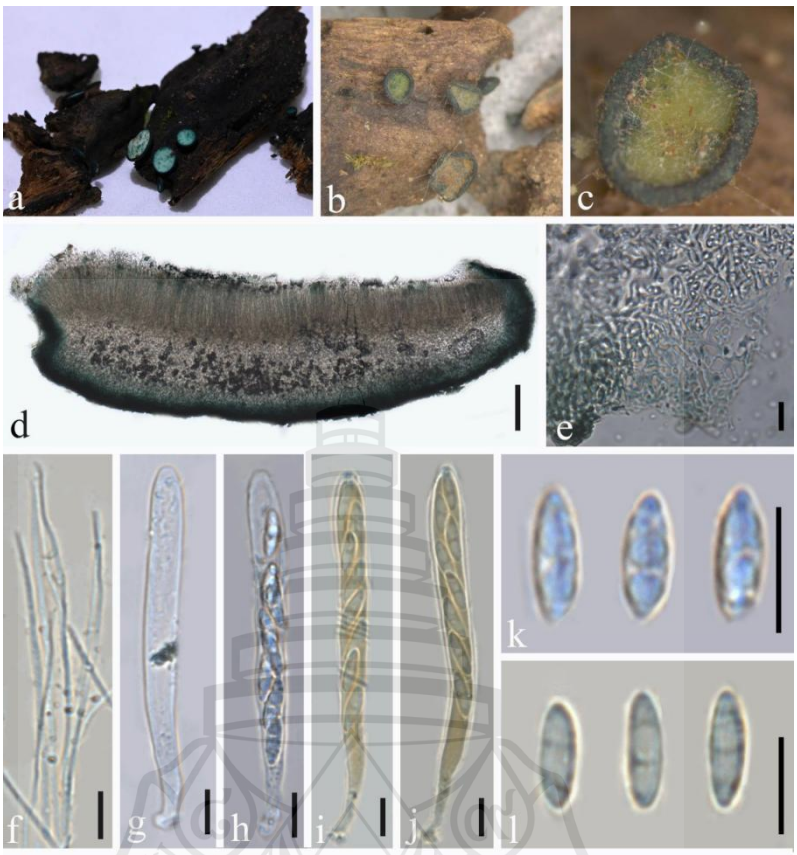
Index Fungorum number: IF356859; Facesoffungi number: FoF 05959. Figure 3.30

Description: Saprobic on decayed wood. Apothecia superficial, gregarious, 0.6–1.7 mm diam. when dry, discoid to cupulate, substipitate to sessile. Disc concave, smooth, bluish-white when fresh, turning yellowish-green when dry; margin slightly incurved, concolorous with receptacle. Receptacle pale blue-green, darker when fresh, bluish-green when dry, glabrous. Hymenium 107–145 μm thick, concave, roughened,

bluish-white when fresh, yellowish-green when dry. Ectal excipulum 33–68 µm thick, of hyaline, thin-walled *textura angularis* to *textura prismatica* cells (1.3–5.1 µm diam.); medullary excipulum 70–120 µm thick, of hyaline *textura intricata* cells (1.5–4.4 µm diam.), non-gelatinous. Paraphyses 55–115 × 0.9–2.1 µm, filiform, straight to slightly curved, aseptate, with slightly obtuse apex. Asci 83–102 × 4.4–9.8 µm, 8-spored, clavate, straight to slightly curved, inoperculate, J+ in MLZ, with thickened apex and tapering to subtruncate base. Ascospores (8.8–)9.1–11.7(–12.0) × 2.3–4.0(–4.4) µm, ellipsoidal, fusiform, hyaline, aseptate, thin-walled, smooth, with 1–2 guttules, partially biseriate, flattened on one side. Asexual morph: not observed.

Material examined: China, Yunnan Province, Xishuangbanna, Gelanghe, altitude 1755 m, on the decayed unidentified wood, 9 October 2022, Le Luo, ly777 (HKAS 145841).

Notes. Phylogenetic analyses (Figure 3.27) placed our collection ly777 (HKAS 145841) with *Chlorociboria poutoensis* strains (HKAS 266511, MFLU 18-0674) with strong support. Compared with the original description (Johnston & Park, 2005), our specimen has slightly larger apothecia (0.6–1.7 mm vs. 0.8–1.5 mm), a bluish-white disc when fresh (vs. bright yellow), somewhat thinner asci, and smaller ascospores. Moreover, ascospores are partially biseriate, while the type was described as uniseriate. These differences are regarded as intraspecific variation, possibly related to geographic origin (Yunnan, China). Morphological and molecular evidence confirm its identification as *C. poutoensis*, representing a new record for China.



Note a-c Apothecia on the host. d Cross section of an apothecium. e Excipular cells. f Paraphyses. g-j Asci (i, j mounted in Melzer's agent). k, l Ascospores. Scale bar: d = 100 μm; e–l=10 μm.

Figure 3.30 *Chlorociboria poutoensis* (HKAS 145841)

Dermateaceae Fr. [as 'Dermatei'], Summa veg. Scand., Sectio Post. (Stockholm): 345 (1849)

Index Fungorum number: IF80686; Facesoffungi number: FoF 05928

Dermateaceae was established by Fries (1849) and typified by the genus *Dermea* Fr., with *Dermea cerasi* Fr. as the type species. The holotype of *D. cerasi* is preserved in the Swedish Museum of Natural History (S), collected by Elias Fries from Sweden. Historically, the family was broadly circumscribed to include numerous genera with cupulate apothecia and pigmented excipula, such as *Mollisia*, *Pyrenopeziza*, and *Phacidium* (Nannfeldt, 1932; Groves, 1937). This broad concept was later narrowed as morphological re-evaluation and molecular phylogenetic evidence demonstrated that several genera were better assigned to other families.

Nauta and Spooner (1999) emphasised excipular structure, particularly the presence of *textura globulosa* or *textura angularis* at the base of the receptacle, as an important diagnostic feature of the family. Dermateaceae is characterised by apothecial ascomata, often dark-coloured and leathery, unitunicate inoperculate asci, and hyaline ascospores that may be aseptate or septate. The ectal excipulum typically comprises globose to angular cells, while the medullary excipulum consists of interwoven hyphae.

Recent multi-locus phylogenetic analyses (Ekanayaka et al., 2019; Iliushin & Kirtsideli, 2023; Gao et al., 2024) have confirmed Dermateaceae as a monophyletic clade within Helotiales, closely related to but distinct from Mollisiaceae and Rutstroemiaceae. ITS and LSU sequences provide family-level resolution, while *RPB2* and *TUB2* improve species delimitation and intrageneric relationships. In this study, we reconstructed a multi-gene phylogeny (Figure 3.30), which corroborates the placement of Dermateaceae and further clarifies its distinction from closely allied families.

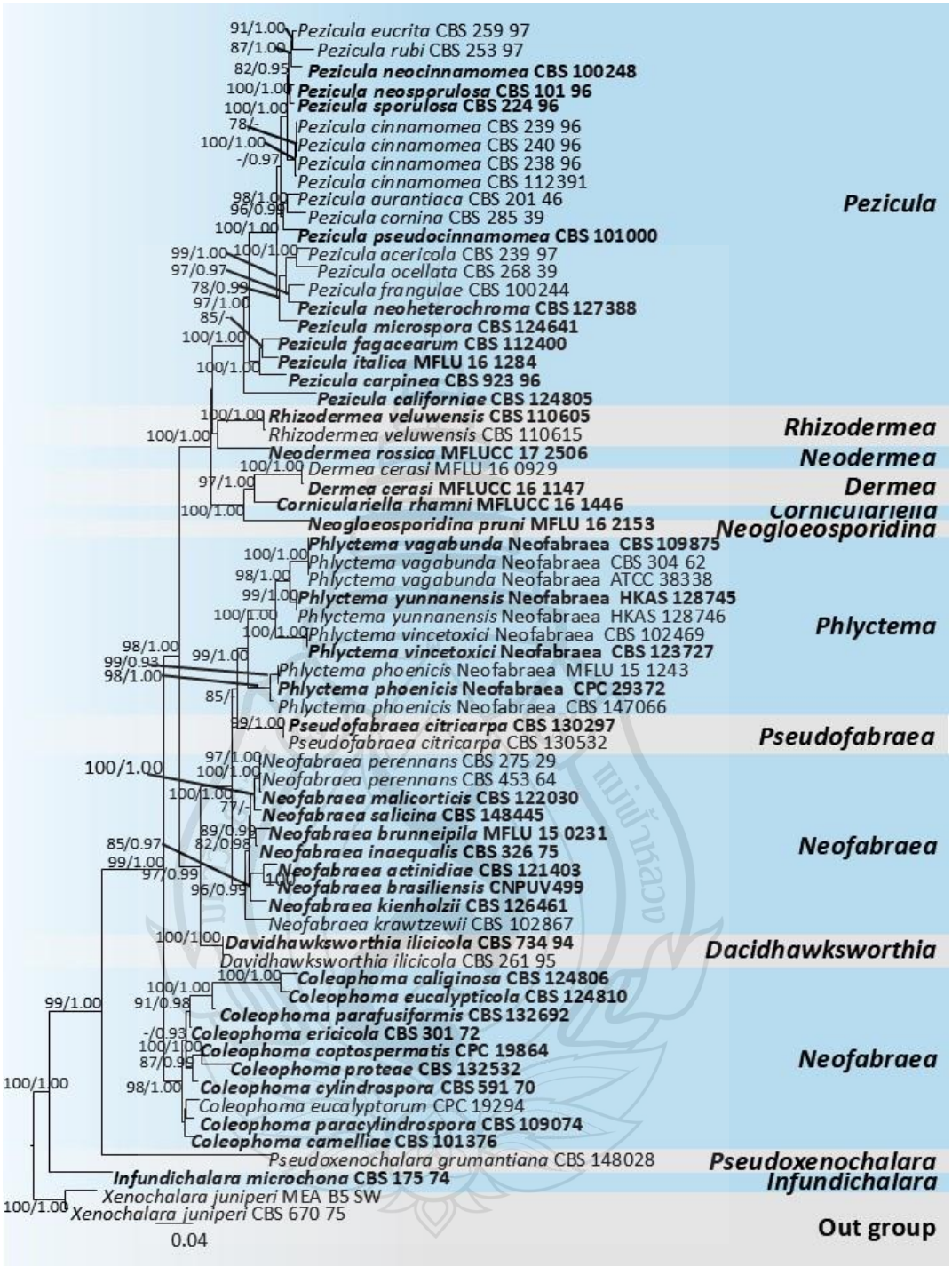


Figure 3.31 Maximum likelihood tree based on the combined ITS, LSU, *RPB*2 and *TUB* dataset of *Dermateaceae*

Figure 3.31 Bootstrap support values (MLBP ≥ 70%) and Bayesian posterior probabilities (BPP ≥ 0.90) are shown at nodes as MLBP/BPP. Values below these thresholds are indicated with a hyphen ("–"). Type strains are shown in bold.

Ascluella DiCosmo, Nag Raj & W.B. Kendr., Can. J. Bot. 61(1): 42 (1983)

Index Fungorum number: IF345; Facesoffungi number: FoF 18274, 1 morphological species (Species Fungorum, 2025), no species with molecular data.

Saprobic on leaf surfaces. Sexual morph: see DiCosmo et al. (1983). Asexual morph: Unknown.

Type species – *Ascluella symplocina* (Syd. & P. Syd.) DiCosmo

Notes – *Ascluella* was introduced by DiCosmo et al. (1983) with *A. symplocina* as the type species. It is placed in Dermateaceae (Helotiales, Leotiomycetes, Ascomycota). The genus is characterised by scattered, discrete, initially immersed, subepidermal, and ultimately erumpent black ascomata, sometimes on a short stipe; margin composed of *textura porrecta*. The hymenium contains unitunicate, inoperculate, clavate, 8-spored asci and paraphyses arising from a basal stroma of *textura intricata*. Asci are non-amyloid and dehisce by a small apical pore. Ascospores are uniseriate, subspherical to ellipsoid, hyaline, smooth-walled except for restricted areas with longitudinal striations, and embedded in a mucilaginous matrix (DiCosmo et al., 1983). Molecular sequence data are currently unavailable for this genus. The holotype of *A. symplocina* is deposited in the U.S. National Fungus Collections (BPI 841085, ex Herb. C.G. Lloyd), collected from *Symplocos tinctoria* in Alabama, USA, by C.G. Lloyd on 3 April 1909 (DiCosmo et al., 1983).

Ascluella symplocina (Syd. & P. Syd.) DiCosmo, Nag Raj & W.B. Kendr., Can. J. Bot. 61(1): 42 (1983)

Index Fungorum number: IF108646; Facesoffungi number: FoF 18275

Description – DiCosmo et al. (1983).

Material considered – DiCosmo et al. (1983).

Distribution, ecological and economical importance

Ascluella is saprobic on leaf surfaces of *Symplocos* species in temperate to subtropical regions. The type species, *A. symplocina*, occurs on fallen leaves of *S. tinctoria*, indicating a preference for decaying leaf litter in forested habitats. Its ecological role likely involves decomposition of lignocellulosic components of leaf litter, contributing to nutrient cycling. It is only reported from the southeastern United States and remains a rarely collected genus, with no additional species described to date (DiCosmo et al., 1983).

Figure – No original illustration available (DiCosmo et al., 1983).

Coleophoma Höhn., Sber. Akad. Wiss. Wien, Math. -naturw. Kl., Abt. 1 116: 637 (1907)

Index Fungorum number: IF7729; Facesoffungi number: FoF 00069, 2 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Species of *Coleophoma* exhibit diverse lifestyles, including plant pathogens, endophytes, and saprobes. Sexual morph: Crous et al. (2016). Asexual morph: see Crous et al. (2016)

Type species – *Coleophoma crateriformis* (Durieu & Mont.) Höhn.

Notes – *Coleophoma* was introduced by Höhnel (1907) with *C. crateriformis* as the type species. It is a member of Dermateaceae, order Helotiales, class Leotiomycetes, phylum Ascomycota. The genus is characterised by pycnidial, subcuticular to intraepidermal conidiomata with well-developed basal and lateral walls, and poorly developed upper walls. Conidiomata are dark, unilocular, often containing hyaline paraphyses, which may be persistent or collapsing. Conidiogenous cells are phialidic, discrete, determinate, hyaline, with prominent periclinal thickenings. Conidia are smooth-walled, hyaline, aseptate, cylindrical to ellipsoidal, guttulate, and rounded at both ends (Nag Raj, 1978; Sutton, 1980; Duan et al., 2007; Crous et al., 2016). Molecular markers available include LSU, ITS, tub2, and tef1 sequence data (Crous et al., 2016).

Historically, the classification of *Coleophoma* was inconsistent because of morphological similarity with other coelomycetous genera and the polyphyletic nature of earlier broad concepts. Initially, some species were placed in the Dothideomycetes (order Dothideales) (De Gruyter et al., 2009; Tanaka et al., 2015). Later, multigene phylogenetic analyses revealed the genus to be polyphyletic. The core *Coleophoma* sensu stricto, including the type species, was confirmed to belong to Helotiales, clustering within Dermateaceae (Crous et al., 2016). The holotype of *C. crateriformis* is preserved in WU (Herbarium of the University of Vienna), collected from *Solanum tuberosum* leaves in Austria by Höhnel in 1907.

Coleophoma crateriformis (Durieu & Mont.) Höhn., Sber. Akad. Wiss. Wien, Math. -naturw. Kl., Abt. 1 116: 637 (1907) Figure 3.32

Index Fungorum number: IF262262; Facesoffungi number: FoF 18276

Description – Crous et al. (2016).

Material considered – Crous et al. (2016).

Distribution, ecological and economical importance

Ecologically, *Coleophoma* plays roles in plant–microbe interactions as pathogens, latent endophytes, and saprobes in leaf litter ecosystems. Economically, some species have pharmaceutical relevance: *C. empetri* and *C. cylindrospora* produce echinocandin-type antifungal metabolites, industrial precursors of micafungin, a widely used antifungal drug (Kanasaki et al., 2006; Men et al., 2021). Other species are important agricultural foliar pathogens of economically significant plants.

Coleophoma species are widely distributed in temperate to subtropical regions of Europe, Asia, North and South America, and Oceania. They are commonly associated with leaves of woody angiosperms, including Proteaceae, Ericaceae, Rosaceae, and Aquifoliaceae (Bianchinotti & Rajchenberg, 2004; Crous et al., 2016).



Source Redrawn from Pedro and Johannes (2016)

Note a Conidia. Scale bars: 10 µm.

Figure 3.32 *Coleophoma crateriformis*

Cornicullariella P. Karst., Hedwigia 23(4): 57 (1884)

Index Fungorum number: IF7785; Facesoffungi number: FoF 18277, 10 morphological species (Species Fungorum, 2025), 2 species with molecular data.

Saprobic in the rhizosphere of plants. Sexual morph: see Zheng and Zhuang (2017). Asexual morph: Unknown.

Type species – *Cornicullariella abietis* P. Karst.

Notes – *Cornicullariella* was introduced by Karsten (1884) with *C. abietis* as the type species. The genus is characterised by scattered, erumpent, subcylindrical to cylindrical conidiomata, which are black, superficial to slightly immersed, and often gregarious. The conidiomatal wall is composed of closely interwoven, septate, subhyaline to dark brown hyphae, compacted toward the exterior. Conidiophores are simple or branched, hyaline, septate, smooth-walled, and arise from the inner conidiomatal wall. Conidiogenous cells are phialidic, subcylindrical to clavulate, hyaline, and smooth-walled. Conidia are blastic-phialidic, falcate to crescentic or subcylindrical, usually 1–7-septate, hyaline to subhyaline, smooth-walled, and sometimes guttulate (DiCosmo, 1978). Dimensions follow the original descriptions in DiCosmo (1978).

Molecular markers (ITS and LSU) are available for non-type species and have been used in phylogenetic analyses to place *Cornicullariella* in a clade within Helotiales, close to *Pilidium* and *Chaetomella* (DiCosmo, 1978; Oliveira et al., 2014). Molecular data for the type species are lacking, and no preserved holotype has been located; Karsten's (1884) original material was not explicitly designated as a type, and it remains unclear whether any authentic material is housed in H (University of Helsinki Herbarium).

Cornicullariella abietis P. Karst., Hedwigia 23(4): 58 (1884) Figure 3.33

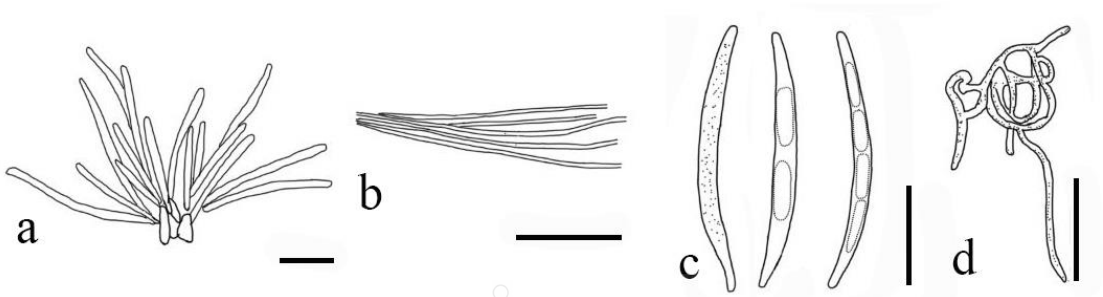
Index Fungorum number: IF431437; Facesoffungi number: FoF 18278

Description – see DiCosmo. (1978).

Material considered – see DiCosmo. (1978).

Distribution, ecological and economical importance

Cornicullariella is a saprobic genus inhabiting the rhizosphere of plants, where it likely functions in decomposing organic matter and contributing to nutrient cycling in soil ecosystems. Species occur on plant debris, bark, and soil. They have been reported from temperate and subtropical regions of North and South America, Europe, and Australia (DiCosmo, 1978; Oliveira et al., 2014).



Source Redrawn from Li et al. (2020)

Note a Conidiogenous cells and developing conidia. b Paraphyses c Conidia. d Germinating conidium. Scale bar: a, c = 20 μm; b = 10 μm; d = 100 μm.

Figure 3.33 *Cornicullariella rhamni*

Davidhawksworthia Crous, in Crous & Groenewald, Fungal Biology 120(11): 1406 (2016)

Index Fungorum number: IF816134; Facesoffungi number: FoF 18279, 2 morphological species (Species Fungorum, 2025), 2 species with molecular data.

Saprobic or weakly endophytic on living or decaying plant leaves. Sexual morph: Unknown. Asexual morph: see Crous and Groenewald (2016).

Type species – *Davidhawksworthia ilicicola* Crous.

Notes – *Davidhawksworthia* was introduced by Crous (2016) with *D. ilicicola* as the type species. It is characterised by spreading, hyaline, septate hyphae that may become pigmented and form chlamydospore-like structures. Conidiophores are dimorphic: macroconidiophores are erect with hyaline or pale brown basal portions, while microconidiophores are penicillate. Macroconidiogenous cells are hyaline, smooth, phialidic, clavate or ampulliform to doliiform, often arising from a mother cell. Macroconidia are aseptate, cylindrical with obtuse ends and a flattened hilum at the base, hyaline, smooth, and granular, usually forming cylindrical aggregates. Molecular markers available include ITS, LSU, *RPB2*, a*nd TUB2 s*equence data (Crous & Groenewald, 2016). The holotype of *D. ilicicola* is deposited in the Westerdijk Fungal Biodiversity Institute (CBS H-21865), collected from *Ilex vomitoria* in New Hanover County, North Carolina, USA, by P.W. Crous; the ex-type culture is CBS 139747 (Crous et al., 2016).

Davidhawksworthia ilicicola Crous, in Crous & Groenewald, Fungal Biology 120(11): 1406 (2016) Figure 3.34

Index Fungorum number: IF816135; Facesoffungi number: FoF 18280

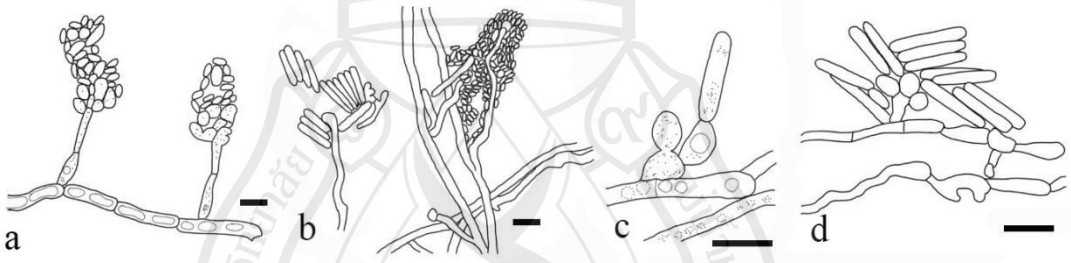
Description – see Crous and Groenewald (2016).

Material considered – see Crous and Groenewald (2016).

Distribution, ecological and economical importance

Davidhawksworthia species occur as saprobes or non-pathogenic endophytes on living or decaying leaves. They likely participate in early leaf litter decomposition and may maintain a latent presence within evergreen hosts such as *Ilex* spp.

Known records include Europe (Netherlands) and Australia, with isolations from leaf surfaces. The genus likely has a wider but under-documented distribution in temperate and subtropical regions.



Source Redrawn from Pedro and Johannes (2016)

Note a Microconidiophores and conidia. b Macro- and microconidiophores and conidia. c, d Macroconidiogenous cells and macroconidia. Scale bar: a–d = 10 μm.

Figure 3.34 *Davidhawksworthia ilicicola*

Dermea Fr., Syst. orb. veg. (Lundae): 114 (1825)

Index Fungorum number: IF1475; Facesoffungi number: FoF 07400, 23 morphological species (Species Fungorum, 2025), 16 species with molecular data.

Pathogenic infecting living tissues of various woody plants and *Saprobic* on dead plants material. Sexual morph: see Groves (1946), Mehrabi et al. (2018). Asexual morph: see Groves (1946), Mehrabi et al. (2018).

Type species – *Dermea cerasi* (Pers.) Fr.

Notes – *Dermea* is characterised by dark brown to black apothecia, and ellipsoid to fusiform, hyaline to yellowish-brown, aseptate to 3-septate ascospores. These fungi

are often associated with *Prunus* species and have been linked to diseases such as dieback in greengage plums (Jiang & Tian, 2019).

Molecular phylogenetic studies place *Dermea* within Dermateaceae, order Helotiales (Mehrabi et al., 2018). ITS, LSU, and SSU rDNA markers are available and have been used to resolve its phylogenetic position. Historically, *Dermea* was recognised mainly on morphological grounds, but recent phylogenetic analyses have confirmed its close relationships with other genera in Dermateaceae. The holotype of *D. cerasi* was collected in Sweden on *Prunus* spp., and is likely preserved in the Uppsala University herbarium (UPS), though this has not been explicitly verified in recent studies. Further taxon sampling and sequence data from additional species will help clarify the genus boundaries and diversity.

Dermea cerasi (Pers.) Fr., Syst. orb. veg. (Lundae): 115 (1825) Figure 3.35

= *Peziza cerasi* Pers., Neues Mag. Bot. 1: 115 (1794)

Index Fungorum number: IF118828; Facesoffungi number: FoF 07273

Description – Fries (1825), Groves (1946, 1951).

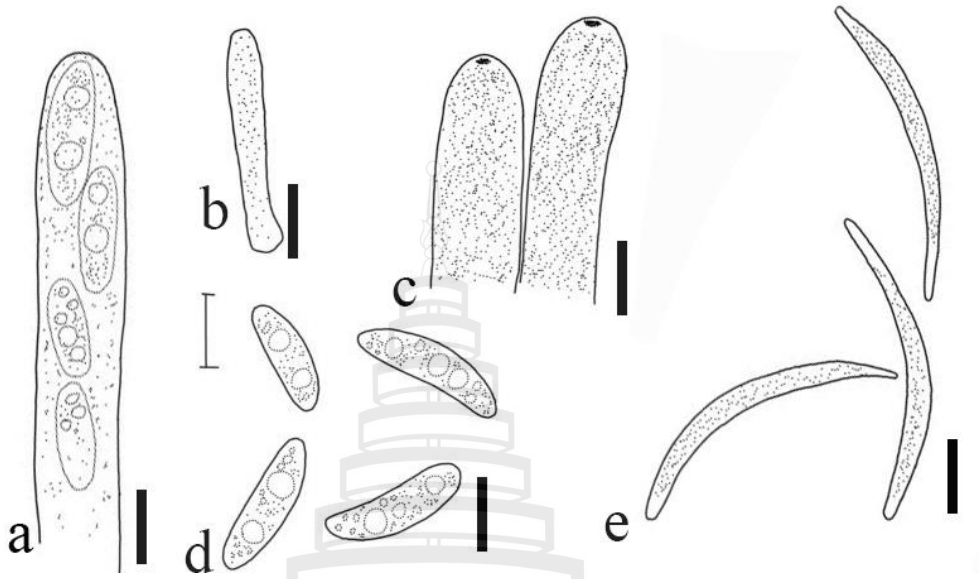
Material considered – Fries (1825), Groves (1946, 1951).

Distribution, ecological and economical importance

Dermea species are generally considered highly host-specific (Groves, 1946, 1951). The plant genus Prunus is the major host for *Dermea*, with *D. cerasi*, *D. padi*, *D. prunastri*, and *D. pruni* described from them (Groves, 1946, 1951). *Dermea* species were considered pathogenic to their hosts (Groves, 1951; Abeln et al., 2000). For example, *D. abietinum* (syn. *D. balsamea*) caused hemlock dieback (Dodge, 1932) and *D. prunastri* was considered the cause of greengage plums die-back (Dowson, 1913). However, members of *Dermea* have not been recently reported to cause serious plant diseases.

Geographically, *Dermea* species have been documented across multiple continents. In North America, they are found in the United States (including states such as New York, Iowa, Washington, North Dakota, Delaware, New Jersey, California, and Pennsylvania) and Canada (provinces like British Columbia, Ontario, and Québec). In Europe, occurrences have been reported in Germany. In Asia, they have been observed in China (Shaanxi province) and Iran. Additionally, *Dermea* species are present in the Southern Hemisphere, with records from New Zealand's South Island. This wide

distribution underscores the genus's adaptability to diverse climatic and ecological conditions.



Source Redrawn from Centro de Estudios Micológicos Asturianos (Year)

Note a Asci. b Croziers (present). c Asci (J+, amyloid reaction). d Ascospores. e Conidia of the anamorph. Scale bars: a–e = 10 µm

Figure 3.35 *Dermea cerasi*

Gelatinoamylaria Prasher & R. Sharma, Kavaka 46: 35 (2016)

Index Fungorum number: IF817325; Facesoffungi number: FoF 18281, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on decaying wood. Sexual morph: see Prasher et al. (2016). Asexual morph: Unknown.

Type species – *Gelatinoamylaria thimphuensis* Prasher & R. Sharma

Notes – *Gelatinoamylaria* was introduced by Prasher and R. Sharma (2016) with *G. thimphuensis* as the type species. The genus is characterised by sessile to substipitate, gelatinous apothecia, a well-developed excipulum composed of *textura angularis* to *prismatica*, and asci with an amyloid apical ring that stains blue in Melzer's reagent. Ascospores are hyaline, ellipsoid to fusoid, smooth-walled, and may contain guttules. Paraphyses are filiform, septate, and slightly swollen at the apex. No molecular sequence data are currently available; its placement in Dermateaceae (Helotiales) is based solely on morphological characters.

Holotype – BHUTAN. Thimphu: Phragmites–Kans landscape, near Begana, alt. 2200 m, on decaying wood, 22 June 2014, I.B. Prasher & R. Sharma (PAN–1588, holotype).

Gelatinoamylaria thimphuensis Prasher & R. Sharma, Kavaka 46: 35 (2016) Figure 3.36

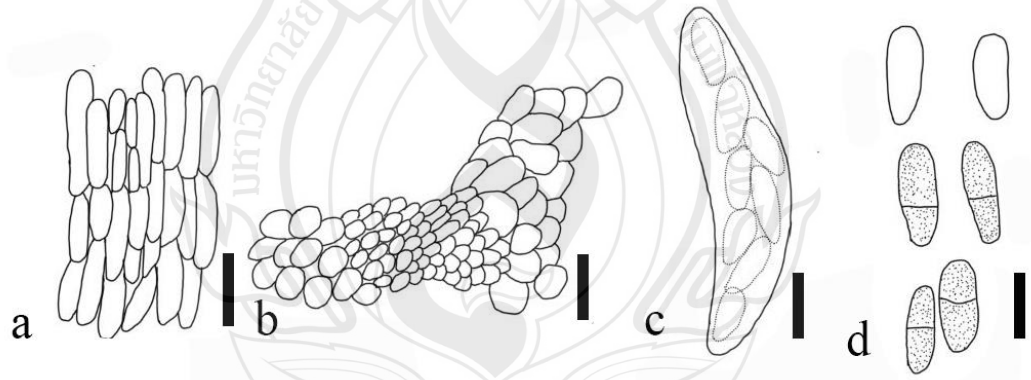
Index Fungorum number: IF817326; Facesoffungi number: FoF 18282

Description – see Prasher et al. (2016).

Material considered – see Prasher et al. (2016).

Distribution, ecological and economical importance

Gelatinoamylaria is a saprobic fungus involved in the decomposition of woody debris, contributing to nutrient cycling in forest ecosystems. It has no known economic or pathogenic significance, but its occurrence can serve as an indicator of a healthy decomposer community in temperate, high-elevation forest habitats. The genus is currently known only from Bhutan, where it was found on decaying wood at 2200 m elevation.



Source Redrawn from Indu et al. (2016)

Note a Gelatinized ectal excipular cells. b Ectal excipular cells and interal excipular cells. c Asci. d Hyaline ascospores and mature septate ascospores. Scale bar: a–d = 10 μm.

Figure 3.36 *Gelatinoamylaria thimphuensis*

Hysteropezizella Höhn., Sber. Akad. Wiss. Wien, Math.-naturw. Kl., Abt. 1 126(4-5): 310 (1917)

Index Fungorum number: IF2472; Facesoffungi number: FoF 18283, 26 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on dead or decaying leaves and culms of monocotyledonous plants. Sexual morph: see Defago (1968). Asexual morph: Unknown.

Type species – *Hysteropezizella subvelata* (Rehm) Höhn.

Notes – *Hysteropezizella* was introduced by von Höhnel (1917) with *H. subvelata* as the type species and is currently placed in Dermateaceae (Helotiales, Leotiomycetes, Ascomycota). The genus is characterised by subepidermal, deeply embedded apothecia with reduced margins, a prismatically arranged excipulum, and a hymenium shielded by a lid-like covering. Asci are inoperculate, J+, clavate, and 8-spored. Ascospores are mostly hyaline, 1–3-septate, and variable in shape. Paraphyses are often broad and apically thickened or with granular deposits, sometimes ampulliform below the apex. The receptacle surface hyphae are compactly arranged, often ending in free hyphal tips that contribute to the marginal structure (Defago, 1968; Hein, 1983; Nannfeldt, 1984). LSU and ITS sequence data are available for one species, but comprehensive phylogenetic studies are lacking.

The genus has undergone several taxonomic revisions. Von Höhnel (1917) placed it in Hysteropezizeae (Dermateaceae) alongside *Hysteropeziza* and *Hysterostegiella*. Nannfeldt (1932) expanded the genus by transferring small, erumpent discomycetes from *Naevia* and *Phragmonaevia*, dividing them into three sections based on paraphysis morphology and pigmentation: Hysterostegiella (pointed paraphyses), Pyrenodiscus (thin apices), and Phaeonaevia (pigmented paraphyses). These proved artificial (Defago, 1968). Defago (1968) redefined the genus, restricting it to species with parallel hyphal margins and strongly reduced apothecial rims, transferring others to *Hysterostegiella*, *Merostictis*, and related genera. Hein (1983) confirmed this circumscription, highlighting paraphysis structure, excipular surface, and apical deposits as key characters. The type specimen of *H. subvelata* was collected in Austria by Rehm and, based on historical records, is likely housed in herb. Rehm or herb. W, although no confirmed type has been located in modern herbaria.

Hysteropezizella subvelata (Rehm) Höhn., Sber. Akad. Wiss. Wien, Math.-naturw. Kl., Abt. 1 126(4-5): 310 (1917) Figure 3.37

Index Fungorum number: IF123402; Facesoffungi number: FoF 18284

Description – Defago (1968).

Material considered –Defago (1968)

Distribution, ecological and economical importance

Hysteropezizella species are saprobic on dead or senescent leaves and culms of Poaceae, Cyperaceae, and Juncaceae, mainly in alpine, subarctic, and cold temperate regions. They contribute to litter decomposition and nutrient cycling in wetland and grassland ecosystems (Defago, 1968; Nannfeldt, 1984). The genus shows a circumpolar–alpine distribution, recorded from Europe (Scandinavia, the Alps, British Isles), Asia, and the Southern Hemisphere, including subantarctic areas of South America such as Tierra del Fuego (Gamundí, 1980).



Source Redrawn from Asturnatura (Year)

Note a Ectal excipular cells. b Paraphyses. c Asci. d Croziers. e Asci(J+). f Ascospores. Scale bars: a–f = 10 µm.

Figure 3.37 *Hysteropezizella diminuens*

Hysterostegiella Höhn., Sber. Akad. Wiss. Wien, Math.-naturw. Kl., Abt. 1 126(4-5): 313 (1917)

Index Fungorum number: IF2474; Facesoffungi number: FoF 18285, 11 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on dead leaves and stems of herbaceous plants. Sexual morph: see Hein 1983. Asexual morph: Unknown.

Type species – *Hysterostegiella fenestrata* (Roberge ex Desm.) Höhn.

Notes – *Hysterostegiella* was introduced by von Höhnel (1917) with *H. fenestrata* as the type species. It is a member of the family Dermateaceae, order

Helotiales, class Leotiomycetes, within the phylum Ascomycota. *Hysterostegiella* is characterised by deeply immersed, cupulate apothecia with a distinct substrate lid, a parallel-textured excipulum with a parenchymatous base, and clavate asci that are 8-spored and show a positive iodine reaction at the apex. Paraphyses are broad, sharply pointed, and extend well beyond the asci. Marginal hairs are cylindrical with wart-like or strongly elevated ornamentation, often flexuous or twisted (Hein, 1983; Defago, 1968). Historically, von Höhnel (1917) placed it within the Hysteropezizeae, a group intermediate between the Pyrenopezizae and Mollisiae. Nannfeldt (1932) later treated it as a section within *Hysteropezizella*, but it was reinstated as an independent genus by Defago (1968) based on distinctive marginal hairs and excipulum structure. Hein (1983) provided a thorough revision and confirmed its separation from related genera using morphological and SEM studies. While *Hysterostegiella* is currently placed in Dermateaceae, its relationships with Hyaloscyphaceae and Hemiphacidiaceae have also been proposed (Korf, 1962; Sutton & Pirozynski, 1963), reflecting the continuing uncertainty in family-level placement within Helotiales. The holotype of *Hysterostegiella fenestrata* is deposited in WU (number not recorded), collected by von Höhnel from decaying leaves of *Typha* sp. in Austria, with no date specified and no living culture available (Defago, 1968, p. 28). No molecular sequence data are currently available.

Hysterostegiella fenestrata (Roberge ex Desm.) Höhn., Sber. Akad. Wiss. Wien, Math.-naturw. Kl., Abt. 1 126(4-5): 313 (1917) Figure 3.38

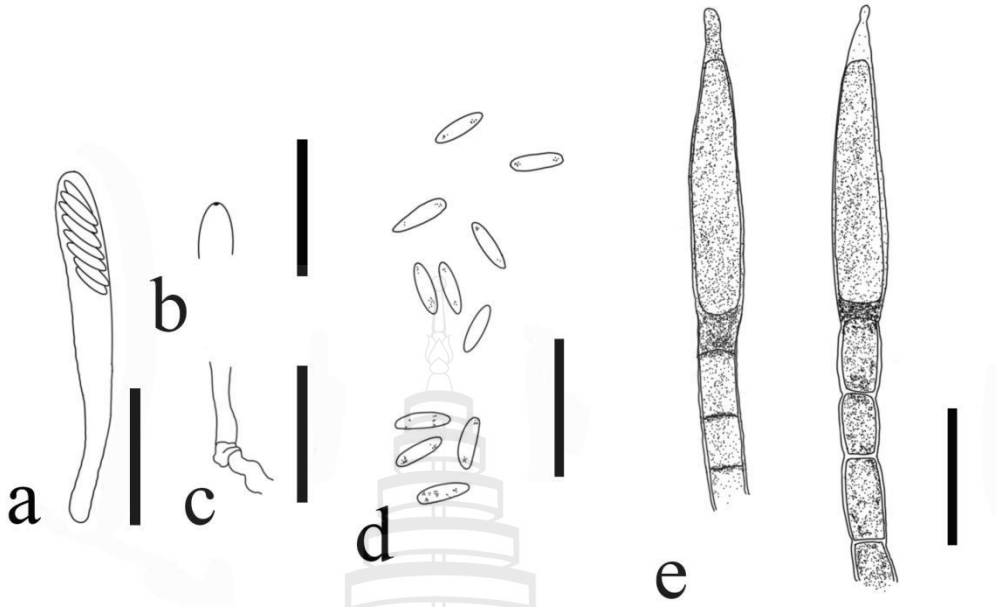
Index Fungorum number: IF431699; Facesoffungi number: FoF 18286

Description – Hein 1983.

Material considered – Hein 1983.

Distribution, ecological and economical importance

Hysterostegiella contributes to nutrient cycling in grassland and wetland ecosystems by decomposing plant litter. No direct economic importance has been recorded, and the genus is not known to be pathogenic or industrially relevant. In terms of distribution, species of *Hysterostegiella* are mainly recorded from temperate regions of Europe, particularly in subalpine to arctic habitats, often associated with wetland vegetation such as *Typha*, though broader sampling may reveal a wider distribution (Hein, 1983; Defago, 1968).



Redrawn from Centro de Estudios Micológicos Asturianos (Year)

Note a Asci. b Asci (J+, in Melzer's reagent). c Croziers present. d Ascospores. e Paraphyses. Scale bars: a–e = 20 µm.

Figure 3.38 *Hysterostegiella fenestrata*

Larissia Raitv., Sommerfeltia 31: 183 (2008)

Index Fungorum number: IF542267; Facesoffungi number: FoF 18287, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on dead leaves of *Pyrola* species in arctic tundra habitats. Sexual morph: see Raitviir (2008). Asexual morph: Unknown.

Type species – *Larissia pyrolae* Raitv.

Notes – *Larissia* was introduced by Raitviir (2008) with *L. pyrolae* as the type species. It is a member of Dermateaceae (Helotiales, Leotiomycetes, Ascomycota). The genus is characterised by superficial, sessile, turbinate apothecia, pale greyish brown to dark cinnamon, turning pale-yellow in KOH. The ectal excipulum consists of textura globulosa at the base with medium-thick, dark brown walls, becoming *textura prismatica* to *textura porrecta* at the flanks, and ending in subhyaline clavate marginal cells. Asci are broadly clavate, 8-spored, arising from croziers, with a blue amyloid apical pore (MLZ+). Ascospores are ellipsoid, aseptate, hyaline when young, maturing to dark brown with thick walls and containing two lipid globules. Paraphyses are

cylindric-clavate, hyaline, and shorter than asci. No molecular data is available for the genus. The holotype of *L. pyrolae* (TAAM 182408) was collected by Raitviir from *Pyrola rotundifolia* in Estonia in 1980, with no living culture available (Tedersoo et al., 2016; BioSample SAMN04578220).

Larissia pyrolae Raitv., Sommerfeltia 31: 184 (2008) Figure 3.39

Index Fungorum number: IF542268; Facesoffungi number: FoF 18288

Description: On dead leaves of *Pyrola*, Magadan, Russian Arctic. **Sexual morph**: Apothecia solitary or gregarious in small groups, superficial, scattered, sessile. Receptacle dark brown, discoid, margin slightly rough, brown to dark brown. Disc slightly raised, cinnamon brown to dark greyish brown. Excipulum not observed; ectal and medullary excipulum not clearly visible. Paraphyses aseptate, thin-walled, hyaline, cylindric-clavate, gradually widening towards the apex. Asci 8-spored, unitunicate, inoperculate, cylindric-clavate, rounded apex, thin-walled, J+ with or without KOH treatment, short stipitate base. Ascospores partially biseriate, ellipsoidal, hyaline, thin-walled, aguttulate, aseptate. **Asexual morph**: Undetermined.

Material examined: Magadan, Chukotka, Bilibinski district, basin of Bolshoi Anjui River. On dead leaves of Pyrola sp. 25 July 1980, L. Vassiljeva (TAAM 182408), holotype.

Distribution, ecological and economical importance

Larissia contributes to nutrient cycling in arctic tundra ecosystems, where decomposition is slow due to low temperatures. The genus is specialised for cold, subarctic to arctic environments, often occurring in microhabitats with prolonged snow cover or constant moisture. The known distribution of *L. pyrolae* is restricted to the Chukotka region of the Russian Arctic, where it was collected from *Pyrola* leaf litter in tundra habitats (Raitviir, 2008).



Note a Details of the herbarium material. b-c Apothecia on the sclerotia surface. d-e Vertical cross-sections of the apothecia. f Asci and filiform paraphyses. g-k Asci (j-k mounted in Melzer's reagent). l-m Ascospores. Scale bars: d–e = 100 µm, f–k = 30 µm, l–m = 10 µm.

Figure 3.39 *Larissia pyrolae* (Re-check TAAM 182408, Holotype)

Neodermea W.J. Li, D.J. Bhat & K.D. Hyde, in Li, McKenzie, Liu, Bhat, Dai, Camporesi, Tian, Maharachchikumbura, Luo, Shang, Zhang, Tangthirasunun, Karunarathna, Xu & Hyde, Fungal Diversity 100: 610 (2020)

Index Fungorum number: IF557151; Facesoffungi number: FoF 07471, 2 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on decaying woody material. Sexual morph: see Li et al. (2020). Asexual morph: see Li et al. (2020).

Type species – *Neodermea rossica* W.J. Li, D.J. Bhat & K.D. Hyde

Notes – *Neodermea* was introduced by Li et al. (2020) with *Neodermea rossica* designated as the type species. The genus is characterised by dark brown to black, stomatic, pycnidial conidiomata, solitary or gregarious, immersed to semi-immersed, erumpent, globose to subglobose, unilocular or multilocular, thick-walled, with a central cylindrical ostiole. The conidiomatal wall comprises hyaline to brown, thick-walled cells of *textura*

angularis. Conidiophores are hyaline, cylindrical, septate, arising from the inner wall layers. Conidiogenous cells are enteroblastic, phialidic, cylindrical, integrated or discrete, indeterminate, and smooth-walled. Conidia are hyaline, oblong-ellipsoid, rounded at both ends or truncate at the base, straight or slightly curved, unicellular, guttulate, and smooth-walled. Microconidia may be present or absent. Molecular markers available for the genus include LSU and ITS sequence data (Li et al., 2020). The holotype of *Neodermea rossica* is deposited in VLA (VLA-Fungi 00021), collected by S.N. Li from leaves of *Alnus incana* in Karelia, Russia, on 1 August 2017, with the ex-type living culture preserved as CGMCC 3.19369.

Neodermea rossica W.J. Li, D.J. Bhat & K.D. Hyde, in Li, McKenzie, Liu, Bhat, Dai, Camporesi, Tian, Maharachchikumbura, Luo, Shang, Zhang, Tangthirasunun, Karunarathna, Xu & Hyde, Fungal Diversity 100: 613 (2020) Figure 3.40

Index Fungorum number: IF557152; Facesoffungi number: FoF 07473

Description – see Li et al. (2020).

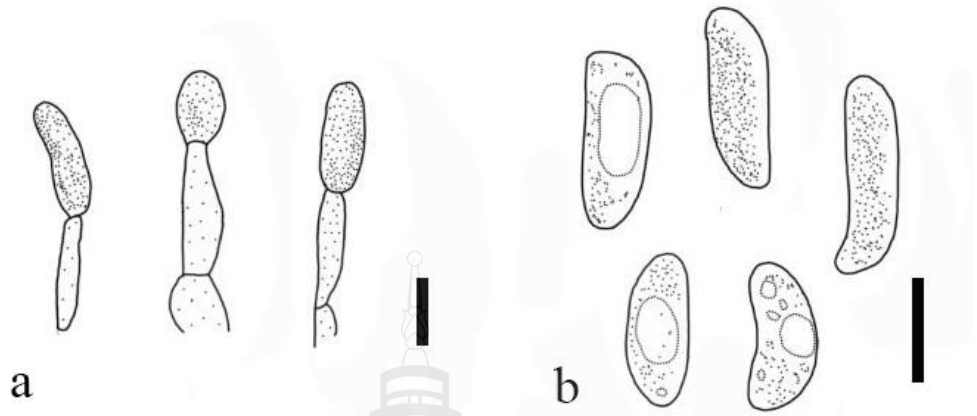
Material considered – see Li et al. (2020).

Distribution, ecological and economical importance

Neodermea is likely an important saprobic fungus involved in the decomposition of woody plant material, particularly in coniferous forest ecosystems. By colonising dead branches, it contributes to nutrient recycling and supports microbial succession on decaying wood. Its occurrence on *Juniperus communis* suggests a possible host preference for conifers, although further sampling is required to confirm host specificity.

At present, there is no known economic importance of *Neodermea*. It has not been reported as a pathogen of living plants, nor has it been documented as beneficial in agriculture, medicine, or biotechnology.

Neodermea is rarely recorded, with the type species *N. rossica* described from Russia, specifically from dead branches of *Juniperus communis*. The known distribution is currently limited to temperate Eurasian regions, although its actual range may be broader due to under-sampling (Li et al., 2020).



Source Redrawn from Li et al. (2020)

Note a Conidiophores, conidiogenous cells and developing conidia. b conidia. Scale bar: a = 5 μm, b = 10 μm.

Figure 3.40 *Neodermea rossica*

Neofabraea H.S. Jacks., Rep. Oregon Exp. Sta.: 187 (1913) [1911-1912]

Index Fungorum number: IF 3452; Facesoffungi number: FoF 18289, 11 morphological species (Species Fungorum, 2025), 10 species with molecular data.

Necrotrophic pathogens. Sexual morph: see Michalecka et al. (2016). Asexual morph: see Cameldi et al. (2017).

Type species – *Neofabraea malicorticis* (Cordley) H.S. Jacks.

Notes – *Neofabraea* was introduced by Jackson (1913) with *Neofabraea malicorticis* as the type species. Members of the genus are characterised by acervular to pycnidial conidiomata, hyaline, phialidic conidiogenous cells, and hyaline, falcate to slightly curved macroconidia, often one-septate, sometimes with a basal scar. Sexual morphs produce dark, erumpent ascomata with bitunicate, 8-spored asci and hyaline, ellipsoid to fusiform, one-celled ascospores. The genus includes important latent necrotrophic plant pathogens causing bull's-eye rot of apples and pears, as well as branch cankers on pome fruit trees. Molecular markers available for *Neofabraea* include ITS, LSU, *RPB2*, and *β-tubulin* (TUB2) sequence data, with TUB2 being the most effective single marker for species delimitation; ITS shows low interspecific variation and is less suitable for delimitation (de Jong et al., 2001; Verkley, 1999). The

holotype of *N. malicorticis* is deposited in BPI (BPI 354238), collected by F.H. Guthrie from decaying bark of *Malus domestica* in Oregon, USA, with the original description by Jackson (1913) and the ex-type culture preserved as CBS 398.50.

Neofabraea malicorticis (Cordley) H.S. Jacks., Rep. Oregon Exp. Sta.: 187 (1913) [1911-1912]

= *Gloeosporium malicorticis* Cordley, Bot. Gaz. 30: 57 (1900) Figure 3.41

Index Fungorum number: IF431853; Facesoffungi number: FoF 18290

Description – see Jackson. (1913).

Material considered – see Jackson. (1913).

Distribution, ecological and economical importance

Neofabraea species are ecologically significant as latent necrotrophic pathogens that infect apple and pear trees, causing bull's-eye rot and branch cankers. Infections typically occur before harvest, remain quiescent in host tissue, and reactivate during cold storage, leading to significant postharvest losses. Economically, they are major pathogens in the pome fruit industry, responsible for substantial yield and quality reduction. The genus is widely distributed across Europe, North and South America, Australia, and New Zealand, particularly in temperate fruit-growing regions of both hemispheres.



Source Redrawn from Chen et al. (2015)

Note a Conidiogenous cells giving rise to macroconidia. b Microconidia c Macroconidia. d, e Intermediate conidia between macro- and micro- conidia. Scale bar: a–e = 10 μm.

Figure 3.41 *Neofabraea malicorticis*

Neogloeosporidina W.J. Li, Camporesi & K.D. Hyde, in Li, McKenzie, Liu, Bhat, Dai, Camporesi, Tian, Maharachchikumbura, Luo, Shang, Zhang, Tangthirasunun, Karunarathna, Xu & Hyde, Fungal Diversity 100: 622 (2020)

Index Fungorum number: IF557154; Facesoffungi number: FoF 07519, 1 morphological species (Species Fungorum 2025), 1 species with molecular data.

Saprobic on dead twigs and branches of angiosperms. Sexual morph: Unknown. Asexual morph: see Li et al. (2020).

Type species – *Neogloeosporidina pruni* W.J. Li, Camporesi & K.D. Hyde

Notes – *Neogloeosporidina* was introduced by Li et al. (2020) with *N. pruni* as the type species. This genus is characterised by brown, eustromatic, pycnidial conidiomata, globose to subglobose, thick-walled, unilocular and glabrous, dehiscing by an irregular rupture in the apical region. The conidiomatal wall is composed of brown, thick-walled cells of compressed *textura angularis*. Conidiophores are mostly reduced to conidiogenous cells, occasionally short, cylindrical, septate and branched at the base, arising from inner layers of conidiomata. Conidiogenous cells are hyaline, enteroblastic, phialidic, cylindrical, integrated, determinate, and smooth-walled. Conidia are hyaline, ellipsoid to ventricose, often with a blunt apiculus, unicellular, thick- and smooth-walled. Phylogenetically, *Neogloeosporidina* forms a well-supported clade basal to *Dermea* and *Cornicullariella*, sharing some morphological traits with *Gloeosporidina* but distinguishable by its eustromatic, pycnidial conidiomata. Molecular data available include LSU and ITS sequences (Li et al., 2020). The holotype of *Neogloeosporidina pruni* is deposited in HMAS (HMAS 255707), collected by from dead branches of *Prunus armeniaca* in Xinjiang, China, on 27 May 2018, with the ex-type living culture preserved as CGMCC 3.19361

Neogloeosporidina pruni W.J. Li, Camporesi & K.D. Hyde, in Li, McKenzie, Liu, Bhat, Dai, Camporesi, Tian, Maharachchikumbura, Luo, Shang, Zhang, Tangthirasunun, Karunarathna, Xu & Hyde, Fungal Diversity 100: 623 (2020). Figure 3.42

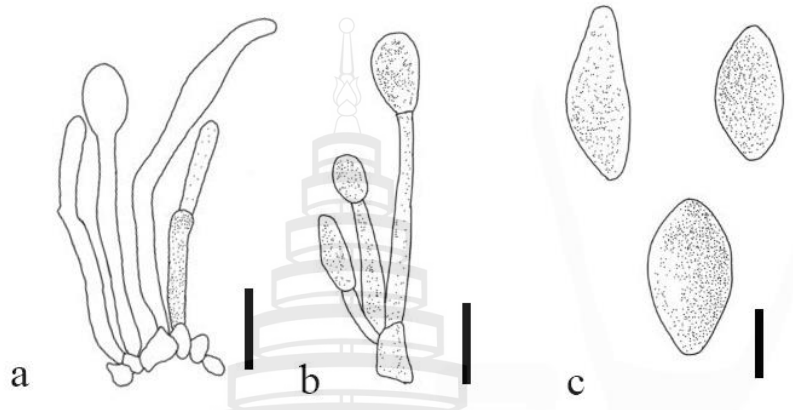
Index Fungorum number: IF557153; Facesoffungi number: FoF 07476

Description – Li et al. (2020).

Material considered – Li et al. (2020).

Distribution, ecological and economical importance

Neogloeosporidina is ecologically important as a saprobe decomposing woody plant material. It has no recorded economic impact as a plant pathogen or industrially relevant fungus. Currently, it is known only from Italy on hosts in *Prunus*.



Source Redrawn from Li et al. (2020)

Note a, b Conidiophores, conidiogenous cells and developing conidia. c Conidia. Scale bars: a–c = 10 μm.

Figure 3.42 *Neogloeosporidina pruni*

Pezicula Tul. & C. Tul., Select. fung. carpol. (Paris) 3: 182 (1865)

Index Fungorum number: IF3858; Facesoffungi number: FoF 07484, 95 morphological species (Species Fungorum, 2025), 38 species with molecular data.

Endophytes, saprobes, or weak plant pathogens inhabit living or recently dead twigs and branches. Sexual morph: see Abeln et al. (2000). Asexual morph: see Abeln et al. (2000).

Type species – *Pezicula carpinea* (Pers.) Sacc.

Notes – *Pezicula* was introduced by Tulasne and Tulasne (1865) with *P. carpinea* as the type species. Members of the genus are characterised by brightly coloured, soft-fleshy to waxy apothecia that are discoid to cupulate, often erumpent and clustered on bark or twigs. Asci are cylindrical to clavate, 8-spored, and ascospores are ellipsoid, hyaline, smooth-walled, aseptate when young but occasionally becoming septate at maturity. Paraphyses are filiform, sometimes slightly enlarged at the apex. The

apothecia are typically associated with cortical tissues of woody hosts, often developing from stromatic tissue beneath the periderm.

The asexual morphs, historically referred to *Cryptosporiopsis*, produce eustromatic conidiomata that are pycnidial or sporodochial, with phialidic, hyaline conidiogenous cells. Conidia are hyaline, ellipsoid to fusiform, aseptate, smooth-walled, and may be slightly curved; older literature also refers to related forms under *Discosporiella*, *Sphaeronema*, or *Tubercullariella*. Some species exhibit both apothecial and pycnidial stages on the same host substrate.

Molecular phylogenetic studies (Abeln et al., 2000; Chen et al., 2016) based on LSU, ITS, *tub2*, and *RPB2* sequences have supported the monophyly of *Pezicula*, while revealing close relationships to *Dermea* and *Neofabraea*. Several taxa formerly placed in *Ocellaria* are now included in *Pezicula*, and species delimitation is aided by *tub2* and *RPB2* sequence data in addition to ITS.

The holotype of *P. carpinea* is preserved in PC (Herb. Tulasne), collected from *Carpinus betulus* in Europe by the Tulasne brothers.

Pezicula carpinea (Pers.) Sacc., Botan. Zbl. 18: 217 (1884) Figure 3.43

Index Fungorum number: IF183043; Facesoffungi number: FoF 18291

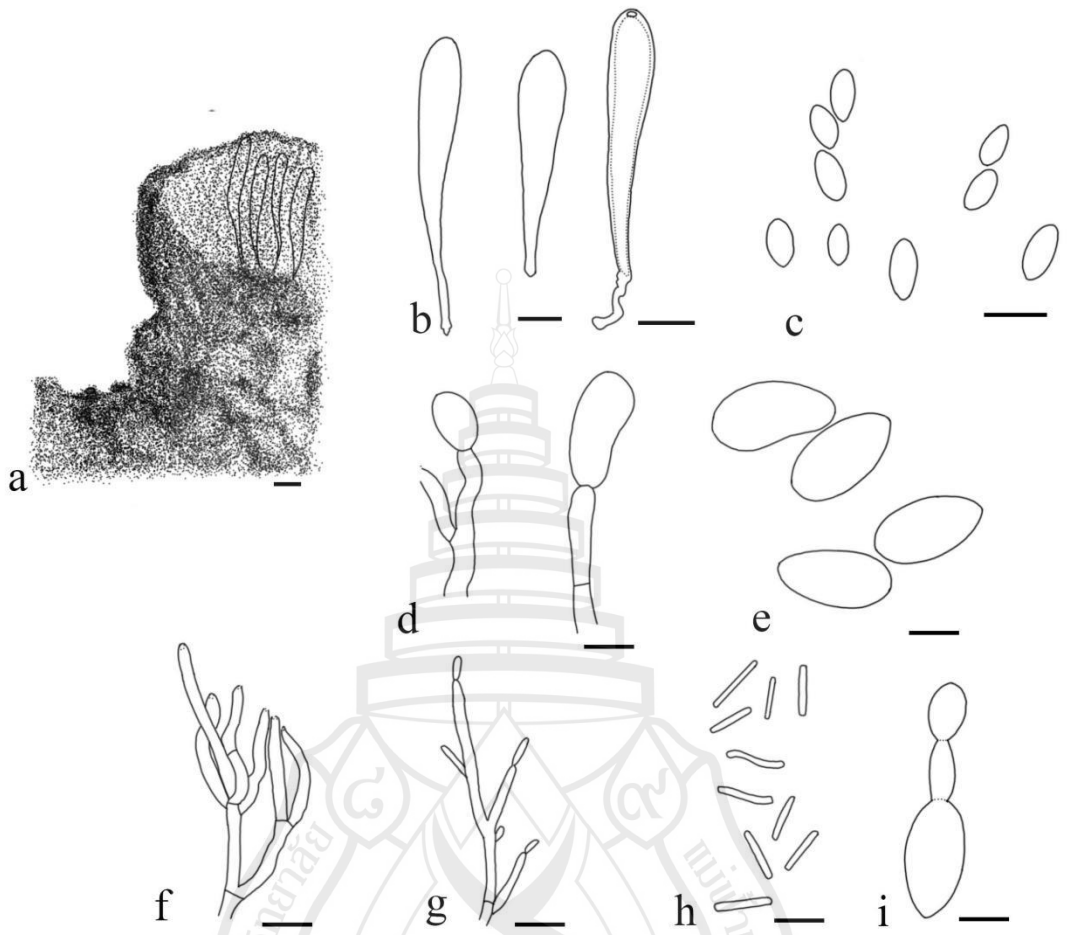
Description – Tulasne and Tulasne (1865).

Material considered – Tulasne and Tulasne (1865).

Distribution, ecological and economical importance

Pezicula species function primarily as endophytes, saprobes, or weak plant pathogens. They often inhabit living or recently dead twigs and branches without causing conspicuous symptoms, but some can become pathogenic under host stress, producing cankers or dieback. Several species are known to synthesise bioactive secondary metabolites with antibacterial or antifungal activity (Kehr, 1992).

The genus is widely distributed in temperate regions worldwide, with records from Europe, North America, and Asia. Hosts include both deciduous and coniferous trees such as *Carpinus*, *Acer*, *Fagus*, *Larix*, *Picea*, and *Prunus*. Many species exhibit host specificity, while others have broader host ranges in forest and orchard ecosystems.



Source Redrawn from Chen et al. (2016)

Note a Ectal excipulum, b Asci. c Ascospores. d Macroconidiophores cells giving rise to macroconidia. e Macroconidia. f-g Microconidiogenous cells giving rise to microconidia. h Microconidia. i Germinating macroconidia. Scale bars: a = 50 µm; b–c = 20 µm; d–i = 10 µm.

Figure 3.43 *Pezicula carpinea*

Pezolepis Syd., Annls mycol. 23(3/6): 408 (1925)

Index Fungorum number: IF3865; Facesoffungi number: FoF 18292, 3 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic or necrotrophic parasite on leaves. Sexual morph: see Sydow (1925). Asexual morph: Unknown.

Type species – *Pezolepis denigrata* Syd

Notes – *Pezolepis* was introduced by Sydow (1925) with *Pezolepis denigrata* as the type species. The genus is tentatively placed in the family Dermateaceae, order Helotiales, class Leotiomycetes, based on morphological features, although its exact phylogenetic position remains uncertain due to the absence of molecular data (Sydow, 1925). *Pezolepis* is characterised by intraepidermal stromata forming dark brown patches, composed of a single layer or several rows of pigmented cells, often amphigenous but mostly hypophyllous. Apothecia are minute, scattered, erumpent from stromata, free, superficial, discoid, and dark, without a distinct hypothecium or excipulum. Asci are clavate to cylindric, 8-spored, lacking a distinct apical ring, and ascospores are ellipsoid to oblong, hyaline, aseptate, measuring 13–16 × 5–6.5 μm. Paraphyses are numerous, filiform, thick-walled, branched apically, embedded in a gelatinous, olive-brown epithecium. No iodine reaction is observed in the apical apparatus. Molecular markers are currently unavailable for this genus (Sydow, 1925).

The holotype of *Pezolepis denigrata* is deposited in B (Herbarium Berolinense), collected by H. Sydow on living leaves of *Philodendron tripartitum* in San Pedro de San Ramon, Costa Rica, on 5 February 1925.

Pezolepis denigrata Syd., Annls mycol. 23(3/6): 409 (1925). Figure 3.44

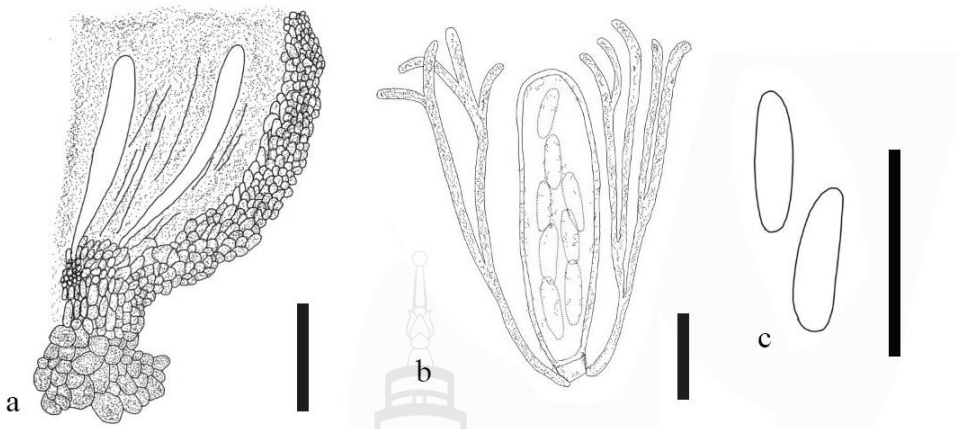
Index Fungorum number: IF262987; Facesoffungi number: FoF 18293

Description – Sydow (1925).

Material considered – Sydow (1925).

Distribution, ecological and economical importance

Pezolepis is a rare genus in Dermateaceae, functioning as a saprobe or necrotrophic parasite on leaves. Stromata develop within the epidermis and give rise to minute apothecia that rupture the epidermis to emerge. Known only from the type locality in Costa Rica, collected on *Philodendron tripartitum*, and no other confirmed records are available.



Source Redrawn from Sydow (1925)

Note a Section through a stroma. b Asci and paraphyses. c Ascospores. Scale bars: a–c = 5 µm.

Figure 3.44 *Pezolepis denigrata*

Pseudofabraea Chen Chen, Verkley & Crous, in Chen, Verkley, Sun, Groenewald & Crous, Fungal Biology 120(11): 1318 (2016）

Index Fungorum number: IF812378; Facesoffungi number: FoF 18294, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Plant pathogenic. Sexual morph: Unknown. Asexual morph: see Zhu et al. 2012.

Type species – ***Pseudofabraea citricarpa*** (L. Zhu, K.D. Hyde & H.Y. Li) Chen Chen, Verkley & Crous

Notes – *Pseudofabraea* was established by Chen Chen et al. (2016) with *P. citricarpa* as the type species. The genus is characterised by its pathogenicity, notably causing citrus target spot disease, a serious foliar disease of citrus that leads to significant yield losses. Morphologically, the asexual morph (Zhu et al., 2012) forms pycnidial conidiomata that are immersed to erumpent, dark brown to black, subglobose to globose, with a central ostiole. Conidiogenous cells are phialidic, hyaline, cylindrical to subulate. Macroconidia are ellipsoid to fusiform, straight to slightly curved, 0–1-septate, hyaline, (5–)7–9 × 3.5–5 µm, broader than those of *Neofabraea* (3–4 µm wide); microconidia are hyaline, aseptate, subcylindrical, 3–5 × 1–1.5 µm. It differs from *Neofabraea* mainly by host range and pathogenicity: *Neofabraea* species are typically associated with fruit rots and branch cankers, whereas *P. citricarpa* causes leaf spot

disease. Johnston et al. (2014) transferred this species to *Neofabraea* based on ITS data from Zhu et al. (2012), but Chen Chen et al. (2016) reinstated *Pseudofabraea* based on combined molecular and morphological evidence. Molecular phylogenetic studies place the genus in Dermateaceae. Molecular markers available include ITS, LSU, and *RPB2* sequence data (Yang et al., 2018).

The holotype of *Pseudofabraea citricarpa* (as *Cryptosporiopsis citricarpa*) is deposited in HMAS (HMAS 248426), collected by H.S. Zhu from infected leaves of *Citrus reticulata* in Yunnan, China, on 26 February 2009, with the ex-type culture preserved as CGMCC 3.15194.

Pseudofabraea citricarpa (L. Zhu, K.D. Hyde & H.Y. Li) Chen Chen, Verkley & Crous, in Chen, Verkley, Sun, Groenewald & Crous, Fungal Biology 120(11): 1318 (2016) Figure 3.45

=*Cryptosporiopsis citricarpa* L. Zhu, K.D. Hyde & H.Y. Li, in Zhu, Wang, Huang, Zhang, Li, Ding & Hyde, Pl. Dis. 96(6): 809 (2012)

=*Neofabraea citricarpa* (L. Zhu et al.,) P.R. Johnst., IMA Fungus 5: 103 (2014).

Index Fungorum number: IF812379; Facesoffungi number: FoF 18295

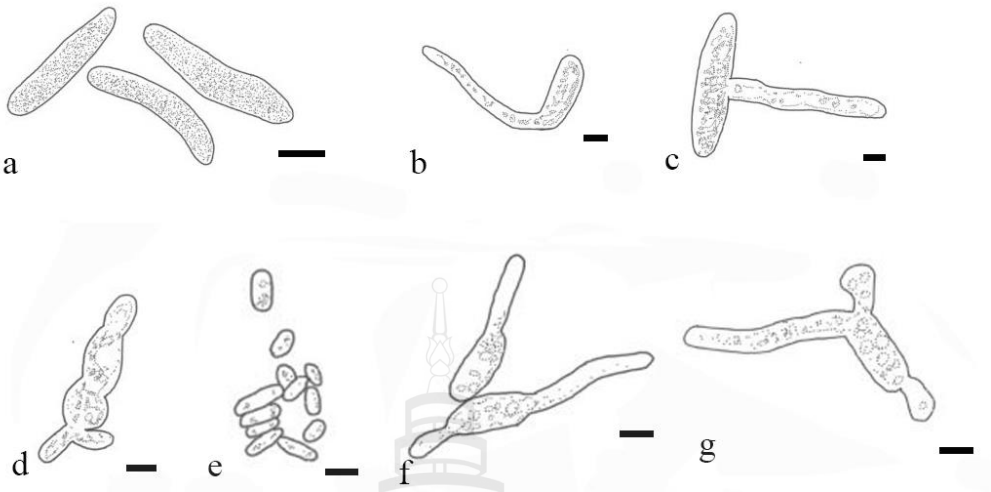
Description – Zhu et al., (2012).

Material considered – Zhu et al., (2012).

Distribution, ecological and economical importance

Pseudofabraea species, particularly *P. citricarpa*, are important plant pathogens causing citrus target spot disease. Infected leaves develop circular to irregular, brown to dark brown lesions, often with lighter centres, sometimes surrounded by yellow halos; severe infection can lead to premature leaf drop and reduced photosynthetic capacity. The disease can also blemish fruit surfaces, affecting market value. The pathogen produces conidia throughout the year but sporulates most abundantly under cool, humid conditions; its ability to adapt to varying temperatures allows spread from cooler high-latitude to warmer low-latitude citrus-growing areas (Liu et al., 2024).

Geographically, *P. citricarpa* has been reported from several citrus-producing regions in China, including Yunnan (type locality) and Hubei Provinces (Xiao et al., 2020), and is likely more widespread in East and Southeast Asia. Hosts include *Citrus reticulata*, *C. sinensis*, and other cultivated citrus varieties. Effective monitoring and integrated disease management are crucial to reduce its impact on citrus production.



Source Redrawn from Zhu et al. (2012)

Note a Macroconidia formed on leaves. b, c macroconidia germinated in sterile distilled water. d Macroconidia formed oval to elliptical microconidia budding off from the side of the spores. e microconidia. k, l microconidia germinated in sterile distilled water. Scale bars: a = 10 µm, b–g = 5 µm.

Figure 3.45 *Pseudofabraea citricarpa*

Rhizodermea Verkley & J.D. Zijlstra, in Verkley, Hofland-Zijlstra & Berendse, Persoonia 24: 131 (2010)

Index Fungorum number: IF518022; Facesoffungi number: FoF 18296, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Endophytic the roots of plants. Sexual morph: see Verkley et al. 2010. Asexual morph: unknown.

Type species – *Rhizodermea veluwensis* Verkley & J.D. Zijlstra.

Notes – *Rhizodermea* was introduced by Verkley et al. (2010) with *Rhizodermea veluwensis* as the type species, isolated from surface-sterilised roots of *Erica tetralix* in the Netherlands. The genus is characterised by hyaline, septate hyphae (initially 1.5–2.5(–3) µm wide, later 5.5–8.5 µm), lacking distinctive asexual reproductive structures in culture. Thick-walled chlamydospores are globose to lemon-shaped, aseptate or occasionally 1-septate, (18–)20–25 µm in diameter, walls hyaline to yellow-brown, often ornamented with warts. Stromata form in culture after 2–4 months, up to 3 mm diam., composed of *textura angularis-globosa*. Phylogenetic

analyses based on ITS and LSU rDNA sequences place *Rhizodermea* within the family Dermateaceae (Verkley et al., 2010). Subsequent studies reported the genus from Korea, isolated from roots of *Rhododendron mucronulatum* (Park & Eom, 2017), as well as other hosts including *Empetrum nigrum*, *Vaccinium myrtillus*, *V. vitis-idaea*, and *Larix decidua*. Molecular markers available for this genus include ITS and LSU. The holotype of *Rhizodermea veluwensis* is deposited as CBS 110605, isolated by J. Zijlstra from surface-sterilised roots of *Erica tetralix* in National Park De Hoge Veluwe, the Netherlands, in November 2000 (JA 222; GenBank HM002555).

Rhizodermea veluwensis Verkley & J.D. Zijlstra, in Verkley, Hofland-Zijlstra & Berendse, Persoonia 24: 131 (2010) Figure 3.46

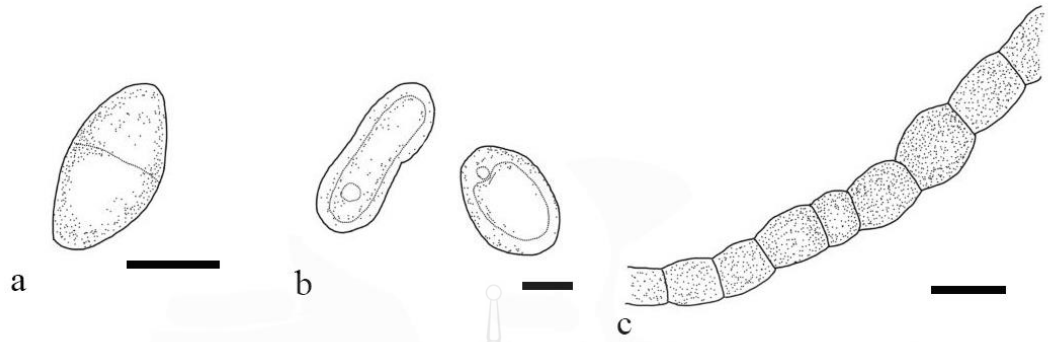
Index Fungorum number: IF518023; Facesoffungi number: FoF 18297

Description – see Verkley et al. (2010).

Material considered – see Verkley et al. (2010).

Distribution, ecological and economical importance

Rhizodermea veluwensis is an endophyte in the roots of a range of hosts, including *Erica tetralix*, *Rhododendron mucronulatum*, *Empetrum nigrum*, *Vaccinium myrtillus*, *V. vitis-idaea*, and *Larix decidua*. It has been reported from Europe (Netherlands, Germany) and Asia (Korea). As an endophyte, it may contribute to plant health and stress tolerance, though its specific ecological functions remain poorly understood. The occurrence across different continents and host plants suggests a broad ecological range, but further research is required to clarify its global distribution and ecological roles.



Source Redrawn from Verkley et al. (2010).

Note a One-septate chlamydospore. b Smooth-walled, 0-septate chlamydospores. c Hypha transformed to a chain of pigmented, isodiametric inflated cells. Scale bars: a–c = 10 μm.

Figure 3.46 *Rhizodermea veluwensis*

Schizothyrioma Höhn., Annls mycol. 15(5): 297 (1917)

Index Fungorum number: IF4910; Facesoffungi number: FoF 18298, 4 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on dead herbaceous stems and leaves**.** Sexual morph: see Adamska (2004). Asexual morph: Unknown.

Type species – *Schizothyrioma ptarmicae* (Desm.) Höhn.

Notes – *Schizothyrioma* was introduced by Höhnel (1917) with *S. ptarmicae* as the type species. The genus is characterised by erumpent, superficial, black apothecia, flattened, circular to irregular in outline, sometimes opening by irregular slits. The excipulum is composed of *textura angularis*. Asci are clavate, usually 2-spored, occasionally 4-spored, thin-walled, without a distinct amyloid apical apparatus. Ascospores are hyaline, ellipsoid to fusiform, 1-septate, often constricted at the septum, (9.4–)10.5–14.5(–15.2) × (3.6–)4.2–6.5(–6.9) μm ($\bar{x}$ = 12.1 × 5.5 μm, n = 30) (Brand 2018). Paraphyses are filiform, septate, extending beyond the asci. No molecular sequence data are currently available for the genus. The holotype of *S. ptarmicae* (basionym: *Labrella ptarmicae* Desm.) is deposited in PC (Herbier Desmazières), collected on leaves of *Achillea ptarmica* in France by Desmazières, with subsequent records from several European countries including Germany and Poland (Adamska 2004; Brand, 2018).

Schizothyrioma ptarmicae (Desm.) Höhn. [as 'ptarmica'], Annls mycol. 15(5): 297 (1917) Figure 3.47

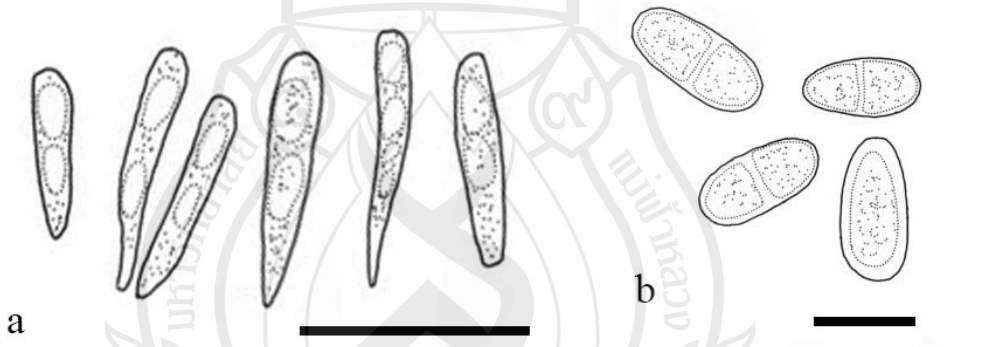
Index Fungorum number: IF121229; Facesoffungi number: FoF 18299

Description – see Adamska (2004).

Material considered – see Adamska (2004).

Distribution, ecological and economical importance

Schizothyrioma species are saprobes, contributing to the decomposition of dead stems and leaves of herbaceous dicotyledons, aiding nutrient recycling in temperate ecosystems. There is no known economic importance, and they are not reported as plant pathogens. *S. ptarmicae* is considered rare, known from scattered records in Europe (France, Germany, Poland, the Netherlands, and the UK) on *Achillea ptarmica* and other herbaceous hosts.



Source Redrawn from Brand (2018)

Note a Asci. b Ascospores. Scale bar: a = 50µm, b = 10 µm.

Figure 3.47 *Schizothyrioma ptarmicae*

Sorokinella J. Fröhl. & K.D. Hyde, Fungal Diversity Res. Ser. 3: 122 (2000)

Index Fungorum number: IF28467; Facesoffungi number: FoF 18300, 2 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on members of the Palmae (Arecaceae) and Pandanaceae families. Sexual morph: see Fröhlich and Hyde (2000). Asexual morph: Unknown.

Type species – *Sorokinella appendicospora* J. Fröhl. & K.D. Hyde

Notes – *Sorokinella* was introduced by Fröhlich and Hyde (2000) with *S. appendicospora* as the type species. The genus is characterised by scattered, sessile,

dark-brown, disc-shaped apothecia, less than 1 mm in diameter, which are flat or slightly concave to convex. The receptacle is saucer-shaped, smooth, and glabrous. The ectal excipulum is composed of hyaline, angular to subglobose cells arranged in *textura globulosa* or *angularis*, while the medullary excipulum consists of tightly packed brown cells. Asci are 8-spored, unitunicate, sessile, and have a large, amyloid apical ring. Paraphyses are cylindrical, unbranched, with rounded or swollen tips, sometimes forming an irregular brown pseudoepithecium. Ascospores are fusiform to ellipsoidal, pale brown, smooth-walled, 1-septate, with or without mucilaginous appendages (Fröhlich & Hyde, 2000). The holotype of *S. appendicospora* is deposited in HKU(M) (Herbarium of the University of Hong Kong), collected by J. Fröhl. & K.D. Hyde on decaying petioles of *Licuala longicalycata* in Sirindhorn Peat Swamp Forest, Narathiwat Province, Thailand, on 18 November 1997.

Sorokinella appendicospora J. Fröhl. & K.D. Hyde, Fungal Diversity Res. Ser. 3: 122 (2000) Figure 3.48

Index Fungorum number: IF482761; Facesoffungi number: FoF 18301

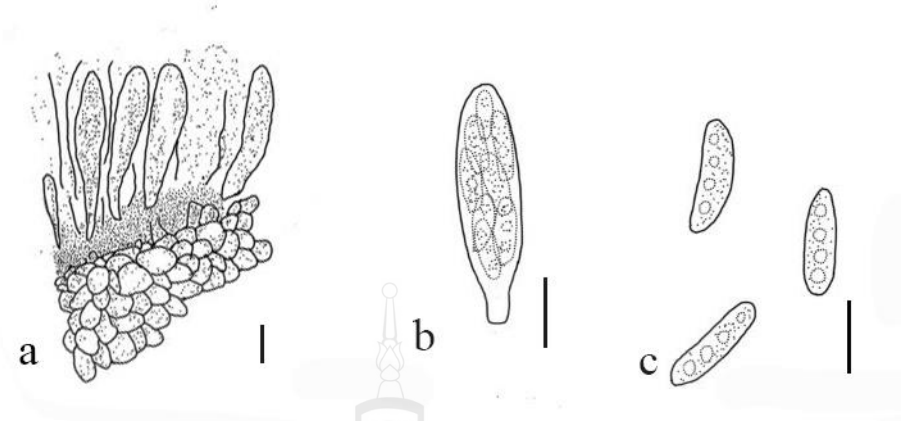
Description – Fröhlich and Hyde (2000).

Material considered – Fröhlich and Hyde (2000).

Distribution, ecological and economical importance

Ecologically, *Sorokinella* contributes to the decomposition of monocotyledonous plant litter, particularly palms and pandanus, in tropical forest ecosystems such as peat swamps and rainforests (Fröhlich & Hyde 2000). Some species may occur on dry, aerially exposed plant tissues, with mucilaginous ascospore appendages potentially aiding in spore dispersal. There is no known economic importance for *Sorokinella* species.

The genus is currently known from Australia, Hong Kong, and Thailand (Taylor et al., 2000; Pereira & Phillips, 2023), although its actual distribution may be broader in Southeast Asia where palm-rich habitats remain under-sampled.



Source Redrawn from Fröhlich and Hyde (2000)

Note a Vertical section illustrating the structure of the excipulum. b Asci. c Ascospores. Scale bars: a–c = 10 μm.

Figure 3.48 *Sorokinella appendicospora*

Verkleyomyces Y. Marín & Crous, in Marin-Felix et al., Stud. Mycol. 86: 165 (2017)

Index Fungorum number: IF820818; Facesoffungi number: FoF 18302, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Endophytic on healthy leaves of *Illicium verum*. Sexual morph: see Marín-Felix et al. (2017). Asexual morph: see Wang et al. (2015).

Type species – *Verkleyomyces illicii* (Xiang Sun, Lin Wang & L.D. Guo) Y. Marín & Crous

Notes – *Verkleyomyces* was introduced by Marín-Felix et al. (2017) to accommodate *Neofabraea illicii* (Wang et al., 2015) as the type species. The genus is characterised by apothecial ascomata, partly immersed, erumpent, sessile, solitary to gregarious; asci unitunicate, clavate to cylindrical-clavate, 8-spored, with a truncate base and an apical apparatus staining blue to purplish blue in Melzer's reagent; ascospores fusoid to ellipsoid, hyaline, thin-walled, guttulate to eguttulate, straight or slightly curved, initially aseptate or becoming 1-septate. The asexual morph produces acervular to cupulate conidiomata with phialidic conidiogenous cells, and aseptate, cylindrical conidia with a distinct basal scar. Molecular markers available include ITS and LSU sequence data (Wang et al., 2015; Marín-Felix et al., 2017). Holotype of *V. illicii*: HMAS 244704, culture ex-

type CGMCC 3.17042, isolated from *Illicium verum*, Guangxi, China, August 2011, coll. Lin Wang.

Verkleyomyces illicii (Xiang Sun, Lin Wang & L.D. Guo) Y. Marín & Crous, in Marin-Felix et al., Stud. Mycol. 86: 167 (2017)

=*Neofabraea illicii* Xiang Sun, Lin Wang & L.D. Guo, in Wang, Sun, Wei, Lou & Guo, Mycoscience 56(3): 334 (2015) Figure 3.49

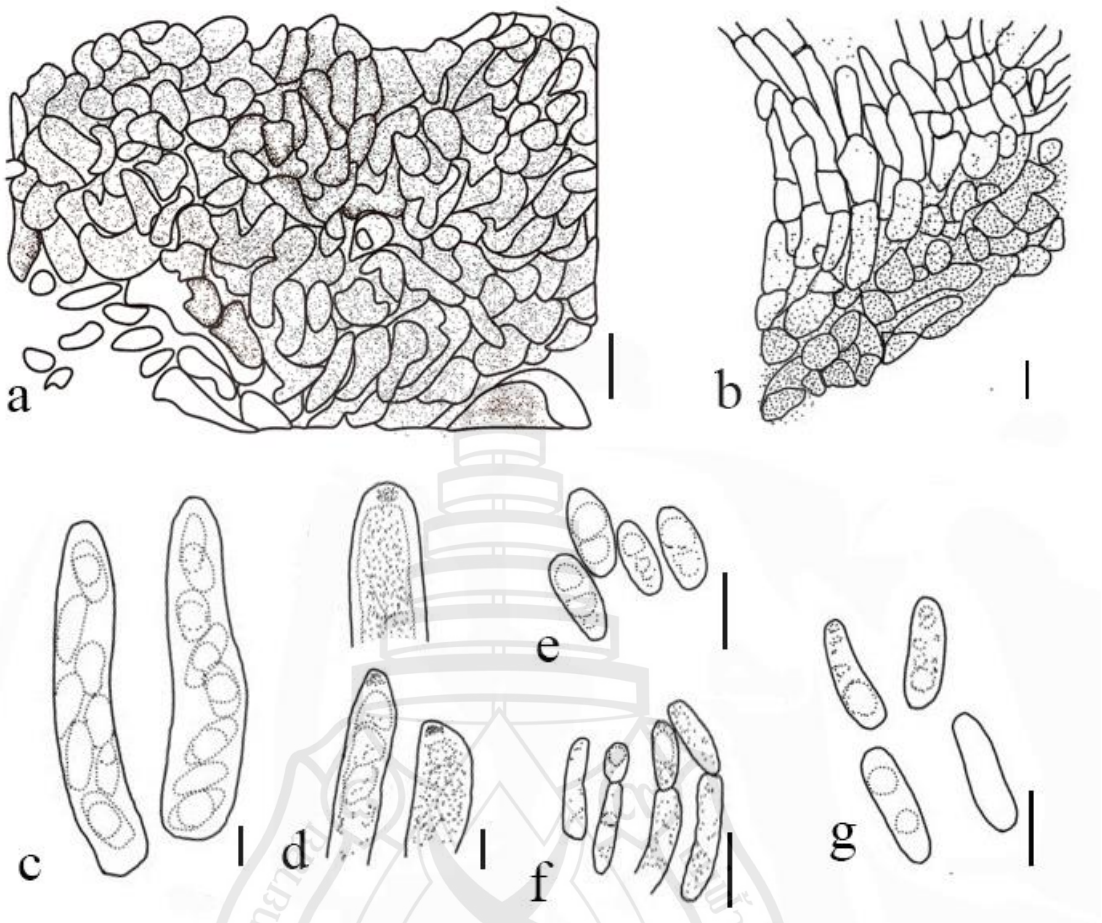
Index Fungorum number: IF804361; Facesoffungi number: FoF 18303

Description – see Wang et al. (2015).

Material considered – see Wang et al. (2015).

Distribution, ecological and economical importance

Verkleyomyces illicii is an endophytic fungus isolated from healthy leaves of *Illicium verum* (star anise) in Guangxi Province, China (Wang et al., 2015). As an endophyte, it inhabits living plant tissues without causing apparent disease symptoms. Its ecological role is not fully understood, but it may be involved in plant–microbe interactions typical of leaf endophytes. Known distribution is limited to the type locality in southern China, associated with *Illicium verum* plantations.



Source Redrawn from Wang et al. (2015)

Note a Ectal excipulum with *textura prismatica*. b Longitudinal section for medullary ecxipulum and ectal ecxipulum. c Asci with ascospores. d Visible apical ring stained in Melzer's reagent. e Ascospores. f Conidiogenous cells with conidia attached. g Conidia of *Cryptosporiopsis*. Scale bar: a = 25 μm, b–g = 25 μm.

Figure 3.49 *Verkleyomyces illicii*

Discinellaceae Ekanayaka & K.D. Hyde, in Ekanayaka, Hyde, Gentekaki, McKenzie, Zhao, Bulgakov & Camporesi, Mycosphere 10(1): 373 (2019)

Index Fungorum number: IF556285; Facesoffungi number: FoF 05888

Discinellaceae was introduced by Ekanayaka et al. (2019) with *Discinella terrestris* designated as the type species. The family is placed within Helotiales (Leotiomycetes, Ascomycota). Members of Discinellaceae are characterised by discoid to cupulate apothecial ascomata, often gelatinous and sometimes hairy. The ectal

excipulum consists of *textura prismatica* or *porrecta*, while the medullary excipulum is composed of *textura intricata* to *prismatica*. Paraphyses are filiform, septate, and frequently branched apically. Asci are cylindrical, 8-spored, with amyloid or non-amyloid apical rings, and sometimes arising from croziers. Ascospores are ellipsoid, aseptate, hyaline, and lacking a mucilaginous sheath. Phylogenetic placement of Discinellaceae has been confirmed using multilocus sequence data, including ITS, LSU, SSU, *TEF*1-α, and *RPB*2. In this study, a multigene phylogeny (Figure 3.49) further confirmed the placement of Discinellaceae within Helotiales and clarified its distinction from closely related families.

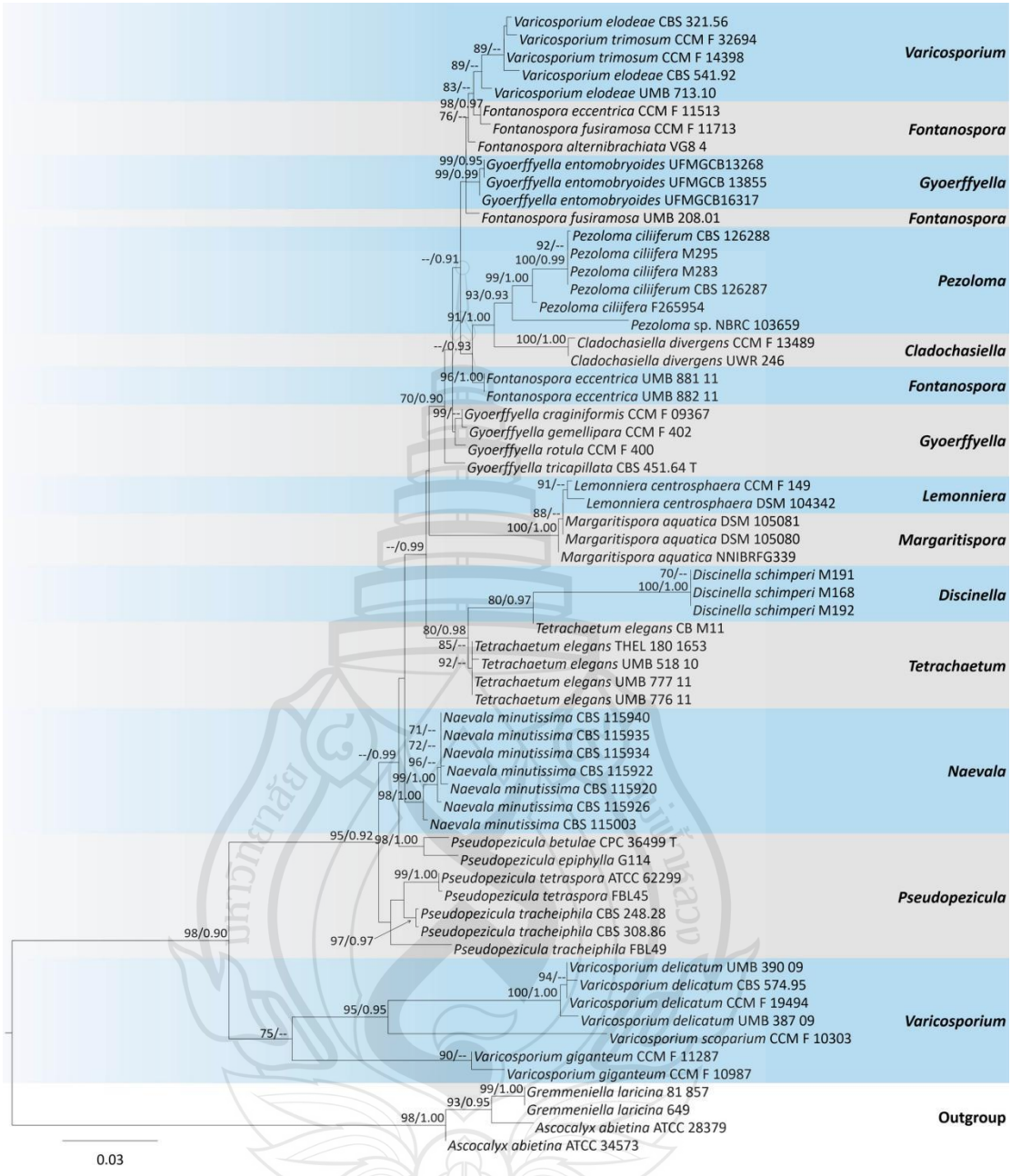


Figure 3.50 Maximum likelihood tree based on the combined ITS and LSU dataset of *Discinellaceae*

Figure 3.50 Bootstrap support values (MLBP ≥ 70%) and Bayesian posterior probabilities (BPP ≥ 0.90) are shown at nodes as MLBP/BPP. Values below these thresholds are indicated with a hyphen ("–"). Type strains are shown in bold.

Cladochasiella Marvanová, Cryptog. Mycol. 18(4): 285 (1997)

Index Fungorum number: IF27789; Facesoffungi number: FoF 18305, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Aaquatic or aeroaquatic. Sexual morph: Unknown. Asexual morph: see Marvanová (1997).

Type species – *Cladochasiella divergens* Marvanová

Notes – *Cladochasiella* was introduced by Marvanová (1997) as a monotypic genus with *C. divergens* as the type species. It is characterised as a mitosporic hyphomycete with hyaline, branched, septate hyphae and semi-macronematous conidiophores. Conidiogenesis is holoblastic; conidiogenous cells are integrated, apical or intercalary, mono- to multilocal, with apical or lateral conidiogenous loci, producing conidia basifugally in sympodial chains. Chains may be simple or dichotomously branched, fractiflexuous, and fragment schizolytically into shorter segments or single conidia. Conidia are clavate, allantoid, sometimes inequilateral or bacilliform, continuous or up to 4-septate, with detachment scars often eccentric and unthickened. Molecular data (ITS) are available for the type species.

Holotype – PRM 842967(ex-type culture CCM F-13489), contaminant isolated from storage bottle with distilled water and a culture of *Fontanospora fusiramosa* CCM F-12089. *Isotype* – PRM 842968.

Cladochasiella divergens Marvanová, Cryptog. Mycol. 18(4): 286 (1997) Figure 3.51

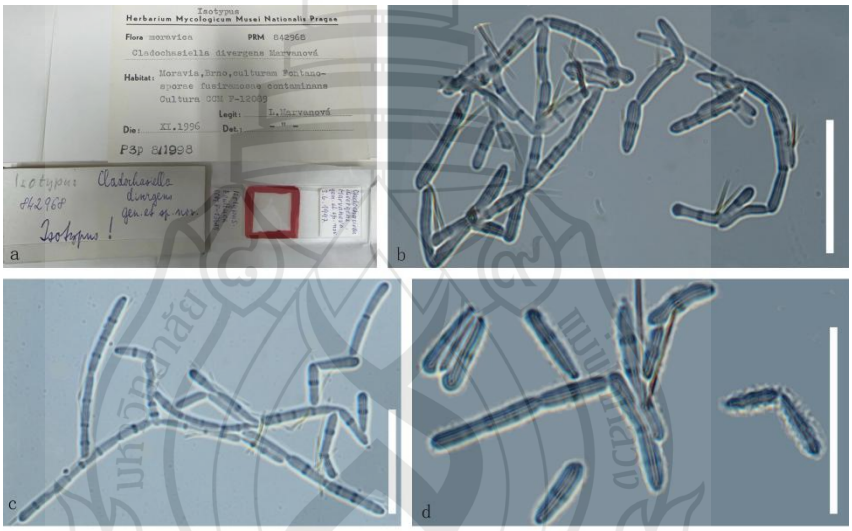
Index Fungorum number: IF442665; Facesoffungi number: FoF 18306

Description – Isolated from distilled water containing a culture of *Fontanospora fusiramosa*. Sexual morph: Unknown. Asexual morph: conidiophores apical, simple or branched, gently knotted, with acrotone branches alternate or opposite. Conidiogenous cells incorporated, apical or intercalary, with one or several apical or lateral conidiogenous sites; monoblastic, denticulate scars broad, unthickened. Conidia blastic, in sympodial chains, simple or branched, often dichotomous and widely divergent, rarely alternate or opposite, fragmenting into shorter segments or individual conidia; schizolytic dehiscence, scars often eccentric. Conidia clavate, sometimes inequilateral or allantoid, rarely bacilliform, continuous or up to 4-septate, measuring (5–)15–30(–45) × 2.5–4 μm.

Material examined – Wheatfen near Norwich, U.K., November 1996, L. Marvanová (PRM 842968, isotype).

Distribution, ecological and economical importance

Cladochasiella likely plays a role in decomposition of organic matter in freshwater ecosystems. Its sporulation pattern resembles that of other aquatic hyphomycetes, important in leaf litter breakdown in streams. Known only from a single culture in the Czech Republic, with probable earlier observation in the U.K. (Ingold & Ellis, 1952: conidia seen in scum on a freshwater tidal ditch at Wheatfen). The original habitat of this fungus remains unknown, and its global distribution is poorly documented.



Note a Details of herbarium material. b-d branched conidiophores. Scale bars: b–d=50 µm.

Figure 3.51 *Cladochasiella divergens* (PRM:842968, isotype)

Discinella Boud., Bull. Soc. mycol. Fr. 1: 112 (1885)

Index Fungorum number: IF1649; Facesoffungi number: FoF 18307, 12 morphological species (Species Fungorum, 2025), 5 species with molecular data.

Saprobic occurring on soil, decaying leaves, humus, and burnt ground. Sexual morph: see Boudier (1907). Asexual morph: Unknown.

Type species – *Discinella boudieri* (Quél.) Boud.

Notes – *Discinella* was introduced by Boudier (1885) and later fully described by Boudier (1907) with *D. boudieri* as the type species. Members of *Discinella* are

characterised by sessile, cup- to disc-shaped apothecia with a regular and sometimes slightly furfuraceous margin. The hymenium is brownish with violet tinges, and the flesh is relatively thick and very fragile. Asci are cylindrical, 8-spored, biseriate or uniseriate, and slightly amyloid. Ascospores are cylindrical-ellipsoid, smooth, hyaline, aseptate, and contain one or more guttules. Paraphyses are filiform, slightly swollen at the apex, and may be curved, twisted, or bifurcate. The ectal excipulum is composed of chains of hymeniform elements, and the subexcipulum consists of cylindrical, septate hyphae. Molecular markers available include LSU and ITS sequence data. Holotype: Germany, Kaiserslautern, on burnt soil, Aug 1985, coll. H.O. Baral (H.B. 4326).

Discinella boudieri (Quél.) Boud., Hist. Class. Discom. Eur. (Paris): 96 (1907) =*Phialea boudieri* Quél., Bull. Soc. bot. Fr. 23: 353 (1877) [1876] Figure 3.52

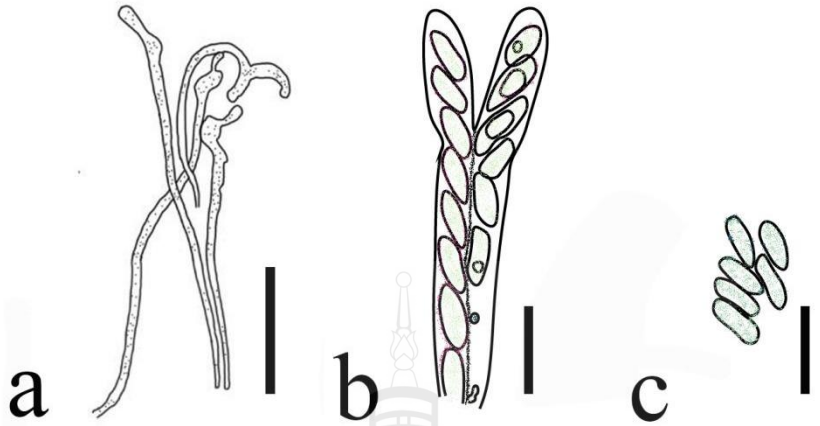
Index Fungorum number: IF431574; Facesoffungi number: FoF 18308

Description – see Boudier (1907).

Material considered – see Boudier (1907).

Distribution, ecological and economical importance

Species of *Discinella* are saprobic, contributing to the decomposition of leaf litter, humus, and organic debris, thereby playing an important role in nutrient cycling in forest ecosystems. They are typically found in temperate to subtropical habitats. *Discinella* has a scattered cosmopolitan distribution, with records from Europe (Spain, Austria, Germany), Australasia (Australia, New Zealand, Tasmania), and occasionally from other temperate and subtropical regions. No direct economic importance has been reported.



Source Redrawn from Ribes (2009)

Note a Paraphyses. b Asci. c Ascospores. Scale bar = 20 μm.

Figure 3.52 *Discinella boudieri*

Fontanospora Dyko, Trans. Br. mycol. Soc. 70(3): 411 (1978)

Index Fungorum number: IF8265; Facesoffungi number: FoF 18309, 4 morphological species (Species Fungorum, 2025), 3 species with molecular data.

Saprobic in freshwater ecosystems. Sexual morph: Unknown. Asexual morph: see Dyko (1978)

Type species – *Fontanospora eccentrica* (R.H. Petersen) Dyko

Notes – *Fontanospora* was introduced by Dyko (1978) with *F. eccentrica* as the type species. Members of the genus are characterised by macronematous, simple to branched, erect, septate, hyaline conidiophores. Conidiogenous cells are integrated, terminal, cylindrical, and proliferate sympodially and percurrently. Conidia are holoblastic, tetraradiate, hyaline, with two appendages arising successively on opposite sides of a constriction on the conidial axis. Conidial release occurs by disarticulation at the basal septum (Dyko, 1978). Molecular markers available include ITS, LSU (D1/D2), and partial SSU rDNA sequence data (Seena et al., 2018). The holotype of *F. eccentrica* is deposited in NY (New York Botanical Garden Herbarium), collected by B.J. Dyko (no. 239) on submerged angiosperm leaves in Walker Prong, Great Smoky Mountains National Park, Tennessee, USA, on 22 November 1975.

Fontanospora eccentrica (R.H. Petersen) Dyko, Trans. Br. mycol. Soc. 70(3): 412 (1978) Figure 3.53

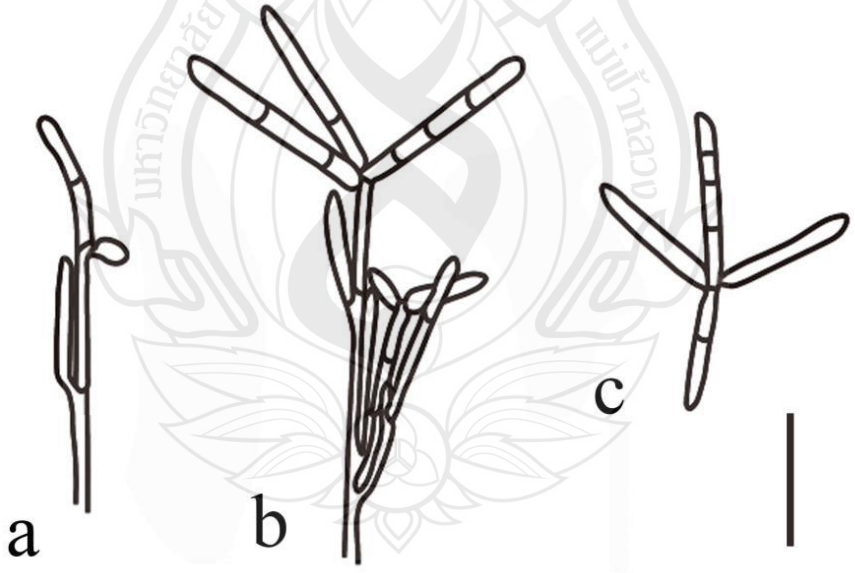
Index Fungorum number: IF314185; Facesoffungi number: FoF 18310

Description – see Dyko (1978).

Material considered – see Dyko (1978).

Distribution, ecological and economical importance

Species of *Fontanospora* are typical aquatic hyphomycetes, contributing significantly to the decomposition of submerged leaf litter in freshwater ecosystems. They decompose complex plant materials, facilitating nutrient cycling and supporting microbial food webs in streams and rivers. The tetraradiate conidia are morphologically adapted for aquatic dispersal, often forming on foam or other submerged substrates. There is currently no known direct economic importance for *Fontanospora*. The genus is known from temperate and subtropical regions, particularly in the Northern Hemisphere, with records from North America (especially the Appalachian region), Europe, and South America (Chile, including Chilean Patagonia).



Source Redrawn from Dyko (1978)

Note a, b Conidium. **c** Mature conidium. Scale bar: a–c = 25 µm.

Figure 3.53 *Fontanospora eccentrica*

Gyoerffyella Kol, Folia Cryptog., Szeged 1: 618 (1928)

Index Fungorum number: IF8410; Facesoffungi number: FoF 18311, 9 morphological species (Species Fungorum 2025), 5 species with molecular data.

Aquatic and terrestrial saprobes and pathogens normally found in decaying leaves. Sexual morph: no observed. 2021. Asexual morph: see Marvanová et al. 1967.

Type species – *Gyoerffyella tatrica* Kol.

Notes – *Gyoerffyella* was introduced by Kol (1928) with *G. tatrica* as the type species. Members of the genus are characterised by hyaline, septate conidia bearing distinctive spiral or helical appendages, produced from hyaline, branched hyphae in aquatic or semi-aquatic environments. Conidiogenesis is holoblastic, and conidia may be produced singly or in sympodial chains. No sexual morph is known. Molecular phylogenetic analyses based on ITS and LSU rDNA sequences have confirmed the placement of *Gyoerffyella* within Discinellaceae (Helotiales, Leotiomycetes) (Baschien et al., 2013; Oh et al., 2023). Ecologically, some taxa (e.g. *G. rotula*) have been isolated from roots of *Abies alba* and shown to act as root pathogens under natural conditions (Jumpponen et al., 2016). Further morphological, molecular, and ecological studies are needed to clarify species boundaries and phylogenetic relationships within this genus. The type species was originally described from submerged decaying leaves in Czechoslovakia; however, no formal type specimen was designated in the protologue.

Gyoerffyella tatrica Kol, Folia Cryptog., Szeged 1: 618 (1928) Figure 3.54

Index Fungorum number: IF255041; Facesoffungi number: FoF 18312

Description – see Kol (1928); Marvanová et al. (1967).

Material considered – see Kol (1928); Marvanová et al. (1967).

Distribution, ecological and economical importance

Gyoerffyella species are primarily aquatic fungi specialising in the decomposition of plant materials, contributing to nutrient cycling in freshwater ecosystems. Certain species, such as *G. tricapillata*, are true aquatic hyphomycetes producing conidia underwater, whereas others (e.g. *G. craginiformis*) occur in semi-aquatic environments and may transition between aquatic and terrestrial habitats. They colonise substrates including submerged rotting leaves (*Prunus*, *Rosa*), leaves of *Lonicera* and *Oxalis acetosella*, and dead leaves of *Myosotis alpestris*. Some are found

on plant stems (*Rosa*) or in unusual habitats such as snowfields and stream scum (Marvanová et al., 1967).

The genus has a broad geographic distribution, being recorded from aquatic environments such as creeks in North Carolina (USA), streams in Japan, and ponds in Great Britain, as well as terrestrial sites in the Netherlands, Austria, and Bulgaria. It also occurs in specialised habitats like snowfields in the High Tatras and Primorye. This ecological versatility allows *Gyoerffyella* species to colonise a wide range of climatic zones.



Source Redrawn from Marvanová et al. (1967)

Note a Conidia. Scale bars: a = 10 µm.

Figure 3.54 *Gyoerffyella tatrica*

Lemonniera De Wild., Ann. Soc. Belge Microscop. 18: 147 (1894)

Index Fungorum number: IF8727; Facesoffungi number: FoF 18313, 9 morphological species (Species Fungorum, 2025), 8 species with molecular data.

Mostly saprobic on submerged decaying leaves and woody debris in freshwater habitats. Sexual morph: Unknown. Asexual morph: see Yu et al. (2019); Campbell et al. (2006)

Type species – *Lemonniera aquatica* De Wild.

Notes – *Lemonniera* was introduced by De Wildeman (1894) with *L. aquatica* as the type species. Members of the genus are characterised by macronematous, mononematous, unbranched or occasionally penicillately branched, septate

conidiophores; terminal, monophialidic conidiogenous cells; and hyaline, tetraradiate conidia with arms arising more or less simultaneously from a central globose or tetrahedral cell. Conidial arms are typically subulate and of roughly equal length. The genus often produces minute, dark sclerotia in culture and exhibits schizolytic conidial secession. Molecular markers available for *Lemonniera* include LSU and ITS sequence data (Campbell et al., 2006; Yu et al., 2019). The holotype of *L. aquatica* is preserved in BR (Botanic Garden Meise, Belgium), collected by De Wildeman in Belgium on submerged decaying leaves in 1894.

Lemonniera aquatica De Wild., Ann. Soc. Belge Microscop. 18: 147 (1894) Figure 3.55

Index Fungorum number: IF241651; Facesoffungi number: FoF 18314

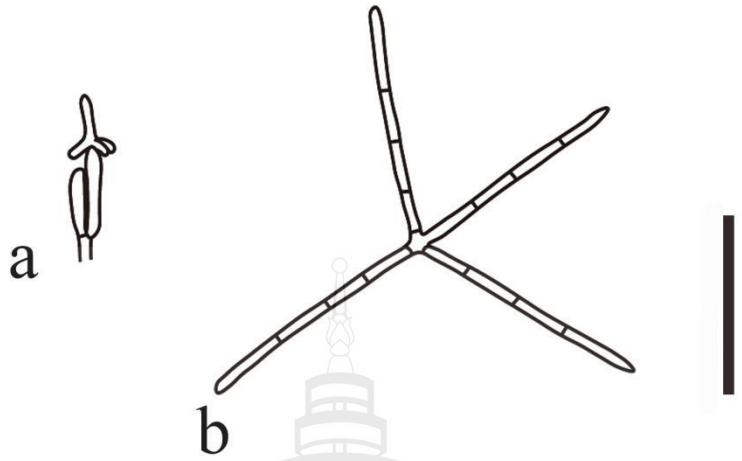
Description – see De Wildeman (1894).

Material considered – see De Wildeman (1894).

Distribution, ecological and economical importance

Species of *Lemonniera* are ecologically significant as aquatic hyphomycetes involved in the early stages of leaf litter decomposition in freshwater ecosystems. By colonising submerged plant debris, they break down complex organic matter, facilitating nutrient release and supporting the microbial food web. Their tetraradiate conidia are well adapted for dispersal in flowing water, enabling rapid colonisation of fresh substrates (Campbell et al., 2006).

Lemonniera is cosmopolitan, recorded across Africa, Asia, Europe, North America, and Australasia. Species typically occur in clean, cool, oxygen-rich freshwater habitats such as streams, rivers, and ponds, from lowlands to high-elevation sites (Yu et al., 2019).



Source Redrawn from Campbell et al. (2006)

Note a Conidial development. b Detached conidia. Scale bar = 50 μm.

Figure 3.55 *Lemonniera aquatica*

Margaritispora Ingold, Trans. Br. mycol. Soc. 25(4): 352 (1942) [1941]

Index Fungorum number: IF8845; Facesoffungi number: FoF 18315, 2 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprotrophic on submerged decaying plant debris in freshwater environments. Sexual morph: Unknown. Asexual morph: see Campbell et al. (2006), Mun et al. (2016).

Type species – *Margaritispora aquatica* Ingold

Notes – The genus *Margaritispora* was introduced by Ingold (1942) with *Margaritispora aquatica* as the type species. *Margaritispora* is characterised by phialidic conidiogenesis, penicillately branched conidiophores, and globose to cuboid conidia with papilliform or conoid protuberances arranged stellately. Conidia formed under submerged conditions are globular with short, equidistant outgrowths. In contrast, those formed at the water–air interface are fusiform or slightly branched. Colonies are typically slow-growing, with sparse to felty aerial mycelium, and produce dark, minute sclerotia in culture (Ingold, 1942; Campbell et al., 2006; Mun et al., 2016). Molecular markers available include LSU and ITS sequence data. The type species *Margaritispora aquatica* was described by Ingold (1942) from collections on submerged *Alnus* leaves in the River Lune near Sedbergh, Yorkshire, UK. However, no physical holotype specimen was designated in the protologue.

Margaritispora aquatica Ingold, Trans. Br. mycol. Soc. 25(4): 353 (1942) [1941] Figure 3.56

Index Fungorum number: IF287980; Facesoffungi number: FoF 18316

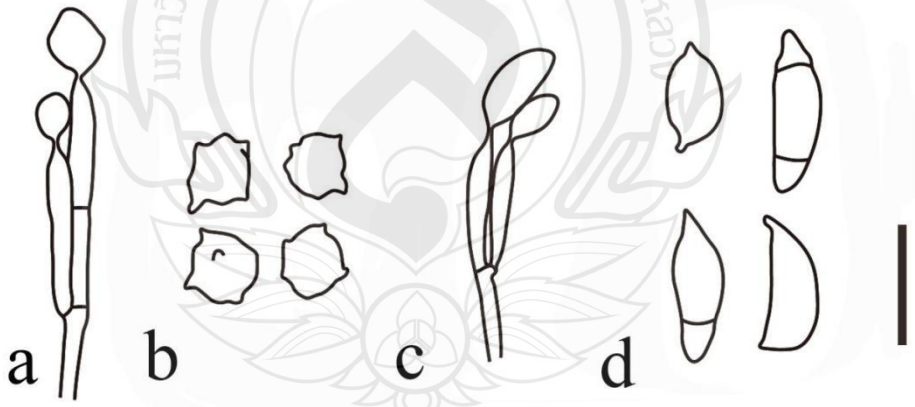
Description – see Campbell et al. (2006); Mun et al. (2016).

Material considered – see Campbell et al. (2006); Mun et al. (2016).

Distribution, ecological and economical importance

Margaritispora plays an important ecological role as a saprotrophic aquatic hyphomycete involved in the decomposition of submerged plant litter in freshwater ecosystems. Its conidia are morphologically adapted to aquatic environments, enhancing dispersal and attachment in flowing water. By breaking down organic matter, *Margaritispora* contributes to carbon and nutrient cycling, supporting microbial food webs and maintaining stream ecosystem function (Campbell et al., 2006; Mun et al., 2016). Currently, *Margaritispora* has no direct economic value.

The genus is distributed globally, primarily in temperate and subtropical regions. Records include Europe (Czech Republic), North America (Canada), and Asia (South Korea). It is commonly found in streams, rivers, and forested aquatic systems, typically on submerged plant debris or in foam.



Source Redrawn from Campbell et al. (2006)

Note a Conidial development at the water level. b Detached conidia at the water level. c Conidial development. d Detached conidia. Scale bar: a–d = 20 µm.

Figure 3.56 *Margaritispora aquatica*

Naevala B. Hein, Willdenowia, Beih. 9: 83 (1976)

Index Fungorum number: IF3412; Facesoffungi number: FoF 18317, 5 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic growing on dead plant material. Sexual morph: see Hein 1976. Asexual morph: Unknown.

Type species – *Naevala perexigua* (Roberge ex Desm.) K. Holm & L. Holm

Notes – *Naevala* was introduced by Hein (1976) as a replacement name for *Naevia* Fr. 1849 sensu Nannfeldt (1932), which was illegitimate due to homonymy with *Naevia* Fr. 1824, a lichen genus. It belongs to the subfamily Naevioideae of the family Dermateaceae (Helotiales, Leotiomycetes), which comprises taxa typically found on dead herbaceous dicotyledonous plant material, with soft to waxy and brightly coloured apothecia. *Naevala* is characterised by apothecia with a distinct dark-walled marginal rim, cylindrical asci with a simple apex, and hyaline, smooth-walled, ellipsoid ascospores. The excipulum consists of *textura globulosa* to *textura prismatica*. This genus is morphologically similar to *Laetinaevia* and *Trochila*, but differs by having a more prominent, pigmented margin. Molecular data for *Naevala* remain scarce, and further phylogenetic studies are needed to clarify its placement within Dermateaceae. The holotype of *Naevala perexigua* was collected by Hein on leaves of *Geum urbanum* in Bayern, Germany, on 15 September 1975, and is deposited in the Botanische Staatssammlung München (M).

Naevala perexigua (Roberge ex Desm.) K. Holm & L. Holm, Bot. Notiser 131(1): 100 (1978) Figure 3.57

=*Naevala minutissima* (Auersw.) B. Hein, Willdenowia, Beih. 9: 88 (1976)

=*Phacidium minutissimum* Auersw., in Rabenhorst, Fungi europ. exsicc.: no. 228 (1860)

Index Fungorum number: IF318467; Facesoffungi number: FoF 18318

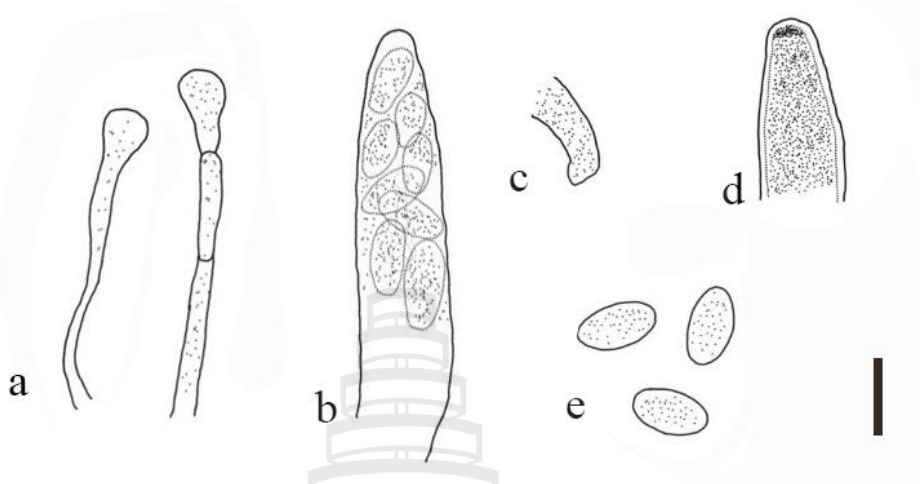
Description – see Hein (1976); Holm and Holm (1978).

Material considered – see Hein (1976); Holm and Holm (1978).

Distribution, ecological and economical importance

Naevala species occur primarily in temperate regions of Europe. They are saprobic on dead leaves and other plant material, contributing to the decomposition of herbaceous dicotyledonous hosts. Records include occurrence on the rotten pericarp of *Epilobium fleischeri* in Austria, on *Solidago virgaurea* in Sweden, on dead leaves of

Quercus rubra in France, and on *Ribes glabellum* in Sweden, indicating their adaptability to different climates and ecological conditions.



Source Redrawn from Centro de Estudios Micológicos Asturianos, accessed on 13 Aug 2025)

Note a Paraphyses. b Asci. c Croziers (+). d Asci (J+). e Ascospores. Scale bars: a–e = 10 μm.

Figure 3.57 *Naevala perexigua*

Pezoloma Clem., Gen. fung. (Minneapolis): 86 (1909)

Index Fungorum number: IF3866; Facesoffungi number: FoF 18319, 13 morphological species (Species Fungorum, 2025), 3 species with molecular data.

Saprobic on decaying plant material, sphagnum, or moss in moist to boggy environments. Sexual morph: see Márquez et al. (2007), Garcia and van Vooren (2005), Baral and Krieglsteiner (2006). Asexual morph: Unknown.

Type species – *Pezoloma griseum* Clem.

Notes – *Pezoloma* was validly published by Clements (1909) with *P. griseum* as the type species. Members of the genus are characterised by sessile or substipitate, discoid to cupulate apothecia, often with a white to pale ochraceous receptacle, sometimes gelatinous, and frequently with a conspicuously ciliate margin. Asci are cylindrical, 8-spored, arising from croziers, and possess an euamyloid apical ring of the **Calycina-type** (broad at the apex, IKI+ blue, distinct from the narrow-ring type in *Hymenoscyphus*). Ascospores are hyaline, smooth, ellipsoid to fusiform, usually guttulate, and aseptate. Paraphyses are filiform, sometimes slightly clavate or branched,

often containing lipid bodies or vacuolar contents. The ectal excipulum is typically bi-layered: an outer gelatinised layer of *textura oblita* and an inner non-gelatinised layer of *textura globulosa* to *prismatica*. Species occur mainly in wet, boggy habitats, frequently associated with *Sphagnum* moss or decomposing plant debris (Midgley et al., 2017; Márquez et al., 2007; Garcia & van Vooren, 2005; Baral & Krieglsteiner, 2006). Molecular markers available for the genus include ITS and LSU sequence data. The holotype of *P. griseum* was collected by E. M. Fries from mossy bark in Vimmerby, Småland, Sweden, and is preserved in herbarium UPS.

Pezoloma griseum Clem., Gen. fung. (Minneapolis): 175 (1909) Figure 3.58

≡ *Helotium griseum* Fr.

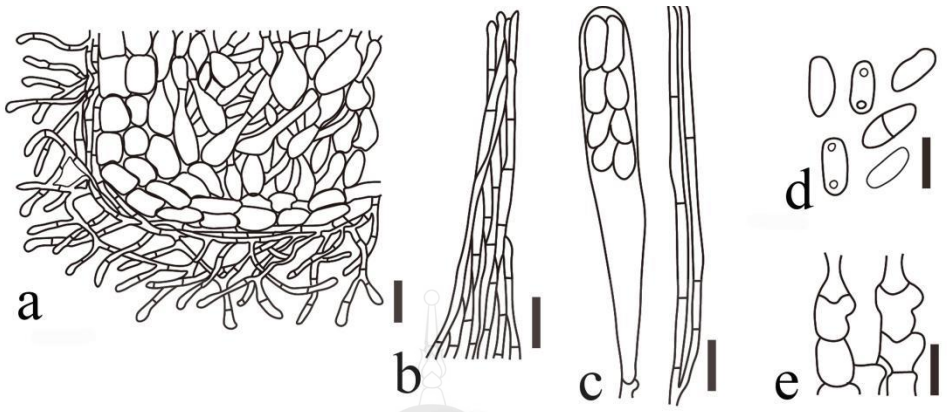
Index Fungorum number: IF214213; Facesoffungi number: FoF 18320

Description – Clements (1909).

Material considered – Clements (1909).

Distribution, ecological and economical importance

Species of *Pezoloma*, particularly *P. ericae*, play a major ecological role as ericoid mycorrhizal fungi. *P. ericae* forms mutualistic associations with the fine hair roots of Ericaceae, enhancing host access to nitrogen and other nutrients in acidic, nutrient-poor soils, particularly in boreal, alpine, and heathland ecosystems (Midgley et al., 2017). Other species are saprobes that contribute to the decomposition of moss and plant debris, participating in nutrient cycling in peatlands and wetlands. No direct economic uses are known. *Pezoloma* has a circumboreal to cosmopolitan distribution, with records from Europe (France, Spain, Switzerland, Finland), Asia, North America, South America, Africa, and Oceania. *P. ericae* is especially widespread, reported from Europe, North America, Patagonia (Argentina), South Africa, and recently from Australia (Midgley et al., 2017).



Source Redrawn from Garcia and van Vooren (2005)

Note a Excipulum. b Excroissance marginale. c Asci and paraphysis. d Ascospores. e Ascogenous cells. Scale bars: a–e = 10 µm.

Figure 3.58 *Pezoloma griseum*

Pseudopezicula Korf, in Korf, Pearson, Zhuang & Dubos, Mycotaxon 26: 463 (1986)

Index Fungorum number: IF25774; Facesoffungi number: FoF 18321, 4 morphological species (Species Fungorum, 2025), 4 species with molecular data.

Pathogens, endophytes or saprobes from leaf litter, decaying plant material, or living plant tissues. Sexual morph: see Crous et al. (2020). Asexual morph: Crous et al. (2020, 2024).

Type species – *Pseudopezicula tetraspora* Korf, R.C. Pearson & W.Y. Zhuang.

Notes – *Pseudopezicula* was introduced by Korf et al. (1986) with *P. tetraspora* as the type species. The genus is characterised by minute apothecia, inoperculate asci, and large, ellipsoid ascospores in the sexual morph, and/or a phialophora-like asexual morph. *Pseudopezicula betulae* produces sporodochial conidiomata composed of hyaline, septate, branched conidiophores and phialidic conidiogenous cells that are subcylindrical to fusoid, with a minute periclinal thickening at the apex and sometimes a collarette; conidia are hyaline, smooth, guttulate, subcylindrical, and aggregated in mucoid masses (Crous et al., 2020, 2024). Molecular markers available include ITS, LSU, *TEF1*, and *RPB2* sequence data. Phylogenetic analyses place *Pseudopezicula* within Dermateaceae (Crous et al., 2020, 2024). The holotype of *P. tetraspora* was

collected by Richard P. Korf on *Rubus allegheniensis* in Tompkins County, New York, on 16 June 1984, and is deposited in the U.S. National Fungus Collections (BPI 870598).

Pseudopezicula tetraspora Korf, R.C. Pearson & W.Y. Zhuang, in Korf, Pearson, Zhuang & Dubos, Mycotaxon 26: 465 (1986) Figure 3.59

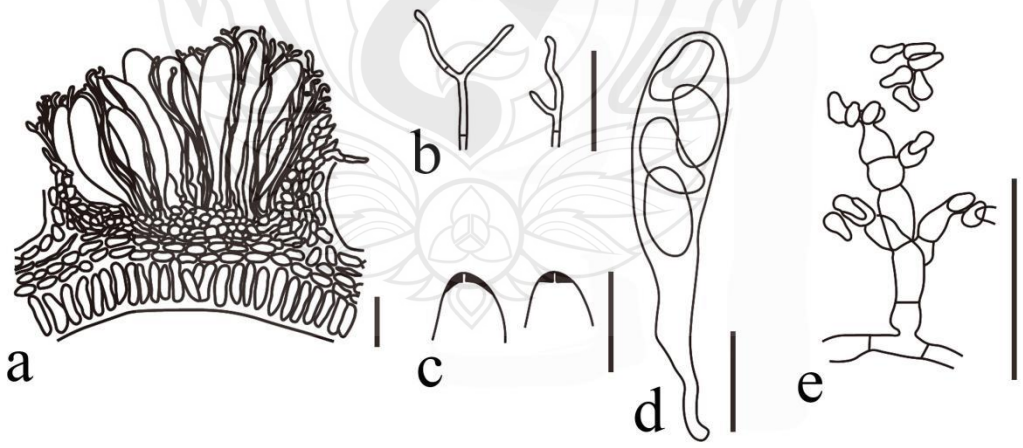
Index Fungorum number: IF103753; Facesoffungi number: FoF 18322

Description – Korf et al. (1986).

Material considered – Korf et al. (1986).

Distribution, ecological and economical importance

Pseudopezicula species are primarily associated with plants, functioning as saprobes, endophytes, or plant pathogens. They may colonise leaf litter, bark, or decaying wood in forest ecosystems, contributing to decomposition and nutrient cycling, or inhabit living plant tissues as part of the phyllosphere microbiota (Crous et al., 2020, 2024). While some species are plant pathogens, they are not known to cause major economic damage. The genus has a broad distribution in the Northern Hemisphere, particularly in temperate regions of Europe and North America. Species have been isolated from *Populus*, *Betula*, and *Quercus* in forested habitats. Recent records include *P. betulae* from Canada (on *Populus tremuloides*) and *P. epiphylla* from sooty mould on *Quercus robur* in Poland, reflecting both native and possibly introduced occurrences (Crous et al., 2020, 2024).



Source Redrawn from Korf et al. (1986)

Note a Section of apothecium. b Paraphysis. c Ascus apices in Melzer's reagent. d Asci. e Anamorph from culture. Scale bars: a–e = 10 µm.

Figure 3.59 *Pseudopezicula tetraspora*

Tetrachaetum Ingold, Trans. Br. mycol. Soc. 25(4): 380 (1942) [1941]

Index Fungorum number: IF10187; Facesoffungi number: FoF 18323, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on dead leaves and branches of both herbaceous plants and trees in freshwater habitats. Sexual morph: Unknown. Asexual morph: see Ingold (1942).

Type species – *Tetrachaetum elegans* Ingold.

Notes – *Tetrachaetum* was established by Ingold (1942) for aquatic hyphomycetes producing distinctive tetraradiate conidia. These conidia are hyaline, smooth, each with four arms radiating from a central point, tapering to acute apices. They are formed singly from denticulate conidiogenous cells borne on macronematous, septate, branched conidiophores. This morphology is well adapted to attachment on submerged plant debris in running water, facilitating dispersal and colonisation in lotic environments. The genus is placed in Leotiomycetes based on ITS and LSU sequence data (Goh et al., 2022). The type species, *T. elegans*, was first described from submerged plant material collected from a stream in the UK; the holotype is deposited at Kew (K) (Ingold, 1942).

Tetrachaetum elegans Ingold., Trans. Br. mycol. Soc. 25(4): 381 (1942) [1941]

Index Fungorum number: IF291359; Facesoffungi number: FoF 18324

Description – Ingold (1942).

Material considered – Ingold (1942).

Distribution, ecological and economical importance

Tetrachaetum species are widely distributed in temperate freshwater ecosystems worldwide and are among the earliest colonisers of freshly fallen leaves in streams. Their conidia are often abundant in the water column during leaf fall seasons, contributing significantly to leaf litter decomposition and nutrient cycling in aquatic ecosystems. Environmental factors such as water temperature, stream flow, and substrate type influence their abundance and distribution (Goh et al., 2022).

Figure – No original illustration available; refer to Ingold (1942) for morphological description.

Varicosporium W. Kegel, Ber. dt. bot. Ges. 24: 213 (1906)

Index Fungorum number: IF10377; Facesoffungi number: FoF 18325, 9 morphological species (Species Fungorum, 2025), 5 species with molecular data.

Saprobic, commonly found in both aquatic and terrestrial habitats. Sexual morph: Unknown. Asexual morph: (Campbell et al., 2009).

Type species – *Varicosporium elodeae* W. Kegel

Notes – *Varicosporium* was introduced by Kegel (1906) with *V. elodeae* as the type species. The genus is characterised by branched, often sigmoid to helical conidia with both primary and secondary branches, which may be constricted or unconstricted at the points of insertion. Conidiogenesis is predominantly thalloblastic, with sympodial or determinate proliferation; blastic development has also been reported in *V. elodeae* (Park, 1982). Conidia are hyaline, smooth, typically 3–6-septate, and produced singly from denticulate conidiogenous cells borne on macronematous, septate, branched conidiophores. Colonies may range from pale to dark in colour and sometimes produce diffusible pigments, particularly under low-light or dark culture conditions (Campbell et al., 2009).

Varicosporium elodeae is commonly isolated from submerged plant debris, but it is also a competitive saprophyte in soils and forest litter, able to colonise substrates such as filter paper, leaf litter, and decaying roots under terrestrial conditions (Park, 1982). The species has a high cellulolysis adequacy index, reflecting its efficiency in degrading cellulose under low-nitrogen conditions, and does not require exogenous vitamins for growth. It can utilise a wide variety of carbon and nitrogen sources, demonstrating ecological flexibility. Molecular markers available for phylogenetic studies include ITS and LSU rDNA sequences (Campbell et al., 2009).

The type species *V. elodeae* was originally described by Kegel (1906), probably from aquatic environments in Germany. No modern type specimen has been formally designated, and the original material may be lost.

Varicosporium elodeae W. Kegel, Ber. dt. bot. Ges. 24: 213 (1906) Figure 3.60

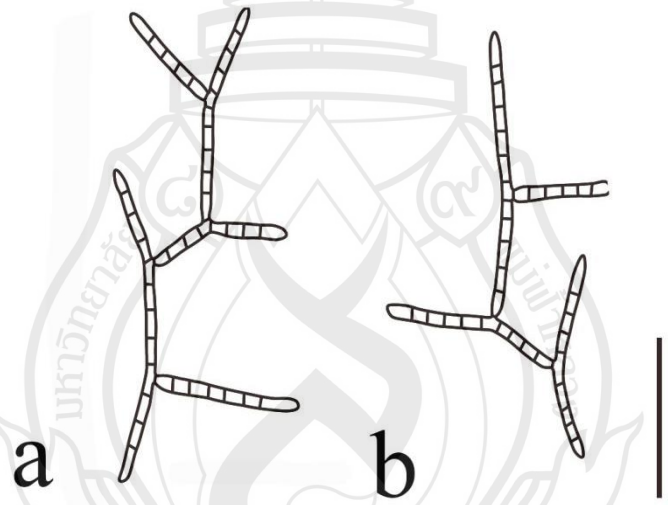
Index Fungorum number: IF229259; Facesoffungi number: FoF 18326

Description – Kegel (1906).

Material considered – Kegel (1906).

Distribution, ecological and economical importance

Species of *Varicosporium*, particularly *V. elodeae*, function as important saprobes in both aquatic and terrestrial ecosystems. They decompose cellulose-rich substrates such as submerged leaves, decaying roots, and forest litter, contributing to nutrient cycling and carbon turnover (Park, 1982). *Varicosporium elodeae* is an early coloniser of submerged leaf litter in streams and also occurs in moderately moist forest soils, showing high ecological plasticity (Ingold, 1942; Park, 1982). *Varicosporium* species have a broad but patchy distribution, most frequently reported from Europe (Germany, UK, Poland), North America (Canada, USA), and Asia (Japan, Korea, China) (Campbell et al., 2009). The type species *V. elodeae* has been recorded from both lotic and terrestrial environments in temperate forest ecosystems.



Source Redrawn from Campbell et al. (2009)

Note a, b Conidia. Scale bars: a, b = 50 µm.

Figure 3.60 *Varicosporium elodeae*

Drepanopezizaceae Baral, in Johnston, Quijada, Smith, Baral, Hosoya, Baschien, Pärtel, Zhuang, Haelewaters, Park, Carl, López-Giráldez, Wang & Townsend, IMA Fungus 1(no. 1): 16 (2019)

Index Fungorum number: IF828889; Facesoffungi number: FoF 05864

Drepanopezizaceae was established by Johnston et al. (2019) based on a multigene phylogenetic reconstruction of Leotiomycetes, supported by combined ITS, LSU, *RPB2*, *TEF1-α*, and *β-tubulin* sequence data. The family is typified by the genus

Drepanopeziza and is characterised by apothecial ascomata with inoperculate, unitunicate, 8-spored asci and hyaline, 1-septate, ellipsoid to oblong ascospores. The ectal excipulum is composed of *textura angularis* to *prismatica*, sometimes with pigmented outer layers, and paraphyses are filiform to slightly clavate, often containing vacuolar bodies. The asexual morph is typically acervular, developing subepidermally and erumpent through host tissues, producing slimy masses of hyaline, 1-septate, oblong conidia on short, branched or unbranched conidiophores arising from a basal stroma (Johnston et al., 2019; Zhu et al., 2023; Yang et al., 2024).

Members of this family are hemibiotrophic foliar pathogens that initially colonise leaves biotrophically and later switch to necrotrophy, causing necrosis and premature defoliation. Economically important diseases include Marssonina apple blotch (*Marssonina coronaria* = *Diplocarpon coronariae*), black spot of rose (*M. rosae* = *D. rosae*), and Entomosporium leaf spot (*Entomosporium mespili*) (Khodadadi et al., 2022; Yang et al., 2024).

Drepanopezizaceae has a cosmopolitan distribution, especially in temperate and subtropical regions with humid growing seasons. Hosts are mainly in Rosaceae, including economically important trees and shrubs such as *Malus* (apple), *Pyrus* (pear), *Rosa* (rose), *Prunus*, and *Photinia*, but members have also been recorded from ornamental plants and wild rosaceous hosts in natural and urban landscapes (Johnston et al., 2019; Yang et al., 2024). In the present study, our multigene phylogenetic analyses (Figure 3.61) confirmed the familial placement of Drepanopezizaceae.

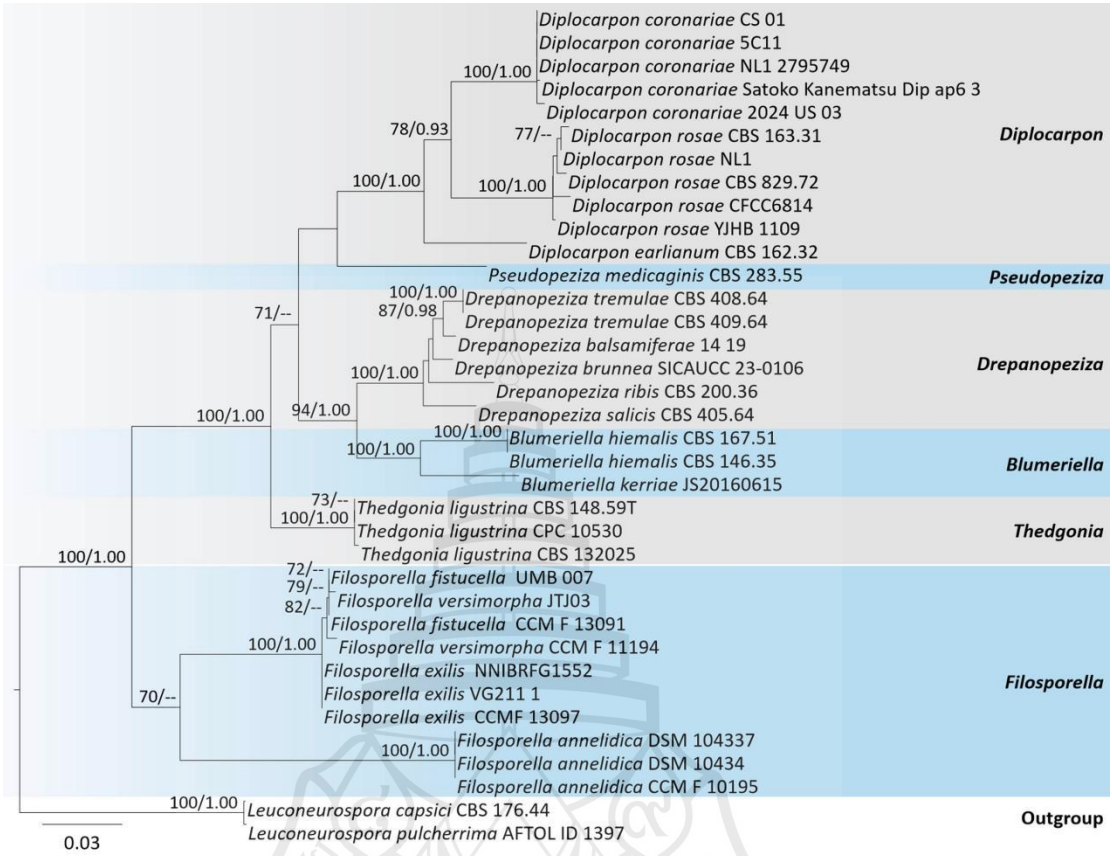


Figure 3.61 Maximum likelihood tree based on the combined ITS and LSU dataset of *Drepanopezizaceae*

Figure 3.61 Bootstrap support values (MLBP ≥ 70%) and Bayesian posterior probabilities (BPP ≥ 0.90) are shown at nodes as MLBP/BPP. Values below these thresholds are indicated with a hyphen ("–"). Type strains are shown in bold.

Blumeriella Arx, Phytopath. Z. 42(2): 164 (1961)

Index Fungorum number: IF601; Facesoffungi number: FoF 18327, 5 morphological species (Species Fungorum, 2025), 3 species with molecular data.

Obligate or facultative plant pathogens. Sexual morph: see Khodaparast (2024). Asexual morph: see Khodaparast (2024), Robinson et al. (2017).

Type species – *Blumeriella jaapii* (Rehm) Arx

Notes – *Blumeriella* was introduced by Arx (1961) with *B. jaapii* as the type species. The genus is characterised by acervular conidiomata developing subcuticularly, usually on the abaxial surface of infected leaves, producing white to cream conidial masses. Conidiophores are short, hyaline, and arise from a basal stroma. Conidiogenous

cells are holoblastic, phialidic, integrated, and determinate in proliferation. Conidia are filiform, hyaline, mostly 2–3-septate, and curved. Sexual morphs, when present, correspond to *Coccomyces*-like apothecia, typically immersed to erumpent, with inoperculate, unitunicate asci and hyaline, ellipsoid to fusiform, 1-septate ascospores. Members of *Blumeriella* are plant pathogens mainly associated with foliar diseases of Rosaceae, particularly *Prunus* species (e.g., cherries), but also infecting other ornamental and fruit trees. Molecular markers available include ITS, LSU, *TEF1-α*, and *β-tubulin* sequences (Khodaparast, 2024; Robinson et al., 2017). The type specimen of *B. jaapii* was collected by Rehm on *Prunus cerasus* in Germany and is deposited in the Farlow Herbarium of Cryptogamic Botany, Harvard University (FH).

Blumeriella jaapii (Rehm) Arx, Phytopath. Z. 42(2): 164 (1961) Figure 3.62

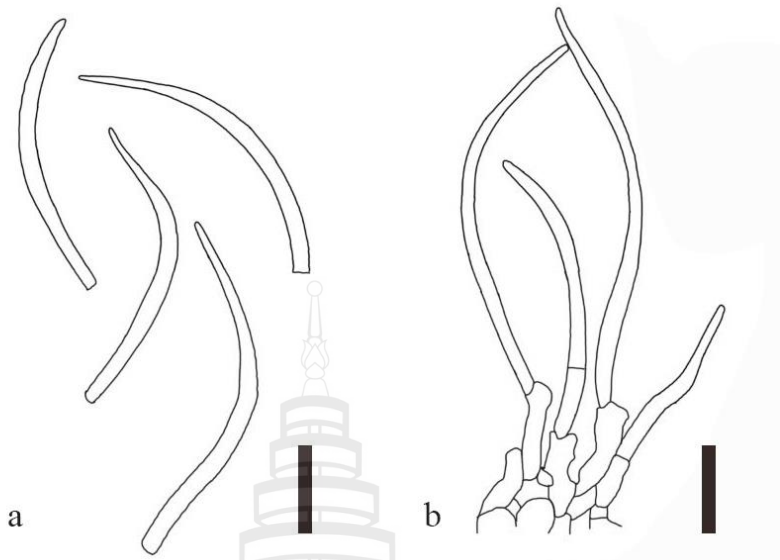
Index Fungorum number: IF327015; Facesoffungi number: FoF 18328

Description – see Khodaparast (2024).

Material considered – see Khodaparast (2024).

Distribution, ecological and economical importance

Species of *Blumeriella*, particularly *B. jaapii*, play a significant role in plant pathology and ecosystem processes as foliar pathogens of woody Rosaceae. They accelerate premature defoliation, especially in humid temperate regions, thereby influencing leaf litter dynamics and nutrient cycling. The pathogen overwinters in fallen infected leaves, contributing to seasonal fungal succession on forest or orchard floor debris (Khodaparast, 2024; Robinson et al., 2017). *Blumeriella* species occur globally, with a predominance in temperate zones. *B. jaapii* is widespread in North America (especially the USA) and Europe, and has recently been reported in Iran (Khodaparast 2024). Other species, such as *B. kerriae*, have been documented in the USA and were newly recorded in the UK (Robinson et al., 2017).



Source Redrawn from Khodaparast (2024)

Note a Conidia. b Conidiogenous cells. Scale bars: a, b = 10 μm.

Figure 3.62 *Blumeriella jaapii*

Diplocarpon F.A. Wolf, Bot. Gaz. 54: 231 (1912)

Index Fungorum number: IF1601; Facesoffungi number: FoF 07317, 14 morphological species (Species Fungorum, 2025), 6 species with molecular data.

Saprobic or more commonly hemibiotrophic plant pathogens on living leaves of angiosperms, especially Rosaceae. Sexual morph: see Harada, Sawamura and Konno (1974). Asexual morph: see Harada, Sawamura and Konno (1974).

Type species – *Diplocarpon* rosae (Lib.) F.A. Wolf

Notes – *Diplocarpon* was introduced by Wolf (1912) with *D. rosae* as the type species. Members of the genus produce cupulate apothecia as sexual fruiting bodies and *Marssonina*-type acervular conidiomata as the asexual morph. The asexual morph is characterised by subcuticular, lenticular to pulvinate acervuli that rupture the epidermis, short hyaline conidiophores arising from a basal stroma, and phialidic conidiogenous cells producing hyaline, 1–2-septate, fusiform to filiform conidia. Sexual morphs have rarely been observed in nature and are formed on overwintered plant debris; apothecia are cupulate, sessile to short-stipitate, with an inoperculate, unitunicate ascus containing eight hyaline, bicellular ascospores.

The genus exhibits a hemibiotrophic lifestyle, with an initial biotrophic phase marked by the formation of intracellular haustoria, followed by a necrotrophic phase with extensive inter- and intracellular hyphal growth. *D. rosae* infects leaves via direct penetration of the cuticle, forming subcuticular hyphae and stromata prior to sporulation. Molecular markers available for phylogenetic studies include LSU, ITS, and *β-tubulin* sequence data (Harada et al., 1974; Blechert & Debener, 2005; Gachomo, 2005).

Diplocarpon rosae (Lib.) F.A. Wolf, Bot. Gaz. 54: 231 (1912) Figure 3.63

Index Fungorum number: IF189722; Facesoffungi number: FoF 18329

Description – Wolf (1912).

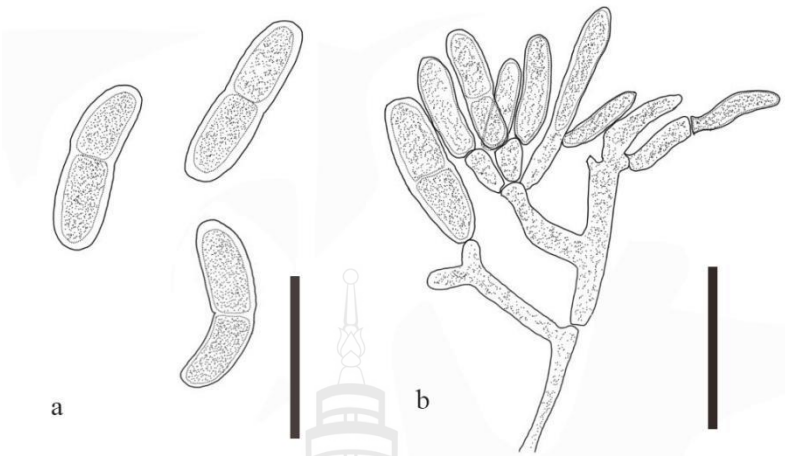
Material considered – Wolf (1912).

Distribution, ecological and economical importance

Diplocarpon species are important foliar pathogens, primarily of Rosaceae, contributing to natural host population regulation and acting as significant agricultural and horticultural pathogens. *D. rosae*, the causal agent of rose black spot, causes premature defoliation, weakens plants, and reduces their ornamental and commercial value, resulting in considerable economic losses in the cut flower and nursery industries. *D. mali*, pathogenic to *Malus* spp., causes apple blotch and is morphologically similar in its asexual stage but differs in host specificity and lesion morphology (Harada et al., 1974).

The life cycle typically involves overwintering in fallen infected leaves as stromatic tissue, with apothecia (sexual stage) or acervuli (asexual stage) forming in spring, releasing ascospores or conidia to initiate primary infections. Secondary spread during the growing season is by splash-dispersed conidia. Control often relies on fungicide sprays and the breeding of resistant cultivars (Blechert & Debener, 2005).

Diplocarpon species have a cosmopolitan distribution, particularly in temperate and subtropical regions. *D. rosae* is reported from Europe, North America, Asia, Australia, and Africa wherever roses are cultivated (Horst, 1983; Gachomo, 2005). *D. mali* is known from Japan and other apple-growing regions in East Asia.



Source Redrawn from Wolf (1912)

Note a Conidia. b Conidiogenous cells. Scale bars: a, b = 20 µm.

Figure 3.63 *Diplocarpon rosae*

Drepanopeziza (Kleb.) Jaap, Verh. bot. Ver. Prov. Brandenb. 56: 79 (1914)

Index Fungorum number: IF1709; Facesoffungi number: FoF 07351, 14 morphological species (Species Fungorum, 2025), 7 species with molecular data.

Necrotrophic pathogens of *Populus* and other deciduous trees. Sexual morph: see Spiers and Hopcroft (1998), Rossman et al. (2017). Asexual morph: see Rossman et al. (2017).

Type species – *Drepanopeziza ribis* (Rehm ex Kleb.) Höhn.

Notes – *Drepanopeziza* was introduced by Klebahn and validated by Jaap (1914), with *D. ribis* as the type species. The genus is characterised by discoid to cupulate apothecia developing subcuticularly on infected leaves, usually on the adaxial surface, which rupture the epidermis at maturity. Asci are unitunicate, clavate to cylindrical, with an amyloid apical ring, and contain eight hyaline, usually one-septate ascospores. Paraphyses are filiform, often slightly enlarged at the apex. The asexual morphs are associated with *Marssonina*- or *Gloeosporium*-like acervuli, producing falcate, aseptate, hyaline conidia borne on short conidiophores. Members of the genus are necrotrophic pathogens, primarily infecting *Populus* species, causing characteristic angular to irregular brown leaf spots or blotches, often leading to premature defoliation (Spiers & Hopcroft, 1998; Rossman et al., 2017). Molecular markers available include LSU and ITS sequence data, which support the monophyly of the genus within

Drepanopezizaceae (Spiers & Hopcroft, 1998; Rossman et al., 2017). The type specimen of *Drepanopeziza populorum* (Kleb.) Jaap in Germany was collected from *Populus* species by F. Klebahn, and the holotype is deposited in the herbarium B.

Drepanopeziza ribis (Rehm ex Kleb.) Höhn., Annls mycol. 15(5): 332 (1917) Figure 3.64

Index Fungorum number: IF119439; Facesoffungi number: FoF 18330

Description – Kunze and Schmidt (1823), Braun and Cook (2012).

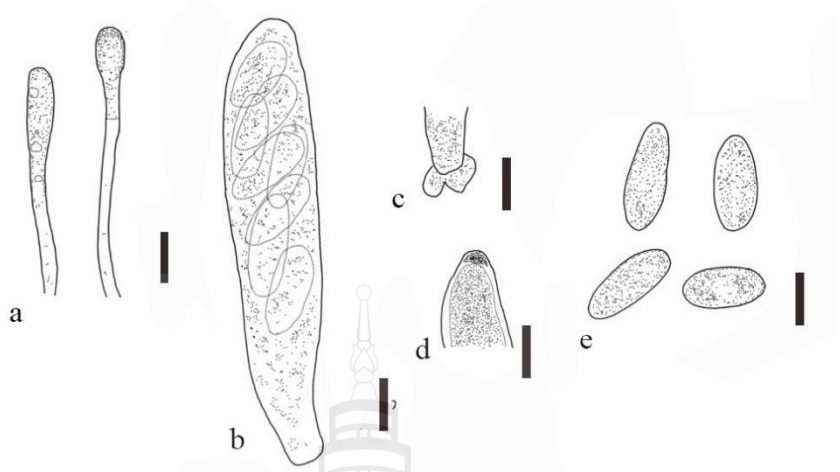
Material considered – Kunze and Schmidt (1823), Braun and Cook (2012).

Distribution, ecological and economical importance

Species of *Drepanopeziza* are necrotrophic foliar pathogens, especially on *Populus*, where they regulate leaf longevity, influence nutrient cycling, and contribute to early-season defoliation in temperate forests (Busby et al., 2013). Infection begins in spring from overwintered fallen leaves bearing apothecia or acervuli. Primary infections produce lesions that expand, and secondary asexual infections accelerate disease spread during humid conditions. Severe infections can reduce photosynthetic capacity and alter leaf phenology, with some hosts exhibiting compensatory second-flush leaf production (Call & St. Clair, 2017).

Economically, *Drepanopeziza* can cause significant yield and quality loss in poplar plantations, especially in clonal forestry systems. Repeated defoliation reduces growth, increases susceptibility to secondary pathogens, and can predispose trees to abiotic stress. This is particularly relevant for hybrid poplars in commercial timber, biomass, and reforestation programs.

The genus has a cosmopolitan distribution, recorded in Europe, North America, Asia, and Oceania. Representative species include *D. populorum*, *D. tremulae*, and *D. populi-albae*, each associated with specific *Populus* taxa in temperate climates (Rossman et al., 2017; Spiers & Hopcroft, 1998).



Source Redrawn from Asturnatura (2016)

Note a Paraphyses. b Asci. c Croziers present. d Asci (J+) e Ascospores. Scale bars: a–e = 10 µm.

Figure 3.64 *Drepanopeziza ribis*

Felisbertia Viégas, Bragantia 4(1-6): 45 (1944)

Index Fungorum number: IF1982; Facesoffungi number: FoF 18331, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on dead leaves and branches. Sexual morph: see Viégas (1944). Asexual morph: see Gómez-Zapata et al. (2021).

Type species – *Felisbertia melastomatacearum* (Speg.) Viégas.

Notes – *Felisbertia* was introduced by Viégas (1944) within *Pseudopezizoideae* Nannfeldt (now placed in Dermateaceae) to accommodate *F. melastomatacearum*, distinguished by its bi-septate (three-celled), hyaline ascospores and occurrence on *Tibouchina* leaves in Brazil. Apothecia are aggregated, sessile to subsessile, with a smooth surface, and asci are clavate with hyaline, 3-celled ascospores. The genus is morphologically distinct from closely related dermateaceous taxa due to its ascospore septation and host specificity. No molecular data are currently available, and further collections and phylogenetic analyses are needed to confirm its systematic placement. The holotype of *F. melastomatacearum* (Fungi puiggariensis no. 199) was collected by C. Spegazzini in 1889 on leaves of *Melastomataceae* in Brazil and is deposited in LPS.

Felisbertia melastomatacearum (Speg.) Viégas [as ‘melastomacearum’], Bragantia 4(1-6): 4 (1944)

≡ *Fabraea melastomatacearum* Speg. [as 'melastomacearum'] 1889

Index Fungorum number: IF663928; Facesoffungi number: FoF 18332

Description – see Viégas (1944).

Material considered – see Viégas (1944).

Distribution, ecological and economical importance

Felisbertia is a monotypic genus in Dermateaceae, with *F. melastomatacearum* known only from Brazil, particularly the São Paulo region. It is saprobic on dead leaves and branches of *Tibouchina* (Melastomataceae), contributing to decomposition and nutrient cycling in local ecosystems. The genus is likely endemic to Brazil and currently has no confirmed asexual morph linked to the type species.

Figure – No original illustration available.

Filosporella Nawawi, Trans. Br. mycol. Soc. 67(1): 175 (1976)

Index Fungorum number: IF8253; Facesoffungi number: FoF 18333, 6 morphological species (Species Fungorum, 2025), 4 species with molecular data.

Aquatic saprobes, typically isolated from submerged decaying plant material. Sexual morph: Unknown. Asexual morph: see Marvanová and Bärlocher (1998).

Type species – *Filosporella aquatica* Nawawi

Notes – *Filosporella* was introduced by Nawawi (1976) with *F. aquatica* as the type species. The genus is characterised by macronematous, erect, septate conidiophores, often apically branched; conidiogenous cells holoblastic, terminal, integrated or discrete, with percurrent or sympodial proliferation; conidia hyaline, filiform to slightly clavate, straight or curved, multiseptate, and schizolytically seceding. Some species produce microconidia through phialidic conidiogenesis, which may function as spermatia in sexual reproduction (Marvanová & Bärlocher, 1998). Molecular markers available include LSU and ITS sequence data (Baschien et al., 2013; Mun et al., 2019; Rissi et al., 2023).

Originally, *Filosporella* was treated as an aquatic hyphomycete of uncertain placement (*incertae sedis*) within Ascomycota. Later, phylogenetic analyses based on rDNA sequences placed *F. fistucella*, *F. exilis*, and *F. versimorpha* in the *Ascocoryne–Hydrocina* clade, while *F. cf. annelidica* was positioned in the *Cudonella–*

Hymenoscyphus clade, indicating that the genus is not monophyletic (Baschien et al., 2013; Mun et al., 2019). *F. fistucella* was tentatively assigned to Drepanopezizaceae in Helotiales based on multigene phylogeny (Rissi et al., 2023). These results suggest that *Filosporella* represents a complex of unrelated lineages convergently adapted to freshwater habitats. The type specimen of *F. aquatica* was collected by A. Nawawi on submerged decaying leaves of *Pandanus helicopus* in Tasek Bera, Pahang, Malaysia, and the holotype is deposited in the herbarium of the University of Malaya, Kuala Lumpur (holotype in herb. KLU).

Filosporella aquatica Nawawi, Trans. Br. mycol. Soc. 67(1): 175 (1976) Figure 3.65

Index Fungorum number: IF314135; Facesoffungi number: FoF 18334

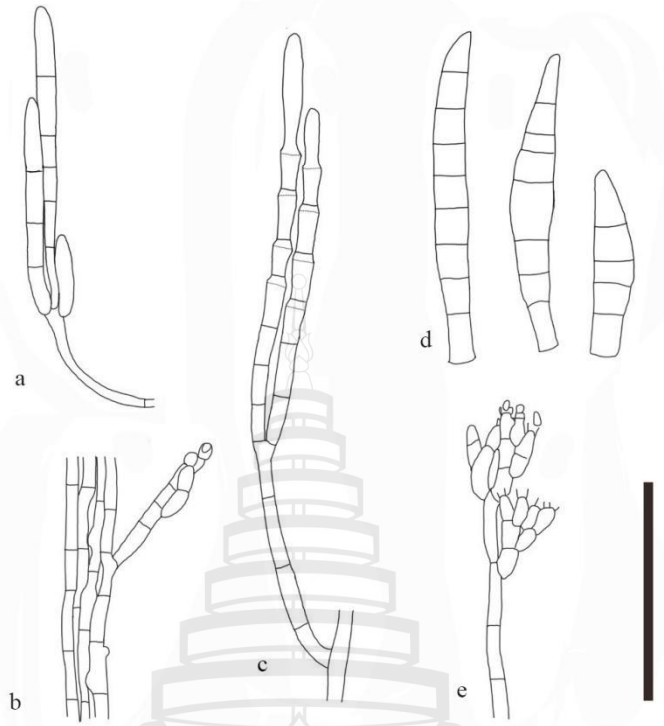
Description – Nawawi (1976), Marvanová and Bärlocher (1998).

Material considered – Nawawi (1976), Marvanová and Bärlocher (1998).

Distribution, ecological and economical importance

Species of *Filosporella* are ecologically important aquatic saprobic fungi, contributing significantly to the decomposition of submerged plant litter such as leaves, twigs, and foam accumulations in freshwater ecosystems. They secrete a wide range of carbohydrate-active enzymes (e.g. cellulases, hemicellulases, xylanases, pectinases, laccases), enabling efficient degradation of complex plant materials (Rissi et al., 2023). Despite their ecological importance, no economic value has been recorded for *Filosporella* species to date.

The genus is reported from a variety of temperate and tropical freshwater environments. It was first described from Malaysia (*F. aquatica*, Nawawi, 1976), and later species were recorded from Europe (*F. fistucella*, UK), Canada (*F. pinguis*), North America, India, Portugal, Germany, and South Korea (Mun et al., 2019; Rissi et al., 2023).



Source Redrawn from Marvanová and Bärlocher (1998)

Note a Young stage of conidial. b, e Microconidial state. c Conidiophores with developing conidia and spent conidiogenous cells. d Conidia. Scale bars: a–e = 50 µm.

Figure 3.65 *Filosporella pinguis*

Leptotrochila P. Karst., Bidr. Känn. Finl. Nat. Folk 19: 245 (1871)

Index Fungorum number: IF2809; Facesoffungi number: FoF 07429, 21 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Biotrophic or weakly parasitic, colonising living leaves of herbaceous plants. Sexual morph: see Samuels et al. (1981). Asexual morph: Unknown.

Type species – *Leptotrochila radians* (Roberge ex Desm.) P. Karst.

Notes – *Leptotrochila* was introduced by P. Karsten with *L. radians* as the type species. The genus is characterised by sessile, innately developing, gregarious to cespitose apothecia, often forming beneath or slightly erumpent through the epidermis of host leaves. Mature apothecia are dark-coloured, with a well-defined margin and a basal layer of pseudoparenchymatous *textura angularis* cells. Asci are clavate, 8-spored, arising from croziers, with a small apical ring; ascospores are unicellular, hyaline,

ellipsoid to fusiform, often containing refractive guttules. Paraphyses are filiform, sometimes branched, and exceed the asci in length. No asexual morph is known for most species, including *L. porri*, which is considered a holomorphic teleomorph. To date, no molecular sequence data are available for this genus (Samuels et al., 1981; Rossman & Johnston, 2016). The type specimen of *L. radians* was collected in France by Roberge on leaves of *Campanula* sp., with *Sporonema campanulae* as its anamorph, and is designated in Fries' herbarium (UPS).

Leptotrochila radians (Roberge ex Desm.) P. Karst., Bidr. Känn. Finl. Nat. Folk 19: 245 (1871) Figure 3.66

Index Fungorum number: IF178317; Facesoffungi number: FoF 18335

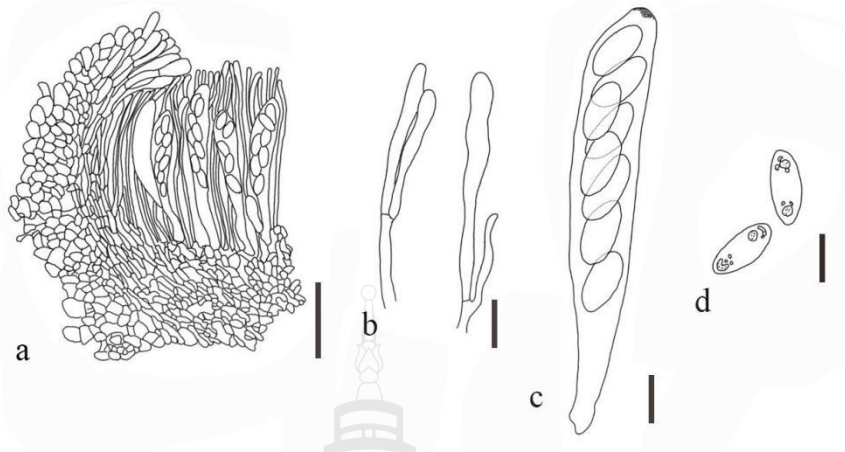
Description – Karsten (1871).

Material considered – Karsten (1871).

Distribution, ecological and economical importance

Leptotrochila species are host-specific foliar ascomycetes primarily associated with herbaceous dicotyledons. They play a role in regulating plant populations and contribute to leaf senescence and litter decomposition in natural and agricultural ecosystems. Their biotrophic or weakly parasitic lifestyle allows persistence within living tissues without immediate host death, forming a functional part of plant–fungal ecological interactions (Samuels et al., 1981).

The genus has a Holarctic distribution, predominantly in temperate regions, with species recorded from Europe, Asia, and New Zealand. *L. radians* and *L. repanda* are native to Europe and commonly associated with *Campanula* and *Potentilla*, respectively. *L. porri* was originally described from the Netherlands and has since been reported from New Zealand, likely introduced through contaminated leek seed (Samuels et al., 1981).



Source Redrawn from Samuels et al. (1981)

Note a Longitudinal section of mature apothecium. b Paraphyses. c Asci, apical ring I+ blue in Melzer's reagent. d Ascospores. Scale bars: a = 50 µm, b–d = 10 µm.

Figure 3.66 *Leptotrochila porri*

Pseudopeziza Fuckel, Jb. nassau. Ver. Naturk. 23-24: 290 (1870) [1869-70]

Index Fungorum number: IF4472; Facesoffungi number: FoF 18336, 53 morphological species (Species Fungorum, 2025), 2 species with molecular data.

Saprobic, colonizing dead leaves and branches of various species of herbaceous plants and trees. Sexual morph: see Fuckel (1870). Asexual morph: Unknown.

Type species – *Pseudopeziza trifolii* (Biv.) Fuckel.

Notes – *Pseudopeziza* was introduced by Fuckel (1870), with *Pseudopeziza trifolii* (Biv.-Bernh. ex Fr.) Fuckel as the type species. The genus is characterised by small, disc-shaped apothecia that arise on the surfaces of host leaves, typically forming within necrotic lesions. The apothecia are sessile, dark-pigmented at maturity, and may be slightly erumpent through the epidermis. Asci are clavate to cylindrical, inoperculate, 8-spored, and arise from croziers, with ascospores that are ellipsoid, hyaline, and aseptate, typically arranged biseriately or triseriately within the asci. Paraphyses are filiform, septate, and often slightly clavate at the apex. *Pseudopeziza* species are commonly associated with leaf spot diseases of herbaceous legumes and other dicots, with *P. trifolii* infecting *Trifolium*, *Medicago*, and *Melilotus* (Meyer & Luttrell, 1986). The ascomata are embedded in or beneath the epidermis and lack a well-defined stroma, though in some cases a pseudoparenchymatous tissue may be formed beneath the

hymenium. Although traditionally classified in Dermateaceae, molecular studies on the genus remain limited. Available sequence data include ITS and LSU rDNA regions (Lestari et al., 2023), but current phylogenetic analyses are insufficient to resolve the exact placement of *Pseudopeziza* within Helotiales. Further multigene sequencing is required to determine whether *Pseudopeziza* represents a monophyletic lineage. The type specimen of *P. trifolii* (Biv.-Bernh. ex Fr.) Fuckel was collected on leaves of *Trifolium pratense* in Germany by Bivona-Bernardi, described by Fries, and later designated in Fries' herbarium (UPS, Uppsala, Sweden), with *Sporonema campanulae* recorded as its anamorph.

Pseudopeziza trifolii (Biv.) Fuckel, Jb. nassau. Ver. Naturk. 23-24: 290 (1870) [1869-70] Figure 3.67

Index Fungorum number: IF159987; Facesoffungi number: FoF 18337

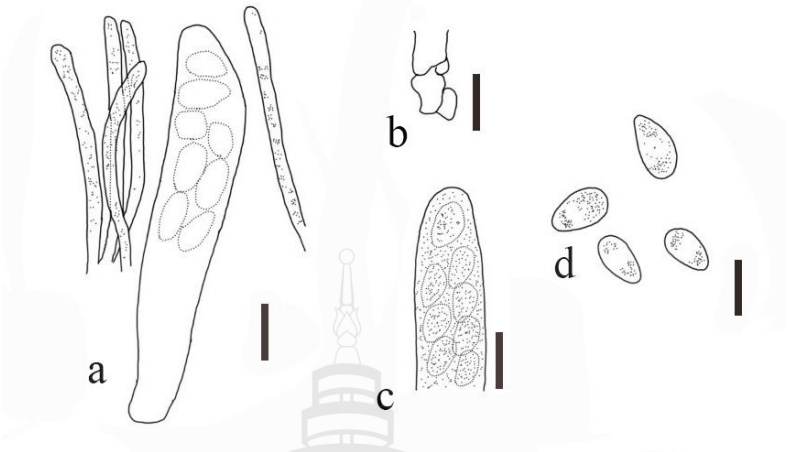
Description – Fuckel (1870).

Material considered – Fuckel (1870).

Distribution, ecological and economical importance

Species of this genus, such as *Pseudopeziza medicaginis* and *Pseudopeziza trifolii*, are responsible for foliar diseases in their respective host plants. *P. medicaginis* causes common leaf spot in alfalfa (*Medicago sativa*), which leads to reduced photosynthetic activity, premature leaf drop, and diminished forage quality. *P. trifolii* infects clover species, including red clover (*Trifolium pratense*) and white clover (*Trifolium repens*), causing leaf spot diseases that can negatively impact plant health and yield.

Pseudopeziza medicaginis is prevalent in alfalfa-growing regions worldwide, including Europe, Asia, Africa, North and South America, and Australia. *Pseudopeziza trifolii* has been reported in Europe, Western and Central America, Japan, Australia, New Zealand, and North America, which aligns with the distribution of its clover hosts. These fungi thrive in temperate climates where their host plants are cultivated, and environmental conditions favor their development and spread.



Source Redrawn from Centro de Estudios Micológicos Asturianos (2017)

Note a Asci and Paraphyses. b Croziers (+) c Asci (J-). d Ascospores. Scale bars: a–d = 10 μm.

Figure 3.67 *Pseudopeziza trifolii*

Spilopodia Boud., Bull. Soc. mycol. Fr. 1: 120 (1885)

Index Fungorum number: IF5147; Facesoffungi number: FoF 18338, 8 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic or weakly pathogenic on leaves or stems of herbaceous or woody plants, often associated with vascular bundles. Sexual morph: see Boud (1885). Asexual morph: see Unkonwn.

Type species – *Spilopodia nervisequa* (DC.) Fr.

Notes – *Spilopodia* is characterised by inoperculate, embedded discomycetes typically found on dead leaves or stems of various plants, often arising from hyphal strands associated with host vascular tissue. The apothecia are very small (0.25–0.5 mm in diameter), with irregular, lacerated blackish margins, usually situated on long, linear black streaks on the substrate. The outer surface of the cup is rough, while the inner surface is ash-gray to olive. Paraphyses are filiform, sometimes branched near the tips, slightly enlarged apically, and grouped in a relatively thick mass. Asci are large, cylindrical, slightly narrowed at the base, 8-spored, arising from croziers, with a distinct apical ring, and contain oblong to ellipsoid, hyaline ascospores measuring 10–12 × 3–6 μm, often with guttules. The ectal excipulum is of *textura angularis* or *textura prismatica*, pigmented in outer layers. The genus is morphologically close to

Leptotrochila Karst., *Fabraea* Sacc., and *Ephelina* Sacc., and has historically been separated based on the origin of apothecia from vascular-associated hyphae, though this feature may vary between species. Molecular data are lacking for most taxa, and its delimitation relative to allied genera remains unresolved. The type specimen *Spilopodia nervisequa* (Pers.) Boud., collected on decaying leaves of *Populus* sp. in France by Persoon, is preserved in herbarium PC (Herbier de Cryptogamie, Muséum National d'Histoire Naturelle, Paris).

Spilopodia nervisequa (Pers.) Boud. [as 'nervisequa'], Hist. Class. Discom. Eur. (Paris): 143 (1907) Figure 3.68

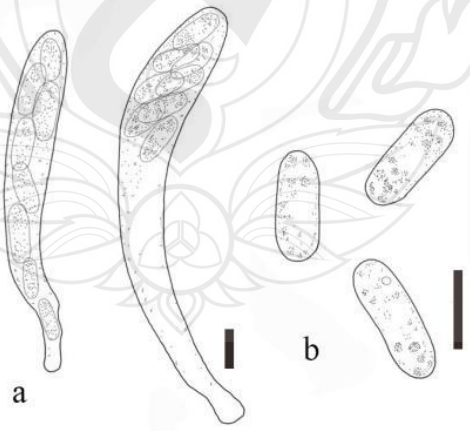
Index Fungorum number: IF493388; Facesoffungi number: FoF 18339

Description – Boud (1885).

Material considered – Boud (1885).

Distribution, ecological and economical importance

This genus has been reported on dead stems of *Mercurialis perennis* in early spring (March), forming black streaks on the substrate. Several species occur on a limited range of hosts and are distinct from other fungi on the same substrate due to their minute apothecia and association with darkened plant tissues. The restricted occurrence on vascular-associated darkened areas and early-spring fruiting may indicate a specialised ecological strategy.



Source Redrawn from Bladmineerders – Host plant parasites of Europe (2021)

Note a Asci. b Ascospores. Scale bars: a, b = 10 µm.

Figure 3.68 *Spilopodia nervisequa*

Spilopodiella E. Müll., Sydowia 41: 220 (1989)

Index Fungorum number: IF25389; Facesoffungi number: FoF 18340, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on on senescent or overwintered leaves of *Carex sempervirens* (Cyperaceae) in alpine habitats. Sexual morph: see Müller (1989). Asexual morph: see Unkonwn.

Type species – *Spilopodiella arxii* E. Müll.

Notes – *Spilopodiella* was introduced by Müller (1989) with *Spilopodiella arxii* as the type species. This genus is characterised by small, cupulate, superficial apothecia that arise from stromatized, sclerotized host vascular tissue. The apothecia are connected to the host via a conical stipe embedded in the substrate. Asci are cylindrical to slightly clavate, iodine-negative, and contain eight three-celled, clavate to subcylindrical, pale to slightly grey-coloured ascospores. Paraphyses are filiform, smooth, and irregularly swollen at the apex. The excipulum is composed of *textura angularis* laterally and *textura prismatica* at the margin. Molecular markers are not yet available for this genus (Müller, 1989). The holotype specimen of *Spilopodiella arxii* was collected on dead leaves of *Carex sempervirens* in Seewis, Fasons, Switzerland, at an elevation of 1950 m on 14 August 1962 by E. Müller, and is preserved in the herbarium ZT (ZT-Myc).

Spilopodiella arxii E. Müll., Sydowia 41: 220 (1989) Figure 3.69

Index Fungorum number: IF125795; Facesoffungi number: FoF 18341

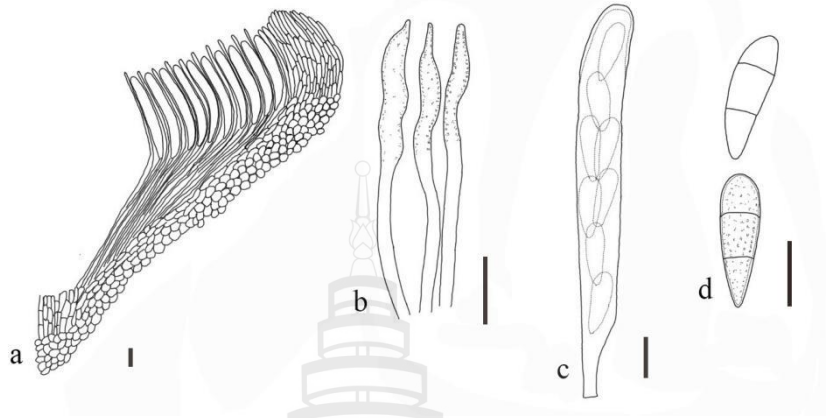
Description – Müller (1989).

Material considered – Müller (1989).

Distribution, ecological and economical importance

pilopodiella is an ecologically specialized genus known from alpine ecosystems, where it occurs on senescent or overwintered leaves of *Carex sempervirens*. It appears to be a late colonizer or decomposer of host tissue, forming stromatic structures in vascular bundles and emerging through the epidermis with cupulate apothecia (Müller, 1989). *Spilopodiella* has no known economic impact. The genus is currently known only from the type locality in the Swiss Alps, specifically in the canton of Graubünden (Raetia), where it was collected at elevations of 1950–2100 m. Based on current records,

it appears to be endemic to this region and highly specific to its host (*Carex sempervirens*).



Source Redrawn from Müller (1989)

Note a Median section through an apothecium. b Paraphyses. c Asci. d Ascospores. Scale bars: a = 20 µm, b–d = 10 µm.

Figure 3.69 *Spilopodiella arxii*

Thedgonia B. Sutton, Trans. Br. mycol. Soc. 61(3): 426 (1973)

Index Fungorum number: IF10207; Facesoffungi number: FoF 18342, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

A foliar pathogen with a presumed necrotrophic lifestyle. Sexual morph: Unknown. Asexual morph: see Sutton (1973), Yoshikawa (1992), Taheriyan et al. (2014).

Type species – *Thedgonia ligustrina* (Boerema) B. Sutton

Notes – *hedgonia* was introduced by Sutton (1973) with *Thedgonia ligustrina* as the type species. The genus is characterised by macronematous, mononematous, caespitose conidiophores that are straight to flexuous, simple or occasionally branched, septate or aseptate, light brown to hyaline toward the apex, and arising from stromatic tissue in host leaves. Conidiogenous cells are integrated, terminal, polyblastic, sympodial, cylindrical, and bear flat, broad, unthickened conidial scars. Conidia are dry, catenate, acropetal, hyaline to pale olivaceous-brown, smooth, cylindrical to subcylindrical, with 0–5 septa, truncate at both ends except that the apical conidium may be obtuse. Fruiting is amphigenous, often hypophyllous, with leaf spots circular to irregular, sometimes zonate with purplish margins (Yoshikawa, 1992; Taheriyan et al., 2014). Molecular markers available include LSU and ITS sequence data. Type specimen of *Thedgonia ligustrina*

(Boerema) B. Sutton, on leaves of *Ligustrum vulgare* (Oleaceae), collected in the Netherlands, described by Sutton in 1973, with holotype preserved in the herbarium of the Commonwealth Mycological Institute, Kew, United Kingdom (IMI 174877).

Thedgonia ligustrina (Boerema) B. Sutton, Trans. Br. mycol. Soc. 61(3): 428 (1973) Figure 3.70

Index Fungorum number: IF324533; Facesoffungi number: FoF 18343

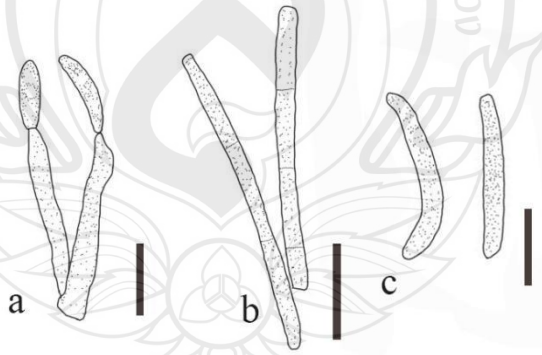
Description – see Sutton (1973).

Material considered – see Sutton (1973).

Distribution, ecological and economical importance

Thedgonia species are foliar pathogens known to infect woody ornamental plants, particularly species in the genus *Ligustrum* (Oleaceae; privet). They contribute to the natural regulation of host populations by causing leaf spot diseases, which can result in premature leaf senescence and defoliation.

Thedgonia has a currently limited but potentially expanding distribution. It was originally described from Europe (Netherlands and Britain) and later reported in Japan (Yoshikawa, 1992) and Iran (Taheriyan et al., 2014). Its known host range includes *Ligustrum* species, and it occurs mainly in temperate and Mediterranean climates where suitable hosts are present.



Source Redrawn from Taheriyan et al. (2014)

Note a Conidiphores. b, c Conidia. Scale bars: a–c = 20 µm.

Figure 3.70 *Thedgonia ligustrina*

Erysiphaceae Tul. & C. Tul. [as 'Erysiphei'], Select. fung. carpol. (Paris) 1: [191] (1861)

Index Fungorum number: IF80754; Facesoffungi number: FoF 05856

The family was first introduced as “Erysiphei” by Tulasne and Tulasne (1861) and later formally established as *Erysiphaceae* by de Bary (1870). It is typified by the genus *Erysiphe*. Historically, the family was placed in the order *Perisporiales* (Salmon, 1900), but molecular phylogenetic analyses have since confirmed its position within the order Helotiales, class Leotiomycetes, phylum Ascomycota.

Erysiphaceae is characterised by superficial ectoparasitic mycelium producing haustoria that penetrate host epidermal cells. The asexual morph consists of simple, erect conidiophores bearing hyaline, single-celled conidia in basipetal chains (the Oidium-type), responsible for the typical white powdery appearance on infected surfaces. The sexual morph forms chasmothecial ascomata with variously shaped appendages, containing one to several bitunicate asci that each produce 2–8 hyaline, non-septate ascospores. Appendage morphology (branched, coiled, or bulbous) remains important for generic delimitation.

Molecular phylogenetics has shown that several traditionally recognised genera (*Uncinula, Microsphaera, Sphaerotheca*) are not monophyletic, and these have been synonymised under a broadly circumscribed *Erysiphe*, while *Blumeria, Podosphaera,* and *Phyllactinia* remain distinct (Braun & Takamatsu, 2000; Takamatsu et al., 2015; Bradshaw et al., 2023).

Members of this family are obligate biotrophs parasitising a wide range of angiosperms, including major crops such as grapevine, cereals, cucurbits, legumes, apples, and ornamentals like roses. Notable pathogens include *Erysiphe necator* (grape powdery mildew), *Blumeria graminis* (cereal powdery mildew), and *Podosphaera xanthii* (cucurbit powdery mildew), which cause substantial economic losses worldwide.

Erysiphaceae has a cosmopolitan distribution, especially abundant in temperate and subtropical regions, and is reported from over 10,000 host species. The family exhibits high host specificity and co-evolution with its hosts, leading to well-defined host ranges at both species and genus levels.

In the present study, our multigene phylogenetic analyses (ITS, LSU, *RPB2*, *TEF1-α*) confirmed Erysiphaceae as a strongly supported monophyletic lineage within Helotiales (Figure 3.71), in agreement with previous studies.

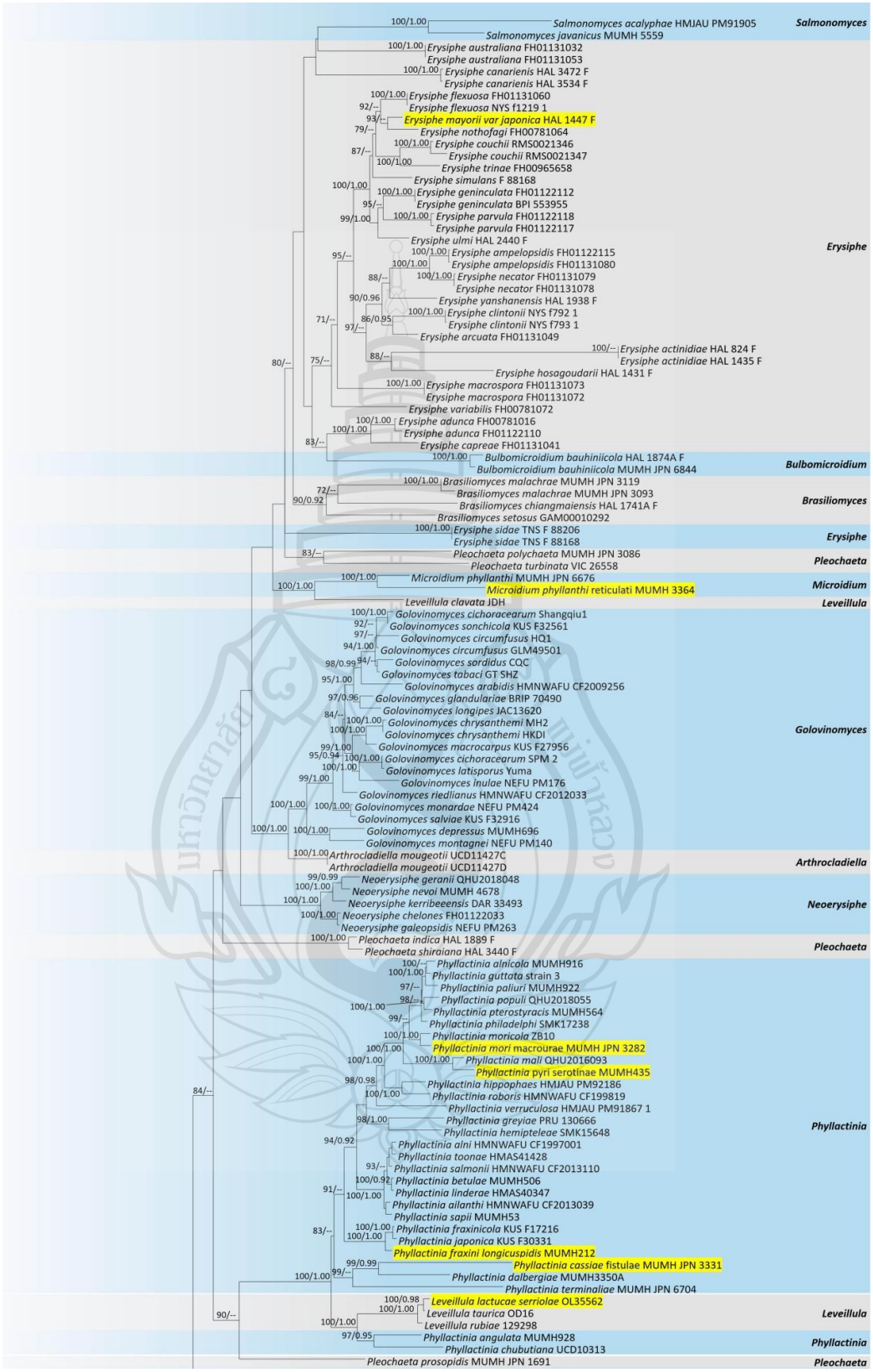


Figure 3.71 Maximum likelihood tree based on the combined ITS and LSU dataset of Erysiphaceae



Figure 3.71 (continued)

Figure 3.71 Bootstrap support values (MLBP ≥ 70%) and Bayesian posterior probabilities (BPP ≥ 0.90) are shown at nodes as MLBP/BPP. Values below these thresholds are indicated with a hyphen ("–"). Type strains are shown in bold

Arthrocladiella Vassilkov, Botanicheskiĭ Zhurnal 45: 1368 (1960)

Index Fungorum number: IF334; Facesoffungi number: FoF 18361, 3 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Obligate biotrophic fungus, parasitic exclusively on *Lycium* species. Sexual morph: see Braun and Cook (2012), Heluta (2022). Asexual morph: see Cook and Braun (2009), Schmidt and Braun (2020).

Type species – *Arthrocladiella mougeotii* (Lév.) Vassilkov,

Notes – Golovin (1956) introduced the name *Arthrocladia* for the powdery mildew on *Lycium*, but it was invalid (*nom. inval.*, Art. 39.1) due to the absence of a Latin description and illegitimate (*nom. illeg.*, Art. 53.1) because it is a later homonym of *Arthrocladia* Duby (Algae). Vassilkov (1960) replaced this with *Arthrocladiella*, providing a Latin description and citing *A. lycii* (based on the invalid *Erysiphe lycii* Lasch) as type. Although this would normally render the genus invalid (Art. 40.1), it was published with a single species and fulfilled the requirements of Art. 38.5 ("description generico-specifica"), thus validating both the genus and its type species simultaneously. The valid combination *A. mougeotii* was later established by Vassilkov (1963).

Arthrocladiella is characterised by superficial, white to greyish powdery mycelium; conidiophores erect, unbranched to occasionally branched, with cylindrical foot-cells followed by 1–3 shorter distal cells. Conidia ellipsoid to cylindrical, (26–)30–38 × 14–20 µm, formed singly or in short chains, length/width ratio 1.4–2.6. Germination is perihilar, with a single short aseptate germ tube (rarely two), cylindrical to clavate, not exceeding the conidial length. Chasmothecia hemispherical to slightly flattened, 110–156 µm diam., with numerous dichotomously branched, hyaline appendages up to 300 µm long; peridium cells polygonal, 8–15 µm diam. Asci 5–12 per chasmothecium, ellipsoid to broadly clavate, mostly 2-spored (rarely 3–4-spored), 44–61 × 22–32 µm; ascospores ellipsoid, 19–27 × 9–14 µm. The asexual morph corresponds to *Graciloidium* (Cook & Braun 2009). Currently available molecular data for *A. mougeotii* include ITS and 28S (LSU) sequences (Braun & Cook, 2012; Schmidt & Braun, 2020; Braun & Kirk, 2023).

Type – *Arthrocladiella mougeotii* (Lév.) Vassilkov, on *Lycium europaeum*, France, Vaugirard, ex herb. Léveillé (PC, lectotype designated by Braun, 1987; isolectotype K).

Arthrocladiella mougeotii (Lév.) Vassilkov, Bot. Mater. Otd. Sporov. Rast. Bot. Inst. Komarova Akad. Nauk S.S.S.R. 16: 122 (1963) Figure 3.72

≡ *Calocladia mougeotii* Lév., Ann. Sci. Nat., Bot., Sér. 3, 15: 158 (1851).

≡ *Microsphaera mougeotii* (Lév.) Cooke, Rust, smut, mildew, & mould: 219 (1865).

≡ *Erysiphe mougeotii* (Lév.) de Bary, Abh. Senckenb. Naturf. Ges. 7: 412 (1870).

Index Fungorum number: IF326485; Facesoffungi number: FoF 18362

Description – See Vassilkov (1960), Braun & Cook (2012), Schmidt & Braun (2020).

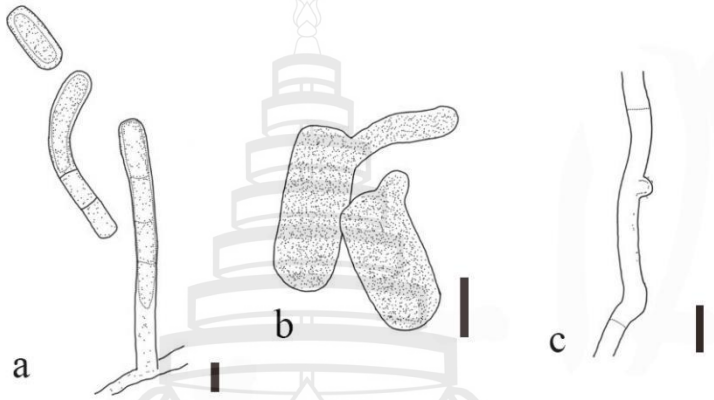
Material considered – Germany, Schleswig-Holstein, Ostholstein, Timmendorfer Strand, OT Niendorf, near the port, on *Lycium barbarum*, 29 Jul. 2000, A. Schmidt, KM 119 (KR-M-0020806); Schleswig-Holstein, Ostholstein, Scharbeutz, Badeweg, on *L. barbarum*, 28 Aug. 2004, A. Schmidt, KM 198 (KR-M-0021919); Hamburg, Teufelsbrück, breakwater between Elbe and marina port, on *Lycium cf. chinense*, 02 Aug. 2000, A. Schmidt, KM 120 (KR-M-0020807).

Distribution, ecological and economical importance

Arthrocladiella mougeotii, the only known species in the genus, is a host-specific powdery mildew pathogen infecting species of *Lycium* (Solanaceae). It contributes to the regulation of wild and cultivated *Lycium* populations by reducing photosynthetic surface area and promoting premature senescence of infected leaves. As a biotrophic fungus, it engages in intimate interactions with host tissues via haustoria, serving as a model for host-pathogen coevolution studies among powdery mildews (Braun & Cook, 2012; Schmidt & Braun, 2020).

Although *Arthrocladiella mougeotii* is not considered a major agricultural pathogen, its presence on *Lycium barbarum* (goji berry), a commercially important plant in traditional medicine and health food markets, may affect leaf quality and plant vigor under certain conditions.

Arthrocladiella mougeotii is widespread on *Lycium* species across Eurasia and has been introduced into other continents. It has been recorded in Central and East Asia (China, Japan, Korea, Kazakhstan), the Caucasus, the Middle East (Israel), throughout Europe (including Ukraine, Germany, France, Poland, Italy, and the UK), North Africa (Canary Islands), and introduced regions of North and South America (USA, Argentina) as well as New Zealand (Braun & Cook, 2012; Heluta, 2022).



Source Redrawn from Elfar et al. (2024)

Note a Conidia and conidiophore. b Conidia. c Hyphal appressoria. Scale bars: a–c = 10 µm.

Figure 3.72 *Arthrocladiella mougeotii*

Blumeria Golovin ex Speer, Sydowia 27(1-6): 2 (1975) [1973-1974]

Index Fungorum number: IF600; Facesoffungi number: FoF 18363, 8 morphological species (Species Fungorum, 2025), 8 species with molecular data.

Obligate biotrophic pathogens, infecting only living host tissue. Sexual morph: see Jankovics et al. (2015). Asexual morph: see Zhang et al. (2005).

Type species – *Blumeria graminis* (DC.) Speer

Notes – *Blumeria* was introduced by Speer (1975) with *B. graminis* as the type species. Members of the genus are characterised by white, superficial mycelium covering host leaf surfaces, producing erect, unbranched conidiophores that bear catenate, hyaline conidia, and forming digitate haustoria within epidermal cells. Conidia are ovoid, produced in long chains, with the apical conidium detaching at maturity. The sexual morph consists of cleistothecia (chasmothecia) containing several

asci, each with hyaline, ellipsoid ascospores. As true obligate biotrophs, these fungi form intimate haustorial interactions with host epidermal cells and cannot be maintained on artificial media (Zhang et al., 2005; Jankovics et al., 2015). Molecular markers available include ITS, LSU, and nuclear protein-coding genes such as *β-tubulin* and EF-1α. The type specimen was based on material of *Erysiphe graminis* DC. ex Mérat collected on *Hordeum vulgare* in Germany; the lectotype was designated by Braun and Cook (2012) and is preserved in the herbarium of the Institute of Botany, University of Halle, Germany (HAL).

Blumeria graminis (DC.) Speer, Sydowia 27(1-6): 2 (1975) [1973-1974] Figure 3.73

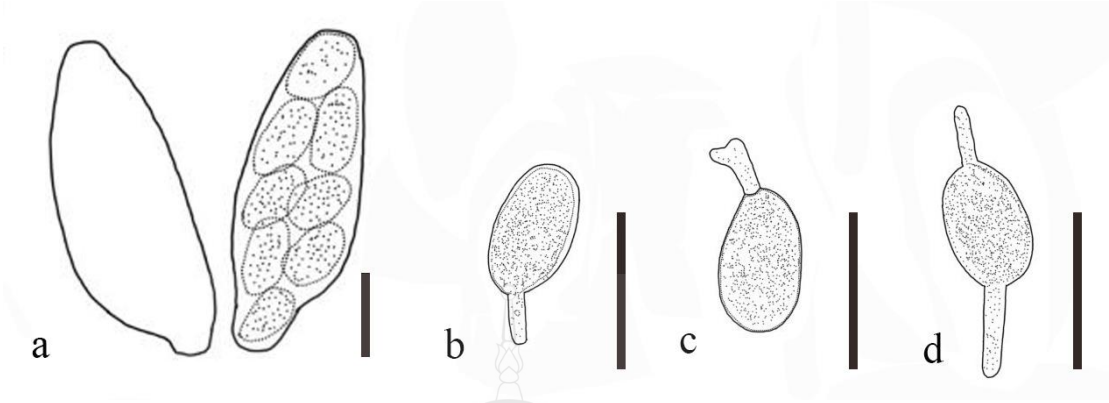
Index Fungorum number: IF309596; Facesoffungi number: FoF 15880

Description – see Speer (1975).

Material considered – Lectotype designated by Braun and Cook (2012), Germany, on *Hordeum vulgare* L., collector unknown, herbarium HAL.

Distribution, ecological and economical importance

Blumeria species are highly specialised obligate biotrophic pathogens of grasses and cereals. *B. graminis* is subdivided into numerous formae speciales based on host specificity, such as *B. graminis* f. sp. *tritici* (on wheat) and f. sp. *hordei* (on barley) (Zhang et al., 2005; Mapuranga et al., 2022). These formae speciales are globally distributed, especially in regions where cereals are extensively cultivated, including Europe, Asia, North and South America, Africa, and Australia. The infection process involves penetration of host epidermal cells and formation of haustoria for nutrient uptake without killing host cells, making *B. graminis* a valuable model for studies on biotrophy, plant–pathogen interactions, and host–parasite co-evolution (Zhang et al., 2005; Mapuranga et al., 2022).



Source Redrawn from Jankovics et al. (2015)

Note a Setae with unilateral synnemata. b Synnemata around the setae, in detail. c Conidiogenous cells. d-e Conidia. Scale bars: a, b = 20 µm, c–e = 10 µm.

Figure 3.73 *Blumeria graminis*

Brasiliomyces Viégas, Bragantia 4(1-6): 17 (1944)

Index Fungorum number: IF646; Facesoffungi number: FoF 18364, 6 morphological species (Species Fungorum, 2025), 3 species with molecular data.

Obligate biotrophic on leaves of herbaceous and woody plants. Sexual morph: see Viégas (1944). Asexual morph: see Viégas (1944).

Type species – *Brasiliomyces malvastri* Viégas (= *B. malachrae* (Seaver) Boesew.).

Notes – *Brasiliomyces* is characterized by small, thin-walled chasmothecia with a single peridial cell layer, often with very few or rudimentary mycelioid appendages (not truly non-appendiculate) (Braun & Cook, 2012; Braun & Cook, 2019; Cabrera et al., 2018). Chasmothecia (c. 45–98 µm diam.) contain ~3 asci, each 4–6-spored; ascospores ellipsoid to ovoid, hyaline (Cabrera et al., 2018). The asexual morph (documented in *B. malachrae*) shows ectophytic hyaline mycelium with simply lobed hyphal appressoria, catenescent conidia (25–37.5 × 15–20 µm), perihilar germination with Reticuloidium-type germ tubes (Cabrera et al., 2018).

Molecular data (18S+5.8S+28S rDNA) place *B. malachrae* as sister to *Erysiphe* and at the boundary between tribes Golovinomyceteae and Erysipheae, highlighting a unique evolutionary position (Takamatsu et al., 2015; Braun et al., 2019).

Circumscription note: taxa on Fagaceae such as *B. trinus*, *B. cyclobalanopsidis*, and *B. kumaonensis* have been transferred to *Erysiphe* sect. *Californiomyces*; the current concept of *Brasiliomyces* is restricted to hosts outside Fagaceae and includes *B. malachrae*, *B. entadae*, *B. setosus*, and *B. chiangmaiensis* (Braun & Cook, 2019).

Type specimen (of the currently accepted name): *B. malachrae* holotype NY 6488, Puerto Rico, on *Malachra capitata*, 11 Mar 1922, N.L. Britton & F.S. Earle.

Brasiliomyces malvastri Viégas, Bragantia 4(1-6): 17 (1944) Figure 3.74

Index Fungorum number: IF284672; Facesoffungi number: FoF 18365

Description – see Viégas (1944); = *B. malachrae* (Seaver) Boesew. sensu Zheng (1984).

Material considered – see Viégas (1944).

Distribution, ecological and economical importance

Species of *Brasiliomyces* are obligate biotrophs forming superficial powdery colonies on leaves, petioles, and stems; infections reduce photosynthetic area and may affect growth and quality in susceptible hosts (Cabrera et al., 2018; Márquez-Licona et al., 2023).

Brasiliomyces malachrae was originally reported from Central and South America, but was recently recorded for the first time in North America (Mexico) on ornamental cotton, with ITS sequences identical to the type (Márquez-Licona et al., 2023).



Source Redrawn from Márquez-Licona et al. (2023)

Note a Asci and ascospores. b Immature chasmothecia. c Mature chasmothecia. Scale bars: a, = 10 µm, b–c= 50 µm.

Figure 3.74 *Brasiliomyces malvastri*

Bulbomicroidium Marm., Siahaan, S. Takam. & U. Braun, Mycoscience 59(1): 3 (2018)

Index Fungorum number: IF820341; Facesoffungi number: FoF 18366, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Parasitic on living leaves of the host plant. Sexual morph: Unknown. Asexual morph: see Marmolejo et al. (2018).

Type species – *Bulbomicroidium bauhiniicola* (U. Braun & Dianese) Marm., Siahaan, S. Takam. & U. Braun

Notes – *ulbomicroidium* was introduced by Marmolejo et al. (2018) with *B. bauhiniicola* as the type species. This genus is characterised by amphigenous, white mycelium; nipple-shaped or lobed hyphal appressoria; and erect conidiophores with a distinct basal swelling just above the septum. Foot-cells are cylindrical-filiform, followed by one to two short cells, and conidia are produced singly or in short chains. Conidia are hyaline, thin-walled, smooth to slightly roughened, ellipsoid to limoniform, with subterminal or perihilar germ tubes. Molecular phylogenetic analyses based on LSU and ITS rDNA sequences revealed that *Bulbomicroidium* is phylogenetically distinct from *Microidium* and all other known powdery mildew genera, forming an isolated lineage within the Erysiphales (Marmolejo et al., 2018). Molecular markers available include ITS and LSU sequence data.

Type – on leaves of *Bauhinia* sp., Brasília, Distrito Federal, Brazil, 4 August 2005, coll. U. Braun & J.C. Dianese (#3528), holotype HAL 1874F.

Bulbomicroidium bauhiniicola (U. Braun & Dianese) Marm., Siahaan, S. Takam. & U. Braun, Mycoscience 59(1): 3 (2018) Figure 3.75

Index Fungorum number: IF820342; Facesoffungi number: FoF 18367

Description – Parasitic on leaves of *Bauhinia* sp. Mycelium amphigenous on leaves, forming thin patches, loose to moderately dense, white to greyish white, covering the entire leaf surface. Hyphae branched, straight to sinuous, thin-walled, hyaline, septate, smooth to somewhat rough-walled. Chasmothecia subglobose; peridium of angular to irregular cells in surface view. Appendages equatorial, about three times the chasmothecial diameter, acicular with crimped tips, walls of the swelling thickened. Asci (3–)4-spored, numerous, broad, obovoid-saccate to almost globose, sessile, thin-walled. Ascospores aseptate, ellipsoid-ovoid, hyaline, smooth to verruculose-walled. **Asexual morph**: Undetermined.

Material examined: Brazília Distrito Federal, on the leaves of *Bauhinia* sp., 4 August 2005, U. Braun & J.C (HAL:1874F), holotype.

Distribution, ecological and economical importance

Bulbomicroidium represents a highly specialised lineage within the powdery mildew fungi (Erysiphales), parasitising members of the Fabaceae. As an obligate biotroph, it plays a role in shaping host–pathogen interactions within tropical and subtropical ecosystems, particularly those involving *Bauhinia* species. The genus is known from tropical regions of the Americas. The type species, *B. bauhiniicola*, was first described from Brazil and later recorded in northeastern Mexico (Nuevo León). Molecular and morphological evidence confirms that the same species occurs in both countries (Marmolejo et al., 2018).



Note a. Details of the herbarium material. b–c. *Mycelia* and chasmothecium on the host surface. d–e. Peridium cells (Push of chasmothecium). f. Appendages equatorial. g–j. Asci. k. Ascospores. Scale bars: d–e = 100 µm; f = 50 µm; g–j = 30 µm; k = 20 µm.

Figure 3.75 *Bulbomicroidium bauhiniicola* (HAL:1874F, holotype)

Caespitotheca S. Takam. & U. Braun, Mycol. Res. 109(8): 907 (2005)

Index Fungorum number: IF28940; Facesoffungi number: FoF 18368, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Parasitic, specifically infecting living leaves. Sexual morph: see Takamatsu et al., 2005. Asexual morph: Not observed.

Type species – *Caespitotheca forestalis* (Mena) S. Takam. & U. Braun

Notes – *Caespitotheca* is a monotypic genus within the family Erysiphaceae, containing the single species *C. forestalis*. It is characterised by chasmothecia with mycelioid appendages, peridial cells polygonal to irregular in outline, and obligate parasitism on species of *Schinopsis*. Molecular phylogenetic analysis based on 28S rDNA places *Caespitotheca* as a basal lineage within the Erysiphales (Takamatsu et al., 2005). Further collections and studies are required to clarify its phylogenetic placement and assess possible undiscovered diversity. The holotype of *C. forestalis* was collected on living leaves of *Schinopsis balansae* in Paraguay by E. Fischer, and is deposited in HAL.

Caespitotheca forestalis (Mena) S. Takam. & U. Braun, Mycol. Res. 109(8): 907 (2005)

Index Fungorum number: IF369307; Facesoffungi number: FoF 18840

Description – Takamatsu et al. (2005).

Material considered – Takamatsu et al. (2005).

Distribution, ecological and economical importance

Caespitotheca forestalis is an obligate biotrophic parasite, specifically infecting leaves of *Schinopsis* spp. (Anacardiaceae). As a powdery mildew fungus, it forms a distinct monophyletic group, reflecting a specialised evolutionary adaptation to its host. This parasitism can impact host vitality and influence plant community dynamics. The species has been recorded in South America, particularly in Argentina and Paraguay, where its host plants are native. Its known distribution closely matches that of *Schinopsis* spp., indicating a highly specialised ecological niche.

Figure – No original illustration available.

Cystotheca Berk. & M.A. Curtis, Proc. Amer. Acad. Arts & Sci. 4: 130 (1860)

Index Fungorum number: IF1395; Facesoffungi number: FoF 18369, 11 morphological species (Species Fungorum, 2025), 6 species with molecular data.

Saprobic or more commonly obligate biotrophic on living plant tissues, especially on members of the Fagaceae and Symplocaceae. Sexual morph: see Michael et al. (2023). Asexual morph: see Michael et al. (2023).

Type species – *Cystotheca wrightii* Berk. & M.A. Curtis.

Notes – *Cystotheca* is characterized by spherical, dark brown chasmothecia containing a single ascus, with peridium composed of distinct *textura angularis* to *textura prismatica* cells, sometimes interpreted as forming two discernible layers (Braun & Takamatsu, 2000; Siahaan et al., 2018). Appendages are simple, hyaline to pale brown, mycelioid or occasionally short setose. The asci are globose to broadly ellipsoid, 45–65 × 35–50 μm, 4–8-spored; ascospores ellipsoid, hyaline, smooth, 15–25 × 9–15 μm. Asexual morph produces hyaline, ellipsoid to doliiform conidia in chains, without conspicuous fibrosin bodies. Molecular phylogenetic analyses based on ITS and LSU sequences have confirmed the placement of *Cystotheca* in the Erysiphaceae (Michael et al., 2023). Additional collections, particularly from under-sampled tropical and subtropical regions, are needed to clarify the phylogenetic relationships and diversity of the genus. The holotype specimen of *Cystotheca wrightii* (on leaves of *Symplocos* sp., Cuba, coll. C. Wright) is deposited in the Kew Herbarium (K).

Cystotheca wrightii Berk. & M.A. Curtis, Proc. Amer. Acad. Arts & Sci. 4: 130 (1860) Figure 3.76

Index Fungorum number: IF217840; Facesoffungi number: FoF 18370

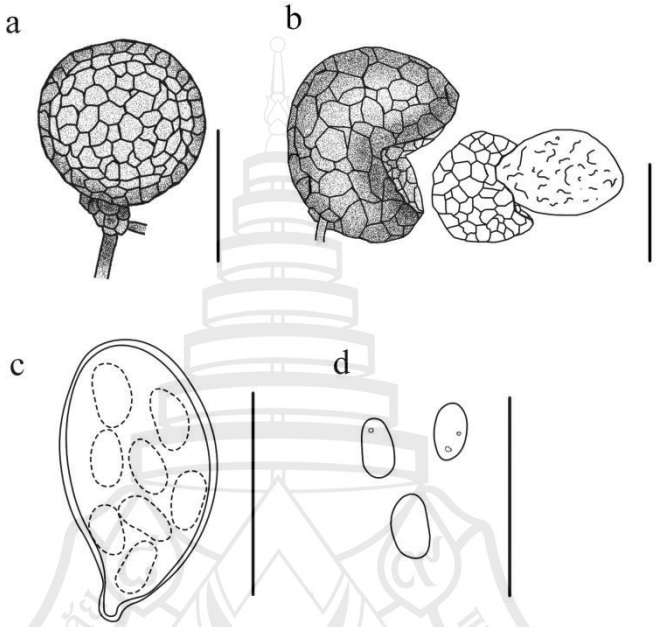
Description – See Berkeley and Curtis (1860); Siahaan et al. (2018).

Material considered – See Berkeley and Curtis (1860); Siahaan et al. (2018).

Distribution, ecological and economical importance

Species of *Cystotheca* are obligate biotrophic pathogens causing powdery mildew on their hosts. Infections manifest as white, powdery mycelium on leaf surfaces, which can reduce photosynthetic efficiency and plant vigor. The type species, *C. wrightii*, is known from Cuba on *Symplocos* sp. Other members of the genus have been reported from a variety of hosts and regions, particularly on *Quercus* spp. (Fagaceae) in North America, Central America, and Asia. For example, *C. lanestris* occurs in California, Arizona, and Mexico, often causing witch's broom on oaks (Braun &

Takamatsu, 2000); *C. tjibodensis* was rediscovered in Java, Indonesia, after 90 years (Meeboon et al., 2012); and *C. mexicana* was described from Mexico on *Quercus* (Michael et al., 2023). This genus has a wide but patchy distribution, closely linked to the ranges of its host plants.



Source Redrawn from Siahaan et al. (2018)

Note a Matured chasmothecium. b Chasmothecim with immature asci. c Asci. d ascospores. Scale bars: a–d = 50 μm.

Figure 3.76 *Cystotheca wrightii*

Erysiphe R. Hedw. ex DC., in Lamarck & de Candolle, Fl. franç., Edn 3 (Paris) 2: 272 (1805)

Index Fungorum number: IF1898; Facesoffungi number: FoF 09218, 467 morphological species (Species Fungorum, 2025), 313 species with molecular data.

Obligate biotrophs on living leaves and stems of a wide range of herbaceous and woody plants. Sexual morph: see Darsaraei et al. (2023). Asexual morph: see Darsaraei et al. (2023).

Type species – *Erysiphe polygoni* DC.

Notes – *Erysiphe* is characterised by producing powdery mildew symptoms, forming white to grayish mycelial growth on host surfaces. Chasmothecia are closed

fruiting bodies containing asci with ascospores, crucial for species identification. Molecular phylogenetic studies place Erysiphe within the Erysiphaceae family. Molecular markers used for phylogenetic studies include ITS, LSU, and 28S rDNA. More collections and detailed morphological and molecular studies are required to fully resolve species complexes within this genus. **Type species of** *Erysiphe polygoni* DC., *Fl. Franç.* 2: 273, 1805. On *Polygonum aviculare*, France. Lectotype designated by Braun (1987), specimen not explicitly numbered, conserved in G. An epitype (on *Polygonum aviculare*, Germany, HAL 1356 FET) was designated and sequenced by Darsaraei et al. (2023).

Erysiphe polygoni DC., in Lamarck & de Candolle, Fl. franç., Edn 3 (Paris) 2: 273 (1805) Figure 3.77

Index Fungorum number: IF121183; Facesoffungi number: FoF 18371

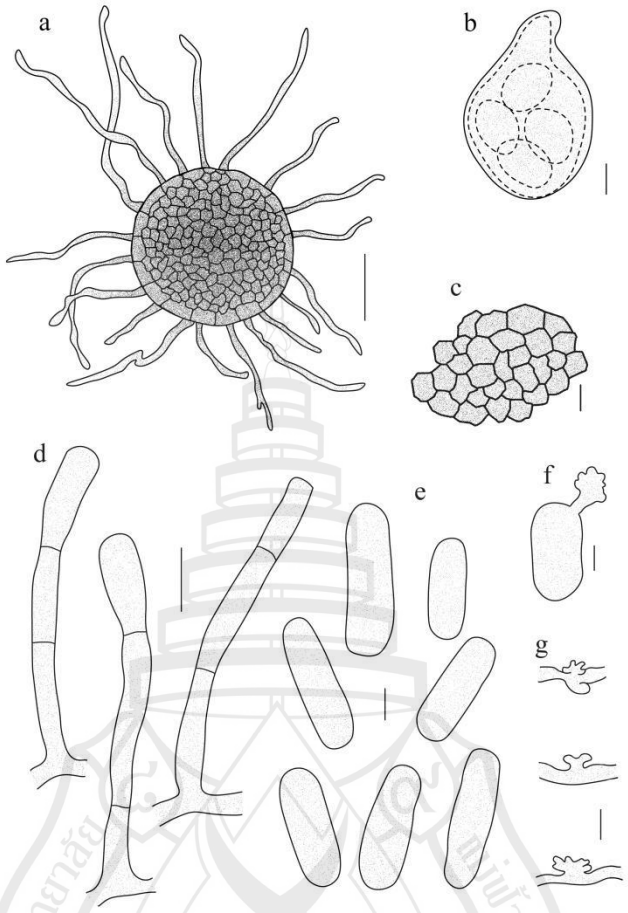
Description – (Takamatsu et al., 2015; Darsaraei et al., 2023).

Material considered – (Takamatsu et al., 2015; Darsaraei et al., 2023).

Distribution, ecological and economical importance

The genus *Erysiphe* is one of the most significant fungal genera within the family Erysiphaceae, causing powdery mildew diseases on over 10,000 species of vascular plants, including agricultural crops, vegetables, fruits, and ornamental plants. These fungi are obligate biotrophs, requiring living host plants for survival and reproduction. Powdery mildew infections lead to reduced photosynthesis, stunted growth, premature leaf drop, and decreased crop yield, significantly affecting global agriculture and horticulture (Takamatsu et al., 2015; Darsaraei et al., 2023).

Erysiphe species have a worldwide distribution, being particularly prevalent in temperate and subtropical regions. They infect a wide range of host plants across different climatic zones. Specific species like *Erysiphe cruciferarum* and *Erysiphe betae* have been reported to infect economically important crops such as crucifers and sugar beet, respectively, in regions including Europe, Asia, and North America (Takamatsu et al., 2015; Darsaraei et al., 2023).



Source Redrawn from Darsaraei et al. (2023)

Note a Chasmothecium. b Ascus. c Peridium cells. d Conidiophores. e Germinated conidium with appressorium. f Conidia. g Appressoria on hyphal cells. Scale bars: a= 50 µm; b, c, e–g = 10 µm; d = 20 µm.

Figure 3.77 *Erysiphe polygoni*

Golovinomyces (U. Braun) Heluta, Biol. Zh. Armenii 41: 357 (1988)

Index Fungorum number: IF25430; Facesoffungi number: FoF 18372, 70 morphological species (Species Fungorum, 2025), 57 species with molecular data.

Obligate biotrophic pathogens infecting a wide range of dicotyledonous host plants, especially in the families Asteraceae, Lamiaceae, and Rosaceae. Sexual morph: see Braun et al. (2019), Qiu et al. (2020). Asexual morph: see Lebeda and Mieslerová (2010)

Type species – *Golovinomyces cichoracearum* (DC.) V.P. Heluta

Notes – The genus *Golovinomyces* was introduced by Heluta (1988) with *G. cichoracearum* as the type species, transferring it from *Erysiphe*. The genus is characterized by producing chasmothecia with mycelioid appendages that are simple or occasionally branched, with blunt or slightly enlarged apices. Chasmothecia contain several, mostly two-spored asci. Asci are broadly obovoid-saccate to subglobose, sessile or short-stalked, thin-walled. Ascospores are ellipsoid-ovoid to globose, hyaline. The asexual morph exhibits Euoidium-type conidia: catenescent, ellipsoid to doliiform, hyaline, without fibrosin bodies, germinating with club-shaped to nipple-shaped appressoria. The ectophytic mycelium is composed of septate, hyaline hyphae. Molecular markers available include ITS and 28S rDNA (for genus-level resolution), and TUB2, CHS1, and IGS (for species-level delimitation) (Qiu et al., 2020; Lebeda & Mieslerová, 2011). The type species, *G. cichoracearum*, was epitypified with material collected on *Cichorium intybus* in Germany, deposited as HAL 156 F (Braun & Cook, 2012). Phylogenetic studies indicate that *G. cichoracearum* sensu lato contains several cryptic species (Qiu et al., 2020).

Golovinomyces cichoracearum (DC.) V.P. Heluta [as 'cichoraceorum'], Ukr. bot. Zh. 45(5): 62 (1988) Figure 3.78

Index Fungorum number: IF134335; Facesoffungi number: FoF 18373

Description – *Parasitic* on leaves of *Scorzonera hispanica.* Sexual morph: *Chasmothecia* amphigenous and occasionally caulicolous,subglobose to somewhat depressed-globose, 50-115µm (x =81.6 µm, n = 18) diam, rarely larger; *peridium cells* irregularly rounded and ploygonal, 9-21µm (x =16.8 µm, n = 16) diam,walls up to 20-48µm (x =36.8 µm, n = 10)thick; *asci* numerous, broad obovoid-saccate or almost globose,(40-)45-65(-70)×(30-)35-50(-55)µm(x =56.7 × 42.6 µm, n = 16), sessile to short-stalked, thin-walled, (1-)2-spored; *ascospores* ellipsoid-ovoid to globose,19-30 (-32)×(12-)14-18(-20)µm(x =24.6 × 16.2 µm, n = 16), colourless. Asexual morph: Undetermined.

Material examined: France, on leaves of *Scorzonera hispanica,* Collection date not indicated, Candolle A.P. de (G 00298360).

Distribution, ecological and economical importance

Species of *Golovinomyces* are important obligate biotrophic pathogens that regulate populations of herbaceous dicotyledonous hosts. Many species exhibit strong host specificity and co-evolutionary relationships with plant tribes in the Asteraceae (Takamatsu et al., 2013). Several species cause economically significant powdery mildew diseases on vegetables (e.g., lettuce, artichoke, endive), ornamentals, and medicinal plants, leading to yield and quality losses, especially under warm, dry conditions (Lebeda & Mieslerová, 2010). The genus has a cosmopolitan distribution, with species present on all continents except Antarctica. *G. cichoracearum* and *G. orontii* are among the most widely distributed species, infecting diverse hosts in North America, Europe, Asia, South America, Africa, and Oceania (Qiu et al., 2020).



Note a, b Details of herbarium material. c Habit and appearance of an apothecium on the host surface. d Peridium cells (Push of apothecium). e Cross section of apothecium. f-m Asci. Scale bars: d = 150 µm, e–f = 50 µm.

Figure 3.78 *Golovinomyces cichoracearum* (G 00298360, Lectotype)

Leveillula G. Arnaud, Annls Épiphyt. 7: 92 (1921)

Index Fungorum number: IF2844; Facesoffungi number: FoF 18374, 41 morphological species (Species Fungorum, 2025), 30 species with molecular data.

Obligate biotrophic fungi, primarily parasitizing a wide range of dicotyledonous and some monocotyledonous plants. Sexual morph: see Meeboon et al. (2018). Asexual morph: see Gómez-Meeboon et al. (2018).

Type species – Leveillula taurica (Lév.) G. Arnaud.

Notes – *Leveillula* is characterised by the production of both primary and secondary conidia, with primary conidia being lanceolate and secondary conidia ellipsoid to cylindrical in shape (Pirnia & Jahani, 2016). The type species of this genus is Leveillula taurica (Lév.) G. Arnaud, which is known to infect various host plants across different families. Molecular studies, particularly analyses of the rDNA ITS region, have provided insights into the phylogenetic relationships within the genus, indicating that L. taurica represents a complex of cryptic species with varying host specificities (Khodaparast et al., 2012). Molecular markers commonly used in the study of Leveillula species include the internal transcribed spacer (ITS) regions of rDNA, which have been instrumental in resolving taxonomic ambiguities and understanding the evolutionary history of the genus (Khodaparast et al., 2012). **Type species of** *Leveillula taurica* (Lév.) G. Arnaud, originally described on *Allium porrum* in France by Léveillé (as *Erysiphe taurica*), with the type material conserved in PC (herbarium of the Muséum national d'Histoire naturelle, Paris), though precise specimen number may not be designated in early literature.

Leveillula taurica (Lév.) G. Arnaud, Annls Épiphyt. 7: 92 (1921) Figure 3.79

Index Fungorum number: IF157968; Facesoffungi number: FoF 18375

Description – Meeboon et al. (2018).

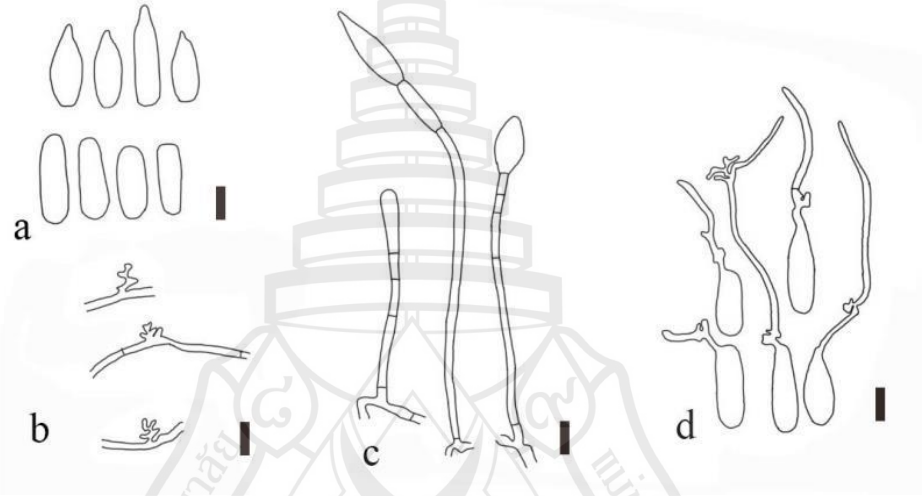
Material considered – Meeboon et al. (2018).

Distribution, ecological and economical importance

Leveillula species are obligate biotrophic fungi that cause powdery mildew diseases on a wide range of host plants, including economically important crops such as peppers, tomatoes, eggplants, onions, and cotton. These fungi are characterized by their endophytic growth habit, producing internal hyphae that emerge through the host's stomata to form conidiophores and conidia. This mode of parasitism allows them to

thrive in xerophytic (dry) conditions, as their conidia can germinate rapidly at various humidity levels (Takamatsu, 2013).

The geographical distribution of Leveillula centers on central and western Asia and the Mediterranean region. However, they have also been reported in subsaharan Africa, South and Southeast Asia, and, less frequently, in the Americas and Australia (Palti, 1988). Their prevalence in arid and semi-arid regions is attributed to their adaptation to dry environments, where they infect a diverse array of host plants.



Source Redrawn from Meeboon et al. (2018)

Note a Conidia. b Appressoria. c Conidiophores. d Germinating conidia. Scale bars: a–d = 20 μm.

Figure 3.79 *Leveillula taurica*

Microidium (To-anun & S. Takam.) To-anun & S. Takam., Taxonomic Manual of the Erysiphales (Powdery Mildews): 624 (2012)

Index Fungorum number: IF561519; Facesoffungi number: FoF 18366, 3 morphological species (Species Fungorum, 2025), 2 species with molecular data.

Obligate biotrophic fungi, parasitic on living leaves and young shoots of plants in the family **Phyllanthaceae**, especially *Phyllanthus* spp. Sexual morph: Unknown. Asexual morph: see To-anun et al. (2005).

Type species – *Microidium phyllanthi* (J.M. Yen) To-anun & S. Takam.

Notes – *Microidium* was established by To-anun and Takamatsu (2012) to accommodate *Oidium*-like powdery mildews parasitizing *Phyllanthus* species. The

genus is distinguished by dimorphic conidia, comprising primary ellipsoid conidia and secondary ovoid to clavate conidia, and by a unique germination pattern with short germ tubes and distinctive emergence points. Molecular phylogenetic analyses (ITS and 28S rDNA) confirm *Microidium* as a distinct monophyletic lineage within Erysiphaceae (To-anun et al., 2005, 2017). It is morphologically similar to *Oidium*, but molecular data and germination characteristics support its separation at the generic level. The type species *M. phyllanthi* was originally described as *Oidium phyllanthi* by Yen (1967) from *Phyllanthus urinaria* in Taiwan. To date, no sexual morph has been discovered, and no neotype or epitype with DNA sequence data has been designated (To-anun et al., 2017).

Microidium phyllanthi (J.M. Yen) To-anun & S. Takam., Taxonomic Manual of the Erysiphales (Powdery Mildews): 626 (2012) Figure 3.80

=*Oidium phyllanthi* J.M. Yen, Cahiers Pacif. 11: 106 (1967)

Index Fungorum number: IF561520; Facesoffungi number: FoF 18376

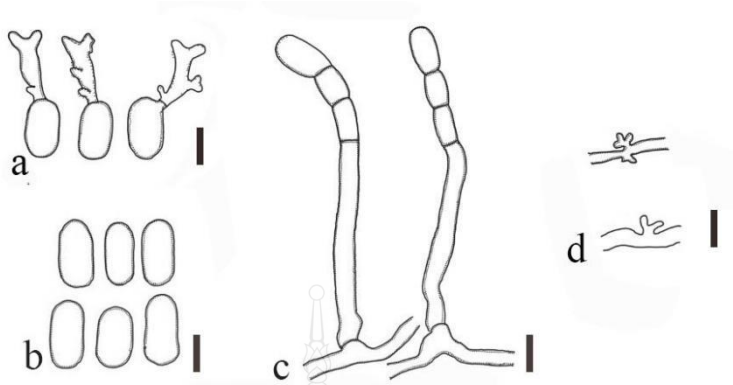
Description – see To-anun et al. (2005).

Material considered – see To-anun et al. (2005).

Distribution, ecological and economical importance

Microidium species are obligate biotrophic plant pathogens, meaning they require living host tissue to complete their life cycle. They are responsible for causing powdery mildew diseases on various plant species, particularly within the genus *Phyllanthus*. For instance, *Microidium phyllanthi* has been reported to infect *Phyllanthus acidus*, *P. amarus*, and *P. reticulatus*, leading to the development of powdery mildew symptoms on leaves, shoots, and stems.

Microidium species have been identified in various regions across Asia and South America. Notably, *Microidium phyllanthi* has been reported in Thailand and Vietnam, infecting *Phyllanthus* species. Additionally, studies have detected the presence of Microidium in soil fungal communities in regions such as the Tianshan Forest in China, indicating a broader distribution (Wang et al, 2021).



Source Redrawn from Meeboon and Takamatsu (2017)

Note a Conidia with germ tubes. b Conidia. c Conidiophores. d Appressoria. Scale bars: a–d = 10 µm.

Figure 3.80 *Microidium phyllanthi*

Neoerysiphe U. Braun, Schlechtendalia 3: 50 (1999)

Index Fungorum number: IF27962; Facesoffungi number: FoF 18377, 17 morphological species (Species Fungorum, 2025), 10 species with molecular data.

Obligate biotrophic pathogens that cause powdery mildew diseases on a wide range of dicotyledonous hosts. Sexual morph: see Gregorio-Cipriano et al. (2020), Beilharz et al. (2010), Heluta et al. (2010). Asexual morph: see Gregorio-Cipriano (2020).

Type species – *Neoerysiphe galeopsidis* (DC.) U. Braun

Notes – *Neoerysiphe* was established by Braun (1999) with *N. galeopsidis* as the type species. It is characterised by catenate conidia lacking fibrosin bodies, lobed appressoria, and longitudinally striated conidial surfaces, corresponding to the anamorph type formerly placed in *Oidium* subgen. *Striatoidium* (Cook et al., 1997; Braun & Cook, 2012). Teleomorphs, when present, produce chasmothecia containing several asci, each with two ascospores that mature after overwintering. Most species exhibit narrow host ranges, usually restricted to a single plant family or tribe, except *N. galeopsidis*, which infects several hosts from four families (Takamatsu et al., 2008). Molecular markers such as ITS and LSU rDNA have been used to delimit species and resolve phylogenetic placement within Erysiphaceae (Takamatsu et al., 2010;

Gregorio-Cipriano et al., 2020). The type species, *N. galeopsidis*, was originally described as *Erysiphe galeopsidis* DC., on *Galeopsis tetrahit* (Lamiaceae) from Europe.

Neoerysiphe galeopsidis (DC.) U. Braun, Schlechtendalia 3: 50 (1999) Figure 3.81

Index Fungorum number: IF460576; Facesoffungi number: FoF 18378

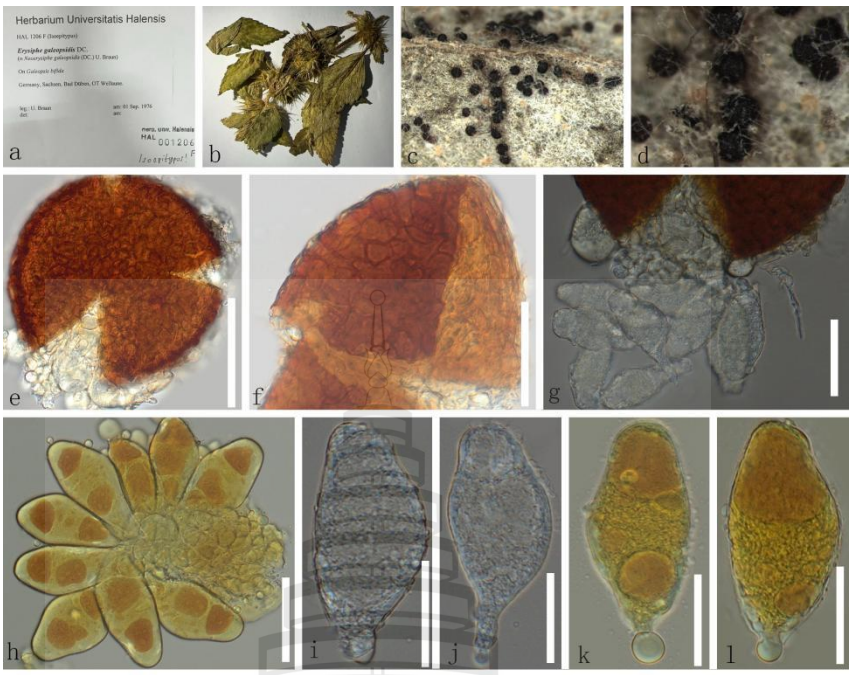
Description – *Parasitic* on the stems and leaves of *Galeopsis bifida.* Sexual morph: Mycelium amphigenous, moderately dense, forming thin patches, white to greyish, covering part of the leaf surface. *Chasmothecia* scattered or gregarious, abundantly epigenous, occasionally cauligenous, dark brown, spherical. *Chasmothecial appendages* numerous, hyaline, septate, mycelioid, rarely irregularly branched, brown at the base and paler upward. *Asci* 8-12 per chasmothecium, (2-)3-spored, obovoid, saccate, sessile to short-stalked with drip-like liquid. *Ascospores* immature, mature ones not observed. Asexual morph: Undetermined.

Material examined – Germany, Sachsen, Bad Duben, OT Wellaune, on the stems and leaves of *Galeopsis bifida.,* 01 September 1976, U. Braun (HAL1206F), isotype.

Distribution, ecological and economical importance

Neoerysiphe species function as obligate biotrophic fungi that cause powdery mildew diseases on a variety of dicotyledonous plants. Their primary ecological role is as host-specific foliar pathogens, often showing strong co-evolutionary relationships with plant lineages such as Asteraceae, Lamiaceae, Rubiaceae, Geraniaceae, and Verbenaceae. They form superficial mycelia and lobed appressoria on host surfaces and extract nutrients via haustoria, without killing host cells immediately.

Neoerysiphe exhibits a broad but patchy global distribution. *Neoerysiphe galeopsidis* is the most widely distributed species, occurring in Europe, Asia, North America, Africa, and Oceania, and infects a diverse range of Lamiaceae and related families. Other species, such as *N. galii* and *N. geranii*, are primarily Eurasian, while *N. cumminsiana* and its allies occur in the Americas and parts of Asia. Recently described taxa such as *N. sechii* from Mexico and *N. kerribeeensis* from Australia highlight the genus's presence in subtropical and temperate regions, often with a narrow host range and endemic associations.



Note a. Details of the herbarium material. b–d. Mycelia and chasmothecium on the host surface. e Squash mount of the chasmothecium, with the appendages. f. Part of the chasmothecium. g–l. Asci. Scale bars: d = 100 µm; f–h = 50 µm; i–l = 30 µm.

Figure 3.81 *Neoerysiphe galeopsidis* (HAL1206F, isotype)

Parauncinula S. Takam. & U. Braun, Mycoscience 46(1): 14 (2005)

Index Fungorum number: IF28941; Facesoffungi number: FoF 18379, 4 morphological species (Species Fungorum, 2025), 3 species with molecular data.

Obligate biotrophic fungi on leaves of Fagaceae, including *Quercus* and *Fagus* species. Sexual morph: see Meeboon et al. (2017). Asexual morph: Unknown.

Type species – *Parauncinula septata* (E.S. Salmon) S. Takam. & U. Braun

Notes – *Parauncinula* is characterised by hypophyllous, scattered, subglobose to lenticular chasmothecia. Peridial cells are polygonal to rounded, with appendages confined to the upper half of the ascoma, flexuous to stiff, usually with uncinate or circinate apices, and bearing 3–13 septa (Takamatsu & Braun, 2005; Meeboon et al., 2017). Asci are short-stalked, containing 3–8 hyaline, curved ascospores. Molecular phylogenetic analyses (ITS, LSU, and 28S rDNA) have placed *Parauncinula* firmly within Erysiphaceae, but phylogenetic resolution is still limited due to sparse taxon

sampling (Frantzeskakis et al., 2019). The genome of *P. polyspora* reveals extensive gene loss compared to other Erysiphaceae, particularly in primary metabolism and plant cell wall-degrading enzymes, consistent with a highly specialised obligate biotrophic lifestyle (Frantzeskakis et al., 2019). The genus is unique among powdery mildews in having no known asexual morph. The type species, *P. septata*, was originally described as *Uncinula septata* E.S. Salmon from *Quercus* leaves in Japan (Salmon, 1900).

Parauncinula septata (E.S. Salmon) S. Takam. & U. Braun, Mycoscience 46(1): 14 (2005) Figure 3.82

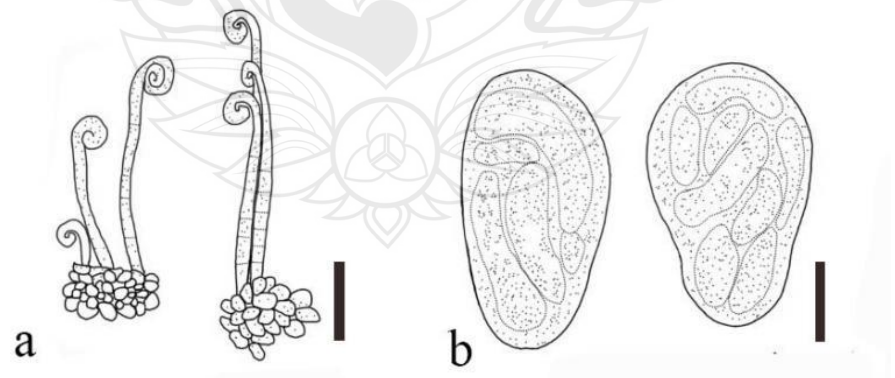
Index Fungorum number: IF369348; Facesoffungi number: FoF 18380

Description – See Meeboon et al. (2017); Frantzeskakis et al. (2019).

Material considered – See Meeboon et al. (2017).

Distribution, ecological and economical importance

Parauncinula species are obligate biotrophs strictly associated with *Quercus* and *Fagus* spp. (Fagaceae). They colonise living leaves, forming endophytic mycelium and hypophyllous chasmothecia without producing an anamorph. Their ecological role is restricted to parasitism on perennial forest hosts, potentially influencing host physiology and contributing to the dynamics of forest canopy health (Meeboon et al., 2017; Frantzeskakis et al., 2019). The genus is geographically confined to temperate East Asia, with confirmed records from Japan and China, corresponding closely to the distribution of their host species in native temperate forests.



Source Redrawn from Meeboon et al. (2017)

Note a Appendages. b Asci with Ascospores. Scale bars: a, b = 20 µm.

Figure 3.82 *Parauncinula septata*

Phyllactinia Lév., Annls Sci. Nat., Bot., sér. 3 15: 144 (1851)

Index Fungorum number: IF4051; Facesoffungi number: FoF 18381, 110 morphological species (Species Fungorum, 2025), 70 species with molecular data.

Saprobic or *parasitic* on leaves and stems of woody plants. Sexual morph: see Khodaparast et al. (2016), Takamatsu (2018). Asexual morph: see Tang et al. (2021).

Type species – *Phyllactinia guttata* (Wallr.) Lév.

Notes – *Phyllactinia* is characterised by its semi-endoparasitic lifestyle, with hyphae forming both internally and on the surface of host plants. It is distinct within the family *Erysiphaceae* for its unique appendages and host specificity. Molecular studies have placed *Phyllactinia* within the tribe *Phyllactinieae*, and it is closely related to *Leveillula*. Molecular markers available for *Phyllactinia* include ITS, 28S rDNA, and D1/D2 regions. Comprehensive studies are needed to further resolve species complexes like *P. guttata* and to understand the evolutionary placement and diversity of the genus. Type specimen of *Phyllactinia suffulta* (Fr.) S. Blumer (≡ *Phyllactinia guttata* (Wallr.: Fr.) Lév.), on leaves of *Corylus avellana*, collected in Germany by Wallroth, with type material deposited in FR (Herbarium of Fungi in Senckenberg Museum, Frankfurt).

Phyllactinia guttata (Wallr.) Lév., Annls Sci. Nat., Bot., sér. 3 15: 144 (1851) Figure 3.83

=*Phyllactinia suffulta* (Rebent.) Sacc., Michelia 2(no. 6): 50 (1880)

Index Fungorum number: IF146972; Facesoffungi number: FoF 18382

Description – Léveillé (1851).

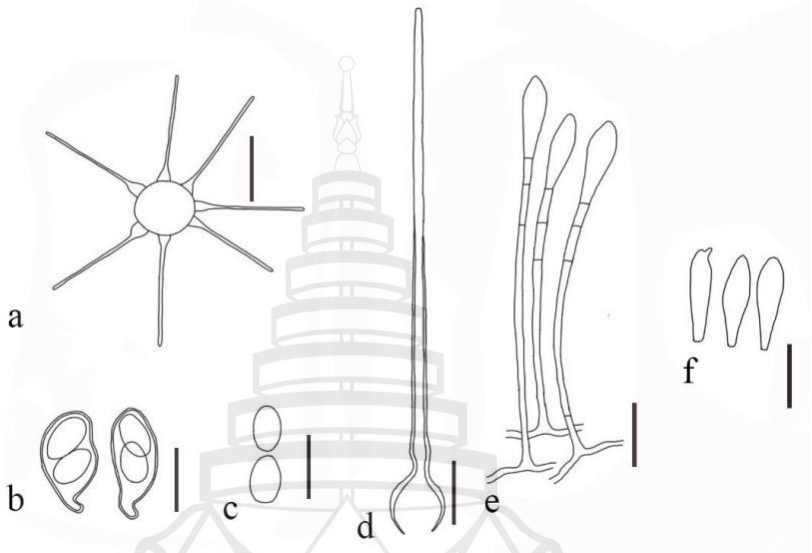
Material considered – Léveillé (1851).

Distribution, ecological and economical importance

As plant pathogens, species of *Phyllactinia* infect the leaves and stems of their hosts, leading to the development of powdery mildew. This infection manifests as white, powdery spots on the plant surface, which can reduce photosynthetic efficiency, impair growth, and diminish the aesthetic and economic value of ornamental and fruit-bearing plants.

Phyllactinia species are distributed globally, predominantly in temperate regions. They have been reported across various continents, including North America, Europe, and Asia. The genus encompasses numerous species, each with specific host

preferences. For instance, *Phyllactinia guttata* is commonly found on hardwood trees such as hazel (*Corylus* spp.) and ash (*Fraxinus* spp.), while other species may target different plant families. The widespread occurrence of *Phyllactinia* underscores its adaptability and the broad range of potential host plants susceptible to infection.



Source Redrawn from Pirnia et al. (2007)

Note a Ascocarp. b Asci. c Ascospores. d Acicular appendage. e Conidiophores. f conidia. Scale bars: a = 200 µm, b–f = 50 µm.

Figure 3.83 *Phyllactinia guttata*

Pleochaeta Sacc. & Speg., in Saccardo, Michelia 2(no. 7): 373 (1881)

Index Fungorum number: IF4206; Facesoffungi number: FoF 18383, 9 morphological species (Species Fungorum, 2025), 5 species with molecular data.

Parasitic on living leaves and branches of host plants, particularly species within the *Celtis* genus. Sexual morph: see Kimbrough and Korf (1963). Asexual morph: see Liberato and Barreto (2005).

Type species – *Pleochaeta lynchii* (Speg.) Speg.

Notes – *Pleochaeta* is characterised by its partly endophytic mycelium, with hyphae penetrating host tissues through stomata and forming haustoria within mesophyll cells. Molecular studies have placed *Pleochaeta* within the family *Erysiphaceae*. Further sampling and molecular analyses are necessary to fully understand the phylogenetic placement and diversity of *Pleochaeta*. Molecular markers

available for *Pleochaeta* include ITS and 28S rDNA regions (Kiss et al., 2006). Type specimen of *Pleochaeta lynchii* (as *Uncinula lynchii* Speg.), on leaves of *Cassia* sp., collected in Argentina by C. Lynch, holotype deposited in LPS (La Plata Herbarium), designated as lectotype by Kimbrough and Korf (1963).

Pleochaeta lynchii (Speg.) Speg. [as 'lynckii'], in Saccardo, Syll. fung. (Abellini) 2: II (1883) Figure 3.84

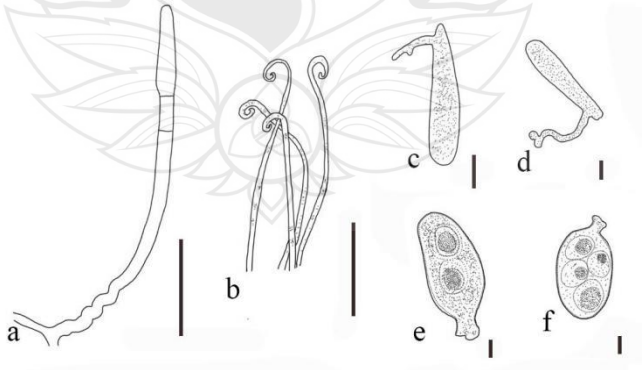
Index Fungorum number: IF143346; Facesoffungi number: FoF 18384

Description – Kimbrough and Korf (1963).

Material considered – Kimbrough and Korf (1963).

Distribution, ecological and economical importance

As obligate biotrophic pathogens, species of *Pleochaeta* infect living plant tissues, extracting nutrients and often leading to reduced photosynthetic efficiency, stunted growth, and decreased agricultural yields. Species of *Pleochaeta* have been reported in various regions, including Asia and the Americas. For instance, *Pleochaeta shiraiana* has been documented in China and Japan, infecting plants in the Ulmaceae family. The genus encompasses several species, each with specific host associations and geographical distributions. For example, *Pleochaeta polychaeta* is known to infect hosts in the Ulmaceae family and has been reported in North America (Kimbrough, 1963). It's important to note that the distribution of *Pleochaeta* species is closely linked to the presence of their host plants, and environmental conditions conducive to fungal growth and dispersal.



Source Redrawn from Kiss et al. (2006)

Note a Setae with unilateral synnemata. b Synnemata around the setae, in detail. c Conidiogenous cells. d-e Conidia. Scale bars: a, b = 20 µm, c–e = 10 µm.

Figure 3.84 *Pleochaeta indica*

Podosphaera Kunze, in Kunze & Schmidt, Mykologische Hefte (Leipzig) 2: 111 (1823)

Index Fungorum number: IF4283; Facesoffungi number: FoF 18385, 114 morphological species (Species Fungorum, 2025), 75 species with molecular data.

Obligate biotrophic *parasites*, infecting a variety of host plants. Sexual morph: see Kunze and Schmidt 1823. Asexual morph: see Braun and Cook (2012).

Type species – *Podosphaera myrtillina* Kunze.

Notes – *Podosphaera* was introduced by Kunze (1823), with *Podosphaera myrtillina* (DC.) U. Braun & S. Takam. as the type species. The genus is characterised by superficial mycelium, erect conidiophores with a cylindrical foot-cell, and conidia that are mostly formed singly or in chains, often containing fibrosin bodies. Chasmothecia typically have simple or branched appendages and usually contain a single ascus with eight ascospores. This genus was redefined by Braun and Takamatsu (2000), who combined *Podosphaera* and *Sphaerotheca* into a single monophyletic genus divided into two sections: *sect. Podosphaera* (with branched appendages) and *sect. Sphaerotheca* (with unbranched appendages). Molecular markers commonly applied include ITS and LSU rDNA, with additional loci such as TUB2 and EF-1α used in recent phylogenetic studies. Species complexes such as *P. xanthii* and *P. macularis* have been shown to contain cryptic taxa. Type species of *Podosphaera myrtillina* (DC.) U. Braun & S. Takam., on *Vaccinium myrtillus*, originally described as *Erysiphe myrtillina* DC., with type material deposited in the herbarium of Geneva (G), collected in France.

Podosphaera myrtillina Kunze, in Kunze & Schmidt, Mykologische Hefte (Leipzig) 2: – 113 (1823) Figure 3.85

Index Fungorum number: IF240456; Facesoffungi number: FoF 18386

DescriptionKunze and Schmidt 1823, Braun and Cook (2012).

Material considered – Kunze and Schmidt 1823, Braun and Cook (2012).

Distribution, ecological and economical importance

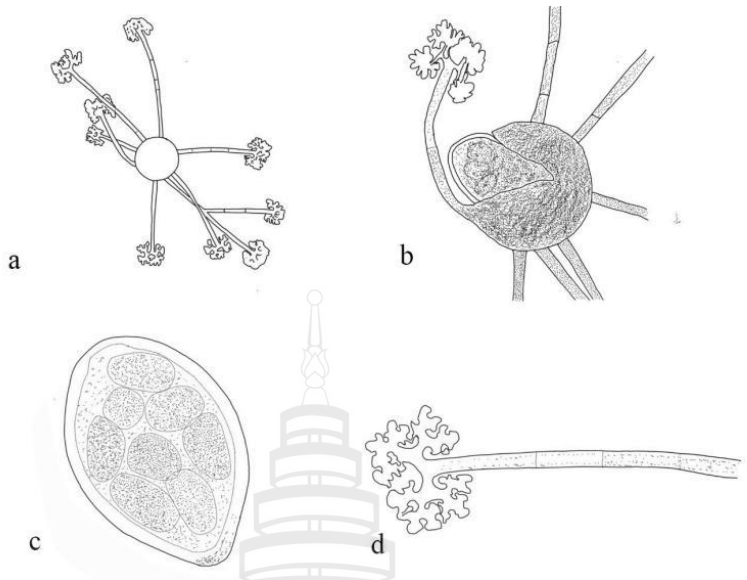
Podosphaera species are obligate biotrophic fungi responsible for powdery mildew diseases across a wide range of host plants, including economically significant crops and ornamentals. These pathogens form characteristic white, powdery mycelial growths on plant surfaces, leading to reduced photosynthetic efficiency, stunted growth,

and diminished agricultural yields. For instance, *Podosphaera xanthii* is a prevalent pathogen affecting cucurbit crops, causing substantial yield losses. The impact of *Podosphaera* on plant health necessitates the development of effective disease management strategies, including the use of resistant cultivars and fungicidal applications. Understanding the role of *Podosphaera* in plant-pathogen interactions is crucial for maintaining plant health and ensuring agricultural productivity.

Podosphaera species exhibit a global distribution, with occurrences documented in diverse climatic regions. In Northeast Asia, including countries such as China, Japan, the Republic of Korea, and the Russian Far East, a significant diversity of powdery mildew fungi has been recorded, with *Podosphaera* being one of the common genera. Notably, 50 shared powdery mildew species have been identified across these regions, indicating a broad host range and adaptability of *Podosphaera* species to various environmental conditions.

The role of Podosphaera species as pathogens significantly impacts agriculture and horticulture. Infected plants often exhibit symptoms such as white, powdery fungal growth on leaves, stems, and fruits, leading to reduced photosynthesis, stunted growth, and decreased yield and quality of produce. For example, Podosphaera leucotricha causes powdery mildew in apples and pears, leading to economic losses due to reduced fruit quality (Sutton et al., 2014).

Geographically, Podosphaera species are distributed worldwide, with occurrences reported in various regions, including North America, Europe, and Asia. For instance, Podosphaera spiraeae, which infects plants in the genus Spiraea, is native to Japan but is likely widespread throughout other regions (Farr & Rossman, 2019).



Source Redrawn from Bladmineerders (2025)

Note a Cleistothecia. b Cleistothecia containing a single ascus. c Asci with eight spores. d Appendage. Scale bars: Original photo no scale bars.

Figure 3.85 *Podosphaera myrtillina*

Salmonomyces Chidd., Sydowia 13(1-6): 55 (1959)

Index Fungorum number: IF4832; Facesoffungi number: FoF 18387, 2 morphological species (Species Fungorum, 2025), 2 species with molecular data.

Obligate biotrophic pathogens, forming intimate associations with living host tissues. Sexual morph: see Chiddarwar (1959), Jin et al. (2021). Asexual morph: see Jin et al. (2021).

Type species – *Salmonomyces acalyphae* (F.L. Tai) L. Kiss, D.N. Jin & S.Y. Liu

Notes – *Salmonomyces* was introduced by Chiddarwar (1959) with *S. kamatii* as the type species, based on specimens from *Croton sparsiflorus* in India. Subsequent taxonomic studies (Kiss et al., 2020; Jin et al., 2021) demonstrated that *S. kamatii* is conspecific with *Uncinula acalyphae* F.L. Tai, originally described from *Acalypha supera* in Yunnan, China (Tai, 1946). Jin et al. (2021) designated an epitype for *S. acalyphae* from *A. supera* collected in Yunnan, providing detailed morphological descriptions and ITS and LSU rDNA sequence data. The genus is characterised by hyaline, ectophytic mycelium, globose, dark brown chasmothecia with numerous

acicular, stiff, simple appendages that are 1-septate, slightly swollen at the base, and subhyaline to hyaline at the apex. Asci are numerous, obclavate, pedicellate, with hyaline, ovoid, aseptate ascospores. The asexual morph is *Pseudoidium*-like, producing hyaline, ellipsoid to barrel-shaped conidia in short chains. Phylogenetic analyses (ITS, LSU) confirmed that *Salmonomyces* forms a distinct lineage within the Erysiphaceae, separate from *Erysiphe*. Currently, two species are recognised: *S. acalyphae* (sexual and asexual morphs) and *S. javanicus* (asexual morph only), both restricted to hosts in *Acalypha* (Euphorbiaceae).

***Salmonomyces* acalyphae** (F.L. Tai) L. Kiss, D.N. Jin & S.Y. Liu, in Kiss et al., *Persoonia* 45: 229 (2020) Figure 3.86

≡ *Uncinula acalyphae* F.L. Tai, *Mycol. Notes Mycol. Soc. China* 2: 1 (1946).
≡ *Salmonomyces kamatii* Chidd., *Sydowia* 13(1–6): 55 (1959), syn. nov.

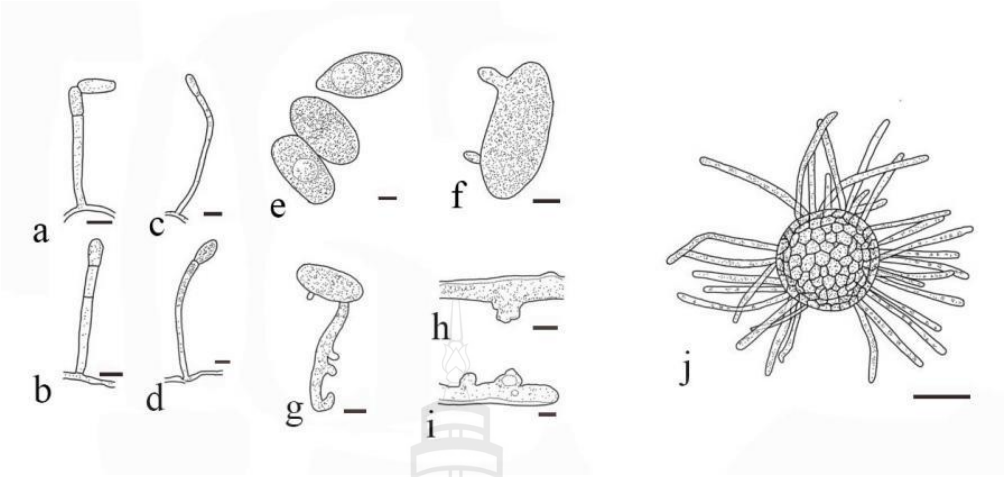
Index Fungorum number: IF305484; Facesoffungi number: FoF 18388

Description –See Jin et al. (2021)

Material considered – China, Yunnan Province, Kunming, on living leaves of *Acalypha supera*, 2017, D.N. Jin (epitype BJTC-F23236, ex-epitype culture CGMCC 3.20374; GenBank ITS = MW301345, LSU = MW301344).

Distribution, ecological and economical importance

Salmonomyces species are host-specific powdery mildew fungi restricted to *Acalypha* (Euphorbiaceae). They act as obligate biotrophs, forming haustoria in epidermal cells for nutrient acquisition. *S. acalyphae* is known from China (Yunnan, Guangdong), India, Indonesia, and Argentina, whereas *S. javanicus* occurs in tropical Asia (Java, Thailand, Vietnam) and South America, mostly on ornamental or wild *Acalypha*. These fungi are typically found in tropical and subtropical regions, in natural vegetation or garden habitats rather than cultivated crops.



Source Redrawn from Kiss et al. (2020)

Note a, b Short conidiophores. c, d Long conidiophores. e Fresh conidia filled with highly granular cytoplasm, occasionally containing voluminous oil droplets. f, g Conidia with primary germ tubes. h, i Hyphal appressoria. j Chasmothecium. Scale bars: a, b = 15 µm; c–d, g = 10 µm; e, f, h, i = 5 µm; j = 50 µm.

Figure 3.86 *Salmonomyces acalyphae*

Sawadaea Miyabe, in Sawada, Rep. Dept Agric., Govern. Res. Inst. Formosa, Spec. Bull. Agric. Exp. Station Formosa 9: 49 (1914)

Index Fungorum number: IF4873; Facesoffungi number: FoF 18389, 10 morphological species (Species Fungorum, 2025), 10 species with molecular data.

Obligate parasites on various maple (Acer) species. Sexual morph: see Homma (1937). Asexual morph: see Schmidt and Braun (2024).

Type species – Sawadaea aceris (DC.) Miyabe 1914

Notes – Colonies are superficial, forming white to greyish powdery patches on living leaves. Conidiophores produce catenescent macroconidia containing fibrosin bodies, a feature characteristic for tribe Cystotheceae (Schmidt & Braun, 2024). Chasmothecia are polyascal, with dichotomously branched appendages bearing uncinate to circinate tips; asci 6–many per chasmothecium; ascospores hyaline, aseptate. These diagnostic sexual features were detailed by Homma (1937) for *Sawadaea* species on *Acer*, including the uncinate/helicoid apices of appendages and multi-ascate ascomata. Conidial germination corresponds to the Orthotubus subtype of the

Fibroidium type; this has been confirmed with fresh material of *S. bicornis* and described for *S. tulasnei* (Schmidt & Braun, 2024).

Molecular phylogenetic analyses based on ITS and LSU (28S) rDNA recover seven major clades within *Sawadaea*, largely associated with sections of *Acer* and partitioned into an East Asian group and a global group; a diagnostic 6–11 bp indel in ITS1 is clade-consistent. These results indicate host jumps and subsequent radiation rather than strict co-speciation (Takamatsu et al., 2015; Frantzeskakis et al., 2019).

Type species of *Sawadaea aceris* (DC.) Miyabe, based on *Erysiphe aceris* DC., collected on leaves of *Acer campestre* in Switzerland by A.P. de Candolle, with the type material preserved in the herbarium G (Geneva).

Sawadaea aceris (DC.) Miyabe [as '*Sawadaia*'], in Sawada, Spec. Report Agric. Exp. Station Formosa 9: 50 (1914) Figure 3.87

=*Sawadaea bicornis* (Wallr.) Homma, J. Fac. agric., Hokkaido Imp. Univ., Sapporo 38(3): 371 (1937)

Index Fungorum number: IF105765; Facesoffungi number: FoF 18390

Description – see Homma (1937); Schmidt and Braun (2024).

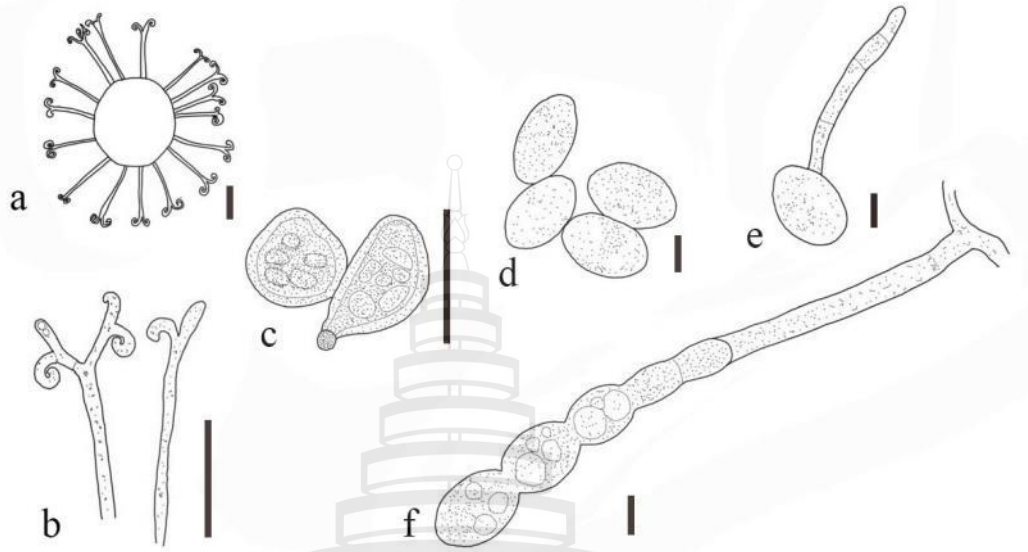
Material considered – see Homma (1937); Schmidt and Braun (2024).

Distribution, ecological and economical importance

In natural ecosystems, *Sawadaea* species play a role in regulating plant health and dynamics. While they can cause disease in their host plants, leading to reduced photosynthetic capacity and vigor, they also contribute to natural selection by potentially limiting the dominance of certain maple species. This dynamic can promote biodiversity by allowing other plant species to thrive. However, in managed landscapes or urban environments, heavy infestations can lead to aesthetic and health concerns for ornamental maples.

Sawadaea species have a widespread distribution, particularly in temperate regions where maple trees are prevalent. For instance, *Sawadaea bicornis* has been reported in various parts of North America, including British Columbia, Canada, and several states in the USA, such as Idaho, Washington, and Wisconsin. In California, this pathogen has been detected on multiple hosts in the Bay Area, Sacramento area, and coastal southern regions. Similarly, *Sawadaea tulasnei* has been observed in states like Wisconsin and Oregon. In Asia, species like *Sawadaea polyfida* occur natively on

certain maple species in China, Japan, and Korea (Hudelson et al., 2008; Beenken et al., 2023).



Source Redrawn from Schmidt and Braun (2024)

Note a Chasmothecium. b Appendage. c Asci with ascospores. d Conidia. e Conidia with germ tubes. f Conidiophore. Scale bars: a–c = 100 µm, d–f = 10 µm.

Figure 3.87 *Sawadaea bicornis*

Takamatsuella U. Braun & A.N. Shi, Taxonomic Manual of the Erysiphales (Powdery Mildews): 179 (2012)

Index Fungorum number: IF561319; Facesoffungi number: FoF 18391, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Obligate biotrophs on members of Rosaceae. Sexual morph: see Braun and Cook 2012. Asexual morph: Unknown.

Type species – *Takamatsuella circinata* (Cooke & Peck) U. Braun & A.N. Shi

Notes – *Takamatsuella* is a monotypic genus in the family Erysiphaceae, established to accommodate *Erysiphe circinata* (≡ *Uncinula circinata* Cooke & Peck) based on distinct morphological features, notably its circinate (coiled) appendages and unique peridial cell morphology (Braun & Cook, 2012). It parasitizes leaves of *Prunus* spp. (Rosaceae), producing dark brown to black, subglobose chasmothecia with coiled appendages. Asci are broadly clavate, containing ellipsoid, hyaline, aseptate ascospores. Phylogenetic analyses based on ITS and LSU sequences place *Takamatsuella* close to

the *Erysiphe/Uncinula* complex, but its unique morphology supports its recognition as a distinct genus (Takamatsu, 2018). Further molecular sampling from diverse hosts and geographic regions would help clarify its phylogenetic relationships and potential cryptic diversity.

Type specimen: Lectotype of *Uncinula circinata* on leaves of *Prunus serotina*, USA, New York, coll. C.H. Peck, 1871, CUP (Cornell University Herbarium).

Takamatsuella circinata (Cooke & Peck) U. Braun & A.N. Shi, Taxonomic Manual of the Erysiphales (Powdery Mildews): 180 (2012)

≡ *Uncinula circinata* Cooke & Peck, *Annual Report of the Regents of the University of the State of New York on the State Museum of Natural History* 24: 77 (1872).

Index Fungorum number: IF561320; Facesoffungi number: FoF 18392

Description – Braun and Cook (2012).

Material considered – Braun and Cook (2012).

Distribution, ecological and economical importance

Takamatsuella is a genus within the family Erysiphaceae, a group of fungi commonly known as powdery mildews. Members of the Erysiphaceae are obligate biotrophic pathogens, meaning they rely on living host plants to complete their life cycle. They are globally distributed and infect a wide range of plant species, causing significant agricultural and ecological impacts (Kusch et al., 2024).

Figure – No original illustration available.

Godroniaceae Baral, Index Fungorum 225: 2 (2015)

Index Fungorum number: IF80754; Facesoffungi number: FoF 05889

Godroniaceae was introduced by Baral (2015) with *Godronia* Moug. & Lév. as the type genus. Members of the family are characterised by urceolate to discoid apothecia (0.3–3.5 mm diam.) with protruding and often hairy margins, a furfuraceous to ribbed exterior, and pigmented excipulum tissues. The ectal excipulum is composed of hyaline to ochre *textura oblita* or dark brown *textura prismatica*, while the medullary excipulum consists of reddish- to olive-brown *textura prismatica-porrecta*. Paraphyses are filiform and frequently encrusted with pigmented exudates. Asci are inoperculate, arising from croziers, with a Calycina-type amyloid apical ring or inamyloid apex, and contain eight septate, ellipsoid to filiform ascospores. The asexual morph is coelomycetous, producing uni- to multilocular conidiomata with phialidic conidiogenesis.

Molecular markers available for the family mainly include ITS and LSU sequences, which have been used in phylogenetic analyses to confirm its placement within Helotiales (Baral, 2015; Johnston et al., 2019). In this study, a multigene phylogenetic analysis (Figure 3.88) was conducted, and the results further confirmed the systematic position of Godroniaceae. Both sexual and asexual morphs are well documented, and members are primarily necrotrophic or hemibiotrophic pathogens on woody hosts. The most important species, *Gremmeniella abietina*, causes Scleroderris canker and Brunchorstia dieback on conifers such as *Pinus*, *Picea*, *Abies*, *Larix*, and *Pseudotsuga*, leading to severe damage in nurseries and plantations and major losses in the timber and Christmas tree industries (EFSA, 2017).

Godroniaceae is widely distributed in boreal and temperate regions of the Northern Hemisphere, including most of Europe, North America, Russia, and Japan. Its members are well adapted to forest ecosystems, exhibiting strong host associations and persistence under diverse ecological conditions (EFSA, 2017; Johnston et al., 2019).

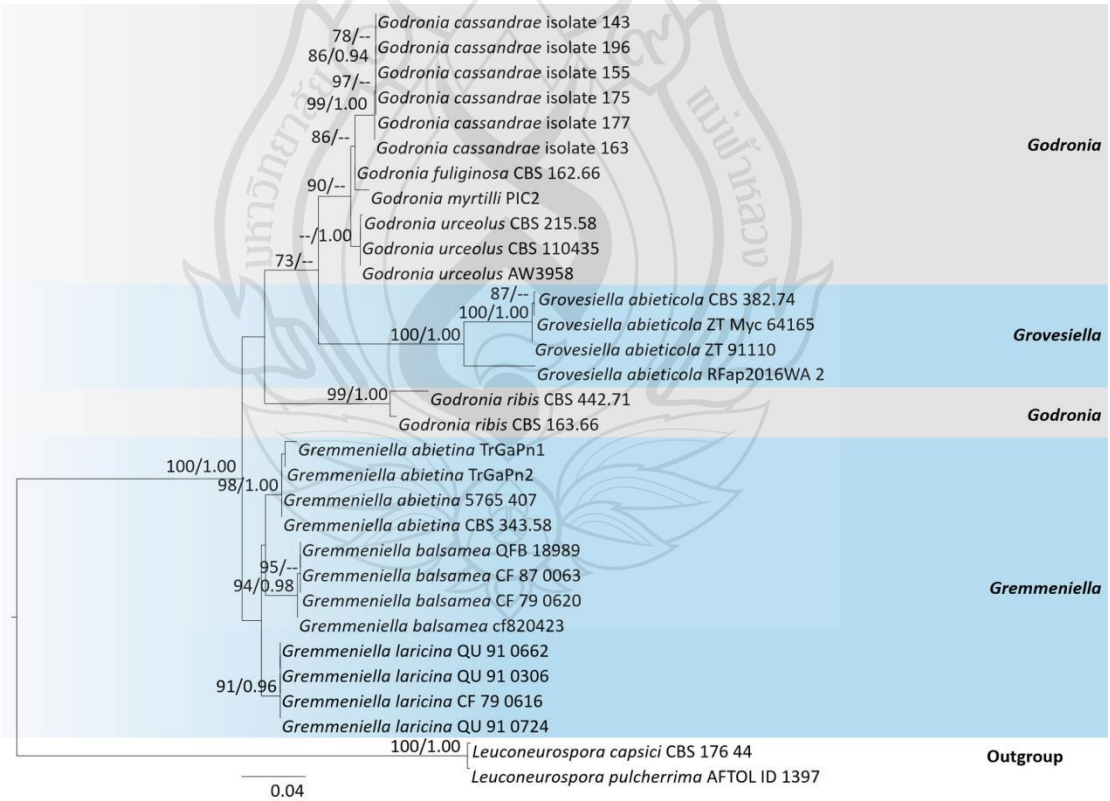


Figure 3.88 Maximum likelihood tree based on the combined ITS and LSU dataset of Godroniaceae

Figure 3.88 Bootstrap support values (MLBP ≥ 70%) and Bayesian posterior probabilities (BPP ≥ 0.90) are shown at nodes as MLBP/BPP. Values below these thresholds are indicated with a hyphen ("–"). Type strains are shown in bold.

Ascocalyx Naumov, Morbi Plant. Script. Sect. Phytopath. Hort. Bot. Prince. USSR 14: 138 (1925) [1926]

Index Fungorum number: IF349; Facesoffungi number: FoF 07120, 6 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic, colonising dead or decaying bark and twigs of conifers, especially Abies spp. Sexual morph: see Naumov (1925), Groves (1968). Asexual morph: see Groves (1968), Kujala (1953).

Type species – *Ascocalyx abietis* Naumov

Notes – Ascocalyx was introduced by Naumov (1925) with *Ascocalyx abietis* as the type species, based on collections from *Abies sibirica* near St. Petersburg, Russia. The genus is characterised by cupulate, dark brown to black apothecia developing on erumpent stromata, leathery to horny in texture, with the receptacle surface composed of thick-walled, dark brown outer cells and inner hyaline, thin-walled cells. The hymenium is concave to nearly flat; paraphyses filiform, septate, slightly enlarged and often pigmented at the tips. Asci are cylindric-clavate, 8-spored, with ascospores hyaline, elongate-fusiform to subfiliform, mostly with 5–9 septa, and ends slightly tapered (Naumov, 1925; Groves, 1968; Kujala, 1953).

The asexual morph corresponds to *Bothrodiscus* (Müller, 1983), producing stromatic discs with multiple immersed pycnidial locules. Conidiogenous cells are hyaline, producing elongate, multi-septate conidia that are straight to slightly curved, aggregated into conspicuous white glomerules on the disc surface (Groves, 1968; Kujala, 1953).

No verified molecular sequence data are currently available for *Ascocalyx* species in GenBank. Future phylogenetic work should prioritise fresh collections and sequencing of ITS and LSU regions to clarify the generic placement within Dermateaceae. The type specimen of *A. abietis* was not assigned a collection number in the protologue and its exact repository is unconfirmed, though it is likely housed in the LE herbarium (St. Petersburg) (Groves, 1968).

Ascocalyx abietis Naumov, Morbi Plant. Script. Sect. Phytopath. Hort. Bot. Prince. USSR 14: 138 (1925) [1926] Figure 3.89

Index Fungorum number: IF255563; Facesoffungi number: FoF 18393

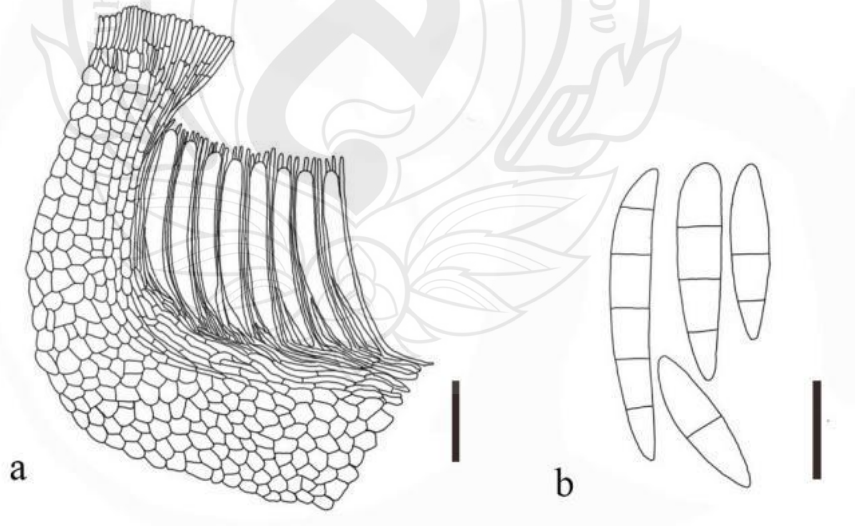
Description – see Groves (1968), Kujala (1953), Müller (1983)

Material considered – Groves (1968), Kujala (1953), Müller (1983)

Distribution, ecological and economical importance

Ascocalyx species are saprobes on dead bark and twigs of coniferous hosts, mainly fir (*Abies* spp.), contributing to decomposition and nutrient cycling in cool temperate forests. Morphological adaptations, such as erumpent stromata and mucilaginous conidial masses, likely facilitate survival and dispersal under moist, shaded conditions. While generally non-pathogenic, *A. abietis* has occasionally been reported as a weak opportunistic pathogen, causing browning and dieback of fir branches in unusually wet years (Kujala, 1953).

The genus has a Northern Hemisphere temperate distribution. *A. abietis* is widespread in Europe (Finland, Russia), Asia (northern Pakistan), and North America (Canada: Nova Scotia, Newfoundland, Yukon Territory) (Groves, 1968; Kujala, 1953; Müller, 1983). Other species, such as *A. tenuisporus* and *A. asiaticus*, have more restricted ranges, often linked to specific fir hosts in high-latitude or montane regions.



Source Redrawn from Müller (1983)

Note a Section trough a portion of the ascoma. b Ascospores. Scale bars: a = 40 µm, b = 10 µm.

Figure 3.89 *Ascocalyx abietis*

Godronia Moug. & Lév., in Mougeot, Consid. Vég. Vosges: 355 (1846)

Index Fungorum number: IF2104; Facesoffungi number: FoF 05889, 50 morphological species (Species Fungorum, 2025), 6 species with molecular data.

Necrotrophic or hemibiotrophic plant pathogens. Sexual morph: see Groves (1965), Seaver (1945). Asexual morph: see Mirzwa-Mróz et al. (2023), Strømeng and Stensvand (2011).

Type species – *Godronia muehlenbeckii* Moug. & Lév.

Notes – *Godronia* was introduced by Mougeot and Léveillé (1846) with *G. muehlenbeckii* as the type species. The genus is characterised by coriaceous to gelatinous, mostly urceolate apothecia, dark brown to black, with a well-differentiated ectal excipulum of *textura oblita*. The hymenium lacks an epithecium; asci are cylindrical to clavate, 8-spored, with filiform paraphyses that are often slightly enlarged at the tips. Ascospores are hyaline, filiform to elongate-fusiform, 1–3-septate at maturity. The asexual morph is *Topospora*- or *Fusicoccum*-like, with conidiomata formed in pycnidia, producing hyaline, mostly bicellular, ellipsoid to fusiform conidia, dispersed mainly by rain splash (Groves, 1965; Strømeng & Stensvand, 2011; Mirzwa-Mróz et al., 2023). Historical taxonomic treatments have sometimes confused *Godronia* with *Crumenula*, *Scleroderris* and *Durandia*, but Seaver (1945) and Nannfeldt (1932) clarified its distinct morphological and ecological features. Molecular markers available for the genus include LSU and ITS rDNA sequences, though sequence data remain sparse and are available for only a few species, limiting phylogenetic resolution. Type – *Godronia muehlenbeckii* on twigs of *Vaccinium* sp., collected in Vosges, France, by Mougeot, deposited in PC (holotype, specimen number not indicated in protologue).

Godronia muehlenbeckii Moug. & Lév. [as 'muhlenbeckii'], in Mougeot, Consid. Vég. Vosges: 355 (1846) Figure 3.90

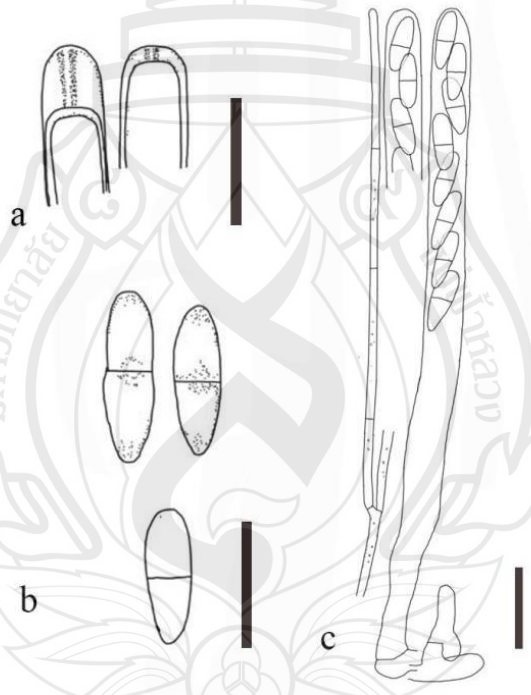
Index Fungorum number: IF204023; Facesoffungi number: FoF 18394

Description – See Groves 1965, Mirzwa-Mróz et al. (2023).

Material considered – France, Vosges, on *Vaccinium* sp., coll. Mougeot (holotype, PC); Norway, Akershus, on *Vaccinium myrtillus*, coll. A. Stensvand, 2009 (O).

Distribution, ecological and economical importance

Species of *Godronia* are primarily pathogens of woody plants, especially in Ericaceae (*Vaccinium*, *Andromeda*, *Ledum*) and Grossulariaceae (*Ribes*), but some also occur on Salicaceae (*Salix*). They can act as hemibiotrophs, causing stem canker and dieback, and later persist saprobically on dead host tissues, contributing to the saprobic–pathogenic continuum in temperate forest ecosystems (Groves, 1965; Strømeng & Stensvand, 2011). *G. muehlenbeckii* is mainly recorded from *Vaccinium* spp. in Europe and North America. The genus has a broad distribution in temperate and boreal regions of the Northern Hemisphere, including Canada, USA, Norway, Poland, Germany, Finland, the UK, and parts of Asia. In cool, moist climates, infections can be severe, with the asexual stage dominating the disease cycle in many European populations, while the sexual stage is rarely encountered (Groves, 1965; Seaver, 1945).



Source Redrawn from Perić et al. (2015)

Note a Apex of the asci in IKI. b Mature ascospores. c Asci and paraphyses Scale bars: a, b = 10 µm, c = 20 µm.

Figure 3.90 *Godronia rosae*

Gremmeniella M. Morelet, Bull. Soc. Sci. nat. Arch. Toulon et du Var 183: 9 (1969)

Index Fungorum number: IF2136; Facesoffungi number: FoF 18394, 4 morphological species (Species Fungorum, 2025), 4 species with molecular data.

Hemibiotrophic pathogen with a prolonged latent phase. Sexual morph: see Petrini et al. (1989), Simard et al. (2001). Asexual morph: see Romeralo et al. (2023).

Type species – *Gremmeniella abietina* (Lagerb.) M. Morelet

Notes – *Gremmeniella* was introduced by Morelet (1969) with *G. abietina* as the type species. Members of the genus are characterised by dark brown to black stromatic pycnidia and small, erumpent apothecia, typically developing on needles, buds, and stems of conifer hosts. Pycnidia are globose to subglobose, subepidermal, and lack an ostiole; conidia are hyaline, aseptate to septate, ellipsoid to fusiform, and produced on simple phialidic conidiogenous cells. Apothecia are discoid, sessile or with a short stipe, and contain 8-spored, cylindric to clavate asci with hyaline, ellipsoid, often septate ascospores. The anamorph is known as *Brunchorstia pinea*. Molecular markers available include ITS, LSU, *β-tubulin* and mtSSU sequence data (Petrini et al., 1989; Romeralo et al., 2023; Simard et al., 2001).

Gremmeniella abietina exhibits considerable intraspecific diversity and is currently divided into two varieties: *var. abietina* and *var. balsamea*. *Var. abietina* includes several biotypes or races with distinct geographic and ecological preferences, such as the European race (biotypes A, B, and Alpine), the North American race, Asian populations, and a Spanish endemic population (Botella & Hantula, 2018; Romeralo et al., 2023). Biotype B is typically associated with snow-covered shoots and exhibits adaptation to colder, prolonged-winter climates, whereas biotype A predominates in milder regions.

The type specimen was collected on twigs of *Pinus sylvestris* in Sweden by T. Lagerberg in 1912, originally described as *Crumenula abietina* Lagerb. (1913). The type material is deposited in the Herbarium of the Swedish Museum of Natural History (S-Fungi); specimen number not specified in the protologue.

Gremmeniella abietina (Lagerb.) M. Morelet, Ann. Soc. Sci. Nat. Arch. Toulon et du Var 183: 9 (1969) Figure 3.91

Index Fungorum number: IF314734; Facesoffungi number: FoF 18395

Description – see Morelet (1969); Petrini et al. (1989).

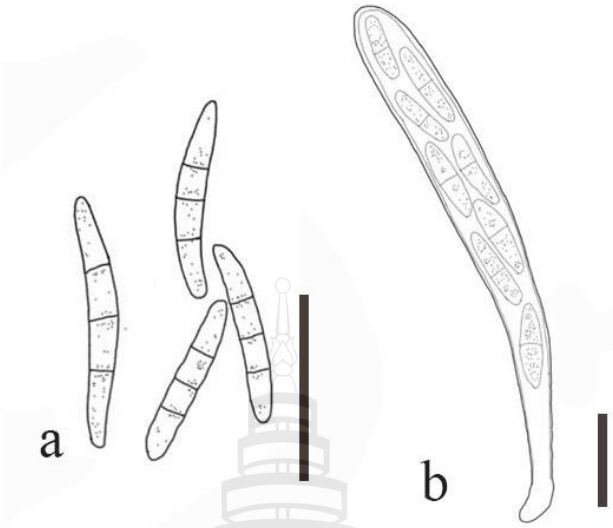
Material considered – Morelet (1969).

Distribution, ecological and economical importance

Species of *Gremmeniella*, particularly *G. abietina*, are significant pathogens in coniferous forest ecosystems. They are capable of causing widespread shoot blight, stem canker, and dieback in both natural stands and managed plantations. The pathogen is adapted to cold, humid, and snow-covered environments, where it can overwinter in host tissues and spread under the protective snow cover. Infections weaken host trees, predispose them to secondary pests, and alter successional dynamics in forest regeneration (Simard et al., 2001; Romeralo et al., 2023).

The host range includes *Pinus*, *Picea*, *Abies*, and *Larix* species, with certain races or biotypes showing marked host preferences. The European race (biotypes A and B, Alpine) is found across Northern, Central, and Southern Europe, with severe outbreaks recorded in Scandinavia and the Alps. The North American race is typically restricted to snow-covered shoots of pines in Canada and the northern USA, while Asian populations occur in Japan and East Asia. The European race has been introduced into North America, causing severe damage in some regions (Petrini et al., 1989; Botella & Hantula, 2018).

Recent studies have revealed that *G. abietina* may harbour a diverse mycovirus community, including partitiviruses, mitoviruses, and endornaviruses, which can serve as molecular markers to study pathogen evolution and dispersal (Botella & Hantula, 2018).



Source Redrawn from Eppo (2009)

Note a Conidia. b Asci and ascospores. Scale bars: a, b = 10 µm.

Figure 3.91 *Gremmeniella abietina*

Grovesiella M. Morelet, Bull. Soc. Sci. nat. Arch. Toulon et du Var 185: 8 (1969)

Index Fungorum number: IF2143; Facesoffungi number: FoF 18396, 2 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Endophytic and opportunistic pathogenic fungi of coniferous hosts, particularly species of *Abies* (true firs). Sexual morph: see Eo and Park (2020), Chastagner et al. (1985), Sieber and Kowalski (1993). Asexual morph: see Eo and Park (2020), Sieber and Kowalski (1993).

Type species – *Grovesiella abieticola* (Zeller & Goodd.) M. Morelet & Gremmen

Notes – *Grovesiella* was introduced by Morelet (1969) and formally established by Morelet and Gremmen (1971) with *G. abieticola* as the type species. The taxon was originally described as *Scleroderris abieticola* by Zeller and Goodding (1930) from *Abies grandis* in Oregon, USA, and later transferred to *Godronia* by Seaver (1951). Groves (1965) questioned this placement due to morphological heterogeneity within *Godronia*. Based on new collections from France, Morelet (1969) recognized that *S.*

abieticola did not fit within *Godronia* or related genera and proposed the new genus *Grovesiella* (Morelet & Gremmen, 1971).

Grovesiella is characterized by dark, sessile to slightly immersed, black apothecia; clavate asci containing eight ascospores; and hyaline, multiseptate, filiform ascospores. The asexual morph includes cylindrical, septate macroconidia and ovoid, aseptate microconidia (Sieber & Kowalski, 1993; Eo & Park, 2020). The macroconidial state corresponds to *Pitostroma abietinum*, and the microconidial state to *Agyriellopsis caeruleoatra*. Molecular markers available include ITS and LSU rDNA sequences (Eo & Park, 2020).

The holotype of *G. abieticola* (Goodding 7247) was collected from *Abies grandis* in Oregon, USA, and is deposited in the New York Botanical Garden (NY).

Grovesiella abieticola (Zeller & Goodd.) M. Morelet & Gremmen, Ann. Soc. Sci. Nat. Arch. Toulon et du Var 185: 8 (1969) Figure 3.92

Index Fungorum number: IF314737; Facesoffungi number: FoF 18397

Description – See Morelet (1969), Morelet and Gremmen (1971), Eo and Park (2020).

Material considered – Holotype: USA, Oregon, on *Abies grandis*, coll. L. N. Goodding 7247 (NY).

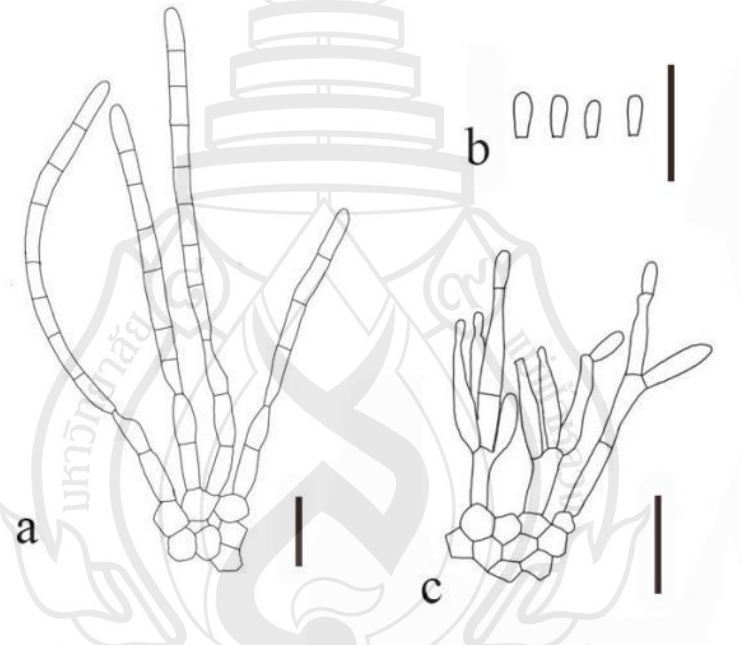
Distribution, ecological and economical importance

Grovesiella abieticola is an endophyte and opportunistic pathogen causing Grovesiella canker, a disease affecting branches and stems of true firs (*Abies* spp.), often leading to shoot dieback, cankers, and occasionally tree mortality. Symptoms include swelling above the canker, browning of needles beyond the infection site, and the development of small (ca. 1–2 mm), grey-black apothecia on cankered tissue (Chastagner et al., 1985). The disease has been reported in both natural forests and plantations, including Christmas tree farms, and can cause substantial losses in commercial *Abies* production.

The pathogen infects multiple *Abies* species, including *A. grandis*, *A. procera*, *A. lasiocarpa*, *A. concolor*, and *A. magnifica*, with occasional records from other conifer hosts. Infections typically initiate on lower branches, spreading upwards, and may girdle stems when established on the main trunk. *G. abieticola* produces spores for most of the year, suggesting a prolonged period of inoculum availability, and is thought

to spread via infected nursery stock or proximity to diseased native firs (Chastagner et al., 1985).

The species is distributed across western North America (from northern California to British Columbia) and has also been reported in Europe and East Asia (Sieber & Kowalski, 1993; Eo & Park, 2020). Environmental factors such as cool, moist conditions favour disease development, and high-elevation or snow-covered habitats may facilitate its persistence and spread. Current management recommendations include pruning and destruction of infected branches to reduce inoculum sources (Chastagner et al., 1985).



Source Redrawn fromSieber and Kowalski (1993)

Note a Macroconidiophore with macroconidia. b Microconidia. c Conidiophores with conidiogenous cells forming microconidia. Scale bars: a–c = 10 µm.

Figure 3.92 *Grovesiella abieticola*

Hamatocanthoscyphaceae Ekanayaka & K.D. Hyde, in Ekanayaka, Hyde, Gentekaki, McKenzie, Zhao, Bulgakov & Camporesi, Mycosphere 10(1): 347 (2019)

Index Fungorum number: IF556274; Facesoffungi number: FoF 05862

Hamatocanthoscyphaceae was first proposed by Baral (2016), later validated by Ekanayaka et al. (2019), and subsequently accepted by Johnston et al. (2019), with

Hamatocanthoscypha as the type genus. Members of the family are characterised by minute, brightly coloured apothecia with conspicuous marginal hairs containing vacuolar bodies. Asci are inoperculate, usually 5–8-spored due to partial spore abortion, and possess non-amyloid apical rings. Ascospores are ellipsoid to fusoid, typically with two non-refractive globules, which become visible upon cresyl-blue staining. Paraphyses are filiform, often with vacuolar bodies, and are embedded in gelatinous excipular tissue (Baral, 2016; Johnston et al., 2019).

Molecular markers available include ITS and LSU sequences. In this study, a multigene phylogenetic analysis (Figure 3.93) was conducted, which further confirmed the systematic placement of Hamatocanthoscyphaceae within Helotiales. The sexual morph is well defined by apothecial ascomata, whereas the asexual morph remains unknown and has not been reported from cultures or environmental samples.

Species of Hamatocanthoscyphaceae are saprobic on decaying plant substrates, including twigs, herbaceous stems, and leaves, and function in the decomposition of plant debris, thereby contributing to nutrient cycling in forest soils. The family has been mainly reported from Europe, particularly in alpine and boreal regions such as Austria, Switzerland, and the UK, although its distribution is probably more widespread but underreported due to the minute and inconspicuous apothecia (Baral, 2016).

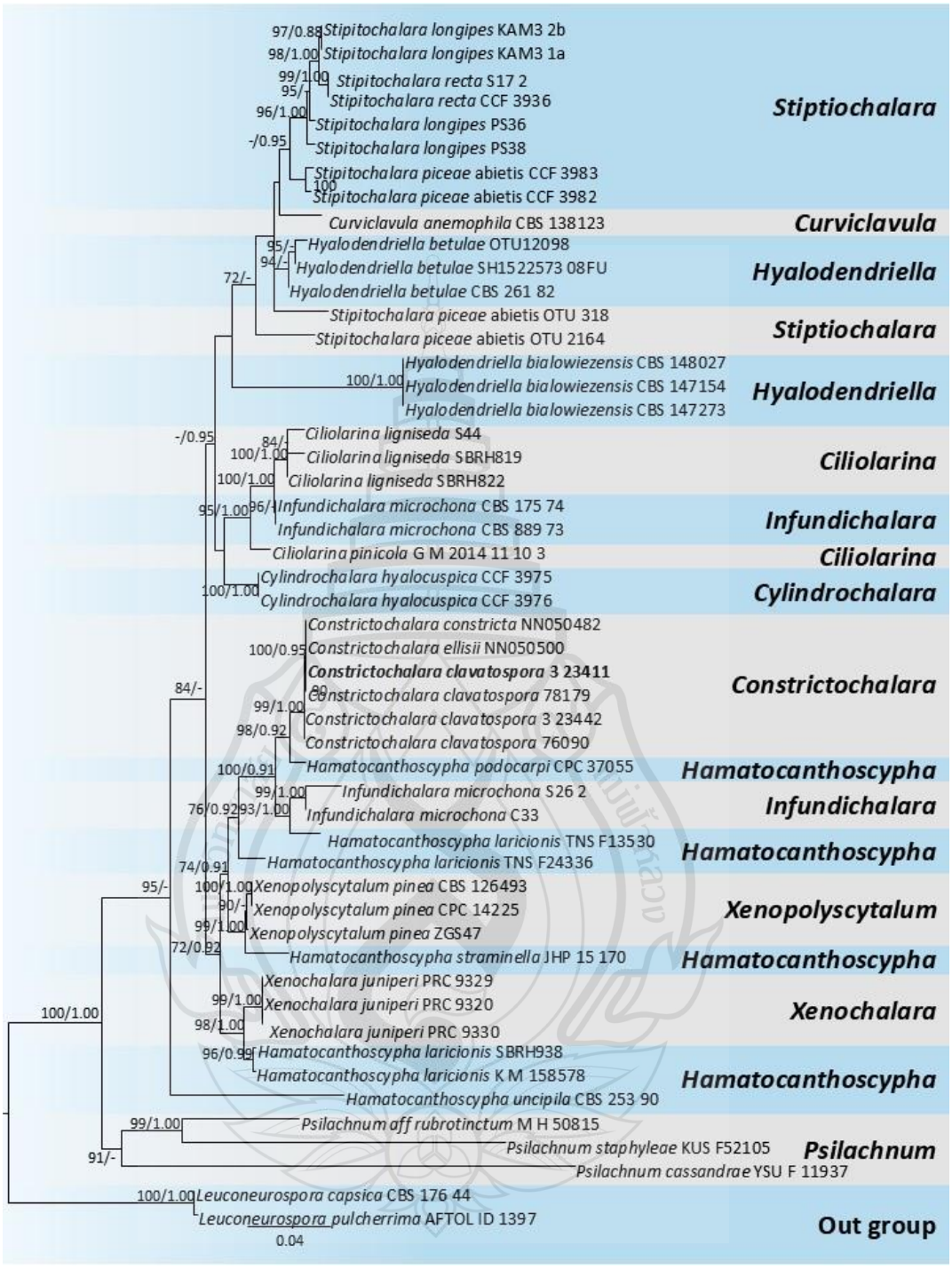


Figure 3.93 Maximum likelihood tree based on the combined ITS and LSU dataset of *Hamatocanthoscyphaceae*

Figure 3.93 Bootstrap support values (MLBP ≥ 70%) and Bayesian posterior probabilities (BPP ≥ 0.90) are shown at nodes as MLBP/BPP. Values below these thresholds are indicated with a hyphen ("–"). Type strains are shown in bold

Ciliolarina Svrček, Česká Mykol. 31(4): 198 (1977)

Index Fungorum number: IF1056; Facesoffungi number: FoF 18398, 7 morphological species (Species Fungorum, 2025), 2 species with molecular data.

Saprobic on fallen leaves, needles, and other decaying plant material in terrestrial habitats. Sexual morph: see Svrček (1977). Asexual morph: Unknown.

Type species – *Ciliolarina laricina*

Notes – *Ciliolarina* was introduced by Svrček (1977) with *Ciliolarina laricina* as the type species, originally described by Raitviir (1965) as *Dasyscyphus laricinus* from fallen leaves of *Larix* in Germany. The genus is characterised by small, cupulate apothecia with conspicuously ciliate margins, hyaline hairs, and hyaline, aseptate, ellipsoid to fusiform ascospores. Ectal excipulum is composed of *textura prismatica* to *textura angularis*. The genus belongs to the Hyaloscyphaceae within Helotiales, and molecular data from ITS and LSU regions support its placement in this family (Svrček, 1977). Available sequence data remain sparse, and no asexual morph is currently known. Further collections and molecular sampling are required to clarify species boundaries and to assess potential cryptic diversity within the genus. The holotype of *C. laricina* is preserved in Herb. Rehm (now incorporated into herbarium M).

Ciliolarina laricina (Raitv.) Svrček, Česká Mykol. 31(4): 199 (1977) Figure 3.94

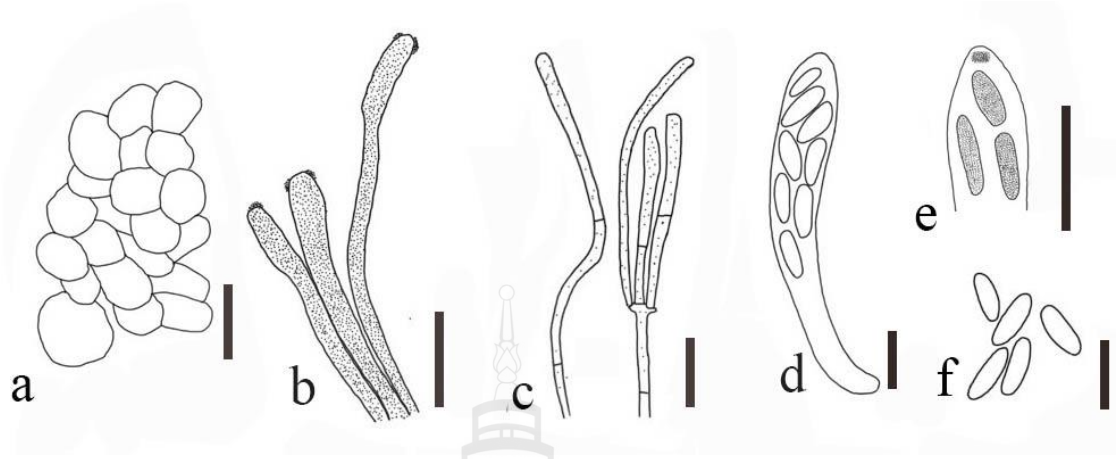
Index Fungorum number: IF311139; Facesoffungi number: FoF 18399

Description – see Svrček (1977).

Material considered – see Svrček (1977).

Distribution, ecological and economical importance

Species of *Ciliolarina* are saprobic, decomposing dead leaves, needles, and small plant debris in forest ecosystems, thus playing an important role in nutrient cycling and organic matter turnover (Filippova, 2012). They occur in cool-temperate to boreal forests, often on specific host litter. For example, *C. laricina* is associated with *Larix* leaves, while *C. pinicola* occurs on *Pinus* needles. Distribution records are scattered, with confirmed occurrences in parts of Europe (e.g., Germany, France, Russia) and isolated reports from Asia, but global coverage remains poorly documented (Svrček, 1977; Filippova, 2012). Additional field surveys and molecular studies are needed to fully elucidate their diversity and biogeography.



Source Redrawn from Asco-Sonneberg (2024)

Note a Hyaline cells of excipulum. b Hairs. c Septate paraphyses with branched at the base. d Asci. e Asci (J+). f Ascospores. Scale bars: a–f = 10 µm.

Figure 3.94 *Ciliolarina laricina*

Constrictochalara W.P. Wu & Y.Z. Diao, Fungal Diversity 119: 440 (2023)

Index Fungorum number: IF845257; Facesoffungi number: FoF 18400, 4 morphological species (Species Fungorum, 2025), 4 species with molecular data.

Saprobic on plant litter in both terrestrial and aquatic environments. Sexual morph: Unknown. Asexual morph: see (Wu & Diao, 2023).

Type species – *Constrictochalara clavatospora*

Notes – *Constrictochalara* is a genus of fungi within the class Leotiomycetes, known for its chalara-like anamorphs. These fungi are characterized by phialidic conidiogenous cells with cylindrical collarettes and deeply seated sporulating loci, producing hyaline, aseptate conidia. Molecular studies have utilized markers such as the internal transcribed spacer (ITS) region and 28S rDNA to elucidate the phylogenetic placement of *Constrictochalara* within the Leotiomycetes. Further comprehensive studies are needed to resolve species complexes within this genus and to understand its evolutionary relationships and diversity (Wu & Diao, 2023). The holotype deposited in CBS (CBS H-24892), isolated from soil collected in Cameroon by M. Réblová.

Constrictochalara clavatospora W.P. Wu & Y.Z. Diao, Fungal Diversity 119: 442 (2023) Figure 3.95

Index Fungorum number: IF845264; Facesoffungi number: FoF 18401

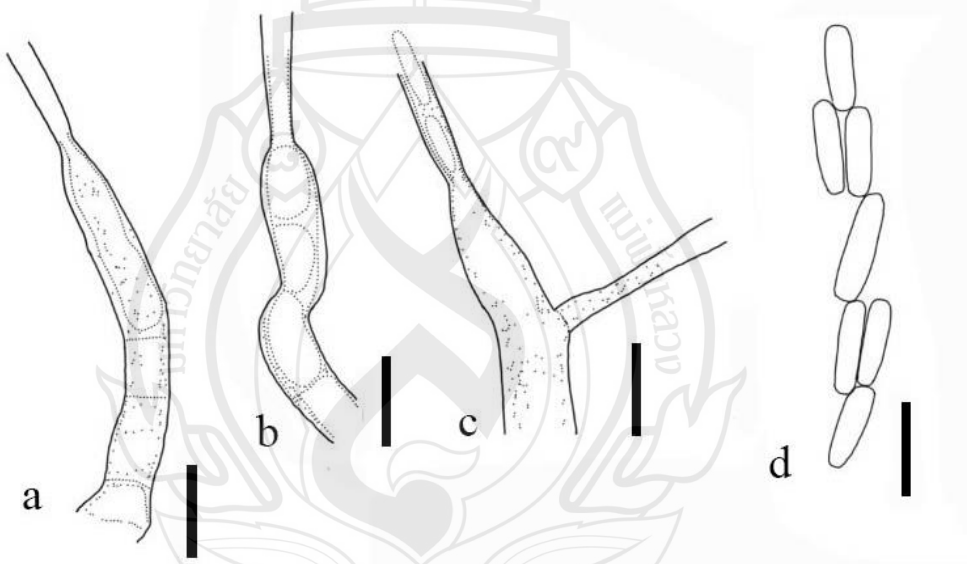
Description – (Wu & Diao, 2023)

Material considered – (Wu & Diao, 2023).

Distribution, ecological and economical importance

These fungi are commonly found on plant litter in both terrestrial and submerged environments, indicating a saprobic lifestyle where they contribute to the decomposition of organic matter. They have a broad geographical distribution, occurring in various regions across the globe (Wu & Diao, 2023).

The role of *Constrictochalara* species in ecosystems primarily involves the breakdown of plant debris, facilitating nutrient cycling. Their presence in diverse habitats underscores their ecological significance in decomposing organic material. Further research is necessary to fully understand the extent of their ecological roles and distribution patterns.



Source Redrawn from Wu and Diao (2023)

Note a–c Conidiophores and phialides. d Conidia. Scale bars: a–d = 5 µm.

Figure 3.95 *Constrictochalara clavatospora*

Curviclavula G. Delgado, F.A. Fernández & A.N. Mill., in Delgado, Miller & Fernández, Mycol. Progr. 14(no. 3): 3 (2015)

Index Fungorum number: IF809670; Facesoffungi number: FoF 18402, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on dead plant material. Sexual morph: Unknown. Asexual morph: see Delgado et al. (2015).

Type species – *Curviclavula anemophila* G. Delgado

Notes – *Curviclavula* was introduced by Delgado et al. (2015) to accommodate *C. anemophila*, an airborne hyphomycete with unique morphological adaptations for aerial dispersal. The genus is characterised by repeatedly dichotomously branched, hyaline, smooth conidiophores, bearing discrete, phialidic conidiogenous cells. Conidia are hyaline, aseptate, smooth, curved to slightly sigmoid, with a distinctive taper toward one end. This combination of features distinguishes *Curviclavula* from morphologically similar genera such as *Hyalodendriella* and *Chalara*. Phylogenetic analyses based on LSU and ITS sequence data place *Curviclavula* within the family Hyaloscyphaceae (Helotiales, Leotiomycetes), showing closest affinities to *Hyalodendriella betulae* and chalara-like taxa (Delgado et al., 2015). The ecological role remains incompletely known, but the airborne conidia suggest adaptation to long-distance dispersal in terrestrial habitats. Holotype: on dead stems of unidentified herbaceous plants, Tenerife, Canary Islands, Spain, coll. G. Delgado, deposited in the Herbarium of the University of La Laguna (TFC Mic.).

Curviclavula anemophila G. Delgado, F.A. Fernández & A.N. Mill., in Delgado, Miller & Fernández, Mycol. Progr. 14(no. 3): 3 (2015) Figure 3.96

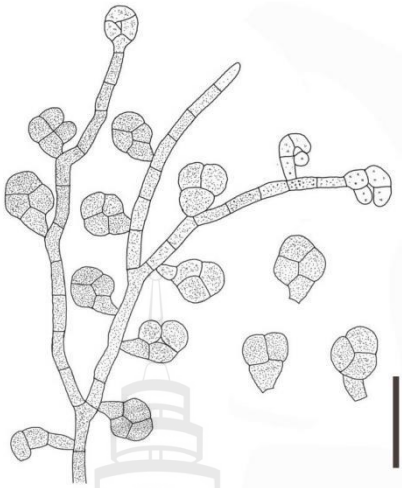
Index Fungorum number: IF809671; Facesoffungi number: FoF 18403

Description – See Delgado et al. (2015).

Material considered – See Delgado et al. (2015).

Distribution, ecological and economical importance

The ecological role of *Curviclavula* is poorly documented. The genus is currently monotypic, represented solely by *C. anemophila*, known from the Canary Islands (Spain) and described from aerial spore traps and dead plant material (Delgado et al., 2015). The distinctive airborne lifestyle suggests it functions primarily as a saprobe, possibly with the ability to colonise a wide range of senescent or decaying plant tissues. Further targeted sampling and culture studies are required to determine its substrate range, ecological interactions, and potential distribution beyond its type locality.



Source Redrawn from Delgado et al. (2015)

Note A branched conidiophore, conidiogenous cells and conidia. Scale bars: 15 µm.

Figure 3.96 *Curviclavula anemophila*

Cylindrochalara W.P. Wu & Y.Z. Diao, Fungal Diversity 119: 445 (2023)

Index Fungorum number: IF845258; Facesoffungi number: FoF 18404, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on needle of Picea abies. Sexual morph: Unknown. Asexual morph: see Wu and Diao (2023).

Type species – *Cylindrochalara hyalocuspica* (Koukol) W.P. Wu & Y.Z. Diao

Notes – *Cylindrochalara* was established by Wu and Diao in 2023 to accommodate chalara-like fungi characterized by solitary, erect, cylindrical conidiophores, consisting of a 1–2-celled basal stalk and a terminal phialide. The conidiogenous cells are phialidic, lageniform, straight or slightly bent, with cylindrical collarettes, and produce hyaline, aseptate, cylindrical conidia in long chains. The type species, *Cylindrochalara variabilis*, was isolated from plant litter in China. Phylogenetically, Cylindrochalara is placed within the family Hamatocanthoscyphaceae of the class Leotiomycetes, closely related to genera such as *Stipitochalara*, *Infundichalara*, and *Xenochalara*. Molecular markers commonly used for Cylindrochalara include the internal transcribed spacer (ITS) region and the large subunit (LSU) rDNA. Comprehensive studies are needed to further resolve species complexes within this genus and to understand its evolutionary placement and diversity (Wu & Diao, 2023). Type specimen of Cylindrochalara hyalocuspica, on Quercus gilva

(Fagaceae), collected in South Korea by K.D. Hyde on 28 July 2020, holotype deposited in CBS (CBS H-25090, MFLU 20-0293).

Cylindrochalara hyalocuspica (Koukol) W.P. Wu & Y.Z. Diao, Fungal Diversity 119: 446 (2023) Figure 3.97

=*Chalara hyalocuspica* Koukol, Fungal Diversity 49(1): 83 (2011)

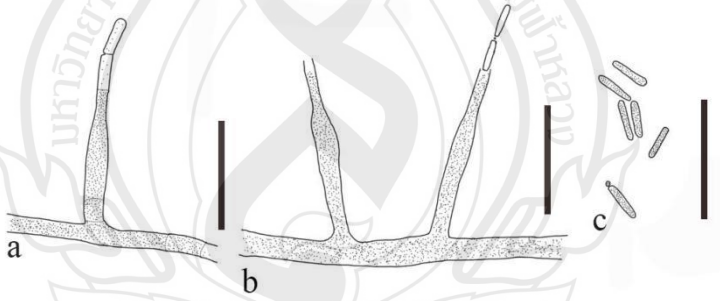
Index Fungorum number: IF845293; Facesoffungi number: FoF 18405

Description – Koukol (2011). Wu and Diao (2023).

Material consid – Wu and Diao (2023).

Distribution, ecological and economical importance

Cylindrochalara is a genus of fungi within the class Leotiomycetes, characterized by chalara-like anamorphs with phialidic conidiogenous cells and cylindrical collarettes. These fungi are commonly found on plant litter in both terrestrial and submerged environments, indicating a saprobic lifestyle. They play a role in decomposing organic matter, contributing to nutrient cycling in ecosystems. Further research is needed to fully understand the ecological functions and distribution of *Cylindrochalara* species (Wu & Diao, 2023).



Source Redrawn from Koukol (2011)

Note a, b Conidiophores. c Conidia. Scale bars: a–c = 20 µm.

Figure 3.97 *Cylindrochalara hyalocuspica*

Hamatocanthoscypha Svrček, Česká Mykol. 31(1): 11 (1977)

Index Fungorum number: IF2214; Facesoffungi number: FoF 05862, 16 morphological species (Species Fungorum, 2025), 4 species with molecular data.

Saprobic on decaying plant debris, especially conifer needles, cones, and twigs, frequently from *Pinus* and *Picea*. Sexual morph: see Svrček (1977), Hosoya and Huhtinen (2002). Asexual morph: unknown.

Type species – Hamatocanthoscypha laricionis (Velen.) Svrček

Notes – *Hamatocanthoscypha* was established by Svrček (1977) to accommodate species formerly placed in *Lachnum* and related genera but distinguished by apothecia with stiff, thick-walled hairs often bearing refractive tips. Apothecia are typically small (0.2–1.5 mm diam.), cupulate to discoid, pale cream to whitish, sometimes with a faint yellowish tint, and externally covered with conspicuous hyaline hairs. Hairs are thick-walled, smooth or faintly roughened, straight to slightly flexuous, with acute to obtuse apices, and often exhibit refractive granules in the wall. Asci are cylindrical to clavate, operculate, containing eight hyaline ascospores. Ascospores are ellipsoid to fusiform, smooth, aseptate, and eguttulate or with minute guttules. Paraphyses are filiform, sometimes branched or forked, and usually exceed the asci in length.

Phylogenetically, *Hamatocanthoscypha* belongs to the Hyaloscyphaceae (Helotiales), but the family's delimitation remains unsettled due to limited taxon sampling and weak phylogenetic support in earlier studies. Available sequence data for *Hamatocanthoscypha* (ITS, LSU) indicate affinities with other hyaline-haired Hyaloscyphaceae, though molecular sampling remains sparse (Hosoya & Huhtinen, 2002; Huhtinen & Læssøe, 2020). Expanded multi-locus phylogenies are required to clarify intrageneric relationships and the genus' placement within the family. Type specimen – Czech Republic, Bohemia, on *Larix* twigs, coll. Velenovský, deposited in PR (Herbarium of Charles University, Prague).

Hamatocanthoscypha laricionis (Velen.) Svrček, Česká Mykol. 31(1): 11 (1977) Figure 3.98

Index Fungorum number: IF314867; Facesoffungi number: FoF 18406

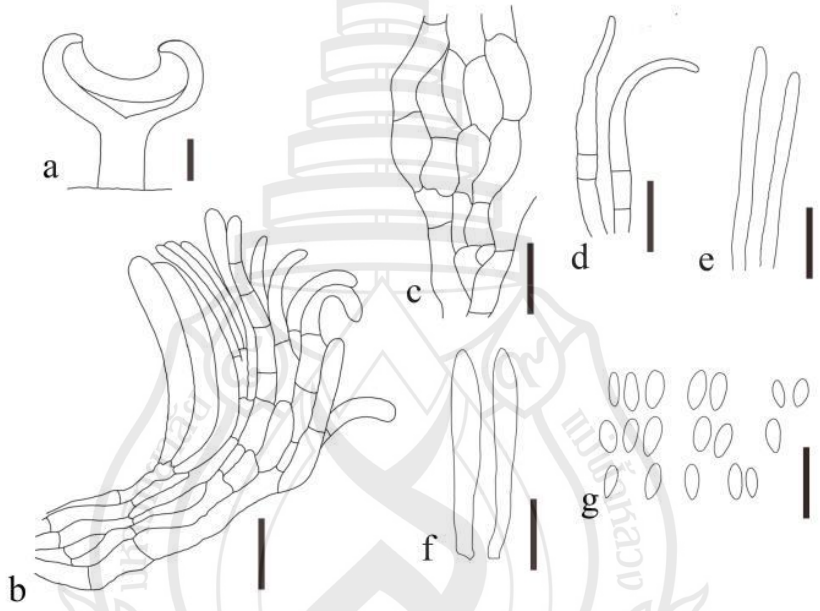
Description – See Svrček (1977).

Material considered – Svrček (1977).

Distribution, ecological and economical importance

Species of *Hamatocanthoscypha* are important saprobes in forest ecosystems, decomposing conifer litter and contributing to nutrient cycling. They are often found in moist, shaded habitats where conifer debris accumulates. By breaking down recalcitrant substrates such as lignin-rich needles and woody cones, these fungi facilitate organic matter turnover and enhance soil fertility.

The genus has a predominantly Holarctic distribution, with records from temperate and boreal regions of Europe, North America, and Asia (including Japan and Russia). Many species exhibit host and substrate specificity, often restricted to particular conifer genera. For example, *H. laricionis* is common on *Larix* and *Pinus* litter in montane forests, while *H. uncipila* and related taxa inhabit *Picea* or *Abies* needles. Despite its wide distribution, *Hamatocanthoscypha* remains underrepresented in molecular datasets, and targeted surveys in under-sampled regions are needed to assess its diversity and biogeography (Svrček, 1977; Hosoya & Huhtinen, 2002).



Source Redrawn from Hosoya and Otani (1997)

Note a Schematic drawing of the apothecial section showing the outline of structure. b Section of apothecium showing ectal excipulum and hairs. c Ectal cells. d Hairs. e Paraphyses. f Asci. g Ascospores. Scale bars: a = 50 µm, b–g = 10 µm.

Figure 3.98 *Hamatocanthoscypha laricionis*

Hyalodendriella Crous, in Crous, Braun, Schubert & Groenewald, Stud. Mycol. 58: 46 (2007)

Index Fungorum number: IF504435; Facesoffungi number: FoF 18407, 2 morphological species (Species Fungorum, 2025), 2 species with molecular data.

Saprobic on decaying wood and plant debris, occasionally endophytic. Sexual morph: Unknown. Asexual morph: see Crous et al. (2007).

Type species – *Hyalodendriella* betulae Crous

Notes – *Hyalodendriella* was introduced by Crous et al. (2007) to accommodate dematiaceous hyphomycetes with septate, highly branched hyphae that are smooth, hyaline to pale brown. Conidiophores arise as lateral branches on the hyphae, subhyaline to pale brown, smooth, 1–6-septate, and bearing terminal or intercalary conidiogenous cells. Conidia are subcylindrical, straight to curved, 1–2-septate, subhyaline to pale brown, smooth-walled, and formed singly. This genus is phylogenetically placed within Hyaloscyphaceae (Helotiales, Leotiomycetes) based on ITS and LSU rDNA sequence data, although the family circumscription remains unresolved and in need of broader sampling.

Endophytic representatives, such as *Hyalodendriella* sp. Ponipodef12, have been shown to produce bioactive metabolites with antibacterial properties (Zhong et al., 2011), suggesting potential ecological roles beyond saprobism. Additional studies are required to assess species boundaries, host specificity, and phylogenetic relationships. The holotype of *H. betulae* (CBS H-23902) was collected by P.W. Crous from *Betula pendula* in the Netherlands in 2013.

Hyalodendriella betulae Crous, in Crous, Braun, Schubert & Groenewald, Stud. Mycol. 58: 46 (2007) Figure 3.99

Index Fungorum number: IF504436; Facesoffungi number: FoF 18408

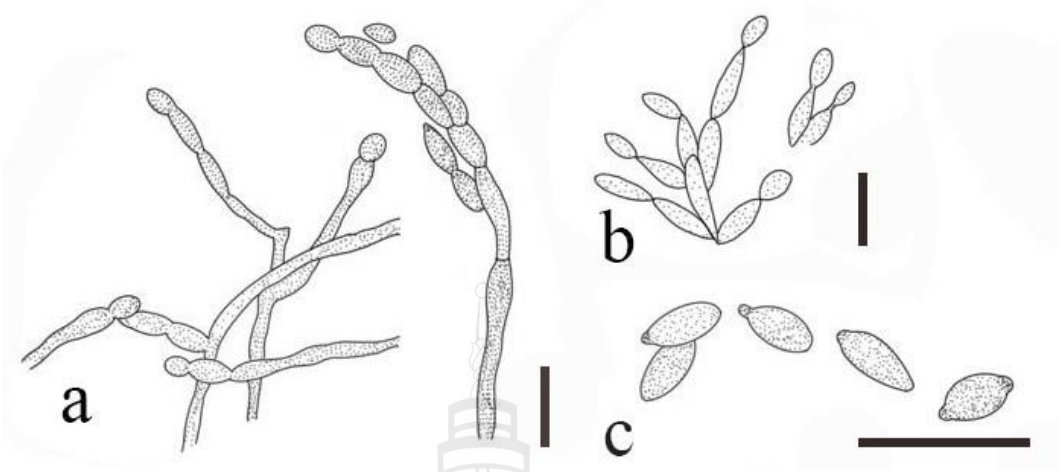
Description – Crous et al. (2007).

Material considered – Crous et al. (2007).

Distribution, ecological and economical importance

Species of *Hyalodendriella* are primarily saprobes, decomposing woody substrates and plant debris, thereby contributing to nutrient cycling in forest ecosystems. Some isolates function as asymptomatic endophytes, with potential plant-protective functions through the synthesis of antimicrobial compounds (Zhong et al., 2011).

The genus has been reported from Europe (Netherlands) and Asia (China), but current records are sparse and likely underrepresent its actual distribution. Broader surveys, particularly targeting diverse woody hosts, are needed to clarify its ecological range and global occurrence.



Source Redrawn from Crous et al. (2007)

Note a Microconidiophores. b Macroconidiophores with fascicles of conidiogenous cells. c Conidia. Scale bars: a–c = 10 μm.

Figure 3.99 *Hyalodendriella betulae*

Infundichalara Réblová & W. Gams, in Réblová, Gams & Štěpánek, Fungal Diversity 46('1'): 78 (2011)

Index Fungorum number: IF518972; Facesoffungi number: FoF 18409, 2 morphological species (Species Fungorum, 2025), 2 species with molecular data.

Saoribic on decaying wood and plant debris. Sexual morph: Unknown. Asexual morph: see Réblová and Gams (2011).

Type species – *Infundichalara microchona* (W. Gams) Réblová & W. Gams

Notes – *Infundichalara* is a genus of hyphomycetous fungi within the family Hyaloscyphaceae, order Helotiales, class Leotiomycetes. It is characterised by brown, septate conidiophores, often reduced to single phialides, occasionally with additional septa. Conidiogenous cells are pigmented, becoming subhyaline toward the apex, often showing sympodial proliferation and tapering slightly below a distinct, funnel-shaped collarette. Conidia are hyaline, smooth-walled, clavate, with a truncate base and a rounded apex, and are produced in long basipetal chains; chlamydospores are absent.

Molecular phylogenetic analyses based on ITS, LSU, and SSU rDNA sequences confirm its placement in Helotiales and support a close relationship with other genera in Hyaloscyphaceae (Réblová & Gams, 2011; Réblová et al., 2016). The genus was originally monotypic, containing only *I. microchona*, but was later expanded to include

I. minuta from pine needle litter in the Czech Republic (Réblová et al., 2014), indicating a broader ecological amplitude within temperate forests. Further collections and multi-locus phylogenies are required to clarify species boundaries and assess hidden diversity in the genus. Type – The Netherlands, on decaying wood of *Betula*, coll. W. Gams, CBS H-20547 (holotype).

Infundichalara microchona (W. Gams) Réblová & W. Gams, in Réblová, Gams & Štěpánek, Fungal Diversity 46('1'): 80 (2011) Figure 3.100

Index Fungorum number: IF518973; Facesoffungi number: FoF 18410

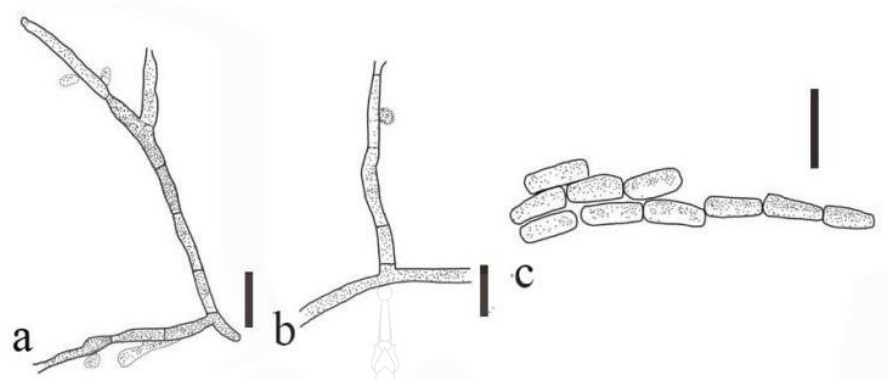
Description – Réblová and Gams (2011).

Material considered – Réblová and Gams (2011).

Distribution, ecological and economical importance

Species within this genus are saprobic, playing a crucial role in decomposing organic matter, particularly decaying wood and plant debris. This decomposition process recycles nutrients back into the ecosystem, supporting plant growth and maintaining soil health (Réblová & Gams, 2014).

The genus *Infundichalara* was initially monotypic, with *Infundichalara microchona* as the sole species. However, subsequent studies have expanded the genus to include additional species. For instance, *Infundichalara minuta* was described from pine needle litter in the Czech Republic, highlighting the genus's presence in European temperate forests. These fungi have been found on decaying wood of various tree species, including conifers like pine (*Pinus* spp.) and deciduous trees such as oak (*Quercus* spp.) and beech (*Fagus sylvatica*). Their distribution includes regions like the Netherlands and the Czech Republic.



Source Redrawn from Réblová and Gams (2011)

Note a, b Conidiophores and conidiogenous cells. c Conidia. Scale bars: a, b = 10 μm, c = 20 μm.

Figure 3.100 *Infundichalara microchona*

Psilachnum Höhn., in Weese, Mitt. bot. Inst. tech. Hochsch. Wien 3(2): 73 (1926)

Index Fungorum number: IF4505; Facesoffungi number: FoF 18411, 32 morphological species (Species Fungorum, 2025), 4 species with molecular data.

Saprobic on decaying plant material, such as wood, leaves, or stems. Sexual morph: see Höhnel (1926), Han et al. (2009). Asexual morph: Unknown.

Type species – *Psilachnum lateritioalbum* (P. Karst.) Höhn.

Notes – *Psilachnum* is a small genus in Hyaloscyphaceae, characterised by small, cupulate apothecia with whitish to pale yellow receptacles and discs, often clothed in white hairs; cylindric, smooth-walled hairs; cylindric to narrowly lanceolate paraphyses; and ellipsoid to fusoid, hyaline, aseptate ascospores with polar guttules (Höhnel, 1926; Han et al., 2009). They are morphologically similar to *Lachnum* but differ by having smooth-walled hairs rather than ornamented ones.

Species occur on various substrates including dead leaves, herbaceous stems, pteridophyte fronds, and woody material (Han et al., 2009). Most species are reported from temperate regions, and some show host specificity, e.g., *P. staphyleae* occurs only on leaves of *Staphylea bumalda* (Han et al., 2009). Molecular data place *Psilachnum* within Hyaloscyphaceae (Helotiales). Available sequence data include ITS and LSU, which have been used for phylogenetic analyses and species delimitation. The holotype of *P. staphyleae* is deposited in KUS-F50507 (Han et al., 2009).

Psilachnum lateritioalbum (P. Karst.) Höhn., in Weese, Mitt. bot. Inst. tech. Hochsch. Wien 3(2): 73 (1926) Figure 3.101

Index Fungorum number: IF269052; Facesoffungi number: FoF 18412

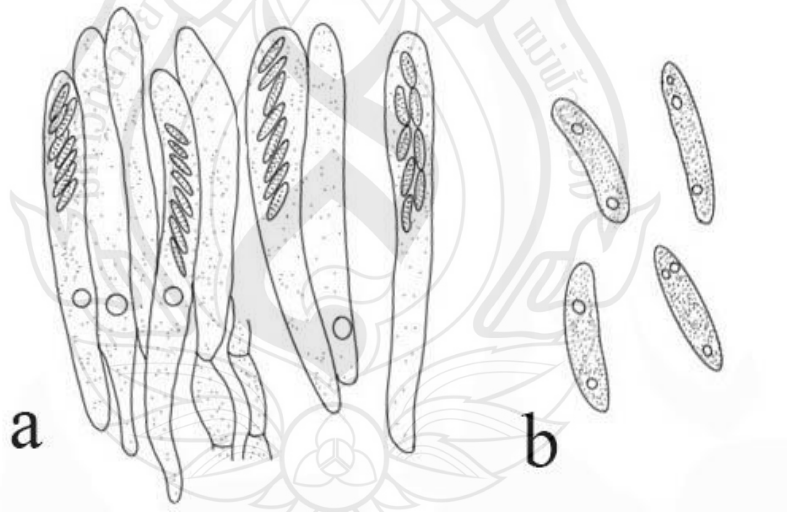
Description – See Höhnel (1926).

Material considered – See Höhnel (1926).

Distribution, ecological and economical importance

Psilachnum species function as saprotrophs, decomposing organic matter, particularly fallen leaves, dead stems, and woody debris. By breaking down lignocellulosic material, they contribute to nutrient cycling and energy flow in forest ecosystems.

They are widely distributed in temperate zones. Examples include *P. chrysostigmum* in British Columbia, Canada, and *P. inquilinum* in Manitoba, Canada (Han et al., 2009), while *P. staphyleae* is known from Korea, occurring specifically on *Staphylea bumalda* leaves (Han et al., 2009). Their distribution pattern suggests adaptation to cooler climates and forested habitats.



Source Redrawn from Centro de Estudios Micológicos Asturianos (2018)

Note a Asci. b Ascospores. Scale bars: Original photos no bars

Figure 3.101 *Psilachnum lateritioalbum*

Stipitochalara W.P. Wu & Y.Z. Diao, Fungal Diversity 119: 447 (2023)

Index Fungorum number: IF845259; Facesoffungi number: FoF 18413, 2 morphological species (Species Fungorum, 2025), 2 species with molecular data.

Saptobic on plant litter in both terrestrial and submerged environments. Sexual morph: Unknown. Asexual morph: see Wu and Diao (2023).

Type species – *Stipitochalara longipes* (Preuss) W.P. Wu & Y.Z. Diao

Notes – *Stipitochalara* is a genus of chalara-like anamorphic fungi within the Leotiomycetes, characterised by phialidic conidiogenous cells with cylindrical collarettes and deeply seated sporulating loci. Conidia are hyaline, aseptate or septate, cylindrical, and produced in slimy heads or chains. Colonies are typically found on plant litter in both terrestrial and aquatic environments, indicating ecological adaptability. Phylogenetic analyses (Wu & Diao, 2023) placed *Stipitochalara* within the family Hamatocanthoscyphaceae. However, the taxonomy of chalara-like hyphomycetes remains complex, and additional collections coupled with molecular data are required to clarify interspecific relationships. Molecular markers such as SSU, LSU, and ITS are available for phylogenetic placement and species identification. The type specimen (*Stipitochalara longipes*) is based on *Cylindrosporium longipes* Preuss (1851) collected on decaying plant material in Europe and deposited in B.

Stipitochalara longipes (Preuss) W.P. Wu & Y.Z. Diao, Fungal Diversity 119: 447 (2023) Figure 3.102

≡ *Cylindrosporium longipes* Preuss, *Linnaea* **24**: 147 (1851)

≡ *Chalara longipes* (Preuss) Cooke.

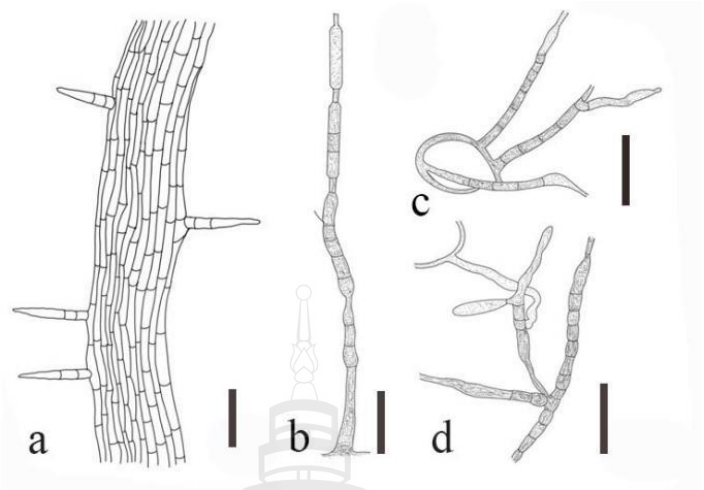
Index Fungorum number: IF845294; Facesoffungi number: FoF 18414

Description – see Wu and Diao (2023).

Material considered – see Wu and Diao (2023).

Distribution, ecological and economical importance

Species of *Stipitochalara* are saprobic, decomposing a wide range of plant-derived substrates, including leaves, branches, stems, bark, wood, and fruits. They contribute to nutrient cycling and energy flow in both terrestrial and freshwater ecosystems. *S. longipes* has been reported from diverse habitats, including submerged wood, forest litter, and decaying herbaceous stems, across temperate and subtropical regions (Wu & Diao, 2023; Koukol, 2011).



Source Redrawn from Koukol (2011)

Note a Multihyphal structures with phialides. b Conidiophore proliferating predominantly percurrently. c Conidiophore proliferating predominantly sympodially. d Predominantly barnche nonproliferatig conidiophore. Scale bars: a–d = 20 μm.

Figure 3.102 *Stipitochalara longipes*

Xenochalara M.J. Wingf. & Crous, S. Afr. J. Bot. 66(2): 101 (2000)

Index Fungorum number: IF28446; Facesoffungi number: FoF 18416, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on decaying needles of *Juniperus communis*. Sexual morph: Unknown. Asexual morph: see Coetsee et al. (2000).

Type species – *Xenochalara juniperi* M.J. Wingf. & Crous

Notes – *Xenochalara* is a chalara-like anamorphic genus in the class Leotiomycetes. Members exhibit phialidic conidiogenesis, producing cylindrical collarettes and deeply seated sporulating loci. Conidia are hyaline, aseptate, cylindrical, and smooth-walled. Molecular phylogenetic studies place *Xenochalara* in the family Dermateaceae. However, the genus is currently monotypic, and additional collections are needed to clarify its phylogenetic relationships and species diversity. Commonly used molecular markers for *Xenochalara* include the internal transcribed spacer (ITS) and large subunit (LSU) rDNA regions, which aid in species identification and phylogenetic inference.

Type specimen – *Xenochalara juniperi* M.J. Wingf. & Crous. Canada, Ontario, on *Juniperus virginiana* needles, coll. Crous, deposited in DAOM 196426.

Xenochalara juniperi M.J. Wingf. & Crous, in Coetsee, Wingfield, Crous & Wingfield, S. Afr. J. Bot. 66(2): 102 (2000) Figure 3.103

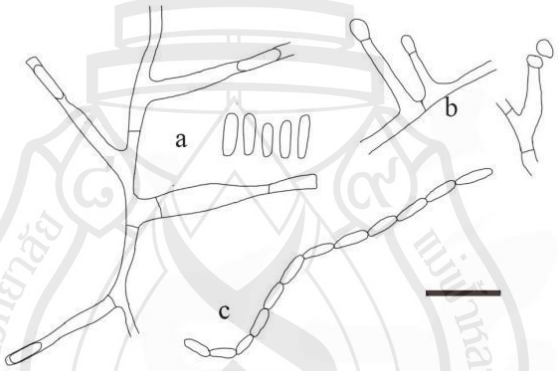
Index Fungorum number: IF464385; Facesoffungi number: FoF 18415

Description – see Coetsee et al. (2000).

Material considered – see Coetsee et al. (2000).

Distribution, ecological and economical importance

Species of *Xenochalara* are saprobic, decomposing plant litter such as needles, leaves, stems, bark, and wood, thus contributing to nutrient cycling in terrestrial ecosystems. The type species has been reported from Canada on *Juniperus virginiana*, and the genus is likely underreported due to its inconspicuous morphology and limited targeted sampling. Broader geographic surveys may reveal a wider distribution.



Source Redrawn from Coetsee et al. (2021)

Note a Conidiophores and conidia. b Phialophora-like synanamorph. c *Sporothrix* synanamorph with catenulate conidia. Scale bars: a–c = 10 µm.

Figure 3.103 *Xenochalara juniperi* and its *Sporothrix* synanamorph

Xenopolyscytalum Crous, Persoonia 25: 131 (2010)

Index Fungorum number: IF517533; Facesoffungi number: FoF 18417, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on plant material, particularly pine needles (*Pinus* spp.). Sexual morph: Unknown. Asexual morph: see Crous and Groenewald (2010).

Type species – *Xenopolyscytalum* pinea Crous

Notes – *Xenopolyscytalum* is characterised by by chalara-like anamorphic fungi within the order Helotiales, found on pine needles (*Pinus* spp.). The fungal colonies

appear as white tufts on the surface of the substrate, producing dimorphic conidiophores. The penicillate conidiophores are erect, brown, and septate, forming branched chains of hyaline, smooth, aseptate conidia. The chalara-like conidiophores are cylindrical, unbranched, and brown, with terminal conidiogenous cells bearing flaring collarettes. The conidia are subcylindrical to narrowly ellipsoid, hyaline, and smooth, with slightly darkened hilum. Molecular studies have placed *Xenopolyscytalum* within Helotiales, distinct from *Polyscytalum*. More taxa and collections are needed to further understand the phylogenetic placement and diversity of *Xenopolyscytalum*. Molecular markers available for *Xenopolyscytalum* include ITS and LSU, which are commonly used for phylogenetic analysis and species identification. Holotype PRM899344, collected from fallen needles of *Pinus sylvestris* in Bohemian Switzerland National Park, Czech Republic, at 450 m elevation, by O. Koukol on 11 December 2006; living culture CCF4156.

Xenopolyscytalum pinea Crous [as 'pinae'], Persoonia 25: 131 (2010) Figure 3.104

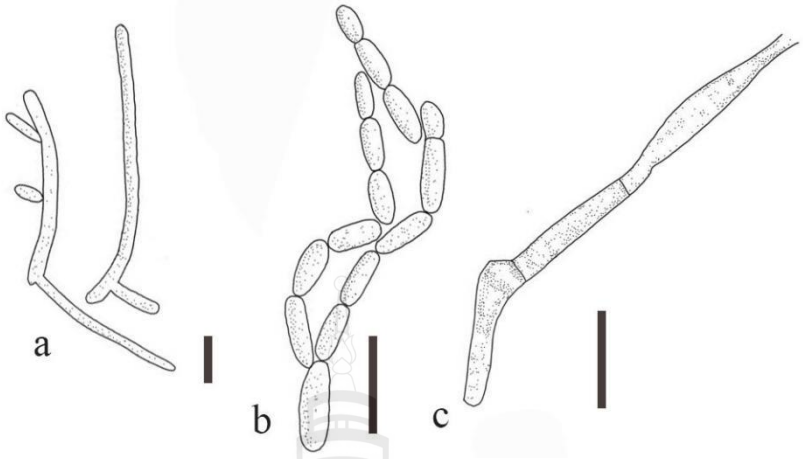
Index Fungorum number: IF517534; Facesoffungi number: FoF 18418

Description – Crous and Groenewald (2010).

Material considered – Crous and Groenewald (2010).

Distribution, ecological and economical importance

Xenopolyscytalum species are saprobic fungi involved in the decomposition of coniferous litter, particularly pine needles, contributing to nutrient cycling in forest ecosystems. The dimorphic conidiogenesis (penicillate and chalara-like morphs) may enhance dispersal and persistence in litter habitats. *X. pinea* has been reported from pine forests in the Netherlands, Czech Republic, Austria, and Russia (Crous & Groenewald, 2010; Koukol, 2012), suggesting an ecological adaptation to coniferous litter decomposition in temperate regions. Further surveys are needed to clarify its geographic range and ecological impact.



Source Redrawn from Crous and Groenewald (2010)

Note a Conidiophores. b Conidial chains. c *Chalara*-like synanamorph. Scale bars: a–c = 10 μm.

Figure 3.104 *Xenopolyscytalum pinea*

Helotiaceae Rehm [as 'Helotieae'], Rabenh. Krypt.-Fl., Edn 2 (Leipzig) 1.3(lief. 37): 647 (1892) [1896]

Index Fungorum number: IF80845; Facesoffungi number: FoF05896

Helotiaceae was established by Whetzel (1945) with *Helotium* Pers. as the type genus. Members of the family are morphologically diverse, typically forming discoid to cupulate apothecia, sessile to short-stipitate, often translucent to brightly pigmented (yellow, orange, red, or brown). The ectal excipulum is usually composed of *textura prismatica*, *textura angularis* or *textura globulosa*, while the medullary excipulum consists of *textura intricata* or loosely arranged hyphae (Baral et al., 2009). Marginal hairs, when present, may be smooth or ornamented, hyaline to brown, thick- or thin-walled, and are sometimes taxonomically diagnostic. Asci are cylindric-clavate, eight-spored, inoperculate, typically arising from croziers and bearing amyloid or hemi-amyloid apical rings. Ascospores are hyaline, ellipsoid to fusiform, mostly aseptate, rarely septate, smooth-walled, sometimes with mucilaginous sheaths or polar caps. Paraphyses are filiform, occasionally branched, often slightly swollen or pigmented apically.

Ecologically, species of Helotiaceae are predominantly saprobic, colonising dead leaves, branches, bark, bamboo culms, mosses, and forest litter, but several taxa

are fungicolous (e.g. bryophilous species on mosses: Gross, 2014), lichenicolous (Calatayud, 2002), or weakly plant-associated as endophytes or pathogens (e.g. *Chlorencoelia*, *Phaeohelotium*). They play an important role in decomposition and nutrient cycling across temperate to tropical ecosystems, and some species inhabit aquatic or aero-aquatic environments, such as *Mitrula* (Wang et al., 2005).

Molecular phylogenetic analyses using ITS, LSU, SSU, mtSSU, *RPB2*, and *TEF1-α* show that Helotiaceae, as traditionally circumscribed, is polyphyletic, and the family requires redefinition (Wang et al., 2006; Baral et al., 2009; Zhuang, 2016). Multigene studies confirm the placement of genera such as *Ascocoryne*, *Bisporella*, *Calycina*, *Dicephalospora*, and *Mollisia* within Helotiaceae, while others formerly included have been excluded. More than 60 genera are currently accommodated, making Helotiaceae one of the largest and most taxonomically challenging families in Helotiales (Phutthacharoen et al., 2022).

Several taxa have been shown to produce bioactive metabolites, e.g. *Dicephalospora rufocornea*, which yields dicephalosterol, a 5α-reductase inhibitor of pharmacological interest (Phutthacharoen et al., 2022). The type genus *Helotium* Pers., with *H. fulvum* as the type species, was originally described from Europe, and remains the nomenclatural foundation of the family.

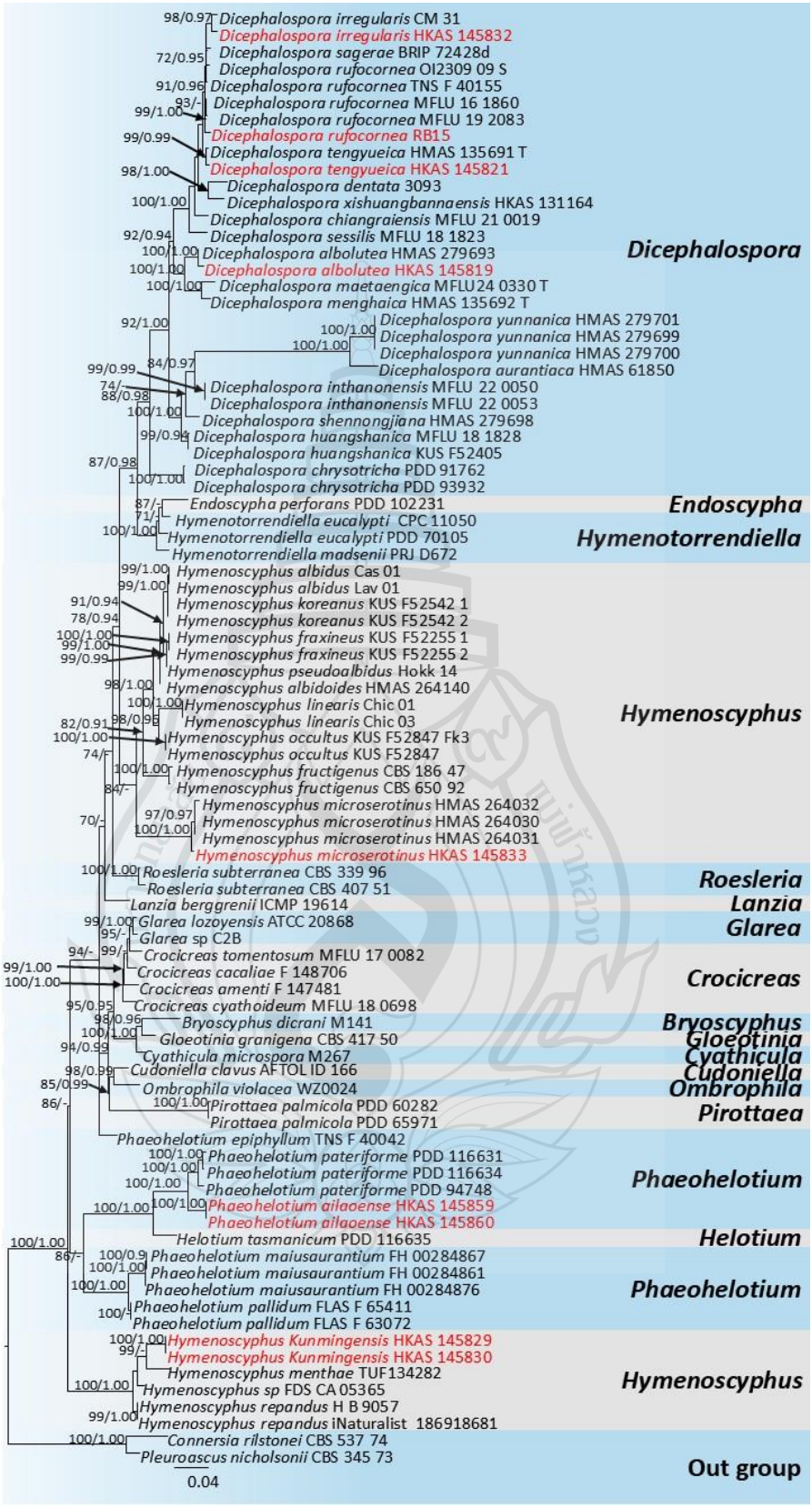


Figure 3.105 Maximum likelihood tree based on the combined ITS and LSU dataset of Helotiaceae

Figure 3.105 Bootstrap support values (MLBP ≥ 70%) and Bayesian posterior probabilities (BPP ≥ 0.90) are shown at nodes as MLBP/BPP

Dicephalospora Spooner, Biblthca Mycol. 116: 267 (1987)

Index Fungorum number: IF25098; Facesoffungi number: FoF 18841, 22 morphological species (Species Fungorum, 2025), 17 species with molecular data.

Saprobic on plant material, including fallen leaves, twigs, bark, and woody debris, particularly in humid forest habitats. Sexual morph: see Zhuang (2016), Phutthacharoen et al. (2022). Asexual morph: Unknown.

Type species – *Dicephalospora calochroa* (Syd. & P. Syd.) Spooner

Notes – *Dicephalospora* is characterised by small to medium-sized, brightly coloured apothecial fungi within the family Helotiaceae, order Helotiales, usually occurring on decaying leaves, twigs, bark, or herbaceous stems. Apothecia are discoid to cupulate, sessile to shortly stipitate, with yellow, orange, red, or sometimes darkened discs. The ectal excipulum consists of *textura prismatica* to *globulosa*, while the medullary excipulum is formed of *textura intricata*. Asci are cylindric to filiform, eight-spored, arising from croziers, with an amyloid apical apparatus. Paraphyses are filiform, straight to slightly curved, sometimes branched or apically swollen. Ascospores are hyaline, ellipsoid to fusoid or clavate, smooth, aseptate or with up to seven septa, guttulate, occasionally with mucilaginous caps at the poles.

Species of *Dicephalospora* are saprobic on forest litter and woody debris, especially in humid habitats. The genus shows a broad distribution but is particularly diverse in Asia, with numerous species described from China, Japan, and Thailand; additional taxa are known from Australasia and Europe (Zhuang, 2016; Phutthacharoen et al., 2022; Luo et al., 2025).

Molecular studies (ITS, LSU, *RPB2*, *TEF1-α*) have confirmed *Dicephalospora* as a monophyletic lineage within Helotiaceae, though its morphological heterogeneity indicates further revision is required. Recent analyses placed the genus close to *Endoscypha* and *Hymenotorrendiella* with high support (Luo et al., 2025). Secondary metabolites such as dicephalosterol, a 5α-reductase inhibitor, have been reported from *D. rufocornea*.

Holotype of the type species *D. calochroa* was collected from Papua New Guinea and China, and is preserved in IMI (Herbarium of CABI Bioscience, UK).

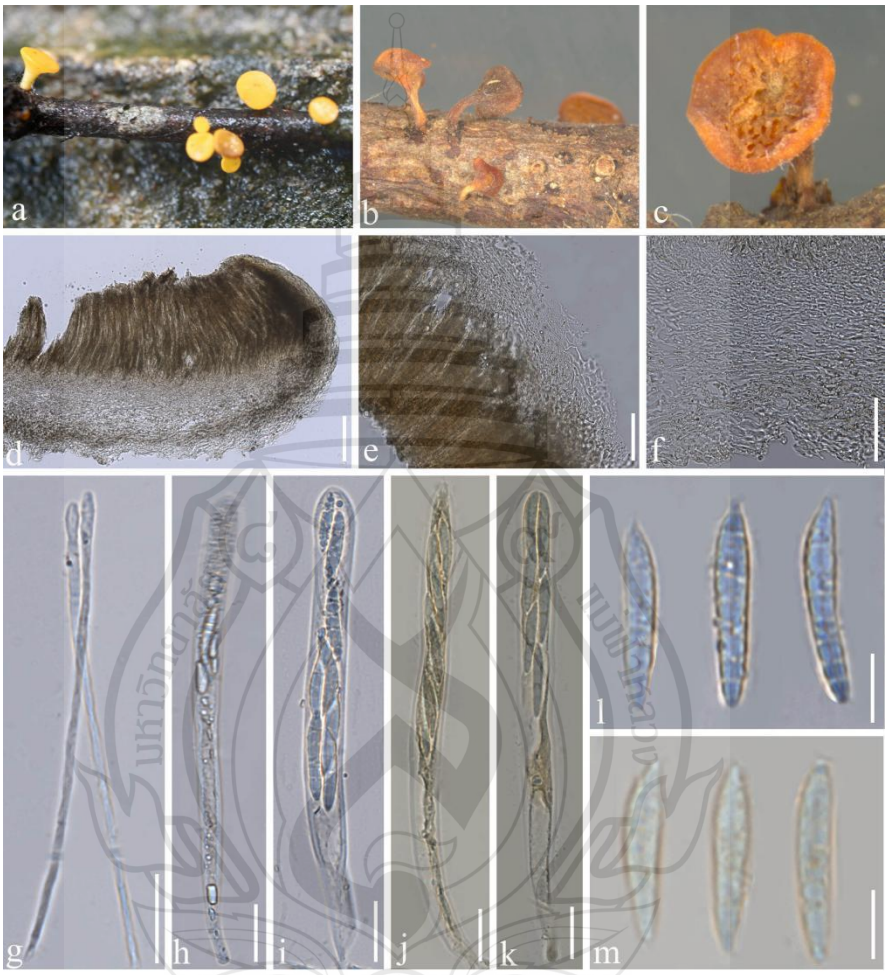
Dicephalospora irregularis Lestari, Pasouvang & K.D. Hyde, in Phutthacharoen, Chethana, Lestari, Stadler & Hyde, Diversity 14(no. 645): 13 (2022) Index Fungorum: IF555157, Facesoffungi Number: FoF11034, Figure 3.106

Description. Saprobic on decayed woody barks. Apothecia superficial, scattered to gregarious, 1.1–2.8 mm diam., 1.0–2.5 mm high when dry, discoid to cupulate, stipitate. Disc concave, smooth, yellowish when fresh, yellowish-orange when dry; margin slightly incurved, concolorous with receptacle. Receptacle wider than stipe, yellowish when fresh, dark orange when dry, glabrous. Stipe 0.2–0.6 mm diam., 0.9–1.8 mm long when dry, orange to dark orange. Hymenium 145–232 µm thick ($\bar{x}$ = 186 µm, n = 42), concave, smooth, yellowish when fresh, minutely roughened, yellow to dark orange when dry. Ectal excipulum 31–102 µm thick ($\bar{x}$ = 66 µm, n = 31), of thin-walled, hyaline cells of *textura globulosa* to *textura prismatica*, 2.3–6.7 µm diam. ($\bar{x}$ = 4.4 µm, n = 60). Medullary excipulum 59–119 µm thick ($\bar{x}$ = 83 µm, n = 31), of thin-walled, hyaline cells of *textura oblita* to *textura intricata*, 3.3–6.0 µm diam. ($\bar{x}$ = 4.5 µm, n = 60), non-gelatinous. Paraphyses 71–143 × 1.8–2.9 µm ($\bar{x}$ = 98 × 2.3 µm, n = 25), filiform, straight to slightly curved, aseptate, hyaline, smooth, with slightly obtuse apices. Asci 83.2–179.3 × 10.0–13.8 µm ($\bar{x}$ = 140.3 × 11.5 µm, n = 50), 8-spored, clavate, straight to slightly curved, inoperculate, hyaline, thin-walled at apex, J− in Melzer's reagent, with a tapering, long stipitate base. Ascospores (85/7/2) (18.8–)21.1–27.4(–27.9) × 3.5–5.6(–5.9) µm ($\bar{x}$ = 24.2 × 4.5 µm, n = 55), partly biseriate, fusoid-clavate, tapering to obtuse ends, with one end rounded and the other blunt, hyaline, septate, thin-walled, smooth, multi-guttulate. **Asexual morph:** Not observed.

Material examined. China, Yunnan Province, Xishuangbanna, altitude 499 m, on decayed unidentified twigs, 1 September 2022, Le Luo, (Ly29) (HKAS 145832).

Notes. Phylogenetic analyses place our collection Ly29 (HKAS 145832) with *D. irregularis* (strain CM 31) with strong statistical support (Figure 3.198). Morphological features, including stipitate, discoid to cupulate apothecia, yellowish to dark orange receptacle, clavate asci, and fusoid-clavate, multi-guttulate ascospores, agree well with the type description (Phutthacharoen et al., 2022). Minor differences were noted: our collection has slightly smaller ascospores (21.1–27.4 × 3.5–5.6 µm vs. 23.7–28.6 × 4.2–6.2 µm) and somewhat shorter asci (140.3 × 10.0–13.8 µm vs. 144–187 × 11–14 µm). These variations are considered within the intraspecific range. This

is the first record of *D. irregularis* from China. Previously, the species was only known from northern Thailand (Chiang Mai, type locality), suggesting a wider distribution in tropical and subtropical Asia. The ecological separation (China vs. Thailand) and altitudinal differences (499 m vs. 1180 m) indicate broader ecological tolerance than previously recognized.



Note a-c Apothecia on the host. d, e Cross section of an apothecium. f Excipular cells. g Paraphyses. h-k Asci (j, k mounted in Melzer's agent). l, m Ascospores. Scale bar: d = 100 µm; e, f = 50 µm; g–k = 20 µm; l, m = 10 µm.

Figure 3.106 *Dicephalospora irregularis* (HKAS 145832)

Dicephalospora rufocornea (Berk. & Broome) Spooner, Biblthca Mycol. 116: 272 (1987)

Index Fungorum: IF130937, Facesoffungi Number: FoF05900. Figure 3.107

Description. Saprobic on decayed woody twigs. Sexual morph: Apothecia superficial, partly gregarious, 1.4−2.4 mm in diameter, 0.8−1.8 mm high when dry, discoid to cupulate, stipitate. Disc concave, surface slightly rough, yellowish to orange when fresh, orange to dark orange when dry; margin entire, center slightly raised, orange-brown. Receptacle wider than the stipe, yellowish when fresh, orange-brown when dry, glabrous. Stipe 0.2−0.4 mm in diameter, 0.7−1.4 mm long, yellowish-white when fresh, orange when dry. Hymenium 130–188 µm ($\bar{x}$ = 155 µm, n = 42), gently convex, yellowish-orange in fresh, yellowish-brown when dry. Ectal excipulum 30–83 µm ($\bar{x}$ = 51 µm, n = 31) thick, of hyaline *textura porrecta* to *textura prismatica*, cells 1.2–3.5 µm ($\bar{x}$ = 2.6 µm, n = 60) diam. Medullary excipulum 55–115 µm ($\bar{x}$ = 83 µm, n = 31) thick, of hyaline *textura globulosa* to *textura intricata*, cells 2.1–3.7 µm ($\bar{x}$ = 2.8 µm, n = 60) diam., gelatinous. Paraphyses 90–130 × 1.3–2.8 µm ($\bar{x}$ = 112 × 2.1 µm, n = 25), filiform, straight to slightly curved, aseptate, hyaline, smooth, with slightly obtuse apex. Asci 112.3–164.3 × 6.2–10.3 µm ($\bar{x}$ = 130.4 × 8.2 µm, n = 50), 8-spored, clavate, straight to slightly curved, inoperculate, hyaline, J– in MLZ, with long tapering stipitate base. Ascospores (85/7/2) (14.6–)15.0–28.7(–30.5) × 2.5–5.1(–5.7) µm ($\bar{x}$ = 19.2 × 3.8 µm, n = 55), partly biseriate, hyaline, fusoid-clavate, tapering to blunt ends, aseptate, thin-walled, smooth, multi-guttulate. Asexual morph: Not observed.

Material examined. The Mushroom Research Foundation, 1Ban Pha Deng, T.Papae, MaeTaeng, Chiang Mai, Thailand, altitude 863 m, on the decayed unidentified twigs, 18 August 2023, Le Luo, RB15 (MFLU 25-0382).

Notes. Our collection RB15 (MFLU 25-0382) grouped with reference strains of *Dicephalospora rufocornea* (MFLU 19-2083) with strong statistical support (Figure 3.198), confirming its conspecific status. RB15 differs slightly in morphology: apothecia are somewhat larger (1.4–2.4 mm vs. 0.5–1.5 mm), asci are longer (mean 130.4 µm vs. 125–150 µm), and ascospores are broader (mean 3.8 µm vs. 2.5–3 µm). These variations remain within the species' known range. Phylogenetic analyses show *Dicephalospora rufocornea* is distinct from *Pezicula cinnamomea* (5.7% ITS, 1.1% LSU differences). Ecologically, RB15 was collected at mid-elevation (863 m) in northern Thailand, whereas most previous records from Yunnan, China were from lower-altitude subtropical forests. This suggests that D. rufocornea has a wider ecological amplitude than previously recognized. Therefore, we identify our collection

as *Dicephalospora rufocornea* and regard it as a new collection record for northern Thailand.



Note a-c Apothecia on the host. d Cross section of an apothecium. e Excipular cells. f Paraphyses. g Paraphyses and Asci. h-k Asci (j, k mounted in Meltzer agent). l, m Ascospores. Scale bar: d = 100 µm; e–k = 20 µm; l,m = 10 µm.

Figure 3.107 *Dicephalospora rufocornea* (MFLU 25-0382)

Dicephalospora tengyueica L. Luo & K.D. Hyde, in Luo, Chethana, Zhao, Thiyagaraja, Khongphinitbunjong, Al-Otibi & Hyde, MycoKeys 115: 72 (2025)

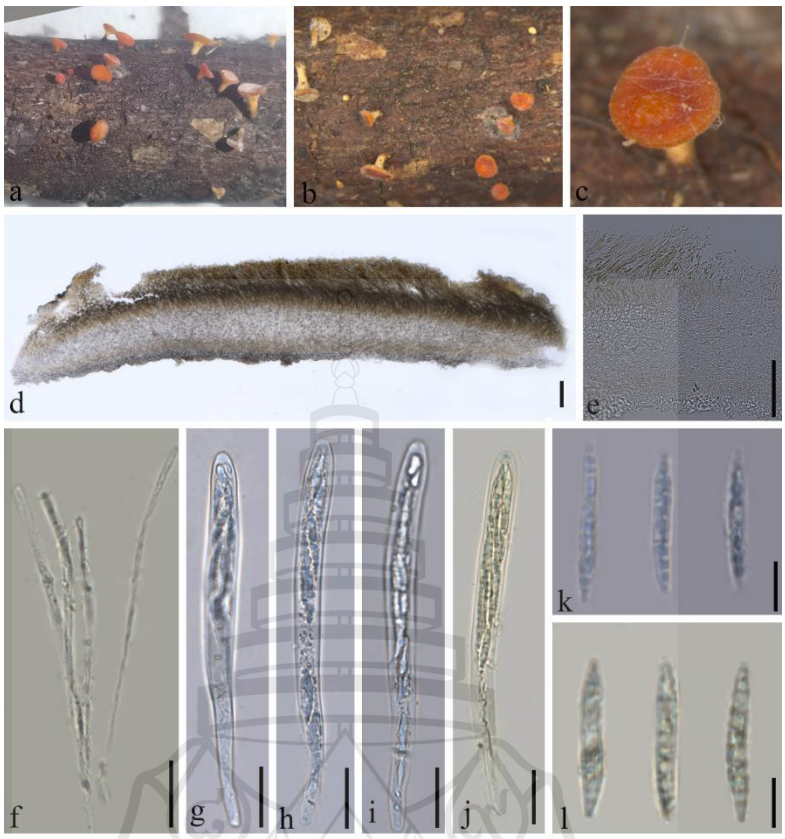
Index Fungorum: IF902889, Facesoffungi Number: FoF16773, Figure 3.108

Description. Saprobic on decayed wood bark. Sexual morph: Apothecia superficial, partly gregarious, 0.7–5.5 mm in diameter, 0.8–3.3 mm high when dry, discoid to cupulate, stipitate. Disc concave, surface smooth, orange to light brown when dry. Margin slightly incurved, light brown. Receptacle wider than stipe, yellowish-white when dry, glabrous. Stipe 0.7–2.6 mm in diameter, 0.3–0.8 mm long, yellowish-white. Hymenium 110–192 µm ($\bar{x}$ = 157 µm, n = 42) thick, orange to light brown when

dry. Ectal excipulum 35–64 µm ($\bar{x}$ = 51 µm, n = 31) thick, of thin-walled, hyaline cells, *textura angularis* to *textura intricata*, 2.6–6.8 µm ($\bar{x}$ = 4.6 µm, n = 60) in diameter. Medullary excipulum 90–156 µm ($\bar{x}$ = 117 µm, n = 31) thick, of hyaline, thin-walled cells, *textura porrecta* to *textura intricata*, 2.6–5.5 µm ($\bar{x}$ = 3.8 µm, n = 60) in diameter, non-gelatinous. Paraphyses 80–142 × 1.0–2.8 µm ($\bar{x}$ = 112 × 2.0 µm, n = 25), filiform, straight to slightly curved, aseptate, hyaline, smooth, with slightly obtuse apex. Asci 81.9–138.6 × 6.2–11.6 µm ($\bar{x}$ = 120 × 9.5 µm, n = 50), 8-spored, clavate, straight to slightly curved, inoperculate, hyaline, with thickened apex, J+ in Melzer's reagent, with tapering, long stipitate base. Ascospores (85/7/2) (17.8–)18.5–27.1(–28.1) × 1.9–3.2(–4.0) µm ($\bar{x}$ = 22.3 × 2.8 µm, n = 55), biseriate, hyaline, fusoid-clavate with pointed ends, thin-walled, smooth, aseptate, multi-guttulate. Asexual morph: Not observed.

Material examined. China, Yunnan Province, Tengchong City, altitude 1774 m, on decayed wood, 18 August 2022, Le Luo, **Ly256** (HKAS 145821).

Notes. According to phylogenetic analyses (Figure 3.105), our collection Ly256 (HKAS 145821) clustered with the type strain of *Dicephalospora tengyueica* (HKAS 135691) with high statistical support, confirming its conspecific identity. Morphologically, Ly256 is consistent with the type in diagnostic features, including discoid to cupulate apothecia, clavate asci, and fusoid-clavate, multi-guttulate, aseptate ascospores. Minor differences were observed in apothecial size (0.7–5.5 mm vs. 1.2–3.2 mm in type), thickness of the medullary excipulum (90–156 µm vs. 21–48 µm), and spore width ($\bar{x}$ = 2.8 µm vs. 2.9 µm), which are considered intraspecific variation. Both the holotype and the present collection were obtained from decaying wood in Tengchong, Yunnan Province, at elevations around 1750 m, suggesting that *D. tengyueica* may be restricted to high-altitude subtropical forests in this region. No asexual morph has been observed in any material examined. The present specimen therefore represents an additional collection from the type locality, providing further evidence for the morphological stability and ecological preference of this species.



Note a-c Apothecia on the host. d Cross section of an apothecium. **e** Excipular cells. f Paraphyses. g-j Asci (j mounted in Meltzer agent). k, l Ascospores. Scale bar: d, e = 100 µm; f–j = 20 µm; k, l = 10 µm.

Figure 3.108 *Dicephalospora tengyueica* (HKAS 145821)

Dicephalospora albolutea H.D. Zheng & W.Y. Zhuang, MycoKeys 55: 90 (2019)

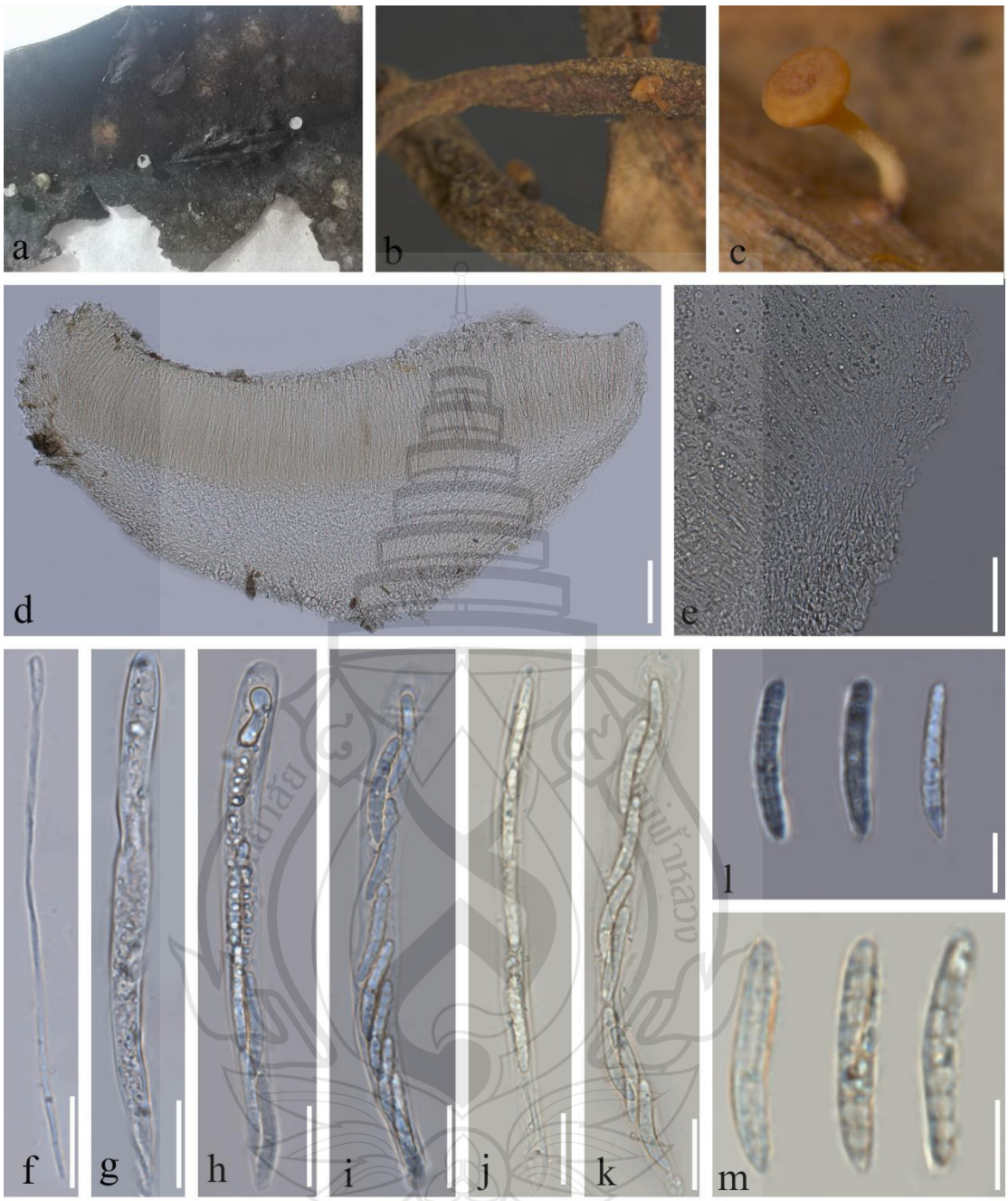
Index Fungorum: IF570602, Facesoffungi Number: FoF 18893, Figure 3.109

Description. Saprobic on decayed leaves. Sexual morph: Apothecia superficial, scattered or sublinearly arranged along the veins of fallen leaves, 0.4−0.8 mm in diameter, 0.8−1.1 mm high when dry, discoid to cupulate, long-stipitate. Disc concave, surface smooth, white when fresh, light brown when dry. Margin slightly incurved, concolorous with receptacle. Receptacle wider than stipe, white when fresh, brown when dry, glabrous. Stipe 0.1−0.2 mm in diameter, 0.6−0.8 mm long, yellowish to pale brown. Hymenium 125–206 µm ($\bar{x}$ = 163 µm, n = 42) thick, concave, white in fresh and orange to brown in dry. Ectal excipulum 18–43 µm ($\bar{x}$ = 28 µm, n = 31) thick,

composed of thin-walled, smooth, hyaline cells of textura globulosa to textura porrecta, 1.9–5.2 µm ($\bar{x}$ = 3.2 µm, n = 60) in diameter. Medullary excipulum 27–71 µm ($\bar{x}$ = 49 µm, n = 31) thick, of hyaline, thin-walled cells of textura porrecta to textura oblita, 1.4–3.4 µm ($\bar{x}$ = 2.4 µm, n = 60) in diameter, non-gelatinous. Paraphyses 107–143 × 1.4–3.4 µm ($\bar{x}$ = 125 × 2.2 µm, n = 25), filiform, straight to slightly curved, aseptate, hyaline, smooth, with slightly obtuse apex. Asci 105.8–137.7 × 6.9–12.6 µm ($\bar{x}$ = 128.8 × 9.5 µm, n = 50), 8-spored, clavate, straight to slightly curved, inoperculate, hyaline, with thickened apex wall, J+ in MLZ, with tapering, short-stipitate or sessile base. Ascospores (85/7/2) (20.5–)22.9–27.9(–28.4) × 2.5–3.8(–4.1) µm ($\bar{x}$ = 25.1 × 3.5 µm, n = 55), partly biseriate, hyaline, sausage-shaped to subfusoid, thin-walled, smooth, aseptate, multiguttulate. Asexual morph: Not observed.

Material examined. China, Yunnan Province, Tengchong City, altitude 1774 m, on decayed leaves, 18 August 2022, Le Luo, **Ly268** (HKAS 145819).

Notes. Phylogenetic analyses (Figure 3.198) place Ly268 (HKAS 145819) with the type strain of *Dicephalospora albolutea* (HKAS 279693) with strong statistical support, confirming their conspecificity. *D. albolutea* is characterized by cream to yellowish-white apothecia and sausage- to subfusoid, multiguttulate ascospores, which are partly biseriate. Compared with the type specimen, Ly268 shows slightly smaller apothecia (0.4–0.8 mm vs. 1–2.5 mm diam.) and somewhat narrower, more clavate ascospores ($\bar{x}$ = 25.1 × 3.5 µm vs. 26–31 × 3.8–5.0 µm). The asci and paraphyses are similar, while the ectal and medullary excipula are thinner and composed of smaller cells. Ecologically, Ly268 was collected from decayed leaves in Tengchong at lower altitude (1774 m), while the type was reported from 2500 m, indicating potential ecological or geographical variation. These differences are considered intraspecific, and Ly268 is therefore treated as an additional collection of *D. albolutea*.



Note a-c Apothecia on the host. d Cross section of an apothecium. e Excipular cells. f Paraphyses. g-k Asci (j, k mounted in Meltzer agent). l, m Ascospores. Scale bar: d = 100 µm; e = 50 µm; f–k = 20 µm; l, m = 10 µm.

Figure 3.109 *Dicephalospora albolutea* (HKAS 145819)

Hymenoscyphus Gray, Nat. Arr. Brit. Pl. (London) 1: 673 (1821)

Index Fungorum number: IF2418; Facesoffungi number: FoF 18842, 239 morphological species (Species Fungorum, 2025), 74 species with molecular data.

Saprobic on plant material, including fallen leaves, petioles, twigs, bark, and other woody debris. Sexual morph: Zhang and Zhuang (2004); Baral and Bemmann (2014). Asexual morph: see Crous and Groenewald (2010).

Type species – *Hymenoscyphus fructigenus* (Bull.) Gray

Notes – *Hymenoscyphus* is characterised by apothecial fungi within the family Helotiaceae, order Helotiales, commonly occurring on fallen leaves, petioles, twigs, bark, and other plant debris. The apothecia are small, cupulate to discoid, sessile or shortly stipitate, with whitish, pale yellow, or brownish discs. The ectal excipulum is usually composed of *textura prismatica* to *textura angularis*, while the medullary excipulum consists of *textura intricata*. Asci are cylindric-clavate, eight-spored, with an amyloid apical ring, arising from croziers. Ascospores are hyaline, ellipsoid to fusoid or scutuloid, aseptate or occasionally septate, smooth-walled, often guttulate. Paraphyses are filiform, septate, sometimes branched or apically swollen.

Species of *Hymenoscyphus* are mostly saprobic on forest litter, but some are ecologically significant as pathogens. *H. fraxineus* (anamorph *Chalara fraxinea*) is the causal agent of ash dieback in Europe, whereas the closely related *H. albidus* is non-pathogenic, representing cryptic speciation within the genus (Queloz et al., 2010; Baral & Bemmann, 2014; Skovsgaard et al., 2017). Other taxa, such as *H. ericae*, form ericoid mycorrhiza with Ericaceae roots and were later segregated into *Rhizoscyphus* (Zhang & Zhuang, 2004; Vrålstad et al., 2001).

Molecular studies (ITS, LSU, SSU, *TEF1-α*, calmodulin) support *Hymenoscyphus* as a distinct lineage within Helotiaceae, although the genus is heterogeneous and includes multiple clades (Gross, 2014; Baral & Bemmann, 2014). The relationships between pathogenic and non-pathogenic taxa, and the boundaries between *Hymenoscyphus* and related genera, remain under revision.

Holotype of the type species *H. fructigenus* was collected in Europe on fruit pericarps and is preserved in Persoon's collections.

Hymenoscyphus microserotinus (W.Y. Zhuang) W.Y. Zhuang, in Zhuang & Liu, Mycotaxon 99: 127 (2007)

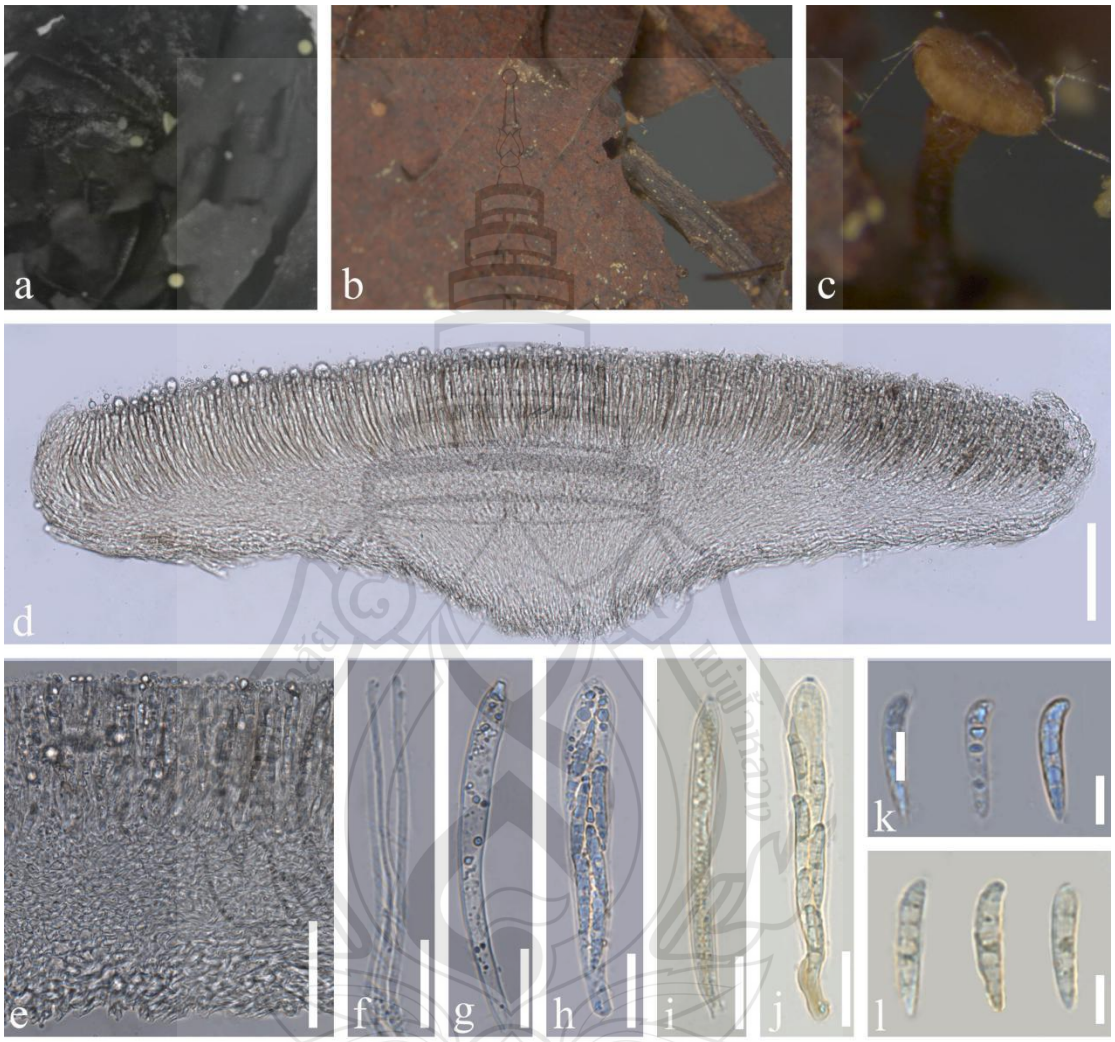
Index Fungorum: IF510596, Facesoffungi Number: FoF18894, Figure 3.110

Description. Saprobic on decayed wood barks. Sexual morph: Apothecia superficial, scattered, 0.2–0.7 mm in diameter, 0.4–0.6 mm high when dry, discoid to cupulate, long stipitate. Disc concave, smooth, white to yellow when fresh, yellowish to light brown when dry. Margin slightly curved inward towards the disc, yellowish-brown. Receptacle wider than the stipe, white to pale yellow when fresh, yellowish-brown when dry, glabrous. Stipe 0.1–0.2 mm in diameter, 0.4–0.5 mm long when dry, dark brown. Hymenium 79–126 μm ($\bar{x}$ = 199 μm, n = 42), convex, smooth, white to pale yellow in fresh and yellowish-brown in dry. Ectal excipulum 18–41 μm ($\bar{x}$ = 30 μm, n = 31) thick, composed of thin-walled, smooth, hyaline cells of *textura globulosa* to *textura intricata*, 3.3–7.6 μm ($\bar{x}$ = 5.2 μm, n = 60) in diameter. Medullary excipulum 56–104 μm ($\bar{x}$ = 73 μm, n = 31) thick, of thin-walled, hyaline cells of textura globulosa to textura porrecta, 1.4–4.3 μm ($\bar{x}$ = 2.7 μm, n = 60) in diameter, non-gelatinous. Paraphyses 77–102 × 1.0–2.4 μm ($\bar{x}$ = 92 × 1.8 μm, n = 25), filiform, straight to slightly curved, aseptate, hyaline, smooth, with slightly obtuse apex. Asci 84.6–104.1 × 6.8–11.8 μm ($\bar{x}$ = 95.3 × 8.6 μm, n = 50), 8-spored, clavate, straight to slightly curved, inoperculate, hyaline, J+ in MLZ, with a tapering short stipitate base. Ascospores (85/7/2) (18.2–)19.6–25.8(–26.1) × 3.2–4.9(–5.4) μm ($\bar{x}$ = 22.1 × 3.9 μm, n = 55), partly biseriate, hyaline, fusiform to fusoid-clavate with a rounded end and a blunt end, thin-walled, smooth, aseptate, multiguttulate. Asexual morph: Not observed.

Material examined. China, Yunnan Province, Cang Mountain, altitude 3991 m, on decayed unidentified leaf, 25 July 2022, Le Luo, Ly128 (HKAS 145833).

Notes. Our collection (Ly128, HKAS 145833) was recovered as conspecific with *Hymenoscyphus microserotinus* based on phylogenetic analyses (Figure 3.198), clustering together with the reference strains (HKAS 264030, HKAS 264031, HKAS 264032) with strong support. Morphologically, it agrees with the protologue (Zhuang, 1996; Zhuang & Liu, 2007) in having small, whitish to yellow apothecia, long stipes, clavate asci, and multiguttulate fusoid-clavate ascospores. However, our collection differs in having slightly shorter apothecia, longer asci, and distinctly longer ascospores. These variations are likely intraspecific and may reflect ecological adaptation, as our

specimen was collected from decayed leaves at 3991 m in Yunnan, much higher than the type locality in Huangshan, Anhui (ca. 1800–1900 m). Therefore, the specimen is identified as *H. microserotinus* and represents a new distribution record for Yunnan Province, China.



Note a–c Apothecia on the host. d Cross section of an apothecium. e Excipular cells. f Paraphyses. g–j Asci (i, j mounted in Meltzer agent). k, l Ascospores. Scale bar: d = 100 µm; e = 50 µm; f–j = 20 µm; k–l = 10 µm.

Figure 3.110 *Hymenoscyphus microserotinus* (HKAS 145833)

Hymenoscyphus kunmingensis L. Luo & K.D. Hyde, sp. nov.

Index Fungorum: IF904293, Facesoffungi Number: FoF18895, Figure 3.111

Etymology. The epithet ***kunmingensis*** refers to the collection site "Kunming City, Yunnan Province" where the holotype specimen was collected.

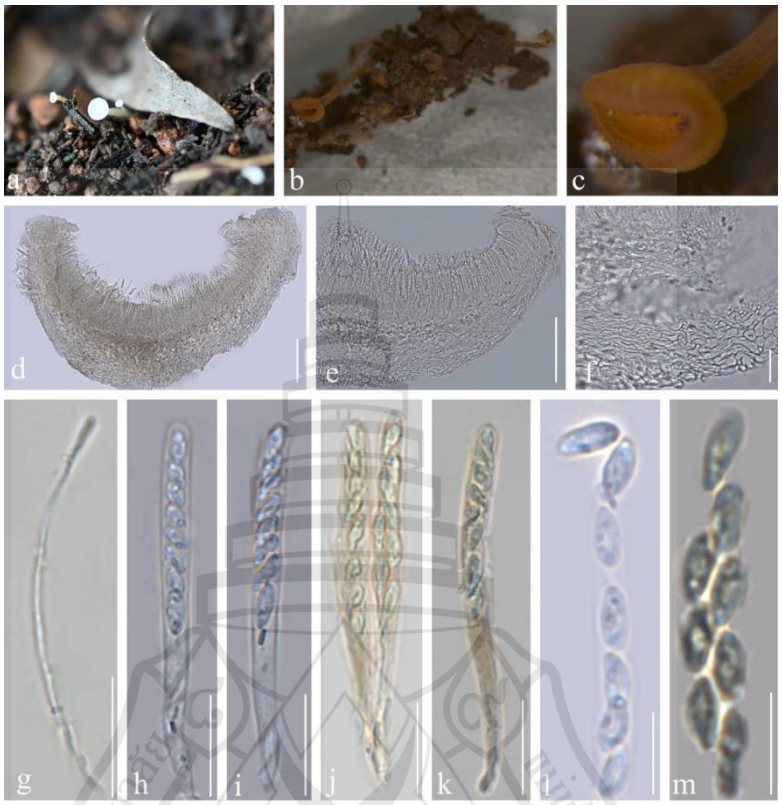
Holotype. HKAS145829.

Description. Saprobic in soil. Sexual morph: Apothecia superficial, scattered, 0.6–0.9 mm in diameter, 1.8–2.2 mm high when dry, discoid to cupulate, long-stipitate. Disc concave, smooth, white when fresh, orange when dry. Margin slightly incurved, concolorous with the receptacle. Receptacle wider than the stipe, white when fresh, orange to light brown when dry, glabrous. Stipe 0.2–0.3 mm in diameter, 1.6–2.1 mm long when dry, orange to light brown. Hymenium 67–116 µm ($\bar{x}$ = 96 µm, n = 42) thick, concave, smooth, white when fresh and orange when dry. Ectal excipulum 21–45 µm ($\bar{x}$ = 29 µm, n = 31) thick, of thin-walled, smooth, hyaline cells, textura globulosa to *textura prismatica*, 2.9–6.2 µm ($\bar{x}$ = 4.4 µm, n = 60) in diameter. Medullary excipulum 32–66 µm ($\bar{x}$ = 47 µm, n = 31) thick, of thin-walled, hyaline cells, *textura prismatica* to *textura oblita*, 1.5–3.6 µm ($\bar{x}$ = 2.1 µm, n = 60) in diameter, non-gelatinous. Paraphyses 55–82 × 0.8–2.1 µm ($\bar{x}$ = 68 × 1.4 µm, n = 25), filiform, straight to slightly curved, aseptate, hyaline, smooth, with slightly obtuse apex. Asci 65.1–81.3 × 4.3–8.1 µm ($\bar{x}$ = 72.1 × 6.5 µm, n = 50), 8-spored, clavate, straight to slightly curved, inoperculate, hyaline, with a thickened wall at the apex, J+ in MLZ, with a tapering, long-stipitate base. Ascospores (85/7/2) (4.9–)5.3–7.3(–7.8) × 1.9–3.1(–3.4) µm ($\bar{x}$ = 6.4 × 2.6 µm, n = 55), overlapping uniseriate and partly biseriate, ellipsoidal to fusiform, hyaline, thin-walled, slightly roughened, aseptate, 1–2-guttulate. Asexual morph: not observed.

Material examined. China, Yunnan Province, Panlong District, Kunming City, altitude 2107 m, on the soil, 22 October 2022, Le Luo, Ly153 (HKAS145829, holotype); *ibid*., Ly1114 (HKAS 145830, paratype).

Notes. Phylogenetic analyses (Figure 3.198) show that Ly153 (HKAS 145829) and Ly1114 (HKAS 145830) form a distinct clade closely related to *Hymenoscyphus menthae* (TUF 134282), with 97% MLBP, but without significant statistical support. The ITS region of *H. kunmingensis* (506 bp) differs from *H. menthae* by 6.7% (34 bp differences, including several substitutions and indels). Morphologically, *H. kunmingensis* is separable from *H. menthae* by its taller apothecia (1.8–2.2 mm vs. 0.6–1.5 mm), longer stipe (1.6–2.1 mm vs. 0.3–1.3 mm), orange colour when dry (vs. white to pale straw), smaller asci (65.1–81.3 × 4.3–8.1 µm vs. 95–120 × 8.5–10.5 µm), smaller ascospores (5.3–7.3 × 1.9–3.1 µm vs. 13.5–16.5 × 3.2–3.8 µm), fewer guttules (1–2 vs. 4–8 or more), and slightly roughened spore surface (vs. smooth). Based on its

phylogenetic position, ITS divergence, and consistent morphological differences, we introduce *Hymenoscyphus kunmingensis* as a new species in the genus.



Note a-c Apothecia on the host. d, e Cross section of an apothecium. f Excipular cells. g Paraphyses. h-k Asci (j, k mounted in Meltzer agent). l, m Ascospores. Scale bar: d, e = 100 μm; f–k = 20 μm; l, m = 10 μm.

Figure 3.111 *Hymenoscyphus kunmingensis* (HKAS145829)

Phaeohelotium Kanouse, Pap. Mich. Acad. Sci. 20: 75 (1935) [1934]

Index Fungorum number: IF3922; Facesoffungi number: FoF 18843, 31 morphological species (Species Fungorum, 2025), 10 species with molecular data.

Saprobic on decaying wood, especially *Quercus*, *Fagus*, and *Corylus avellana*. Sexual morph: see Dougoud (2012). Asexual morph: Unknown.

Type species – *Phaeohelotium flavum* Kanouse

Notes – *Phaeohelotium* was established by Kanouse (1935) with *P. flavum* as the type species. Members of the genus are characterised by small to medium-sized apothecia, often yellowish to ochraceous, with a gelatinised ectal excipulum composed of *textura prismatica* to hyphoid cells. Asci are cylindric-clavate, 8-spored, arising from

simple septa, with a Hymenoscyphus-type apical ring, either amyloid or inamyloid depending on species. Ascospores are ellipsoid to fusoid, hyaline when young but sometimes turning brown with age, containing lipid bodies, and usually aseptate. Paraphyses are filiform, septate, often with vacuolar bodies that may become refractive and pigmented in the dead state.

Species of *Phaeohelotium* are typically saprobic on soil, wood, or litter, but several taxa appear linked to ectomycorrhizal hosts, especially *Eucalyptus* and *Nothofagus*, suggesting facultative mycorrhizal associations (Baral et al., 2013; Grupe et al., 2022). Terricolous species such as *P. undulatum* and *P. succineoguttulatum* are found under *Eucalyptus* plantations in Spain, while *P. confusum* occurs under *Nothofagus* in New Zealand. Other species, like *P. monticola* and *P. geogenum*, are associated with *Fagus* litter and seeds in Europe.

Molecular phylogenetic analyses based on ITS and LSU sequences indicate that *Phaeohelotium* is paraphyletic, forming clades separate from *Discinella* and *Hymenoscyphus*, and closely related to *Cudoniella* and *Pezoloma*. The genus is thus heterogeneous, with some species potentially requiring reassignment in future systematic revisions (Baral et al., 2013; Grupe et al., 2022). The holotype of *P. flavum* was collected on rotten wood in Michigan, USA (Kanouse 1935), whereas recently described species such as *P. succineoguttulatum* were collected under *Eucalyptus globulus* in Spain (Baral et al., 2013).

Phaeohelotium ailaoense L. Luo & K.D. Hyde, sp. nov.

Index Fungorum: IF904292, Facesoffungi Number: FoF18221, Figure 3.112

Etymology. The epithet *ailaoense* refers to the collection site “Ailao Mountain” where the holotype specimen was collected.

Holotype. HKAS 145859.

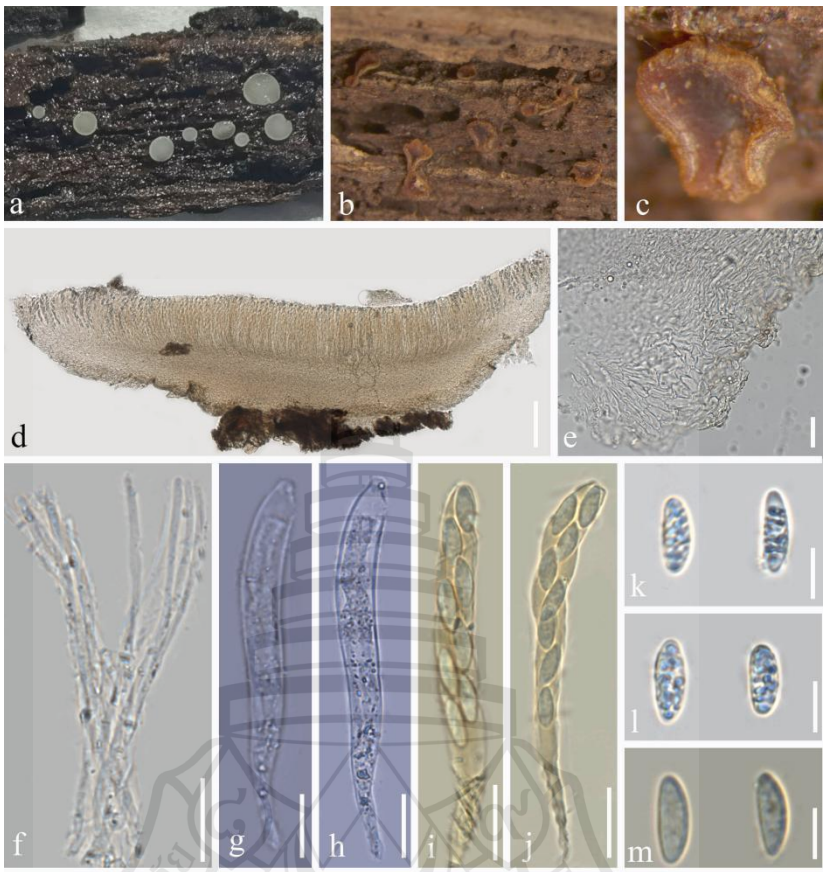
Description. Saprobic on decayed wood. Sexual morph: Apothecia superficial, partly gregarious, 0.3–1.1 mm in diameter when dry, discoid to cupulate, sessile. Disc concave, surface smooth, smoke grey to white when fresh, orange-brown when dry. Margin slightly curled inward towards the disc, concolorous with the receptacle. Receptacle glabrous, orange-brown when dry. Hymenium 86–146 µm ($\bar{x}$ = 121 µm, n = 42), concave, smooth, smoke grey when fresh, orange-brown when dry. Ectal excipulum 38–98 µm ($\bar{x}$ = 65 µm, n = 31) thick, of thin-walled, smooth, hyaline cells

of *textura angularis* to *textura porrecta*, 2.5–6.2 µm ($\bar{x}$ = 4.3 µm, n = 60) in diameter. Medullary excipulum 57–94 µm ($\bar{x}$ = 71 µm, n = 31) thick, composed of hyaline, thin-walled cells of *textura porrecta* to *textura intricata*, 1.8–3.5 µm ($\bar{x}$ = 2.6 µm, n = 60) in diameter, non-gelatinous. Paraphyses 75–129 × 0.7–1.8 µm ($\bar{x}$ = 101 × 1.4 µm, n = 25), filiform, straight to slightly curved, aseptate, hyaline, slightly rough, with a slightly obtuse apex. Asci 93.5–125.3 × 10.0–15.5 µm ($\bar{x}$ = 106.7 × 13.1 µm, n = 50), 8-spored, clavate, straight to slightly curved, inoperculate, hyaline, with a thickened wall at the apex, J– in MLZ, with a tapering, long stipitate base. Ascospores (85/7/2) (12.8–)13.9–18.9(–19.4) × 4.6–8.6(–9.0) µm ($\bar{x}$ = 16.4 × 6.7 µm, n = 55), partly uniseriate and partly biseriate, elongate to ellipsoidal, hyaline, fusiform, thin-walled, smooth, aseptate, multi-guttulate. Asexual morph: Not observed.

Material examined. China, Yunnan Province, Ailao Mountain, altitude 2451 m, on the decayed unidentified wood, 24 August 2022, Le Luo, Ly460 (HKAS 145859, holotype); *ibid*., Ly473(HKAS 145860, paratype).

Notes. Phylogenetic analyses (Figure 3.198) placed our collections Ly460 (HKAS 145859) and Ly473 (HKAS 145860) in a strongly supported clade with *Phaeohelotium pateriforme* (PDD:112176, PDD:94748, PDD:116634), indicating a close relationship (** MLBP, **BIPP). However, *P. ailaoense* differs from *P. pateriforme* by 5.1% (21/413 bp) in the ITS gene region. Morphologically, *P. ailaoense* can be distinguished from *P. pateriforme* by its darker apothecia when dry (orange-brown vs. straw-colored), the absence of a basal pad, wider and shorter ascospores (13.9–18.9 × 4.6–8.6 µm vs. 23–28 × 4–5 µm), and a negative amyloid reaction of the ascus apex (J– vs. J+). Furthermore, the apothecia of *P. ailaoense* are smoke grey to white when fresh, whereas *P. pateriforme* is pale yellow. Ecologically, *P. ailaoense* was collected from decayed wood at 2451 m altitude in Ailao Mountain, Yunnan, China, while *P. pateriforme* has been reported from New Zealand and Tasmania, often associated with decayed wood and possible ectomycorrhizal habitats.

Based on morphological characteristics, DNA sequence divergence, and ecological differences, we introduce *Phaeohelotium ailaoense* as a novel species in the genus.



Note a-c Apothecia on the host. d Cross section of an apothecium. **e** Excipular cells. f Paraphyses. g-j Asci (i, j mounted in Meltzer agent). k-m Ascospores. Scale bar: d = 100 µm; e–j = 20 µm; k–m = 10 µm.

Figure 3.112 *Phaeohelotium ailaoense* (HKAS 145859)

Hyaloscyphaceae Nannf., Nova Acta R. Soc. Scient. upsal., Ser. 4 8(no. 2): 258 (1932)

Index Fungorum number: IF80871; Facesoffungi number: FoF 05892

Hyaloscyphaceae was established by Nannfeldt (1932) and is currently placed in the class Leotiomycetes, order Helotiales. Members of this family are characterized by minute, cupulate apothecia usually less than 1 mm in diameter, with distinct marginal and lateral hairs. The ectal excipulum is typically composed of *textura prismatica* or *textura angularis*. Asci are clavate to cylindrical, mostly thin-walled, and often possess an amyloid apical ring. Ascospores are hyaline, aseptate or septate, ranging from ellipsoid to filiform, while paraphyses are filiform to lanceolate, sometimes embedded in a gelatinous matrix.

The sexual morph is well developed and typically apothecial. Asexual morphs are rare or unknown for most genera, though phialidic anamorphs such as *Pseudaegerita* and *Phialophora*-like forms have been reported in species like *Hyaloscypha spiralis*.

Species in Hyaloscyphaceae are predominantly saprobic, decomposing dead wood, bark, leaves, bryophytes, or herbaceous stems. Some taxa, such as *Hyaloscypha hepaticicola*, function as root endophytes or form ericoid mycorrhizae, highlighting their ecological diversity. The family is cosmopolitan, occurring in both temperate and tropical zones, but remains under-documented due to the small and short-lived fruiting bodies.

Molecular markers available for the family include ITS, LSU, *RPB1*, *RPB2*, *TEF1-α*, and mtSSU (Han et al., 2014; Fehrer et al., 2019; Kosonen et al., 2021). In this study, we reconstructed a multigene phylogeny (Figure 3.113), which confirmed the systematic placement of Hyaloscyphaceae.

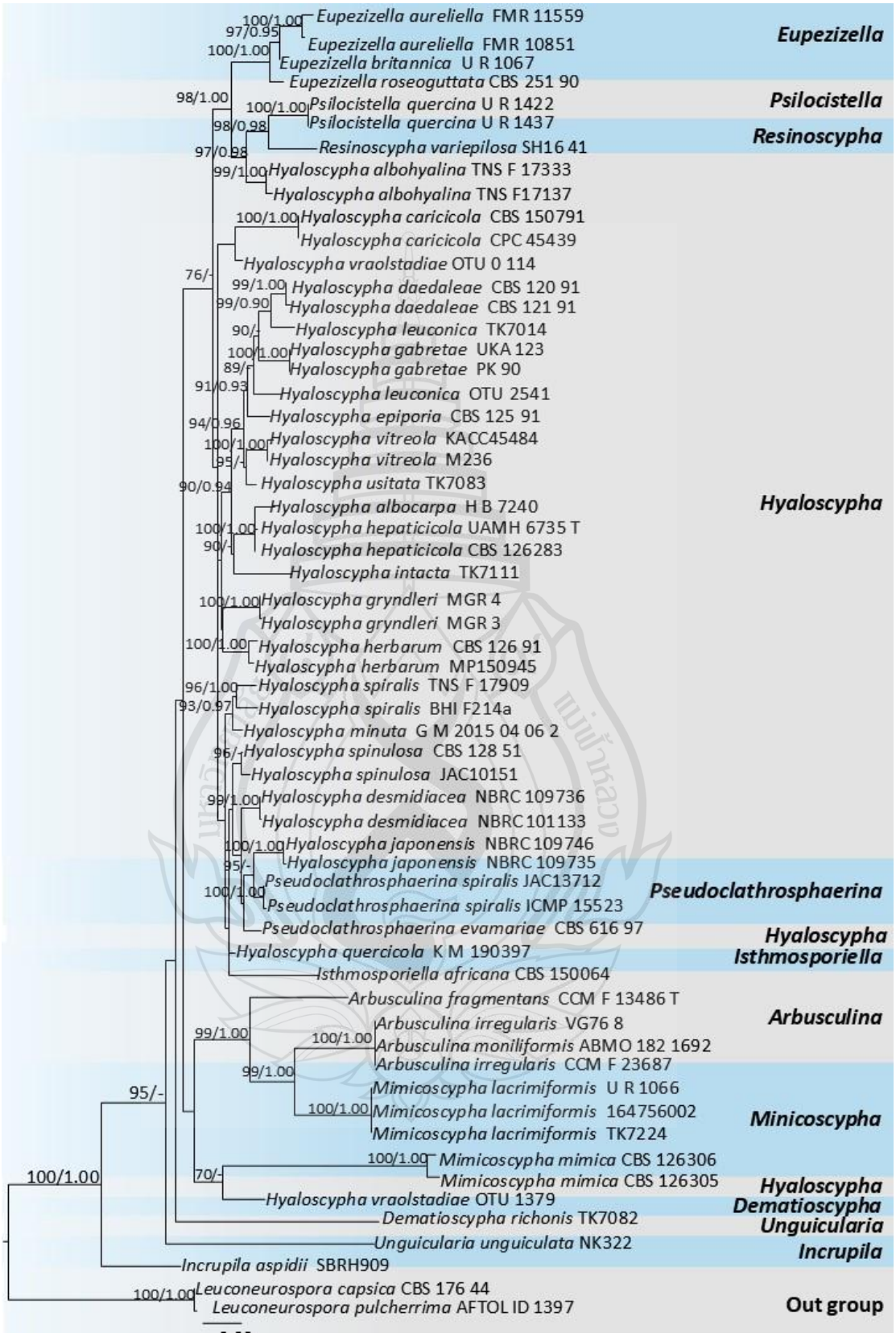


Figure 3.113 Maximum likelihood tree based on the combined ITS and LSU dataset of *Hyaloscyphaceae*

Figure 3.113 Bootstrap support values (MLBP ≥ 70%) and Bayesian posterior probabilities (BPP ≥ 0.90) are shown at nodes as MLBP/BPP. Values below these thresholds are indicated with a hyphen ("–"). Type strains are shown in bold.

Aeruginoscyphus Dougoud, Ascomycete.org 4(1): 2 (2012)

Index Fungorum number: IF564367; Facesoffungi number: FoF 18469, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on decaying wood, especially *Quercus*, *Fagus*, and *Corylus avellana*. Sexual morph: see Dougoud (2012). Asexual morph: Unknown.

Type species – *Aeruginoscyphus sericeus* (Alb. & Schwein.) Dougoud

Notes – *Aeruginoscyphus* was established by Dougoud (2012) with *A. sericeus* as the type species, based on material collected in Russia (Popov, 2009). It belongs to the family Hyaloscyphaceae (Helotiales, Leotiomycetes). The genus is characterized by small, cupulate apothecia, typically <1 mm diam., formed on decaying wood, often of *Quercus*, *Fagus*, or *Corylus*. The receptacle is densely covered with silky white hairs; the hymenium and excipulum are pigmented with a distinctive blue-green coloration that also stains the substrate, a feature unusual within Hyaloscyphaceae. Asci are clavate, inoperculate, containing hyaline, cylindrical to clavate, triseptate ascospores. Paraphyses are filiform, exceeding the asci. No asexual morph has been reported.

Molecular data (ITS, LSU) are currently unavailable for *Aeruginoscyphus*, and thus its phylogenetic placement within Hyaloscyphaceae remains to be confirmed. Additional collections, particularly with molecular sampling, are needed to clarify its relationships to morphologically similar genera such as *Proliferodiscus* and *Arachnopeziza*.

Type – *Aeruginoscyphus sericeus*, collected on 18 Sep 2009 by E.S. Popov from a fallen branch of *Salix* at Zvenigorod Biological Station of Moscow State University, Moscow Province, Russia; holotype LE 254604.

Aeruginoscyphus sericeus (Alb. & Schwein.) Dougoud, Ascomycete.org 4(1): 2 (2012) Figure 3.114

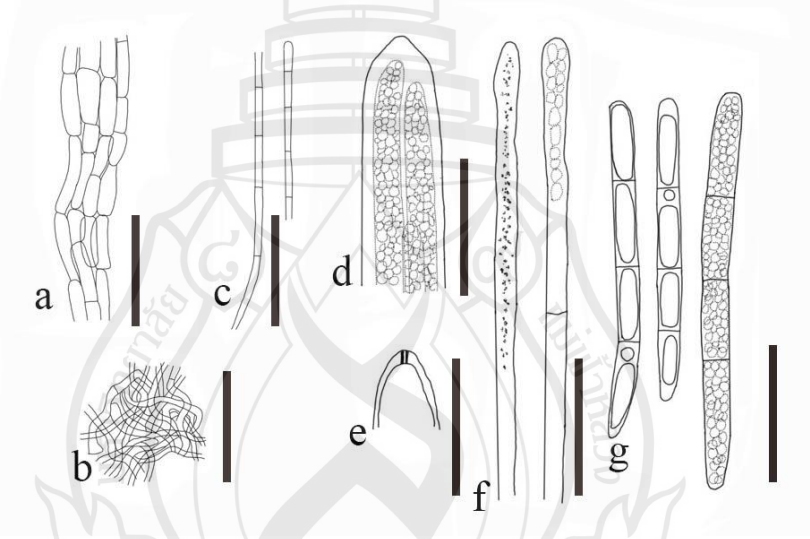
Index Fungorum number: IF564368; Facesoffungi number: FoF 18470

Description – see Dougoud (2012).

Material considered – see Dougoud (2012).

Distribution, ecological and economical importance

Species of *Aeruginoscyphus* are saprotrophs decomposing woody debris, thereby contributing to nutrient recycling in forest ecosystems. They are typically found on decorticated or partially decayed wood of broadleaved trees, especially *Quercus*, *Fagus*, and *Corylus*. The striking blue-green pigmentation of the substrate and apothecia is a distinctive field character. Records are primarily from Europe, with confirmed occurrences in Switzerland, France, and Russia (Dougoud, 2012; Fedosova et al., 2019). The full geographic range is unknown due to the rarity of collections and the inconspicuous size of the fruit bodies. Further surveys in temperate forest habitats are likely to expand its known distribution.



Source Redrawn from Dougoud (2012)

Note a Ectal excipulum. b Medullary excipulum. c Hairs. d Asci (Submature apical part with ascospores). e Apical part of asci in IKI. f Paraphyses. g Ascospores. Scale bars: a–c = 40 µm, d–g = 20 µm.

Figure 3.114 *Aeruginoscyphus sericeus*

Ambrodiscus S.E. Carp., Mycologia 80(3): 320 (1988)

Index Fungorum number: IF25216; Facesoffungi number: FoF 18471, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Parasite infects Douglas fir (*Pseudotsuga menziesii*). Sexual morph: see Carpenter (1988). Asexual morph: Unknown.

Type species – *Ambrodiscus pseudotsugae* S.E. Carp.

Notes – *Ambrodiscus* was introduced by Carpenter (1988) with *A. pseudotsugae* as the type species. The genus is characterised by sessile, pulvinate, and superficial apothecia developing in ambrosia beetle galleries in the sapwood of *Pseudotsuga menziesii*. Apothecia are translucent pale greenish-yellow, extremely fragile, and embedded in a gelatinous matrix. Asci are clavate, eight-spored, lacking an apical pore or ring. Ascospores are cylindrical, hyaline, aseptate, smooth, and enveloped by a gelatinous sheath, which may facilitate dispersal via insect vectors. Carpenter (1988) discussed its uncertain taxonomic position within the Leotiales, pending molecular confirmation. No sequence data are currently available for *Ambrodiscus*. Additional collections and DNA sequencing are needed to clarify its phylogenetic placement and assess whether it belongs to a known family or represents an isolated lineage within Leotiomycetes.

Holotype – USA, Oregon, Linn County, Andrews Experimental Forest, ambrosia beetle gallery in sapwood of fallen *Pseudotsuga menziesii*, 10 Sep. 1986, coll. S.E. Carpenter (OSC #46720).

Ambrodiscus pseudotsugae S.E. Carp., Mycologia 80(3): 320 (1988)

Index Fungorum number: IF133560; Facesoffungi number: FoF 18472

Description – see Carpenter (1988).

Material considered – USA, Oregon, Linn County, Andrews Experimental Forest, ambrosia beetle gallery in sapwood of fallen *Pseudotsuga menziesii*, 10 Sep. 1986, coll. S.E. Carpenter (OSC #46720 – holotype).

Distribution, ecological and economical importance

Ambrodiscus pseudotsugae is a necrotrophic parasite associated with Douglas fir (*Pseudotsuga menziesii*), where it colonises sapwood within ambrosia beetle galleries. Its association with insect vectors suggests an ecological adaptation to beetle-mediated dispersal and infection. The species is currently known only from the Pacific Northwest of the United States, particularly Oregon, and is likely restricted to areas with abundant Douglas fir stands. Due to its limited known range and specialised habitat, *A. pseudotsugae* may be rare, and further surveys are required to determine its distribution, host specificity, and potential impact on forest health.

Figure – No original illustration available.

Arbusculina Marvanová & Descals, Trans. Br. mycol. Soc. 89(4): 499 (1987)

Index Fungorum number: IF11024; Facesoffungi number: FoF 18473, 2 morphological species (Species Fungorum, 2025), 3 species with molecular data.

Saprobic on submerged plant material in freshwater habitats. Sexual morph: Unknown. Asexual morph: see Marvanová and Descals, 1987).

Type species – *Arbusculina irregularis* (R.H. Petersen) Marvanová & Descals

Notes – *Arbusculina* was established by Marvanová and Descals (1987) for aquatic hyphomycetes producing irregularly branched, multicellular conidia. Colonies exhibit dark, woolly aerial mycelium composed of hyaline, thin-walled, and brown, thick-walled hyphae. Conidiophores are semimacronematous, usually single, apical, rarely lateral, flexuous, simple or sparsely branched. Conidia are hyaline to subfuscous, branched, septate, with torulose or obclavate cells; the apical cell may be elongated or ampulliform. Branching is irregular, with primary, secondary, and sometimes tertiary branches arranged alternately. Conidia are liberated by schizolytic dehiscence. Although *Arbusculina* is morphologically distinct, molecular phylogenetic placement within Helotiales remains unresolved due to limited sequence data. To date, ITS and LSU sequences are available for only a few collections, and additional sampling is needed to clarify its phylogenetic affinities and species diversity. The genus was originally described from European material, but subsequent records indicate a broader occurrence in freshwater habitats (Marvanová & Descals, 1987; Descals & Moralejo, 2001). The protologue did not designate a herbarium specimen, and type material was based on fresh collections from submerged leaves.

Arbusculina irregularis (R.H. Petersen) Marvanová & Descals, Trans. Br. mycol. Soc. 89(4): 499 (1987)

Index Fungorum number: IF133417; Facesoffungi number: FoF 18474

Description – Marvanová and Descals (1987).

Material considered – Marvanová and Descals (1987).

Distribution, ecological and economical importance

Arbusculina species are aquatic hyphomycetes that play an important role in the decomposition of submerged plant litter, contributing to nutrient cycling and energy flow in freshwater ecosystems. They are often associated with decaying leaves, twigs, or wood in streams and rivers, where they help condition plant debris for invertebrate

feeding. This genus has been recorded from Europe, with *A. irregularis* reported from the United Kingdom and other parts of western Europe (Marvanová & Descals, 1987). Due to limited studies outside Europe, its global distribution is uncertain, and additional surveys using both morphological and molecular data are required to assess its ecological range and taxonomic diversity.

Figure – No original illustration available.

Dematioscypha Svrček, Česká Mykol. 31(4): 193 (1977)

Index Fungorum number: IF1449; Facesoffungi number: FoF 18475, 6 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprotrophic on decayed plant material. Sexual morph: see Quijada and Beltrán-Tejera (2019). Asexual morph: Unknown.

Type species – *Dematioscypha dematiicola* (Berk. & Broome) Svrček

Notes – *Dematioscypha* was introduced by Svrček (1977) with *D. dematiicola* as the type species. Members of the genus are characterized by minute, sessile, discoid to urceolate apothecia, typically 0.1–0.2 mm in diameter and up to 0.8 mm high. The apothecia are yellow-gray to grayish-greenish-yellow, with a conspicuously hairy, whitish margin. Marginal hairs are tapered, aseptate, straight to rarely sinuous, smooth-walled, and usually covered with loosely attached amorphous material. Asci are cylindric-clavate, 8-spored, (39–)41–45 × 6–7.8 µm, with an iodine-negative apical pore, arising from croziers. Ascospores are hyaline, subcylindrical to clavate, straight or slightly curved, aseptate, (6.5–)7.2–10 × 2.2–2.9 µm, containing 2–6 guttules. Paraphyses are cylindrical, hyaline, 2–3-septate, branched near the base, not inflated at the apex. The ectal excipulum is composed of *textura prismatica-angularis*, slightly gelatinized, without crystals, exudates, or guttules (Quijada & Beltrán-Tejera, 2019). Molecular data available for the genus include LSU and ITS sequences. The holotype of *D. dematiicola* was collected in France, Département du Cantal, St. Mary le Cros, under *Vaccinium myrtillus*, on 19 August 1996 by E. Müller (MUCL 52863).

Dematioscypha dematiicola (Berk. & Broome) Svrček, Česká Mykol. 31(4): 193 (1977) Figure 3.115

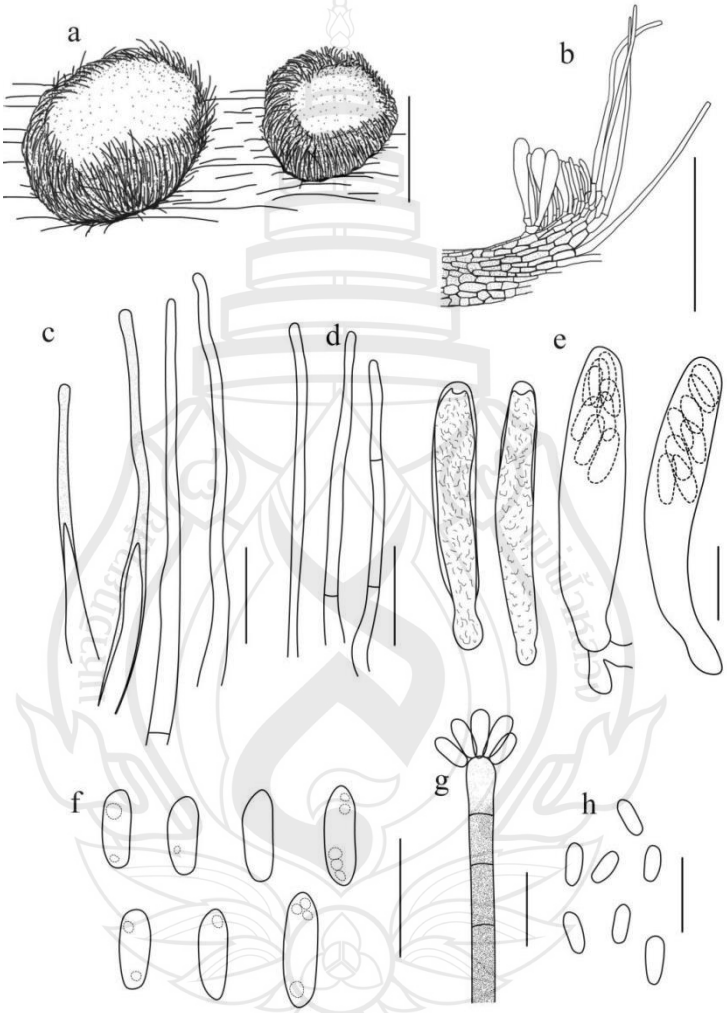
Index Fungorum number: IF312809; Facesoffungi number: FoF 18476

Description – See Svrček (1977).

Material considered – Svrček (1977).

Distribution, ecological and economical importance

Dematioscypha species are saprotrophs contributing to the decomposition of woody and herbaceous plant debris. *D. dematiicola* occurs mainly on fallen branches in forested habitats, particularly under ericaceous vegetation. Records are primarily from temperate regions of Europe, but the overall distribution and ecological amplitude of the genus remain poorly known, requiring additional field and molecular surveys.



Source Redrawn from Quijada and Beltrán-Tejera (2019)

Note a Apothecia. b Section of apothecia. c Hairs. d Paraphyses. e Asci. f Ascospores. g Anamorph. h Conidia. Scale bars: a = 100µm, b = 50 µm, c–e = 10 µm.

Figure 3.115 *Dematioscypha dematiicola*

Echinula Graddon, Trans. Br. mycol. Soc. 69(2): 255 (1977)

Index Fungorum number: IF1739; Facesoffungi number: FoF 18477, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on fallen leaves of Rubus (Rosaceae). Sexual morph: see Graddon (1977). Asexual morph: Unknown.

Type species – *Echinula asteriadiformis* Graddon

Notes – *Echinula* is a hyaloscyphaceous discomycete producing minute, superficial, sessile and hyaline apothecia (to ca. 200 μm diam.) with a few, very long, tentacle-like processes ("processibus … tentaculiformis"), the "tentacles" reaching up to ca. 350 μm, composed of fascicles of numerous filiform hyphae. The excipulum is minute *textura-prismatica*. Asci clavate, 8-spored, to ca. 60 × 13 μm, with a blueing apical pore in iodine. Ascospores elliptic, 10–11 × 4 μm, with polar guttules. Paraphyses filiform, apically forked. These characters (especially the few, very long tentacular processes and the iodine-positive apical apparatus) diagnose the genus and its type species.

Type – *Echinula asteriadiformis* Graddon. UK, Scotland, Glen Aros, Isle of Mull, on dried leaves of *Rubus fruticosus*, May 1974, leg. M. C. Clark; Holotype K, W.D.G. 2393.

Echinula asteriadiformis Graddon, Trans. Br. mycol. Soc. 69(2): 255 (1977) Figure 3.116

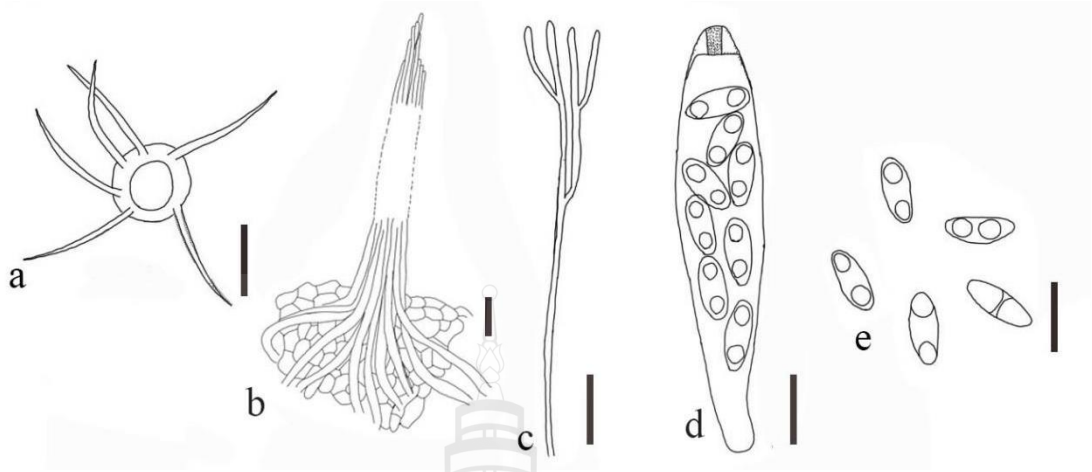
Index Fungorum number: IF313461; Facesoffungi number: FoF 18478

Description – Graddon (1977).

Material considered – Graddon (1977).

Distribution, ecological and economical importance

Echinula is saprotrophic on fallen Rubus leaves. Graddon noted it to be apparently widespread but overlooked in Britain, with collections "always on *Rubus* leaves" from ~20 localities spanning Dorset, Gloucestershire, Merioneth, Shropshire (Salop), Warwickshire and Worcestershire, in addition to the type locality on Mull.



Source Redrawn from Graddon (1977)

Note a Apothecium. b excipular cells with hair. c Paraphysis. d Ascus. e Ascospores. Scale bars: a = 200 µm, b–e = 10 µm.

Figure 3.116 *Echinula asteriadiformis*

Eupezizella Höhn., in Weese, Mitt. bot. Inst. tech. Hochsch. Wien 3(2): 61 (1926)

Index Fungorum number: IF1934; Facesoffungi number: FoF 18479, 6 morphological species (Species Fungorum, 2025), 3 species with molecular data.

Saprobic on decaying plant material, including wood and leaf litter. Sexual morph: see Kosonen et al. (2021). Asexual morph: Unknown.

Type species – *Eupezizella candida* (Starbäck) Höhn.

Notes – *Eupezizella* was introduced by Höhnel (1926) with *E. candida* as the type species. Members of the genus are characterised by small, sessile, cupulate apothecia, usually pale to light brown, occurring on decaying wood and other plant debris in forest ecosystems. The ectal excipulum is composed of *textura prismatica* or *textura globulosa*. Asci are cylindrical to clavate, eight-spored, amyloid, and contain ellipsoid to fusiform, hyaline, aseptate ascospores. Paraphyses are filiform, slightly enlarged at the apex, and often contain vacuolar bodies.

Recent phylogenetic analyses based on a five-locus dataset (LSU, *RPB1*, *RPB2*, *TEF-1α*, mtSSU) strongly support *Eupezizella* as a monophyletic lineage within Hyaloscyphaceae and reveal its close relationship to *Hyaloscypha*. It forms a well-supported sister group to *Mimicoscypha*, a newly established genus in the same family

(Kosonen et al., 2021). Molecular data are available for three species, aiding in resolving its placement within the Hyaloscyphaceae.

The holotype of *E. candida* was collected on fallen leaves of *Populus tremula*, Germany, Bayern, Regensburg, Naturpark Altmühltal, 11 November 2019, by M. L. Davey (MLD 2019/124) and P. R. Johnston, and is preserved in PDD (PDD 118582).

Eupezizella candida (Starbäck) Höhn., in Weese, Mitt. bot. Inst. tech. Hochsch. Wien 3(2): 61 (1926) Figure 3.117

Index Fungorum number: IF431623; Facesoffungi number: FoF 18480

Description – see Höhnel (1926).

Material considered – Höhnel (1926).

Distribution, ecological and economical importance

Species of *Eupezizella* are saprotrophic fungi that contribute to the decomposition of organic matter, especially wood and leaf litter, thereby playing an important role in nutrient cycling in forest ecosystems. The genus is documented mainly from Northern Europe, but its distribution is likely wider, pending more comprehensive surveys. Further taxonomic and ecological studies, particularly incorporating molecular data from under-sampled regions, are necessary to elucidate its diversity and global range.



Source Redrawn from Centro de Estudios Micológicos Asturianos (2023)

Note a Excipulum cells with hairs. b Hairs. c Asci and paraphysis. d Asci (IKI b). e Ascospores. Scale bars: a–e = 10 µm.

Figure 3.117 *Eupezizella aureliella*

Graddonidiscus Raitv. & R. Galán, Mycotaxon 44(1): 34 (1992)

Index Fungorum number: IF25742; Facesoffungi number: FoF 18482, 3 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic, growing on dead wood and other plant matter. Sexual morph: see Galán and Raitviir (1994). Asexual morph: Unknown.

Type species – *Graddonidiscus coruscatus* (Graddon) Raitv. & R. Galán

Notes – *Graddonidiscus* was introduced by Galán and Raitviir (1994) to accommodate species formerly placed in *Lachnum*, typified by *G. coruscatus*. The genus is characterised by minute (0.3–0.8 mm diam.), sessile to short-stipitate, cupulate apothecia with a translucent to pale yellowish receptacle and a contrasting, often slightly darker hymenium. The receptacle surface is pruinose to sparsely hairy; marginal hairs are hyaline, smooth, thin-walled, aseptate, and tapering to an acute apex. The ectal excipulum is of *textura angularis* to *textura prismatica*, sometimes with outer cells pigmented; the medullary excipulum is of *textura intricata*. Asci are cylindrical to clavate, 8-spored, arising from croziers, with an amyloid apical apparatus. Ascospores are hyaline, ellipsoid, aseptate, smooth-walled, and without guttules. Paraphyses are filiform, slightly enlarged at the apex, containing refractive vacuolar bodies, and embedded in a gelatinous matrix. No molecular sequence data are currently available for *Graddonidiscus*, and its phylogenetic position within Hyaloscyphaceae remains tentative, inferred from morphology. The type species *G. coruscatus* was collected in Navacerrada, Sierra de Guadarrama, Spain, on fallen leaves of *Quercus ilex* and *Quercus* sp., on 17 January 1992 by G. Guzmán & J. Muñoz (holotype: MA-Fungi 34270).

Graddonidiscus coruscatus (Graddon) Raitv. & R. Galán, Mycotaxon 44(1): 35 (1992) Figure 3.118

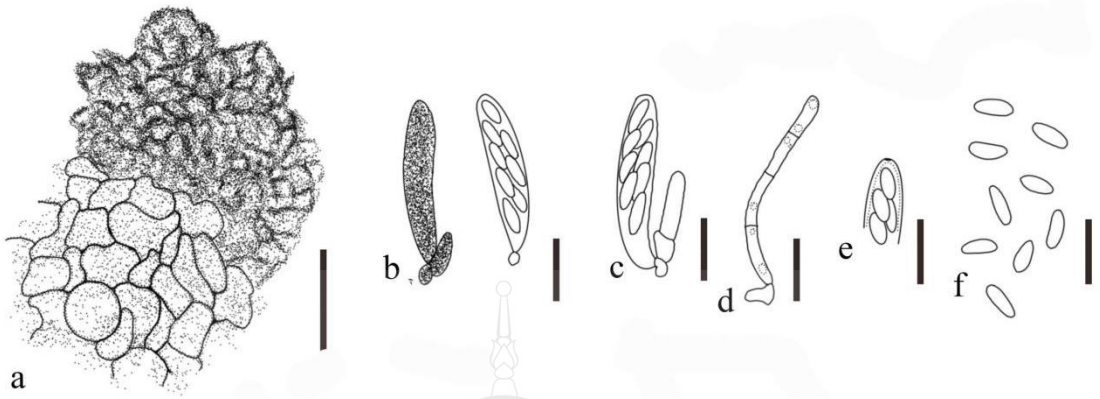
Index Fungorum number: IF359040; Facesoffungi number: FoF 18481

Description – Galán and Raitviír (1992).

Material considered – Galán and Raitviír (1992).

Distribution, ecological and economical importance

Species of *Graddonidiscus* are saprobic, decomposing fallen leaves and other plant debris, and thereby contributing to nutrient cycling in forest ecosystems. Known records are from Spain, but the genus is likely more widespread in temperate regions, especially in habitats with abundant deciduous leaf litter.



Source Redrawn from Centro de Estudios Micológicos Asturianos (2023)

Note a Margin. b Asci. c Asci with Croziers (-). d Paraphyses. e Asci (IKI b). f Ascospores. Scale bars: a, b = 20 µm, c–e = 10 µm.

Figure 3.118 *Graddonidiscus hispanicus*

Grahamiella Spooner, Trans. Br. mycol. Soc. 76(2): 281 (1981)

Index Fungorum number: IF2124; Facesoffungi number: FoF 18483, 2 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on dead or decaying plant material, especially leaves of *Dryas octopetala*. Sexual morph: see Spooner (1981). Asexual morph: Unknown.

Type species – *Grahamiella dryadis* (Nannf. ex L. Holm) Spooner

Notes – *Grahamiella* was introduced by Spooner (1981) to accommodate *G. dryadis*, originally described as *Peziza dryadis* by Nannfeldt (1932) and later transferred by L. Holm (1961). The genus is characterised by small (0.3–1.0 mm diam.), cupulate to discoid apothecia, with a smooth, pale to whitish receptacle and a slightly darker, disc-shaped hymenium. The ectal excipulum consists of *textura prismatica* to *textura angularis*, with the outer cells sometimes covered by a thin hyaline layer. Asci are cylindric-clavate, eight-spored, arising from croziers, with an amyloid apical ring. Ascospores are hyaline, ellipsoid to fusoid-ellipsoid, smooth, aseptate, and non-guttulate, measuring 8–10 × 2.5–3.5 µm. Paraphyses are filiform, slightly enlarged at the apex, occasionally branched, and embedded in a gelatinous matrix. Although morphology supports its placement in Hyaloscyphaceae, no molecular data are currently available, and its phylogenetic position remains to be confirmed.

The holotype of *G. dryadis* is deposited at Kew (K(M) 123832). Further collections and molecular analyses are needed to clarify its relationship to other hyaloscyphaceous genera (Spooner, 1981).

Grahamiella dryadis (Nannf. ex L. Holm) Spooner, Trans. Br. mycol. Soc. 76(2): 281 (1981) Figure 3.119

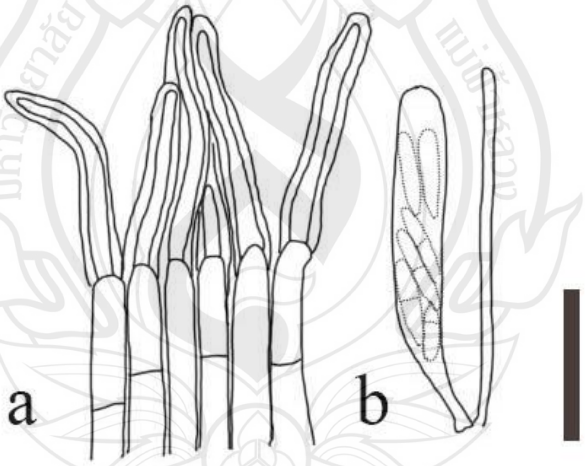
Index Fungorum number: IF112341; Facesoffungi number: FoF 18484

Description – Spooner (1981).

Material considered – Spooner (1981).

Distribution, ecological and economical importance

Grahamiella is a saprobic discomycete colonising dead or senescent leaves of *Dryas octopetala*, contributing to the decomposition of plant litter and nutrient recycling in cold-temperate ecosystems. The genus is currently known from Scotland (Loch Assynt, Glen Feshie), Sweden, and Iceland, and is associated with limestone-rich habitats in alpine and subarctic regions. Its apparent habitat specificity suggests potential as a bioindicator of calcareous tundra and alpine heath environments.



Source Redrawn from Spooner (1981)

Note a Marginal hairs. b Asic and paraphysis. Scale bars: a, b = 10 µm.

Figure 3.119 *Grahamiella dryadis*

Hegermila Raitv., Eesti Teaduste Akadeemia Toimetised, Bioloogia 44(1-2): 23 (1995)

Index Fungorum number: IF27596; Facesoffungi number: FoF 18485, 4 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on decayed wood and other plant debris. Sexual morph: see Raitviir and Järv (1995). Asexual morph: Unknown.

Type species – *Hegermila andina* (Pat.) Raitv.

Notes – *Hegermila* was established by Raitviir and Järv (1995) to accommodate a small group of hyaloscyphaceous fungi with minute, cupulate apothecia, a smooth, pale receptacle, and a darker, disc-shaped hymenium. The ectal excipulum is composed of *textura angularis* to *textura prismatica*; the medullary excipulum is of *textura intricata*. Asci are cylindrical, 8-spored, arising from croziers, with an amyloid apical apparatus. Ascospores are hyaline, ellipsoid, aseptate, and smooth-walled. Paraphyses are filiform, slightly branched or anastomosing. Currently, the genus includes four accepted species (*H. andina*, *H. crassispora*, *H. octopartita*, *H. vermispora*), all described from high-altitude or montane habitats. No molecular data are available, and the phylogenetic placement of *Hegermila* within Hyaloscyphaceae remains inferred from morphology. Future studies integrating DNA sequence data are required to test the monophyly of the genus and its relationship to morphologically similar genera such as *Arachnopeziza* and *Hyaloscypha*. The holotype of *H. andina* was collected in Colombia (Dept. Cundinamarca, Páramo de Cruz Verde, ca. 3500 m a.s.l.) on decorticated wood of *Polylepis quadrijuga*, and is deposited in GENT (specimen GENT 11875).

Hegermila andina (Pat.) Raitv., in Raitviir & Järv, Eesti Teaduste Akadeemia Toimetised, Bioloogia 44(1-2): 24 (1995) Figure 3.120

Index Fungorum number: IF414926; Facesoffungi number: FoF 18486

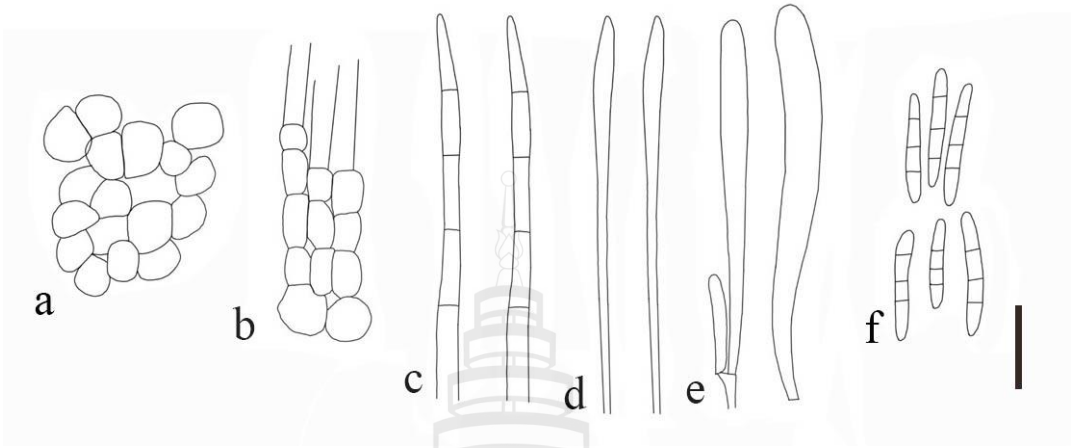
Description – see Raitviir and Järv (1995).

Material considered – Raitviir and Järv (1995).

Distribution, ecological and economical importance

Species of *Hegermila* are saprobes on decorticated wood, bark, or other plant remains, contributing to lignocellulose decomposition and nutrient cycling in forest ecosystems. They appear to have a preference for cool, montane to alpine habitats, with records from South America (Colombia), Southeast Asia (Vietnam), and East Africa (Kenya). Due to the lack of molecular data and limited sampling, the full ecological amplitude and global distribution of *Hegermila* remain poorly understood. Targeted

surveys in underexplored montane forests are likely to yield additional species diversity in this genus.



Source Redrawn from Raitviir and Järv (1995)

Note a Cells of basal and lateral ectal ecxipulum. b Marginal ectal excipulum arising into hairs. c Apical part of a hair. d Paraphysis. e Asci. f Septate ascospores. Scale bars: a–f = 20 µm.

Figure 3.120 *Hegermila andina*

Hyaloscypha Boud., Bull. Soc. mycol. Fr. 1: 118 (1885)

Index Fungorum number: IF2392; Facesoffungi number: FoF 18487, 118 morphological species (Species Fungorum, 2025), 20 species with molecular data.

Saprobes mainly of wood, but they appear also on arboreal and herbaceous litter. Sexual morph: see Quijada et al. (2017). Asexual morph: see Quijada et al. (2017).

Type species – *Hyaloscypha vitreola* (P. Karst.) Boud.

Notes – *Hyaloscypha* is characterised by minute, sessile to subsessile apothecia, often with conspicuous hyaline, lageniform to conic hairs. The ectal excipulum consists of *textura prismatica*, while the medullary excipulum is composed of *textura intricata* to *textura oblita*. Paraphyses are filiform, sometimes slightly enlarged at the apex, often containing refractive vacuolar bodies. Asci are cylindric-clavate, arising from croziers, and contain hyaline, aseptate ascospores with one or more oil drops.

Asexual morphs are hyphomycetous, including *Cheiromycella*, *Pseudaegerita* and Phialophora-like states, exhibiting holoblastic or enteroblastic conidiogenesis (Quijada et al., 2017). Phylogenetic analyses based on multi-gene datasets (ITS, LSU,

SSU, *RPB1*, *RPB2*, *TEF1*) support the monophyly of *Hyaloscypha* within Hyaloscyphaceae (Helotiales) (Kosonen et al., 2021). Some species form ericoid or ectomycorrhizae and can colonise rhizoids of liverworts, expanding their ecological amplitude beyond saprotrophy. The original protologue (Boudier, 1885) did not indicate a holotype specimen or depository; later treatments have stabilised the genus by reference to authentic material and epitypification proposals (Quijada et al., 2017).

Hyaloscypha vitreola (P. Karst.) Boud., Hist. Class. Discom. Eur. (Paris): 126 (1907) Figure 3.121

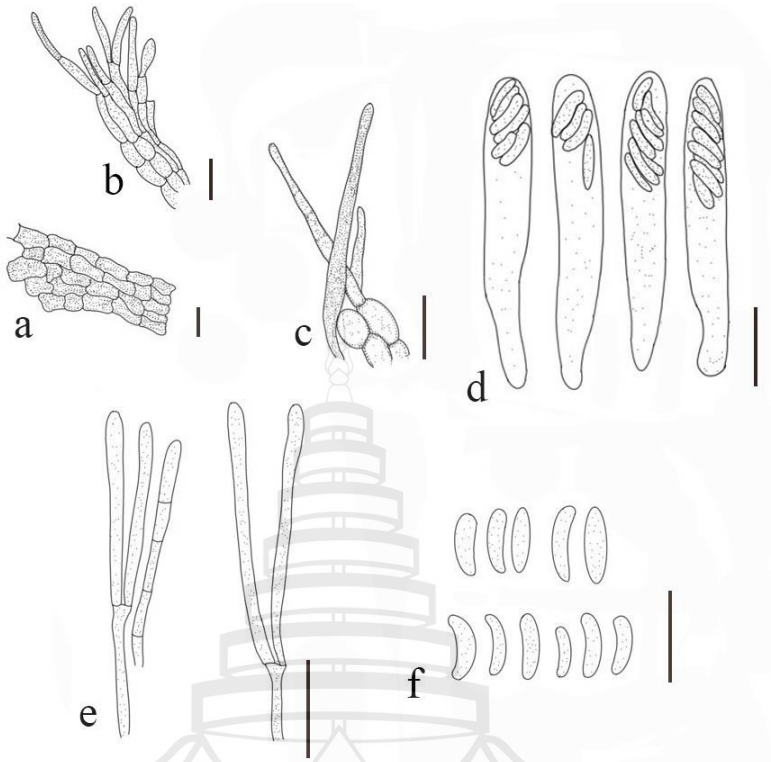
Index Fungorum number: IF124237; Facesoffungi number: FoF 18488

Description – see Quijada et al. (2017).

Material considered – Quijada et al. (2017).

Distribution, ecological and economical importance

Species of *Hyaloscypha* are primarily saprobes on decaying wood and plant litter, contributing to nutrient cycling and organic matter decomposition in forest ecosystems. In vitro studies have demonstrated that certain taxa (*H. hepaticicola*, *H. bicolor*) can form ericoid mycorrhizae with Ericaceae, ectomycorrhizae with woody plants, and associations with bryophytes (Kosonen et al., 2021). The genus has a predominantly temperate Northern Hemisphere distribution, but also occurs in Australia, New Zealand, Chile, Argentina and the Philippines (Quijada et al., 2017). Continued field sampling and molecular studies are needed to clarify species limits, uncover cryptic diversity and refine its phylogenetic framework.



Source Redrawn from Quijada et al. (2017)

Note a, b Excipular tissues in section. c Hairs. d Asci. e Paraphyses.f Ascospores. Scale bars: a–f = 10 μm.

Figure 3.121 *Hyaloscypha vitreola*

Incrupila Raitv., Scripta Mycol. Inst. Zool. Bot. Acad. Sc. Estonian S.S.R. 1: 31 (1970)

Index Fungorum number: IF2487; Facesoffungi number: FoF 18489, 12 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic or endophytic on ferns, particularly inhabiting the internal tissues of healthy fronds. Sexual morph: see Raitviir (1970). Asexual morph: Unknown.

Type species – *Incrupila aspidii* (Lib.) Raitv.

Notes – *Incrupila* was introduced by Raitviir (1970) for a group of hyaloscyphoid fungi associated predominantly with fern hosts, especially in the genus *Phegopteris*. The genus is characterised by minute, sessile to subsessile apothecia, often pale and translucent, bearing hyaline, lageniform to conic hairs. The ectal excipulum is composed of *textura prismatica*, while the medullary excipulum consists of *textura*

intricata. Asci are cylindric-clavate, 8-spored, arising from simple septa or croziers, and contain hyaline, aseptate ascospores. Paraphyses are filiform and may be slightly swollen at the apices.

Phylogenetically, *Incrupila* is placed in Hyaloscyphaceae (Helotiales), but molecular data are scarce, with only one species sequenced to date. Additional sampling and sequencing are necessary to clarify its relationship to morphologically similar genera such as *Hyaloscypha* and *Eupezizella*. The type species, *I. aspidii*, was originally described on *Phegopteris* spp., but other members have also been reported on different fern taxa.

Incrupila aspidii (Lib.) Raitv., Akad. Nauk Estonskoi S.S.R., Inst. Zool. Bot., Tartu: 31 (1970) Figure 3.122

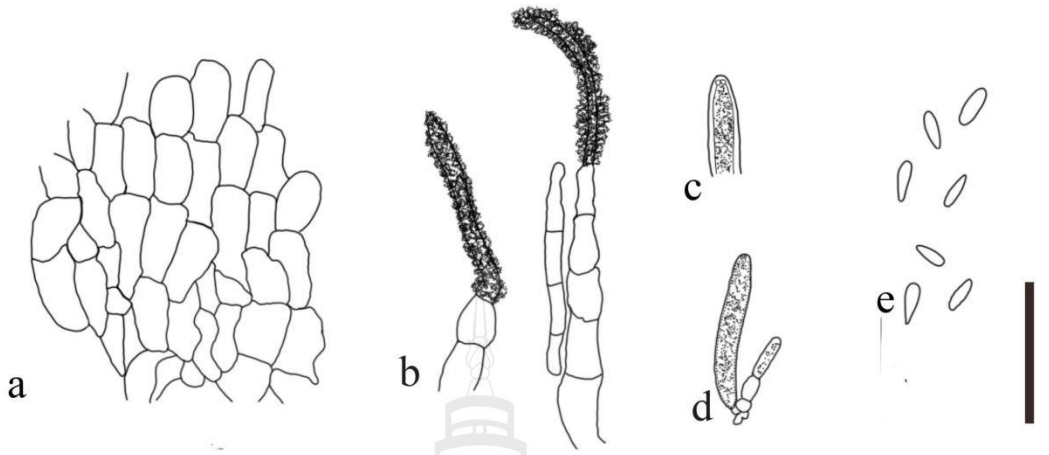
Index Fungorum number: IF240456; Facesoffungi number: FoF 18490

Description – Raitviir (1970).

Material considered – Raitviir (1970).

Distribution, ecological and economical importance

Species of *Incrupila* are often endophytic in living fern fronds, with occasional reports as saprobes on dead fronds or other plant material. As endophytes, they may provide hosts with increased tolerance to abiotic stress or pathogen attack, although this has yet to be experimentally verified. The genus is known from Europe (Estonia, UK), Asia (including northern Thailand), and other temperate to subtropical regions. Broader surveys are required to determine the global distribution and host range of *Incrupila* species.



Source Redrawn from Centro de Estudios Micológicos Asturianos (2023)

Note a Excipular cells. b Excipular cells with hairs. c Asci with IKIb. d Asci with Croziers (+). e Ascospores. Scale bars: a–e = 10 µm.

Figure 3.122 *Incrupila aspidii*

Isthmosporiella Crous, in Crous et al., Persoonia 51: 395 (2023)

Index Fungorum number: IF850618; Facesoffungi number: FoF 18491, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on dead twigs of an unidentified tree. Sexual morph: Unknown. Asexual morph: see Crous et al. (2023).

Type species – *Isthmosporiella africana* Crous

Notes – *Isthmosporiella* was introduced by Crous et al. (2023) with *I. africana* as the type species. The genus is characterised by brown, septate, macronematous conidiophores; terminal, monoblastic, integrated conidiogenous cells; and ellipsoid to fusiform, brown, 3-septate conidia with a conspicuous central constriction (isthmus) at the median septum. Conidia are thick-walled and slightly verruculose. The genus was isolated from dead twigs of an unidentified tree in South Africa. Molecular markers available for *Isthmosporiella* include ITS and LSU sequence data (Crous et al., 2023). The holotype of *I. africana* is deposited in CBS Herbarium (CBS H-22189) with the ex-type culture CBS 135233. Given its distinctive conidial morphology and preliminary phylogenetic data, *Isthmosporiella* is tentatively placed within the Hyaloscyphaceae, but further taxon sampling is needed to confirm its familial position.

Isthmosporiella africana Crous, in Crous et al., Persoonia 51: 395 (2023) Figure 3.123

Index Fungorum number: IF850619; Facesoffungi number: FoF 18492

Description – see Crous et al. (2023).

Material considered – Crous et al. (2023).

Distribution, ecological and economical importance

Isthmosporiella appears to be saprobic, decomposing woody plant material and contributing to nutrient cycling within subtropical forest ecosystems. At present, it is only known from the type locality in South Africa (Crous et al., 2023). Its apparent rarity may reflect limited sampling rather than true distributional restriction. Additional field surveys in Africa and similar habitats elsewhere may reveal a broader host and geographic range.



Source Redrawn from Crous et al. (2023)

Note a-c Conidiophores and conidiogenous cells giving rise to conidia. d Conidia. Scale bars: a–e = 10 µm.

Figure 3.123 *Isthmosporiella africana*

Mimicoscypha Kosonen, Huhtinen & K. Hansen, Persoonia 46: 49 (2020)

Index Fungorum number: IF835735; Facesoffungi number: FoF 14070, 3 morphological species (Species Fungorum, 2025), 3 species with molecular data.

Saprobic on organic matter such as wood, bryophytes, and plant debris. Sexual morph: see Kosonen et al. (2021). Asexual morph: Unknown.

Type species – *Mimicoscypha lacrimiformis* (Hosoya) T. Kosonen, Huhtinen & K. Hansen

Notes – *Mimicoscypha* is characterized by light-colored, hairy apothecia found on substrates such as wood, bryophytes, and plant debris. The hairs are 1–3-septate, thin- to somewhat thick-walled, hyaline, and mostly smooth, though they may

sometimes be covered with hyaline to yellowish superficial resin. These hairs lack amyloid nodules. The ectal excipulum consists of a *textura angularis* to *prismatica*, typically without dextrinoid reactions, but may exhibit strongly amyloid nodules within the cells. Asci arise from croziers or simple septa, possess an MLZ-positive apical pore, and are 8-spored. Ascospores are ellipsoid to oblong-ellipsoid, aseptate to 1-septate. Paraphyses are cylindrical. Molecular studies have placed *Mimicoscypha* within the family Hyaloscyphaceae. The genus was established to accommodate species that share morphological features with both *Eupezizella* and *Resinoscypha*, yet are distinct based on multi-gene phylogenetic analyses. Currently, three species are included in this genus: *M. lacrimiformis*, *M. mimica*, and *M. paludosa*. Further taxonomic studies and additional collections are necessary to fully understand the diversity and phylogenetic relationships within *Mimicoscypha*. Type specimen of *Mimicoscypha lacrimiformis* was collected in France, Haute-Savoie, Les Mouilles, in moss on *Fagus sylvatica*, on 2 November 1985 by B. Pericard (Herbarium PC0125154, holotype).

Mimicoscypha lacrimiformis (Hosoya) T. Kosonen, Huhtinen & K. Hansen, Persoonia 46: 53 (2020) Figure 3.124

Index Fungorum number: IF835736; Facesoffungi number: FoF 14071

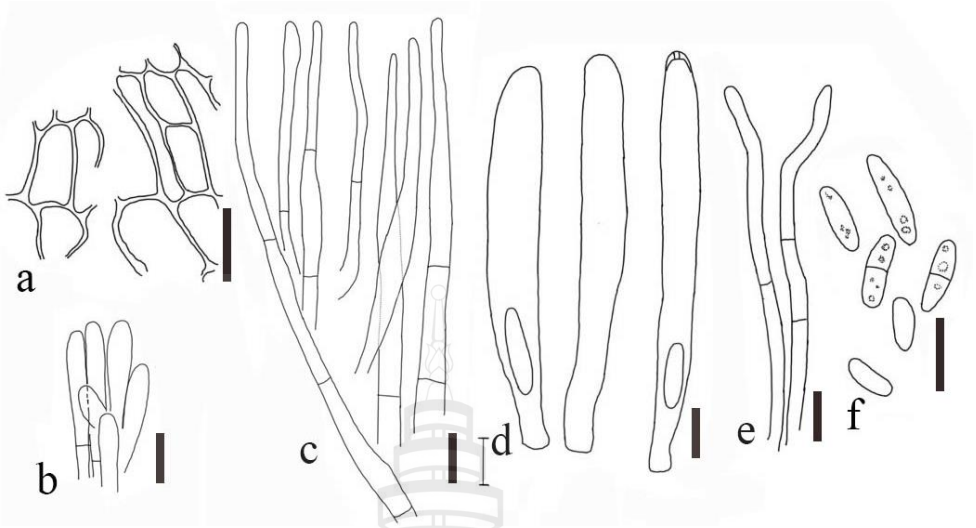
Description – Kosonen et al. (2021)

Material considered – Kosonen et al. (2021)

Distribution, ecological and economical importance

Mimicoscypha species are primarily saprobic fungi, playing a crucial role in the decomposition of organic matter such as wood, bryophytes, and plant debris. This decomposition process contributes significantly to nutrient cycling within forest ecosystems. Currently, there is no evidence to suggest that *Mimicoscypha* species form mycorrhizal associations.

In terms of distribution, *Mimicoscypha* species have been identified in various regions, including Europe and North America. However, due to the limited number of collections and studies, the full extent of their geographical distribution remains unclear. Further research and additional specimen collections are necessary to accurately map their global presence and understand their ecological roles more comprehensively.



Source Redrawn from Kosonen et al. (2021)

Note a Ectal excipulum. b Marginal end cells. c Marginal hairs. d Asci. e Paraphyses. f Ascospores. Scale bars: a–f = 10 µm.

Figure 3.124 *Mimicoscypha lacrimiformis*

Proprioscypha Spooner, Biblthca Mycol. 116: 600 (1987)

Index Fungorum number: IF25128; Facesoffungi number: FoF 18493, 2 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on dead wood and other plant matter. Sexual morph: see Spooner (1987). Asexual morph: see Unknown.

Type species – *Proprioscypha corticicola* Spooner

Notes – *Proprioscypha* is characterised by small, sessile to subsessile apothecia with hyaline, lageniform to conic hairs. The ectal excipulum consists of a *textura prismatica*, and the paraphyses are filiform. The asci are cylindric-clavate, arising from simple septa or croziers, and contain eight hyaline, aseptate ascospores. However, the original description does not provide a specimen number or depository for the holotype.

Proprioscypha corticicola Spooner, Biblthca Mycol. 116: 601 (1987)

Index Fungorum number: IF130990; Facesoffungi number: FoF 18494

Description – Spooner (1987).

Material considered – Spooner (1987).

Distribution, ecological and economical importance

Species in this family have cosmopolitan distribution and are saprobic, growing on dead wood and other plant matter. Currently, there is limited specific information available regarding the ecological role and detailed distribution of *Proprioscypha* species. Further research and additional collections are necessary to fully understand the ecological functions and geographical distribution of this genus.

Figure – No original illustration available.

Pseudoclathrosphaerina Voglmayr, Mycologia 89(6): 943 (1997)

Index Fungorum number: IF27800; Facesoffungi number: FoF 18495, 2 morphological species (Species Fungorum, 2025), 2 species with molecular data.

An aero-aquatic fungus that plays a significant role in the decomposition of organic matter in freshwater ecosystems. Sexual morph: Unknown. Asexual morph: see Voglmayr and Krisai-Greilhuber (1997).

Type species – *Pseudoclathrosphaerina evamariae Voglmayr*

Notes – *Pseudoclathrosphaerina* is characterised by its aeroaquatic nature, producing globose to subglobose conidia composed of a repeatedly dichotomously branched conidial filament**.** These filaments form a hollow, interwoven structure with branch tips that do not fuse or anastomose. The conidiophores are micro- to semimacronematous, mononematous, erect, simple, and septate**,** with holoblastic, terminal conidiogenous cells. The conidia are hyaline**,** white in mass**,** irregularly globose to subglobose**,** and often appear horizontally compressed, measuring 25–45 µm in diameter**.** Colony growth in vitro is slow, with cultures appearing whitish, pale ochraceous, light grey, or pinkish**,** and the reverse side being ochraceous, brownish, or greyish. The mycelium is woolly-strigose**,** composed of hyaline, septate hyphae measuring 1.5–3 µm wide**,** sometimes with interspersed globose cells up to 8 µm in diameter. Holotype: USA, Tennessee, Blount County, Great Smoky Mountains National Park, Cades Cove, near the intersection of Forge Creek Road and Parson Branch Road, on submerged deciduous leaves, 2 August 1996, coll. H. Voglmayr, deposited in the herbarium WU (WU 17015), living culture preserved as CBS 616.97

Pseudoclathrosphaerina evamariae Voglmayr, in Voglmayr & Krisai-reilhuber, Mycologia 89(6): 943 (1997) Figure 3.125

Index Fungorum number: IF442655; Facesoffungi number: FoF 18496

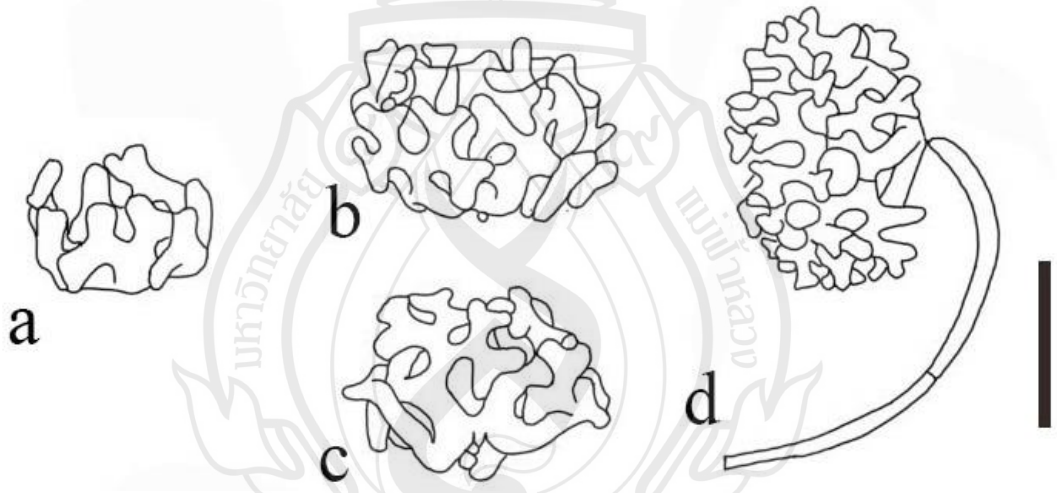
Description – Voglmayr and Krisai-Greilhuber (1997)

Material considered – Voglmayr and Krisai-Greilhuber (1997)

Distribution, ecological and economical importance

Pseudoclathrosphaerina is an aero-aquatic fungus that plays a significant role in the decomposition of organic matter in freshwater ecosystems. Its unique conidial structures are adapted for dispersal on water surfaces, facilitating the breakdown of submerged plant debris and contributing to nutrient cycling within these habitats (Yamaguchi, 2023).

Regarding its distribution, *Pseudoclathrosphaerina* has been documented in various regions, including North America and Europe. However, comprehensive data on its global distribution remain limited, and further research is necessary to elucidate its presence in other parts of the world.



Source Redrawn from Voglmayr and Krisai-Greilhuber (1997)

Note a Young conidium. b, c Conidia. d Old conidium sitting on the conidiophore. Scale bars: a–d = 20 μm.

Figure 3.125 *Pseudoclathrosphaerina evamariae.*

Psilocistella Svrček, Česká Mykol. 31(4): 196 (1977)

Index Fungorum number: IF4506; Facesoffungi number: FoF 18497, 12 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on dead wood and bark. Sexual morph: see Svrček (1977). Asexual morph: Unknown.

Type species – *Psilocistella obsoleta* (Velen.) Svrček

Notes – *Psilocistella* is characterized by small, sessile apothecia measuring 0.2–0.6 mm in diameter and up to 0.2 mm in height. These apothecia are typically white to greyish-red-brown, with a concolorous to darker receptacle. The ectal excipulum comprises *textura angularis*, with hyaline, thin-walled cells. The hairs are hyaline, thin-walled, and measure 25–72.5 × 2–4 µm, lacking a swollen apex or surface ornamentation. The asci are cylindrical, 41–62 × 5.7–7 µm, and contain eight hyaline, aseptate ascospores measuring 5.5–9.8 × 2–3.2 µm. Paraphyses are filiform, sparsely septate, and slightly exceed the asci. *Psilocistella* is morphologically similar to *Cistella* but can be distinguished by the absence of a swollen apex with surface ornamentation on its hairs. The type species *P. obsoleta* was based on *Hyaloscypha priapi* var. *obsoleta* Velen., with type material in PRM (PRM 150906)

Psilocistella obsoleta (Velen.) Svrček, Česká Mykol. 31(4): 196 (1977) Figure 3.126

Index Fungorum number: IF321901; Facesoffungi number: FoF 18498

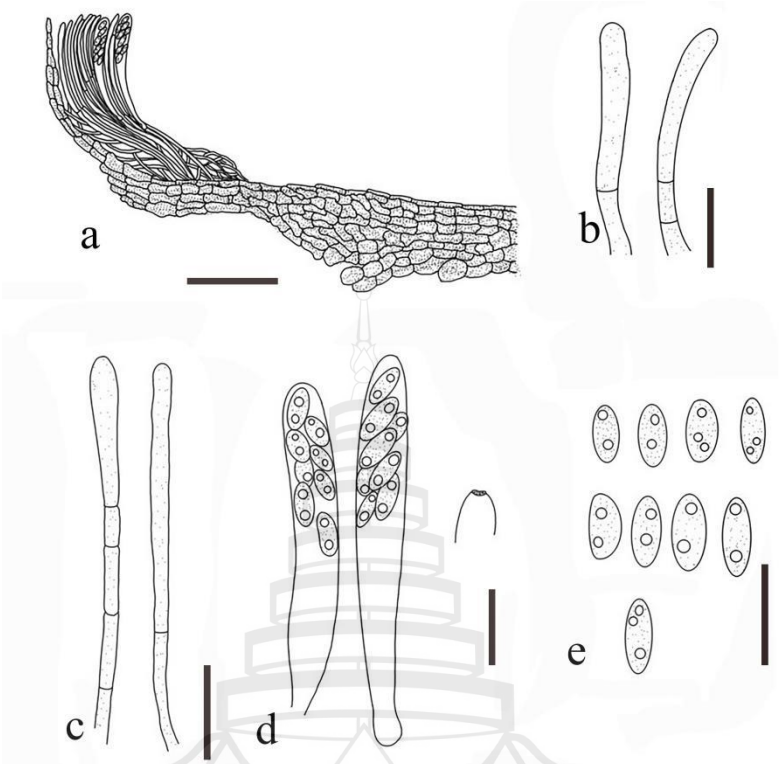
Description – see Svrček (1977)

Material considered – Svrček (1977)

Distribution, ecological and economical importance

Psilocistella is a genus of fungi within the family Hyaloscyphaceae, primarily functioning as saprobes that decompose dead organic matter, particularly wood and bark. This ecological role contributes significantly to nutrient cycling and energy flow within forest ecosystems. Species such as *Psilocistella quercina* have been found on the wood or bark of deciduous trees like *Fagus* and *Quercus*, indicating their role in breaking down lignocellulosic materials (Quijada et al., 2014).

Geographically, *Psilocistella* species have been reported in various regions, including the Czech Republic, France, the Canary Islands, and the Northwest Territories of Canada. For instance, *Psilocistella quercina* has been collected in France and the Canary Islands, while *Psilocistella obsoleta* has been documented in the Northwest Territories (Quijada et al., 2014).



Source Redrawn from Quijada et al. (2014)

Note a Excipular tissues in section. b Hairs. c Paraphyses. d Asci and asci (J+). e Ascospores. Scale bars: a = 50 µm, b–e = 10 µm.

Figure 3.126 *Psilocistella quercina*

Resinoscypha T. Kosonen, Huhtinen & K. Hansen, Persoonia 46: 58 (2020)

Index Fungorum number: IF835739; Facesoffungi number: FoF 14072, 2 morphological species (Species Fungorum, 2025), 2 species with molecular data.

Saprobic on decaying wood. Sexual morph: see Kosonen et al. (2021). Asexual morph: Unknown.

Type species – *Resinoscypha variepilosa* (R. Galán & Raitv.) T. Kosonen, Huhtinen & K. Hansen

Notes – *Resinoscypha* is a light-coloured, hairy, lignicolous genus characterised by long, smooth, hyaline, thin-walled, regularly somewhat flexuous hairs with 1–4 septa that taper to a blunt apex and contain a cyanophilous, non-glassy resinous substance, especially at the hair apex and septa; shorter marginal hairs are highly variable; refractive globules absent. The ectal excipulum is of *textura angularis-prismatica*, without dextrinoid reactions; both hairs and excipular cells may contain

strongly amyloid nodules. Asci arise from croziers, with an MLZ+ apical pore, 8-spored; ascospores are ellipsoid to oblong-ellipsoid, aseptate to 1-septate; paraphyses cylindrical. Etymology refers to the cyanophilous resinous substance in hairs. The holotype is preserved in SFSU (San Francisco State University Herbarium), collected by H.E. Bigelow from the USA (Tennessee, Great Smoky Mountains National Park, on wood), on 2 July 1966.

Resinoscypha variepilosa (R. Galán & Raitv.) T. Kosonen, Huhtinen & K. Hansen, Persoonia 46: 58 (2020) Figure 3.127

Index Fungorum number: IF835740; Facesoffungi number: FoF 14073

Description – Kosonen et al. (2021).

Material considered – Kosonen et al. (2021).

Distribution, ecological and economical importance

Resinoscypha species are lignicolous saprobes on decorticated woody substrates. *R. monoseptata* is so far restricted to cold, arctic–subarctic or high-elevation regions on softwood boards or timber, whereas *R. variepilosa* occurs on both hard- and softwoods with confirmed records in Europe and North America.



Source Redrawn from Kosonen et al. (2021)

Note a Marginal hairs. b Ectal excipulum. c Asci. d Paraphysis. e Ascospores. Scale bars: a–e =20 μm.

Figure 3.127 *Resinoscypha variepilosa*

Thindiomyces Arendh. & R. Sharma, Mycotaxon 17: 486 (1983)

Index Fungorum number: IF25851; Facesoffungi number: FoF 18499, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on decaying organic matter, particularly on leaves. Sexual morph: see Arendholz and Sharma (1983). Asexual morph: Unknown.

Type species – *Thindiomyces epiphyllus* Arendh. & R. Sharma

Notes – *Thindiomyces* is characterised by gregarious to scattered, erumpent, short-stalked apothecia, cream-coloured when fresh, drying to honey-coloured or angular; receptacle hairy with short, irregularly branched, septate, hyaline hairs (up to 25 × 2–3 μm). Ectal excipulum of *textura prismatica* with thick-walled, glassy, hyaline cells, becoming elongated and incurved near the margin; medullary excipulum of *textura porrecta* to *textura intricata* with thick-walled hyphae. Asci are J+, 8-spored, cylindric-clavate, arising from croziers; ascospores hyaline, fusiform, aseptate, obliquely uniseriate. Paraphyses cylindrical, apices blunt, slightly longer than the asci. The peculiar irregularly branched thick-walled hairs are unique within Helotiales and support the placement of this genus in Leotiaceae rather than Hyaloscyphaceae. Similar branched hairs have been described in *Dendrotrichoscypha* Svrček (1977), but these are more irregularly branched and reminiscent of dendrocystidia or acanthophyses in Basidiomycetes, and are also aseptate. The hair type in *Thindiomyces* may represent an intermediate step in hyphal wall thickening, with the lumen narrowing by secondary wall deposition, a process comparable to that seen in *Mollisina*. *Thindiomyces* differs from *Bisporella* in having branched and multiseptate hairs, whereas in *Bisporella* the hairs are unbranched. The type specimen of *Thindiomyces epiphyllus* was collected by Raghunandan Sharma on September 26, 1980, from both surfaces of dead angiosperm leaves in Nawephu, Bhutan (PAN 17589), and is preserved as the holotype in the herbarium of Panjab University, Chandigarh, India.

Thindiomyces epiphyllus Arendh. & R. Sharma, Mycotaxon 17: 487 (1983)

Index Fungorum number: IF109260; Facesoffungi number: FoF 18500

Description – Arendholz and Sharma (1983).

Material considered – Arendholz and Sharma (1983).

Distribution, ecological and economical importance

Thindiomyces epiphyllus is a saprobic fungus that decomposes dead angiosperm leaves, contributing to nutrient cycling in forest ecosystems. It was first discovered in Nawephu, Bhutan, within a mixed forest environment. Currently, this species is only known from this location, and there are no records of its presence elsewhere.

Figure – No original illustration available.

Unguicularia Höhn., Annls mycol. 3(5): 404 (1905)

Index Fungorum number: IF5675; Facesoffungi number: FoF 18501, 12 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on decaying stems or leaves of herbaceous and woody plants. Sexual morph: see Inman et al. (1992). Asexual morph: Unknown.

Type species – *Unguicularia unguiculata* Höhn.

Notes – *Unguicularia* was introduced by Höhnel (1905) with *U. unguiculata* as the type species, and is currently placed in Leotiomycetes, Helotiales, Hyaloscyphaceae. The genus is characterised by minute, cupulate to sessile apothecia, often covered by refractive, glassy hairs on the receptacle surface. The ectal excipulum typically comprises *textura prismatica* or *textura angularis*, often with thick-walled cells (Raschle, 1977). Hairs are solid or nearly solid, usually non-septate, occasionally branched, thick-walled, and remain unchanged in 5% KOH; resinous or crystalline deposits are absent. Asci are cylindrical to clavate, eight-spored, and often weakly amyloid. Ascospores are hyaline, aseptate, oblong to fusoid, and frequently biguttulate. Paraphyses are filiform, hyaline, and slightly longer than the asci. Raschle (1977) and Huhtinen (1985, 1988) provided detailed morphological and taxonomic treatments, while Inman et al. (1992) supplied additional descriptive notes and illustrations. The original publication did not specify a holotype depository.

Unguicularia unguiculata Höhn., Annls mycol. 3(5): 404 (1905) Figure 3.128

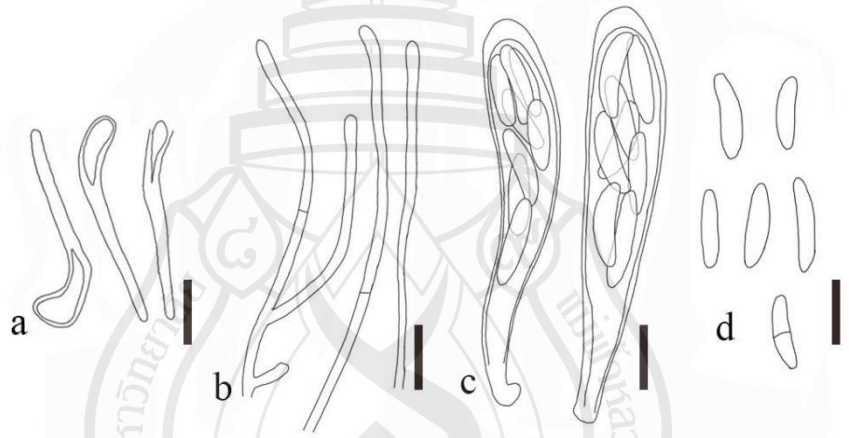
Index Fungorum number: IF162207; Facesoffungi number: FoF 18502

Description – Inman et al. (1992).

Material considered – Inman et al. (1992).

Distribution, ecological and economical importance

Species of *Unguicularia* are saprobic, commonly occurring on decaying stems or leaves of herbaceous and woody plants, including *Equisetum sylvaticum* and *Brassica napus* (Inman et al., 1992; Huhtinen, 1985). They contribute to litter decomposition and nutrient cycling in temperate forest ecosystems. Although there is no known direct economic importance, some species may be relevant in plant pathology research due to the morphological similarity of their ascospores to those of pathogenic taxa such as *Pyrenopeziza brassicae*. The genus is known from several European countries, including Finland, the United Kingdom, Switzerland, and Austria, but is considered under-collected rather than truly rare (Raschle, 1977; Huhtinen, 1985, 1988).



Source Redrawn from Inman et al. (1992)

Note a Hairs from surface of apothecium. b Paraphyses. c Asci. d Ascospores. Scale bars: a–d = 10 µm.

Figure 3.128 *Unguicularia* cfr. *raripila*

Unguiculariella K.S. Thind & R. Sharma, Proc. Indian Acad. Sci., Pl. Sci. 100(5): 279 (1990)

Index Fungorum number: IF25557; Facesoffungi number: FoF 18503, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on dead wood and decaying plant material. Sexual morph: see Thind and Sharma (1990). Asexual morph: Unknown.

Type species – *Unguiculariella bhutanica* K.S. Thind & R. Sharma

Notes – *Unguicullariella* was established by Thind and Sharma (1990) with *U. bhutanica* as the type species. The genus is characterised by small, sessile to subsessile apothecia up to 0.5 mm in diameter, bearing conspicuous, glassy, brittle hairs that resemble the apices of the paraphyses, and turn blue in Melzer's reagent. The ectal excipulum consists mainly of *textura porrecta*, approaching *textura prismatica* near the surface. Paraphyses are filiform, slightly exceeding the asci, with apices also turning blue in Melzer's reagent. Asci are cylindric-clavate, eight-spored, J+, arising from croziers, and contain hyaline, aseptate, oblong to fusiform ascospores. Based on morphology, *Unguicullariella* is placed in the Hyaloscyphaceae and can be distinguished from related genera such as *Unguicularia*, *Unguiculariopsis*, and *Protounguicularia* by its brittle hairs and strong amyloid reaction in both hairs and paraphysis tips. The holotype of *Unguicullariella bhutanica* (type species of *Unguicullariella*) was collected by R. Sharma on August 7, 1981, from decaying leaf stalks of a broad-leaved angiosperm in Begana near Thimphu, Bhutan, and is deposited in the Herbarium of the Botany Department, Panjab University, Chandigarh (PAN 24081), with a duplicate held at Cornell University Herbarium (CUP).

Unguicullariella bhutanica K.S. Thind & R. Sharma, Proc. Indian Acad. Sci., Pl. Sci. 100(5): 280 (1990) Figure 3.129

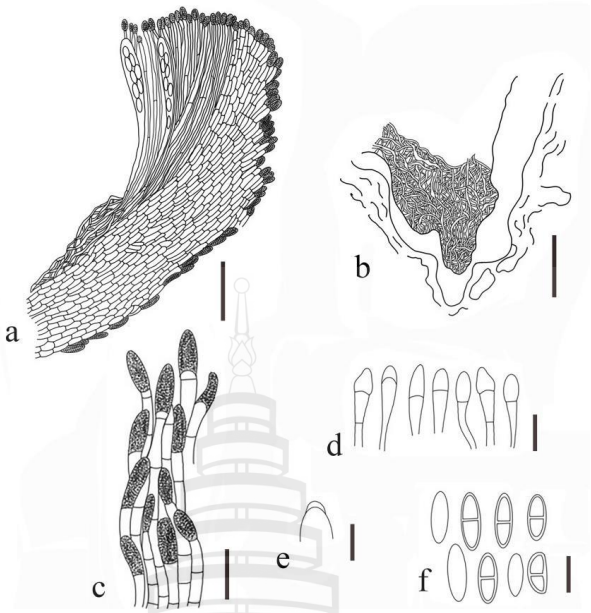
Index Fungorum number: IF128552; Facesoffungi number: FoF 15683

Description – Thind and Sharma (1990).

Material considered – Thind and Sharma (1990)

Distribution, ecological and economical importance

Unguicullariella is presumed to be saprobic, occurring on decaying leaf stalks and other plant debris, likely contributing to the decomposition of organic matter in forest ecosystems. Currently, *U. bhutanica* is known only from its type locality in Begana near Thimphu, Bhutan. Additional collections and molecular data are needed to assess the full distribution and phylogenetic placement of the genus.



Source Redrawn from Thind and Sharma (1990)

Note a Section apothecium toward margin. b Section apothecium at basal region. c Ectal excipular cells with hairs on the surface. d Paraphyses with tips like the hairs. e Ascal tip. f Ascospores. Scale bars: a, b = 50 µm, c–f = 10 µm.

Figure 3.129 *Unguicullariella bhutanica*

Unguiculella Höhn., Sber. Akad. Wiss. Wien, Math.-naturw. Kl., Abt. 1 115: 1281 (1906)

Index Fungorum number: IF5677; Facesoffungi number: FoF 18504, 14 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic or fungicolous. Sexual morph: see Kunze and Schmidt (1823). Asexual morph: Unknown.

Type species – *Unguiculella hamulata* (Feltgen) Höhn.

Notes – *Unguiculella* was established by Höhnel (1906) with *U. hamulata* as the type species. Members of the genus are characterised by small, sessile to shortly stipitate apothecia, usually whitish, occurring on dung, plant debris, or associated with fruit bodies of pyrenomycetes. The ectal excipulum consists of thin-walled, hyaline *textura prismatica*. Marginal hairs are distinctive—curved to hook-shaped, smooth, aseptate, and slightly thickened at the apex. Asci are cylindric-clavate, eight-spored, apically rounded, without a distinct apical pore and typically non-amyloid. Ascospores are hyaline, smooth, aseptate,

ellipsoid, and thick-walled. Paraphyses occur in two forms: cylindrical, thin-walled filaments, and protruding hair-like elements with refractive walls. Molecular data (LSU, ITS) are available for some taxa, supporting their placement in Hyaloscyphaceae (Huhtinen & Spooner, 2003, 2005). The holotype of *U. hamulata* was collected in Germany from *Epilobium hirsutum* on 16 September 1983 by W.D. Graddon (collection no. 4016) and is preserved in the Royal Botanic Gardens, Kew (K).

Unguiculella hamulata (Feltgen) Höhn., Sber. Akad. Wiss. Wien, Math.-naturw. Kl., Abt. 1 115: 1281 (1906) Figure 3.130

= *Unguiculella falcipila* Höhn., Sber. Akad. Wiss. Wien, Math.-naturw. Kl., Abt. 1 115: 654 (1906)

Index Fungorum number: IF119057; Facesoffungi number: FoF 18505

Description – Höhnel (1906).

Material considered – Höhnel (1906).

Distribution, ecological and economical importance

Species of *Unguiculella* occupy specialised ecological niches, functioning as saprobes on plant debris or as fungicolous taxa on fruit bodies of coprophilous pyrenomycetes, e.g., *Podospora* spp., sometimes developing directly from perithecial ostioles (Huhtinen & Spooner, 2003). Others occur as lichenicolous fungi (Huhtinen, 1987). They play a role in the decomposition of organic substrates, including dung and fungal tissues, contributing to nutrient cycling.

The genus is primarily distributed in temperate regions of the Northern Hemisphere. *U. tityrii*, for example, has been reported from Central and Western Europe (Czech Republic, UK, Sweden), Greenland, and North America (USA), usually associated with dung or pyrenomycete hosts (Huhtinen & Spooner, 2003, 2005).



Source Redrawn from Centro de Estudios Micológicos Asturianos (2023)

Note a Ectal excipular cells. b Excipular hairs. c Paraphyses. d Asci. e Ascospores. Scale bars: a–e = 20 μm.

Figure 3.130 *Unguiculella hamulata*

Lachnaceae Raitv., Scripta Mycol., Tartu 20: 7 (2004)

Index Fungorum number: IF82168; Facesoffungi number: FoF 05904

Lachnaceae was established by Raitviir (2004), with *Lachnum* Retz. as the type genus and *L. virgineum* designated as the type species. The family is placed in Ascomycota, Pezizomycotina, Leotiomycetes, Helotiales, and currently accommodates several genera including *Lachnum*, *Albotricha*, *Brunnipila*, *Capitotricha*, *Dasyscyphella*, *Erioscyphella*, *Incrucipulum*, *Lachnellula*, *Neodasyscypha*, and *Proliferodiscus* (Baral & Krieglsteiner, 1985; Hosoya et al., 2010; Tochihara & Hosoya, 2019, 2022). Members of the family are characterized by small, cupulate to discoid apothecia, often stipitate, with margins and receptacles typically clothed in hyaline or pigmented hairs. Hairs may be smooth, granulated, resinous, or encrusted with crystals. The ectal excipulum is usually *textura prismatica* or *textura angularis*, sometimes gelatinised. Asci are inoperculate, 8-spored, usually with croziers and amyloid apical rings. Ascospores are hyaline, one-celled, globose to filiform, often guttulate, and sometimes surrounded by gelatinous sheaths. Paraphyses are filiform to clavate and may contain vacuolar bodies or pigmented inclusions.

Species of Lachnaceae are saprobic, mostly occurring on dead plant material such as twigs, stems, culms, bark, and leaves. Some taxa display host specificity, e.g. *Lachnum callunae* on *Calluna vulgaris* and *L. spartinae* on *Spartina* spp. (Baral et al., 2025). The family has a cosmopolitan distribution, with high diversity in temperate and tropical forests, where they play a role in the decomposition of organic matter and nutrient cycling. Recent molecular studies based on ITS, LSU, mtSSU, and *RPB2* sequences confirm Lachnaceae as a monophyletic clade within Helotiales, although generic boundaries remain under revision (Hosoya et al., 2010; Tochihara & Hosoya, 2019, 2022).

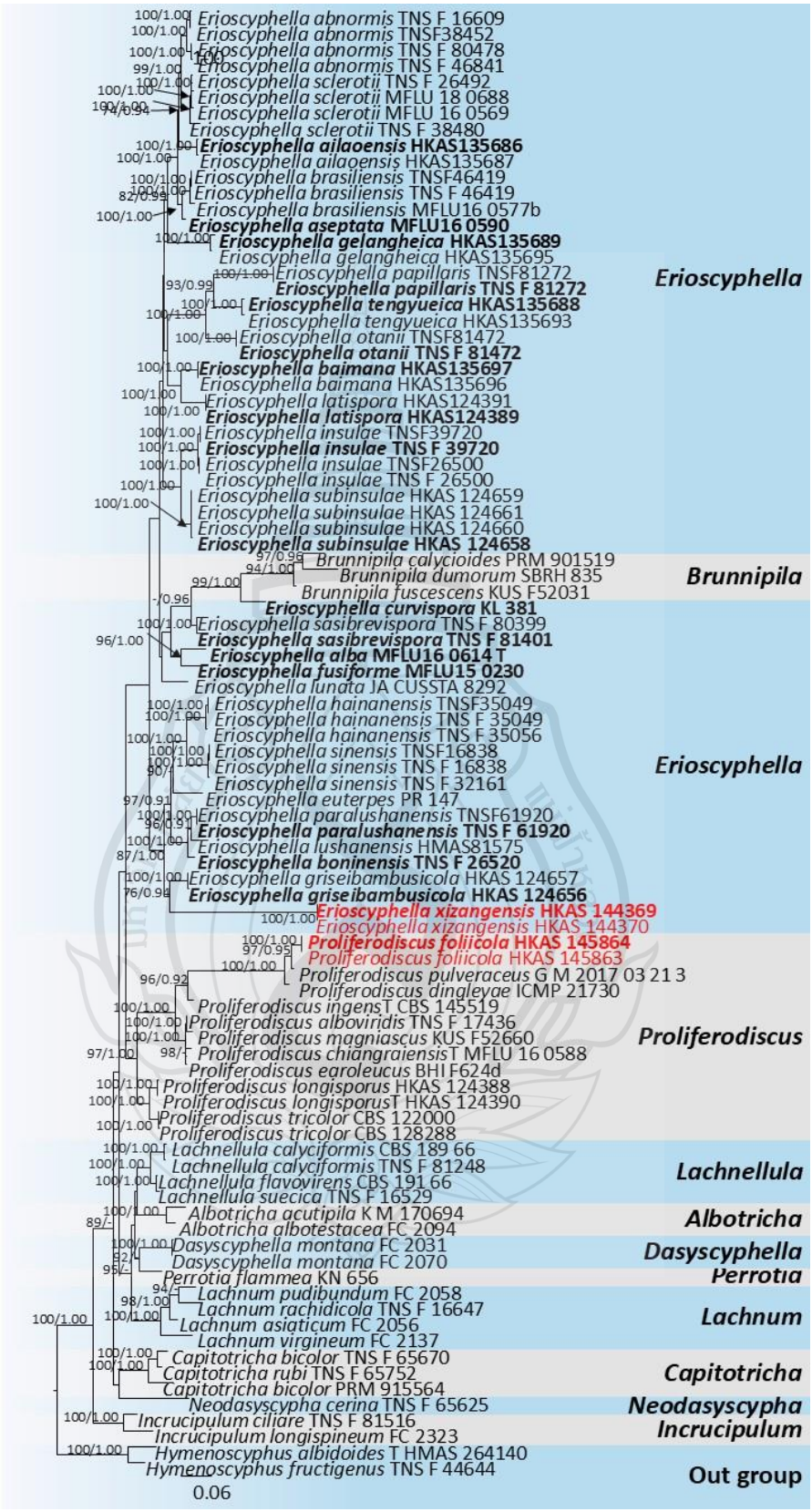


Figure 3.131 Maximum likelihood tree based on the combined ITS, LSU, mtSSU and *RPB*2 dataset of Lachnaceae

Figure 3.131 Bootstrap support values (MLBP ≥ 70%) and Bayesian posterior probabilities (BPP ≥ 0.90) are shown at nodes as MLBP/BPP

Erioscyphella Kirschst., Annls mycol. 36(5/6): 384 (1938)

Index Fungorum number: IF1890; Facesoffungi number: FoF12852, 25 morphological species (Species Fungorum, 2025), 19 species with molecular data.

Saprobic on fallen leaves, bamboo culms, bark, woody debris and other plant material. Sexual morph: see Kirschstein (1939). Asexual morph: Unknown.

Type species – *Erioscyphella longispora* (P. Karst.) Kirschst.

Notes – *Erioscyphella* was established by Kirschstein (1939) with *E. longispora* (≡ *Lachnum longisporum*) and *E. bambusina* (≡ *Erinella bambusina*), and later typified by Haines (1984) who selected *E. longispora* as the lectotype. Members of the genus are characterised by small, discoid to cupulate apothecia, sessile to shortly stipitate, with hymenia white to orange and receptacles white, brown or reddish. The ectal excipulum is composed of *textura prismatica* to *textura angularis*. Marginal hairs are distinctive—cylindrical, septate, granulated, often with amorphous or resinous material at the apices, and lacking crystals. Asci are cylindric-clavate, eight-spored, with an amyloid apical pore. Ascospores are hyaline, smooth, aseptate, fusiform to filiform or needle-like, usually longer than in *Lachnum*. Paraphyses are filiform to lanceolate, sometimes containing vacuolar bodies. Molecular data (ITS, LSU, mtSSU, *RPB2*) are available for many taxa, confirming the genus as a monophyletic lineage within Lachnaceae (Perić & Baral, 2014; Li et al., 2022; Su et al., 2023). The holotype of *E. longispora* was collected on bamboo material in Germany by W. Kirschstein in 1939 and is preserved in the herbarium B (Berlin).

Erioscyphella xizangensis L. Luo & K.D. Hyde, sp. nov.

Index Fungorum: IF904294, Facesoffungi Number: FoF 18506, Figure 3.132

Etymology. The epithet *xizangensis* refers to the collection site “Xizang (Tibet) Autonomous Region, China” where the holotype specimen was collected.

Holotype. HKAS 144369.

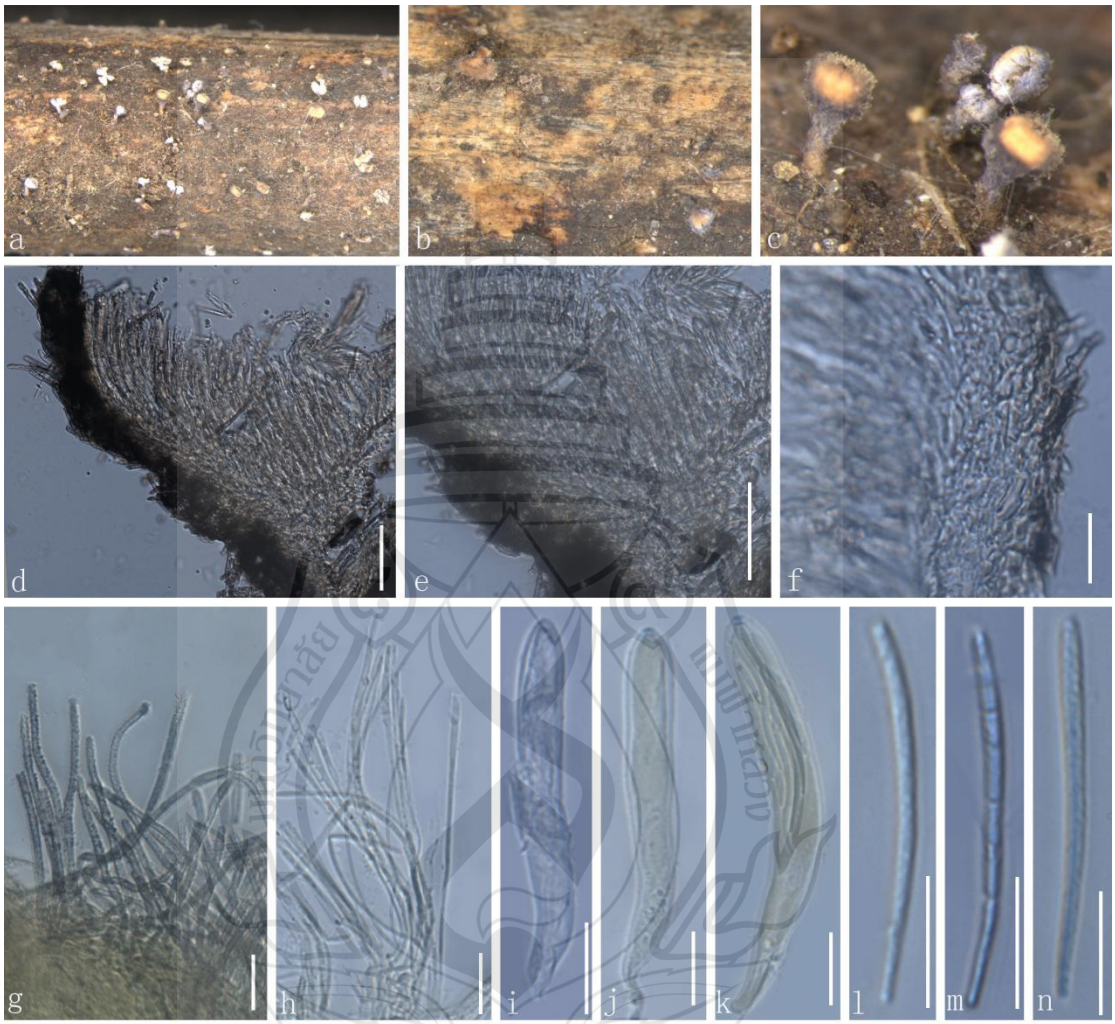
Description. Saprobic on decayed bamboo culms. Apothecia superficial, gregarious to scattered, 0.5–0.8 mm in diameter, discoid to cupulate, stipitate. Disc plane to slightly concave, smooth, translucent when fresh, yellow to pale brown when dry. Margin entire, straight to slightly incurved, concolorous with the receptacle.

Receptacle cylindrical to clavate, smooth, pale yellow to pale brown, with a distinct stipe. Hairs 23.7–74.9 × 2.4–4.2 μm ($\bar{x}$ = 51.5 × 3.1 μm, n = 40), cylindrical, aseptate, hyaline, thin-walled, often covered with hyaline granules, sometimes with amorphous or resinous deposits at the apex, arranged perpendicularly on the receptacle surface. Ectal excipulum 30–72 μm thick, of *textura angularis* to *textura prismatica*, composed of hyaline thin-walled cells, 4.2–11.5 μm diam. Medullary excipulum 48–97 μm thick, *textura intricata*, composed of interwoven hyaline thin-walled hyphae, 2.1–5.3 μm wide. Hymenium 80–125 μm thick, hyaline. Paraphyses 43–87 × 0.9–2.6 μm ($\bar{x}$ = 65 × 1.7 μm, n = 25), filiform, straight to slightly curved, aseptate, hyaline, occasionally slightly swollen at the apex. Asci 59.7–125.7 × 6.3–14.3 μm ($\bar{x}$ = 92.4 × 10.2 μm, n = 40), 8-spored, clavate to cylindrical, inoperculate, hyaline, thin-walled, with a tapering long stipitate base; apical ring not amyloid (J– in MLZ). Ascospores (85/7/2) (47.8–) 50.1–61.4(–62.3) × (1.9–)2.2–3.2(–3.4) μm ($\bar{x}$ = 55.7 × 2.6 μm, n = 50), uniseriate, rarely biseriate, fusiform, hyaline, smooth-walled, aseptate, without guttules. Asexual morph: Not observed.

Material examined. China, Yadong County, Xigaze City, Tibet Autonomous Region, altitude 3626 m, on the decayed unidentified twig, 2 July 2022, Lei Lei, Ly18 (HKAS 144369, holotype); *ibid*., Ly329(HKAS 144370 paratype).

Notes. *Erioscyphella xizangensis* (HKAS 144369, holotype; HKAS 144370, paratype) formed a well-supported clade with *E. griseibambusicola* (HKAS 124656, HKAS 124657) in our phylogenetic analyses, with strong support (100% MLBP and ** BIPP; Figure 206). However, *E. xizangensis* differs from *E. griseibambusicola* by 10.4% (86/822 bp) nucleotide differences in the ITS region, confirming its status as a distinct species. Morphologically, *E. xizangensis* can be distinguished from *E. griseibambusicola* by its larger apothecia (0.5–0.8 mm vs. 0.2–0.4 mm in diameter), distinctly discoid to cupulate form with a longer, yellow to pale brown stipe (vs. cupulate to globose, shortly stipitate, dark brown), and shorter, hyaline hairs covered with hyaline granules and often bearing amorphous or resinous material at the apex (23.7–74.9 × 2.4–4.2 μm vs. 60–160 × 2.5–5.0 μm, brown). The ascospores of *E. xizangensis* are longer and narrower (50.1–61.4 × 1.9–3.2 μm) compared to those of *E. griseibambusicola* (57.0–76.0 × 2.5–4.0 μm), being fusiform with blunt ends and non-guttulate, while those of *E. griseibambusicola* are filiform to narrowly fusiform and sometimes guttulate. Moreover, *E. xizangensis* has

shorter paraphyses (43–87 × 0.9–2.6 µm vs. 100–150 × 2.0–3.0 µm) and slightly shorter asci (59.7–125.7 × 6.3–14.3 µm vs. 100–120 × 10–15 µm). These morphological distinctions, together with the significant ITS sequence divergence and phylogenetic evidence, support the recognition of *E. xizangensis* as a novel species.



Note a-c Apothecia on the host. d, e Cross section of an apothecium. f Excipular cells. g Hairs. h. Paraphyses. i-k Asci (j, k mounted in Meltzer agent). l-n Ascospores. Scale bar: d, e = 50 µm; f–n = 20 µm.

Figure 3.132 *Erioscyphella xizangensis* (HKAS 144369)

Proliferodiscus J.H. Haines & Dumont, Mycologia 75(3): 536 (1983)

Index Fungorum number: IF25839; Facesoffungi number: FoF 18844, 11 morphological species (Species Fungorum, 2025), 9 species with molecular data.

Saprobic on bark, decaying wood, and plant debris. Sexual morph: see Haines and Dumont (1983). Asexual morph: Bien and Damm (2020).

Type species – *Proliferodiscus inspersus* (Berk. & M.A. Curtis) J.H. Haines & Dumont,

Notes – *Proliferodiscus* was established by Haines and Dumont (1983) with *P. inspersus* as the type species. Members of the genus are characterised by small to medium-sized, sessile to shortly stipitate apothecia, typically yellow, orange, cream, or pale brown, often proliferating from the margin of the disc. The receptacle is clothed with hyaline to coloured, thin-walled, curled or bushy hairs, sometimes granulated or encrusted with amorphous material. The ectal excipulum is composed of thin-walled, hyaline *textura prismatica* or *textura globulosa*, while the medullary excipulum is of *textura intricata*, sometimes gelatinised. Asci are cylindrical to clavate, eight-spored, usually J– but occasionally J+, with or without croziers. Ascospores are hyaline, smooth, narrowly fusiform to fusoid-clavate, straight or sinuous, 0–6-septate, occurring in fascicles within the ascus. Paraphyses are filiform, cylindrical, aseptate or sparsely septate, and apically rounded, sometimes exceeding the asci.

Molecular data (ITS, LSU) confirm the monophyly of the genus within Lachnaceae and separate it from related genera such as *Brunnipila* and *Lachnum* (Li et al., 2022; Luo et al., 2025). An asexual morph is known only in *P. ingens*, producing subglobose conidiomata, hyaline, septate conidiophores, and cylindrical to ellipsoidal, aseptate conidia (Bien & Damm, 2020). Species are saprobic on wood, bark, or plant debris, with distributions reported from Asia, Europe, America, and Australasia (Spooner, 1987; Han et al., 2014; Popov 2013).

The holotype of *P. inspersus* (Berk. & M.A. Curtis) J.H. Haines & Dumont was collected in the USA from decaying wood (Haines & Dumont, 1983). Recently, several new species have been described from China, such as *P. longisporus* (HKAS 124390, holotype) and *P. ailaoensis* (HKAS 137596, holotype), expanding the known diversity of the genus (Li et al., 2022; Luo et al., 2025).

Proliferodiscus foliicola L. Luo & K.D. Hyde, sp. nov.

Index Fungorum: IF904295, Facesoffungi Number: FoF 18507, Figure 3.133

Etymology. The epithet *foliicola* refers to the habitat on a decayed leaf.

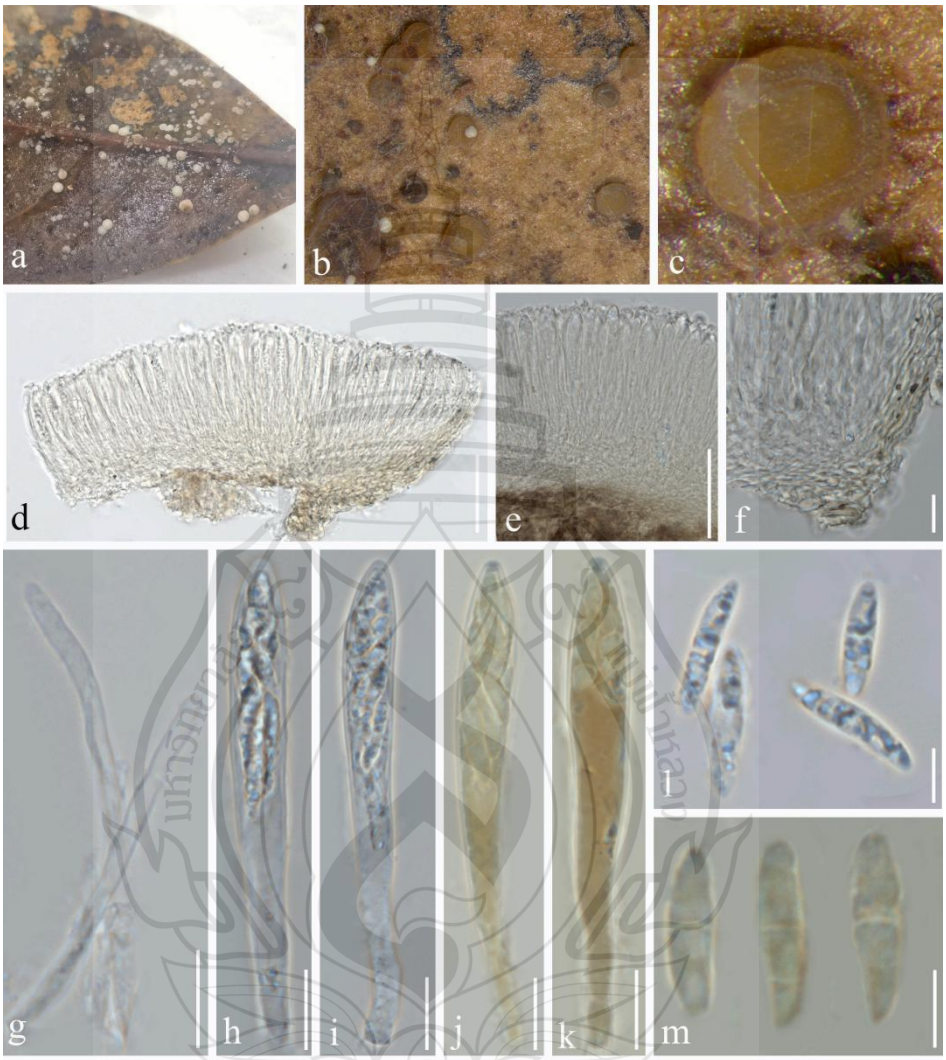
Holotype. HKAS 145864.

Description: Saprobic on decayed leaves. Sexual morph: Apothecia superficial, scattered to partly gregarious, 0.3−1.3 mm in diameter when dry, discoid to cupulate, sessile. Disc concave, surface smooth, dark yellowish brown when dry. Margin slightly incurved towards the disc, concolorous with the receptacle. Receptacle dark reddish brown when dry, glabrous. Hymenium 67–104 µm ($\bar{x}$ = 88 µm, n = 42) thick, concave, smooth, light stone-grey when dry. Ectal excipulum 11–32 µm ($\bar{x}$ = 20 µm, n = 31) thick, composed of thin-walled, smooth, hyaline cells of textura globulosa to textura porrecta, 1.2–2.3 µm ($\bar{x}$ = 1.8 µm, n = 60) in diameter. Medullary excipulum 16–28 µm ($\bar{x}$ = 23 µm, n = 31) thick, composed of hyaline, thin-walled cells of *textura intricata*, 0.9–2.3 µm ($\bar{x}$ = 1.4 µm, n = 60) in diameter, non-gelatinous. Paraphyses 48–70 × 1.3–2.8 µm ($\bar{x}$ = 58 × 2.1 µm, n = 25), filiform, straight to slightly curved, aseptate, hyaline, smooth, with slightly obtuse apices. Asci 47.4–67.7 × 4.7–8.6 µm ($\bar{x}$ = 58.8 × 6.5 µm, n = 50), 8-spored, clavate, straight to slightly curved, inoperculate, hyaline, with thickened wall at apex, J+ in MLZ, with a tapering, long stipitate base. Ascospores (85/7/2) (9.1–)9.4–13.8(–14.7) × 2.0–3.6(–3.9) µm ($\bar{x}$ = 11.8 × 2.9 µm, n = 55), multi-seriate, elongate to ellipsoidal or fusoid-clavate with rounded ends, thin-walled, hyaline, smooth, 1-septate, multiguttulate. Asexual morph: Not observed.

Material examined. China, Yunnan Province, Ailao Mountain, altitude 2451 m, on the decayed unidentified leaf, 23 August 2022, Le Luo, Ly443 (HKAS 145864), holotype); *ibid*., Ly1103 (HKAS 145863 paratype).

Notes. Specimen Ly443 (HKAS 145864) formed a distinct clade, clustering with *Proliferodiscus pulveraceus* (G.M. 2017-03-21.3) with strong support (100% MLBP and ** BIPP; Figure 206). However, *Proliferodiscus* sp. Ly443 differs from *P. pulveraceus* by 1.5% (8/532 bp) sequence divergence in the ITS region, supporting its recognition as a separate species. Morphologically, Ly443 differs in several characters: (1) apothecia sessile, smaller to moderately sized (0.3–1.3 mm) vs. turbinate with distinct stipe in *P. pulveraceus*; (2) receptacle glabrous and dark yellowish brown vs. densely pulverulent with greyish cover; (3) hymenium thinner (67–104 µm vs. thicker in *P. pulveraceus*); (4) ectal excipulum composed of smaller cells (1.2–2.3 µm vs. larger in *P. pulveraceus*); (5) ascospores shorter and broader (9.4–13.8 × 2.0–3.6 µm), 1-septate and multiguttulate vs. aseptate and eguttulate; (6) asci smaller (47.4–67.7 × 4.7–8.6 µm vs. longer in *P. pulveraceus*); (7) paraphyses shorter and narrower (48–70

× 1.3–2.8 µm vs. thicker in *P. pulveraceus*). Moreover, Ly443 was collected from decayed leaves (vs. woody bark in *P. pulveraceus*), indicating substrate preference differences. Taken together, morphological distinctions and ITS sequence divergence support *Proliferodiscus foliicola* as a novel species.



Note a-c Apothecia on the host. d, e Cross section of an apothecium. f Excipular cells. g Paraphyses. h-k Asci (j, k mounted in Meltzer agent). l, m Ascospores. Scale bar: d, e = 50 µm; f–k = 10 µm; l, m = 5 µm.

Figure 3.133 *Proliferodiscus foliicola* (HKAS 145864)

Mitrulaceae Rchb., in Reichenbach, Conspectus regni vegetabilis: 13 (1828)

Index Fungorum number: IF81648; Facesoffungi number: FoF 05875

Mitrulaceae was originally established by Reichenbach (1828) and later redefined and phylogenetically confirmed by Cho et al. (2022) to accommodate the genus *Mitrula*, with *M. paludosa* as the type species. It is currently classified in the phylum Ascomycota, subphylum Pezizomycotina, class Leotiomycetes, and order Helotiales.

Members of Mitrulaceae are characterised by fleshy, brightly coloured, club-shaped apothecia with an orange to yellow hymenium and a hollow, water-soaked whitish stipe. Asci are elongate-clavate, bearing amyloid apical rings and croziers. Ascospores are hyaline, cylindrical to lunate, one- or two-celled, sometimes surrounded by a gelatinous sheath, while paraphyses are filiform to clavate. Only the sexual morph is known, although conidial formation has been reported in culture for some species (Wang et al., 2005).

Ecologically, species of Mitrulaceae are saprobic, inhabiting decaying plant material such as submerged needles, twigs, and leaves in standing or slow-moving freshwater. They play an important role in aero-aquatic environments by contributing to leaf litter decomposition and carbon cycling. The family shows a Holarctic distribution, with most species occurring in temperate regions of North America, Europe, and East Asia, particularly in bogs, forest pools, and shallow streams.

In this study, we reconstructed a multigene phylogenetic tree (Figure 3.134), which confirmed the placement of Mitrulaceae within Helotiales. Molecular markers available for this family include ITS, LSU, and SSU sequence data (Wang et al., 2005; Cho et al., 2022).

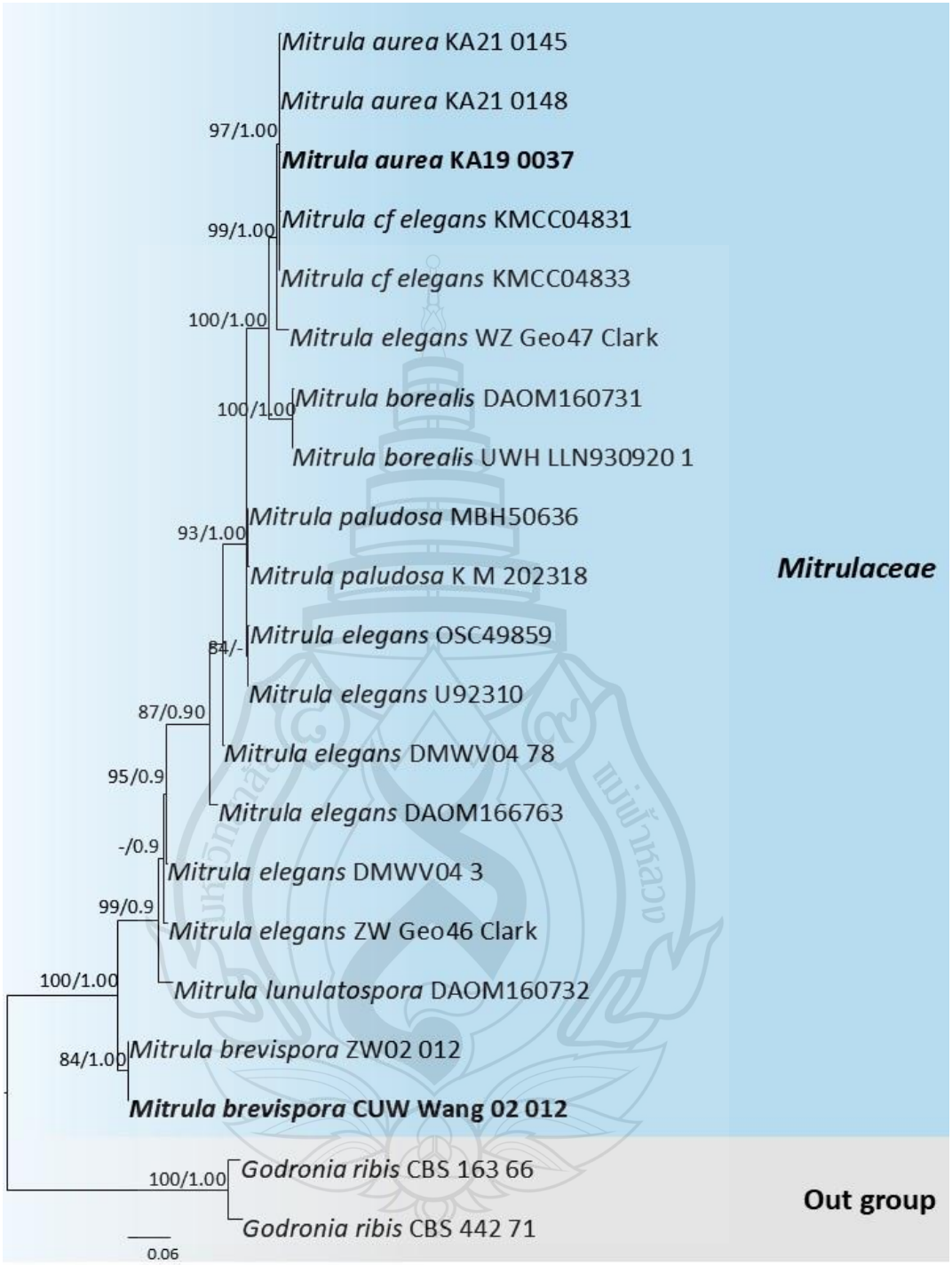


Figure 3.134 Maximum likelihood tree based on the combined ITS and LSU dataset of Mitrulaceae

Figure 3.134 Bootstrap support values (MLBP ≥ 70%) and Bayesian posterior probabilities (BPP ≥ 0.90) are shown at nodes as MLBP/BPP. Values below these thresholds are indicated with a hyphen ("–"). Type strains are shown in bold.

Mitrula Fr., Syst. mycol. (Lundae) 1: 463, 491 (1821)

Index Fungorum number: IF3223; Facesoffungi number: FoF 18508, 17 morphological species (Species Fungorum, 2025), 6 species with molecular data.

Saprobic, inhabiting submerged or water-soaked decaying plant debris. Sexual morph: see Wang et al. (2005), Redhead (1977). Asexual morph: Unknown.

Type species – *Mitrula paludosa*.

Notes – *Mitrula* was introduced by Fries (1821) with *M. paludosa* as the type species. It is currently classified in Leotiomycetes, Helotiales, and placed in the monogeneric family Mitrulaceae (Cho et al., 2022). Historically, the genus was variably placed in Geoglossaceae due to its clavate apothecia and semi-aquatic habitat (Imai, 1941; Dennis, 1968), and later in Sclerotiniaceae based on ascus ultrastructure (Verkley, 1994; Hawksworth et al., 1995). Molecular phylogenetic analyses of ITS, LSU, and SSU rDNA sequences demonstrated that *Mitrula* is distinct from these families, forming a clade with other aero-aquatic genera such as *Cudoniella*, *Hydrocina*, *Vibrissea*, and *Hymenoscyphus* (Wang et al., 2005). This led to the formal establishment of Mitrulaceae by Cho et al. (2022). Morphologically, *Mitrula* is characterised by fleshy, brightly coloured, club-shaped apothecia with orange to yellow hymenophores and whitish, hollow, water-soaked stipes bearing a basal mat of submerged hyaline hairs. Asci are elongate-clavate, eight-spored, with amyloid apical rings and croziers. Ascospores are hyaline, one- or two-celled, cylindrical to lunate, with or without a gelatinous sheath. Paraphyses are filiform to clavate. The asexual morph is rarely observed in nature but has been induced in culture for *M. elegans*, producing bicellular, brown conidia (Wang et al., 2005). Holotype not indicated in the original description; lectotype designated by Redhead (1977) based on Fries's original collection from Sweden, deposited in UPS (Herbarium of Uppsala University).

Mitrula paludosa Fr., in Liljeblad, Utkast Sv. Fl., Edn 3 (Upsala): 664 (1816) Figure 3.135.

Index Fungorum number: IF159924; Facesoffungi number: FoF 18509

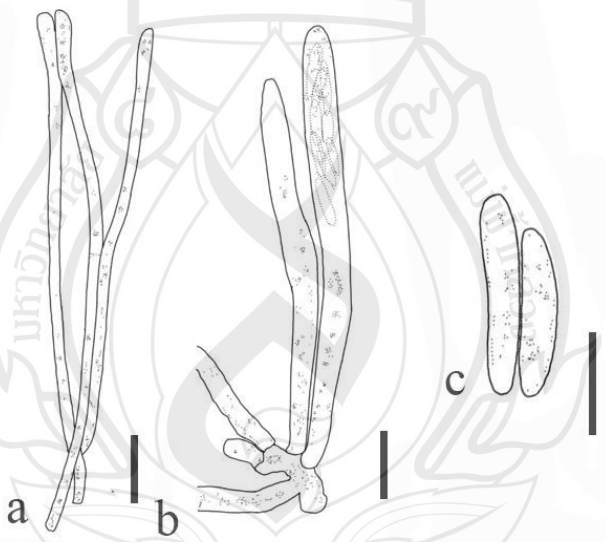
Description – Redhead (1977).

Material considered – Redhead (1977).

Distribution, ecological and economical importance

Mitrula species are important saprobes in freshwater ecosystems, decomposing submerged leaves, twigs, and other plant materials, thus playing a key role in nutrient cycling (Wang et al., 2005; Cho et al., 2022). Their aero-aquatic lifestyle involves fruiting above the water surface while remaining anchored to submerged substrates, enabling them to colonise early-successional habitats in forest streams and bogs (Redhead, 1977).

They are widely distributed in the Northern Hemisphere. *Mitrula paludosa* is common in European peat bogs and forest streams; *M. elegans* and *M. borealis* occur in North America and arctic or subalpine zones, while *M. aurea* extends the genus to East Asia. Species prefer cool, slow-flowing or standing waters with abundant organic detritus (Redhead, 1977; Kankainen, 1969; Cho et al., 2022).



Source Redrawn from Cho et al. (2022)

Note a Paraphyses. b Asci. c Ascospores. Scale bars: a–c = 10 µm.

Figure 3.135 *Mitrula paludosa*

Myxotrichaceae Locq. ex Currah, Mycotaxon 24: 103 (1985)

Index Fungorum number: IF81054; Facesoffungi number: FoF 18510

Myxotrichaceae was formally established by Currah (1985), based on earlier concepts by Locquin, to accommodate a group of cellulolytic, keratinolytic, and xerophilic ascomycetes including *Myxotrichum*, *Oidiodendron*, *Pseudogymnoascus*,

and *Gymnostellatospora*. The family is characterised by gymnothecial, often bristly or reticulate ascomata; evanescent, unitunicate asci; and fusiform to ellipsoidal, striate or smooth-walled ascospores. Asexual morphs are commonly arthroconidial, resembling *Oidiodendron*, *Malbranchea*, or *Geomyces* types. Sexual morphs are well-documented and may develop both in nature and in culture on suitable substrates (Sigler et al., 2000; Tsuneda & Currah, 2004).

Members of Myxotrichaceae are predominantly saprobic on lignocellulosic substrates, acidic forest soils, peat bogs, animal dung, or stored products, although some are symbiotic. For example, *Myxotrichum setosum* and *Pseudogymnoascus roseus* form ericoid mycorrhizal associations with *Vaccinium* and other Ericaceae, producing intracellular hyphal coils similar to those formed by *Oidiodendron* spp. (Dalpé, 1989). Many taxa tolerate extreme conditions such as low nutrient availability, acidic pH, cold climates, and low water activity, enabling their occurrence in boreal and alpine soils, Antarctic habitats, and xeric substrates such as honey (Sigler et al., 2000; Okubo et al., 2025).

Molecular phylogenetic analyses based on ITS, LSU, SSU, *RPB2*, MCM7, and *RPB1* sequence data support the monophyly of Myxotrichaceae and recognise two principal lineages: a *Myxotrichum* clade (including *M. chartarum, M. setosum, M. aurantium, M. cinereum, M. limonium*) and an *Oidiodendron* clade (including *O. maius, O. atrovirens, O. mellicola*) (Okubo et al., 2025). Morphological differentiation among taxa is based on colony colour, conidial pigmentation and ornamentation, conidiophore structure, optimal growth temperature, and tolerance to sucrose concentration or alkaline media. In this study, a multigene phylogenetic tree was reconstructed (Figure 3.136), which confirmed the systematic placement of Myxotrichaceae within Helotiales.

Species of Myxotrichaceae are cosmopolitan, with highest diversity in the temperate and boreal regions of Europe, North America, and Asia. They play important ecological roles in decomposition, nutrient cycling, and plant–fungus symbiosis, and some are adapted to xeric microhabitats such as stored products and bee-associated environments (Currah, 1985; Sigler et al., 2000; Dalpé, 1989; Okubo et al., 2025).

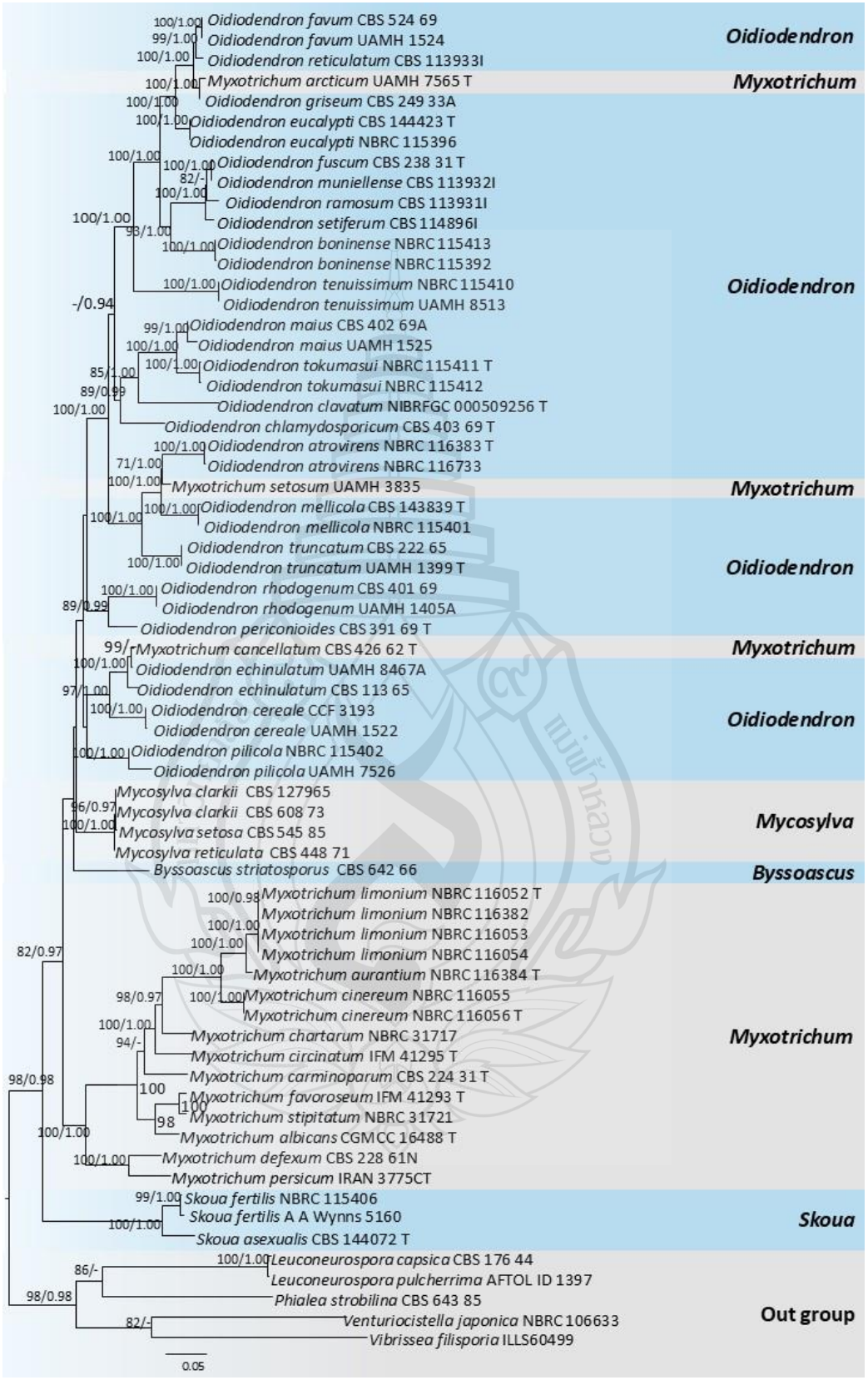


Figure 3.136 Maximum likelihood tree based on the combined ITS and LSU dataset of *Myxotrichaceae*

Figure 3.136 Bootstrap support values (MLBP ≥ 70%) and Bayesian posterior probabilities (BPP ≥ 0.90) are shown at nodes as MLBP/BPP. Values below these thresholds are indicated with a hyphen ("–"). Type strains are shown in bold.

Byssoascus Arx, Persoonia 6(3): 377 (1971)

Index Fungorum number: IF699; Facesoffungi number: FoF 16698, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprotrophic on organic matter in soil and plant debris. Sexual morph: see von Arx (1971). Asexual morph: see von Arx (1971).

Type species – *Byssoascus striatosporus* (G.L. Barron & C. Booth) Arx [as 'striatisporus']

Notes – *Byssoascus* is characterised by superficial, powdery cleistothecial ascomata developing on various substrates, including soil and plant debris. The ascomata are small, closed, and often dark-coloured, with a wall of interwoven hyphae. Asci are globose to subglobose, evanescent, unitunicate, and contain multiple ascospores. Ascospores are hyaline, ellipsoidal, aseptate, and often longitudinally striate, which is a diagnostic feature of the genus. The asexual morph is linked to *Oidiodendron*-like anamorphs, producing erect, pigmented conidiophores fragmenting into arthroconidia. Molecular phylogenetic analyses place *Byssoascus* in Myxotrichaceae, closely related to *Oidiodendron* and *Myxotrichum*. Type specimen of *Byssoascus was* CBS 642.66, isolated from soil in Canada, received from G. L. Barron

Byssoascus striatosporus (G.L. Barron & C. Booth) Arx [as 'striatisporus'], Persoonia 6(3): 377 (1971)

Index Fungorum number: IF564994; Facesoffungi number: FoF 18511

Description – Von (1971)

Material considered – Von (1971)

Distribution, ecological and economical importance

Species of *Byssoascus* act as saprotrophs, decomposing organic matter in soil and plant debris and contributing to nutrient cycling and soil health. *Byssoascus* species are cosmopolitan, occurring in soil, decaying plant debris, and other organic substrates in temperate to boreal regions.

Figure – No original illustration available.

Mycosylva M.C. Tulloch, Trans. Br. mycol. Soc. 60(1): 155 (1973)

Index Fungorum number: IF9034; Facesoffungi number: FoF 18512, 3 morphological species (Species Fungorum, 2025), 3 species with molecular data.

Saprobic, isolated from animal and insect feces, as well as decaying organic matter. Sexual morph: Unknown. Asexual morph: see Tulloch (1973).

Type species – *Mycosylva clarkii* M.C. Tulloch

Notes – *Mycosylva* is characterised by synnematous hyphomycetes that produce erect, mononematous synnemata composed of branched, septate hyphae, which fuse laterally and terminate in an expanded, often somewhat rounded conidial head. The stalk of the synnema consists of parallel, compressed, darkly pigmented structural hyphae, providing rigidity, while the apex bears hyaline, contorted fertile hyphae. Conidiogenous hyphae are holoblastic, formed laterally on curved fertile branches, producing conidia on thin, short stalks. Conidia develop in short acropetal chains, each separated from the previous by a narrow constriction; they are globose to subglobose, usually smooth-walled but occasionally slightly verrucose, hyaline, 3–4 µm in diameter. In the type species, ampullae are 4.5–6.5 × 2.5–3.5 µm, sometimes longer. The genus remains insufficiently resolved phylogenetically but is considered among hyphomycetous fungi. The type species *M. clarkii* was described from unidentified animal dung collected in Monk's Park Wood, Warwickshire, UK, on 3 October 1971 (Warwickshire Fungus Survey No. 2960; holotype IMI 163345). Additional records include *M. setosa* on fungal-infected fruiting bodies of *Vuilleminia comedens* (Sutton et al., 2014) and specimens from Ukraine (Akulov & Golubtsova, 2010).

Mycosylva clarkii M.C. Tulloch, Trans. Br. mycol. Soc. 60(1): 155 (1973) Figure 3.137

Index Fungorum number: IF328339; Facesoffungi number: FoF 18513

Description – Tulloch (1973).

Material considered – Tulloch (1973).

Distribution, ecological and economical importance

Mycosylva species primarily function as saprotrophic fungi, decomposing organic matter such as animal feces, insect excrement, and decaying wood. This genus is significant in nutrient cycling and organic matter decomposition within forest and grassland ecosystems. Some species, such as *M. setosa*, have been found associated

with fungal-infected fruiting bodies of Vuilleminia comedens, suggesting potential ecological interactions with other fungi (Sutton et al., 2014).

Mycosylva species are globally distributed but are most frequently recorded in Europe, North America, and Asia.



Source Redrawn from Tulloch (2021)

Note a Conidial production. b Conidia. Scale bars: a, b = 10 μm.

Figure 3.137 *Mycosylva clarkii*

Myxotrichum Kunze, in Kunze & Schmidt, Mykologische Hefte (Leipzig) 2: 108 (1823)

Index Fungorum number: IF3405; Facesoffungi number: FoF 17775, 17 morphological species (Species Fungorum, 2025), 9 species with molecular data.

Saprobic on a wide range of organic substrates, including cellulose- and keratin-rich materials such as paper, cardboard, leather, cloth, and decaying plant debris; some species are xerophilic, occurring in sugar-rich environments. Sexual morph: see Jamali (2023). Asexual morph: see Orr et al. (1963), Okubo et al. (2025).

Type species – *Myxotrichum chartarum* Kunze, in Kunze & Schmidt

Notes – *Myxotrichum* is characterised by superficial, setose, cleistothecial ascomata, dark-coloured, spherical to subglobose, and covered with branched, septate,

thick-walled appendages that are straight, curved, or uncinate, often with hyaline apices. Asci are hyaline, globose to subglobose, evanescent, containing eight ellipsoidal, hyaline, aseptate ascospores, which are fusiform to navicular and frequently striate. Species within *Myxotrichum* are well adapted to xerophilic habitats, with some able to grow on honey and other high-sugar substrates (Orr et al., 1963). Asexual morphs are typically Oidiodendron-like or Malbranchea-like, producing arthroconidia from pigmented, erect conidiophores. Molecular phylogenetic analyses based on ITS, LSU, MCM7, and *RPB1* genes place *Myxotrichum* firmly within Myxotrichaceae (Helotiales, Leotiomycetes), closely related to *Oidiodendron* (Okubo et al., 2025). The neotype strain of *M. chartarum* is NBRC 31717, isolated from corrugated cardboard in a cellar in Sheffield, England, UK, and preserved in the NITE Biological Resource Center (NBRC).

Myxotrichum chartarum Kunze, in Kunze & Schmidt, Mykologische Hefte (Leipzig) 2: 110 (1823)

Index Fungorum number: IF224500; Facesoffungi number: FoF 18514

Description – Jamali (2023).

Material considered – Jamali (2023).

Distribution, ecological and economical importance

Members of *Myxotrichum* function as saprotrophs, decomposing cellulose- and keratin-rich materials, and play a role in nutrient cycling and organic matter breakdown in soil ecosystems. They are capable of colonising dry, nutrient-poor environments and may occur in association with stored products, books, building materials, and natural substrates such as decaying wood. The genus is widely distributed in temperate regions of Europe, North America, and Asia, with additional records from the Middle East, Australasia, and the Arctic. *M. chartarum* has been reported from Germany, Russia, Italy, France, Switzerland, the United Kingdom, Japan, Austria, the Czech Republic, the United States (Maine, Massachusetts, New York), and Canada (Ontario) (Okubo et al., 2025).

Figure – No original illustration available.

Oidiodendron Robak, Nytt Mag. Natur. 71: 245 (1932)

Index Fungorum number: IF9141; Facesoffungi number: FoF 16697, 30 morphological species (Species Fungorum, 2025), 25 species with molecular data.

Saprobes and mycorrhizal symbionts. Sexual morph: see Calduch et al. (2004). Asexual morph: see Rice and Currah (2005).

Type species – *Oidiodendron fuscum* Robak

Notes – *Oidiodendron* is characterised by erect, well-differentiated, dematiaceous conidiophores, smooth and melanised, usually arising singly or in small groups. The conidiophores are profusely dichotomously branched at the apex, bearing fertile branches that fragment basipetally into chains of arthroconidia. Conidia are thick-walled, melanised, globose to ellipsoidal, sometimes with warted or asperulate ornamentation depending on the species (smooth in *O. maius*, roughened in *O. tenuissimum*). The teleomorphs belong to *Myxotrichum* and *Byssoascus* (Myxotrichaceae). The genus was established by Robak (1932) from isolates obtained from wood pulp in Norway. Molecular phylogenetic analyses based on ITS and LSU sequences (Lacourt et al., 2001; Calduch et al., 2004) have placed *Oidiodendron* within Myxotrichaceae (Helotiales), closely related to *Myxotrichum* and *Byssoascus*, with multi-gene data providing strong support for this relationship. The original description of the type species did not designate a type specimen or depository.

Oidiodendron fuscum Robak, in Nyt, Mag. Naturvididensk. 71: 249 (1932) Figure 3.138

=*Oidiodendron tenuissimum* (Peck) S. Hughes, Can. J. Bot. 36: 790 (1958)

Index Fungorum number: IF265686; Facesoffungi number: FoF 18515

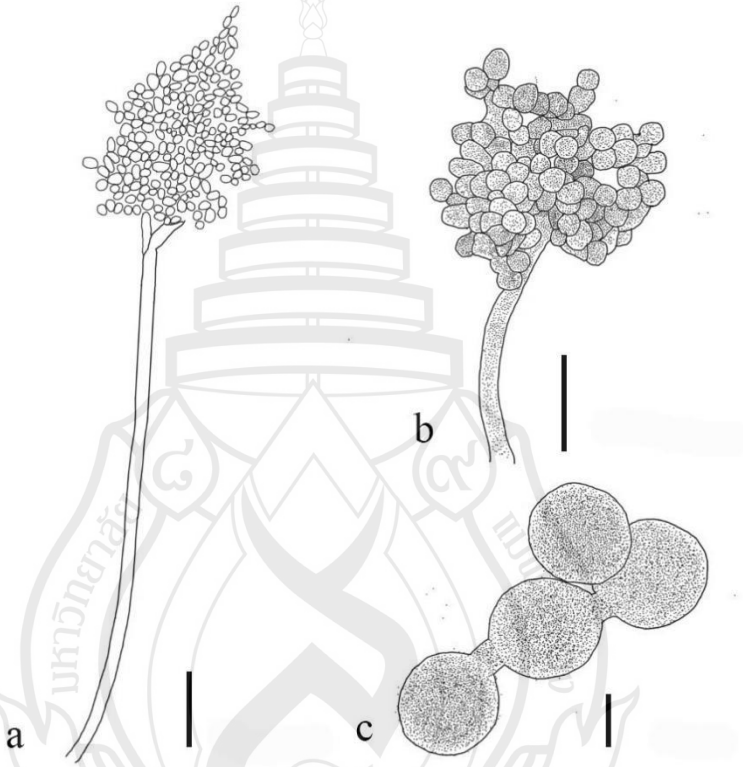
Description – Hughes (1958), Robak (1932).

Material considered – Hughes (1958), Robak (1932).

Distribution, ecological and economical importance

Oidiodendron species have important ecological roles, functioning primarily as saprobes and mycorrhizal symbionts. They decompose organic matter in peat, soil, humus, decaying wood, and lichens, thereby contributing to nutrient cycling in forest ecosystems. Certain species, such as *O. maius*, form ericoid mycorrhizas with members of the Ericaceae (e.g., *Vaccinium* spp.), enhancing nutrient acquisition in acidic, nutrient-poor soils (Rice & Currah, 2005). Some taxa may also interact antagonistically with plants, although pathogenicity is not well documented. These fungi have a

cosmopolitan distribution and are particularly common in temperate and boreal regions, especially in forest soils associated with ericaceous plants. They have been recorded from a wide range of habitats, including marine sediments, animal feces, human skin, foodstuffs, and indoor dust. They are often found in acidic and cool environments, particularly in climates where the mean summer temperature does not exceed 25°C (Rice & Currah, 2005).



Source Redrawn from Rice and Currah (2005)

Note a Tall, erect conidiophore bearing a dense head of thin-walled, subglobose to ellipsoidal conidia. b Conidiophore bearing a large, dense head of dimpled, asperulate, subglobose conidia. c Short chain of subglobose to ellipsoidal, dimpled, asperulate to minutely verruculose conidia. Scale bars: a = 15 µm, b = 10 µm, c = 1 µm.

Figure 3.138 *Oidiodendron fuscum*

Skoua A.A. Wynns, BMC Evol. Biol. 15(no. 145): 8 (2015)

Index Fungorum number: IF551198; Facesoffungi number: FoF 18516, 2 morphological species (Species Fungorum, 2025), 2 species with molecular data.

Obligate xerophiles, thriving in substrates with low water activity. Sexual morph: see Wynns, 2015 Asexual morph: Unknown.

Type species – *Skoua fertilis* (Stoppel) A.A. Wynns

Notes – *Skoua* was established by Wynns (2015) with *Skoua fertilis* as the type species, originally described from bee bread collected in Denmark. The genus is characterized by the presence of completely naked asci, lacking any ascocarp or protective tissue, and by hyaline, smooth-walled, globose to ellipsoidal ascospores, 4.5–6.5 × 2.5–4.0 μm (Wynns, 2015). Asci are evanescent, formed singly or in small groups without an organized hymenium, and accompanied by sparse paraphysis-like hyphae. No asexual morph is known. *Skoua* species are obligate xerophiles, thriving in substrates with very low water activity, such as bee bread, pollen provisions, and honey. These fungi exhibit osmophilic growth and morphological reduction of sexual structures, which are considered adaptations to high-sugar, low-moisture habitats. The genus is phylogenetically placed in the Myxotrichaceae (Helotiales, Leotiomycetes) based on LSU and SSU rDNA sequence data, and is closely related to *Myxotrichum* and *Oidiodendron* (Wynns, 2015; Rodríguez-Andrade et al., 2019). The holotype of *S. fertilis* is preserved in the Mycological Herbarium of the University of Copenhagen (C, C-F-12345; ex-type culture CBS 138592).

Skoua fertilis (Stoppel) A.A. Wynns, BMC Evol. Biol. 15(no. 145): 8 (2015) Figure 3.139

Index Fungorum number: IF551199; Facesoffungi number: FoF 18517

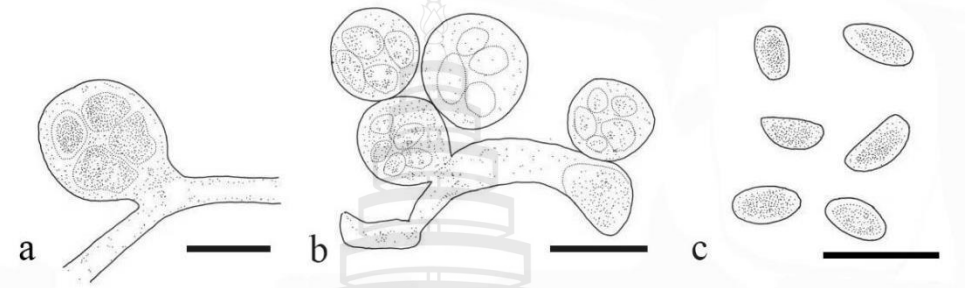
Description – Wynns (2015).

Material considered – Wynns (2015).

Distribution, ecological and economical importance

Skoua species are highly specialized xerophilic fungi occupying bee-associated microhabitats, particularly stored pollen (bee bread), honey, and occasionally other osmotic substrates. Their naked asci and lack of a protective fruiting body may facilitate dispersal through direct contact between bees and hive materials, representing a case of convergent evolution toward reduced ascocarp structures in bee-related niches.

Ecologically, *Skoua* contributes to the microbial community within bee provisions, where it may participate in slow decomposition processes under low water activity. The genus is rare, with *S. fertilis* recorded from Denmark and Spain (Wynns, 2015; Rodríguez-Andrade et al., 2019) and more recently from the gut of the willow wood borer (*Xiphydria prolongata*) in Turkey (Doğan et al., 2024), representing the first report from an insect digestive tract.



Source Redrawn from Wynns (2015)

Note a, b Naked asci. c Conidia. Scale bars: a, b = 10 µm, c = 20 µm.

Figure 3.139 *Skoua fertilis*

Neolauriomycetaceae Crous, in Crous, Wingfield, Burgess, Hardy, Gené, Guarro, Baseia, García, Gusmão, Souza-Motta, Thangavel, Adamčík, Barili, Barnes, Bezerra, Bordallo, Cano-Lira, de Oliveira, Ercole & Hubka, Persoonia 40: 359 (2018).

Index Fungorum number: IF825414; Facesoffungi number: FoF 05956

Neolauriomycetaceae was established by Crous et al. (2018) to accommodate chalara-like hyphomycetes that form a distinct and strongly supported monophyletic clade within Helotiales, clearly separated from morphologically similar families such as Pezizellaceae, Helotiaceae, and Hamatocanthoscyphaceae. Members of the family are characterised by phialidic conidiogenous cells that arise on sporodochial to synnematous conidiomata or solitary conidiophores. The phialides typically possess a well-developed basal venter and a cylindrical collarette with a deeply seated conidiogenous locus. Conidia are hyaline, aseptate, cylindrical to obclavate, and extruded in slimy heads or short chains. Chlamydospores and sexual morphs remain unknown.

In this study, we reconstructed a multigene phylogeny (Figure 3.140), which confirmed the systematic placement of Neolauriomycetaceae within Helotiales.

Molecular phylogenetic analyses based on ITS and LSU rDNA sequences consistently recover Neolauriomycetaceae as a well-supported lineage (Crous et al., 2018; Wu & Diao, 2023). The family currently comprises the genera *Neolauriomyces*, *Exochalara*, *Lareunionomyces*, and *Minichalara*, which share similar conidiogenesis and conidial morphology.

Species of Neolauriomycetaceae are saprobic on decaying leaves, twigs, and woody plant litter, with a preference for substrates such as *Eucalyptus* spp. and other trees in tropical and subtropical regions. They are ecologically important as decomposers in forest ecosystems, contributing to organic matter recycling and nutrient cycling. To date, no sexual morphs have been documented in this family.

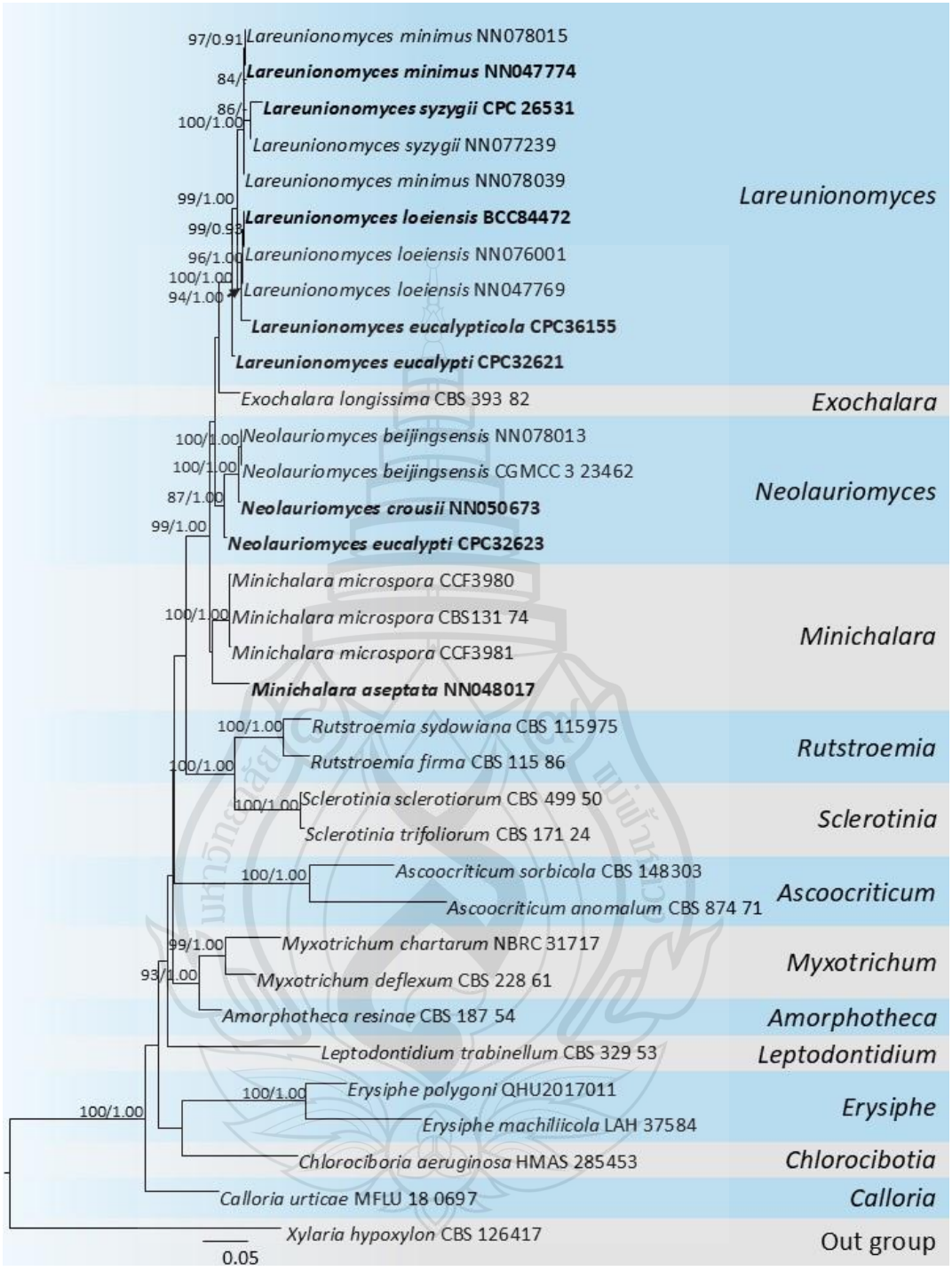


Figure 3.140 Maximum likelihood tree based on the combined ITS and LSU dataset of *Neolauriomycetaceae*

Figure 3.140 Bootstrap support values (MLBP ≥ 70%) and Bayesian posterior probabilities (BPP ≥ 0.90) are shown at nodes as MLBP/BPP. Values below these thresholds are indicated with a hyphen ("–"). Type strains are shown in bold.

Exochalara W. Gams & Hol.-Jech., Stud. Mycol. 13: 56 (1976)

Index Fungorum number: IF8232; Facesoffungi number: FoF 18518, 3 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on decaying wood and herbaceous stems. Sexual morph: Unknown. Asexual morph: see Wu and Diao (2023).

Type species – *Exochalara longissima* (Grove) W. Gams & Hol.-Jech.

Notes – *Exochalara* is characterised by cylindrical conidiophores with a few stalk cells and a terminal phialide bearing a funnel-shaped collarette. The conidia are hyaline, aseptate, and fusiform to slightly obclavate, forming chains. Molecular phylogenetic analyses based on combined LSU and ITS datasets have placed *Exochalara* within Neolauriomycetaceae (Crous et al., 2018; Wu & Diao, 2023). In phylogenetic trees, *Exochalara* forms a strongly supported clade within this family. Morphologically, it resembles *Minichalara* in having cylindrical conidiophores with a septate stalk and terminal phialide but differs in collarette morphology and conidial shape. The holotype specimen of *E. longissima* is preserved at CBS (CBS H-19995), collected from decaying wood in Taiwan by H.-J. Su in 1983.

Exochalara longissima (Grove) W. Gams & Hol.-Jech., Stud. Mycol. 13: 56 (1976) Figure 3.141

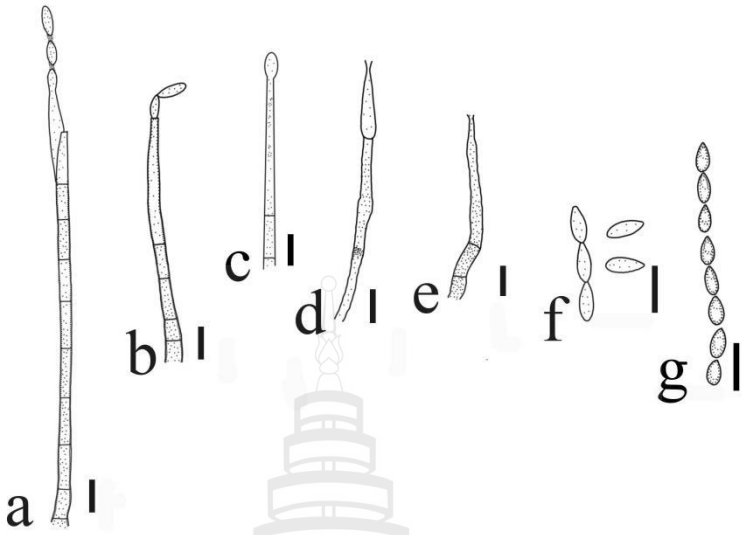
Index Fungorum number: IF314038; Facesoffungi number: FoF 18519

Description – Gams & Holubová-Jechová (1976); Réblová et al. (2011)

Material considered – Gams & Holubová-Jechová (1976); Réblová et al. (2011)

Distribution, ecological and economical importance

Species of *Exochalara* are saprobic fungi contributing to the decomposition of organic matter, particularly plant litter and decaying wood, thereby playing a role in nutrient cycling in terrestrial and aquatic ecosystems. They have a broad geographical distribution and are frequently isolated from plant debris in various habitats worldwide. *Exochalara longissima* has been reported from China, Malaysia, and Mexico (Kirschner et al., 2001), and similar habitats in tropical and subtropical regions.



Source Redrawn from Réblová et al. (2021)

Note a-e Conidiophores, conidiogenous cells and conidia. f, g = Conidia. Scale bars: a–e = 10 µm, f–g = 20 µm.

Figure 3.141 *Exochalara longissima*

Lareunionomyces Crous & M.J. Wingf., in Crous et al., Persoonia 36: 387 (2016)

Index Fungorum number: IF817053; Facesoffungi number: FoF 17728, 7 morphological species (Species Fungorum, 2025), 6 species with molecular data.

Saprobe on dead leaves of trees. Sexual morph: see Unknown. Asexual morph: see Crous et al. (2016).

Type species – *Lareunionomyces syzygii* Crous & M.J. Wingf.

Notes – *Lareunionomyces* is characterised by solitary, erect, subcylindrical conidiophores that are dark brown, smooth, septate, and thick-walled, with slightly swollen basal cells. The conidiogenous apparatus is penicillate, composed of pale brown, smooth, subcylindrical to clavate primary, secondary, and tertiary branches, with the uppermost branches giving rise to several phialides. Conidiogenous cells are pale brown to medium brown, flexuous, ampulliform to lageniform, with a prominent cylindrical collarette. Conidia are hyaline, smooth, guttulate, subcylindrical, and aseptate, with bluntly rounded apices and truncate bases, forming short chains that aggregate into slimy spore masses. Morphologically, *Lareunionomyces* is closely

related to *Exochalara* and *Neolauriomyces*, and all three genera were placed in the family Neolauriomycetaceae in 2018 based on combined morphological and molecular evidence. The type specimen of *L. syzygii* is deposited at PC (Herbarium of the Muséum National d'Histoire Naturelle, Paris) under the collection number J. L. Gueho 83/365, collected in 1983 from leaves of *Syzygium jambos* in Réunion, France.

Lareunionomyces syzygii Crous & M.J. Wingf., in Crous et al., Persoonia 36: 387 (2016) Figure 3.142

Index Fungorum number: IF817064; Facesoffungi number: FoF 18520

Description – Crous et al. (2016).

Material considered – Crous et al. (2016).

Distribution, ecological and economical importance

Lareunionomyces species are saprobic fungi that decompose organic matter, playing a crucial role in nutrient cycling within ecosystems. They are commonly found on plant litter in both terrestrial and submerged environments, indicating a broad ecological distribution (Wu & Diao, 2023).

The genus has been reported in various geographical locations, including South Africa and Thailand. For instance, *Lareunionomyces loeiensis* was identified as a new species based on morphological characteristics and phylogenetic analyses (Crous et al., 2018).



Source Redrawn from Crous et al. (2016)

Note a, b Conidiophores and conidia. Scale bars: a, b = 10 µm.

Figure 3.142 *Lareunionomyces syzygii*

Minichalara W.P. Wu & Y.Z. Diao, Fungal Diversity 119: 460 (2023)

Index Fungorum number: IF845260; Facesoffungi number: FoF 18521, 2 morphological species (Species Fungorum, 2025), 2 species with molecular data.

Saprobic on plant litter. Sexual morph: Unknown. Asexual morph: see Wu and Diao (2023).

Type species – *Minichalara aseptata* W.P. Wu & Y.Z. Diao

Notes – *Minichalara* is characterised by effuse, pale brown, superficial colonies with a hairy appearance. Mycelium partly immersed and partly superficial, composed of pale to medium brown, septate, branched hyphae with smooth, thin walls. Stroma and setae are absent. Conidiophores arise from superficial hyphae or aggregated cells, solitary or in small groups, erect, straight or slightly curved, simple, consisting of a short basal stalk and a terminal phialide. Phialides obclavate to subcylindrical or lageniform, pale to medium brown, smooth, with an abrupt transition from the venter to the collarette, often marked by a darker constriction. Conidia endogenous, extruded in short chains, cylindrical, with truncated or flattened ends, hyaline, aseptate.

Morphologically, *Minichalara* resembles *Chalara* s. str., *Constrictiochlara*, *Cylindro-chalara* and *Stipitiochlara*, but differs in having reduced conidiophores, obclavate to lageniform phialides, and narrower conidia (<1.5 μm). Phylogenetic analyses based on combined LSU and ITS datasets place *M. aseptata* and *M. microspora* within Leotiomycetes but not always forming a monophyletic clade. Their ITS sequences share low identity (89%), suggesting possible generic separation; further analyses with additional loci are required to confirm this. Molecular markers available for the genus include LSU and ITS. The holotype of the type species (*M. aseptata*, HMAS 352190 = Wu8110) was collected from dead leaves of an unidentified broadleaf tree in Shennongjia, Hubei Province, China, and the ex-type culture is preserved as CGMCC 3.23377 (= NN48017).

Minichalara aseptata W.P. Wu & Y.Z. Diao, Fungal Diversity 119: 460 (2023) Figure 3.143

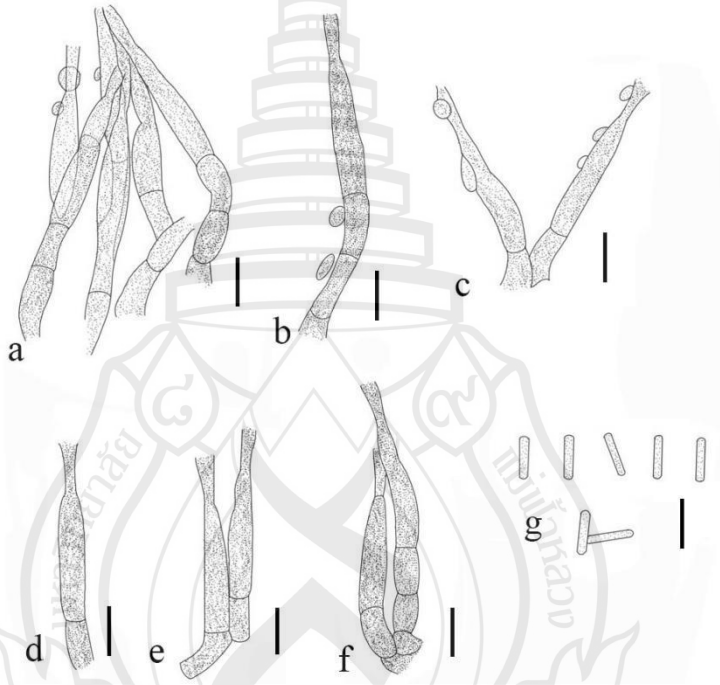
Index Fungorum number: IF845266; Facesoffungi number: FoF 18522

Description – Wu and Diao (2023).

Material considered – Wu and Diao (2023).

Distribution, ecological and economical importance

Minichalara comprises saprobic fungi decomposing plant litter, including dead leaves and occasionally fruitbodies of other fungi, contributing to nutrient cycling and organic matter decomposition. Species have been recorded from Asia (China), Europe (Czechoslovakia, Netherlands), and North America (USA), indicating a broad but scattered distribution. Further collections from different habitats are needed to clarify their ecology and global range.



Source Redrawn from Wu and Diao (2023)

Note a-f Conidiophores and phialides. g Conidia. Scale bars: a–g = 5 µm.

Figure 3.143 *Minichalara aseptata*

Neolauriomyces Crous, in Crous, Wingfield, Burgess, Hardy, Gené, Guarro, Baseia, García, Gusmão, Souza-Motta, Thangavel, Adamčík, Barili, Barnes, Bezerra, Bordallo, Cano-Lira, de Oliveira, Ercole & Hubka, Persoonia 40: 359 (2018)

Index Fungorum number: IF825415; Facesoffungi number: FoF 13999, 3 morphological species (Species Fungorum, 2025), 3 species with molecular data.

Saprobic fungus found on dead leaves and decaying wood. Sexual morph: Unknown. Asexual morph: see Wu and Diao (2023).

Type species – *Neolauriomyces eucalypti* Crous

Notes – *Neolauriomyces* is characterised by erect, subcylindrical, slightly flexuous, solitary and unbranched conidiophores, dark brown, smooth, septate, and thick-walled, terminating in a pale brown penicillate conidiogenous apparatus. Primary branches are subcylindrical to doliform, medium brown, smooth; secondary branches doliform to subcylindrical, bearing 1–2 ampulliform phialides. Phialidic conidiogenous cells are medium brown, smooth, with an apical cylindrical collarette. Conidia are endogenous, extruded in short dry chains, hyaline, smooth-walled, subcylindrical, aseptate, with truncate ends.

Phylogenetically, *Neolauriomyces* belongs to Neolauriomycetaceae and clusters with *Exochalara* and *Lareunionomyces* in multi-locus analyses. Molecular markers available include LSU and ITS. Additional taxa and collections are required to clarify species boundaries and assess intrageneric diversity. The holotype of the type species (*N. eucalypti*) is CBS H-23577, collected by P.W. Crous on 30 November 2016 from *Eucalyptus* leaves in Drummer Forest, Victoria, Australia. The ex-type culture is CPC 32623 (= CBS 144425).

Neolauriomyces eucalypti Crous, in Crous, Wingfield, Burgess, Hardy, Gené, Guarro, Baseia, García, Gusmão, Souza-Motta, Thangavel, Adamčík, Barili, Barnes, Bezerra, Bordallo, Cano-Lira, de Oliveira, Ercole & Hubka, Persoonia 40: 359 (2018) Figure 3.144

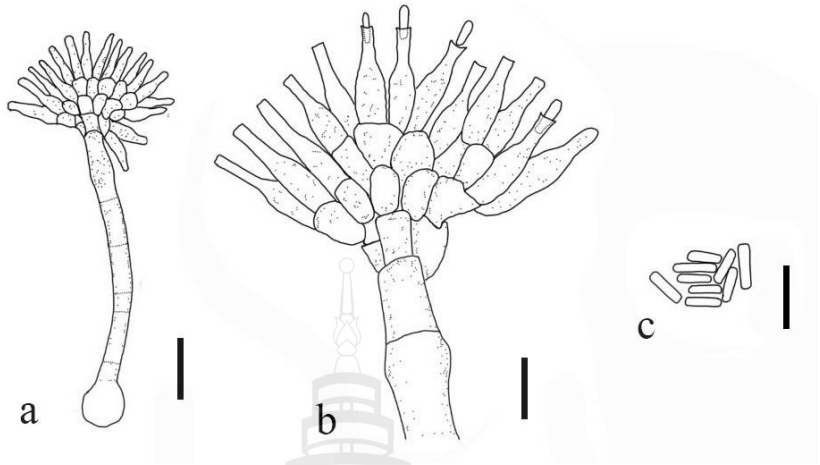
Index Fungorum number: IF825416; Facesoffungi number: FoF 18523

Description – Crous et al. (2018).

Material considered – Crous et al. (2018).

Distribution, ecological and economical importance

Neolauriomyces species are saprobic on plant litter, including dead leaves, decaying wood, and other plant debris, contributing to nutrient cycling and organic matter decomposition in forest ecosystems. They have been recorded from Australia, China, Colombia, France, and Thailand, indicating a wide but scattered distribution across tropical, subtropical, and temperate regions.



Source Redrawn from Crous et al. (2018)

Note a Conidiophores and apical fertile region with phialides. b Apical fertile regions with branches and termial phialides. c Conidia. Scale bars: a = 10 μm, b–c = 5 μm.

Figure 3.144 *Neolauriomyces eucalypti*

Patellariopsidaceae Karun., Camporesi & K.D. Hyde, in Karunarathna, Peršoh, Ekanayaka, Jayawardena, Chethana, Goonasekara, Cheewangkoon, Camporesi, Hyde, Lumyong & Karunarathna, Frontiers Microbiol. 11 (no. 906): 3 (2020)

Index Fungorum number: IF556719; Facesoffungi number: FoF 06573,

Patellariopsidaceae was introduced by Karunarathna et al. (2020) with *Patellariopsis atrovinosa* as the type species. It is classified in the phylum Ascomycota, class Leotiomycetes, order Helotiales, and forms a distinct clade closely related to Vibrisseaceae in phylogenetic analyses based on combined LSU and ITS datasets (Karunarathna et al., 2020; Tian et al., 2024).

Members of the family are characterised by superficial, black, globose to subglobose ascomata with a central ostiole, and a peridium composed of dark brown to black *textura angularis*. Asci are cylindrical to clavate, unitunicate, with a J+ apical ring. Ascospores are hyaline, aseptate, ellipsoidal to fusiform, and sometimes guttulate. In this study, a multigene phylogeny (Figure 3.118) confirmed the systematic placement of the family.

The asexual morph is coelomycetous, producing black sporodochia with conidiophores reduced to phialidic conidiogenous cells, which generate hyaline, aseptate, cylindrical to ellipsoidal conidia (Karunarathna et al., 2020). Species of

Patellariopsidaceae are saprobic on dead twigs, bark, and wood of both angiosperms and gymnosperms, contributing to lignocellulose decomposition and nutrient recycling in temperate and subtropical forest ecosystems. Records of the family are mainly from Asia (China: Sichuan, Yunnan) and Europe (Italy) at various elevations in forest habitats (Karunarathna et al., 2020; Tian et al., 2024).

Patellariopsidaceae resembles Vibrisseaceae in possessing black, superficial ascomata and hyaline, aseptate ascospores, but differs in having a coelomycetous asexual morph with reduced conidiophores. Additional collections and molecular data are required to clarify its diversity and phylogenetic relationships.

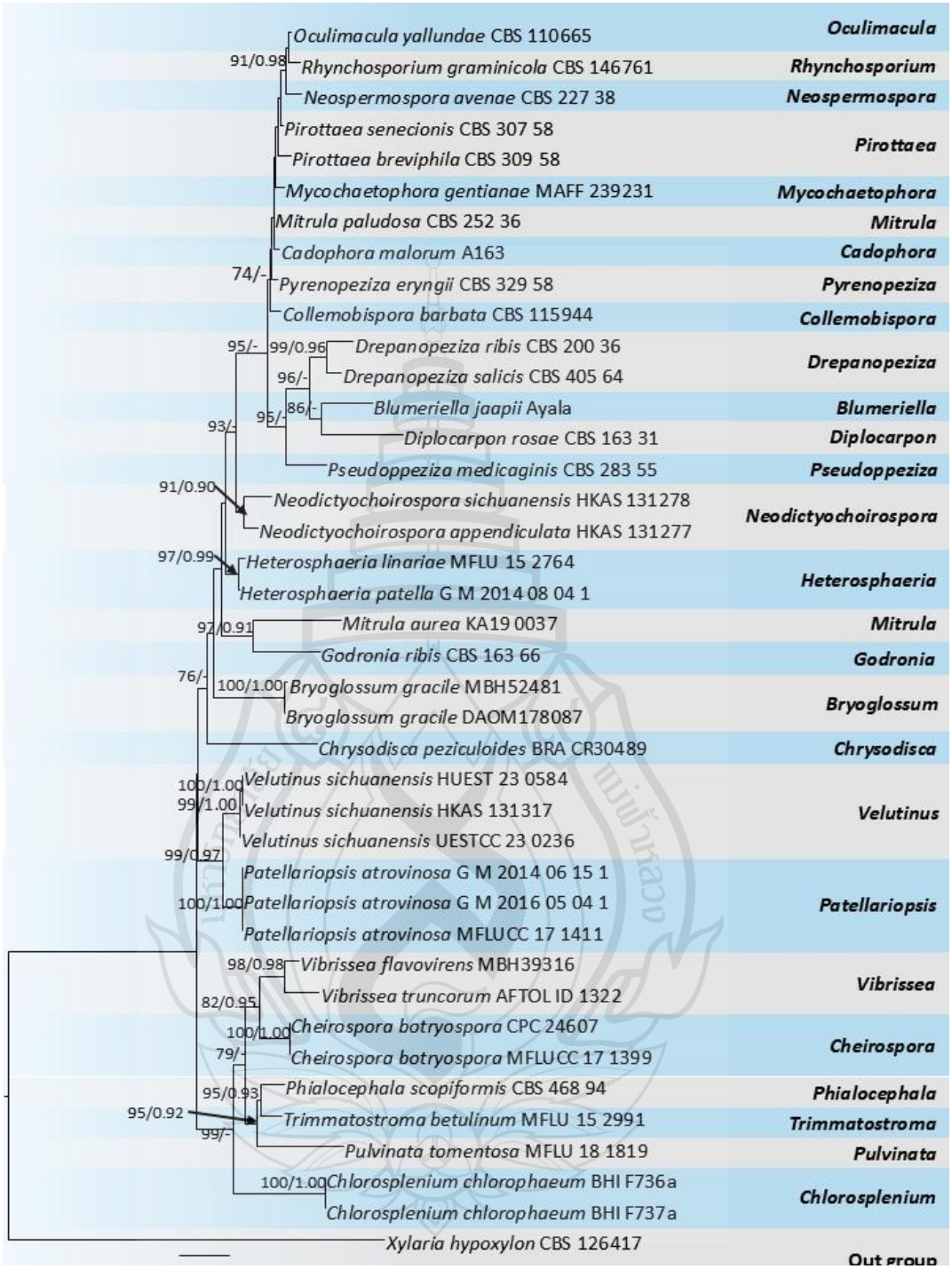


Figure 3.145 Maximum likelihood tree based on the combined ITS and LSU dataset of Patellariopsidaceae

Figure 3.145 Bootstrap support values (MLBP ≥ 70%) and Bayesian posterior probabilities (BPP ≥ 0.90) are shown at nodes as MLBP/BPP. Values below these thresholds are indicated with a hyphen ("–"). Type strains are shown in bold.

Patellariopsis Dennis, Kew Bull. 19(1): 114 (1964)

Index Fungorum number: IF3766; Facesoffungi number: FoF 06575, 5 morphological species (Species Fungorum, 2025), 2 species with molecular data.

Saprobic on dead branches of various host plants. Sexual morph: see Karunarathna et al., (2020). Asexual morph: see Karunarathna et al. (2020).

Type species – *Patellariopsis clavispora* (Berk. & Broome) Dennis

Notes – *Patellariopsis* is characterised by sessile, discoid apothecia with a darkly pigmented ectal excipulum composed of globose to angular cells. The asci are cylindric-clavate, amyloid, 8-spored, containing ellipsoid to fusoid, hyaline, and septate ascospores. The asexual morph is sporodochial, sub-epidermal or sub-peridermal, solitary, with cylindrical, straight or slightly curved, branched, septate, hyaline conidiophores that broaden toward the apices. Conidiogenous cells are holoblastic, polyblastic, cylindrical, integrated, hyaline, and smooth, producing spherical to cylindrical, thick-walled, dark brown, septate, smooth, cheiroid conidium-complexes. Molecular phylogenetic studies place *Patellariopsis* in the family Patellariopsidaceae. Additional taxon sampling and molecular data are required to clarify species boundaries and phylogenetic relationships within the genus. Common molecular markers used include ITS and LSU. The holotype of *P. clavispora* was collected by R.W.G. Dennis in Trinidad on leaves of *Eugenia* sp. and is deposited at the Royal Botanic Gardens, Kew (K(M) 151361) (Dennis, 1964).

Patellariopsis clavispora (Berk. & Broome) Dennis, Kew Bull. 19(1): 114 (1964) Figure 3.146

Index Fungorum number: IF335659; Facesoffungi number: FoF 18524

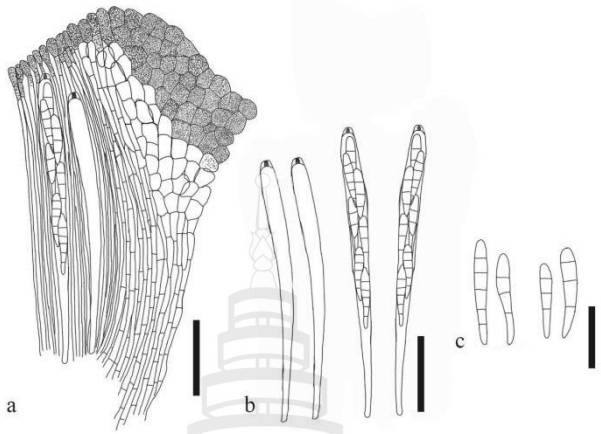
Description – Karunarathna et al. (2020), Dennis (1964).

Material considered – Karunarathna et al. (2020), Dennis (1964).

Distribution, ecological and economical importance

Patellariopsis species are saprobic, decomposing dead plant material such as branches and twigs, and thus contributing to nutrient cycling in forest ecosystems. For example, *P. atrovinosa* has been found on dead branches of *Crataegus* (hawthorn) and *Prunus laurocerasus* (cherry laurel). The genus has a wide distribution: *P. clavispora* is reported from British Columbia (Canada), while *P. atrovinosa* is known from France.

Members of the genus likely occur in temperate to subtropical regions, inhabiting diverse woody hosts.



Source Redrawn from Dennis (1964)

Note a Section of margin. b Asci. c Ascospores. Scale bars: a–c = 20 μm.

Figure 3.146 *Patellariopsis clavispora*

Velutinus N. Wu & Jian K. Liu, in Wu, Chethana & Liu, Phytotaxa 638(2): 168 (2024)

Index Fungorum number: IF901518; Facesoffungi number: FoF 15233, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on dead branches of medicinal plants (*Loropetalum chinense*). Sexual morph: Unknown. Asexual morph: see Wu and Liu (2024).

Type species – *Velutinus sichuanensis* N. Wu & Jian K. Liu

Notes – *Velutinus* was introduced by Wu et al. (2024) with *V. sichuanensis* as the type species. The genus is characterised by sporodochial, convex, spherical, dark brown to black conidiomata with a velvety surface covered by dense, short setae-like structures. Conidiophores are hyaline, cylindrical, straight or slightly curved, smooth, septate, and unbranched, often surrounded by a mucilaginous sheath. Conidiogenous cells are monoblastic, holoblastic, terminal, and integrated. Conidia are acrogenous, hyaline to pale brown, spherical or subglobose, arranged in branched acropetal chains, and bear hyaline, globose to subglobose basal appendages. No sexual morph has been observed. Molecular data, including ITS and LSU sequences, were generated for phylogenetic analysis, confirming the distinct placement of *Velutinus* within its lineage. The type specimen of *V. sichuanensis* was collected by Na Wu on 27 March 2021 from

dead branches of *L. chinense* in Qingcheng Mountain, Dujiangyan City, Chengdu, Sichuan Province, China. The holotype is deposited in HKAS (HKAS 131317) and the isotype in HUEST (HUEST 23.0222).

Velutinus sichuanensis N. Wu & Jian K. Liu, in Wu, Chethana & Liu, Phytotaxa 638(2): 168 (2024) Figure 3.147

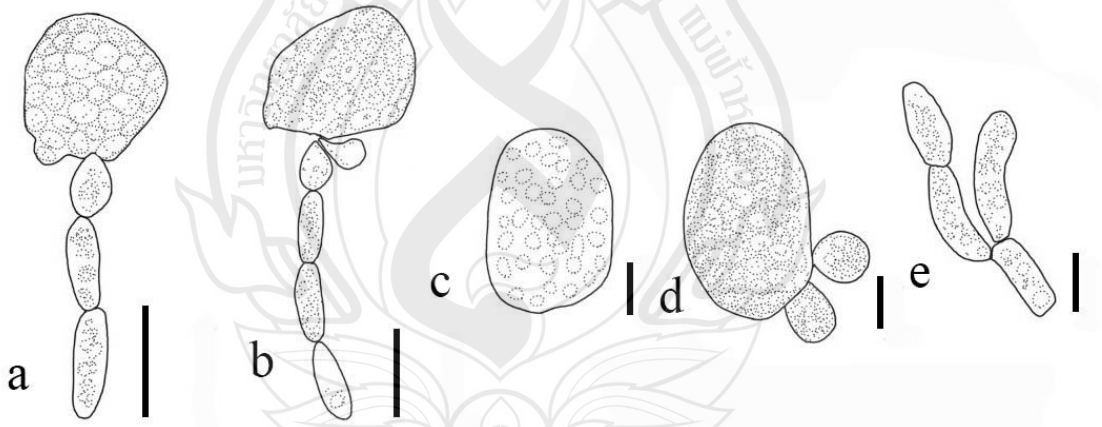
Index Fungorum number: IF901519; Facesoffungi number: FoF 15233

Description – Wu and Liu (2024).

Material considered – Wu and Liu (2024).

Distribution, ecological and economical importance

Velutinus is saprobic on dead branches of medicinal plants, contributing to the decomposition of woody plant material and playing a role in nutrient cycling within terrestrial forest ecosystems. It is currently known only from Qingcheng Mountain in Sichuan Province, China, where it was found on *L. chinense* var. *rubrum* (Hamamelidaceae) in subtropical evergreen broad-leaved forest. No economic applications have been documented to date (Wu et al., 2024).



Source Redrawn from Wu and Liu (2024)

Note a, b Conidia attached to the conidiophores. c, d Conidia. e Partial conidiophores. Scale bars: a, b = 20 µm, c–e = 10 µm.

Figure 3.147 *Velutinus sichuanensis*

Pezizellaceae Velen., Monogr. Discom. Bohem. (Prague): 154 (1934)

Index Fungorum number: IF81135; Facesoffungi number: FoF 05941,

Pezizellaceae was introduced by Velenovský (1934) with *Calycina herbarum* (Pers.) Gray as the type species. It is classified in the phylum **Ascomycota**, class **Leotiomycetes**, order **Helotiales**, and forms a distinct clade within the Helotiales, closely related to Hyaloscyphaceae and Lachnaceae, as confirmed in multigene phylogenetic analyses based on ITS, LSU, mtSSU and *RPB2* datasets (Baral & Rämä, 2015; Wu & Diao, 2023; Luo et al., 2025).

Members of the family are characterised by small to medium-sized apothecia, sessile to shortly stipitate, whitish, yellowish to orange or pale brown, occurring on decaying leaves, twigs, bark, wood, and sometimes algae or lichens. The ectal excipulum consists of hyaline *textura angularis* to *textura prismatica*, occasionally gelatinised. Marginal hairs are usually present, hyaline, septate, smooth to verrucose, sometimes with vacuolar bodies or resinous deposits. Asci are cylindric-clavate, mostly eight-spored, with an amyloid apical ring. Ascospores are hyaline, smooth, aseptate or rarely one-septate, ellipsoid to fusoid, and often contain lipid bodies. Paraphyses are filiform to slightly clavate, septate, and may contain refractive vacuoles.

The asexual morph is chalara-like, producing sporodochia or solitary conidiophores with phialidic conidiogenous cells that generate hyaline, aseptate, cylindrical conidia (Wu & Diao, 2023). Species of Pezizellaceae are saprobic on a wide range of plant substrates, with some taxa lichenicolous (e.g. *Calycina alstrupii*), contributing to litter decomposition and nutrient cycling in forest ecosystems.

Recent studies report new species and combinations worldwide, such as *Calycina papaeana* from China (Lestari & Hyde, 2022), *C. montana* comb. nov. from Thailand, and *C. botanica* and *C. xishuangbanica* from Yunnan (Luo et al., 2025). Pezizellaceae is therefore a morphologically and ecologically diverse family with a cosmopolitan distribution, but species diversity remains underexplored, and additional molecular data are required to resolve generic boundaries, especially within *Calycina* and allied genera.

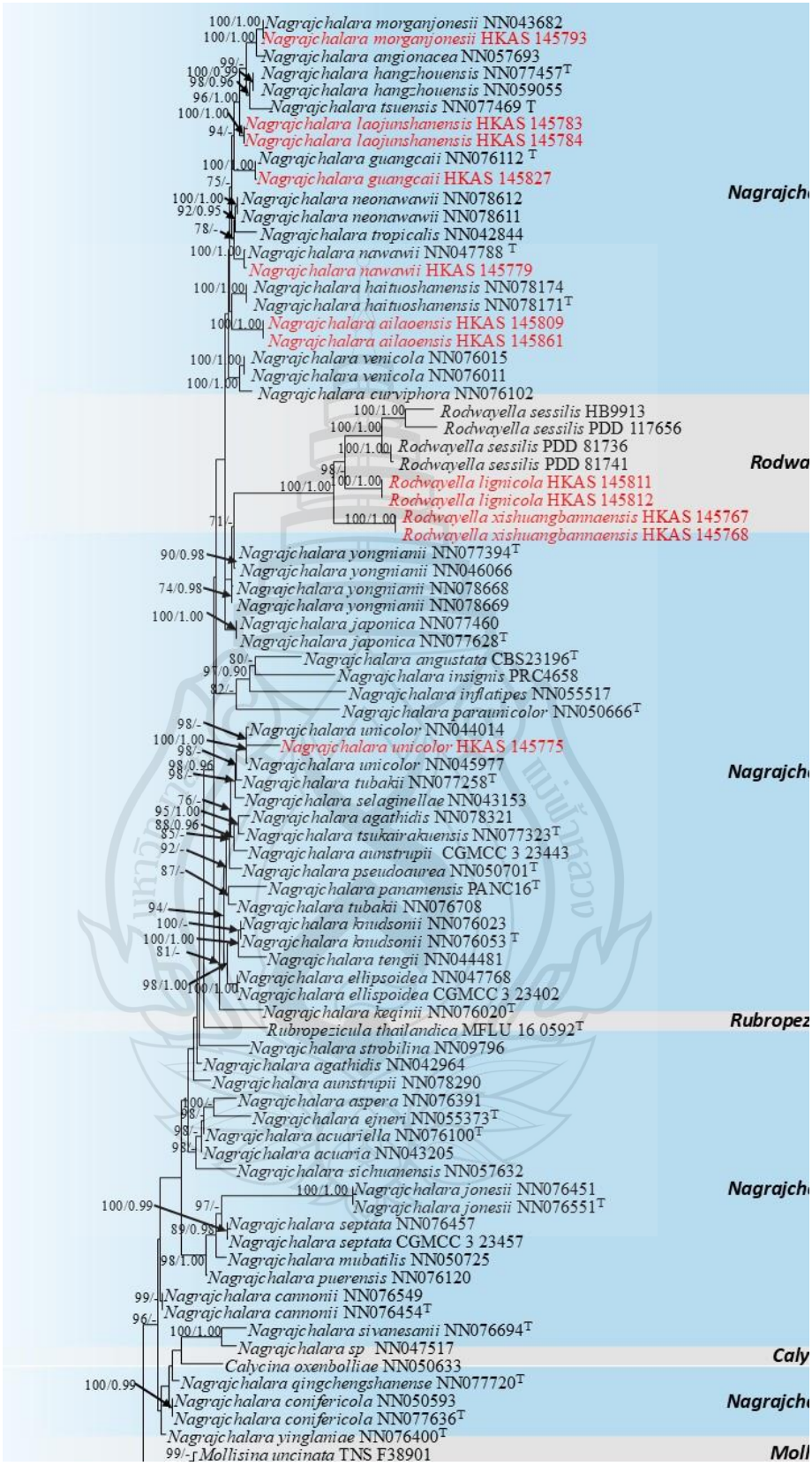


Figure 3.148 Maximum likelihood tree based on the combined ITS and LSU dataset of Pezizellaceae

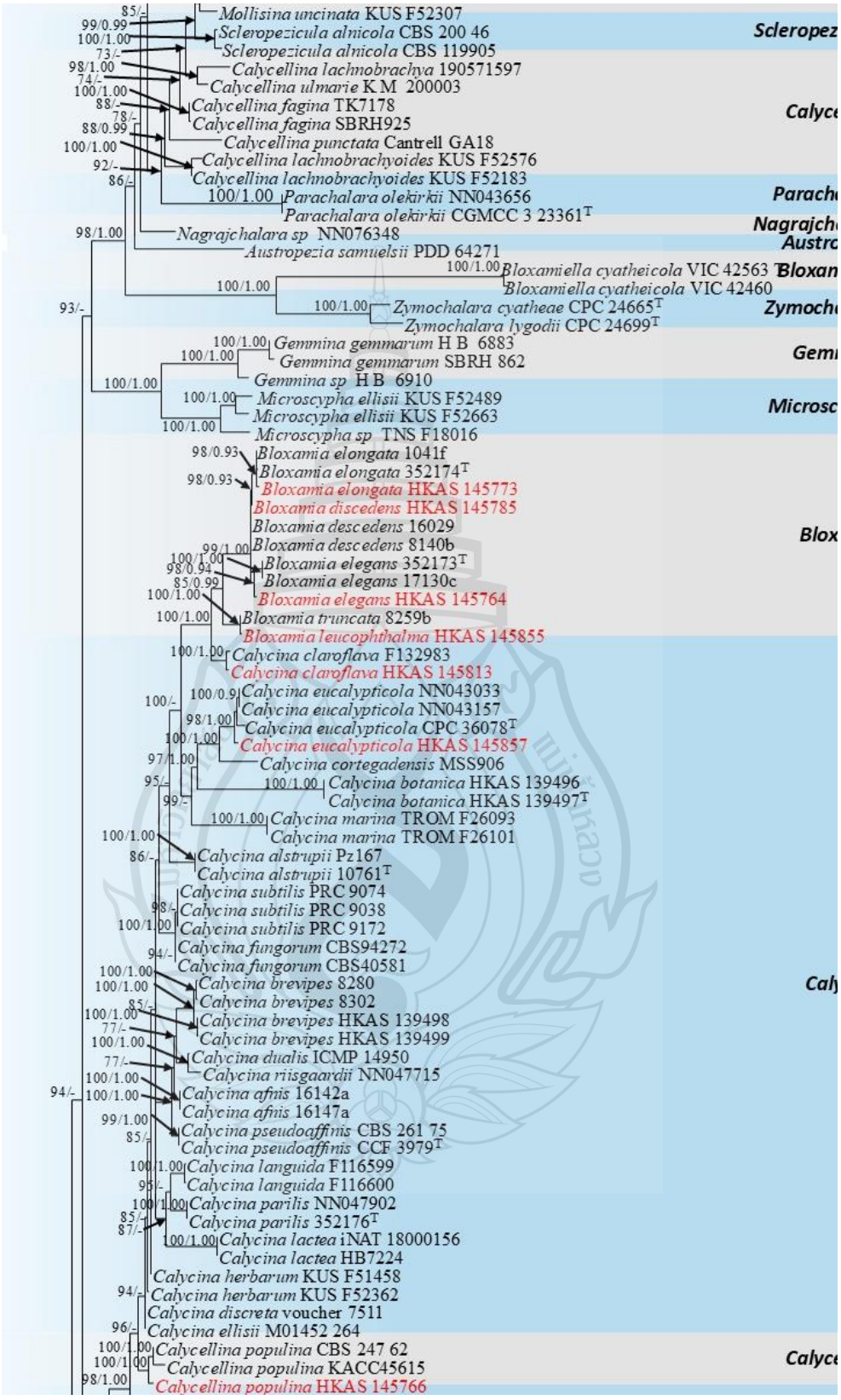


Figure 3.148 (continued)

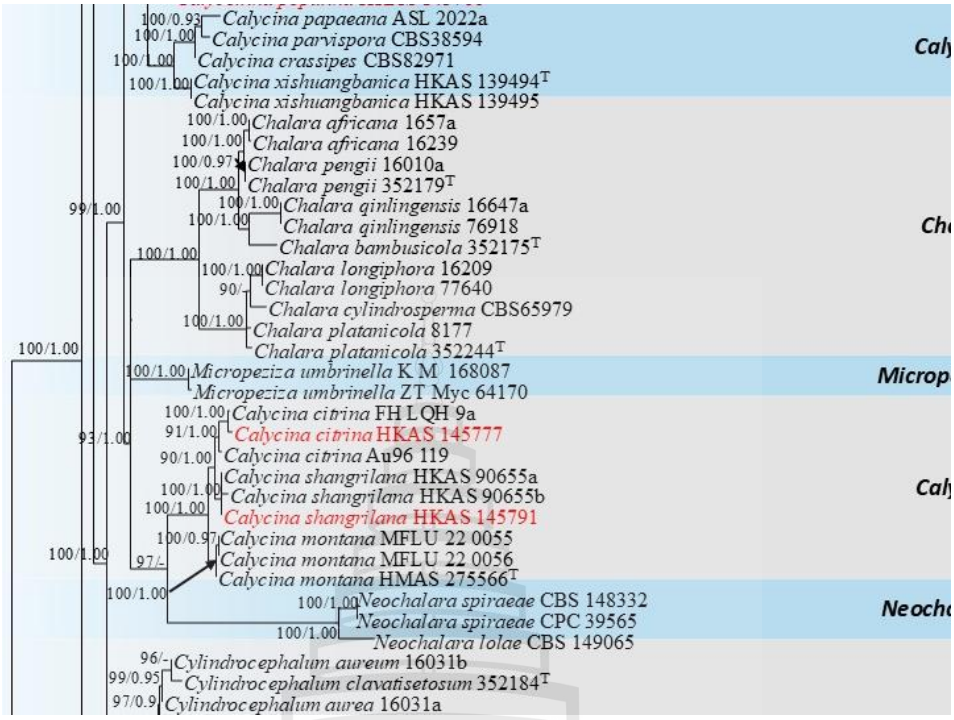


Figure 3.148 (continued)

Figure 3.148 Bootstrap support values (MLBP ≥ 70%) and Bayesian posterior probabilities (BPP ≥ 0.90) are shown at nodes as MLBP/BPP.

Bloxamia Berk. & Broome, Ann. Mag. nat. Hist., Ser. 2 13: 468 (1854)

Index Fungorum number: IF7406; Facesoffungi number: FoF 18845, 12 morphological species (Species Fungorum, 2025), 5 species with molecular data.

Saprobic on dead branches of medicinal plants (*Loropetalum chinense*). Sexual morph: Unknown. Asexual morph: see Wu and Liu (2024).

Type species – *Bloxamia leucophthalma* (Lév.) Höhn.

Notes – *Bloxamia* was established by Berkeley and Broome (1854) with *B. truncata* as the type species. The genus is characterised by sporodochial or synnematal, superficial, black to brown conidiomata, sometimes gelatinous when fresh, later dry and crustose. Conidiophores are macronematous, erect, cylindrical, septate, and aggregated into palisades over a basal stromatic layer. Conidiogenous cells are phialidic, cylindrical to subcylindrical, monophialidic, and typically possess a tubular collarette. Conidia are hyaline to subhyaline, unicellular, smooth, cylindrical to oblong, clavate, or truncate at one or both ends, and are produced singly, in slimy masses, or in short chains. No sexual morph has been observed.

Species of *Bloxamia* are saprobic, growing on decaying wood, bark, pine needles, or submerged stems of aquatic and helophytic plants. The genus encompasses taxa with both sporodochial (*B. truncata, B. hesterae, B. bohemica*) and synnematal (*B. nilagirica, B. foliicola*) conidiomata.

Molecular data (ITS, LSU, SSU) have been obtained for several species, supporting their placement in Helotiales, Pezizellaceae. However, phylogenetic analyses indicate that *Bloxamia* is **polyphyletic**, and some species have been transferred to the segregate genus *Bloxamiella* (Wu & Diao, 2023).The type specimen of *B. truncata* was collected on angiospermous wood in Britain and described by Berkeley and Broome in 1854, with additional material later cultured and studied by Glawe (1984).Further species, such as *B. hesterae* from submerged helophyte stems in the Netherlands, have expanded the ecological range of the genus to freshwater habitats.

Bloxamia elegans W.P. Wu & Y.Z. Diao, Fungal Diversity 119: 260 (2023)

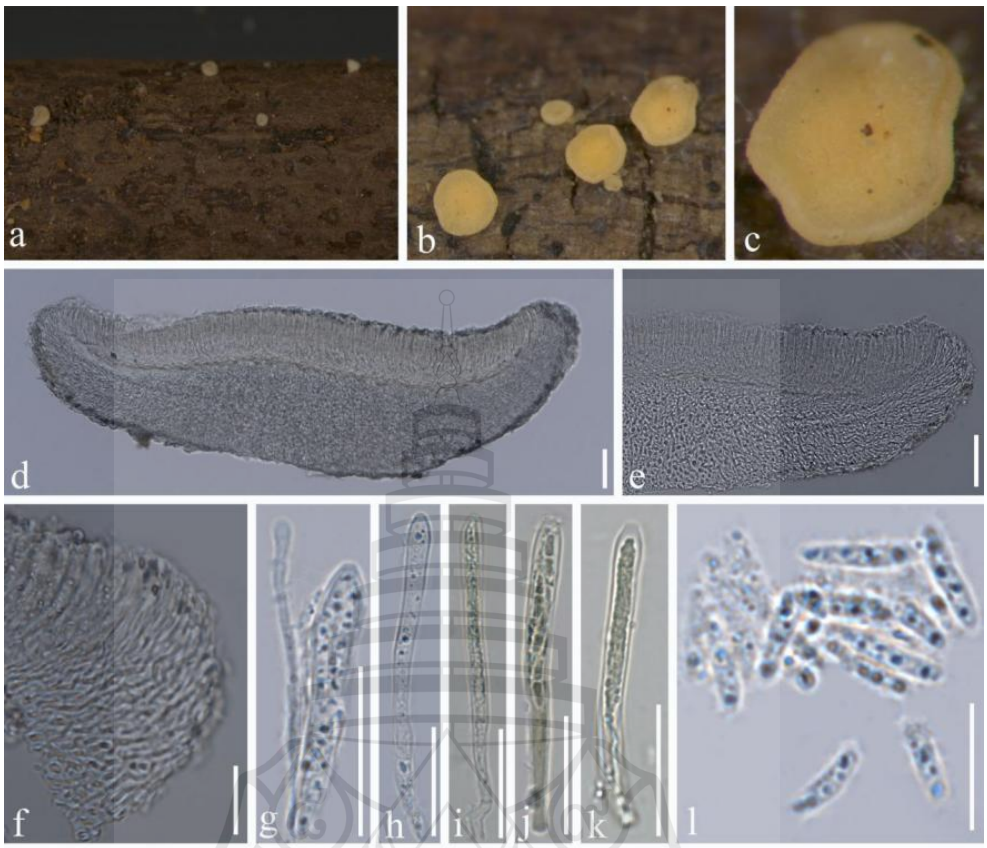
Index Fungorum: IF845310, Facesoffungi Number: FoF 18537, Figure 3.149

Description. Saprobic on decayed wood barks. Apothecia superficial, scattered to partly gregarious, 0.5–2.7 mm in diameter, discoid to cupulate, sessile, becoming concave when dry. Disc smooth, light yellowish brown when dry. Margin slightly curled inward, concolorous with receptacle. Receptacle light yellowish brown, glabrous. Hymenium 47–78 µm thick ($\bar{x}$ = 62 µm, n = 42), concave, smooth. Ectal excipulum 53–89 µm thick ($\bar{x}$ = 71 µm, n = 31), composed of thin-walled hyaline cells of textura porrecta to textura globulosa, 1.5–3.2 µm ($\bar{x}$ = 2.3 µm, n = 60) in diameter. Medullary excipulum 17–32 µm thick ($\bar{x}$ = 24 µm, n = 31), of hyaline, thin-walled textura globulosa to textura porrecta cells, 1.7–3.4 µm ($\bar{x}$ = 2.4 µm, n = 60), non-gelatinous. Paraphyses 29.6–53.9 × 0.9–1.9 µm ($\bar{x}$ = 37.3 × 1.4 µm, n = 25), filiform, straight to slightly curved, aseptate, unbranched, hyaline, smooth, with slightly obtuse apices. Asci 34.9–57.6 × 3.7–6.9 µm ($\bar{x}$ = 45.6 × 4.8 µm, n = 50), 8-spored, clavate, straight to slightly curved, inoperculate, hyaline, with thickened apex, J− in MLZ, arising from a long tapering stipitate base, occasionally with croziers. Ascospores (85/7/2) (7.3–)7.8–11.7(–13.1) × 0.9–1.7(–1.9) µm ($\bar{x}$ = 9.6 × 1.4 µm, n = 55), overlapping uniseriate, elongate to ellipsoidal or fusoid-clavate, ends rounded, hyaline, thin-walled, smooth, aseptate or occasionally 1-septate, containing 3–4 guttules. Asexual morph: not observed.

Material examined. China, Yunnan Province, Xishan District, altitude 2222 m, on the decayed unidentified twig, 11 November 2022, Le Luo, Ly1094 (HKAS 145764).

Notes. Our specimen Ly1094 (HKAS 145764) forms a strongly supported clade with *Bloxamia elegans* (HMAS 352173 and 17130c) (Figure 3.209), confirming its conspecificity with the type species. The original description of *B. elegans* (Wu & Diao, 2023) was based solely on the asexual morph, characterized by black sporodochia, densely aggregated phialidic conidiophores, and 3-septate cuboid conidia. In contrast, our collection represents the first observation of the sexual morph, displaying discoid to cupulate apothecia, asci, and ascospores, with no asexual structures present.

Molecular data support this identification: in ITS sequences, Ly1094 differs from *B. elegans* (HMAS 352173 and 17130c) by only 1.2% (6/506 bp), which is within the range of intraspecific variation. We therefore recognize Ly1094 as the sexual morph of *B. elegans*. This finding expands the knowledge of the species' reproductive modes, ecology, and distribution. Ecologically, our specimen was collected on decayed wood bark at 2222 m in Yunnan Province, while the holotype originated from rotten wood in Qingchengshan, Sichuan Province. This indicates that *B. elegans* has a wider ecological amplitude and geographic distribution than previously known.



Note a-c Apothecia on the host. d, e Cross section of an apothecium. f Excipular cells. g Paraphyses and Asci. h-k Asci (j, k mounted in Meltzer agent). l Ascospores. Scale bar: d, e = 50 μm; f–k = 20 μm; l = 10 μm.

Figure 3.149 *Bloxamia elegans* (HKAS 145764)

Bloxamia discedens W.P. Wu & Y.Z. Diao, Fungal Diversity 119: 261 (2023)

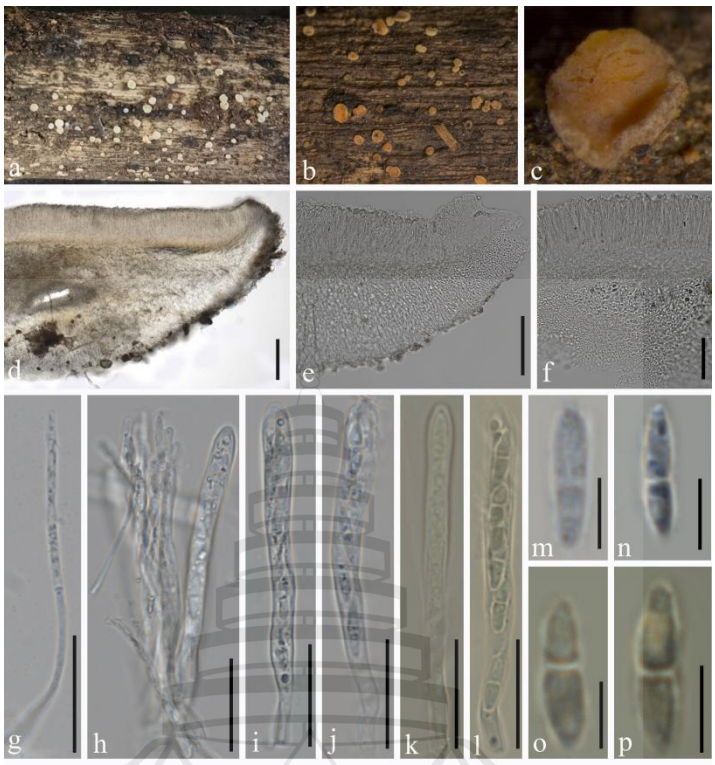
Index Fungorum: IF846920, Facesoffungi Number: FoF 18538, Figure 3.150

Description: *Saprobic* on decayed wood barks. **Sexual morph**: *Apothecia* superficial, scattered to gregarious, 0.7−1.9 mm in diameter, when dry, discoid to cupulate, sessile. *Disc* concave, surface smooth, grayish cream when fresh, light orange when dry. *Margin* slightly curl inward towards the disc, concolorous to the receptacle. *Receptacle* light orange to pale orange-brown when dry, glabrous. *Hymenium* 74–105 μm ($\bar{x}$ = 90 μm, n = 42), concave, surface smooth, light grayish-brown in dry. *Ectal excipulum* 102–149 μm ($\bar{x}$ = 123 μm, n = 31) thick, thin-walled, smooth, hyaline cells of *textura globulosa to textura porrecta*, 1.5–3.9 μm ($\bar{x}$ = 2.5 μm, n = 60) in diameter. *Medullary excipulum* 32–60 μm ($\bar{x}$ = 44 μm, n = 31) thick, hyaline, thin-walled cells of

textura globulosa to textura intricata, 2.6–5.4 µm ($\bar{x}$ = 4.1 µm, n = 60) in diameter, non-gelatinous. *Paraphyses* 40–90 × 1.1–2.3 µm ($\bar{x}$ = 62× 1.7 µm, n = 25) wide, filiform, straight to slightly curved, aseptate, hyaline, smooth, with slightly obtuse apex. *Asci* 35.0–77.9 × 4.0–6.4 µm ($\bar{x}$ = 56.3 × 5.2µm, n = 50), 8-spored, clavate, straight to slightly curved, inoperculate, hyaline, with a tapering long or short stipitate base, J– in MLZ. *Ascospores* (85/7/2) (5.3–)6.8–10.4(–11.1) × 1.5–2.9 (–3.2) µm ($\bar{x}$ = 8.9 × 3.0 µm, n = 55), overlapping uniseriate, elongate to ellipsoidal or fusoid-clavate with rounded ends, hyaline, thin-walled, smooth, 1-septate, with or without guttules. **Asexual morph**: Not observed.

Material examined. China, Yunnan Province, Heilongtan, altitude 1927 m, on the decayed unidentified twig, 30 July 2022, Le Luo, Ly137 (HKAS 145785).

Notes. Our specimen Ly137 (HKAS 145785) clustered in a well-supported clade with *Bloxamia discedens* (strains 8140b and 16029) (Figure 3.209), with negligible sequence divergence, confirming its conspecificity with this species. *Bloxamia discedens* was originally described by Wu and Diao (2023) from Guizhou Province, China, based solely on its asexual morph, which was characterized by black, discoid sporodochia, densely packed phialidic conidiophores, and entoblastic-phialidic conidia in slimy masses. In contrast, our collection Ly137 represents the first documentation of its sexual morph, comprising fully developed, sessile, discoid to cupulate apothecia, hyaline 8-spored asci, and fusoid to ellipsoidal, 1-septate ascospores, while no asexual features were observed. This discovery significantly expands the morphological concept of *B. discedens*. Ecologically, Ly137 was collected from decayed twig bark at an elevation of 1927 m in Yunnan Province, Southwest China, whereas previous records of the species were largely confined to lowland dead wood and branches in Guangxi, Jilin, Hubei, and other provinces, as well as reports from Brazil, Colombia, Haiti, Japan, and New Zealand. These findings suggest that *B. discedens* possesses a broader ecological breadth and wider geographic distribution than previously recognized, thriving in both temperate and subtropical forests across diverse altitudinal gradients.



Note a-c Apothecia on the host. d, e Cross section of an apothecium. f Excipular cells. g Paraphyses. h Paraphyses and Asci.i-l Asci (k, l mounted in Meltzer agent). m-p Ascospores. Scale bar: d, e = 100 µm; f = 50 µm; g–l = 20 µm; m-p = 5 µm.

Figure 3.150 *Bloxamia descedens* (HKAS 145785)

Bloxamia elongata W.P. Wu & Y.Z. Diao, Fungal Diversity 119: 261 (2023)

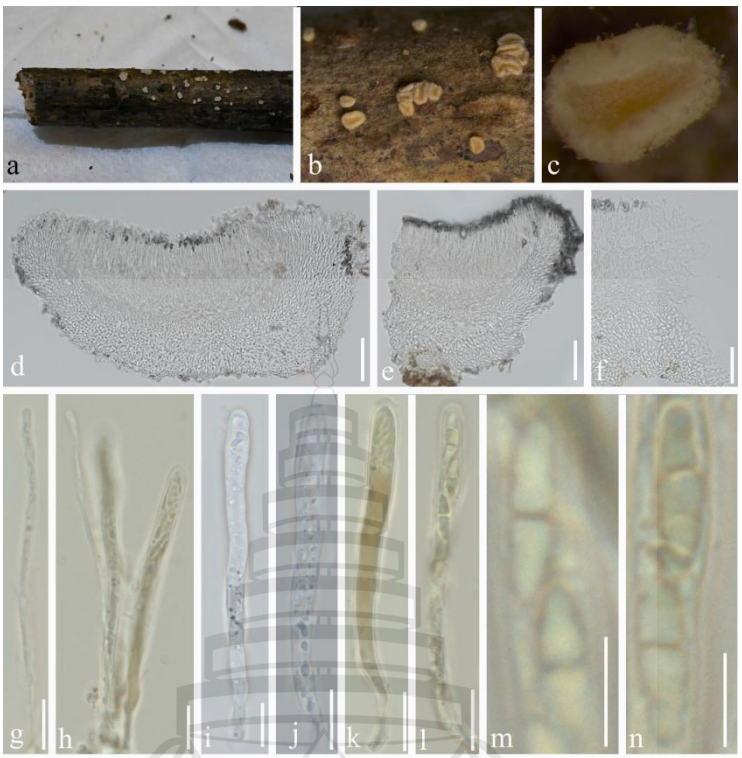
Index Fungorum: IF845311, Facesoffungi Number: FoF 18539, Figure 3.151

Description: *Saprobic* on decayed wood barks. **Sexual morph**: *Apothecia* superficial, scattered to gregarious, 0.6−1.1 mm in diameter, when dry, discoid to cupulate, sessile. *Disc* concave, surface smooth, light yellowish brown when dry. *Margin* slightly curl inward towards the disc, concolorous to the receptacle. *Receptacle*light yellowish brown when dry, glabrous. *Hymenium* 45–61 µm ($\bar{x}$ = 54 µm, n = 42), concave, surfacesmooth, grayish brown in dry. *Ectal excipulum* 45–75 µm ($\bar{x}$ = 58 µm, n = 31) thick, thin-walled, smooth, hyaline cells of *textura porrecta* to *textura globulosa*, 1.7–3.9 µm ($\bar{x}$ = 2.7 µm, n = 60) in diameter. *Medullary excipulum* 16–33 µm ($\bar{x}$ = 21 µm, n = 31) thick, hyaline, thin-walled cells of *textura porrecta*, 1.4–2.6 µm ($\bar{x}$ = 1.9 µm, n = 60) in diameter, non-gelatinous. *Paraphyses* 40–68 × 1.3–2.6 µm ($\bar{x}$ = 59× 1.7 µm, n = 25) wide, filiform, straight to slightly curved, aseptate, hyaline,

smooth, with slightly obtuse apex. *Asci* 39.4–76.2 × 2.8–6.5 µm ($\bar{x}$ = 57.3 × 4.9µm, n = 50), 8-spored, clavate, straight to slightly curved, inoperculate, hyaline, J– in MLZ, with a tapering long stipitate base. *Ascospores* (85/7/2) (4.1–)5.7–8.6(–9.8) × 1.0–2.1 (–2.3) µm ($\bar{x}$ = 6.9 × 1.7 µm, n = 55), uniseriate to partly biseriate, overlapping, elongate to ellipsoidal or fusoid-clavate with rounded ends, hyaline, thin-walled, smooth, 1-septate, eguttulate. **Asexual morph**: Not observed.

Material examined. China, Yunnan Province, Xishuangbanna, altitude 528 m, on the decayed unidentified twig, 1 September 2022, Le Luo, Ly633 (HKAS 145773).

Notes. Our specimen Ly633 (HKAS 145773) clustered in a well-supported lineage with *Bloxamia elongata* (HMAS 1041f and HMAS 352174) (Figure 3.209), with only 0.4% sequence divergence (2/450 bp) in the ITS region, confirming its conspecificity. *Bloxamia elongata* was originally described by Wu and Diao (2023) from Kunming Botanical Garden, Yunnan Province, based solely on its asexual morph, characterized by black sporodochia, aggregated phialidic conidiophores, and short oblong conidia with 1–4 septa. In contrast, our collection represents the first documentation of the sexual morph of this species, consisting of sessile, discoid to cupulate apothecia, hyaline 8-spored asci, and elongate to ellipsoidal, 1-septate ascospores, while no asexual structures were observed. This finding significantly broadens the morphological concept of *B. elongata*. Ecologically, Ly633 was collected from a decayed twig at 528 m elevation in Xishuangbanna, Southwest China, whereas the holotype was from ca. 1900 m elevation in Kunming Botanical Garden. This suggests that *B. elongata* is ecologically more plastic than previously recognized, occupying both lowland and montane habitats across a broad altitudinal range.



Note a-c Apothecia on the host. d, e Cross section of an apothecium. f Excipular cells. g Paraphyses. h Paraphyses and Asci. i-l Asci (k, l mounted in Meltzer agent). m, n Ascospores. Scale bar: d–f = 50 µm; g–l = 10 µm; m, n = 5 µm.

Figure 3.151 *Bloxamia elongata* (HKAS 145773)

Bloxamia leucophthalma (Lév.) Höhn., Sber. Akad. Wiss. Wien, Math.-naturw. Kl., Abt. 1 119: 653 (1910)

Index Fungorum: IF120782, Facesoffungi Number: FoF 18540, Figure 3.152

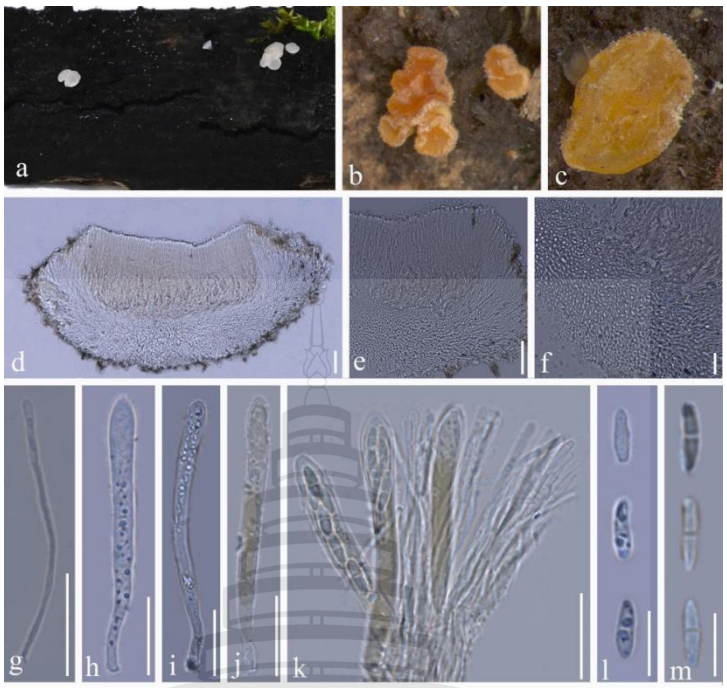
Description. Saprobic on decayed bark. Sexual morph: Apothecia superficial, scattered to gregarious, 0.4−0.8 mm in diameter, discoid to cupulate, sessile. Disc concave, surface smooth, pale grayish beige when fresh, turning brownish yellow when dry. Margin slightly incurved towards the disc, concolorous with the receptacle. Receptacle pale orange-brown when dry, glabrous. Hymenium 76–110 µm ($\bar{x}$ = 91 µm, n = 42) thick, concave, smooth, pale orange-brown when dry. Ectal excipulum 80–124 µm ($\bar{x}$ = 95 µm, n = 31) thick, composed of hyaline thin-walled cells of textura globulosa to textura porrecta, 1.7–4.5 µm ($\bar{x}$ = 2.9 µm, n = 60) in diameter. Medullary excipulum 33–60 µm ($\bar{x}$ = 44 µm, n = 31) thick, of hyaline, thin-walled cells of textura globulosa, 0.8–2.1 µm ($\bar{x}$ = 1.2 µm, n = 60) in diameter, non-gelatinous. Paraphyses

46–81 × 1.2–2.6 µm ($\bar{x}$ = 67 × 1.8 µm, n = 25), filiform, straight to slightly curved, aseptate, hyaline, smooth, with slightly obtuse apices. Asci 57.5–81.3 × 4.0–7.9 µm ($\bar{x}$ = 65.7 × 5.8 µm, n = 50), 8-spored, clavate, straight to slightly curved, inoperculate, hyaline, with a slightly thickened apex wall, J– in MLZ, arising from a long tapering stipitate base. Ascospores (85/7/2) (7.6–)8.2–12.1(–13.1) × 1.8–2.3(–2.5) µm ($\bar{x}$ = 10.5 × 2.1 µm, n = 55), multi-seriate, overlapping, elongate to ellipsoidal or fusoid-clavate with rounded ends, hyaline, thin-walled, smooth, 1-septate, eguttulate or with a few guttules. Asexual morph: Not observed.

Material examined. China, Yunnan Province, Xishuangbanna, altitude 1755.7 m, on the decayed unidentified twig, 6 September 2022, Le Luo, ly797 (HKAS 145855).

Notes. Our specimen Ly797 (HKAS 145855) forms a strongly supported monophyletic clade with Bloxamia leucophthalma (strain 8259b) in the phylogenetic analysis (Figure 209), with maximum support values of 100% MLBP and XX% BIPP, confirming its conspecificity. In the ITS region, Ly797 differs from strain 8259b by only 0.2% (1/466 bp), representing intraspecific variation. Bloxamia leucophthalma was originally described as *Catinula leucophthalma* by Léveillé (1848) from the bark of *Ulmus* in France, and later transferred to *Bloxamia* by Höhnel (1910), who distinguished it from *B. truncata* based on spore size and apothecial features. The protologue reported unusually small “ascospores” (2–2.2 µm), which are inconsistent with modern collections and likely represent immature spores or misinterpreted structures, a common issue in early Helotiales descriptions. Our specimen closely resembles the original description in apothecial habit and color, but with mature ascospores measuring 8.2–12.1(–13.1) µm, providing a more accurate morphological concept of the species.

To date, *B. leucophthalma* has not been reported from China. Therefore, Ly797 (HKAS 145855) represents the first record of this species from China, extending its distribution from Europe to subtropical montane forests of Yunnan Province. Its identification is robustly supported by both morphological characteristics and molecular data.



Note a-c Apothecia on the host. d, e Cross section of an apothecium. f Excipular cells. g Paraphyses. h-j Asci (j mounted in Meltzer agent). k Paraphyses and Asci. l, m Ascospores. Scale bar: d, e = 50 µm; f –k = 20 µm; l, m = 10 µm.

Figure 3.152 *Bloxamia leucophthalma* (HKAS 145855)

Calycina Nees ex Gray, Nat. Arr. Brit. Pl. (London) 1: 669 (1821)

Index Fungorum number: IF770; Facesoffungi number: FoF 18846, 38 morphological species (Species Fungorum, 2025), 17 species with molecular data.

Saprobic on decaying leaves, dead branches, bark, other plant litter. Sexual morph: Han et al., (2014). Asexual morph: Luo et al. (2025).

Type species – *Calycina herbarum* (Pers.) Gray

Notes – *Calycina* was established by Gray (1821) with *C. herbarum* (Pers.) Gray as the type species (Dumont, 1972). The genus is characterised by small to medium-sized, sessile to shortly stipitate apothecia, disc-like to pulvinate, whitish to yellow, orange or ochraceous. The receptacle surface is smooth to slightly hairy, with marginal hairs often reduced or absent; when present, they are hyaline to pale, thin-walled, smooth or faintly ornamented, aseptate to sparsely septate. The ectal excipulum is composed of thin- to moderately thick-walled *textura prismatica* to *textura angularis,* frequently gelatinised in wet or mature apothecia. Asci are cylindric to clavate, eight-

spored, usually arising from croziers, and bear hemi-amyloid to amyloid apical rings. Ascospores are hyaline, smooth, ellipsoid to fusiform or subcylindrical, aseptate or 1-septate, sometimes enclosed by a thin gelatinous sheath. Paraphyses are filiform to slightly clavate or capitate, with vacuolar bodies and often slightly thickened apices. Asexual morphs are chalara-like, producing hyaline, cylindrical, aseptate conidia from phialidic conidiogenous cells (Luo et al., 2025).

Molecular data (ITS, LSU, mtSSU, *RPB2*) confirm *Calycina* as a distinct clade within Pezizellaceae, separated from Hyaloscyphaceae. The type specimen of *C. herbarum* was collected in Europe on decaying herbaceous material and is preserved in Persoon's collections, later stabilised under Gray's treatment (1821) and formally typified by Dumont (1972).

Calycina claroflava (Grev.) Kuntze [as 'clariflava'], Revis. gen. pl. (Leipzig) 3(3): 448 (1898)

Index Fungorum: IF587813, Facesoffungi Number: FoF 18532, Figure 3.153

Description. Saprobic on decayed wood barks. Sexual morph: Apothecia superficial, scattered to gregarious, 0.3–1.1 mm in diameter, discoid to cupulate, sessile, concave when dry. Disc bright yellow when fresh, yellowish-orange when dry, smooth, with margin slightly incurved, concolorous with the receptacle. Receptacle light yellowish-brown when dry, glabrous. Hymenium 73–110 µm ($\bar{x}$ = 97 µm, n = 42) thick, concave, smooth, yellowish-orange when dry. Ectal excipulum 26–95 µm ($\bar{x}$ = 58 µm, n = 31) thick, composed of hyaline, thin-walled textura porrecta cells, 1.1–3.1 µm ($\bar{x}$ = 1.9 µm, n = 60) diam. Medullary excipulum 30–80 µm ($\bar{x}$ = 48 µm, n = 31) thick, composed of hyaline, thin-walled *textura globulosa* to *textura intricata* cells, 1.6–4.5 µm ($\bar{x}$ = 2.8 µm, n = 60) diam., non-gelatinous. Paraphyses 32–85 × 1.3–2.1 µm ($\bar{x}$ = 58.8 × 1.6 µm, n = 25), filiform, straight to slightly curved, septate, unbranched, hyaline, smooth, with slightly obtuse apex. Asci 57.2–81.3 × 3.1–5.8 µm ($\bar{x}$ = 69.1 × 4.3 µm, n = 50), 8-spored, clavate, straight to slightly curved, inoperculate, hyaline, J– in MLZ, with a long tapering stipitate base. Ascospores (85/7/2) (4.4–)5.1–7.4(–8.1) × 1.3–2.2(–2.4) µm ($\bar{x}$ = 6.1 × 1.9 µm, n = 55), elongate, ellipsoidal to fusoid-clavate, with rounded ends, hyaline, thin-walled, smooth, 1-septate, eguttulate. Asexual morph: Not observed.

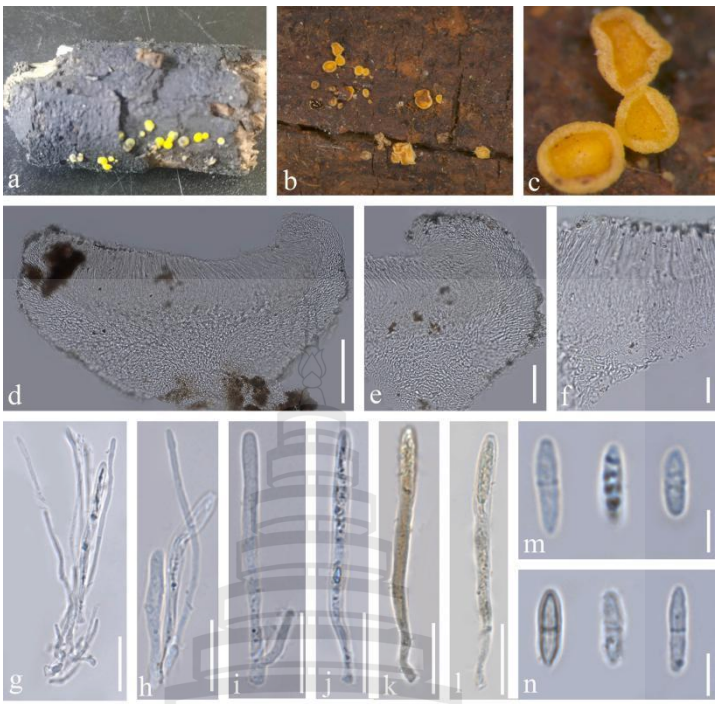
Material examined. China, Yunnan Province, Changchong Mountain, altitude 2162 m, on the decayed unidentified twig, 15 August 2022, Le Luo, Ly178 (HKAS 145813).

Notes. Our specimen Ly178 (HKAS 145813) forms a strongly supported clade with *Calycina claroflava* (strain F132983) in the phylogenetic tree (Figure 3.209), with maximum support values of 100% MLBP and XX% BIPP, confirming its taxonomic placement. In the ITS region, Ly178 differs from strain F132983 by only 0.8% (4/481 bp), indicating intraspecific variation.

Calycina claroflava was originally described as *Peziza claroflava* by Greville (1824) from Great Britain, occurring on decayed wood and branches. The apothecia were described as bright yellow, minute, obconical, concave, with a darker hymenium and slightly raised margin. Kuntze (1898) later transferred it to *Calycina*. Our collection from Changchong Mountain agrees well with the protologue in substrate preference, apothecial size (0.3–1.1 mm diam., consistent with "not half a line broad" ≈ ≤1 mm), bright yellow pigmentation, and concave disc.

Microscopically, Ly178 exhibits clavate, inoperculate asci, hyaline fusoid-clavate 1-septate ascospores, and filiform paraphyses with obtuse apices, fully consistent with the generic concept of *Calycina*. Although no asexual morph was observed, the combined morphological and molecular evidence confirms its conspecificity.

To date, *Calycina claroflava* has not been reported from China (Species Fungorum, 2025; Index Fungorum, 2024). Thus, Ly178 (HKAS 145813) represents the first record of *C. claroflava* from China, extending its distribution from Europe and other regions to East Asia, and demonstrating that this species thrives in subtropical montane forests as well as its previously known habitats.



Note a-c Apothecia on the host. d, e Cross section of an apothecium. f Excipular cells. g Paraphyses. h Paraphyses and Asci. i-l Asci (k, l mounted in Meltzer agent). m, n Ascospores. Scale bar: d = 100 µm; e = 50 µm; f–l = 20 µm; m, n = 5 µm.

Figure 3.153 *Calycina claroflava* (HKAS 145813)

Calycina eucalypticola (Crous) W.P. Wu, in Wu & Diao, Fungal Diversity 119: 279 (2023)

Index Fungorum: IF846915, Facesoffungi Number: FoF 18533, Figure 3.154

Description: *Saprobic* on decayed wood barks. **Sexual morph**: *Apothecia* superficial, scattered to gregarious, 0.3−0.6 mm in diameter, when dry, discoid to cupulate, sessile. *Disc* concave, surface smooth, pale olive-brown when dry. *Margin* slightly curl inward towards the disc, concolorous to the receptacle. *Receptacle* pale olive-brown when dry, glabrous. *Hymenium* 41–87 µm ($\bar{x}$ = 65 µm, n = 42), concave, surface slightly rough, deep yellowish brown when dry, with scattered small projections. *Ectal excipulum* 52–88 µm ($\bar{x}$ = 75 µm, n = 31) thick, thin-walled, smooth, hyaline cells of *textura porrecta* to *textura globulosa*, 1.8–4.2 µm ($\bar{x}$ = 2.8 µm, n = 60) in diameter. *Medullary excipulum* 47–75 µm ($\bar{x}$ = 57 µm, n = 31) thick, hyaline, thin-walled cells of *textura globulosa*, 1.6–3.4 µm ($\bar{x}$ = 2.5 µm, n = 60) in diameter, non-gelatinous. *Paraphyses* 36–88 × 0.8–1.7 µm ($\bar{x}$ = 60× 1.2 µm, n = 25) wide, filiform, straight to

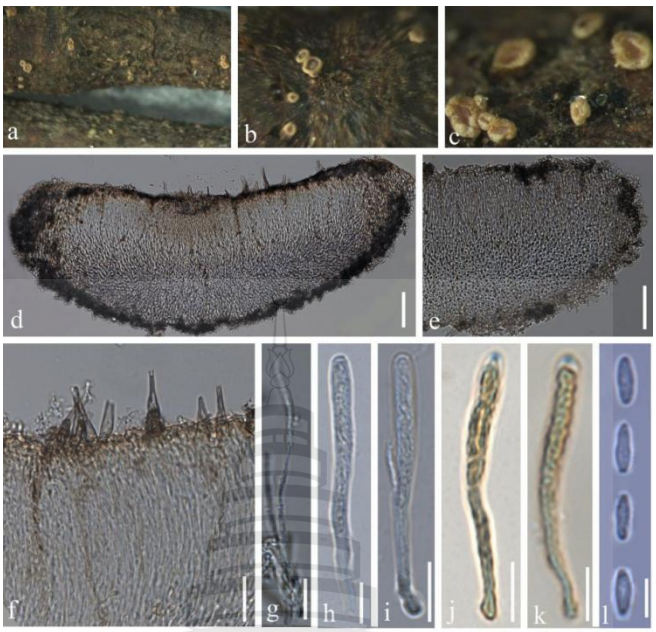
slightly curved, septate, unbranched, hyaline, smooth, with slightly obtuse apex. *Asci* 30.5–63.7 × 1.7–5.1 µm ($\bar{x}$ = 26.8 × 3.8µm, n = 50), 8-spored, clavate, straight to slightly curved, inoperculate, hyaline, J+ in MLZ, with a tapering long stipitate base. *Ascospores* (85/7/2) (3.1–)3.4–6.3(–6.9) × 1.3–2.4(–2.6) µm ($\bar{x}$ = 5.2 × 2.0 µm, n = 55), overlapping uniseriate or partly biseriate, elongate to ellipsoidal or fusoid-clavate with rounded ends, hyaline, thin-walled, smooth, aseptate, eguttulate. **Asexual morph**: Not observed.

Material examined. China, Yunnan Province, Tengchong City, altitude 1555 m, on the decayed unidentified twig, 20 August 2022, Le Luo, Ly353 (HKAS 145857).

Notes. Our specimen Ly353 (HKAS 145857) formed a strongly supported monophyletic clade with *Calycina eucalypticola* (strains NN043033, NN043157, CPC 36078) in the phylogenetic tree (Figure 3.209), with maximum support values of 100% MLBP and XX% BIPP, confirming its conspecificity with this species. In the ITS region, Ly353 differs from reference strains by only 2.0% (10/516 bp), 0.6% (3/476 bp), and 0.6% (3/476 bp), representing intraspecific variation.

Calycina eucalypticola was originally described as *Chalara eucalypticola* from *Eucalyptus* leaves and twigs in South China (Crous et al., 2019), and later transferred to *Calycina* by Wu and Diao (2023) based on phylogenetic evidence. Previous records were largely based on the asexual morph, whereas the sexual state has rarely been documented. Our collection provides one of the few confirmed records of the sexual morph, characterized by small discoid to cupulate, pale olive-brown apothecia, clavate inoperculate asci with a J+ apical ring, filiform paraphyses, and smooth, aseptate, fusoid-clavate ascospores. The hymenium of Ly353 is distinctive in being roughened with scattered small projections, a feature not noted in the protologue and possibly related to developmental stage or substrate effects.

This is the first record of *C. eucalypticola* from Yunnan Province, Southwest China, extending its known distribution within China and documenting the rare occurrence of its sexual morph in nature.



Note a-c Apothecia on the host. d Cross section of an apothecium. **e** Excipular cells. f *Hymenium* with scattered small projections. g Paraphyses. h-k Asci (j, k mounted in Meltzer agent). l, m Ascospores. Scale bar: d, e = 50 µm; f = 20 µm; g–k = 10 µm; l = 5 µm.

Figure 3.154 *Calycina eucalypticola* (HKAS 145857)

Calycina citrina (Hedw.) Gray, Nat. Arr. Brit. Pl. (London) 1: 670 (1821)

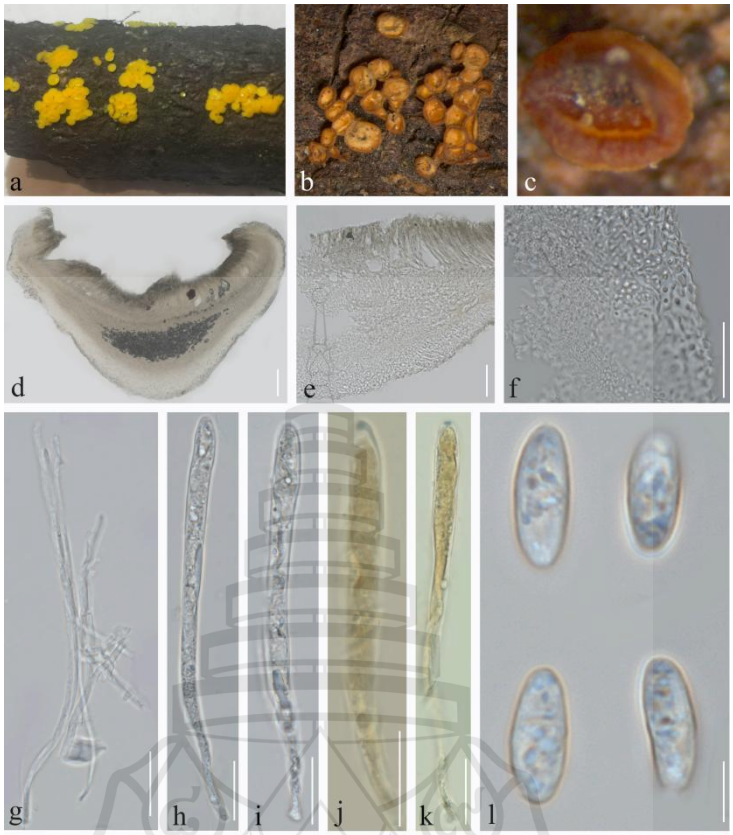
Index Fungorum: IF491731, Facesoffungi Number: FoF 18535, Figure 3.155

Description. Saprobic on decayed wood bark. Sexual morph: Apothecia superficial, gregarious, 0.8–2.2 mm in diameter when dry, discoid to cupulate, sessile. Disc concave, surface smooth, bright yellow when fresh, turning dark reddish brown when dry. Margin slightly incurved towards the disc, concolorous with the receptacle. Receptacle bright yellow when fresh, dark reddish brown when dry, glabrous. Hymenium 99–149 µm ($\bar{x}$ = 113 µm, n = 42) thick, smooth, bright yellow when fresh, dark reddish brown when dry. Ectal excipulum 33–46 µm ($\bar{x}$ = 39 µm, n = 31) thick, of thick-walled, smooth, hyaline cells of textura globulosa, 1.6–3.9 µm ($\bar{x}$ = 2.9 µm, n = 60) in diameter. Medullary excipulum 38–68 µm ($\bar{x}$ = 57 µm, n = 31) thick, composed of hyaline, thin-walled cells of textura porrecta to textura globulosa, 2.3–4.9 µm ($\bar{x}$ = 3.5 µm, n = 60) in diameter, non-gelatinous. Paraphyses 47–88 × 1.1–2.1 µm ($\bar{x}$ = 69 × 1.6 µm, n = 25), filiform, straight to slightly curved, aseptate, unbranched, hyaline,

smooth, with slightly obtuse apices. Asci 57.5–102.6 × 5.2–8.9 µm ($\bar{x}$ = 86.3 × 7.2 µm, n = 50), 8-spored, clavate, straight to slightly curved, inoperculate, hyaline, with thickened apical wall, J+ in MLZ, tapering to a long stipitate base. Ascospores (85/7/2) (8.5–)9.5–11.1(–11.8) × 2.6–4.8(–5.2) µm ($\bar{x}$ = 10.3 × 4.1 µm, n = 55), overlapping, uniseriate to partly biseriate, ellipsoidal to fusoid-clavate with rounded ends, hyaline, thin-walled, smooth, aseptate, occasionally guttulate. A sexual morph: Not observed.

Material examined. China, Yunnan Province, Ailao Mountain, altitude 2451 m, on the decayed unidentified twig, 26 August 2022, Le Luo, Ly593 (HKAS 145777).

Notes. Our specimen Ly593 (HKAS 145777) forms a strongly supported monophyletic clade with reference strains of *Calycina citrina* (FH LQH-9a and Au96-119) in the phylogenetic tree (Figure 3.209), with maximum support values of 100% MLBP and XX% BIPP, clearly confirming its taxonomic placement. ITS sequence divergence between Ly593 and the reference strains is only 1.0% (5/485 bp) and 1.6% (8/492 bp), which falls within the range of intraspecific variation. *Calycina citrina* is one of the most widely reported species of the genus, originally described as *Octospora citrina* by Hedwig (1789) and later transferred to *Calycina* by Gray (1821). The protologue emphasized its bright lemon-yellow apothecia, varying in size, sometimes with a short conical stipe, usually on dry twigs or trunks, especially *Fagus*. Our collection Ly593 shares the diagnostic features of the species, including sessile, bright yellow apothecia that darken upon drying, clavate inoperculate asci with a J+ apical reaction in MLZ, and ellipsoidal to fusoid-clavate, aseptate, hyaline ascospores, sometimes containing guttules. The apothecia of Ly593 reach up to 2.2 mm in diameter, slightly exceeding some published ranges, but well within the species' known morphological variation. The ectal and medullary excipulum show typical *Calycina*-type tissues (textura porrecta to globulosa), and the paraphyses are filiform with slightly obtuse apices. Although *C. citrina* is broadly distributed in temperate regions of Europe and North America, molecularly confirmed records remain relatively scarce. The present collection from Ailao Mountain (Yunnan, China, 2451 m) represents the first molecularly confirmed record of *C. citrina* from China, thereby expanding both its ecological amplitude (occurring on unidentified twigs instead of *Fagus*) and its known geographic distribution in East Asia.



Note a-c Apothecia on the host. d, e Cross section of an apothecium. f Excipular cells. g Paraphyses. h-k Asci (j, k mounted in Meltzer agent). l Ascospores. Scale bar: d = 100 µm; e, f = 50 µm; g–k = 20 µm; l = 5 µm.

Figure 3.155 *Calycina citrina* (HKAS 145777)

Calycina shangrilana (W.Y. Zhuang & H.D. Zheng) J.K. Mitch., Quijada, P.R. Johnst. & Pfister, Mycologia 114(4): 726 (2022)

Index Fungorum: IF842854, Facesoffungi Number: FoF 18536, Figure 3.156

Description: *Saprobic* on decayed wood barks. **Sexual morph**: *Apothecia* superficial, scattered, 0.7−2.8 mm in diameter, when dry, discoid to cupulate, sessile. *Disc* concave, surface smooth, pale brownish-yellow when fresh, bright orange-brown when dry. *Margin* slightly curl inward towards the disc, concolorous to the receptacle. *Receptacle* bright orange-brown when dry, glabrous. *Hymenium* 107–142 µm ($\bar{x}$ = 121 µm, n = 42), concave, surface smooth, deep orange-brown in dry. *Ectal excipulum* 26–51 µm ($\bar{x}$ = 43 µm, n = 31) thick, thick-walled, smooth, hyaline cells of *textura globulosa*, 2.5–6.3 µm ($\bar{x}$ = 4.2 µm, n = 60) in diameter. *Medullary excipulum* 55–83

µm ($\bar{x}$ = 69 µm, n = 31) thick, hyaline, thin-walled cells of *textura oblita* to *textura intricata*, 0.9–2.5 µm ($\bar{x}$ = 1.6 µm, n = 60) in diameter, non-gelatinous. *Paraphyses* 52–106 × 0.9–1.8 µm ($\bar{x}$ = 78× 1.1 µm, n = 25) wide, filiform, straight to slightly curved, aseptate, unbranched, hyaline, smooth, with slightly obtuse apex. *Asci* 67.4–89.7 × 3.9–7.6 µm ($\bar{x}$ = 75.4 × 5.7µm, n = 50), 8-spored, clavate, straight to slightly curved, inoperculate, hyaline, J+ in MLZ, with a tapering long stipitate base. *Ascospores* (85/7/2) (4.8–)5.4–7.1(–7.7) × 2.3–3.9 (–4.3) µm ($\bar{x}$ = 6.3 × 3.3 µm, n = 55), uniseriate, overlapping, ellipsoidal to fusiform, hyaline, thin-walled, smooth, aseptate, eguttulate. **Asexual morph**: Not observed.

Material examined. China, Yunnan Province, Laojun Mountain, altitude 3823 m, on the decayed unidentified twig, 22 July 2022, Le Luo, Ly33 (HKAS 145791).

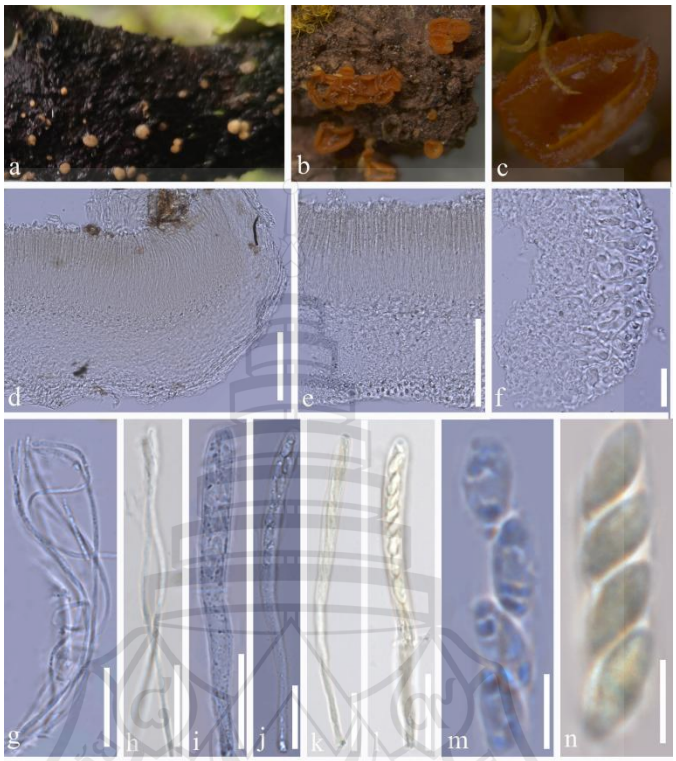
Notes. Our specimen Ly33 (HKAS 145791) forms a strongly supported monophyletic clade with *Calycina shangrilana* strains (HKAS 90655a and HKAS 90655b) in the phylogenetic tree (Figure 3.209), with maximum support values of 100% MLBP and ** BIPP, clearly confirming its taxonomic placement. In the ITS region, Ly33 differs from these strains by only 1.1% (10/872 bp) and 1.3% (11/870 bp), indicating intraspecific variation.

Calycina shangrilana was originally described as *Bisporella shangrilana* by Zhuang and Zheng (2017) from Shangri-La, Yunnan Province, and was later recombined into *Calycina* by Mitch et al. (2022) based on molecular and morphological evidence. The type strain (HMAS 275568) is characterized by stipitate, pinkish-orange apothecia, a gelatinized ectal excipulum of *textura intricata*, and a euamyloid (J+) apical ring in the ascus.

Our collection Ly33 shares these diagnostic features, including discoid to cupulate apothecia up to 2.8 mm in diameter, bright orange-brown coloration, J+ clavate asci, and ellipsoidal to fusiform, aseptate, hyaline ascospores. Although our collection is sessile rather than stipitate, this difference is interpreted as morphological plasticity rather than taxonomic distinction, given the strong molecular congruence.

Importantly, Ly33 was collected from Laojun Mountain at 3823 m, which is significantly higher than the type locality (Shangri-La, ca. 3300 m). This constitutes a **new geographical and altitudinal record of** *C. shangrilana* **in Yunnan, China**, and

suggests that the species occupies a broader ecological range in the alpine regions of southwestern China than previously recognized.



Note a-c Apothecia on the host. d, e Cross section of an apothecium. f Excipular cells. g Paraphyses. h-l Asci (k, l mounted in Meltzer agent). m, n Ascospores. Scale bar: d, e = 100 μm; f–l = 20 μm; m, n = 5 μm.

Figure 3.156 *Calycina shangrilana* (HKAS 145791)

Calycellina Höhn., Sber. Akad. Wiss. Wien, Math.-naturw. Kl., Abt. 1 127(8-9): 601 (1918)

Index Fungorum number: IF767; Facesoffungi number: FoF 18847, 51 morphological species (Species Fungorum, 2025), 7 species with molecular data.

Saprobic on decaying leaves, dead branches, bark, bamboo culms, mosses, and other plant litter. Sexual morph: Unknown. Asexual morph: see Wu and Diao (2023).

Type species – *Calycellina punctata* (Fr.) Lowen & Dumont.

Notes – *Calycellina* was established by Höhnel (1918) with *C. punctiformis* (≡ *Peziza punctiformis* Grev.) as the type species. Members of the genus are characterised by very small, whitish to pale apothecia, usually sessile to shortly stipitate, often with a conspicuous dark basal cell layer (Lowen & Dumont, 1984). The ectal excipulum

consists of thin- to moderately thick-walled *textura prismatica* or *angularis*, with marginal hyphae extending as short hyphoid hairs (von Bonsdorff et al., 2016). Asci are cylindric-clavate, eight-spored, with a distinct hemi-amyloid apical apparatus. Ascospores are hyaline, smooth, one- to four-celled, ellipsoid to fusiform, arranged uniseriately or biseriately in the ascus. Paraphyses are filiform, septate, sometimes slightly enlarged apically (Helleman, 2012).

Species of *Calycellina* are saprobic, occurring on fallen leaves, twigs, ferns, mosses, and bark in forest litter. Several taxa are linked to chalara-like anamorphs with phialidic conidiogenous cells, indicating connections between sexual and asexual morphs (Nag Raj & Kendrick, 1975; Wu & Diao, 2023). The genus has a broad distribution, especially in temperate regions of Europe, North America, and Asia, but species have also been reported from South America and Oceania (Lowen & Dumont, 1984; von Bonsdorff et al., 2016). Molecular data (ITS, LSU, SSU) support the placement of *Calycellina* within Hyaloscyphaceae, distinct from closely related genera such as *Calycina* and *Mollisia* (Wu & Diao, 2023). The type specimen of *C. punctiformis* was originally collected by R.K. Greville from fallen oak leaves in Scotland and preserved in European herbaria; epitypification was later proposed based on modern collections (Lowen & Dumont, 1984).

Calycellina populina (Fuckel) Höhn., Sber. Akad. Wiss. Wien, Math.-naturw. Kl., Abt. 1 127(8-9): 601 (1918)

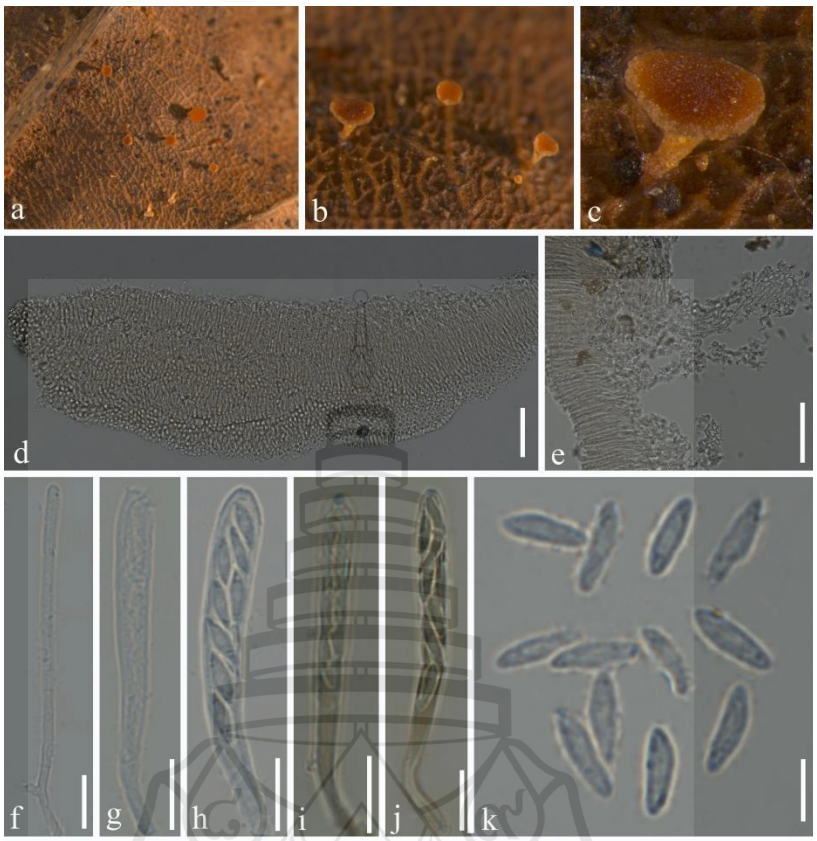
Index Fungorum: IF275063, Facesoffungi Number: FoF 18534, Figure 3.157

Description. Saprobic on decayed leaf litter. Sexual morph: Apothecia superficial, scattered to gregarious, 0.4−0.9 mm in diameter, 0.4−0.7 mm high when dry, discoid to cupulate, stipitate. Disc concave, surface smooth, dark reddish-brown when dry. Margin slightly curved inward, concolorous with receptacle. Receptacle wider than stipe, orange-brown when dry, glabrous. Stipe short and broad, 0.1−0.2 mm in diameter, 0.3−0.5 mm long, orange-brown. Hymenium 75–98 µm ($\bar{x}$ = 85 µm, n = 42) thick, concave, smooth, dark reddish-brown when dry. Ectal excipulum 32–62 µm ($\bar{x}$ = 42 µm, n = 31) thick, composed of thin-walled, hyaline textura globulosa cells, 0.8–2.1 µm ($\bar{x}$ = 1.4 µm, n = 60) in diameter. Medullary excipulum 33–53 µm ($\bar{x}$ = 44 µm, n = 31) thick, composed of hyaline textura globulosa to textura porrecta cells, 1.0–3.2 µm ($\bar{x}$ = 1.9 µm, n = 60) in diameter, non-gelatinous. Paraphyses 27–80 × 1.4–3.2

µm ($\bar{x}$ = 50 × 2.3 µm, n = 25), filiform, straight to slightly curved, septate, branched, hyaline, with slightly obtuse apices. Asci 43.2–59.8 × 2.6–5.2 µm ($\bar{x}$ = 51.3 × 4.3 µm, n = 50), 8-spored, clavate, straight to slightly curved, inoperculate, hyaline, thickened wall at apex, J+ in MLZ, with a long tapering stipitate base. Ascospores (85/7/2) (4.2–)5.2–7.3(–7.7) × 1.3–2.3 (–2.8) µm ($\bar{x}$ = 6.3 × 1.9 µm, n = 55), mostly uniseriate, sometimes partly biseriate, elongate to ellipsoidal or fusoid-clavate with rounded ends, hyaline, thin-walled, smooth, aseptate, eguttulate. Asexual morph: Not observed.

Material examined. China, Yunnan Province, Kunming City, Panlong District, altitude 2107 m, on the decayed unidentified leaf, 22 October 2022, Le Luo, Ly1063 (HKAS 145766).

Notes. Our specimen Ly1063 (HKAS 145766) formed a strongly supported monophyletic clade with *Calycellina populina* strains CBS 247.62 and KACC 45615 (Figure 3.209), with maximum support values of 100% MLBP and XX% BIPP, clearly confirming its taxonomic placement. In the ITS region, Ly1063 differs from CBS 247.62 and KACC 45615 by only 1.1–1.2% (5–6 bp differences), which falls within intraspecific variation. Morphologically, Ly1063 agrees well with the protologue and subsequent descriptions: apothecia are small, stipitate, glabrous, with a dark reddish-brown disc and orange-brown receptacle; asci are clavate, J+ in MLZ, with long tapering bases; and ascospores are hyaline, aseptate, fusoid to ellipsoidal. The branched paraphyses and well-developed medullary excipulum composed of textura globulosa and textura porrecta are also typical for the genus. Notably, the short but distinct stipe (0.3–0.5 mm) is a character rarely emphasized in earlier literature, but observed in our collection. *Calycellina populina* has been primarily reported from Europe (Fuckel, 1870; Höhnel, 1918), with no prior confirmed records in China. Thus, Ly1063 represents the first report of *C. populina* from China, extending its known distribution to East Asia and highlighting its adaptability to montane subtropical forests.



Note a-c Apothecia on the host. d Cross section of an apothecium. e Excipular cells. f Paraphyses. g-j Asci (i, j mounted in Meltzer agent). k Ascospores. Scale bar: d, e = 50 µm; f–j = 10 µm; k = 5 µm.

Figure 3.157 *Calycellina populina* (HKAS 145766)

Nagrajchalara W.P. Wu & Y.Z. Diao, Fungal Diversity 119: 314 (2023)

Index Fungorum number: IF845218; Facesoffungi number: FoF 18848, 54 morphological species (Species Fungorum, 2025), 43 species with molecular data.

Saprobic on decaying leaves, dead branches, bark, bamboo culms and other plant litte. Sexual morph: Unknown. Asexual morph: see Wu and Diao (2023).

Type species – *Nagrajchalara yongnianii* W.P. Wu & Y.Z. Diao

Notes – *Nagrajchalara* was introduced by Wu and Diao (2023) with *N. aquatica* as the type species. The genus is characterised by chalara-like anamorphs with phialidic conidiogenous cells consisting of a swollen venter and a cylindrical collarette bearing a deeply seated conidiogenous locus. Conidiophores are hyaline to pale brown, cylindrical, smooth, septate, and unbranched, sometimes reduced to conidiogenous

cells. Conidia are hyaline, cylindrical to oblong, aseptate or septate, smooth-walled, and are typically extruded in chains from the collarette. No sexual morph has been observed to date. Molecular data, including ITS, LSU, and SSU sequences, were generated for phylogenetic analyses, confirming the distinct placement of *Nagrajchalara* as a monophyletic lineage within Pezizellaceae, clearly separated from related chalara-like genera such as *Chalara*, *Neochalara*, and *Zymochalara*. The type specimen of *N. aquatica* was collected by Wu & Diao from decaying leaves submerged in a stream in Yunnan Province, China, and is preserved in HMAS, with the ex-type strain deposited in CGMCC.

Nagrajchalara morganjonesii W.P. Wu & Y.Z. Diao, Fungal Diversity 119: 363 (2023)

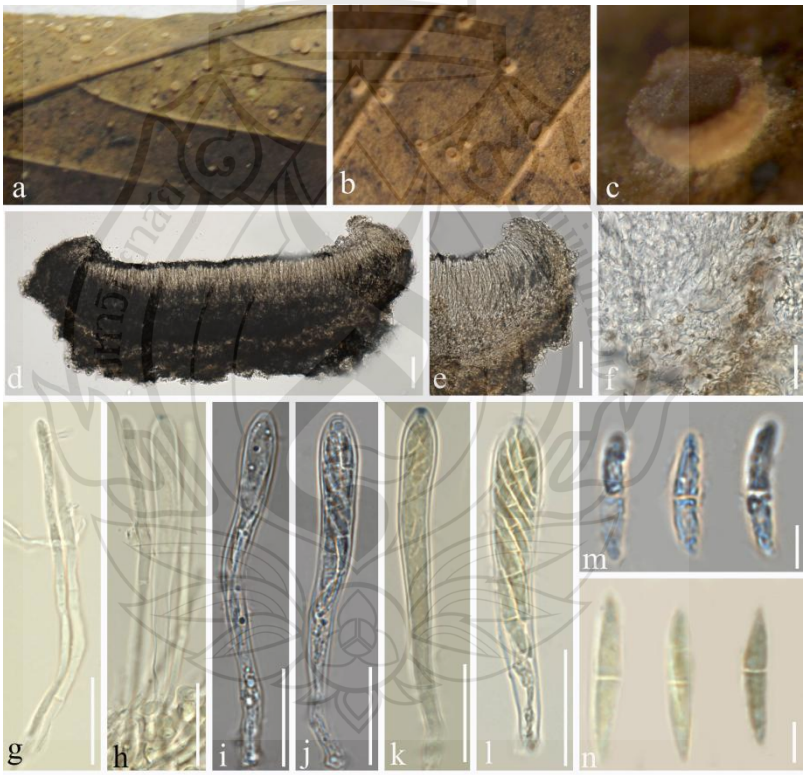
Index Fungorum: IF845232, Facesoffungi Number: FoF 18525, Figure 3.158

Description. Saprobic on decayed leaves. Sexual morph: Apothecia superficial, scattered, discoid to cupulate, 0.4–1.0 mm diam., 0.2–0.3 mm high when dry, sessile. Disc concave, surface smooth, yellowish brown when dry. Margin slightly curled inward, concolorous with receptacle. Receptacle yellowish brown, glabrous. Hymenium 76–133 µm thick ($\bar{x}$ = 103 µm, n = 42), concave, smooth, yellowish brown when dry, with scattered dark inclusions. Ectal excipulum 33–64 µm thick ($\bar{x}$ = 46 µm, n = 31), of hyaline, thin-walled cells, textura globulosa to textura oblita, 0.5–1.4 µm diam. ($\bar{x}$ = 1.0 µm, n = 60). Medullary excipulum 23–50 µm thick ($\bar{x}$ = 36 µm, n = 31), of hyaline, thin-walled cells, *textura porrecta* to *textura intricata*, 1.1–2.9 µm diam. ($\bar{x}$ = 2.1 µm, n = 60), non-gelatinous. Paraphyses 59–90 × 1.5–3.9 µm ($\bar{x}$ = 75 × 2.6 µm, n = 25), filiform, straight to slightly curved, septate, hyaline, smooth, apex slightly obtuse. Asci 55.7–88.9 × 4.9–8.5 µm ($\bar{x}$ = 66.7 × 7.1 µm, n = 50), 8-spored, clavate, straight to slightly curved, inoperculate, hyaline, J+ in MLZ, with a tapering long stipitate base. Ascospores (85/7/2) (12.2–)12.9–16.9(–17.4) × 1.6–2.5(–2.7) µm ($\bar{x}$ = 14.8 × 2.2 µm, n = 55), overlapping uniseriate, fusoid to clavate, blunt-ended, thin-walled, hyaline, smooth, 1-septate, eguttulate. Asexual morph: Not observed.

Material examined. China, Yunnan Province, Tengchong City, altitude 1555 m, on the decayed unidentified leaf, 20 August 2022, Le Luo, Ly347 (HKAS 145793).

Notes. Our specimens Ly347 (HKAS 145793) grouped as a distinct clade, grouped to Nagrajchalara morganjonesii (NN043682) with 100% MLBP and ** BIPP

(Figure 3.209) statistical support. Unlike the original description, which reported only the asexual morph (Wu & Diao, 2023), this collection represents the first record of the sexual morph. The discoid to cupulate apothecia, J+ asci, and 1-septate ascospores confirm its placement in Leotiomycetes and provide morphological support for its phylogenetic affinity. The specimen was collected in Tengchong, Yunnan, at 1555 m in a warm, humid subtropical evergreen broad-leaved forest with dense vegetation and abundant decayed organic matter, providing ideal substrates for saprobic fungi. *N. morganjonesii* was observed scattered on fallen leaves, indicating a preference for moist, humus-rich, well-ventilated forest floors. This collection expands the known morphological and ecological diversity of the species, and, combined with molecular evidence, provides new insights into the phylogeny and ecological adaptation of *Nagrajchalara*.



Note a-c Apothecia on the host. d, e Cross section of an apothecium. f Excipular cells. g Paraphyses. h-l Asci (k, l mounted in Meltzer agent). m, n Ascospores. Scale bar: d, e = 50 μm; f–l = 20 μm; m, n = 5 μm.

Figure 3.158 *Nagrajchalara morganjonesii* (HKAS 145793)

Nagrajchalara *laojunshanensis* L. Luo & K.D. Hyde, sp. nov.

Index Fungorum: IF904296, Facesoffungi Number: FoF 18526, Figure 3.159

Etymology. The epithet laojunshanensis refers to the collection site "Laojun Mountain (Laojunshan)" where the holotype specimen was collected.

Holotype. HKAS 145783.

Description: *Saprobic* on decayed wood barks. **Sexual morph**: Ascomata superficial, scattered to partly gregarious, 0.2–0.6 mm in diameter when dry, discoid to cupulate, sessile. Disc concave, surface slightly roughened, yellowish-brown when dry. Margin slightly incurved towards the disc, concolorous with the receptacle. Receptacle pale yellowish-brown when dry, glabrous. Hymenium 56–92 µm ($\bar{x}$ = 67 µm, n = 42) thick, concave, surface smooth, yellowish-brown when dry. Ectal excipulum 11–20 µm ($\bar{x}$ = 15 µm, n = 31) thick, composed of hyaline, thin-walled cells of *textura porrecta* to *textura globulosa*, 0.8–2.6 µm ($\bar{x}$ = 1.5 µm, n = 60) diam. Medullary excipulum 11–18 µm ($\bar{x}$ = 13 µm, n = 31) thick, composed of hyaline, thin-walled cells of *textura globulosa*, 1.2–3.0 µm ($\bar{x}$ = 1.9 µm, n = 60) diam., non-gelatinous. Paraphyses 61–74 × 1.6–3.7 µm ($\bar{x}$ = 68 × 2.5 µm, n = 25), filiform, straight to slightly curved, septate, hyaline, smooth, with slightly obtuse apices. Asci 53.4–71.5 × 5.4–9.4 µm ($\bar{x}$ = 62.3 × 7.4 µm, n = 50), 8-spored, clavate, straight to slightly curved, inoperculate, hyaline, J+ in MLZ, with a long tapering stipitate base. Ascospores (85/7/2) (10.4–)11.6–14.7 (–16.0) × 1.6–3.1(–3.3) µm ($\bar{x}$ = 12.7 × 2.7 µm, n = 55), partly overlapping uniseriate and partly biseriate, fusoid to clavate with rounded ends, hyaline, thin-walled, smooth, 1-septate, eguttulate. Asexual morph not observed.

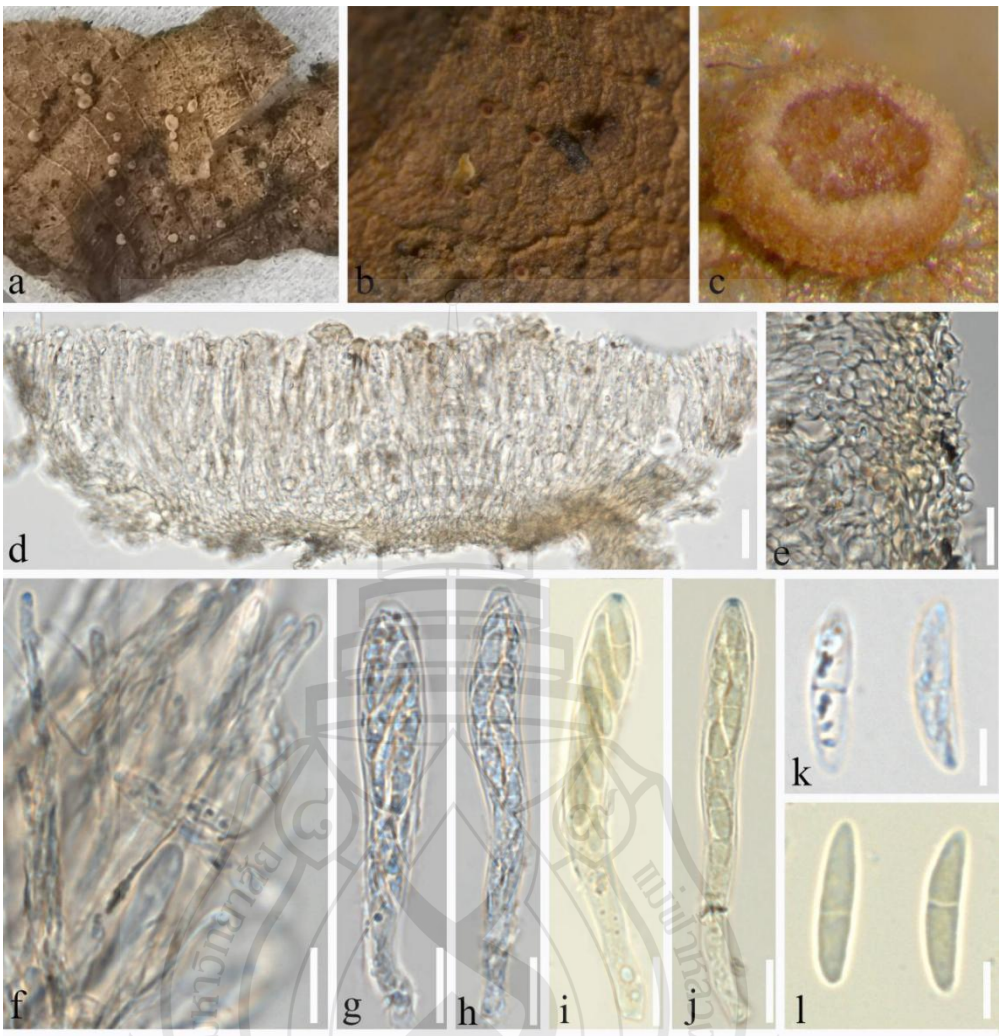
Material examined. China, Yunnan Province, Laojun Mountain, altitude 1676 m, on the decayed unidentified leaf, 17 August 2022, Le Luo, Ly233 (HKAS 145783, holotype); *ibid*. Ly1101(HKAS 145784, paratype).

Notes. Our specimens Ly233 (HKAS 145783) and Ly1101 (HKAS 145784) formed a distinct lineage in the phylogenetic tree (Figure 3.209), clustering with *Nagrajchalara tsuensis*, *N. hangzhouensis*, *N. morganjonesii*, and *N. angionacea*, with strong statistical support (99% MLBP and ** BIPP). In the ITS region, Ly233 differs from *N. tsuensis*, *N. hangzhouensis*, *N. morganjonesii*, and *N. angionacea* by 5.7% (26/459 bp), 2.6% (12/459 bp), 3.9% (18/459 bp), and 3.9% (17/459 bp), respectively.

Although the ITS divergence between Ly233 and *N. hangzhouensis* (2.6%) is slightly below the conventional 3% threshold, Ly233 occupies a distinct phylogenetic position with strong support. More importantly, Ly233 exhibits a well-developed sexual morph (discoid to cupulate apothecia, J+ clavate asci, 1-septate fusoid ascospores), whereas *N. hangzhouensis* and related species were described solely from asexual morphs. This provides a robust morphological criterion for species delimitation.

Ecologically, Ly233 was collected on leaf litter at 1676 m altitude, whereas most *Nagrajchalara* species are reported from decayed wood in lowland habitats. This indicates that *Nagrajchalara* can also inhabit foliar substrates and higher-elevation environments, thereby expanding the known ecological range of the genus.

Given the distinct phylogenetic placement, the presence of a sexual morph absent in closely related taxa, and its unique ecological niche, we recognize *Nagrajchalara laojunshanensis* as a novel species.



Note a-c Apothecia on the host. d Cross section of an apothecium. **e** Excipular cells. f Paraphyses. g-j Asci (i, j mounted in Meltzer agent). k, l Ascospores. Scale bar: d = 20 μm; e–j = 10 μm; k, l = 5 μm.

Figure 3.159 *Nagrajchalara laojunshanensis* (HKAS 145783)

Nagrajchalara guangcaii W.P. Wu & Y.Z. Diao, Fungal Diversity 119: 344 (2023)

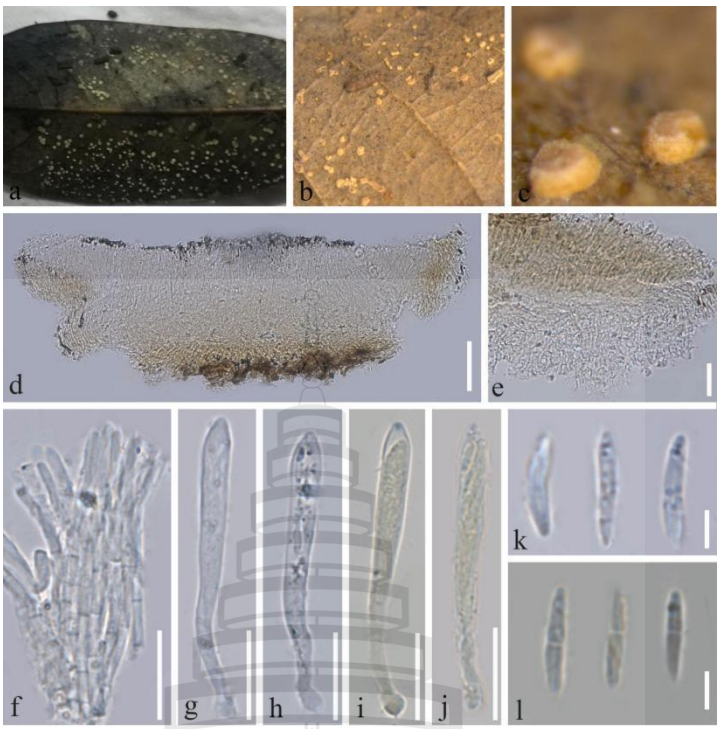
Index Fungorum: IF845225, Facesoffungi Number: FoF 18527, Figure 3.160

Description. Saprobic on decayed leaves. Sexual morph: Apothecia superficial, scattered to partly gregarious, 0.2–0.5 mm in diameter, discoid to cupulate, sessile, when dry yellowish brown, smooth, with margin slightly curled inward, concolorous with the receptacle. Hymenium 48–70 μm ($\bar{x}$ = 57 μm, n = 42) thick, concave, smooth, yellowish brown when dry. Ectal excipulum 26–38 μm ($\bar{x}$ = 34 μm, n = 31) thick,

composed of thin-walled hyaline cells of textura globulosa to textura oblita, 0.7–2.5 µm ($\bar{x}$ = 1.4 µm, n = 60) in diameter. Medullary excipulum 20–36 µm ($\bar{x}$ = 26 µm, n = 31) thick, of *textura oblita* to *textura intricata*, hyaline, non-gelatinous, cells 1.1–1.9 µm ($\bar{x}$ = 1.5 µm, n = 60) in diameter. Paraphyses 41–67 × 1.6–2.9 µm ($\bar{x}$ = 52 × 2.2 µm, n = 25), filiform, straight to slightly curved, septate, hyaline, smooth, with slightly obtuse apices. Asci 45.8–66.3 × 5.1–8.0 µm ($\bar{x}$ = 54.5 × 6.7 µm, n = 50), 8-spored, clavate, straight to slightly curved, inoperculate, hyaline, J+ in MLZ, with a long tapering stipe. Ascospores (85/7/2) (10.6–)10.8–16.1(–16.8) × 1.7–2.5(–2.8) µm ($\bar{x}$ = 13.7 × 2.4 µm, n = 55), overlapping uniseriate, fusoid to clavate, with obtuse rounded ends, hyaline, thin-walled, smooth, 1-septate, mostly eguttulate, occasionally guttulate. Asexual morph: Not observed.

Material examined. China, Yunnan Province, Tengchong City, altitude 1774 m, on the decayed unidentified leaf, 18 Auguet 2022, Le Luo, Ly269 (HKAS 145827).

Notes. Our specimens Ly269 (HKAS 145827) grouped as a distinct clade, grouped to Nagrajchalara *guangcaii* (NN076112) with 100% MLBP and ** BIPP (Figure 209) statistical support. Morphologically, Ly269 shares all diagnostic characters of *N. guangcaii*, including superficial discoid to cupulate apothecia, hyaline J+ clavate asci, and fusoid to clavate, 1-septate ascospores. The major difference is that Ly269 represents the sexual morph, whereas the holotype of *N. guangcaii* was described solely from its asexual morph (Wu & Diao, 2023). This collection therefore confirms the teleomorphic state of *N. guangcaii*, providing direct evidence of sexual reproduction in this species. Ecologically, Ly269 was collected from decayed leaves at 1774 m elevation in Tengchong, Yunnan Province, whereas the holotype originated from lowland tropical forests of Xishuangbanna at 600–800 m. This suggests that *N. guangcaii* occupies a broader ecological niche, from lowland tropical to mid-elevation montane forests, and can occur on both woody and foliar substrates. Consequently, Ly269 represents the sexual morph and a new ecological and geographic record of *N. guangcaii* from China.



Note a-c Apothecia on the host. d Cross section of an apothecium. e Excipular cells. f Paraphyses. g-j Asci (i, j mounted in Meltzer agent). k, l Ascospores. Scale bar: d = 50 µm; e–j = 20 µm; k, l = 5 µm.

Figure 3.160 *Nagrajchalara guangcaii* (HKAS 145827)

Nagrajchalara nawawii W.P. Wu & Y.Z. Diao, Fungal Diversity 119: 365 (2023)

Index Fungorum: IF845233, Facesoffungi Number: FoF 18528, Figure 3.161

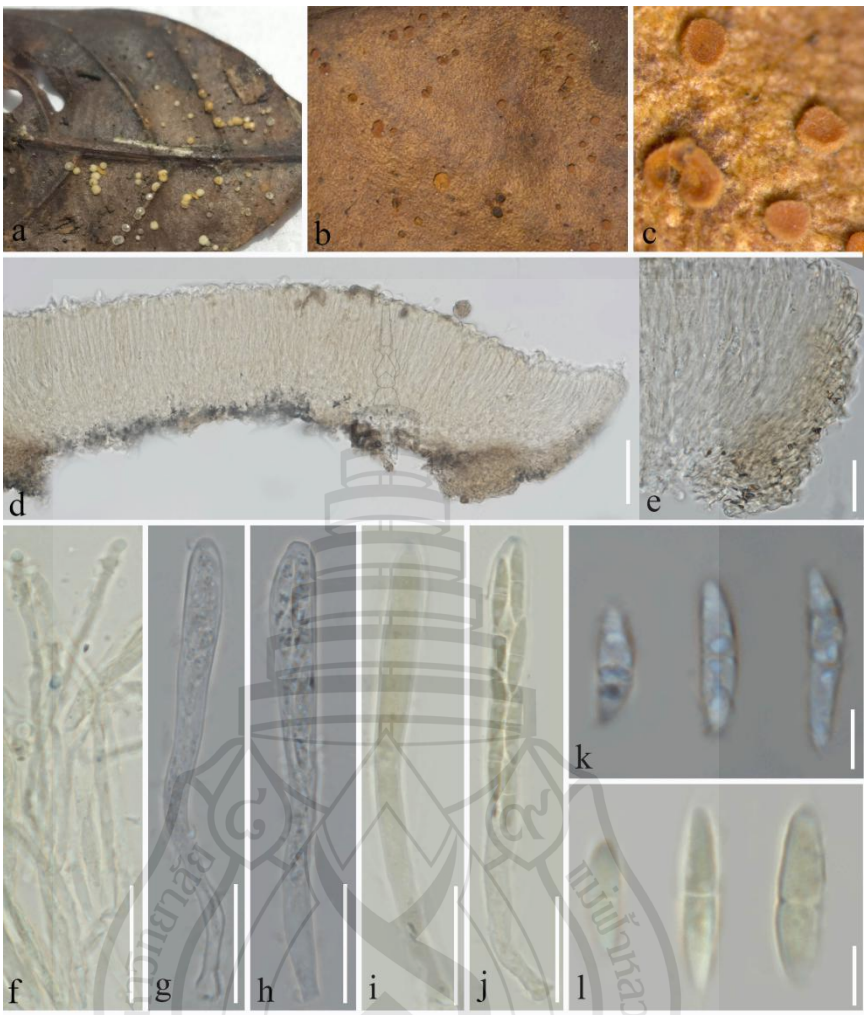
Description. Saprobic on decayed leaves. Sexual morph: Apothecia superficial, scattered to partly gregarious, 0.5–1.2 mm in diameter, discoid to cupulate, sessile, drying orange-brown. Disc concave, smooth, pale yellow-brown when fresh, becoming orange-brown when dry. Margin slightly incurved towards the disc, concolorous with the receptacle. Receptacle light brownish-gray to pale yellow-brown, glabrous. Hymenium 65–102 µm ($\bar{x}$ = 90 µm, n = 42), concave, surface smooth, pale yellow-brown when fresh, orange-brown when dry. Ectal excipulum 17–40 µm ($\bar{x}$ = 31 µm, n = 31) thick, of thin-walled, smooth, hyaline cells, *textura globulosa* to *textura prismatica*, 1.0–1.5 µm ($\bar{x}$ = 1.2 µm, n = 60) in diameter. Medullary excipulum 28–34 µm ($\bar{x}$ = 31 µm, n = 31) thick, of thin-walled, hyaline cells, textura oblita to textura

porrecta, 1.1–2.6 µm ($\bar{x}$ = 2.0 µm, n = 60) in diameter, non-gelatinous. Paraphyses 52–78 × 1.4–2.7 µm ($\bar{x}$ = 64 × 2.0 µm, n = 25), filiform, straight to slightly curved, septate, hyaline, smooth, with slightly obtuse apices. Asci 64.9–92.6 × 5.7–9.7 µm ($\bar{x}$ = 81.7 × 7.3 µm, n = 50), 8-spored, clavate, straight to slightly curved, inoperculate, hyaline, J– in MLZ, with a long tapering stipitate base. Ascospores (85/7/2) (11.2–)12.1–16.5(–16.8) × 2.0–3.3(–3.5) µm ($\bar{x}$ = 13.9 × 2.8 µm, n = 55), biseriate, overlapping, elongate to ellipsoidal or fusiform, hyaline, thin-walled, smooth, 1-septate, with or without guttules.

Asexual morph: Not observed.

Material examined. China, Yunnan Province, Ailao Mountain, altitude 2451 m, on the decayed unidentified leaf, 25 August 2022, Le Luo, Ly537 (HKAS 145779).

Notes. Our specimen Ly537 (HKAS 145779) forms a well-supported clade with *Nagrajchalara nawawii* (NN047788), with 100% MLBP and ** BIPP support (Figure 3.209). In the ITS gene region, Ly537 differs from NN047788 by only 0.4% (2/469 bp), confirming conspecificity. Morphologically, Ly537 agrees with the diagnostic features of *N. nawawii* but represents the first record of its sexual morph, as the holotype and other reported strains were only known from the asexual morph (Wu & Diao, 2023). The apothecia are discoid to cupulate, asci are clavate with a long tapering base and J– reaction, and ascospores are fusoid, hyaline, 1-septate, and smooth. Ecologically, Ly537 was collected on decayed leaves at high elevation (2451 m) in Ailao Mountain, contrasting with the type collection from lowland Xishuangbanna (600–800 m). This discovery significantly expands the known altitudinal and ecological range of *N. nawawii* and demonstrates that the species is capable of sexual reproduction. Given the minimal molecular divergence, strong phylogenetic support, and consistent morphology, Ly537 is best interpreted as the teleomorph (sexual morph) of *N. nawawii*.



Note a-c Apothecia on the host. d Cross section of an apothecium. e Excipular cells. f Paraphyses. g-j Asci (i, j mounted in Meltzer agent). k, l Ascospores. Scale bar: d = 50 µm; e-j = 20 µm; k, l = 5 µm.

Figure 3.161 *Nagrajchalara nawawii* (HKAS 145779)

Nagrajchalara ailaoensis L. Luo & K.D. Hyde, sp. nov.

Index Fungorum: IF904297, Facesoffungi Number: FoF 18529, Figure 3.162

Etymology. The epithet *ailaoensis* refers to the collection site "Ailao Mountain, Yunnan Province" where the holotype specimen was collected.

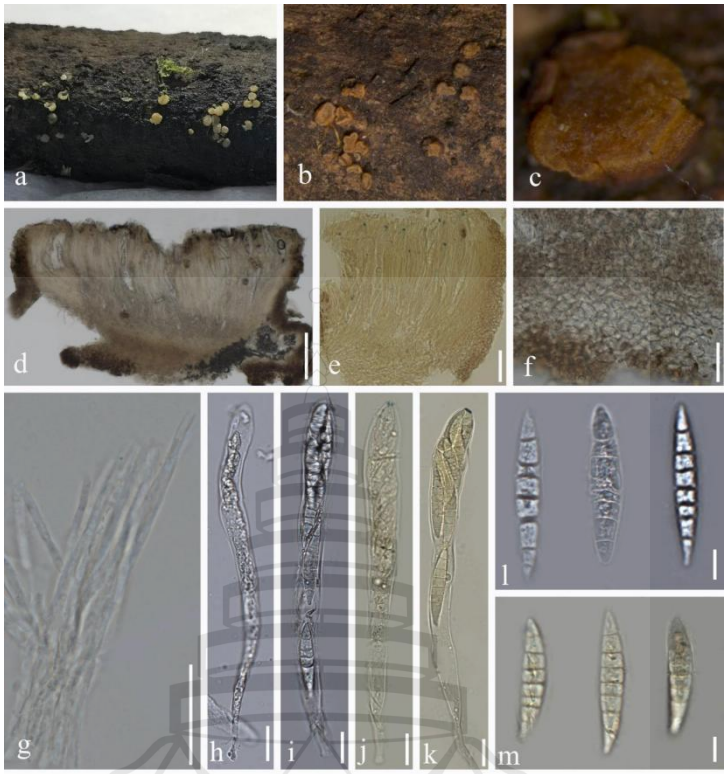
Holotype. HKAS 145809.

Description. Saprobic on decayed leaf litter. Sexual morph: Apothecia superficial, scattered to partly gregarious, 0.7–1.7 mm in diameter, discoid to cupulate, sessile, drying orange-brown. Disc concave, smooth, grayish yellow-brown when fresh,

rusty orange when dry. Margin slightly incurved towards the disc, concolorous with the receptacle. Receptacle light grayish-brown when fresh, bright orange-yellow when dry, glabrous. Hymenium 150–265 µm ($\bar{x}$ = 223 µm, n = 42), concave, smooth, light brownish-gray when dry. Ectal excipulum 49–109 µm ($\bar{x}$ = 71 µm, n = 31) thick, of thin-walled, smooth, hyaline cells, textura globulosa, 5.6–16.6 µm ($\bar{x}$ = 9.6 µm, n = 60) in diameter. Medullary excipulum 29–68 µm ($\bar{x}$ = 52 µm, n = 31) thick, of hyaline, thin-walled cells, textura globulosa to textura oblita, 1.2–3.1 µm ($\bar{x}$ = 1.8 µm, n = 60) in diameter, non-gelatinous. Paraphyses 126–213 × 1.6–3.7 µm ($\bar{x}$ = 173 × 2.4 µm, n = 25), filiform, straight to slightly curved, aseptate, hyaline, smooth, with obtuse apices. Asci 185.6–271.1 × 17.4–26.7 µm ($\bar{x}$ = 231.3 × 21.4 µm, n = 50) , 8-spored, clavate, straight to slightly curved, inoperculate, hyaline, with apically thickened wall, J+ in MLZ, with a long tapering stipitate base. Ascospores (85/7/2) (42.8–)43.3–55.8(–56.5) × 6.4–10.3(–11.2) µm ($\bar{x}$ = 49.7 × 8.7 µm, n = 55), multiseriate, elongate-ellipsoidal to fusoid-clavate with blunt ends, hyaline, thin-walled, smooth, 5–7

Material examined. China, Yunnan Province, Ailao Mountain, altitude 2451 m, on the decayed unidentified leaf, 23 August 2022, Le Luo, Ly450 (HKAS 145809, holotype); *ibid*. ly550(HKAS 145861, paratype).

Notes. Specimens Ly450 (HKAS 145809) and Ly550 (HKAS 145861) form a distinct clade in the phylogenetic tree, clustering with *Nagrajchalara haituoshanensis* (NN078171, NN078174) but with moderate statistical support (81% MLBP, ** BIPP) (Figure 3.209). In the ITS region, Ly450 differs from *N. haituoshanensis* by 8.1% (38/469 bp), well above the common species threshold, supporting recognition as a distinct species. Morphologically, *N. ailaoensis* differs from *N. haituoshanensis* by its well-developed sexual morph, larger apothecia (0.7–1.7 mm), longer asci (185.6–271.1 µm), and larger, multiseptate ascospores (43.3–55.8 × 6.4–10.3 µm, 5–7-septate). In contrast, *N. haituoshanensis* is only known from the asexual morph. Ecologically, *N. ailaoensis* was collected on decayed leaf litter at high elevation (2451 m, Yunnan Province), while *N. haituoshanensis* was isolated from dead fruits of *Quercus dentata* in northern China (Hebei Province, ~1300 m). These molecular, morphological, and ecological distinctions strongly support the establishment of *N. ailaoensis* as a novel species within the genus.



Note a-c Apothecia on the host. d, e Cross section of an apothecium. f Excipular cells. g Paraphyses. h-k Asci (j, k mounted in Meltzer agent). l, m Ascospores. Scale bar: d = 100 μm; e = 50 μm; f–k = 20 μm; l, m = 10 μm.

Figure 3.162 *Nagrajchalara ailaoensis* (HKAS 145809)

Nagrajchalara unicolor (S. Hughes & Nag Raj) W.P. Wu & Y.Z. Diao, Fungal Diversity 119: 400 (2023)

Index Fungorum: IF845285, Facesoffungi Number: FoF 17731, Figure 3.163

Description. Saprobic on decayed twigs. Sexual morph: Apothecia superficial, scattered to partly gregarious, 0.3–0.9 mm in diameter, discoid to cupulate, sessile, becoming concave when dry. Disc smooth, dark yellowish brown; margin slightly incurved towards the disc, concolorous with the receptacle. Receptacle yellowish brown, glabrous. Hymenium 91–131 μm ($\bar{x}$ = 112 μm, n = 42) thick, grayish brown to yellowish brown in dry condition. Ectal excipulum 20–62 μm ($\bar{x}$ = 37 μm, n = 31) thick, composed of hyaline thin-walled *textura intricata* to *textura globulosa* cells, 1.2–4.2 μm ($\bar{x}$ = 2.4 μm, n = 60) diam. Medullary excipulum 27–44 μm ($\bar{x}$ = 36 μm, n = 31) thick, of non-gelatinous hyaline textura globulosa cells, 1.6–4.5 μm ($\bar{x}$ = 2.9 μm, n =

60) diam. Paraphyses 51–93 × 1.5–3.4 µm ($\bar{x}$ = 64 × 2.3 µm, n = 25), filiform, straight to slightly curved, aseptate, unbranched, hyaline, smooth, with obtuse apices. Asci 73.8–109.3 × 12.7–18.7 µm ($\bar{x}$ = 87.9 × 15.6 µm, n = 50), 8-spored, clavate, straight to slightly curved, inoperculate, J+ in MLZ, with tapering short to long stalks. Ascospores (20.2–)20.8–26.5(–27.5) × 4.7–8.6(–9.3) µm ($\bar{x}$ = 23.7 × 6.0 µm, n = 55), multi-seriate, elongate to ellipsoidal or fusoid-clavate with rounded ends, hyaline, thin-walled, smooth, 3-septate, eguttulate or multiguttulate.

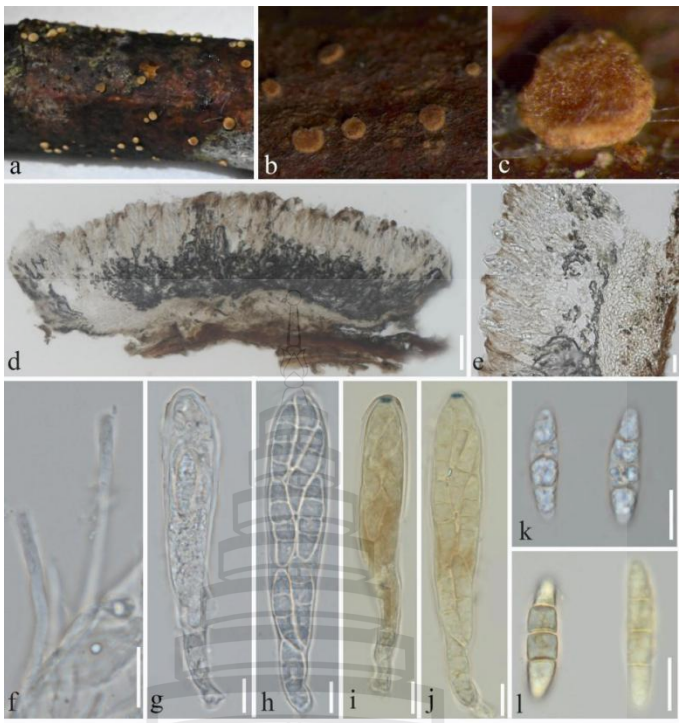
Asexual morph: Not observed.

Material examined. China, Yunnan Province, Xishuangbanna, altitude 1786.7 m, on the decayed unidentified twig, 5 September 2022, Le Luo, Ly714 (HKAS 145775).

Notes. Our specimen Ly714 (HKAS 145775) formed a well-supported clade with *Nagrajchalara unicolor* (NN044014 and NN045977) (Figure 3.209), confirming its identity (100% MLBP / ** BIPP). Unlike the holotype and all previous reports, which were exclusively based on the asexual morph (Hughes & Nag Raj, 1974; Wu & Diao, 2023), this collection represents the first documentation of the sexual morph of *N. unicolor*. The apothecia are discoid to cupulate, with glabrous yellowish brown receptacles, and asci are 8-spored, J+, clavate with tapering bases. Ascospores are hyaline, fusoid-clavate, 3-septate, and either eguttulate or multiguttulate.

The discovery of the teleomorph complements the previous anamorphic description, where conidiophores are solitary or aggregated, dark brown, cylindrical to lageniform, and conidia are hyaline, 3-septate, cylindrical with marginal frills. Our material expands the reproductive morphology of *N. unicolor*, demonstrating that the species is capable of sexual reproduction.

Ecologically, Ly714 was collected from a subtropical evergreen broad-leaved forest at 1786.7 m elevation in Xishuangbanna, Yunnan, on decayed twigs. Previous records were from decayed culms and branches of *Pinus*, *Saccharum*, and *Leptospermum* in China, New Zealand, and the USA (Nag Raj & Kendrick, 1975; Wu & Diao, 2023). This finding broadens the ecological and geographical range of *N. unicolor* and provides critical evidence of its teleomorphic stage, representing the first sexual record of this species from Asia.



Note a-c Apothecia on the host. d, e Cross section of an apothecium. f Excipular cells. g Paraphyses. h-k Asci (j, k mounted in Meltzer agent). l, m Ascospores. Scale bar: d = 50 μm; e = 20 μm; f-l = 10 μm.

Figure 3.163 *Nagrajchalara unicolor* (HKAS 145775)

Rodwayella Spooner, in Dennis, Fungi of the Hebrides (Kew): 383 (1986)

Index Fungorum number: IF25733; Facesoffungi number: FoF 18849, 4 morphological species (Species Fungorum, 2025), 2 species with molecular data.

Saprobic on decaying leaves, dead branches, bark, other plant litter. Sexual morph: Han et al. (2014). Asexual morph: Unknown.

Type species – *Rodwayella sessilis* (Rodway) Spooner

Notes – *Rodwayella* was introduced by Spooner (1986) with *R. sessilis* as the type species. The genus is characterised by small, sessile to shortly stipitate apothecia, pale ocher to lemon-yellow when fresh, often darkening on drying. The receptacle is smooth to finely pruinose, without differentiated marginal hairs, and develops on a sparse subiculum. The ectal excipulum is composed of thin-walled hyaline *textura angularis* to *textura globulosa*, arranged in parallel or interwoven hyphae. Asci are cylindric to cylindric-clavate, eight-spored, arising from croziers, and possess an amyloid apical pore. Ascospores are hyaline,

smooth, elliptic-fusoid to clavate, aseptate when young, but becoming 1-septate at maturity, sometimes constricted at the septum. Paraphyses are cylindrical, slightly swollen at the apex, septate, and slightly exceeding the asci. No asexual morph has been observed. Molecular data are limited, and the genus is provisionally placed in Hyaloscyphaceae, tribe Arachnopezizeae, based on morphological features. The type specimen of *R. sessilis* was collected in Tasmania (Australia) on litter of *Myrica* species and is preserved in IMI. Additional species, such as *R. citrinula*, were later recorded from Europe and Asia, including collections on dead herbs in Turkey deposited in KUS and KACC (Han et al., 2014).

Rodwayella xishuangbannaensis L. Luo & K.D. Hyde, sp. nov.

Index Fungorum: IF904298, Facesoffungi Number: FoF 18530, Figure 3.164

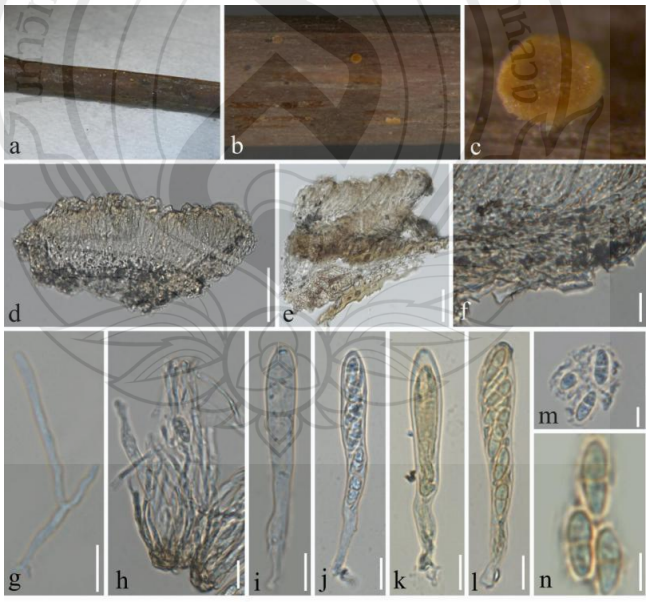
Etymology. The epithet *xishuangbannaensis* refers to the collection site "Xishuangbanna, Yunnan Province" where the holotype specimen was collected.

Holotype. HKAS 145767.

Description. Saprobic on decayed twigs. Sexual morph: Apothecia superficial, scattered, 0.3–0.5 mm in diameter, discoid to cupulate when dry, sessile. Disc concave, surface slightly roughened, dark reddish brown when dry. Margin slightly incurved toward the disc, concolorous with the receptacle. Receptacle dark orange-brown when dry, glabrous. Hymenium 48–60 µm ($\bar{x}$ = 55.6 µm, n = 42), concave, surface slightly roughened, grayish olive when dry. Ectal excipulum 15–29 µm ($\bar{x}$ = 23 µm, n = 31) thick, of thin-walled, hyaline cells of textura porrecta to textura globulosa, 1.6–3.4 µm ($\bar{x}$ = 2.4 µm, n = 60) in diameter. Medullary excipulum 13–22 µm ($\bar{x}$ = 15.3 µm, n = 31) thick, composed of thin-walled, hyaline cells of *textura prismatica* to *textura intricata*, 0.6–2.6 µm ($\bar{x}$ = 1.3 µm, n = 60) in diameter, non-gelatinous. Paraphyses 39–75 × 1.1–2.1 µm ($\bar{x}$ = 55 × 1.4 µm, n = 25), filiform, straight to slightly curved, aseptate, branched, hyaline, smooth, with slightly obtuse apices. Asci 49.9–72.7 × 6.3–10.5 µm ($\bar{x}$ = 61.2 × 8.5 µm, n = 50), 8-spored, clavate, straight to slightly curved, inoperculate, hyaline, J– in MLZ, with a tapering, long-stipitate base. Ascospores (85/7/2) (5.7–)6.1–9.9(–10.4) × 2.7–3.7(–3.9) µm ($\bar{x}$ = 8.3 × 3.2 µm, n = 55), overlapping uniseriate, elongate to ellipsoidal or fusoid-clavate with rounded ends, hyaline, thin-walled, smooth, 1-septate, with or without guttules. Asexual morph: Not observed.

Material examined. China, Yunnan Province, Xishuangbanna, altitude 1786.7 m, on the decayed unidentified twig, 5 September 2022, Le Luo, Ly716 (HKAS 145767, holotype). *ibid*. Ly934(HKAS 145768, paratype).

Notes. Specimens Ly716 (HKAS 145767) and Ly934 (HKAS 145768) formed a distinct, well-supported clade sister to *Rodwayella sessilis* (PDD 81736, PDD 81741, PDD 117656, HB9913) with 94% MLBP and ** BIPP support (Figure 209). In the ITS region, Ly716 differs from *R. sessilis* strains by 4.8–9.5% (23–84 bp across 479–888 bp), which exceeds typical intraspecific variation, supporting its recognition as a distinct species. Morphologically, the new species shares generic traits of *Rodwayella*, including sessile, discoid to cupulate apothecia, smooth receptacle, clavate 8-spored asci, and hyaline, 1-septate ascospores. However, it is clearly distinguishable from *R. sessilis* by its smaller apothecia (0.3–0.5 mm vs. up to 1 mm), roughened hymenium, and significantly smaller ascospores (8.3 × 3.2 µm vs. 17 × 8 µm). Ecologically, *R. xishuangbannaensis* was collected on decayed twigs in a montane forest at 1786.7 m in Xishuangbanna, Yunnan, whereas *R. sessilis* occurs in lowland habitats of Tasmania on dead wood. These combined differences in morphology, molecular data, and ecology provide robust evidence for recognition of *R. xishuangbannaensis* as a novel species within *Rodwayella*.



Note a-c Apothecia on the host. d, e Cross section of an apothecium. f Excipular cells. g Paraphyses. h-l Asci (k, l mounted in Meltzer agent). m, n Ascospores. Scale bar: d, e = 50 µm; f–l =10 µm; m, n = 5 µm.

Figure 3.164 *Rodwayella xishuangbannaensis* (HKAS 145767)

Rodwayella lignicola L. Luo & K.D. Hyde, sp. nov.

Index Fungorum: IF904299, Facesoffungi Number: FoF 18531, Figure 3.165

Etymology. The epithet *lignicola* refers to its habitat on decayed wood.

Holotype. HKAS 145811.

Description. Saprobic on decayed wood bark. Apothecia superficial, scattered to partly gregarious, 0.4–0.9 mm diam., discoid to cupulate, sessile, when dry. Disc concave, surface smooth, dark yellowish brown. Margin slightly incurved towards the disc, concolorous with the receptacle. Receptacle yellowish brown, glabrous. Hymenium 85–105 µm thick ($\bar{x}$ = 97 µm, n = 42), concave, surface smooth, grayish brown to yellowish brown when dry. Ectal excipulum 44–71 µm thick ($\bar{x}$ = 59 µm, n = 31), of hyaline thin-walled cells, textura porrecta to textura globulosa, 1.1–2.4 µm diam. ($\bar{x}$ = 1.6 µm, n = 60). Medullary excipulum 14.3–40.9 µm thick ($\bar{x}$ = 25.3 µm, n = 31), of hyaline thin-walled textura globulosa cells, 0.7–2.1 µm diam. ($\bar{x}$ = 1.2 µm, n = 60), non-gelatinous. Paraphyses 52–90 × 0.7–2.0 µm ($\bar{x}$ = 68 × 1.4 µm, n = 25), filiform, straight to slightly curved, septate, hyaline, smooth, with obtuse apex. Asci 47.2–95.5 × 8.6–13.8 µm ($\bar{x}$ = 74.5 × 10.7 µm, n = 50), 8-spored, clavate, straight to slightly curved, inoperculate, hyaline, J+ in MLZ, with a tapering stipitate base. Ascospores (85/7/2) (9.2–)9.6–15.9(–17.8) × 3.5–5.1(–5.2) µm ($\bar{x}$ = 12.7 × 4.4 µm, n = 55), multiseriate, elongate to ellipsoidal or fusoid-clavate, rounded at ends, hyaline, thin-walled, smooth, 1-septate, with or without multiple guttules. Asexual morph: not observed.

Material examined. China, Yunnan Province, Xishuangbanna, altitude 1786.7 m, on the decayed unidentified wood, 5 September 2022, Le Luo, Ly726 (HKAS 145811, holotype), *ibid*. Ly756(HKAS 145812, paratype).

Notes. In phylogenetic analyses, specimen Ly726 (HKAS 145811) formed a distinct, well-supported clade (100% MLBP and ** BIPP) with *Rodwayella sessilis* (PDD 81736, PDD 81741, PDD 117656, HB9913) and *Rodwayella xishuangbannaensis* (Ly716) (Figure 3.209). In ITS sequences, Ly726 differs from *R. sessilis* by 2.5–10.8% and from *R. xishuangbannaensis* by 8.1% (72/888 bp), confirming its recognition as a separate lineage. Morphologically, Ly726 differs from *R. sessilis* in having smaller, 1-septate ascospores (9.6–15.9 × 3.5–5.1 µm vs. 17 × 8 µm), longer asci (up to 95.5 µm vs. shorter in *R. sessilis*), and J+ asci in MLZ (reaction

not reported in *R. sessilis*). Compared with *R. xishuangbannaensis*, Ly726 has larger apothecia (0.4–0.9 mm vs. 0.3–0.5 mm), thicker ectal excipulum (44–71 µm vs. 15–29 µm), longer asci (74.5–95.5 µm vs. 49.9–72.7 µm), and J+ asci (vs. J– in *R. xishuangbannaensis*). Ascospores in Ly726 are larger, multiseriate, and more distinctly fusoid-clavate, while those of *R. xishuangbannaensis* are smaller, uniseriate, and ellipsoidal. Ecologically, Ly726 was collected on decayed wood in montane forest at 1786.7 m in Xishuangbanna, Yunnan Province, a tropical–subtropical transitional zone with high biodiversity. In contrast, *R. sessilis* occurs in Tasmania, Australia, on mosses and wood at sea level to mid-altitudes. The combined molecular, morphological, and ecological evidence supports Ly726 as a novel taxon, herein introduced as *Rodwayella lignicola*.



Note a-c Apothecia on the host. d, e Cross section of an apothecium. f Excipular cells. g Paraphyses. h-k Asci (j, k mounted in Meltzer agent). l Ascospores. Scale bar: d, e = 50 µm; f–l = 10 µm.

Figure 3.165 *Rodwayella lignicola* (HKAS 145811)

Tricladiaceae P.R. Johnst. & Baschien

Index Fungorum number: IF1354; Facesoffungi number: FoF 14076

Tricladiaceae was introduced by Johnston and Baschien (2020) to accommodate a monophyletic clade of aquatic hyphomycetous fungi previously placed in the polyphyletic family Solenopeziaceae. It is currently classified in the phylum Ascomycota, class Leotiomycetes, order Helotiales.

The family is characterised by hyphomycetous asexual morphs with branched, multiseptate, sigmoid, tetraradiate or scolecoid conidia, often adapted to aquatic or aero-aquatic habitats. Conidiophores are usually macronematous, hyaline to pale brown, simple or sparsely branched, and the conidiogenous cells are monoblastic or polyblastic. The asexual morph is morphologically diverse and commonly observed on submerged plant litter in freshwater ecosystems. Sexual morphs, reported in genera such as *Cudoniella* and *Mycofalcella*, produce glabrous apothecia with cylindrical to clavate, unitunicate asci containing inamyloid or weakly amyloid apical rings, and hyaline, aseptate ascospores. The sexual morph is often inconspicuous in nature and more frequently observed in culture. In this study, a multigene phylogeny (Figure 3.166) confirmed the systematic placement of the family.

Species of Tricladiaceae are saprobic, functioning as primary decomposers of allochthonous plant material, especially submerged leaves and twigs, and play an essential role in nutrient cycling and carbon turnover in freshwater ecosystems. By facilitating microbial conditioning of plant litter, they contribute significantly to energy transfer to higher trophic levels. The family is cosmopolitan, occurring widely in freshwater habitats across Europe, North and South America, Asia, Africa, and Oceania, with particular abundance in temperate and montane streams (Franco-Duarte et al., 2022).

Molecular markers available for this family include ITS, LSU, SSU, *RPB1*, *RPB2*, *MCM7*, *TEF1*, and *β-tubulin*, which provide robust phylogenetic resolution at both genus and species levels (Johnston & Baschien, 2020).

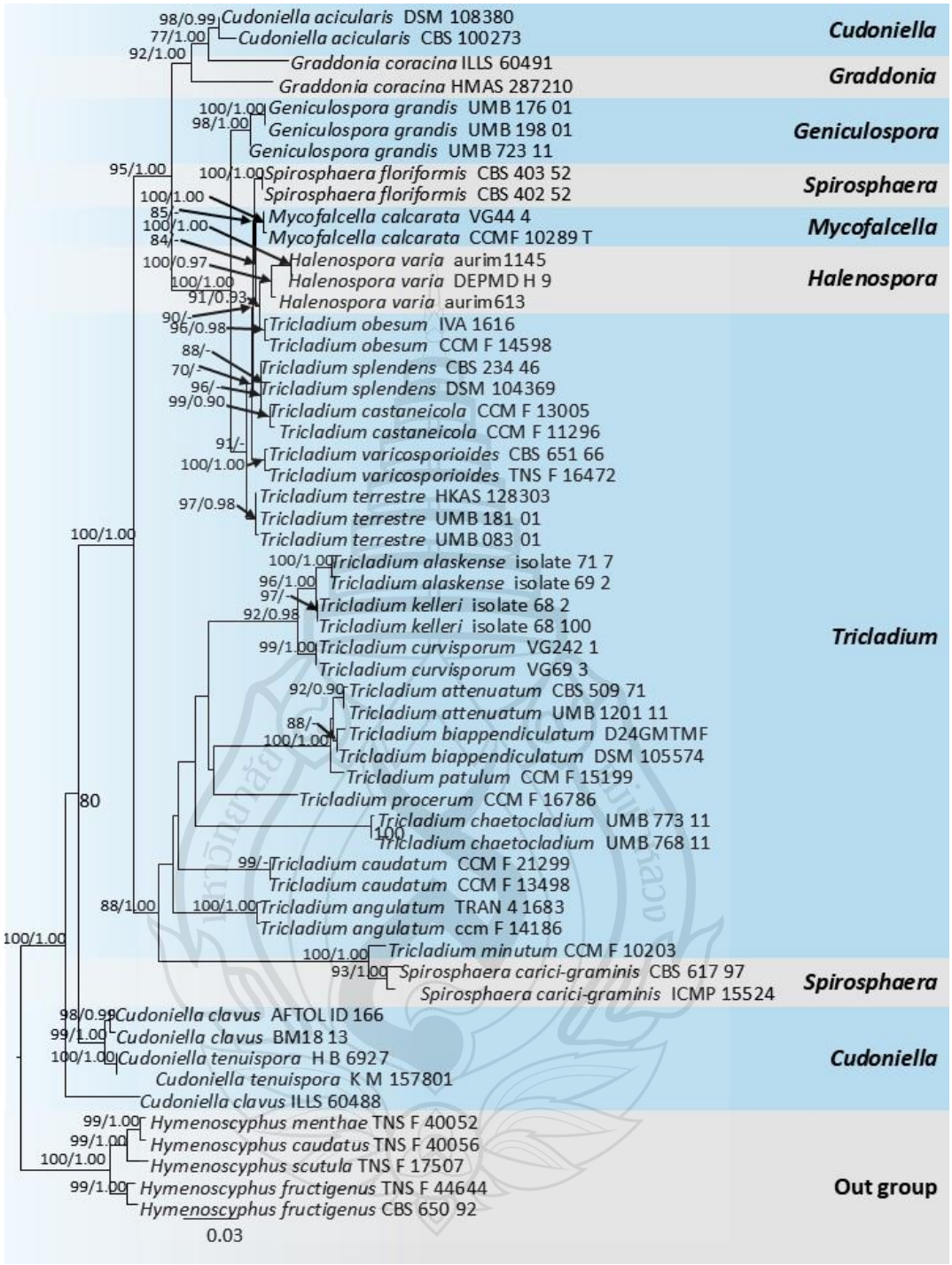


Figure 3.166 Maximum likelihood tree based on the combined ITS and LSU dataset of *Tricladiaceae*

Figure 3.166 Bootstrap support values (MLBP ≥ 70%) and Bayesian posterior probabilities (BPP ≥ 0.90) are shown at nodes as MLBP/BPP. Values below these thresholds are indicated with a hyphen ("–"). Type strains are shown in bold.

Cudoniella Sacc., Syll. fung. (Abellini) 8: 41 (1889)

Index Fungorum number: IF1354; Facesoffungi number: FoF 18541, 22 morphological species (Species Fungorum, 2025), 4 species with molecular data.

Saprobic on decaying herbaceous stems, submerged twigs, bark, pine needles. Sexual morph: Mains (1956), Huhtinen (1992). Asexual morph: Unknown.

Type species – *Cudoniella queletii* (Fr.) Sacc.

Notes – *Cudoniella* was introduced by Saccardo (1889) with *C. queletii* as the type species. Species of the genus are typically found on submerged or water-soaked plant debris in wet habitats such as forest streams, marshes, and damp woodlands. They are characterised by stipitate, disc- to turbinate apothecia with smooth, glabrous surfaces and a gelatinous to cartilaginous texture. Asci are clavate to cylindrical, eight-spored, and arise from croziers, with amyloid or non-amyloid apical rings. Ascospores are hyaline, fusoid to subfusoid, aseptate or becoming septate at maturity, often containing small guttules. Paraphyses are filiform, occasionally slightly swollen at the tips, and may have vacuolar pigmentation. Molecular data are available for a few species, with ITS and LSU rDNA sequences most commonly used for phylogenetic analysis (Johnston & Baschien, 2020). However, the original description does not provide a specimen number or depository for the holotype.

Cudoniella queletii (Fr.) Sacc., Syll. fung. (Abellini) 8: 41 (1889) Figure 3.167

Index Fungorum number: IF229857; Facesoffungi number: FoF 18542

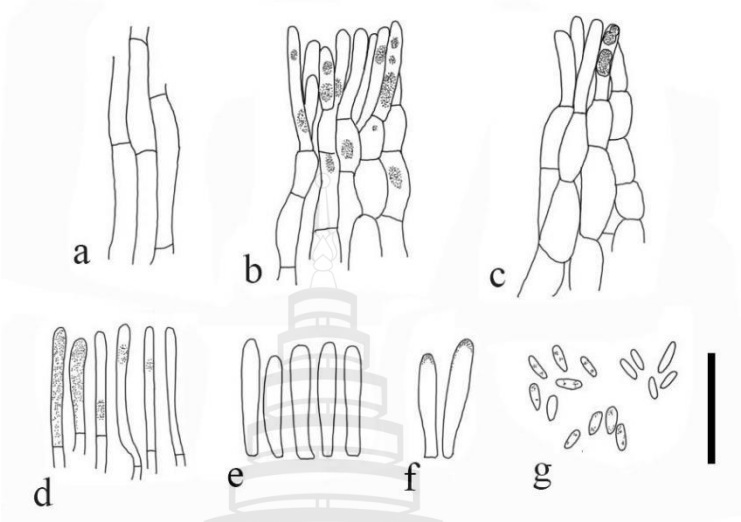
Description – Huhtinen (1992), Eckel and Schulz (1992).

Material considered –Huhtinen (1992), Eckel and Schulz (1992).

Distribution, ecological and economical importance

Cudoniella species are important saprobes, contributing to the decomposition of lignocellulosic plant material in wet or aquatic environments, thereby facilitating nutrient cycling and energy transfer in freshwater and riparian ecosystems. They colonise substrates such as submerged wood, fallen twigs, bark, pine needles, and herbaceous stems. Typical habitats include alder swamps, marshes, woodland streams, and other moist forested areas. Members of the genus are primarily distributed in the Northern Hemisphere, especially in temperate regions of Europe, North America, and East Asia. Notable species such as *C. clavus* and *C. queletii* are relatively widespread in Europe. *C. tenuispora* was recently recorded in Slovenia for the first time (Šparl &

Zupan, 2019), suggesting that species of this genus may be underreported due to their small apothecia, ephemeral fruiting bodies, and specialised habitats.



Source Redrawn from Huhtinen (1992)

Note a Ectal excipulum from middle flanks. b, c Margin. d Paraphyses. e Asci. f Asci with MLZ. g Ascospores. Scale bars: a–g = 20 µm.

Figure 3.167 *Cudoniella viridula*

Geniculospora Sv. Nilsson ex Marvanová & Sv. Nilsson, Trans. Br. mycol. Soc. 57(3): 532 (1971)

Index Fungorum number: IF8321; Facesoffungi number: FoF 18543, 2 morphological species (Species Fungorum, 2025), 2 species with molecular data.

Saprobic aquatic hyphomycetes, inhabiting streams, rivers, and other freshwater systems rich in organic detritus. Sexual morph: see Descals et al. (1984). Asexual morph: see Nolan (1972), Shearer and Webster (1985).

Type species – *Geniculospora inflata* (Ingold) Sv. Nilsson ex Marvanová & Sv. Nilsson

Notes – *Geniculospora* was introduced by Nilsson (1964) as a provisional genus and was validly published by Marvanová and Nilsson (1971) with *Geniculospora inflata* as the type species, originally described by Ingold (1958) from submerged decaying leaves. The genus is characterised by hyaline, tetraradiate aleuriospores in which the third and fourth arms arise successively from the same level of a bent axis. Conidia are produced directly from aleuriophores, with a septum separating the basal

arm from the spore body, and without a basal separation cell. Conidiogenesis is holoblastic and schizolytic. The sexual morph, rarely observed in nature, produces small, glabrous apothecia with clavate to cylindrical, unitunicate asci and hyaline, aseptate ascospores (Descals et al., 1984). Members of *Geniculospora* are adapted to aquatic habitats, where their tetraradiate conidia are suited for entanglement in submerged plant litter and foam, aiding in dispersal in turbulent water. Molecular phylogenetic analyses place *Geniculospora* in the family Tricladiaceae (Helotiales, Leotiomycetes), forming a distinct clade within the group. Available molecular markers include ITS and LSU rDNA sequence data (Nolan, 1972; Descals et al., 1984; Johnston & Baschien, 2020). The original description did not designate a specimen number or herbarium depository for the holotype, which was likely based on a culture isolate.

Geniculospora inflata (Ingold) Sv. Nilsson ex Marvanová & Sv. Nilsson, Trans. Br. mycol. Soc. 57(3): 532 (1971) Figure 3.168

Index Fungorum number: IF314390; Facesoffungi number: FoF 18544

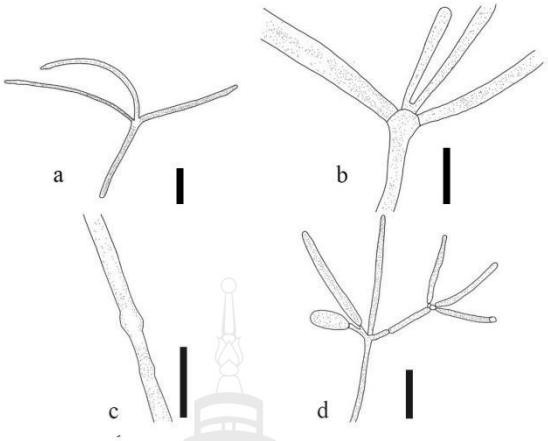
Description – Descals et al. (1984), Nolan (1972), Shearer and Webster (1985).

Material considered – Descals et al. (1984), Nolan (1972), Shearer and Webster (1985).

Distribution, ecological and economical importance

Species of *Geniculospora* are ecologically important components of freshwater fungal assemblages, especially in temperate lotic systems. As aquatic hyphomycetes, they are involved in the early stages of leaf litter decomposition, contributing to carbon turnover and the release of nutrients into stream ecosystems. Their tetraradiate conidia are morphologically adapted for attachment to submerged plant debris and foam in flowing water, facilitating colonisation and dispersal. These fungi also serve as a primary food source for detritivorous invertebrates, thus influencing energy transfer within aquatic food webs (Shearer & Webster, 1985; Descals et al., 1998).

Geniculospora has a widespread but patchy distribution across the Northern Hemisphere, with records from Europe (UK, Sweden), North America (Canada, USA), and parts of Asia. Both *G. inflata* and *G. grandis* occur in pristine as well as human-impacted streams, particularly in areas dominated by deciduous vegetation (Nolan, 1972; Shearer & Webster, 1985; Johnston & Baschien, 2020). Sparse records from Asia may reflect undersampling rather than true absence.



Source Redrawn from Nolan (1972)

Note a Tetra-radiate aleuriospore. b Inflartion at apical end of spore arm. c Swelling at base of the aleuriophore. d Variant spore. Scale bars: a, d = 100 µm; b, c = 20 µm.

Figure 3.168 *Geniculospora inflata*

Graddonia Dennis, Kew Bull. [10](3): 359 (1955)

Index Fungorum number: IF2123; Facesoffungi number: FoF 18545, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on decaying plant material. Sexual morph: see Dennis (1955). Asexual morph: Unknown.

Type species – *Graddonia coracina* (Bres.) Dennis

Notes – *Graddonia* was established by Dennis (1955) to accommodate *Graddonia coracina*, originally described as *Patinella coracina* by Bresadola in 1897. The genus is placed in Helotiales (Leotiomycetes) and is morphologically distinguished from related patellarioid genera by its sessile, superficial, dark brown to blackish apothecia with a thick, parenchymatous excipulum composed of light-coloured prismatic inner cells and dark, isodiametric outer cells. Asci are cylindric-clavate, thin-walled, eight-spored, inamyloid, with an obtuse apex lacking an apical apparatus. Ascospores are hyaline, ellipsoid to fusiform, multiguttulate when young, becoming 1-septate at maturity. Paraphyses are cylindrical, with slightly enlarged, rounded apices. The genus typically inhabits moist or semi-submerged decaying twigs and logs in temperate forest habitats. Molecular markers available for the genus include LSU and ITS rDNA sequence data (Dennis, 1955; Hustad & Miller, 2011).

The type specimen of *G. coracina* (collection number 876) was collected by W. D. Graddon from fallen twigs of *Prunus laurocerasus* at Grantley Hall, near Ripon, Yorkshire, in April 1954, and is deposited at K (herbarium of the Royal Botanic Gardens, Kew).

Graddonia coracina (Bres.) Dennis, Kew Bull. [10](3): 359 (1955) Figure 3.169

Index Fungorum number: IF297949; Facesoffungi number: FoF 18546

Description – Dennis (1955).

Material considered – Dennis (1955).

Distribution, ecological and economical importance

Graddonia is a saprobic genus inhabiting decaying woody substrates, particularly in moist or hygrophilous environments. It plays a role in the decomposition of lignified plant material, contributing to nutrient cycling within temperate forest ecosystems. The ecological preference for damp or semi-submerged substrates suggests an adaptation to habitats where periodic water saturation occurs (Dennis, 1955; Hustad & Miller, 2011). No direct economic significance is currently known.

The genus is monotypic, represented by *G. coracina*, which is known from northern Italy (type locality) and subsequently reported from the United Kingdom, France, Sweden, and the USA. Records are restricted to the Northern Hemisphere, with collections typically occurring on decaying twigs of broadleaf trees such as *Prunus laurocerasus* (Hustad & Miller, 2011).



Source Redrawn from Centro de Estudios Micológicos Asturianos (2024)

Note a Marginal cells. b Paraphysis. C Asci. d Croziers (+) e Ascospores. Scale bars: a–e = 10 μm.

Figure 3.169 *Graddonia coracina*

Halenospora E.B.G. Jones, Fungal Diversity 35: 154 (2009)

Index Fungorum number: IF513077; Facesoffungi number: FoF 18547, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on submerged wood and decaying plant material. Sexual morph: Unknown. Asexual morph: see Jones et al. (2009), El-Elimat et al. (2014).

Type species – *Halenospora varia* (Anastasiou) E.B.G. Jones

Notes – *Halenospora* was established by Jones et al. (2009) to accommodate *H. varia*, originally described as *Helicoma varia* Anastasiou from submerged wood in the Mediterranean. The genus is morphologically defined by helicoid, brown, multi-septate conidia composed of irregularly coiled, thick-walled cells, sometimes forming compact, contorted hyphal masses. Conidiogenesis occurs directly on submerged woody debris or other plant substrates in marine and freshwater habitats. Multigene phylogenetic analyses (ITS, LSU) place *Halenospora* within Tricladiaceae (Helotiales, Leotiomycetes) . The type species *H. varia* was collected from an intertidal stem of *Avicennia marina* at Bordi, Maharashtra, India, and is represented by specimen S.A. Gosavi 1122 (PGDB), collected on 15 October 2013. Reports indicate a preference for saline or brackish waters, with occurrence in intertidal and estuarine zones (Jones et al., 2009; El-Elimat et al., 2014; Gosavi et al., 2018).

Halenospora varia (Anastasiou) E.B.G. Jones, Fungal Diversity 35: 154 (2009) Figure 3.170

Index Fungorum number: IF513086; Facesoffungi number: FoF 18548

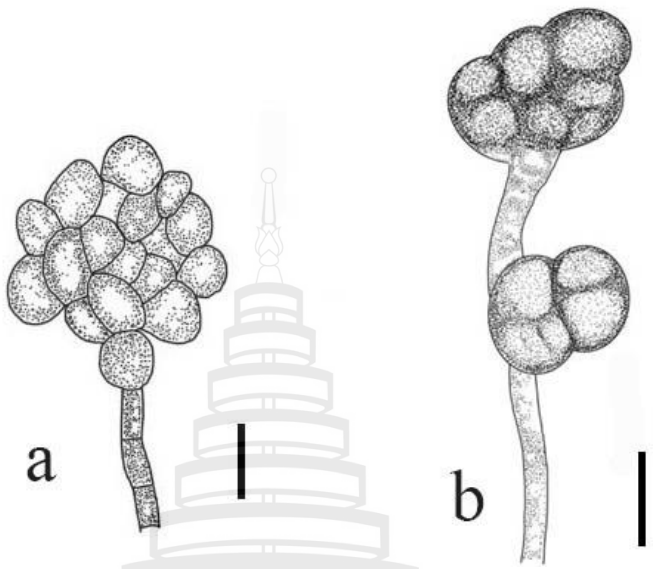
Description – Jones et al. (2009).

Material considered – Jones et al. (2009).

Distribution, ecological and economical importance

Halenospora species are ecologically important helicosporous hyphomycetes inhabiting submerged wood, driftwood, and other plant debris in marine, brackish, and occasionally freshwater environments. They play a role in the decomposition of lignocellulosic material, contributing to nutrient cycling in coastal ecosystems. Their presence in habitats with fluctuating salinity suggests physiological adaptability to osmotic stress (Jones et al., 2009; El-Elimat et al., 2014; Gosavi et al., 2018). The genus has been recorded from the Red Sea, India, Southeast Asia, and the Mediterranean, but appears to

have a patchy distribution, primarily in tropical and subtropical waters. No direct economic importance is currently known.



Source Redrawn from Jones et al. (2021)

Note a Conidia. B Highly convoluted, knotlike conidia. Scale bars: a, b = 10 µm.

Figure 3.170 *Halenospora varia*

Mycofalcella Marvanová, Om-Kalth. & J. Webster, Nova Hedwigia 56(3-4): 402 (1993)

Index Fungorum number: IF26474; Facesoffungi number: FoF 18549, 2 morphological species (Species Fungorum, 2025), 2 species with molecular data.

Aquatic hyphomycetes. Sexual morph: Unknown. Asexual morph: see Marvanová (1993).

Type species –*Mycofalcella* was introduced by Marvanová, Om-Kalthoum and Webster (1993) with *M. calcarata* as the type species. The genus is characterised by hyaline, septate hyphae; micro- to semi-macronematous, unbranched conidiophores; polyblastic, sympodially proliferating conidiogenous cells; and bacilliform arthroconidia arranged in simple or occasionally branched chains, with schizolytic secession. Colonies may exhibit light-induced pigmentation under culture conditions. *Mycofalcella* is placed in Tricladiaceae (Helotiales, Leotiomycetes), a family comprising aero-aquatic fungi with hyphomycete-like asexual morphs and glabrous apothecia (Johnston & Baschien, 2020). Molecular markers available for the genus

include ITS and SSU rDNA sequence data (Marvanová et al., 2002). The ex-type culture of *M. calcarata* is deposited in the Culture Collection of Fungi, Charles University, Prague (CCM F-10289).

Mycofalcella calcarata Marvanová, Om-Kalth. & J. Webster, Nova Hedwigia 56(3-4): 402 (1993)

Index Fungorum number: IF357725; Facesoffungi number: FoF 18550

Description – Marvanová (1993).

Material considered – Marvanová (1993).

Distribution, ecological and economical importance

Mycofalcella species are aquatic hyphomycetes typically inhabiting freshwater ecosystems such as streams, irrigation channels, and submerged plant debris. They play an important ecological role in decomposing lignocellulosic substrates, contributing to nutrient cycling and energy flow in aquatic environments (Arshad & Firdaus-e-Bareen, 2007; Johnston & Baschien, 2020). Geographically, the genus has been reported from Europe, Asia (including Pakistan and China), and New Zealand. *M. iqbalii* occurs in irrigation channels in tropical Pakistan (Arshad & Firdaus-e-Bareen, 2007), while *M. calcarata* was originally described from Europe.

Figure – No original illustration available.

Spirosphaera Beverw., Trans. Br. mycol. Soc. 36(2): 120 (1953)

Index Fungorum number: IF10013; Facesoffungi number: FoF 18551, 5 morphological species (Species Fungorum, 2025), 5 species with molecular data.

Saprobic, aero-aquatic fungi colonizing submerged plant debris. Sexual morph: Unknown. Asexual morph: see Hennebert (1968), Voglmayr (1997, 2004).

Type species – *Spirosphaera floriformis* Beverw.

Notes – *Spirosphaera* was introduced by van Beverwijk (1953) with *S. floriformis* as the type species. Members of this genus are characterised by micronematous to semi-macronematous, simple, septate conidiophores bearing terminal, holoblastic conidiogenous cells. Conidia are globose to subglobose, hyaline to pale brown, and consist of spirally coiled, loosely interwoven, septate filaments that branch unilaterally or irregularly. These complex multicellular propagules enclose air, enabling dispersal on water surfaces in aero-aquatic habitats (Hennebert, 1968; Voglmayr et al., 2004, 2011). Molecular markers available include ITS and LSU rDNA sequence data.

Phylogenetic analyses have shown that *Spirosphaera* is highly polyphyletic, with species distributed across different classes of Ascomycota (Voglmayr et al., 2011). The type species *S. floriformis* is phylogenetically placed within Leotiomycetes, associated with aquatic members of Helotiales. In contrast, *S. beverwijkiana* and *S. minuta* belong to Dothideomycetes, with *S. beverwijkiana* closely related to *Microthyrium microscopicum*, and *S. minuta* forming a sister lineage to the *S. beverwijkiana/Microthyrium* clade. *S. cupreorufescens* is nested within Pleosporales (Dothideomycetes) and is closely related to *Spiroplana centripeta*, a leaf pathogen with convergent conidial morphology. The specimen collected in Ommen, Netherlands (November 1947) is designated as the type, although no formal herbarium accession number was provided.

Spirosphaera floriformis Beverw. [as 'floriforme'], Trans. Br. mycol. Soc. 36(2): 121 (1953) Figure 3.171

Index Fungorum number: IF119722; Facesoffungi number: FoF 18552

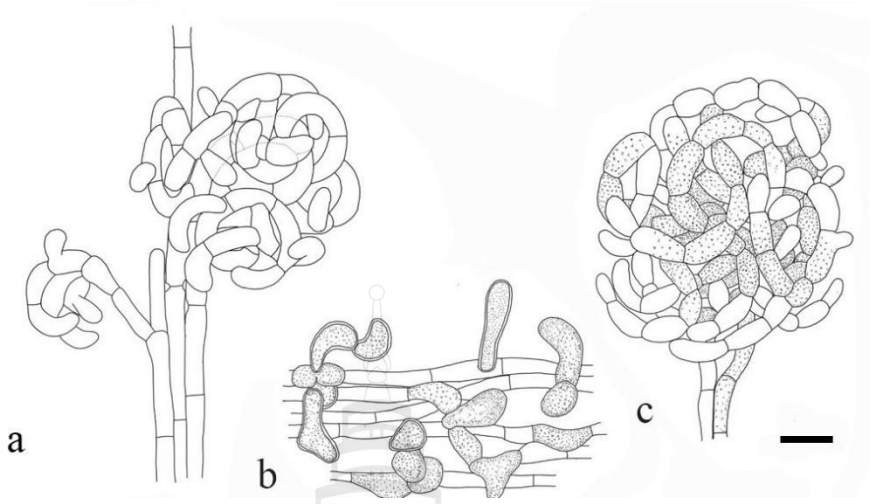
Description – Beverwijk (1953).

Material considered – Beverwijk (1953).

Distribution, ecological and economical importance

Spirosphaera species are specialised aero-aquatic fungi contributing to the decomposition of submerged plant litter, particularly leaves, in stagnant or slow-flowing water bodies such as ditches, bogs, ponds, and forest pools. The coiled, air-trapping conidia are an adaptation for dispersal across water surfaces, enabling colonisation of new substrates (van Beverwijk, 1953; Hennebert, 1968; Voglmayr, 2004).

These fungi are primarily distributed in temperate regions of the Northern Hemisphere, including Europe, East Asia, and North America. They are commonly recorded from lowland and montane forests with organic-rich aquatic environments. Reported substrates include submerged leaves of *Alnus*, *Salix*, *Betula*, and other deciduous trees (Hennebert, 1968; Voglmayr et al., 1997, 2004, 2011).



Source Redrawn from Hennebert (1968)

Note a Setae with unilateral synnemata. b Synnemata around the setae, in detail. c Conidiogenous cells. d-e Conidia. Scale bars: a, b = 20 µm, c–e = 10 µm.

Figure 3.171 *Spirosphaera floriformis*

Tricladium Ingold, Trans. Br. mycol. Soc. 25(4): 388 (1942) [1941]

Index Fungorum number: IF10306; Facesoffungi number: FoF 14077, 30 morphological species (Species Fungorum, 2025), 16 species with molecular data.

Saprobic fungi predominantly in freshwater ecosystems. Sexual morph: Unknown. Asexual morph: see Willoughby and Minshall (1975).

Type species – *Tricladium splendens* Ingold

Notes – *ricladium* was introduced by Ingold (1942) with *T. splendens* as the type species. Members of this genus are characterised by macronematous, septate, often simple or occasionally branched conidiophores; terminal, sympodial or percurrently proliferating conidiogenous cells; and acropleurogenous, branched, multiseptate conidia typically with a main axis and two alternate primary lateral branches. Conidiogenesis is thalloblastic. Conidia show structural variation among species, e.g., in *T. giganteum* the main axis may reach up to 280 µm with as many as 13 septa, while lateral arms may bear up to 7 septa (Willoughby & Minshall, 1975). In culture, conidia are often less abundant, with mycelia extending for several millimetres and being subject to grazing by aquatic invertebrates.

Some species (e.g., *T. giganteum*) can produce two distinct asexual propagule types: (1) thalloconidia—large, multiseptate, branched conidia typical of the genus, and (2) phialoconidia—minute, spherical to subspherical conidia (2–2.7 μm diam.) produced from flask-shaped phialides. In acidic natural waters (pH ~5.0), only phialoconidia are produced, whereas in neutral waters both propagule types occur (Willoughby & Minshall, 1975). Phialoconidia have not been observed to germinate in vitro but can either produce additional conidia directly or germinate via hyphal growth on nutrient media.

Molecular markers available for *Tricladium* include ITS and LSU rDNA sequences (Campbell et al., 2009; Gulis et al., 2012). Phylogenetic analyses place *Tricladium* within Helotiales (Leotiomycetes), and some species have demonstrated connections to teleomorphs in *Hymenoscyphus* (e.g., *H. varicosporoides* with *Tricladium* anamorph). This suggests that *Tricladium* may represent the asexual morphs of diverse Helotiales lineages adapted to freshwater habitats.

The type species *T. splendens* was described from submerged decaying leaves of *Alnus glutinosa* in a stream in Leicestershire, England (Ingold, 1942). No herbarium or culture accession number was provided in the protologue.

Tricladium splendens Ingold, Trans. Br. mycol. Soc. 25(4): 389 (1942) [1941] Figure 3.172

Index Fungorum number: IF291606; Facesoffungi number: FoF 18553

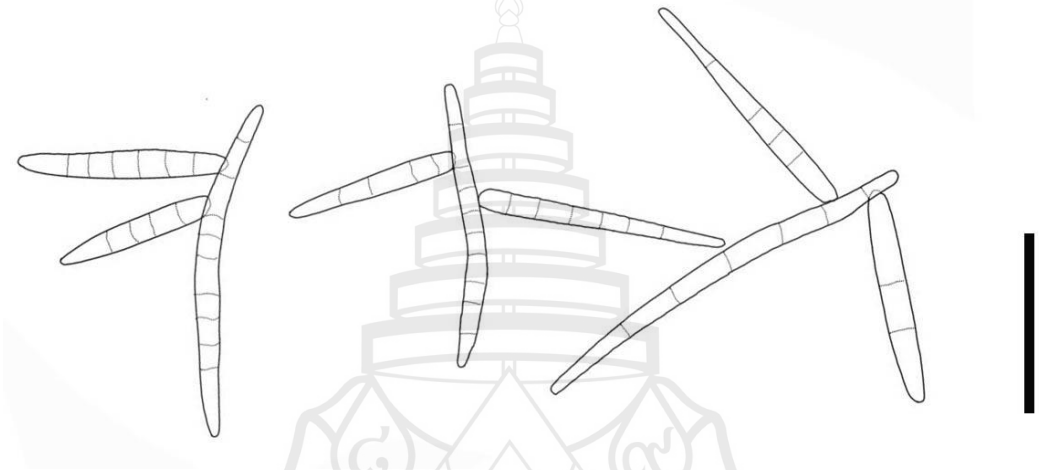
Description – Ingold (1942).

Material considered – Ingold (1942).

Distribution, ecological and economical importance

Tricladium species are ecologically important components of freshwater ecosystems, particularly in temperate and tropical forest streams. As aquatic hyphomycetes, they colonise submerged decaying plant materials such as leaves, grass blades, and woody debris, and contribute significantly to the decomposition of allochthonous organic matter (Willoughby & Minshall, 1975; Gulis et al., 2012). Their branched, multiseptate conidia are adapted for attachment to submerged surfaces and dispersal in running water. They also serve as a direct food source for aquatic invertebrates, with mycelia and conidia being grazed in situ. Some species show a preference for grass leaves in habitats where leaf litter from trees is scarce, highlighting

their adaptability to different detrital inputs (Willoughby & Minshall, 1975). *Tricladium* species have a cosmopolitan distribution in freshwater habitats, occurring on all continents except Antarctica. They are recorded from both lowland and montane streams, with notable diversity in Europe (UK, France), North America (Canada, USA), Asia (Thailand, India, China), Oceania (New Zealand), and Africa (South Africa) (Sivichai et al., 2003; Gulis et al., 2012).



Source Redrawn from Ingold (1942)

Note Spore. Scale bars: 50 µm.

Figure 3.172 *Tricladium splendens*

Vandijckellaceae Sand.-Den., in Crous et al.,, Persoonia 39: 455 (2017)

Index Fungorum number: IF823486; Facesoffungi number: FoF 18554,

Vandijckellaceae is a distinct lineage within Helotiales (Ascomycota, Leotiomycetes), introduced by Sandoval-Denis et al. (2017) with *Vandijckella johannae* as the type species. Colonies are buff to ochreous, flat, radially folded, and produce abundant aerial mycelium aggregated into hyphal ropes. Hyphae are hyaline, septate, branched, and smooth-walled. Conidiophores are simple and determinate, often reduced to phialidic conidiogenous cells borne directly on aerial hyphae. Conidiogenous cells are ampulliform, hyaline, smooth-walled, and bear a conspicuous elongate apical collarette. Conidia are clavate to cylindrical, hyaline, smooth- and thin-walled, and produced in easily detachable chains. The sexual morph is currently unknown and remains to be discovered in nature.

Species of Vandijckellaceae are saprobic, known only from culture-based isolations from soil and decomposing organic material, with no confirmed host association or pathogenicity. In this study, we reconstructed a multigene phylogeny (Figure 3.173), which confirmed the placement of the family within Helotiales. Phylogenetic analyses based on combined ITS, LSU, *RPB2*, and TUB2 datasets consistently resolve Vandijckellaceae as a strongly supported, monophyletic lineage, clearly distinct from morphologically similar families such as *Helotiaceae* and *Myxotrichaceae* (Sandoval-Denis et al., 2017). Additional collections and molecular data are required to further elucidate its ecological range and taxonomic relationships.

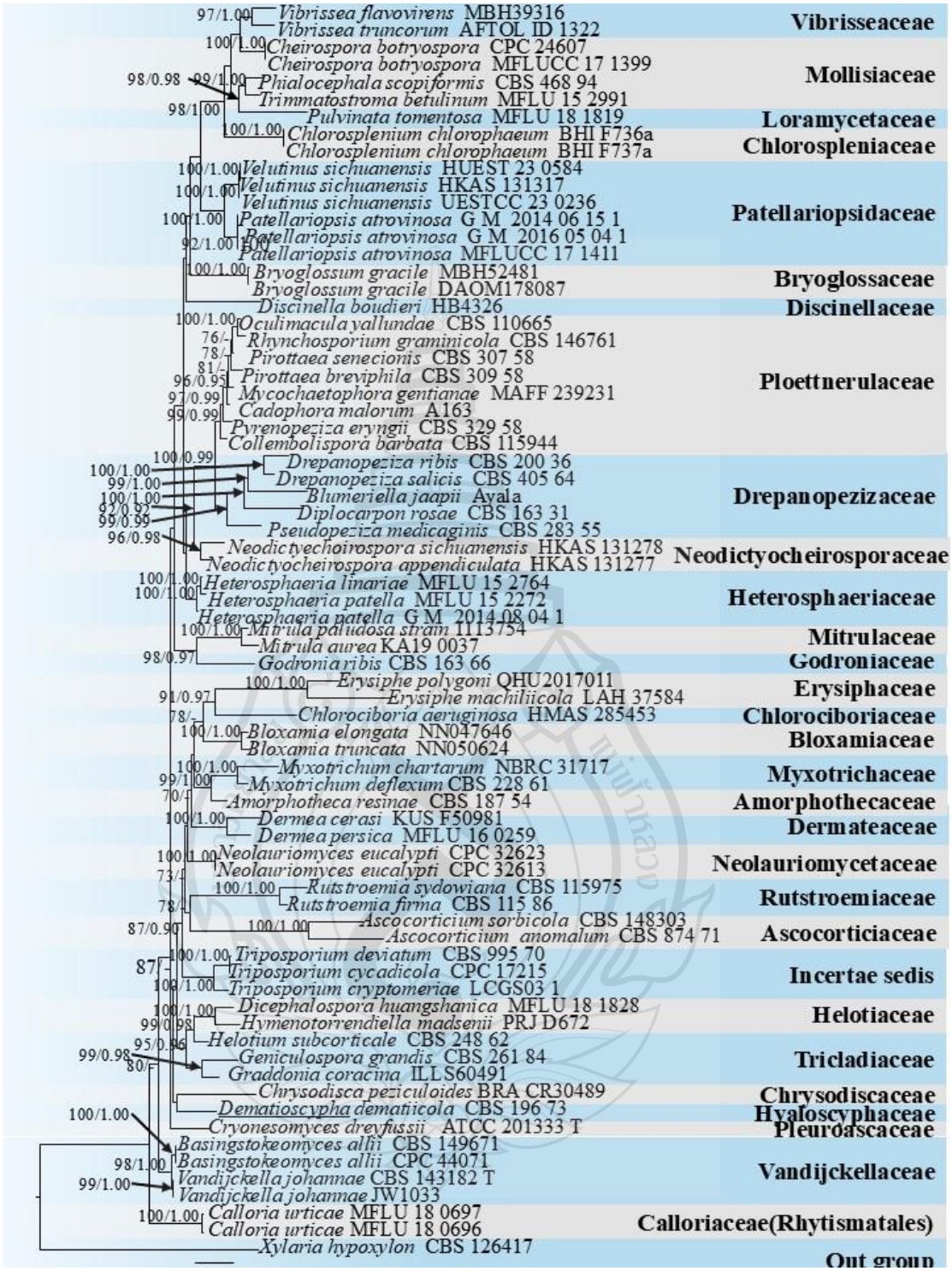


Figure 3.173 Maximum likelihood tree based on the combined ITS and LSU dataset of *Vandijckellaceae*

Figure 3.173 Bootstrap support values (MLBP ≥ 70%) and Bayesian posterior probabilities (BPP ≥ 0.90) are shown at nodes as MLBP/BPP. Values below these thresholds are indicated with a hyphen ("–"). Type strains are shown in bold.

Basingstokeomyces Crous & Denman, in Crous et al., Persoonia 50: 187 (2023)

Index Fungorum number: IF848070; Facesoffungi number: FoF 15325, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Obligate biotrophic on members of the Rosaceae family. Sexual morph: Unknown. Asexual morph: see Crous et al. (2023).

Type species – *Basingstokeomyces allii* Crous & Denman

Notes – *Basingstokeomyces* is a monotypic genus introduced by Crous et al. (2023) with *B. allii* as the type species. It is characterised by penicillate conidiophores bearing flame-like, hyaline structures that turn bright yellow on synthetic nutrient-poor agar. Mycelium hyaline, smooth, branched, septate. Conidiophores erect, clustered, subcylindrical, septate, with terminal clusters of 2–4 cylindrical, smooth, hyaline, aseptate primary branches. Conidiogenous cells terminal, subcylindrical, with flat-tipped apical loci, unthickened and not darkened. Conidia subcylindrical, aseptate, hyaline, smooth, guttulate, with obtuse ends, arranged in branched chains and aggregated in mucoid packets.

Molecular phylogenetic analyses based on ITS, LSU, and *RPB2* sequence data place *Basingstokeomyces* in Vandijckellaceae (Helotiales, Leotiomycetes), clearly separated from morphologically similar genera. Further collections and sequence data are needed to clarify its phylogenetic diversity and host range. The type species *Basingstokeomyces allii* was described from the UK, England, Basingstoke, on *Allium schoenoprasum* (Amaryllidaceae), collected in May 2022 by P.W. Crous. The holotype is CBS H-25210.

Basingstokeomyces allii Crous & Denman, in Crous et al., Persoonia 50: 187 (2023) Figure 3.174

Index Fungorum number: IF848071; Facesoffungi number: FoF 18555

Description – Crous et al. (2023).

Material considered – Crous et al. (2023).

Distribution, ecological and economical importance

Basingstokeomyces is a recently described fungal genus, with its type species, *Basingstokeomyces allii*, isolated from the leaves of *Allium schoenoprasum* (chives) in the United Kingdom. Due to its recent discovery, detailed information regarding its ecological role and broader distribution remains limited. The initial identification on chive leaves suggests a possible association with this host plant, but further research is necessary to determine its specific ecological functions, potential interactions with other plant species, and geographical range. Comprehensive studies involving additional collections and molecular analyses are essential to elucidate the full extent of *Basingstokeomyces*' role in its ecosystem and its distribution patterns.



Source Redrawn from Crous et al. (2023)

Note a Penicillate conidiophores with branched apical apparatus. b Catenulate conidia. Scale bars: a, b = 10 μm.

Figure 3.174 *Basingstokeomyces allii*

Cryonesomyces Unter. & Réblová, in Untereiner, Yue, Chen, Li, Bills Stepanek & Reblova, Mycologia 111(6): 1017 (2019)

Index Fungorum number: IF829380; Facesoffungi number: FoF 18556, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Aquatic fungi known for their role in decomposing organic matter in freshwater ecosystems. Sexual morph: Unknown. Asexual morph: see Untereiner et al. (2019).

Type species – *Cryonesomyces dreyfussii* Unter., Réblová & Bills

Notes – The genus was introduced by Untereiner et al. (2019) with *C. dreyfussii* as the type species. Colonies are hyaline to lightly pigmented, composed of hyaline, septate hyphae. Conidiogenous cells are phialidic, cylindrical, arising singly from undifferentiated hyphae or from sparsely and basitonously branched conidiophores, and bear a cylindrical or cup-shaped collarette. Conidia are hyaline, clavate to ellipsoidal, with a truncate base, slimy, accumulating in chains or small clusters at the phialide apices. Molecular markers available include ITS and LSU rDNA. Holotype: UAMH 12041 (dried culture on MLA).

Cryonesomyces dreyfussii Unter., Réblová & Bills, in Untereiner, Yue, Chen, Li, Bills Stepanek & Reblova, Mycologia 111(6): 1017 (2019) Figure 3.175

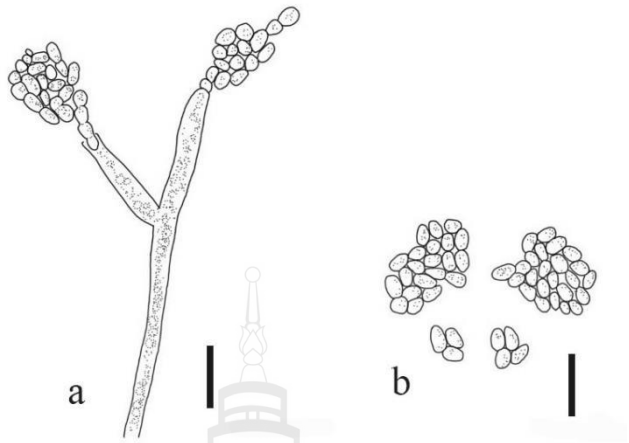
Index Fungorum number: IF829381; Facesoffungi number: FoF 18557

Description – Untereiner et al. (2019).

Material considered – Untereiner et al. (2019).

Distribution, ecological and economical importance

Cryonesomyces is a psychrotolerant fungal genus, with its type species, *Cryonesomyces dreyfussii*, isolated from moss in Antarctica. This genus is closely related to *Tetracladium*, a group of aquatic fungi known for their role in decomposing organic matter in freshwater ecosystems. While the specific ecological role of *Cryonesomyces* remains under investigation, its psychrotolerant nature suggests it may contribute to organic matter decomposition in cold environments, thereby playing a part in nutrient cycling within these ecosystems. Currently, *Cryonesomyces* has been identified in Antarctic regions, but further research is necessary to determine its full distribution and ecological significance (Untereiner et al., 2019).



Source Redrawn from Untereiner et al. (2019)

Note a Phialides with conidia. b Conidia. Scale bars: a, b = 10 µm.

Figure 3.175 *Cryonesomyces dreyfussii*

Vandijckella Sand.-Den., in Crous et al., Persoonia 39: 455 (2017)

Index Fungorum number: IF822625; Facesoffungi number: FoF 18558, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on soil. Sexual morph: Unknown. Asexual morph: see Crous et al. (2017).

Type species – *Vandijckella johannae* Sand.-Den.

Notes – *Vandijckella* was introduced by Sandoval-Denis et al. (2017) with *V. johannae* as the type species. This genus is characterised by monomorphic, short, simple, determinate conidiophores that are often reduced to conidiogenous cells. The conidiogenous cells are hyaline, smooth- and thin-walled, monophialidic, ampulliform, borne laterally on aerial hyphae, and terminate in a conspicuous, long apical collarette. Conidia are clavate to short cylindrical or oblong, straight or slightly curved, smooth- and thin-walled, hyaline, rounded at the apices, (5–)6–9(–10) × 2–3 µm ($\bar{x}$ = 7.5 × 2.3 µm, n = 30), 0–1-septate, and formed in dry, easily detachable chains. Colonies on MEA at 25 °C reach 45–50 mm diam. in 7 d, with a buff to pale olivaceous surface, flat and radially folded, abundant aerial mycelium forming hyphal ropes; reverse buff to ochreous. Mycelium hyaline, septate, branched, smooth-walled. Phylogenetically, *Vandijckella* forms a well-supported clade within Vandijckellaceae (Helotiales, Leotiomycetes), sister to *Basingstokeomyces*, and is clearly distinct from

morphologically similar families such as Helotiaceae and Myxotrichaceae based on multigene analyses (ITS, LSU, *RPB2*, *TUB2*). The type species *V. johannae* was collected from garden soil in Amsterdam, The Netherlands, in February 2017 by J.F.T.M. van Dijck; *holotype* CBS H-23223 (dried culture on MEA), ex-type culture CBS 143182.

Vandijckella johannae Sand.-Den., in Crous et al., Persoonia 39: 455 (2017) Figure 3.176

Index Fungorum number: IF822626; Facesoffungi number: FoF 18559

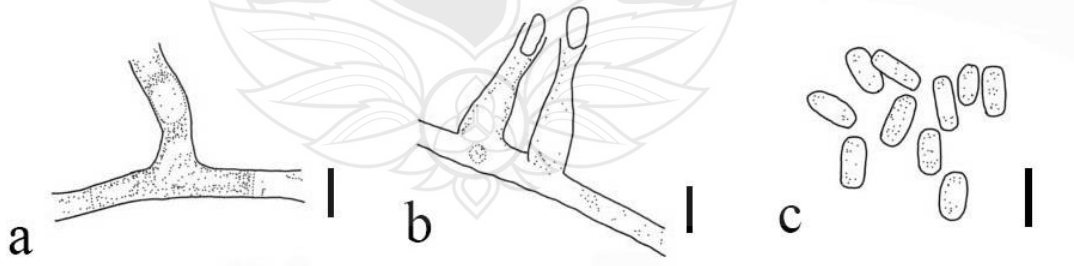
Description – Crous et al. (2017).

Material considered – Crous et al. (2017).

Distribution, ecological and economical importance

Vandijckella is presumed to be a saprobic fungus based on its isolation from soil. Its ecological function likely involves decomposition of organic material in terrestrial environments, contributing to nutrient cycling in soil ecosystems. However, due to the scarcity of field observations, the exact ecological niche and substrate specificity remain uncertain. No plant, animal, or microbial associations have been documented to date (Sandoval-Denis et al., 2017).

Vandijckella has only been reported from the Netherlands, where the type species *Vandijckella johannae* was isolated from soil. The limited geographical data suggests a restricted known distribution, though environmental sampling in other temperate regions may reveal a broader presence (Sandoval-Denis et al., 2017).



Source Redrawn from Crous et al. (2017)

Note a, b Conidiophores. b Conidia. Scale bars: a–c = 5 μm.

Figure 3.176 *Vandijckella johannae*

Vibrisseaceae Korf, Mycosystema 3: 23 (1990)

Index Fungorum number: IF82072; Facesoffungi number: FoF 05884.

Vibrisseaceae was introduced by Korf (1990) to accommodate genera such as *Vibrissea*, *Chlorovibrissea*, and *Leucovibrissea*. It is currently classified in the class Leotiomycetes, order Helotiales, within the phylum Ascomycota. Members of Vibrisseaceae are typically aquatic or semi-aquatic, forming sessile to long-stipitate apothecia, with colours ranging from whitish, yellowish, brownish, olivaceous to blackish green. The ectal excipulum is composed of *textura globosa*, *textura angularis*, or *textura prismatica*. Asci are unitunicate, cylindrical to clavate, inoperculate, with an amyloid apical apparatus, and ascospores are filiform and hyaline.

The three main genera can be distinguished by the colour and morphology of the apothecia, the structure of the ectal excipulum, and the ascal apical ring. The sexual morph is well developed in *Vibrissea*, *Chlorovibrissea*, and *Leucovibrissea*, whereas the asexual morph is known in some taxa, such as *Phialocephala*, which produces hyaline to brown, septate conidia in culture. Members of Vibrisseaceae are saprobic or endophytic, occurring on submerged woody debris, decaying herbaceous material, or roots in freshwater habitats. They play a significant role in nutrient cycling in aquatic and semi-aquatic ecosystems, particularly in cold-temperate or alpine stream environments.

In this study, a combined ITS and LSU phylogeny (Figure 3.177) was reconstructed to evaluate the familial relationships within Vibrisseaceae. The results confirm the overall placement of Vibrisseaceae within Helotiales, but the family appears polyphyletic, as two distinct clades of Vibrisseaceae are separated by Chlorospleniaceae (Chlorosplenium chlorophaeum) with high statistical support (≥99/1.00). This topology indicates that the traditional circumscription of Vibrisseaceae may not represent a natural monophyletic group.

The first clade includes Vibrissea flavovirens, V. truncorum, and Srinivasamyces species, which correspond to the core members of Vibrisseaceae. The second clade, containing Patellariopsis atrovinosa and related taxa, shows morphological affinity to Vibrisseaceae but is separated phylogenetically, suggesting possible misplacement or a need for reevaluation of Patellariopsidaceae. A similar topological pattern was noted by Rajesh Jeewon et al., (personal observation) and has

been hinted at in previous analyses (e.g., Wang et al., 2006; Zhuang 2017; Karunarathna et al., 2020).

Further molecular and morphological investigations—ideally incorporating multi-locus or genome-scale data—are required to clarify whether these lineages should be treated as distinct families or united under an expanded Vibrisseaceae concept. Despite this phylogenetic complexity, members of Vibrisseaceae remain morphologically and ecologically coherent, characterized by vividly colored apothecia and filiform multiseptate ascospores typically found in aquatic or semi-aquatic habitats.

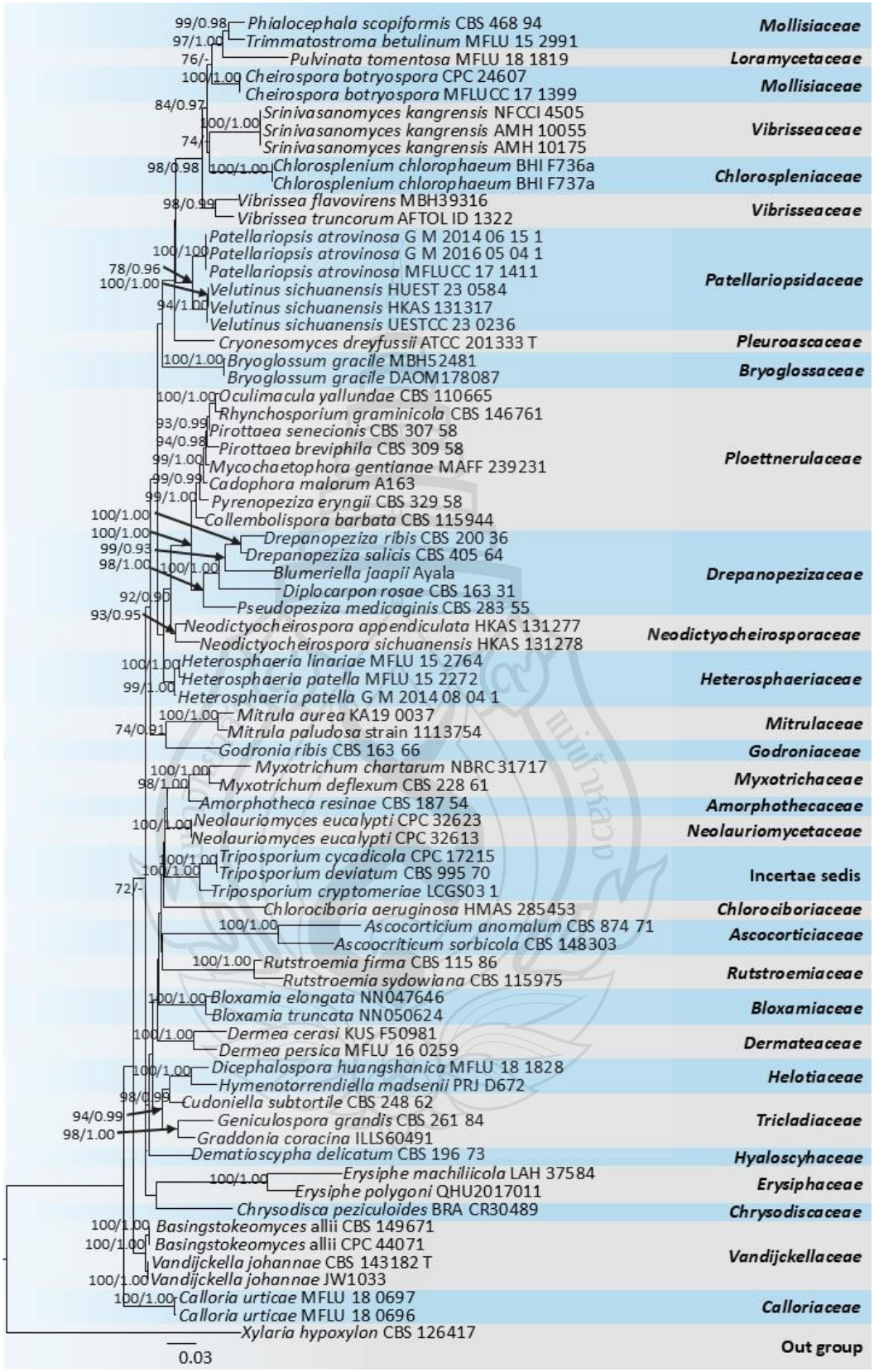


Figure 3.177 Maximum likelihood tree based on the combined ITS and LSU dataset of *Vibrisseaceae*

Figure 3.177 Bootstrap support values (MLBP ≥ 70%) and Bayesian posterior probabilities (BPP ≥ 0.90) are shown at nodes as MLBP/BPP. Values below these thresholds are indicated with a hyphen ("–"). Type strains are shown in bold.

Cheirospora Moug. & Fr., in Fries, Syst. orb. veg. (Lundae): 365 (1825)

Index Fungorum number: IF7614; Facesoffungi number: FoF01456, 2 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on dead twigs. Sexual morph: unknown. Asexual morph: see Karunarathna et al. (2020).

Type species – Cheirospora *botryospora* (Mont.) Berk. & Broome, Ann. Mag. nat. Hist., Ser. 2 5: 455 (1850)

Notes – The genus *Cheirospora* was originally described by Montagne (1836) with *C. botryospora* as the type species, later transferred to its current combination by Berkeley and Broome (1850). It is currently placed in the family Vibrisseaceae, order Helotiales, class Leotiomycetes, phylum Ascomycota. *Cheirospora* is characterised by acervular, subepidermal to erumpent, gelatinous conidiomata producing pulvinate, olivaceous to black conidial masses. Conidiophores are simple, hyaline, septate, cylindrical, branched only at the base or unbranched, and give rise to holoblastic, cylindrical, integrated, smooth-walled conidiogenous cells. Conidia are cheiroid (hand-shaped), consisting of several short, lateral, acropetally branched chains, enclosed within a thick gelatinous sheath. The genus is phylogenetically well supported within Vibrisseaceae, with combined LSU and ITS analyses placing *C. botryospora* in a highly supported clade with *Vibrissea* and *Chlorociboria* (MLBP 100%, BIPP 1.00) (Karunarathna et al., 2020). Members of Vibrisseaceae share morphological traits such as gelatinous fruiting bodies and hyaline, aseptate conidia. The holotype of *C. botryospora* was collected in France on *Fagus sylvatica* and is preserved in herb. Mont. (Montagne, 1836).

Cheirospora *botryospora* (Mont.) Berk. & Broome, Ann. Mag. nat. Hist., Ser. 2 5: 455 (1850) Figure 3.178

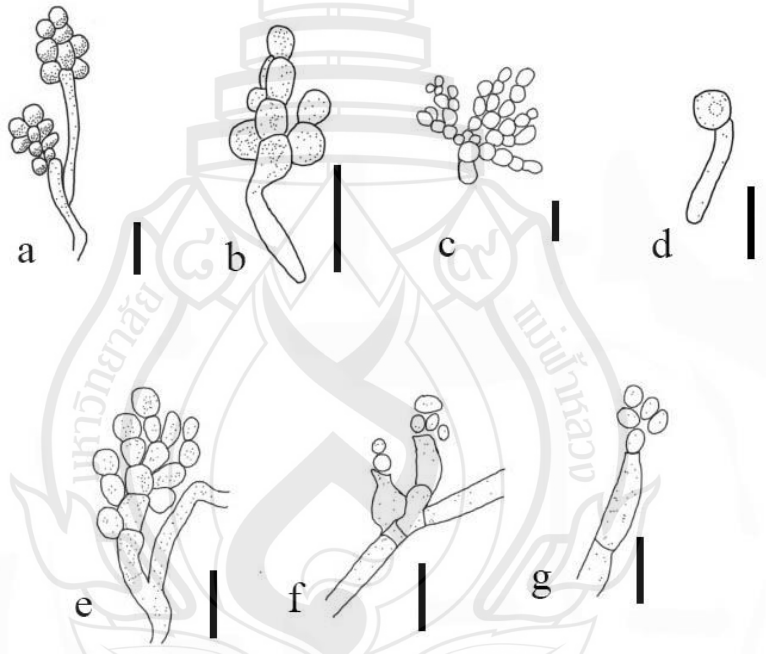
Index Fungorum number: IF294800; Facesoffungi number: FoF 06594

Description – Karunarathna et al. (2020).

Material considered – Karunarathna et al. (2020).

Distribution, ecological and economical importance

Species of *Cheirospora* are saprobic fungi involved in the decomposition of lignocellulosic plant material, particularly dead twigs and bark of angiosperms in temperate forest ecosystems. By breaking down complex organic matter, they contribute to nutrient cycling and ecosystem stability. *C. botryospora* has been recorded from France, Italy (on *Fagus sylvatica*), and the United Kingdom, suggesting a distribution centred in temperate Europe. Due to the inconspicuous nature of their gelatinous sporodochia and limited targeted surveys, the true distribution is likely underestimated, and the genus may be more widespread across temperate forest biomes (Crous et al., 2015; Karunarathna et al., 2020).



Sources Redrawn from Crous et al. (2015), Karunarathna et al. (2020)

Note a Conidia attached to the conidiophores. b Conidia. c Conidia. d Germinated conidium. e Conidiogenous cells giving rise to botryose conidia. f, g Conidiogenous cells with *Phialophora* synasexual morph. Scale bars: a = 50 µm, b–g = 10 µm.

Figure 3.178 *Cheirospora botryospora*

Chlorovibrissea L.M. Kohn, Mem. N. Y. bot. Gdn 49: 113 (1989)

Index Fungorum number: IF25291; Facesoffungi number: FoF 18560, 7 morphological species (Species Fungorum, 2025), 5 species with molecular data.

Saprobic on organic matter, particularly in aquatic or semi-aquatic environments. Sexual morph: see Kohn (1989). Asexual morph: see Kohn (1989).

Type species – *Chlorovibrissea bicolor* (G.W. Beaton & Weste) L.M. Kohn

Notes – *Chlorovibrissea* was introduced by Kohn (1989) with *C. bicolor* as the type species, based on collections from submerged wood in freshwater streams in Australia. This genus is currently placed in the family Vibrisseaceae, order Helotiales, class Leotiomycetes, phylum Ascomycota. *Chlorovibrissea* is characterised by stipitate-capitate apothecia with vivid green to blackish-green pigmentation in the stipe and hymenium; the ectal excipulum consists of *textura prismatica* with hyphae parallel to the surface; asci are inoperculate, with a deeply staining apical apparatus showing a J+ reaction in Melzer's reagent; ascospores are filiform, hyaline, multiseptate, and often slightly curved. The green pigmentation, persistent in dried specimens, distinguishes *Chlorovibrissea* from the morphologically similar genus *Vibrissea*. Molecular phylogenetic analyses based on ITS, LSU, and *RPB2* sequence data (Wang et al., 2006; Sandoval-Leiva et al., 2014) consistently place *Chlorovibrissea* as a distinct monophyletic clade within Vibrisseaceae, separate from *Vibrissea*, but sharing the family's adaptation to aquatic or semi-aquatic habitats. In combined-gene phylogenies, *C. bicolor* clusters with *C. melanochlora*, *C. chilensis*, and *C. korfii*, supported by high bootstrap values (>90%) and posterior probabilities (>0.95). The holotype specimen was collected in Australia, Victoria, Melba Gully near Laver's Hill, on the underside of an unidentified log with ascomata partially immersed in stream, on 22 July 1976 by G. Beaton (collection number 389, deposited in MELU).

Chlorovibrissea bicolor (G.W. Beaton & Weste) L.M. Kohn, Mem. N. Y. bot. Gdn 49: 114 (1989) Figure 3.179

Index Fungorum number: IF135945; Facesoffungi number: FoF 18561

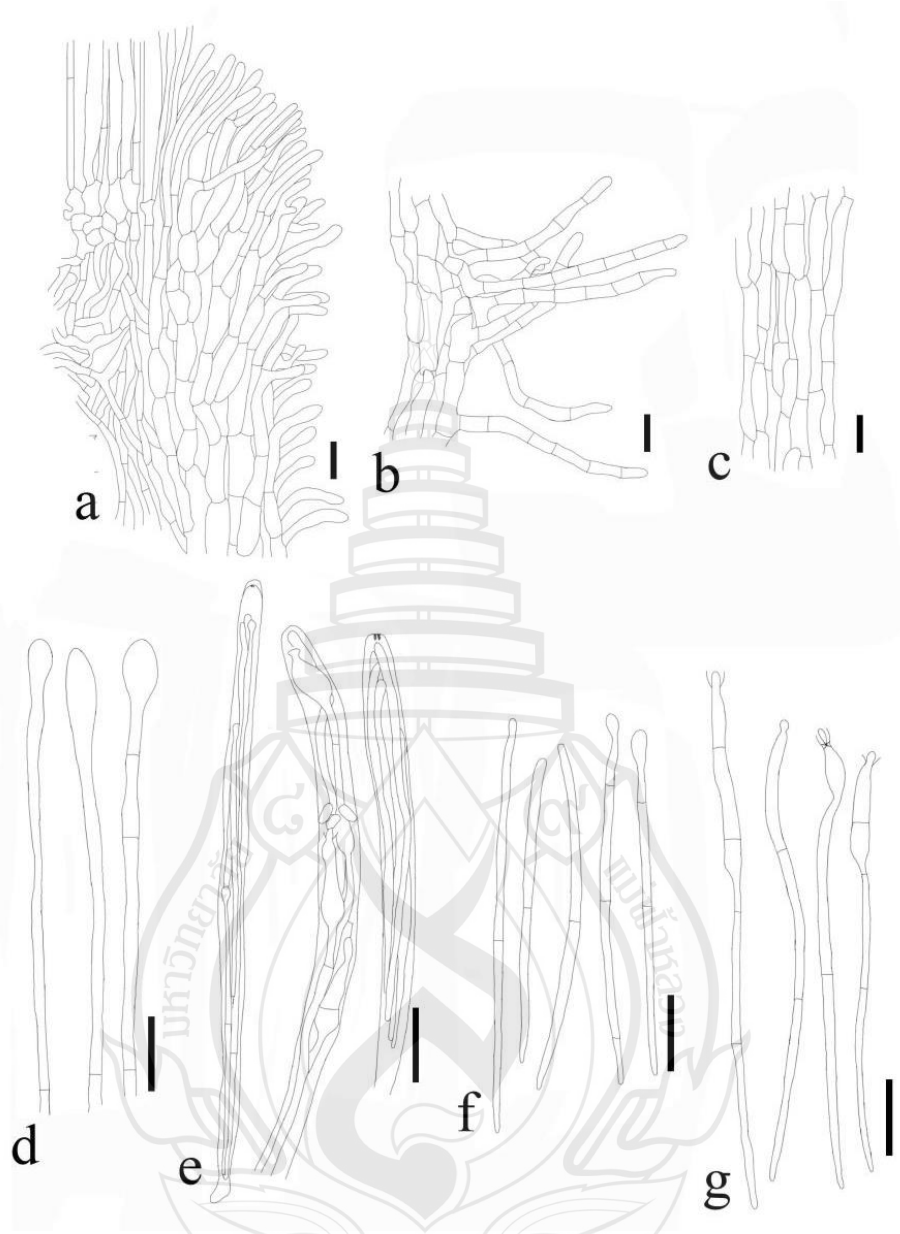
Description – Kohn (1989).

Material considered – Kohn (1989).

Distribution, ecological and economical importance

Species of *Chlorovibrissea* are saprobic, occurring primarily on submerged wood, bark, and other plant debris in cool, clean, fast-flowing streams, waterfall splash zones, and other moist forest microhabitats. They contribute to the decomposition of lignocellulosic material under wet conditions, facilitating nutrient recycling in freshwater forest ecosystems.

Originally thought to be restricted to the Southern Hemisphere (Australia and New Zealand), the discovery of *C. chilensis* in Chile (Sandoval-Leiva et al., 2014) extended the range to South America, while *C. korfii* from China confirmed its presence in the Northern Hemisphere. Known species include *C. bicolor*, *C. melanochlora*, *C. chilensis*, *C. korfii*, *C. saccardoi*, and others, indicating a likely wider but under-documented distribution in temperate and subtropical montane stream systems worldwide.



Source Redrawn from Réblová et al. (2021)

Note a Setae with unilateral synnemata. b Synnemata around the setae, in detail. c Conidiogenous cells. d-e Conidia. Scale bars: a, b = 20 µm, c–e = 10 µm.

Figure 3.179 *Chlorovibrissea phialophora*

Leucovibrissea (A. Sánchez) Korf, Mycosystema 3: 23 (1990)

Index Fungorum number: IF25516; Facesoffungi number: FoF 18562, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on decaying wood. Sexual morph: see Kunze and Schmidt 1823. Asexual morph: Unknown.

Type species – *Leucovibrissea obconica* (Kanouse) Korf

Notes – *Leucovibrissea* is a monotypic genus in the family Vibrisseaceae (Helotiales, Leotiomycetes). It contains only *Leucovibrissea obconica*, originally described as *Helotium obconicum* by Kanouse and later transferred to *Leucovibrissea* by Korf (1990). The genus is characterised by its occurrence on terrestrial substrates, often associated with woody debris in wetland habitats. Currently, no sequence data are available for *Leucovibrissea*, and its precise phylogenetic placement within Vibrisseaceae remains unresolved. The type species, *Leucovibrissea obconica*, is based on the holotype MICH 14405, collected by A.H. Smith, J.L. Lowe and J.B. McFarland on 28 May 1933 from Whitmore Lake, Mud Lake Bog, Michigan, USA, on old sticks buried in sphagnum and debris at the bases of *Chamaedaphne calyculata* bushes.

Leucovibrissea obconica (Kanouse) Korf, Mycosystema 3: 23 (1990) Figure 3.180

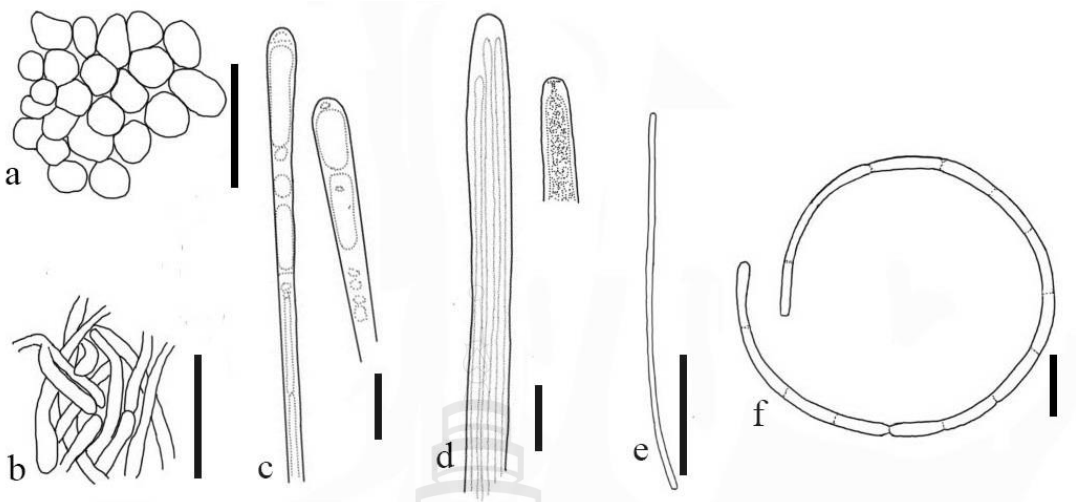
Index Fungorum number: IF126886; Facesoffungi number: FoF 18563

Description – Korf (1990).

Material considered – Korf (1990).

Distribution, ecological and economical importance

Leucovibrissea is known only from the type locality in Michigan, USA. Due to the absence of additional collections and molecular data, its wider distribution and ecological role remain poorly understood. Based on habitat records, it may be involved in the decomposition of woody material in sphagnum bog ecosystems. Further field surveys are needed to clarify its ecological functions and biogeography.



Source Redrawn from Centro de Estudios Micológicos Asturianos (2023)

Note a Ectal ecxipulum. b = Medullary ecxipulum. c Paraphysis. d Asci and apcal asci (IKI b). e, f Ascospores. Scale bars: a, b = 50 µm, c, d, e = 10 µm.

Figure 3.180 *Leucovibrissea obconica*

Srinivasanomyces S. Rana & S.K. Singh, in Hyde et al., Fungal Diversity 100: 156 (2020)

Index Fungorum number: IF830717; Facesoffungi number: FoF 06119, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on decaying twigs and bark of angiosperms. Sexual morph: see Hyde et al. (2020). Asexual morph: Unknown.

Type species – *Srinivasanomyces kangrensis* S. Rana & S.K. Singh

Notes – *Srinivasanomyces* was introduced by Rana and Singh in Hyde et al. (2020) with *S. kangrensis* as the type species, based on collections from Himachal Pradesh, India. This genus is characterised by immersed to erumpent, globose to subglobose, dark brown to black ascomata with a central ostiole, bitunicate, fissitunicate asci, and ellipsoidal to fusiform, hyaline, aseptate ascospores often with guttules. The sexual morph is unknown. The asexual morph is phialidic, with conidiophores arising laterally from hyphae, solitary to densely branched, septate, hyaline to pale olivaceous; conidiogenous cells variable in shape, phialidic, solitary or in clusters; conidia smooth, pyriform to ovoid, with 1–2 guttules; chlamydospores common, solitary or in chains, globose to subglobose, pigmented, smooth, subhyaline

to pale olivaceous. Molecular markers available include ITS (MK478471) and LSU (MK478470) sequence data. Phylogenetic analysis placed *Srinivasanomyces* within Vibrisseaceae, closely related to *Phialocephala* species such as *P. cladophialophoroides*, *P. oblonga* and *P. dimorphospora*, but forming a distinct, well-supported clade. The holotype specimen (AMH 10175) was collected from dead bark of *Prunus cerasoides* in Simal, Kangra District, Himachal Pradesh, India, on 10 April 2018 by S. Rana and A.N. Mishra; the ex-type culture is preserved as NFCCI 4505.

Srinivasanomyces kangrensis S. Rana & S.K. Singh, in Hyde et al., Fungal Diversity 100: 159 (2020) Figure 3.181

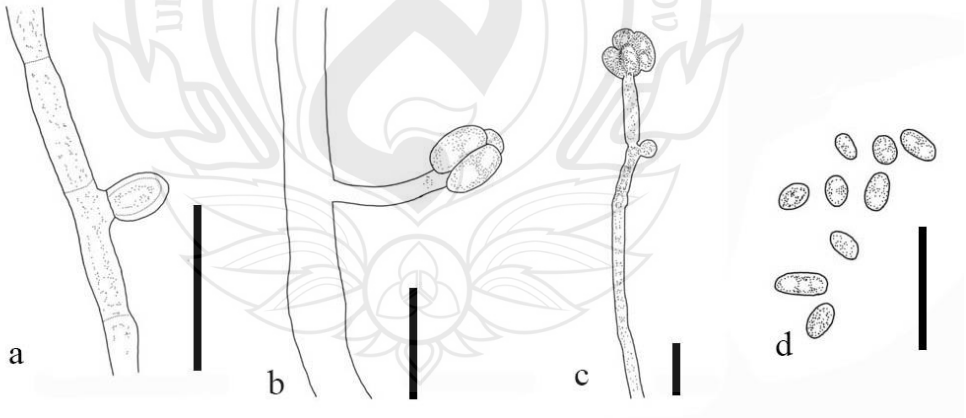
Index Fungorum number: IF830718; Facesoffungi number: FoF 06589

Description – Hyde et al. (2020).

Material considered – Hyde et al. (2020).

Distribution, ecological and economical importance

This genus plays a role in the decomposition of lignocellulosic materials, contributing to nutrient recycling in temperate forest ecosystems. *Srinivasanomyces kangrensis* is currently known only from the type locality in Himachal Pradesh, India, collected in a temperate broadleaf forest at mid-elevation, associated with *Prunus cerasoides*. No economic importance or pathogenicity has been reported.



Source Redrawn from Hyde et al. (2020)

Note a Conidia produced from lateral hyphae. b, c Conidiophores produced from lateral hyphae with conidia. d = Conidia. Scale bars: a–d =20 μm.

Figure 3.181 *Srinivasanomyces kangrensis*

Vibrissea Fr., Syst. mycol. (Lundae) 2(1): 4, 31 (1822)

Index Fungorum number: IF5737; Facesoffungi number: FoF 18564, 35 morphological species (Species Fungorum, 2025), 7 species with molecular data.

Saprobic on submerged wood and plant debris in freshwater habitats. Sexual morph: see Schumacher (1976), Beaton and Weste (1980). Asexual morph: Unknown.

Type species – *Vibrissea truncorum* (Alb. & Schwein.) Fr.

Notes – *Vibrissea* is characterised by its aquatic or semi-aquatic habitat, typically on submerged wood or plant debris in streams, creeks, or other freshwater environments. Fruiting bodies are usually small, stalked, disc- to cup-shaped apothecia, often with yellow, orange, or brownish coloration; pigmentation patterns of disc and stipe are important diagnostic features within the genus. The ectal excipulum is composed of *textura prismatica* with cells arranged at a high angle to the surface; the stipe cortex consists of vertically arranged hyphae, sometimes bearing short hairs. Asci are cylindrical, 8-spored, containing filiform, hyaline, multi-septate ascospores; ascus apical ring reactions (J+ or J−) and spore length are used for sectional delimitation within the genus. *Vibrissea* is placed in Vibrisseaceae, order Helotiales. Type information for *V. truncorum*: type specimen at Royal Botanic Gardens, Kew; type locality unknown. More taxa and collections are needed to clarify the genus's phylogenetic relationships.

Vibrissea truncorum (Alb. & Schwein.) Fr., Syst. mycol. (Lundae) 2(1): 51 (1822) Figure 3.182

Index Fungorum number: IF211998; Facesoffungi number: FoF 18565

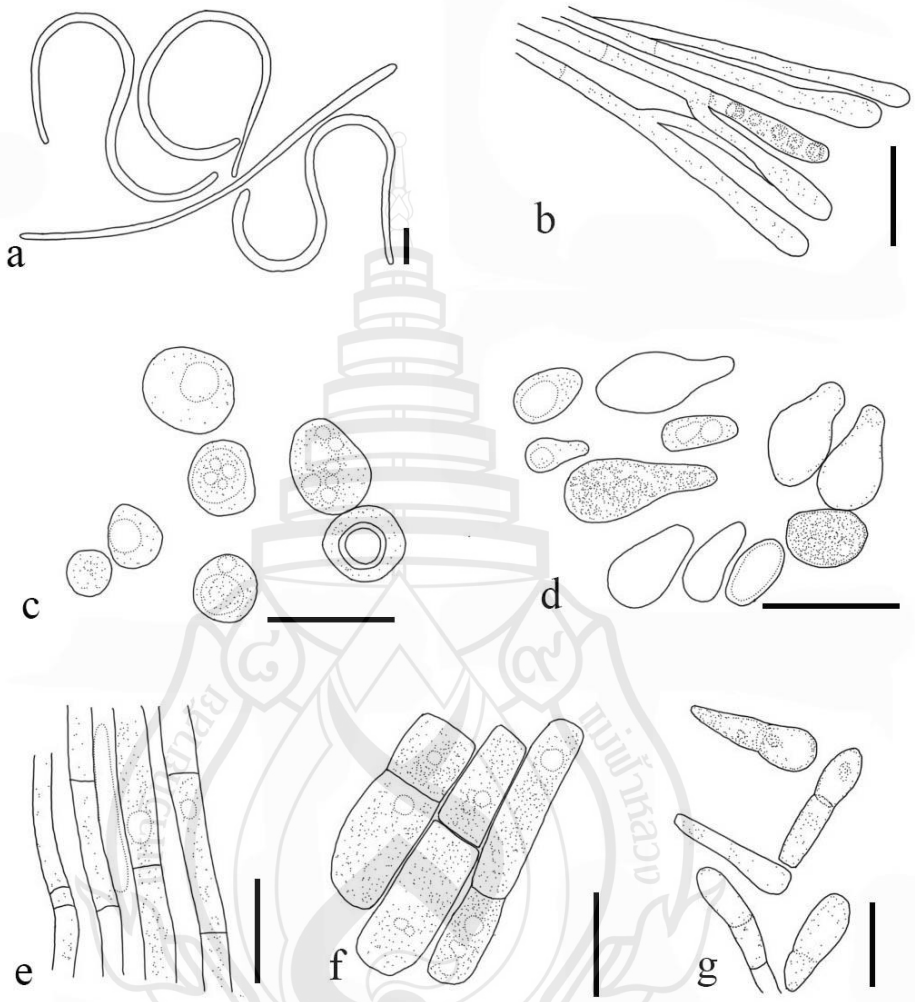
Description – Schumacher (1976), Beaton and Weste (1980).

Material considered – Schumacher (1976), Beaton and Weste (1980).

Distribution, ecological and economical importance

Species of *Vibrissea* contribute to the decomposition of submerged woody debris and plant material, playing an important role in nutrient cycling in freshwater ecosystems. They inhabit cold, clean streams and splash zones, but also occur in unusual habitats such as lake bottoms at depths up to 8 m. The genus is widely distributed in the Northern Hemisphere (North America, Europe, Asia) and is also recorded from the Southern Hemisphere, e.g., *V. albofusca* from multiple localities in

New Zealand's North Island. European records include *V. truncorum* from La Rioja, Spain, indicating a broader global distribution than previously recognised.



Source Redrawn from Martínez-Gil and Caballero (2016)

Note a Spores. b Paraphyses. c Ectal excipulum. d Margin. e Medullary excipulum. f Stipe trama. g Elements of the stipitipellis. Scale bars: 20 µm.

Figure 3.182 *Vibrissea truncorum*

Helotiales genera *incertae sedis*

Acidea Hujslová & M. Kolařík, in Hujslova, Kubatova, Kostovcik, Blanchette, de Beer, Chudicková & Kolařík, Mycol. Progr. 13(3): 826 (2014)

Index Fungorum number: IF805195; Facesoffungi number: FoF 13859, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on highly acidic soils. Sexual morph: Unknown. Asexual morph: Hujslová et al. (2014).

Type species – ***Acidea extrema*** Hujslová & M. Kolařík.

Notes – *Acidea* was introduced by Hujslová & M. Kolařík (2014) with *A. extrema* as the type species, based on isolates from kaolin quarry soils with pH ~ 2 in Western Bohemia, Czech Republic. Colonies are compact to cerebriform, sometimes with ruffled margins, and may appear yeast-like. Hyphae are hyaline, septate; conidiophores are reduced to conidiogenous cells borne directly on hyphae or short, unbranched conidiophores. Conidiogenous cells are hyaline, integrated, terminal or intercalary, monoblastic. Conidia are hyaline, smooth, obovoid to ellipsoidal, aseptate, produced singly, and secede rhexolytically. This genus is adapted to extremely acidic environments (pH < 3) and is slightly halophilic. It shows acidotolerant to acidophilic growth, with tolerance to high concentrations of sulfates and metals. In phylogenetic analyses based on LSU, SSU and ITS sequence data, *Acidea* forms a distinct lineage within the Helotiales (Leotiomycetes, Ascomycota) but remains *incertae sedis* at the family level. The holotype specimen (PRM 922617) is deposited in the herbarium of the National Museum, Prague; the ex-type culture is CBS 136258.

Acidea extrema Hujslová & M. Kolařík, in Hujslová, Kubátová, Kostovčík, Blanchette, De Beer, Chudíčková & Kolařík, Mycol. Progr. 13(3): 827 (2014) Figure 3.183

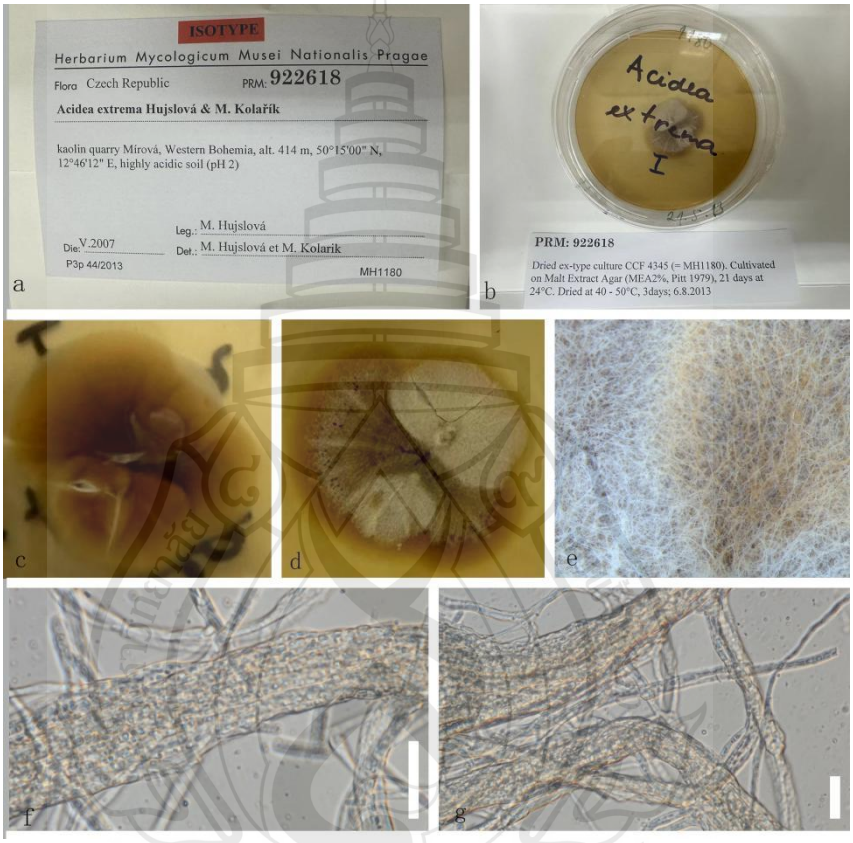
Index Fungorum number: IF805425; Facesoffungi number: FoF 18566

Description – Isolated from highly acidic soil (pH 2). Sexual morph: Unknown. Asexual morph: Dried colonies on PDA medium, irregular to circular, white to light brown, dark white at the margin, floccose at the surface with dense, ashen-white to light brown mycelia, reverse honey to ochre, 17–22 mm in diam. Mycelium sterile, irregular branched, flocked to bundle, 2.0–5.5µm wide, partial fragmented, fully-filled with granules.

Material considered – Czech Republic, Western Bohemia, kaolin quarry Mírová, from soil (pH2), May 2007, M. Hujslová (PRM:922618), isotype.

Distribution, ecological and economical importance

Acidea extrema is a saprobe in extremely acidic, low-vegetation soils, often associated with kaolin quarries containing sulfur and brown coal layers. Known only from the type locality in the Czech Republic, it tolerates a wide pH range but grows optimally at pH 2–3, indicating high ecological specialisation. No economic uses or pathogenicity are known.



Note a-b Details of herbarium material. c-d Dried colony. e Mycelium on MEA. f-g Sterile mycelium under microscope. Scale bars: f–g = 20 µm.

Figure 3.183 *Acidea extrema* (PRM:922618, isotype)

Algincola Velen., Novitates Mycologicae Novissimae: 176 (1940) [1939]

Index Fungorum number: IF123; Facesoffungi number: FoF 18567, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobes, terrestrial. Sexual morph: see Velenovský (1939). Asexual morph: Unknown.

Type species – *Algincola quercina* Velen.

Notes – *Algincola* was introduced by Velenovský in 1939. Currently, Algincola is a monotypic genus, containing only the species Algincola quercina. Molecular markers and detailed genetic data for Algincola are currently unavailable, and the genus is noted to require further taxonomic revision due to limited available information on its cultures and sequences. No type specimen was designated in the original publication.

Algincola quercina Velen., Novitates Mycologicae Novissimae: 177 (1940) [1939]

Index Fungorum number: IF275919; Facesoffungi number: FoF 18568

Description –Velenovský (1939).

Material considered –Velenovský (1939).

Distribution, ecological and economical importance

Algincola is saprobic on *Pleurococcus*, on *Quercus*: former Czechoslovakia.

Figure – No original illustration available.

Aphanodesmium Réblová & Hern.-Restr., in Réblová, Hernández-Restrepo, Fournier & Nekvindová, Stud. Mycol. 95: 442 (2020)

Index Fungorum number: IF832922; Facesoffungi number: FoF 14078, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Endophytic in green needles of *Picea abies*. Sexual morph: Unknown. Asexual morph: see Réblová et al. (2020).

Type species – *Aphanodesmium gabretae* (Koukol & Kolářová) Réblová & Hern.-Restr.

Notes – *Aphanodesmium* was introduced by Réblová & Hernández-Restrepo to accommodate *Bactrodesmium gabretae*, following phylogenetic analyses that demonstrated the polyphyly of *Bactrodesmium*. It is characterised by semi-macronematous or micronematous, loosely fasciculate, branched conidiophores, sometimes swollen, hyaline, up to 90 µm long and 3–6 µm wide. Conidiogenous cells are monoblastic, integrated, terminal, or intercalary. Conidia are dry, solitary, ellipsoidal to obovoid, pale to mid brown, with 1–3 transverse distosepta (one may be oblique), 13–19(24) × 9–13.5 µm; the basal cell is hyaline to pale brown, 4–7(10) × 2.5–4.5 µm; conidia secede rhexolytically. In culture, colonies on PDA reach 16–18 mm in diameter after 30 days at 25 °C, while on 2% MA they reach 11–12 mm, and on PCA 11–13 mm; on 2% MA with a sterile spruce needle, black sporodochium-like

clusters form. This genus is placed in the Helotiales (Leotiomycetes) based on ITS (FN561756) and LSU (FN561755) sequence data. The holotype specimen (PRM 915691, dried culture) is deposited in the National Museum in Prague.

Aphanodesmium gabretae (Koukol & Kolářová) Réblová & Hern.-Restr., in Réblová, Hernández-Restrepo, Fournier & Nekvindová, Stud. Mycol. 95: 442 (2020) Figure 3.184

≡ *Bactrodesmium gabretae* Koukol & Kolářová, Nova Hedwigia 91(1-2): 244 (2010)

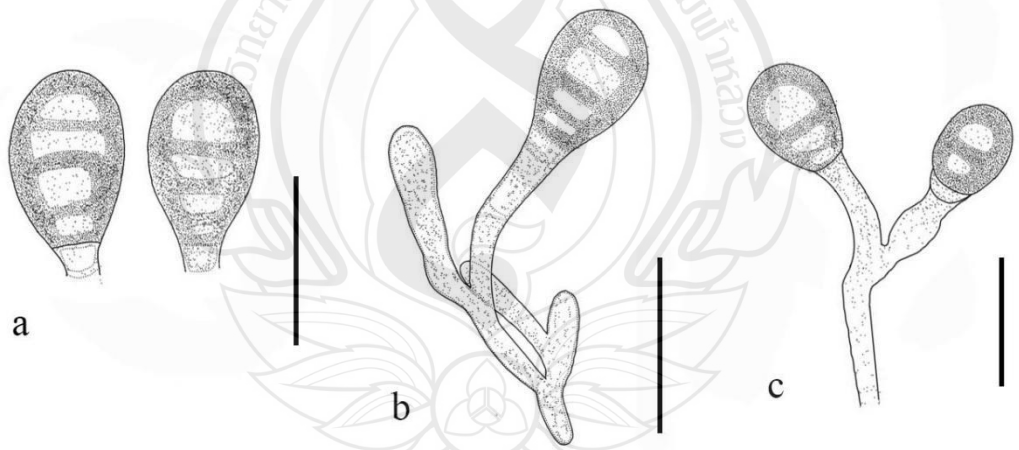
Index Fungorum number: IF832923; Facesoffungi number: FoF 14079

Description – see Réblová et al. (2020).

Material considered – Réblová et al. (2020).

Distribution, ecological and economical importance

Known as an endophyte from *Picea abies* needles in the Bohemian Forest National Park, Czech Republic. It inhabits premature green needles that have fallen due to bark beetle damage, suggesting a role in the early stages of needle decomposition in boreal forest ecosystems.



Source Redrawn from Koukol and Kolárová (2010)

Note a Mature detached conidia. b, c Conidiophores producing conidia. Scale bars: a–c = 20 μm.

Figure 3.184 *Aphanodesmium gabretae*

Aquadiscula Shearer & J.L. Crane, Mycologia 77(3): 441 (1985)

Index Fungorum number: IF25173; Facesoffungi number: FoF 18569, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on submerged plant debris in freshwater habitats. Sexual morph: see Shearer 1985. Asexual morph: Unknown.

Type species – *Aquadiscula appendiculata* Shearer & J.L. Crane

Notes – *Aquadiscula* was introduced by Shearer and Crane (1985) with *A. appendiculata* as the type species, based on collections from submerged leaves of *Acer rubrum* in LaRue Swamp, Union County, Illinois, USA. The genus is characterised by small, stipitate, cupulate apothecia that are white to cream-coloured or pale ochraceous, often becoming convex or applanate with age. The ectal excipulum consists of *textura angularis* to *textura prismatica*. Asci are 8-spored, clavate, rounded at the apex, with a slightly thickened apex, J+ in Melzer's reagent. Ascospores are hyaline, smooth-walled, initially 1-celled and becoming 2-celled, oblong to short-cylindrical, with a distinctive mucilaginous appendage at one end, which may aid in attachment to substrates. Paraphyses are hyaline, filiform, septate, and smooth-walled, sometimes branched. Phylogenetically, LSU sequence data support its placement within Helotiales, but its familial affinity remains unresolved (*incertae sedis*). The holotype (ILLS 44301) and isotype (NY) are preserved in recognised herbaria, and an ex-type culture is available as ATCC 56667.

Aquadiscula appendiculata Shearer & J.L. Crane, Mycologia 77(3): 442 (1985) Figure 3.185

Index Fungorum number: IF105057; Facesoffungi number: FoF 18570

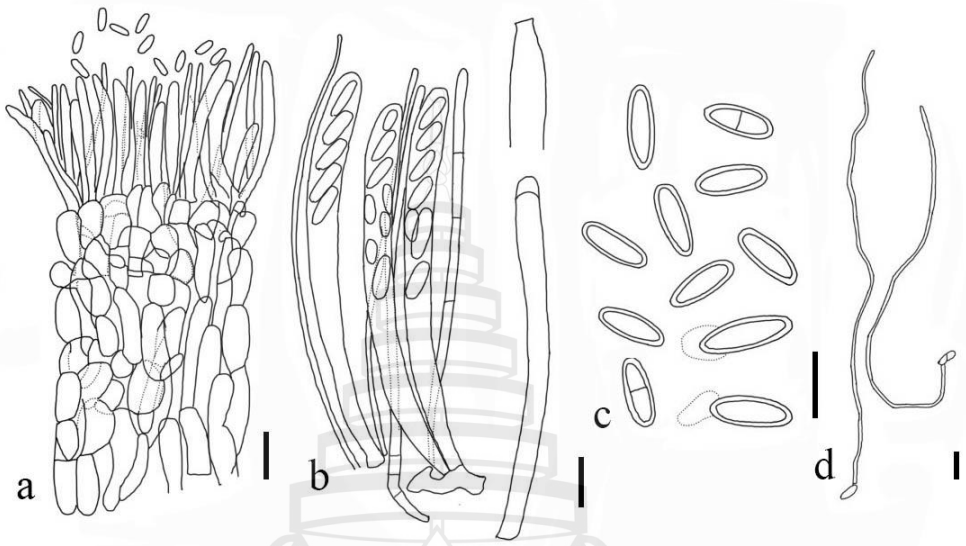
Description – Shearer and Crane (1985).

Material considered – Shearer and Crane (1985).

Distribution, ecological and economical importance

Species of *Aquadiscula* are important components of freshwater fungal communities, acting as decomposers of submerged plant debris. They contribute to nutrient cycling by breaking down complex organic compounds, enhancing the productivity of aquatic ecosystems. *A. appendiculata* is known from North America (Illinois, Wisconsin), occurring in both lotic (flowing water) and lentic (standing water) habitats. A second species, *A. clavispora*, has been reported from submerged stems of

Scirpus atrovirens in Wisconsin, USA, extending the known ecological range to emergent aquatic plants. Both species appear to prefer temperate freshwater environments.



Source Redrawn from Shearer and Crane (1985)

Note a Median section of apothecium illustrating hymenium and excipulum. b Asci, paraphyses, young ascus with thickened apex which stains blue in Melzer's reagent. c Appendaged and unappendaged ascospores. d Germinating ascospores. Scale bars: a, d = 20 μm; b, c = 10 μm.

Figure 3.185 *Aquadiscula appendiculata*

Aquapoterium Raja & Shearer, in Raja, Miller & Shearer, Mycologia 100(1): 142 (2008)

Index Fungorum number: IF506627; Facesoffungi number: FoF 18571, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on submerged coniferous leaf litter. Sexual morph: see Raja et al. (2008). Asexual morph: Unknown.

Type species – *Aquapoterium pinicola Raja & Shearer 2008*

Notes – The genus name *Aquapoterium* is derived from "aqua-" (water) and "poterium" (a cup-like vessel), referring to the aquatic habitat and cupulate apothecia of the type species. *Aquapoterium* is characterised by minute, white to cream-coloured apothecia that are sessile or short-stipitate and cupulate. The receptacle surface is

glabrous, and the excipulum is composed of a single layer of parallel hyphae forming chains of cells, narrow at the basal end and enlarged at the apical end. Paraphyses are hyaline, filiform, simple or branched, obtuse to clavate at the apex, septate, smooth-walled. Asci are cylindric-clavate, inoperculate, 8-spored, with a non-amyloid (MEZ–) apical pore, slightly thickened apical wall, (77–)88–105 × 8.5–10.5 µm, short-stipitate (4–7 µm). Ascospores are hyaline, smooth-walled, aseptate or occasionally 1-septate, short clavate to cylindrical, (11.5–)12.5–15 × 3.5–4.5 µm, multiguttulate with two large guttules at each end, surrounded by a gelatinous sheath (1–1.5 µm thick). LSU rDNA sequence data confirmed its placement in the Helotiales, but its familial affiliation remains unresolved (Raja et al., 2008). The holotype specimen (ILL 40117) is deposited at the herbarium of the University of Illinois, and an ex-type culture is available as ILLS 62939.

Aquapoterium pinicola Raja & Shearer, in Raja, Miller & Shearer, Mycologia 100(1): 142 (2008) Figure 3.186

Index Fungorum number: IF506628; Facesoffungi number: FoF 18572

Description – On needles of Pinus submerged in swamp: Florida. **Sexual morph**: Apothecia not observed, characters such as receptacle, disc, hymenium and excipulum not clear. Paraphyses filiform, aseptate, thin-walled, hyaline, with guttules, swollen at the apex. Asci 8-spored, unitunicate, inoperculate, cylindric-clavate, rounded apex, thin-walled, tapered short stipitate base. Ascospores partially biseriate, ellipsoidal, hyaline, thin-walled, two large guttules at each end, 1-septate or aseptate. **Asexual morph**: Undetermined.

Material examined – U.S.A., Florida, Liberty County, Apalachicola National Forest, unnamed swamp. On needles of *Pinus* submerged in the swamp. 12 July 2004, Huzefa A. Raja and Christopher Brown (ILL&ILLS 40117), holotype.

Distribution, ecological and economical importance

Aquapoterium is a monotypic genus known only from its type species, *A. pinicola*, described from submerged, decaying *Pinus elliottii* needles in lentic freshwater habitats in Florida, USA. It is saprobic, contributing to the decomposition of coniferous leaf litter under aquatic conditions. The multiguttulate ascospores enclosed in a gelatinous sheath may aid attachment to substrates and protect against water currents, suggesting adaptation to submerged environments. Its known distribution is restricted to warm-

temperate freshwater habitats with coniferous input, although this may reflect under-sampling rather than a true range limit.



Note a Details of the herbarium material. b Party of squash apothecia. c Asci and filiform paraphyses. d-g Asci. h, i Ascospores. Scale bars: b = 100 µm, c-g=30 h-i = 10 µm.

Figure 3.186 *Aquapoterium pinicola* (ILL&ILLS 40117, Holotype)

Arboricolonus S. Bien & Damm, MycoKeys 63: 130 (2020)

Index Fungorum number: IF832106; Facesoffungi number: FoF 11362, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on dead plant material, isolated from brown wedge-shaped necrosis of *Prunus domestica* wood. Sexual morph: Unknown. Asexual morph: see Bien and Damm (2020).

Type species – *Arboricolonus simplex* S. Bien & Damm

Notes – The genus name *Arboricolonus* (Latin *arbor* = tree, *colonus* = settler) refers to its colonization of woody substrates. It was introduced by Bien and Damm (2020) with *A. simplex* as the type species. Colonies grow slowly, moist, white to buff on oatmeal agar, lacking aerial mycelium. Conidiophores are reduced to conidiogenous cells, which are enteroblastic, intercalary, and form either short, discrete phialides or, more often, short tubular to narrowly funnel-shaped collarettes directly on hyphal cells.

Conidia are small, hyaline, 1-celled, cylindrical, ovoidal to allantoid, smooth-walled, and typically aggregated around the hyphae. Vegetative hyphae and phialides are hyaline, smooth-walled, septate, and branched. In culture on synthetic nutrient-poor agar (SNA), colonies remain very small (≤6 mm in 4 weeks), moist, white to pale buff, and conidia are produced abundantly; sexual morph is unknown.Molecular phylogenetic analyses based on LSU and ITS sequence data place *Arboricolonus* within Helotiales, in proximity to *Polydesmia*, *Polyphilus*, and *Hyalodendriella*, but without strong statistical support, leaving its familial position unresolved.The type species, *A. simplex*, was collected in Saxony, Germany, from brown wedge-shaped necrosis in wood of *Prunus domestica* (50°58′42.3″N, 13°49′40.0″E) on 16 January 2015 by S. Bien. The holotype is deposited in GLM (GLM-F106309), with the ex-type culture preserved at CBS (CBS 145520).

Arboricolonus simplex S. Bien & Damm, MycoKeys 63: 130 (2020) Figure 3.187

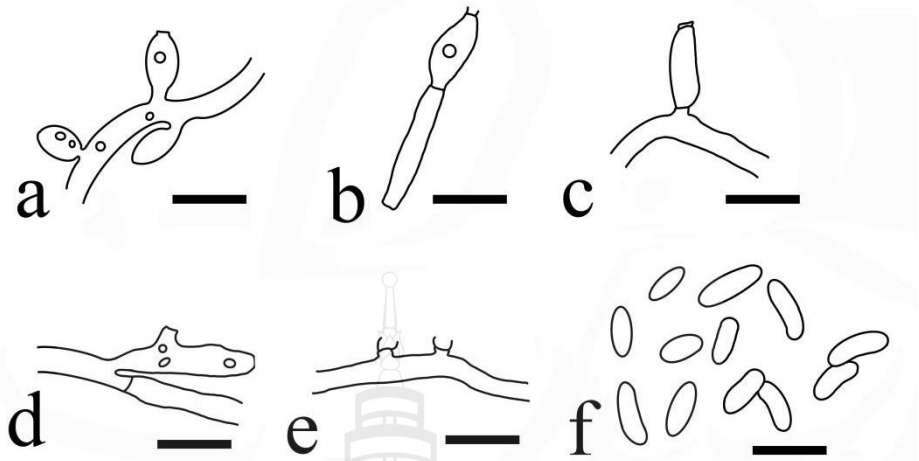
Index Fungorum number: IF832107; Facesoffungi number: FoF 11363

Description – Bien and Damm (2020).

Material considered – Bien and Damm (2020)

Distribution, ecological and economical importance

Arboricolonus is currently known only from its type species *A. simplex*, isolated from necrotic wood of *Prunus domestica* in Saxony, Germany. Its occurrence in necrotic tissue suggests a saprobic lifestyle, potentially contributing to the decomposition of dead woody material, although its ability to act as a latent pathogen cannot be excluded without further pathogenicity tests. Despite surveys in Germany and South Africa, no additional isolates have been recovered, indicating a possibly restricted geographic and host range, though this may reflect limited sampling.



Source Redrawn from Bien and Damm (2020)

Note a-e Conidiogenous cells. f Conidia. Scale bars: a–f = 5 µm.

Figure 3.187 *Arboricolonus simplex*

Asterocalycella Höhn. ex R. Kirschner, in Kirschner, Lee & Huang, Taiwania 64(2): 170 (2019)

Index Fungorum number: IF556311; Facesoffungi number: FoF 18573, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on dead fern tissues. Sexual morph: see Kirschner et al. (2019). Asexual morph: Unknown.

Type species – *Asterocalycella mirabilis* (Höhn.) R. Kirschner

Notes – The genus name *Asterocalycella* was proposed by Kirschner et al. (2019) as a replacement for the illegitimate name *Asterocalyx* Höhn., which is a later homonym of the algal genus *Asterocalyx* Ettingsh. It is characterised by superficial, apothecial ascomata (0.6–1.2 mm diam.), brown to light brown, occasionally white in albino mutants, developing on dead petioles and rachises of ferns (Cyatheaceae, Marattiaceae). The fungus grows intercellularly within epidermal and subepidermal tissues of the host, producing a plectenchymatic layer beneath the cuticle from which ascomata emerge. Asci are unitunicate, 8-spored, clavate with a rounded apex. Ascospores are hyaline, smooth-walled, long-ellipsoid, aseptate. Vegetative hyphae are hyaline, septate, and branched. Molecular data (ITS) place *Asterocalycella* in Helotiales (Leotiomycetes), but outside Sclerotiniaceae, with uncertain familial placement. The type species, *A.*

mirabilis, has been recorded on *Sphaeropteris lepifera* in Taiwan. Specimens examined include Taipei, Yangmingshan (4185, TNM, coll. 4 April 2015) and Taitung, Dulan Mountain at ca. 600 m elevation (4605, TNM, coll. 7 February 2018).

Asterocalycella mirabilis (Höhn.) R. Kirschner, in Kirschner, Lee & Huang, Taiwania 64(2): 170 (2019)

Index Fungorum number: IF556312; Facesoffungi number: FoF 18574

Description – Kirschner et al. (2019).

Material considered – Kirschner et al. (2019).

Distribution, ecological and economical importance

Asterocalycella is a specialised saprobe decomposing dead fronds of ferns in humid subtropical to tropical forests, contributing to nutrient cycling during litter decomposition. It has been documented from Taiwan on *Sphaeropteris lepifera* and other tree fern species. Sequence matches suggest its presence in Australia, indicating a potential wider but under-documented distribution in the Asia–Pacific region. No economic impact or pathogenicity is known (Kirschner et al., 2019).

Figure – No original illustration available.

Banksiamyces G.W. Beaton, in Beaton & Weste, Trans. Br. mycol. Soc. 79(2): 272 (1982)

Index Fungorum number: IF510; Facesoffungi number: FoF 18575, 4 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on seed follicles of dead cones of various species of *Banksia* (Proteaceae). Sexual morph: see Beaton and Weste (1982). Asexual morph: Unknown.

Type species – *Banksiamyces macrocarpus* G.W. Beaton

Notes – The genus name *Banksiamyces* is derived from its host plant genus *Banksia* and the Greek *mykes* (fungus), referring to its occurrence on *Banksia* cones. It was introduced by Beaton and Weste (1982) with *B. macrocarpus* as the type species. Species of *Banksiamyces* are characterised by small (typically ≤10 mm diam.), shallow, dark cupulate apothecia developing on the seed follicles of dead *Banksia* cones. The apothecia are stipitate, dark brown to black with a dark grey disc, and covered when dry with a whitish pruina; margins may roll inward, giving a slit-like appearance. Asci are cylindrical to clavate, 8-spored, (80–)95–110(–125) × 7–9 µm, unitunicate, with an apical ring in Melzer's reagent. Ascospores are ellipsoid, slightly curved, sometimes

tapered, (9–)10–13(–14) × 3.5–4.5 µm, hyaline, smooth-walled, typically containing two large oil drops. Paraphyses are filiform, branched and anastomosing near the apex, sometimes forked, with tips slightly enlarged and pale brown-pigmented. No asexual morph is known. Currently, *Banksiamyces* is *incertae sedis* within Helotiales; morphological affinities have been noted with Helotiaceae and Encoeliaceae, but molecular sequence data are scarce (only one species with ITS data). The holotype of *B. macrocarpus* was collected in Victoria, Australia, near Tonimbuk, from seed follicles of dead cones of *Banksia spinulosa* on 26 April 1981 by B. Fuhrer (MELU).

Banksiamyces macrocarpus G.W. Beaton, in Beaton & Weste, Trans. Br. mycol. Soc. 79(2): 273 (1982) Figure 3.188

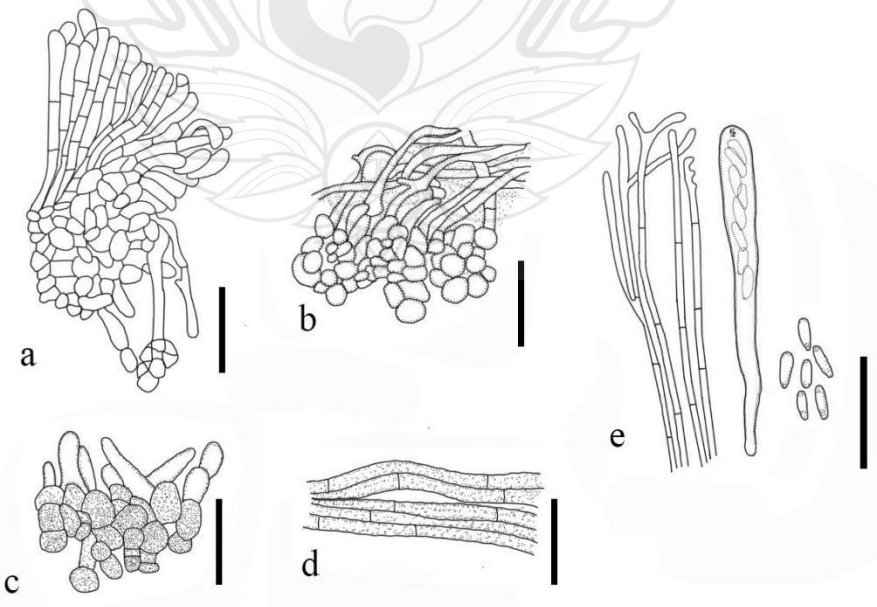
Index Fungorum number: IF109616; Facesoffungi number: FoF 18576

Description – Beaton and Weste (1982).

Material considered – Beaton and Weste (1982).

Distribution, ecological and economical importance

Species of *Banksiamyces* are specialised saprobes on dead *Banksia* cones, accelerating the breakdown of woody follicles and contributing to nutrient cycling in Australian ecosystems. Their distribution is closely tied to that of their *Banksia* hosts, with records from Victoria, South Australia, Western Australia, Tasmania, and New South Wales. No occurrences have been reported outside Australia.



Source Redrawn from Beaton and Weste (1982)

Note a Structure of margin. b Structure of stalk cortex with hyphae lying at a high angle to the surface and embedded in a gelatinous matrix. c cells of ectal excipulum showing distribution of pigmentation. d pigmented, granular surfaced hyphae of medullary excipulum. e Paraphyses, asci and ascospores. Scale bars: a–d = 25 μm, e = 20 μm.

Figure 3.188 *Banksiamyces macrocarpus*

Belonioscyphella Höhn., Sber. Akad. Wiss. Wien, Math.-naturw. Kl., Abt. 1 127(8-9): 589 (1918)

Index Fungorum number: IF537; Facesoffungi number: FoF 18577, 3 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Parasitic (necrotrophic) on mosses. Sexual morph: see (Huhtinen et al., 2010). Asexual morph: Unknown.

Type species – *Belonioscyphella hypnorum* (Syd. & P. Syd.) Höhn.

Notes – *Belonioscyphella* was introduced by Höhnel (1918) with *B. hypnorum* as the type species. It is characterized by small, turbinate to shallowly cupulate, glabrous apothecia (orange-brown to light brown when dry), borne on a straight or curved stipe tapering towards the base. The excipulum is composed of thin-walled *textura prismatica*. Asci are unitunicate, inoperculate, clavate, 8-spored, with a long, gradually tapering base arising from croziers, and an amyloid apical apparatus in IKI (with KOH pretreatment) or MLZ. Ascospores are fusiform, hyaline, smooth, (3–)7-septate, often constricted at the septa, containing one large or several small guttules. Paraphyses are filamentous, slightly exceeding the asci, unbranched, septate, and apically swollen (to 3–6 μm). The fungus grows intercellularly within host moss tissues, producing necrotic lesions (Huhtinen et al., 2010). Multi-locus phylogenetic analyses (ITS, LSU, EF1α) of fresh collections place the genus within Helotiales but outside any known family, and it is currently treated as *incertae sedis* (Egertová et al., 2016). The holotype originates from Austria, but no detailed locality or collection number was provided in the protologue. A modern specimen representing this species was collected in the Czech Republic, South Moravian region, Brno-venkov district, Moravian Karst Protected Landscape Area, on *Hypnum cupressiforme*, *Radula complanata*, and

Orthotrichum sp. on a recently cut *Acer* trunk, on 8 November 2015, by Z. Egertová (PRM 935152, designated as reference specimen).

Belonioscyphella hypnorum (Syd. & P. Syd.) Höhn., Sber. Akad. Wiss. Wien, Math.-naturw. Kl., Abt. 1 127(8-9): 589 (1918) Figure 3.189

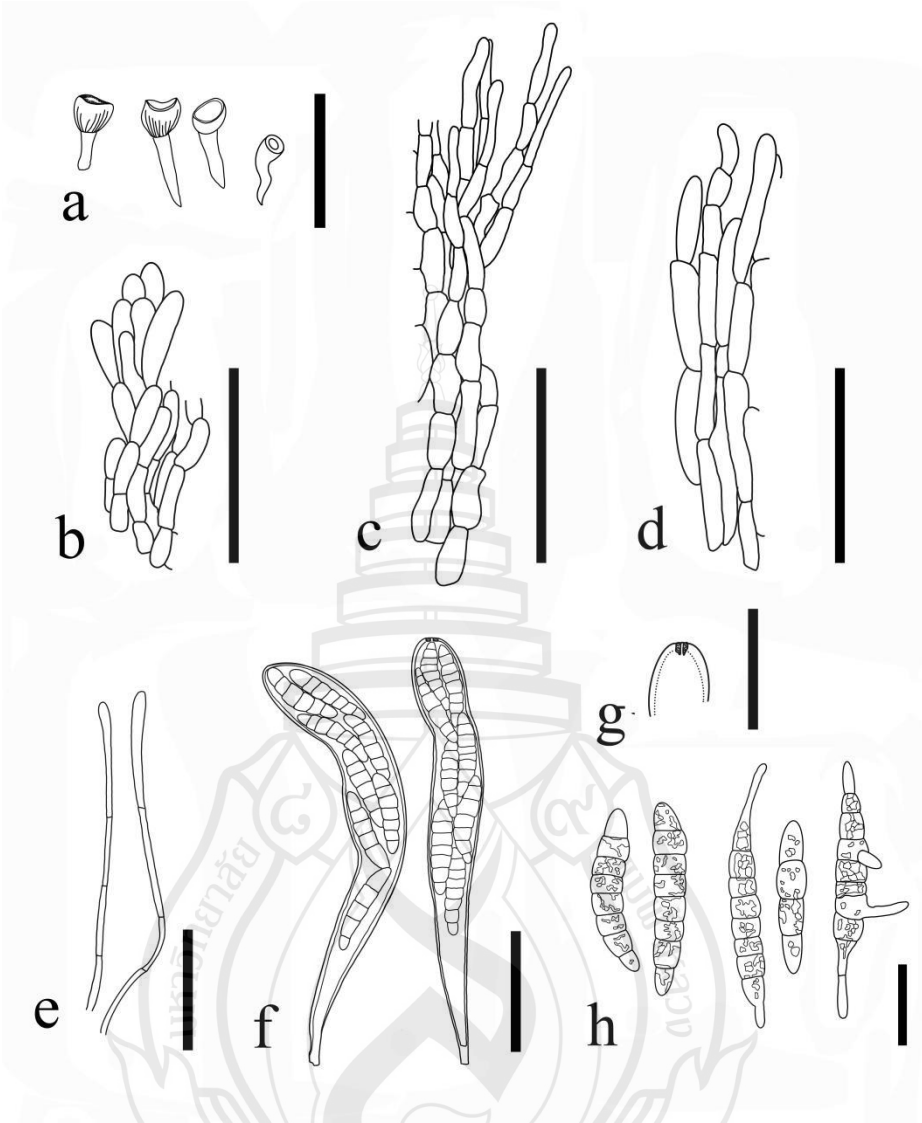
Index Fungorum number: IF431427; Facesoffungi number: FoF 18578

Description – Höhnel (1918).

Material considered – Höhnel (1918).

Distribution, ecological and economical importance

Belonioscyphella is an obligate moss parasite causing yellowing and necrosis of host leaves and stems, potentially influencing moss community structure. Known hosts include *Hypnum cupressiforme*, *Radula complanata*, *Orthotrichum* sp., *Didymodon rigidulus*, *Eurhynchium schleicheri*, and *Homalia trichomanoides* (Egertová et al., 2016). The species is distributed across several European countries (Austria, Germany, Italy, Romania, Finland, Czech Republic) and North America (Quebec, Canada), with the first Czech records from three localities in Moravia, including the Moravian Karst (Egertová et al., 2016; Huhtinen et al., 2010).



Source Redrawn from Huhtinen et al. (2010)

Note a Dry apothecia. b, c Ectal excipulum at the margin of the apothecium. d Ectal excipulum at stipe. e Paraphyses. f Mature asci. g Ascus apex with IKI. H Ascospores, two germinating. Scale bars: a = 1mm, b–g = 50 μm, h = 20 μm.

Figure 3.189 *Belonioscyphella hypnorum*

Benguetia Syd. & P. Syd., Annls mycol. 15(3/4): 252 (1917)

Index Fungorum number: IF544; Facesoffungi number: FoF 18579, 1morphological species (Species Fungorum, 2025), 0 species with molecular data.

Obligate biotrophic on members of the Rosaceae family. Sexual morph: see Sydow and Sydow (1917). Asexual morph: Unknown.

Type species – *Benguetia omphalodes* Syd. & P. Syd.

Notes – Sydow and Sydow (1917) introduced *Benguetia* with *B. omphalodes* as the type species, collected on living leaves of *Pygeum* sp. in Benguet subprovince, Luzon, Philippines. The genus is characterised by erumpent to superficial, coriaceous to carbonaceous ascomata, with a short, central stipe deeply embedded in the substrate. The disc is flat to slightly convex, black, becoming exposed at maturity, and surrounded by a distinct margin. The hypothecium is thick and parenchymatic. Asci are clavate, 8-spored, with paraphyses forming an epithecium. Ascospores are ellipsoidal, aseptate, pigmented. No molecular sequence data are currently available for this genus, and its systematic position within Helotiales remains unresolved. The holotype of *B. omphalodes* was collected in May 1914 by E.D. Merrill (no. 9716) and is deposited in the herbarium of BPI.

Benguetia omphalodes Syd. & P. Syd., Annls mycol. 15(3/4): 252 (1917) Figure 3.190

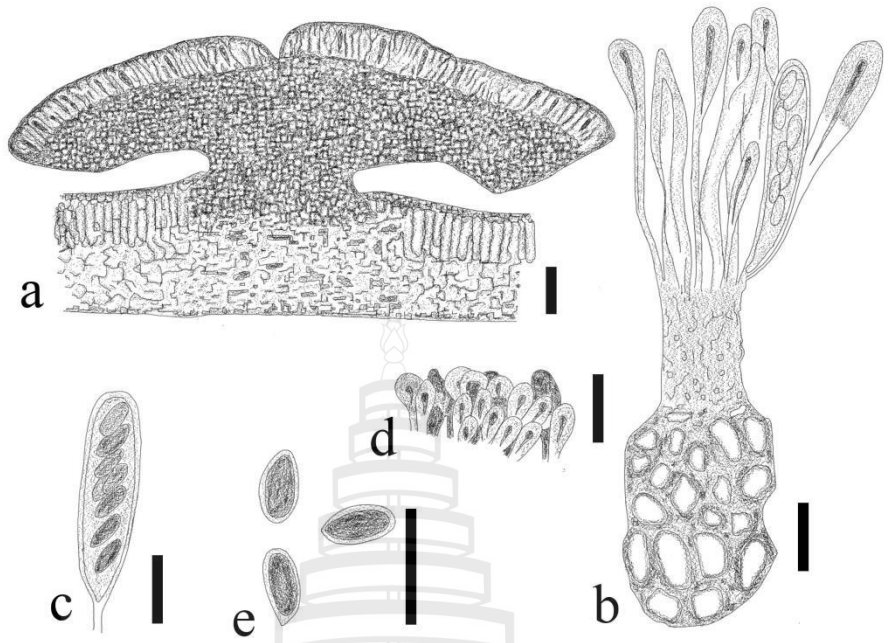
Index Fungorum number: IF146164; Facesoffungi number: FoF 18580

Description – Sydow and Sydow (1917).

Material considered – Sydow and Sydow (1917).

Distribution, ecological and economical importance

Benguetia is an obligate biotrophic genus parasitic on leaves of Rosaceae, particularly *Pygeum* spp., likely causing necrosis or leaf spot symptoms on the host. Its ecological role is associated with pathogenic interactions on living foliage. The genus is known only from the type locality in Benguet, Luzon, Philippines, and no further records are currently available.



Source Redrawn from Sydow and Sydow (1917)

Note a Longitudinal section through the fruiting body. b Tissue with part of the hymenium. c Part of the epithecium. d Paraphysis. e Ascospores. Scale bars: a = 200 µm, b–e =50 µm.

Figure 3.190 *Benguetia omphalodes*

Bioscypha Syd., Annls mycol. 25(1/2): 102 (1927)

Index Fungorum number: IF577; Facesoffungi number: FoF 18581, 2 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Pathogenic on living pinnae of ferns such as *Cyathea* spp. Sexual morph: see Sydow (1927). Asexual morph: see Sydow (1927), Wu and Diao (2023).

Type species – *Bioscypha cyatheae* Syd.

Notes – *Bioscypha* was introduced by Sydow (1927) with *Bioscypha cyatheae* as the type species.

The genus is characterized by circular to elliptic, shallowly discoidal, sessile apothecia, broadly attached, light to dark brown when dry. Asci are cylindrical, 130–150 × 12–18 µm, with a thick lateral wall and thinner apex, 8-spored. Ascospores are broadly ellipsoidal to broadly ovoidal, 15.5–17.5 × 9–10.5 µm, unicellular, hyaline when young, becoming light brown and finely spinulose with age. Paraphyses exceed the asci by ~20

μm, are septate, dichotomously branched toward the tip, with clavate to lanceolate apices filled with yellow contents that turn blue in cotton blue. The ectal excipulum is well-developed, composed of compact, septate hyphae. The asexual morph is *Chalara*-like, with conidiophores arising in dense clusters from the host surface (Sydow, 1927).

Currently, there are no molecular markers or sequence data for *Bioscypha*. The type species, *Bioscypha cyatheae*, was collected on the abaxial surface of living pinnae of *Cyathea* sp. in Piedades de San Ramon, Costa Rica, on 7 February 1925 by H. Sydow (H. Sydow 63; isotypes at BPI and NY).

Bioscypha cyatheae Syd., Annls mycol. 25(1/2): 103 (1927) Figure 3.191

Index Fungorum number: IF262593; Facesoffungi number: FoF 18582

Description – Sydow (1927), Wu and Diao (2023).

Material considered – Sydow (1927), Wu and Diao (2023).

Distribution, ecological and economical importance

Bioscypha species occur on ferns, particularly *Cyathea* spp., in tropical and subtropical regions. *B. cyatheae* is known from Costa Rica, while *B. pteridicola* has been reported from Colombia. They are likely weak pathogens or endophytes transitioning to saprotrophy, contributing to the decomposition of fern fronds in humid forest habitats.



Source Redrawn from Samuels and rogerson (1990)

Note a Apothecia. b Ascal tip in Melazer's reagent. c Dehisced ascus in Melzer's reagent. Scale bars: a = 4 μm; b–c = 10 μm.

Figure 3.191 *Bioscypha cyatheae*

Blastosporium Z.F. Yu & H. Zheng, in Zheng, Zhang, Wen, Castañeda-Ruíz & Yu, MycoKeys 51: 60 (2019)

Index Fungorum number: IF828280; Facesoffungi number: FoF 18583, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Isolated from the surface of mildewed leaves of *Nicotiana tabacum*. Sexual morph: Unknown. Asexual morph: see Zheng et al., (2019).

Type species – *Blastosporium persicolor* Z.F. Yu & H. Zheng

Notes – *Blastosporium* was introduced by Zheng et al. (2019) with *B. persicolor* as the type species. The genus is characterized by branched, septate, smooth-walled, hyaline hyphae giving rise to macronematous or semi-macronematous, erect or prostrate conidiophores, which are smooth-walled, hyaline, unbranched or occasionally slightly branched. Conidiogenous cells are mono- or polyblastic, terminal, integrated or discrete, sometimes with sympodial elongations, clavate or cylindrical, with a distinct or inconspicuous denticle at the conidiogenous loci. Conidia are solitary or blastocatenate, acrogenous, unicellular, obovoid, oblong, ellipsoidal, subcylindrical, allantoid, broad fusiform to irregular, slightly attenuated, truncate at one or both ends, hyaline, measuring (3.5–)5–12 × 1–4 μm. Molecular markers available include ITS, LSU, *RPB2*, and tef1 sequence data. The holotype of *B. persicolor* (YMFT 1.05546) was collected on mildewed leaves of *N. tabacum* in Xiamen, Fujian Province, China, in June 2018 by Z.N. Zhang, with the ex-type culture preserved as YMF 1.05546.

Blastosporium persicolor Z.F. Yu & H. Zheng, in Zheng, Zhang, Wen, Castañeda-Ruíz & Yu, MycoKeys 51: 60 (2019) Figure 3.192

Index Fungorum number: IF828281; Facesoffungi number: FoF 18584

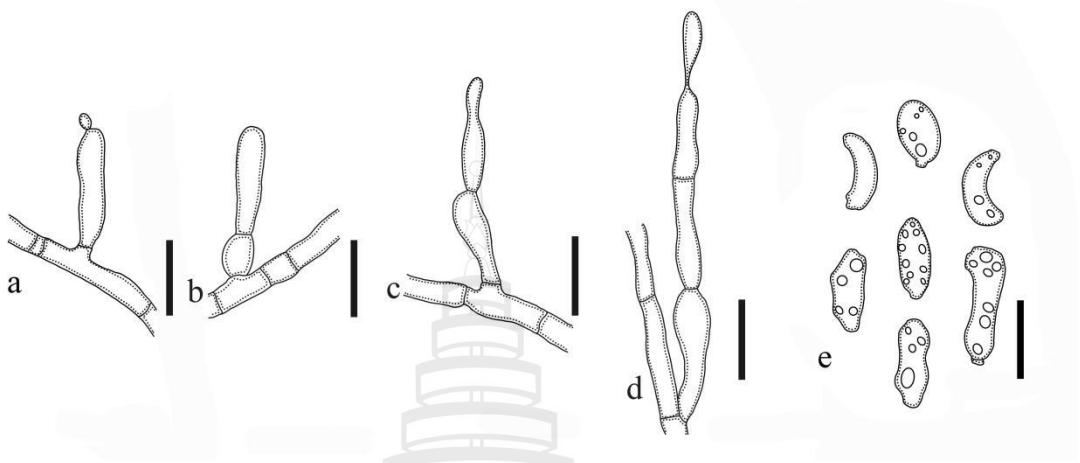
Description – Zheng et al. (2019).

Material considered – Zheng et al. (2019).

Distribution, ecological and economical importance

The ecological role of *Blastosporium* is not yet well understood. The type species *B. persicolor* was found on the surface of diseased *N. tabacum* leaves, and it grows readily on PDA, MEA, and SNA media, forming colonies with characteristic colour variation. To date, *Blastosporium* is only known from Fujian Province, China. Phylogenetic analyses suggest that it may have close affinities to some unnamed

isolates, indicating a potentially wider distribution than currently recorded. Further research is required to clarify its ecological role, host range, and global distribution.



Source Redrawn from Zheng et al. (2019)

Note a-d Conidiophores and conidiogenous cells. e Conidia. Scale bars: a–e = 10 µm.

Figure 3.192 *Blastosporium persicolor*

Brachyalara Réblová & W. Gams, in Réblová, Gams & Štěpánek, Fungal Diversity 46(‘1’): 72 (2011)

Index Fungorum number: IF518970; Facesoffungi number: FoF 18585, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Fungicolous on decaying apothecia of *Bulgaria inquinans* on trunks of *Quercus* spp. Sexual morph: Unknown. Asexual morph: Réblová et al. (2011)

Type species – *Brachyalara straminea* Réblová & W. Gams

Notes – *Brachyalara* was introduced by Réblová and Gams (2011) with *Brachyalara straminea* as the type species. The genus is characterised by pale brown, septate conidiophores that are simple or occasionally branched near the base in natural substrates, and frequently sympodially branched in culture. Conidiogenous cells are ampulliform phialides, subhyaline to pale brown, moderately tapering toward the collarette. Conidia are hyaline, smooth-walled or finely verruculose, ellipsoidal to obovoidal, truncate at the base, and formed in long basipetal chains. Chlamydospores are absent. Molecular markers available include ITS, LSU (nc28S), and SSU (nc18S) rDNA sequence data (Réblová et al., 2011). The type species, *B. straminea*, was collected on ascomata of *Bulgaria inquinans* on *Quercus* sp. in Forêt de Reisetje,

Ardennes, Belgium, on 6 December 2003 by M.S. Kulik (holotype CBS H-204712; ex-holotype culture CBS 114633).

Brachyalara straminea Réblová & W. Gams, in Réblová, Gams & Štěpánek, Fungal Diversity 46(‘1’): 73 (2011) Figure 3.193

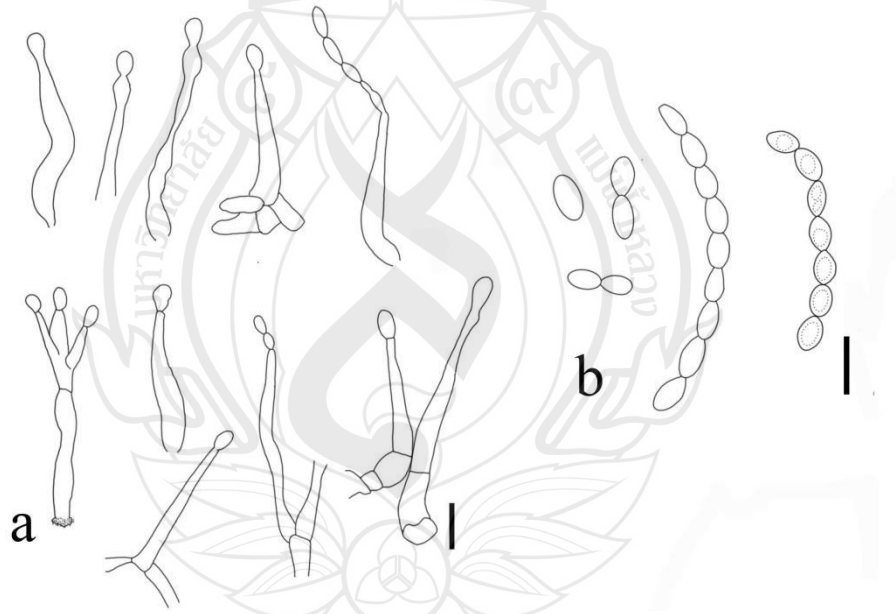
Index Fungorum number: IF518971; Facesoffungi number: FoF 18586

Description – Réblová et al. (2011).

Material considered – Réblová et al. (2011).

Distribution, ecological and economical importance

Brachyalara appears to be a specialised fungicolous saprobe associated with the decomposition of discomycete fruiting bodies (*Bulgaria inquinans*), suggesting a role in late-stage fungal succession on decaying hardwood substrates. Distribution is currently confirmed from Belgium and Germany, where collections were made from *Bulgaria inquinans* on oak trunks (*Quercus* spp.) (Réblová et al., 2011).



Source Redrawn from Réblová et al. (2021)

Note a Conidiophores, conidiogenous cells and conidia. b Conidia. Scale bars: a = 10 µm, b = 20 µm.

Figure 3.193 *Brachyalara straminea*

Brefeldochium Verkley, Nova Hedwigia 80(3-4): 504 (2005)

Index Fungorum number: IF28954; Facesoffungi number: FoF 18587, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on decaying wood. Sexual morph: see Verkley (2005). Asexual morph: see Verkley (2005).

Type species – *Brefeldochium pruinosum* Verkley

Notes – *Brefeldochium* was introduced by Verkley (2005) with *B. pruinosum* as the type species, isolated from single ascospores of *Polydesmia pruinosa*. The genus is characterised by sporodochial conidiomata, circular to irregular, solitary or aggregated, consisting of conidiophores intermixed with paraphyses. Conidiophores are acrogenous, arising from a simple, septate, cylindrical, hyaline, smooth-walled stipe, bearing 1–3 terminal phialidic conidiogenous cells, sometimes with a short collarette. Conidiogenous cells are cylindrical to subcylindrical, hyaline, smooth-walled. Conidia are falcate or falcate-cylindrical, 3–5-septate, often slightly constricted at septa, hyaline, smooth-walled, gradually attenuated towards a subtruncate base and curved into a blunt tip, measuring (19–)22–28(–30) × 2.5–3.5 µm. Chlamydospores are absent. Molecular data are currently limited to ITS rDNA sequences from the ex-holotype strain. The familial placement of *Brefeldochium* remains unresolved within Helotiales. The type species, *B. pruinosum*, was collected in De Lutte, Overijssel, the Netherlands, from old pyrenomycete fruitbodies on dead wood in a temperate deciduous forest. Holotype: CBS H-11004; ex-holotype culture CBS 111545.

Brefeldochium pruinosum Verkley, Nova Hedwigia 80(3-4): 504 (2005) Figure 3.194

Index Fungorum number: IF336578; Facesoffungi number: FoF 18588

Description – Verkley (2005).

Material considered – Verkley (2005).

Distribution, ecological and economical importance

Brefeldochium is a specialised saprobe associated with the decomposition of old ascomata of *Polydesmia pruinosa*, likely occupying a niche in late-stage fungal succession on decaying hardwood substrates. Known only from the type locality in the Netherlands; further distribution records are lacking.



Source Redrawn from Verkley (2005)

Note Conidia and part of a conidioma. Scale bars: 10 µm.

Figure 3.194 *Brefeldochium pruinosum*

Bulgariella P. Karst., Acta Soc. Fauna Flora fenn. 2(no. 6): 142 (1885) [1881-1885]

Index Fungorum number: IF684; Facesoffungi number: FoF 05914, 3 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on decaying wood. Sexual morph: see Iturriaga et al., (2017). Asexual morph: Unknown.

Type species – *Bulgariella pulla* (Fr.) P. Karst.

Notes – *ulgariella* was established by Karsten (1885) for small, dark, discoid apothecial ascomycetes previously included in *Bulgaria* or *Patellaria*. Modern morphological and molecular studies show that *B. pulla* is conspecific with *B. sphaerospora* (≡ *Patellaria sphaerospora*), and the genus is placed in Leotiomycetes but remains *incertae sedis* at ordinal and familial levels (Iturriaga et al., 2018). Apothecia are dark brown to olivaceous, superficial to erumpent from stromatized tissue, with pigmented paraphyses and dark ascospores at maturity. Asci are thick-walled laterally, lack an apical pore, and dehisce via a distinctive bivalvate splitting into two valves — a rare mechanism in Leotiomycetes. Ascospores are dark brown, aseptate, ellipsoidal to subglobose,

occasionally with a germ pore. Paraphyses are pigmented, containing purple-violet to brown granular contents, and may show ionomidotic reactions in KOH. Molecular markers available include ITS, 18S, 28S, *TEF1-α*, and *RPB2*, which confirm generic monophyly but have not resolved its ordinal placement. The long-used fungal name *Lagerheima* Sacc. was later synonymized with *Bulgariella* when *Lagerheima sphaerospora* was shown to be conspecific with *B. pulla*. To avoid confusion with the algal genus *Lagerheimia* (Oocystaceae), *Lagerheimia* (alga) was formally conserved against *Lagerheima* (fungus) (Davydov et al., 2016). The type species, *Bulgariella pulla*, was collected on bark of *Betula* sp. in Finland by P.A. Karsten. Dennis (1956) designated the lectotype as H 6017192 (Helsinki Herbarium), with isolectotypes preserved in H and K.

Bulgariella pulla *(Fr.)* P. Karst., Acta Soc. Fauna Flora fenn. 2(no. 6): 142 (1885) [1881-1885] Figure 3.195

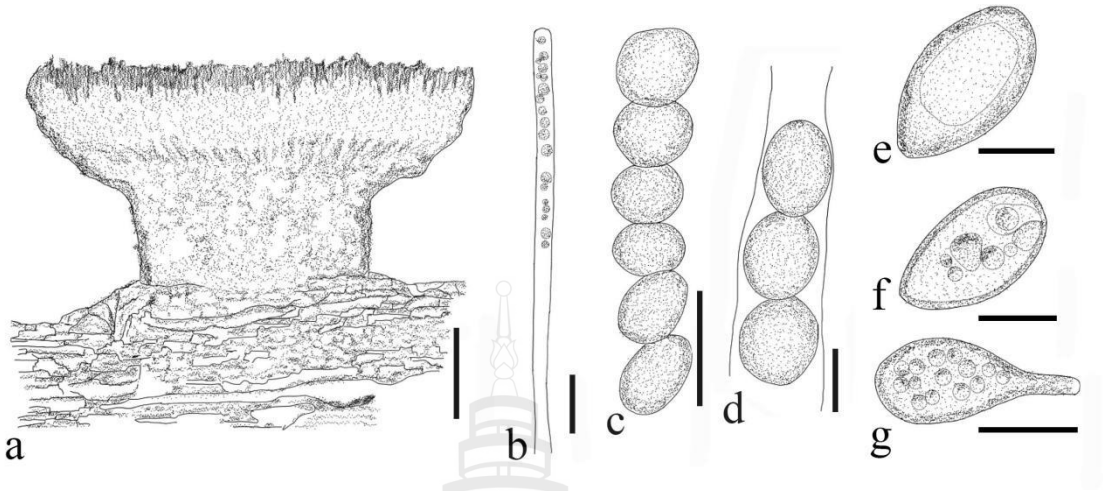
Index Fungorum number: IF217170; Facesoffungi number: FoF 18589

Description – Iturriaga et al. (2017).

Material considered – Iturriaga et al. (2017).

Distribution, ecological and economical importance

Species of *Bulgariella* are saprobic on decorticated hardwood and conifer wood, contributing to lignocellulose decomposition and nutrient cycling. Hosts include *Betula*, *Corylus avellana*, *Fagus sylvatica*, *Carpinus betulus*, *Nothofagus*, and *Drimys*. The genus has a broad temperate distribution, recorded from Europe (Finland, Norway, Sweden, UK, Ireland, Germany), North America (Canada, USA), South America (Chile, Argentina), and Oceania (New Zealand, Australia). Fruiting bodies typically occur in late summer to winter in temperate climates.



Source Redrawn from Iturriaga et al. (2017)

Note a Median section of mature apothecium; ectal excipulum. b Paraphyses. c, d Asci with ascospores. e, f Ascospores. g Germinating ascospores. Scale bars: a = 50 µm; b-d = 20 µm; e, f = 5 µm; g = 10 µm.

Figure 3.195 *Bulgariella pulla*

Caesiodiscus Holien & Suija, Agarica 42: 82 (2021)

Index Fungorum number: IF838686; Facesoffungi number: FoF16083, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Corticolous, non-lichenized, saprobic on the bark of *Populus tremula*. Sexual morph: see Holien and Suija (2021). Asexual morph: Unknown.

Type species – *Caesiodiscus populicola* Holien & Suija

Notes – *Caesiodiscus* was introduced by Holien and Suija (2021) with *C. populicola* as the type species. This genus is characterised by pale bluish to bluish-grey, effuse, discoid apothecia (0.1–0.3 mm diam.) that are sessile to slightly immersed, with a smooth, waxy disc and an indistinct or slightly sunken margin. The ectal excipulum is composed of textura globulosa with thin-walled cells containing pale bluish pigments. The hymenium is colourless to pale bluish, turning orange-brown in KOH. Asci are clavate, (25–)28–35(–37) × (6–)7–9 µm, eight-spored, J+ with a distinct apical apparatus. Ascospores are hyaline, ellipsoid to broadly fusiform, aseptate or occasionally with a single septum, (6–)7–8.5(–9.5) × (2.5–)3–3.5 µm. Paraphyses are filiform, often curved at the tips, slightly swollen apically, containing yellow to orange pigments. Molecular markers available include ITS (MW540546) and LSU

(MW540547) sequence data. Phylogenetic analyses place *Caesiodiscus* within Hyaloscyphaceae, closely related to *Hyaloscypha albohyalina* and allied taxa. The type species, *C. populicola*, was collected on rough bark of *P. tremula* in a natural *Populetum tremulae* forest near Lake Unkervatnet, Hattfjelldal, Nordland, Norway, at 460 m elevation, on 17 September 2015 by H. Holien (H. Holien 13237; TRH-V182623 holotype; isotype in TAA).

Caesiodiscus populicola Holien & Suija, Agarica 42: 82 (2021) Figure 3.196

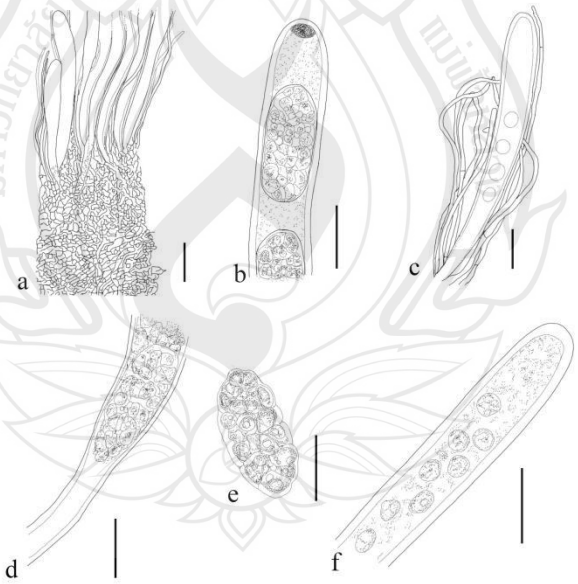
Index Fungorum number: IF838687; Facesoffungi number: FoF 15300

Description – Holien and Suija (2021).

Material considered – Holien and Suija (2021).

Distribution, ecological and economical importance

Caesiodiscus is a corticolous, non-lichenized saprobe, contributing to the decomposition of organic matter on tree bark and participating in nutrient cycling within boreal forest ecosystems. Currently, the genus is only known from its type locality in Northern Norway, suggesting it may be rare or regionally restricted.



Source Redrawn from Holien and Suija (2021)

Note a Lower part of the hymenium with asci and paraphyses, and upper part of medullary exciple. b Mature ascus with mature ascospores (in K/I). c Young ascus with 1-celled ascospores (in K). d Base of the ascus (in K/I). e Ascospores. f Young ascus with eight 1-celled ascospores. Scale bars: a = 20 µm, b–f = 10 µm.

Figure 3.196 *Caesiodiscus populicola*

Cairneyella D.J. Midgley & Tran-Dinh, in Midgley, Rosewarne, Greenfield, Li, Vockler, Hitchcock, Sawyer, Brett, Edwards, Pitt & Nai, Mycorrhiza 26(4): 347 (2015)

Index Fungorum number: IF807149; Facesoffungi number: FoF 18617, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Both as symbionts and as free-living saprotrophs on organic matter in the soil. Sexual morph: Unknown. Asexual morph: see Midgley et al. (2016).

Type species – *Cairneyella variabilis* D.J. Midgley & Tran-Dinh

Notes – *Cairneyella* was introduced by Midgley et al. (2016) with *Cairneyella variabilis* as the type species. The genus is characterised by slow-growing colonies that are initially off-white to white, becoming pale brown, yellowish-brown, crimson, or violet with age. Colonies are felty to woolly with aerial mycelium; hyphae are septate, smooth to finely asperulate, and lack conidia, chlamydospores, and sclerotia. The genus forms ericoid mycorrhizal associations with members of the Ericaceae, producing intracellular hyphal coils within epidermal root cells, but can also occur as a free-living saprotroph in soil, decomposing complex organic matter. Molecular markers available include ITS, LSU, and *β-tubulin* sequence data. The type species, *Cairneyella variabilis*, was isolated from roots of *Leptospermum polygalifolium* growing in a *Nothofagus moorei*-dominated cool temperate rainforest in Lamington National Park, Queensland, Australia. The holotype is deposited in the Victorian Plant Pathology Herbarium (VPRI 42388), with ex-type cultures preserved as VPRI 42388 and UAMH 11840.

Cairneyella variabilis D.J. Midgley & Tran-Dinh, in Midgley, Rosewarne, Greenfield, Li, Vockler, Hitchcock, Sawyer, Brett, Edwards, Pitt & Nai, Mycorrhiza 26(4): 347 (2015) Figure 3.197

Index Fungorum number: IF807150; Facesoffungi number: FoF 18618

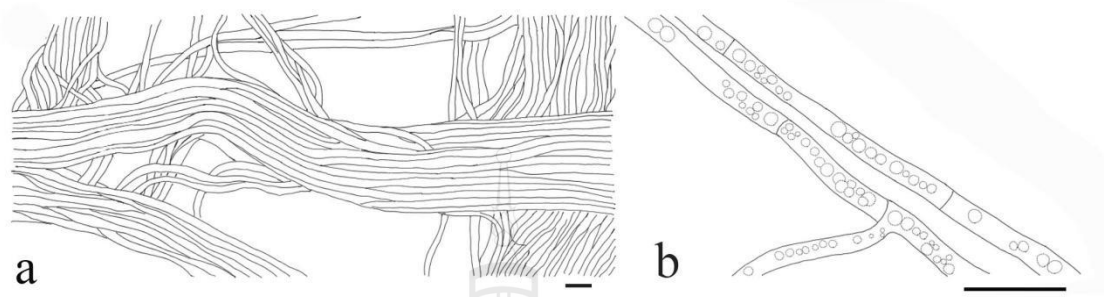
Description – Midgley et al. (2016).

Material considered – Midgley et al. (2016).

Distribution, ecological and economical importance

Cairneyella plays a dual ecological role: as an ericoid mycorrhizal symbiont, it facilitates host nutrient acquisition—particularly nitrogen and phosphorus—in acidic, nutrient-poor soils; as a saprotroph, it contributes to the decomposition of organic matter, enhancing nutrient cycling. Currently, the genus is known only from eastern Australia, with records from Queensland and New South Wales in cool temperate

rainforests and montane habitats dominated by *Nothofagus moorei* and associated ericaceous vegetation.



Source Redrawn from Midgley et al. (2016)

Note a Demonstrating hyphae. b Individual hyphae, a branch point, septa. Scale bars: a, b = 10 μm.

Figure 3.197 *Cairneyella variabilis*

Cashiella Petr., Sydowia 5(3-6): 371 (1951)

Index Fungorum number: IF832; Facesoffungi number: FoF 18619, 4 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprophytic on decaying plant material, leaf litter, and soil. Sexual morph: see Petrak (1951). Asexual morph: Unknown.

Type species – *Cashiella atra* Petr.

Notes – *Cashiella* was introduced by Petrak (1951) with *C. atra* as the type species, based on material from Wyoming, USA. The genus is characterized by scattered, superficial, sessile apothecia that are dark brown to black, circular to broadly elliptic, and sometimes irregular in shape. The receptacle is pseudoparenchymatous, composed of dark brown, irregularly angular cells arranged in more or less distinct radial rows. The hypothecium is fibrous or indistinctly microparenchymatous and hyaline. Asci are clavate-cylindrical, short-stalked, thin-walled, and 8-spored. Ascospores are ellipsoidal, unicellular, hyaline, often containing two large oil droplets. Paraphyses are filiform to clavate, mostly conglutinated, diverging at the apex, gradually becoming pale olive-colored and broader, with a rounded or ellipsoidal thick-walled terminal cell. Dennis (1961) further discussed the morphology and suggested

possible affinities with Dermateaceae. Currently, no molecular markers are available for *Cashiella*, and its phylogenetic placement within Helotiales remains uncertain.

Cashiella atra Petr., Sydowia 5(3-6): 371 (1951) Figure 3.198

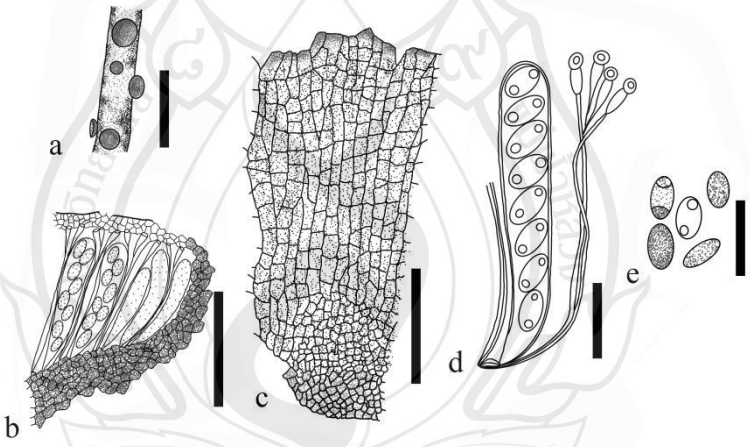
Index Fungorum number: IF294102; Facesoffungi number: FoF 18620

Description – Petrak (1951).

Material considered – Petrak (1951).

Distribution, ecological and economical importance

Cashiella species are saprobic fungi involved in the decomposition of woody and herbaceous plant debris, contributing to nutrient cycling. Known records include *C. atra* from Wyoming, USA, *C. monticola* from New Zealand (on decorticated stems of *Dracophyllum*), and *C. sticheri* from Orongorongo Forest, New Zealand. Distribution records suggest a disjunct occurrence in North America and Oceania, but the genus is likely underreported due to its small and inconspicuous apothecia.



Source Redrawn from Petrak (1951)

Note a A stem fragments with apothecia. b Cross-section through half of an apothecium. c Surface view of a sector of the excipulum. d An ascus with paraphyses. e Ascospores. Scale bars: a = 5cm; b, c = 50 µm; d, e = 20 µm.

Figure 3.198 *Cashiella atra*

Cejpia Velen., Monogr. Discom. Bohem. (Prague): 125 (1934)

Index Fungorum number: IF832; Facesoffungi number: FoF 18621, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on decaying wood, branches, and plant debris. Sexual morph: see Svrček (1976). Asexual morph: Unknown.

Type species – *Cejpia coerulea* Velen.

Notes – *Cejpia* was established by Velenovský (1934) with *Cejpia coerulea* as the type species, based on collections from Central Bohemia, Czech Republic. Later, Svrček (1976) recombined *Peziza amoena* Boud. into *Cejpia* as *C. amoena* (Boud.) Svrček and treated it as a synonym of *C. coerulea*. Members of *Cejpia* are characterised by scattered, discrete apothecia that are initially immersed and subepidermal, later erumpent, black to dark bluish, and often with a short stipe. The apothecia are 0.5–1.5 mm in diameter, discoid to cupulate, with a margin of textura porrecta and an excipulum composed of *textura angularis* to *textura globulosa*, with dark brown outer cells and hyaline inner layers. The hymenium consists of clavate, 8-spored asci (130–160 × 10–14 μm) with a non-amyloid (J–) apical structure, arising from a basal stroma of *textura intricata*. Paraphyses are filiform, slightly enlarged at the apex. Ascospores are uniseriate, subspherical to ellipsoid, hyaline, smooth except for restricted areas with longitudinal striations, and embedded in a mucilaginous sheath (12–16 × 6–8 μm). Molecular data are scarce, with only limited ITS sequences available, and phylogenetic analyses place the genus as *incertae sedis* within Leotiomycetes. The holotype of *C. coerulea* (PRM 155601) was collected on decaying wood in the Kokořín Valley, Central Bohemia, Czech Republic, in 1922 by J. Velenovský.

Cejpia coerulea Velen., Monogr. Discom. Bohem. (Prague): 125 (1934) Figure 3.199

=*Cejpia amaena* (Boud.) Svrček [as 'amoena'], Česká Mykol. 30(1): 14 (1976)

Index Fungorum number: IF294102; Facesoffungi number: FoF 18622

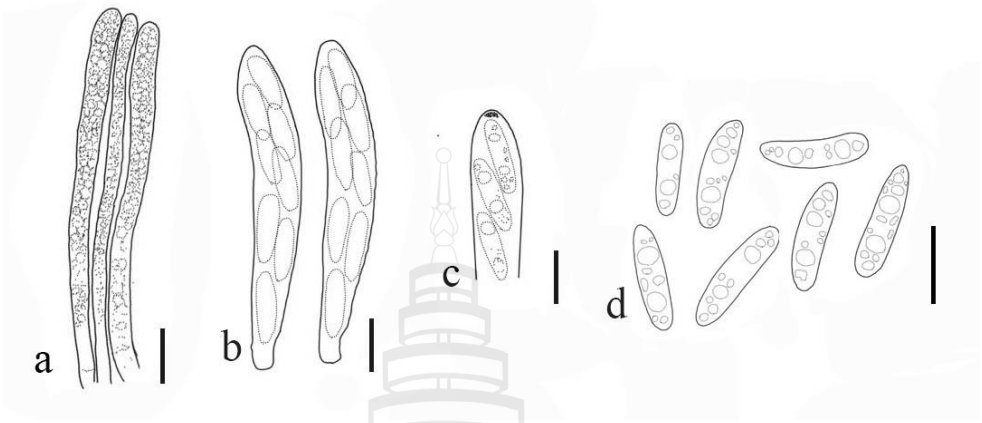
Description – Svrček (1976).

Material considered – Svrček (1976).

Distribution, ecological and economical importance

Cejpia is a rare genus of saprobic fungi that contributes to the decomposition of lignocellulosic material, thus playing a role in nutrient cycling in temperate forest ecosystems. Species occur on decaying wood, barkless branches, and plant debris, sometimes on moss-covered substrates.

The genus is known from several European countries, including the Czech Republic, Austria, Germany, and France, mainly in temperate forest habitats.



Sources Redrawn from Centro de Estudios Micológicos Asturianos (2023)

Note a Paraphyses. b Asci. c Asci(lKlr). d Ascospores. Scale bars: a–d = 10 µm.

Figure 3.199 *Cejpia hystrix*

Cenangiumella J. Fröhl. & K.D. Hyde, Fungal Diversity Res. Ser. 3: 240 (2000)

Index Fungorum number: IF28468; Facesoffungi number: FoF 18623, 1 morphological species (Species Fungorum, 2025), 0species with molecular data.

Saprobic on terrestrial habitats, specifically associated with rattan palms. Sexual morph: see Fröhlich and Hyde (2000). Asexual morph: Unknown.

Type species – *Cenangiumella rattanicola* J. Fröhl. & K.D. Hyde

Notes – *Cenangiumella* was introduced by Fröhlich and Hyde (2000) with *Cenangiumella rattanicola* as the type species, collected on decaying stems of *Calamus* sp. (Arecaceae) in Brunei. The genus is characterized by superficial, gregarious, sessile apothecia that are initially cup-shaped, later becoming saucer-shaped, circular to ellipsoidal, and dark brown. The excipulum comprises *textura intricata* and *textura oblita*, with outer layers of dark brown to black cells. Asci are broad-cylindrical, 8-spored, with a distinct apical pore; paraphyses are septate, slightly thickened at the rounded apex. Ascospores are fusiform, hyaline, smooth-walled, aseptate, and enclosed in a mucilaginous sheath. Currently, no molecular sequence data are available for the genus. Its familial placement within Helotiales remains unresolved due to lack of

phylogenetic evidence. The holotype of *C. rattanicola* is deposited in HKU(M) (HKU(M) 003240), with ex-type cultures preserved in the same herbarium.

Cenangiumella rattanicola J. Fröhl. & K.D. Hyde, Fungal Diversity Res. Ser. 3: 240 (2000) Figure 3.200

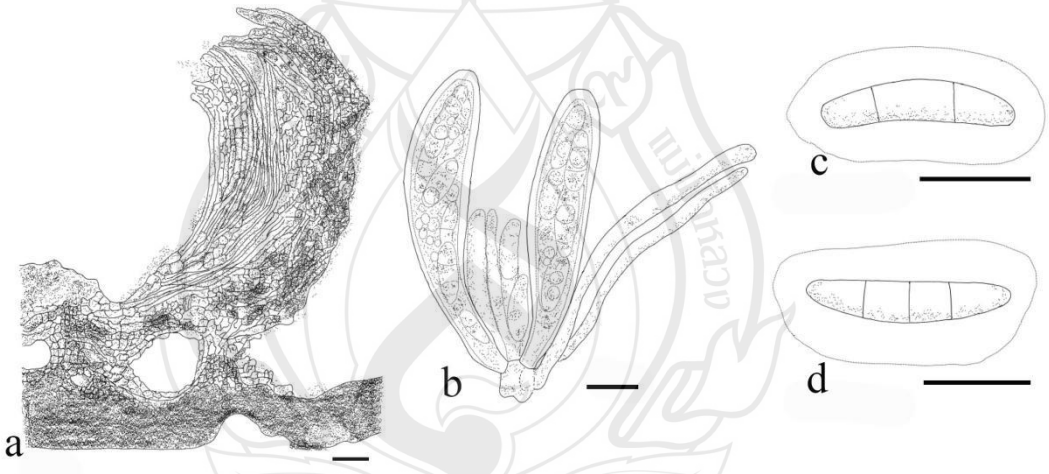
Index Fungorum number: IF482797; Facesoffungi number: FoF 18624

Description – Fröhlich and Hyde (2000).

Material considered – Fröhlich and Hyde (2000).

Distribution, ecological and economical importance

Cenangiumella is a saprobic genus involved in the decomposition of monocot plant material, contributing to nutrient cycling in tropical forest ecosystems. The known distribution is restricted to Brunei, suggesting a potential host-specific or habitat-limited occurrence, possibly tied to rattan palms (*Calamus* spp.) in Southeast Asian lowland rainforests.



Sources Redrawn from Fröhlich and Hyde (2000)

Note a Vertical sections through the sides of the ascoma illustraing the structure of the excipulum. b Asci and paraphyses. c Ascospores with mucilaginous sheaths. Scale bars: a–d = 10 µm.

Figure 3.200 *Cenangiumella rattanicola*

Chlorospleniella P. Karst., Acta Soc. Fauna Flora fenn. 2(no. 6): 141 (1885) [1881-1885]

Index Fungorum number: IF1015; Facesoffungi number: FoF 18625, 3 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on dead wood, particularly on hardwood hosts such as *Alnus* and *Betula*. Sexual morph: see Groves and Wilson (1967). Asexual morph: Unknown.

Type species – *Chlorospleniella fennica* (P. Karst.) Sacc. ex Clem. & Shear

Notes – *Chlorospleniella* was established by Karsten (1885) with *Sphaeria fennica* P. Karst. as the basionym, later transferred to the genus by Saccardo and validated by Clements & Shear. Species of this genus are lignicolous, with apothecia usually scattered to gregarious, sessile, and superficial, measuring up to 1 mm in diameter, disc green to olive, sometimes with a yellowish tinge, margin concolorous or slightly darker, receptacle adnate to the substrate. The excipulum is composed of *textura prismatica* to *textura globulosa*, with outer cells greenish to dark olive. The hymenium bears cylindrical to clavate, eight-spored asci with an amyloid (J+) apical ring. Paraphyses are filiform, sometimes branched, slightly swollen or curved at the apex, containing greenish to yellow pigments. Ascospores are ellipsoid to fusiform, hyaline, aseptate or occasionally 1-septate at maturity, with one or two guttules, smooth-walled. Currently, no molecular data are available for *Chlorospleniella*, and its phylogenetic placement remains uncertain. The type species, *C. fennica*, was described from *Alnus glutinosa* in Finland (Karsten Herbarium, H 7004982, Helsinki, lectotype designated by Groves and Wilson (1967) and has also been recorded on *Betula* and other hardwood hosts.

Chlorospleniella fennica (P. Karst.) Sacc. ex Clem. & Shear, Gen. fung., Edn 2 (Minneapolis): 326 (1931)

Index Fungorum number: IF431480; Facesoffungi number: FoF 18626

Description – Groves and Wilson (1967).

Material considered – Groves and Wilson (1967).

Distribution, ecological and economical importance

Chlorospleniella species are saprobic, contributing to the decomposition of hardwood in temperate forest ecosystems. *C. fennica* occurs mainly in moist, shaded habitats, colonising dead wood of *Alnus* and *Betula*. Known distribution includes Finland (type locality), Sweden, Norway, and Canada (British Columbia), with scattered reports in other parts of Europe and North America.

Figure – No original illustration available.

Ciliella Sacc. & P. Syd., Syll. fung. (Abellini) 16: 748 (1902)

Index Fungorum number: IF1054; Facesoffungi number: FoF 18627, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on leaves of *Epidendrum* (Orchidaceae). Sexual morph: see Saccardo and Sydow (1902). Asexual morph: Unknown.

Type species – *Ciliella epidendri* (Rehm) Sacc. & P. Syd.

Notes – *Ciliella* was established by Saccardo and Sydow (1902) to accommodate *Trichobelonium epidendri* Rehm, with *C. epidendri* as the type species. The genus is characterized by epiphyllous, sessile, orbicular, subgelatinous apothecia that are subplanate and immarginate, with a very thin parenchymatic exciple. The outer excipular cells are violaceous to fuscous-violet, forming a fuscoviolaceous epithecium. Asci are ovate, short-stipitate, eight-spored. Ascospores are fusiform, 3-septate, hyaline, (15 × 3 µm), each end bearing a long, filiform, often curved apical cilium (5–7 µm long). Paraphyses are conglutinate, forming a distinct pigmented epithecium. The ciliate ascospores are the most distinctive feature of the genus and the basis for its name. No molecular data are available, and the familial placement within Helotiales remains uncertain. Rehm (1900) noted its resemblance to *Harknessiella* and questioned whether it might be better placed near *Bulgaria*.

Ciliella epidendri (Rehm) Sacc. & P. Syd., Syll. fung. (Abellini) 16: 748 (1902)

Index Fungorum number: IF158196; Facesoffungi number: FoF 18628

Description – Saccardo and Sydow (1902).

Material considered – Saccardo and Sydow (1902).

Distribution, ecological and economical importance

Ciliella is a monotypic genus known only from the type locality in Rio de Janeiro, Brazil. It is likely a saprobe or weak parasite on living leaves of *Epidendrum* species. Its ecological role, life cycle, and global distribution remain poorly studied due to the scarcity of records and lack of molecular data.

Figure – No original illustration available.

Cistella Quél., Enchir. fung. (Paris): 319 (1886)

Index Fungorum number: IF1069; Facesoffungi number: FoF 18629, 50 morphological species (Species Fungorum, 2025), 9 species with molecular data.

Saprotrophic on dead plant material. Sexual morph: see Baral (2005). Asexual morph: Unknown.

Type species – *Cistella dentata* (Pers.) Quél.

Notes – *Cistella* was introduced by Quélet (1886) with *Cistella dentata* as the type species. The genus is characterised by small, discoid to cupulate apothecia, white to isabelline, usually growing on forest debris, herbaceous stems, dead wood, bark, or fallen leaves. The apothecial hairs are typically clavate, septate, hyaline, with the apical cell densely warted or spinulose, often bearing acyanophilous or cyanophilous spines; the basal part of hairs is usually smooth. The ectal excipulum is composed of *textura prismatica* to *angularis-globulosa*, non-gelatinised, often with resinous exudates. Asci are cylindrical-clavate, 8-spored, arising from croziers or simple septa, with hemiamyloid or amyloid apical rings. Ascospores are hyaline, aseptate, cylindric to subfusoid, often with small guttules. Paraphyses are cylindrical, straight to slightly flexuous, rarely exceeding the asci. Molecular markers available include ITS and LSU sequence data (Quijada et al., 2015; Baral, 2005; Acar, 2021). A modern specimen identified as *C. dentata* was described in detail by Quijada et al. (2015) from Tenerife, Canary Islands, Spain, deposited at the Mycological Section of the Herbarium of the University of La Laguna (TFC Mic). Another recent collection is deposited in the Fungarium of Van Yüzüncü Yıl University (VANF, specimen no. VANF–ACAR 1118), collected from Bingöl Province, Turkey (Acar, 2021). Although ITS and LSU data exist for some species, multi-locus datasets are still lacking, and the phylogenetic placement of several taxa within the genus remains unresolved.

Cistella dentata (Pers.) Quél., Enchir. fung. (Paris): 319 (1886) Figure 3.201

Index Fungorum number: IF414659; Facesoffungi number: FoF 18630

Description – Baral (2005).

Material considered – Baral (2005).

Distribution, ecological and economical importance

Cistella species are saprotrophic fungi that decompose dead plant material, particularly fallen leaves, bark, herbaceous stems, and decaying wood, contributing to nutrient cycling in forest ecosystems (Baral, 2005; Quijada et al., 2015). They are often associated with specific host plants or microhabitats, such as previous-year fallen leaves of *Acer*, *Quercus*, and *Castanea*, indicating microhabitat specialization (Baral, 2005). Some species also occur on decorticated twigs and woody debris.

The genus is cosmopolitan, reported from Europe (Germany, Switzerland, Estonia, Spain including Canary Islands, UK, Norway, Sweden), North America (USA), Asia (Pakistan, Turkey), and Australia (Acar, 2021; Baral, 2005; Quijada et al., 2015). Recent records from Bingöl Province, Turkey, and Tenerife, Canary Islands, expand its known distribution in West Asia and Macaronesia.



Source Redrawn from Acar (2021)

Note a Hairs. b Asci. c Asci, ascospores and paraphyses. d Asce (in Melzer's reagent). e Ascospores. Scale bars: a–e = 20 µm.

Figure 3.201 *Cistella dentata*

Clathrosporium Nawawi & Kuthub., Trans. Br. mycol. Soc. 89(3): 408 (1987)

Index Fungorum number: IF11050; Facesoffungi number: FoF 18632, 4 morphological species (Species Fungorum, 2025), 2 species with molecular data.

Saprotrophic on submerged or periodically wet plant material, such as leaves, wood, and other organic debris. Sexual morph: Unknown. Asexual morph: see Hennebert (1998).

Type species – *Clathrosporium intricatum* Nawawi & Kuthub.

Notes – *Clathrosporium* was introduced by Nawawi and Kuthubutheen (1987) with *Clathrosporium intricatum* as the type species, collected from submerged plant

debris in Malaysia. Species are characterised as hyphomycetous, helicosporous, aero-aquatic or hydrophilic fungi. Colonies develop as gregarious propagules on appressed or submerged mycelium, which is subhyaline to dark brown, regularly septate, branched, and either immersed in or superficial on the substrate. Conidiophores are similar to vegetative hyphae, erect, single or fasciculate, bearing one or several propagules. The conidiogenous hypha terminates the conidiophore, producing a coiled, helicoid structure with repeated bilateral branching. Propagules are initially loose, pale gray, later compact, vinaceous brown to grayish black, subglobose to ovate (60–150 μm diam.), composed of several helicoid arms; each arm is made of branched, septate hyphae with triangular or polygonal meshes. At maturity, the propagules disarticulate into smooth- or rough-walled arthroconidia. This aero-aquatic lifestyle allows propagules to float on the water surface, aiding dispersal (Hennebert, 1998). Molecular markers available include LSU and ITS sequence data for *C. intricatum* and *C. retortum* (Moro et al., 2015), which indicate an affinity with members of Sordariomycetidae.The type species, *Clathrosporium intricatum*, was originally described by Nawawi and Kuthubutheen (1987) based on specimens collected from submerged plant debris in Malaysia. The holotype is preserved in the Herbarium of the University of Malaya (KLU).

Clathrosporium intricatum Nawawi & Kuthub., Trans. Br. mycol. Soc. 89(3): 408 (1987) Figure 3.202

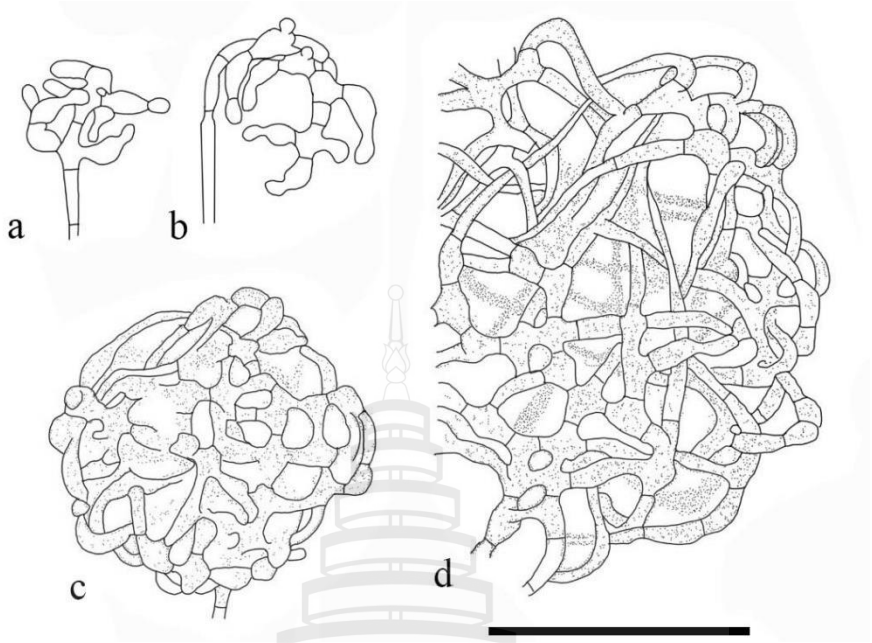
Index Fungorum number: IF133442; Facesoffungi number: FoF 18633

Description – Nawawi and Kuthubutheen (1987).

Material considered – Nawawi and Kuthubutheen (1987).

Distribution, ecological and economical importance

Clathrosporium species are saprotrophs decomposing submerged plant debris, periodically wet wood, and leaf litter. They occur in freshwater streams, seasonal flood zones, artificial wetlands, and occasionally terrestrial habitats. Their aero-aquatic propagules enable persistence and dispersal during alternating wet and dry periods. Species have been reported from tropical and subtropical regions including Malaysia, Thailand, Brazil, Sri Lanka, and Costa Rica, and rarely in temperate regions such as Canada. Host associations include decaying leaves and twigs of *Alnus*, *Quercus*, *Castanea*, *Salix*, *Picea*, *Fagus*, and *Betula*.



Source Redrawn from Hennebert (1998)

Note a, b Conidia at various. c A young globose conidium. d Part of a mature conidium. Scale bars: a–d = 50 μm.

Figure 3.202 *Clathrosporium intricatum*

Coleosperma Ingold, Trans. Br. mycol. Soc. 37(1): 9 (1954)

Index Fungorum number: IF1173; Facesoffungi number: FoF 18634, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on submerged plant debris. Sexual morph: see Ingold (1954). Asexual morph: Unknown.

Type species – *Coleosperma lacustre* Ingold

Notes – *Coleosperma* was introduced by Ingold (1954) as a monotypic genus with *C. lacustre* as the type species. This genus is characterized by minute (0.15–0.3 mm diam.), sessile, translucent white apothecia. The asci are stout (140 × 18 μm), octosporous, and dehisce by an apical pore, releasing spores singly. Ascospores are unicellular, lenticular, thin-walled, faintly yellow due to numerous oil globules, and measure on average 27.6 × 7.6 μm (extremes: 22.5–33.5 × 6.5–9.0 μm). A delicate, extremely narrow sheath surrounds each spore, which is closed immediately upon discharge but dissolves at the ends shortly afterwards. Paraphyses are both simple and branched. Molecular data for *Coleosperma* are not yet available, and its phylogenetic

position remains uncertain. The genus was described as new because the fungus did not fit readily into any known genus at the time. The holotype of *C. lacustre* is preserved at the International Mycological Institute (IMI 51536).

Coleosperma lacustre Ingold, Trans. Br. mycol. Soc. 37(1): 9 (1954) Figure 3.203

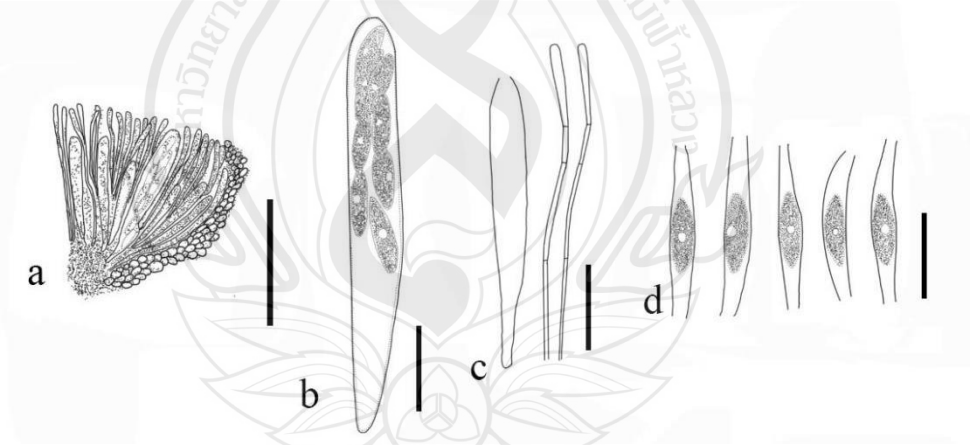
Index Fungorum number: IF295284; Facesoffungi number: FoF 18635

Description – Ingold (1954).

Material considered – Ingold (1954).

Distribution, ecological and economical importance

Coleosperma lacustre is saprobic, contributing to the decomposition of submerged plant debris, particularly the dead but still attached stalks of *Schoenoplectus lacustris*. It occurs submerged in freshwater at depths of 1–1.5 ft (ca. 30–45 cm) and has been collected repeatedly from May to September. It is known from several lakes in Lancashire, England, including Windermere, Esthwaite, Bleham Tarn, and Little Langdale Tarn. The species may have a wider distribution in similar temperate freshwater habitats, but further surveys are required to clarify its range.



Source Redrawn from Réblová et al. (2021)

Note a Apothecium in vertical section. b Single ascus. c Empty ascus and an unbranched paraphysis. d Five spores. Scale bars: a = 100 µm, b–d = 30 µm.

Figure 3.203 *Coleosperma lacustre*

Colipila Baral & Guy García, in Baral, Garcia, Bogale, O'Hara & Untereiner, Mycol. Progr. 11(1): 204 (2011)

Index Fungorum number: IF517661; Facesoffungi number: FoF 18636, 2 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprotrophic on moist, decayed hardwood in forest habitats. Sexual morph: see Baral et al. (2011). Asexual morph: Unknown.

Type species – *Colipila masduguana* Baral & Guy García

Notes – *Colipila* was introduced by Baral and García (2011) with *C. masduguana* as the type species. The genus is characterized by white, distinctly stipitate apothecia, ranging from delicate to robust, densely covered with long, smooth, hyaline, thin-walled, multiseptate hairs that are subulate to basally fusoid, often curved on the stipe and lower flanks. Paraphyses are dimorphic: some scarcely exceeding the asci, others strongly protruding and resembling the hairs. The ectal excipulum is composed of large, thin-walled prismatic cells. Asci are clavate to subcylindrical, 8-spored, with hemi-amyloid or strongly amyloid apical rings (species-specific). Ascospores are hyaline, aseptate, narrowly ellipsoid to fusiform-clavate, often with polar oil drops. *Colipila* is lignicolous, occurring on decayed wood in humid forest environments. LSU rDNA sequence data are available for *C. masduguana*. The type species was collected from decorticated wood of *Castanea sativa* in Saint-Vincent d'Olargues, France, on 18 Jan 2004 by G. García. The holotype is deposited in the Herbier Cryptogamique of the Muséum National d'Histoire Naturelle, Paris (PC), and the ex-type culture is preserved as CBS 128287.

Colipila masduguana Baral & Guy García, in Baral, Garcia, Bogale, O'Hara & Untereiner, Mycol. Progr. 11(1): 204 (2011) Figure 3.204

Index Fungorum number: IF517662; Facesoffungi number: FoF 18637

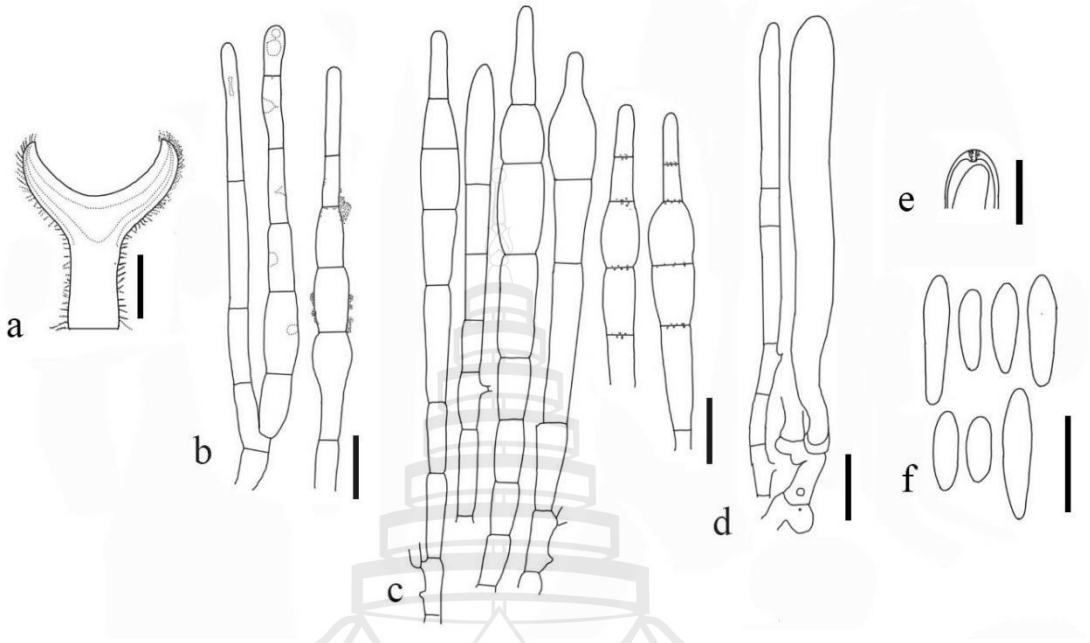
Description – Baral et al. (2012).

Material considered – Baral et al. (2012).

Distribution, ecological and economical importance

Colipila is a lignicolous genus playing a saprotrophic role in decomposing dead wood in forest ecosystems. *C. masduguana* is known from sub-Mediterranean acidic forests in southern France, typically on *Castanea sativa* and occasionally *Quercus*

robur, fruiting in winter. *C. pilatensis* is found in temperate deciduous forests of the Northern Alps, on Rosaceae wood, fruiting in summer.



Source Redrawn from Baral et al. (2012)

Note a Apothecium in median section. b Hairs on margin and flanks of apothecia. c Paraphyses. d Paraphyses and asci. e Ascus apex with amyloid apical ring. f Ascospores. Scale bars: a = 500 µm; b–d, f = 10 µm; e = 5 µm.

Figure 3.204 *Colipila masduguana*

Coronellaria (P. Karst.) P. Karst., Not. Sällsk. Fauna et Fl. Fenn. Förh., Ny Ser. 11: 248 (1870) [1871]

Index Fungorum number: IF1252; Facesoffungi number: FoF 18638, 8 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on dead plant material. Sexual morph: see Kanouse 1941. Asexual morph: Unknown.

Type species – *Coronellaria delitschiana* (Auersw.) P. Karst.

Notes – *Coronellaria* was introduced by Karsten (1871) with *C. delitschiana* as the type species, originally described as *Peziza delitschiana* by Auerswald and later transferred by Karsten. Members of this genus are characterized by sessile, cup-shaped to discoid apothecia with a soft, waxy texture, often with a minutely pruinose margin. The excipulum consists of a pseudoparenchymatic basal layer of dark brown cells and

an upper palisade-like layer of subhyaline, elongated cells. Asci are broadly clavate, thick-walled, and eight-spored, with a broad apical pore that stains bright blue in iodine. Ascospores are hyaline, fusoid, spuriously septate, and multiguttulate. Paraphyses are filiform, branched at the tips, and extend beyond the asci, forming a loose epithecium (Kanouse, 1941; Dennis, 1954; Richter & Baral, 2008). The holotype was collected by P.A. Karsten in September 1869 from submerged stems of *Schoenoplectus lacustris* at Kuivajärvi, Tammela, Finland, and is preserved in the Herbarium of the University of Helsinki (H).

Coronellaria delitschiana (Auersw.) P. Karst., Not. Sällsk. Fauna et Fl. Fenn. Förh., Ny Ser. 11: 248 (1870) [1871] Figure 3.205

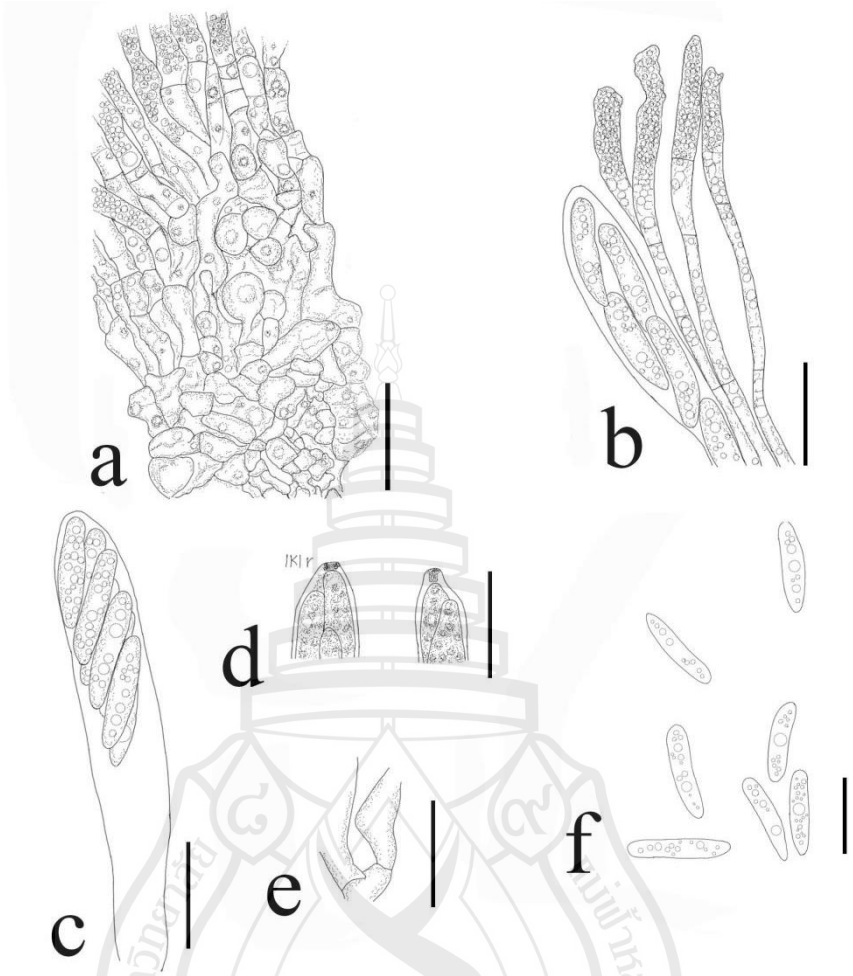
Index Fungorum number: IF180421; Facesoffungi number: FoF 18639

Description – Kanouse (1941).

Material considered – Kanouse (1941).

Distribution, ecological and economical importance

Species of *Coronellaria* are saprobic, contributing to the decomposition of dead plant material. They occur on fallen leaves and stems of various hosts, including *Schoenoplectus lacustris* (Cyperaceae) and *Castanopsis chrysophylla* (Fagaceae) (Kanouse, 1941). The genus is recorded from temperate and wetland environments, with confirmed occurrences in Europe (Germany, Finland) and North America (USA: Oregon), and is likely more widespread in suitable habitats (Dennis, 1954; Richter & Baral, 2008).



Source Redrawn from Centro de Estudios Micológicos Asturianos (2023)

Note a Excipulum. b Asci and paraphyses. c Asci. d Ascal tip with IkIr. e Croziers (-). f Ascospores. Scale bars: a–f = 20 µm.

Figure 3.205 *Coronellaria benkerti*

Criserosphaeria Speg., Anal. Mus. nac. Hist. nat. B. Aires 23: 72 (1912)

Index Fungorum number: IF1293; Facesoffungi number: FoF 18640, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprotrophic or possibly weakly pathogenic on plant material. Sexual morph: see Spegazzini (1912). Asexual morph: Unknown.

Type species – *Criserosphaeria phyllostictoides* Speg.

Notes – *Criserosphaeria* was introduced by Spegazzini (1912) with *C. phyllostictoides* as the type species. The genus is characterized by erumpent, globose perithecia, initially immersed in host tissue and later emerging through several rounded ostioles. Perithecia

are minute, glabrous, olive-colored at maturity, with a very thin subprosenchymatic wall. The asci are cylindrical, short-stalked, eight-spored, with a slightly attenuate-rounded apex, measuring 110–120 × 5–6 μm, and do not show an iodine reaction. Ascospores are filiform, hyaline, straight to slightly flexuous, tapering at both ends, measuring 80–85 × 1 μm, and lack septation; paraphyses are absent. No holotype was designated by Spegazzini, but the original material is presumably deposited in the Spegazzini herbarium (LPS). Molecular sequence data are not available for this genus, and its phylogenetic placement within Ascomycota remains uncertain.

Criserosphaeria phyllostictoides Speg., Anal. Mus. nac. Hist. nat. B. Aires 23: 72 (1912)

Index Fungorum number: IF142183; Facesoffungi number: FoF 18641

Description – Spegazzini (1912).

Material considered – Spegazzini (1912).

Distribution, ecological and economical importance

Criserosphaeria is known only from the type locality in Argentina, where it was found on senescent or decaying leaves. Based on morphology, the genus is presumed to be saprotrophic, but a weakly pathogenic habit cannot be excluded. Its global distribution and ecological roles remain poorly documented.

Figure – No original illustration available.

Crocicreas Fr., Summa veg. Scand., Sectio Post. (Stockholm): 418 (1849)

Index Fungorum number: IF1294; Facesoffungi number: FoF 18642, 56 morphological species (Species Fungorum, 2025), 4 species with molecular data.

Saprobic on various types of plant debris. Sexual morph: see Iturriaga et al. (1999), Zheng and Zhuang (2015, 2016). Asexual morph: Unknown.

Type species – *Crocicreas gramineum* (Fr.) Fr.

Notes – *Crocicreas* was established by Fries (1849) with *C. gramineum* as the type species. Species of the genus are characterised by small, stipitate to subsessile apothecia, with a whitish, cream, yellowish to brownish hymenium; ectal excipulum composed of gelatinised *textura intricata*, *textura oblita*, *textura prismatica*, or *textura porrecta*; medullary excipulum often of *textura intricata* or *textura porrecta*. Asci are cylindrical to clavate, arising from croziers, eight-spored, with a Hymenoscyphus-type apical apparatus that can be J+ or J− in iodine; ascospores are hyaline, smooth, aseptate

to multiseptate, variable in shape (ellipsoid, fusiform, filiform, ovoid, or obpyriform), with or without guttules (Carpenter, 1981; Baral et al., 2015; Zheng & Zhuang, 2016). The genus is morphologically similar to *Bisporella*, *Cyathicula*, and *Calycina*, but differs in its more delicate receptacle tissues, broader substrate range, and frequently more gelatinised ectal excipulum (Carpenter, 1981; Baral, 2005). Molecular markers available for some species include ITS and LSU sequences (Zheng & Zhuang, 2016). Phylogenetic analyses indicate that *Crocicreas* is polyphyletic within Helotiaceae, suggesting the need for taxonomic revision (Baral et al., 2009; Zheng & Zhuang, 2016). The type species, *C. gramineum*, was originally described as *Peziza graminea* by Fries and later transferred to *Crocicreas* by Fries himself. The lectotype was designated by Carpenter (1981) from material collected by Fries in Småland, Sweden, on dead herbaceous stems, and is preserved in the herbarium of Uppsala University (UPS).

Crocicreas gramineum (Fr.) Fr., Summa veg. Scand., Sectio Post. (Stockholm): 418 (1849) Figure 3.206

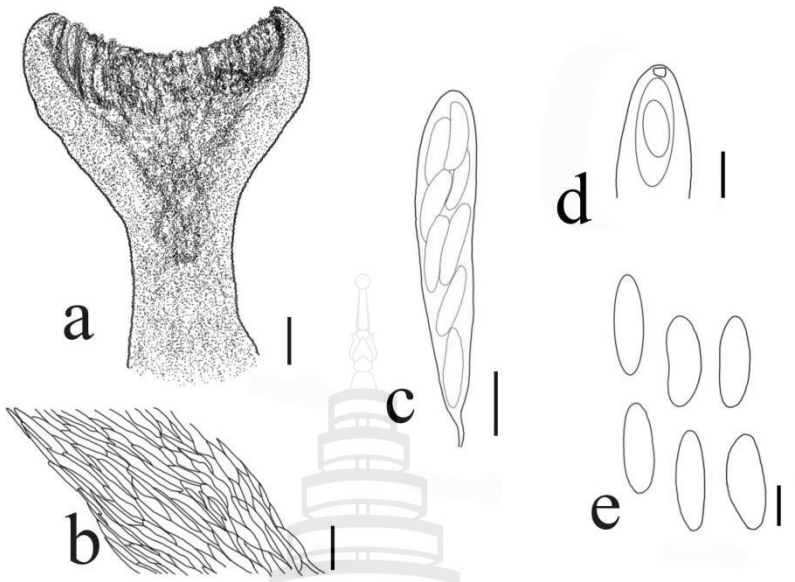
Index Fungorum number: IF246584; Facesoffungi number: FoF 18643

Description – Baral (2005).

Material considered – Baral (2005).

Distribution, ecological and economical importance

Species of *Crocicreas* are saprobic, decomposing a wide variety of plant debris, particularly herbaceous stems, culms, fallen leaves, and decorticated wood (Iturriaga et al., 1999; Zheng & Zhuang, 2015, 2016). They contribute to nutrient cycling in forest and litter-rich ecosystems but have no known economic importance, as they do not include plant pathogens or commercially valuable taxa (Carpenter, 1981). The genus has a cosmopolitan distribution, predominantly in temperate and subtropical regions, with species diversity centres in Europe, North America, and Asia. In China, at least nine species have been recorded, including several newly described from Hebei, Hubei, Sichuan, Xinjiang, and Yunnan provinces (Zheng & Zhuang, 2015, 2016). The type species *C. gramineum* occurs in Europe, while species such as *C. epifagicola* are known from the northeastern United States (Iturriaga et al., 1999).



Source Redrawn from Zheng and Zhuang (2015)

Note a Longitudinal section of apothecium. b Excipular structure at flank. c Asci. d Ascus apical rings in IKI. e Ascospores. Scale bars: a = 100μm, b–e = 10 μm.

Figure 3.206 *Crocicreas gramineum*

Crucellisporium M.L. Farr, in Farr & Horner, Nova Hedwigia 15: 264 (1968)

Index Fungorum number: IF7821; Facesoffungi number: FoF 07181, 3 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on dead or decaying plant tissues. Sexual morph: Unknown. Asexual morph: see Nag Raj and Kendrick (1978), Punithalingam (1989b, 2003).

Type species – *Crucellisporium selaginellae* M.L. Farr

Notes – *Crucellisporium* was introduced by Farr and Horner (1968) with *C. selaginellae* as the type species, originally described from dead or senescent leaves of *Selaginella* in North Carolina, USA. The genus is characterised by acervular conidiomata surrounded by a fringe of sterile hyphae, holoblastic conidiogenous cells, and hyaline, septate, tetraradiate stauroconidia with one basal and two or three apical arms (Nag Raj & Kendrick, 1978; Punithalingam, 1989b). Conidial arms are filiform, usually non-septate from the conidium body, and may be slightly curved. These morphological traits distinguish *Crucellisporium* from morphologically similar genera such as *Crucellisporiopsis* (which has phialidic conidiogenesis and stromatic

conidiomata) (Nag Raj, 1982; Crous et al., 2014) and *Dendroseptoria* (Koukol et al., 2017).

Molecular data for the genus are scarce; ITS and LSU rDNA sequences of *C. umtamvunae* placed it within Helotiales (Marincowitz et al., 2010), but the phylogenetic position of other species remains unresolved due to the lack of sequence data and cultures. The holotype of *C. selaginellae* (US 1184620) was collected from the southern ridge of Snow Ball Mountain, Buncombe County, North Carolina, USA, on 28 July 1933 by S.N. Wherry.

Crucellisporium selaginellae **M.L. Farr**, in Farr & Horner, Nova Hedwigia **15**: 264 (1968) Figure 3.207

Index Fungorum number: IF329349; Facesoffungi number: FoF 18644

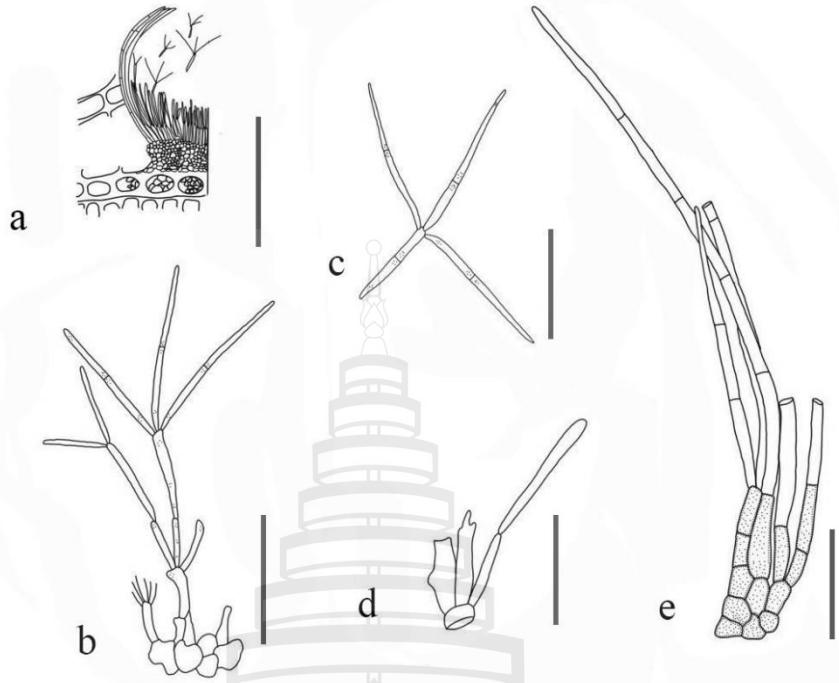
Description – Farr (1968).

Material considered – Farr (1968).

Distribution, ecological and economical importance

Species of *Crucellisporium* are saprobes on dead or senescent leaves, fronds, or other plant debris, mostly in humid forest habitats. They occur on a range of hosts, including *Selaginella* (type species) and dicotyledonous plants (Nag Raj & Kendrick, 1978; Punithalingam, 2003). Although primarily decomposers, they may occasionally be isolated as endophytes or observed as minor leaf-spot pathogens. Their ecological role is in decomposition and nutrient recycling in leaf litter ecosystems.

The genus has a disjunct but broad distribution, reported from North America (USA), southern Africa, and parts of Asia. For instance, *C. umtamvunae* was described from *Nectaropetalum zuluense* in Pondoland, South Africa (Marincowitz et al., 2010), while *C. selaginellae* occurs in temperate North America. In Asia, Nag Raj and Kendrick (1978) recorded species on diverse hosts in tropical and subtropical forests, though many records are based on single collections.



Source Redrawn from Farr (1968)

Note a Vertical section of a conidioma. b Conidiophores, conidiogenous cells, and developing conidia. c Mature conidia. d Conidiophores, conidiogenous cells. e Sterile hyphae. Scale bars: a = 50 µm, b–e = 20 µm.

Figure 3.207 *Crucellisporium africar*

Cryptohymenium Samuels & L.M. Kohn, Sydowia 39: 204 (1987) [1986]

Index Fungorum number: IF25096; Facesoffungi number: FoF 18645, 2 morphological species (Species Fungorum, 2025), 2 species with molecular data.

Saprobic on organic matter in forest litter and soil. Sexual morph: see Johnston et al. (2012). Asexual morph: see Johnston et al. (2012).

Type species – *Cryptohymenium pycnidiophorum* Samuels & L.M. Kohn

Notes – *Cryptohymenium* was introduced by Samuels and Kohn (1986, 1987) with *C. pycnidiophorum* as the type species, distinguished by its unusual combination of apothecial and pycnidial morphs on the same stromatic base. The apothecia arise in small clusters from a common, often buried, dark stromatic base in forest litter and soil, especially under humid conditions. They have a long, scaly, dark grey-brown stipe and a shallow, flaring disc with a flattened hymenium. The ectal excipulum comprises an

outer layer of dark brown, thick-walled, short-cylindrical to subglobose cells, an inner layer of long-cylindrical hyaline cells, and a *textura intricata* subhymenium. Asci are cylindrical, eight-spored, with a thickened amyloid apical ring and pore. Ascospores are hyaline, fusoid, smooth-walled, and aseptate. Asexual morph develops as black, multiloculate pycnidia at the apices of the apothecia, containing cylindric to flask-shaped conidiogenous cells producing subglobose to short cylindrical conidia. Molecular markers available include LSU and ITS rDNA sequence data (Johnston et al., 2012). The holotype (*PDD 46964*) was collected in New Zealand, Gisborne, Urewera National Park, Lake Waikaremoana, Waikare-iti track, on soil among mosses, by Samuels et al., on 24 May 1981.

Cryptohymenium pycnidiophorum Samuels & L.M. Kohn, Sydowia 39: 206 (1987) [1986] Figure 3.208

Index Fungorum number: IF130898; Facesoffungi number: FoF 18646

Description – Samuels and Kohn (1986).

Material considered – Samuels and Kohn (1986).

Distribution, ecological and economical importance

Cryptohymenium is saprotrophic, contributing to the decomposition of forest litter and soil organic matter. Initially considered endemic to New Zealand, it has since been recorded from New Caledonia (Ascomycete.org, 2019), extending its known range to the southwestern Pacific. In New Zealand, it is associated primarily with *Nothofagus* forest litter, whereas in New Caledonia it occurs under *Arillastrum gummiferum* in ultramafic soils. Its occurrence appears restricted to humid, temperate to subtropical forest ecosystems.



Source Redrawn from Samuels and Kohn (1986)

Note a Longitudinal section through pycnidium. b Section showing "epithecium", tips of asci and paraphyses (Melzer's reagent). c Median longitudinal section through stipe. d Asci, ascospores and paraphyses (Melzer's reagent). e Phialides and conidia. Scale bars: a, c = 100 µm; b, d, e = 10 µm.

Figure 3.208 *Cryptohymenium pycnidiophorum*

Cryptopezia Höhn., Sber. Akad. Wiss. Wien, Math.-naturw. Kl., Abt. 1 128(7-8): 571 (1919)

Index Fungorum number: IF1327; Facesoffungi number: FoF 18647, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprotrophic lifestyle. Sexual morph: see Höhnel (1919). Asexual morph: see Unknown.

Type species – *Cryptopezia mirabilis* Höhn.

Notes – *Cryptopezia* was introduced by Höhnel (1919) with *C. mirabilis* as the type species. The genus is characterized by glabrous, unstipitate, soft-fleshed, brightly coloured apothecia. The hypothecium is thick and micropseudoparenchymatous. The ectal excipulum is composed of parallel layers of very thin hyphae. Paraphyses are filiform, not swollen at the apex, but abundant. The asci are cylindrical, stalked, thickened at the apex, and non-amyloid. Ascospores are fusiform, aseptate, arranged uniseriately or biseriately in the ascus. No holotype was designated in the protologue; the original material was collected from old perithecia and may be housed in WU (Vienna). The genus is morphologically distinctive but remains poorly studied, and its phylogenetic placement within Leotiomycetes is unresolved due to the lack of molecular data.

Cryptopezia mirabilis Höhn., Sber. Akad. Wiss. Wien, Math.-naturw. Kl., Abt. 1 128(7-8): 571 (1919)

Index Fungorum number: IF431515; Facesoffungi number: FoF 18648

Description – Höhnel (1919).

Material considered – Höhnel (1919).

Distribution, ecological and economical importance

Cryptopezia is an unusual discomycete with a secondary saprotrophic role, colonizing the remains of old perithecia of other fungi, possibly acting as a late colonizer in fungal succession on woody substrates. It is only known from the type locality described by Höhnel (Austria), and no subsequent collections have been reported. The asexual morph is unknown, and further collections and molecular studies are needed to clarify its distribution, ecology, and phylogenetic affinities.

Figure – No original illustration available.

Dactylaria Sacc., Michelia 2(no. 6): 20 (1880)

Index Fungorum number: IF7916; Facesoffungi number: FoF 18649, 111 morphological species (Species Fungorum, 2025), 28 species with molecular data.

Saprotrophic, nematophagous, fungicolous or plant pathogenic. Sexual morph: Unknown. Asexual morph: see Goh and Hyde (1997), Paulus et al. (2003).

Type species – *Dactylaria purpurella* (Sacc.) Sacc.

Notes – *Dactylaria* was introduced by Saccardo (1880) with *D. purpurella* as the type species. The genus is characterised by macronematous, erect, simple or occasionally branched, septate conidiophores, sympodially proliferating conidiogenous cells with prominent denticles, and hyaline, fusiform to cylindrical, 1–multiseptate conidia. Species occur on a wide range of substrates, including decaying wood, bark, leaves, soil, litter, submerged wood, and other fungi. Some species are nematophagous and produce adhesive or constricting hyphal traps (*D. candida*, *D. brochopaga*). Members are reported from tropical, subtropical, and temperate regions, including Australia, China, Iran, Papua New Guinea, and Venezuela. Molecular data available for several species include LSU, ITS, SSU and TEF1 sequences. Phylogenetic analyses indicate that *Dactylaria* is polyphyletic within the Helotiales and requires taxonomic revision (Réblová, 2012; Paulus et al., 2003; Kralovič, 1995). No type specimen was designated in the original publication.

Dactylaria purpurella (Sacc.) Sacc., Michelia 2(no. 6): 20 (1880) Figure 3.209

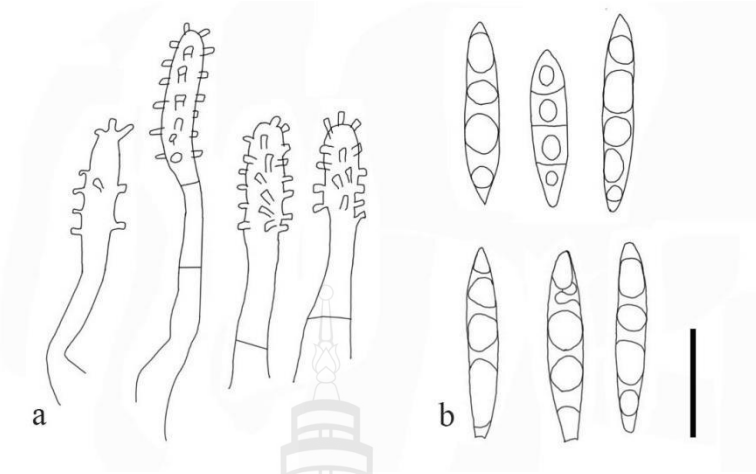
Index Fungorum number: IF176853; Facesoffungi number: FoF 18650

Description – Paulus et al. (2003).

Material considered – Paulus et al. (2003).

Distribution, ecological and economical importance

Dactylaria is an ecologically diverse genus with roles as saprotrophs, nematode-trapping fungi, plant pathogens, fungicolous hyperparasites, and opportunistic animal pathogens. It has a cosmopolitan distribution and occurs in terrestrial, freshwater, and occasionally marine environments. The genus contributes to nutrient cycling and has potential applications in biological control through nematode predation.



Source Redrawn from Gharizadeh et al. (2007)

Note a Conidia. b Conidiophores. d-e = Conidia. Scale bars: 10 μm.

Figure 3.209 *Dactylaria purpurella*

Dawsicola Döbbeler, Mitt. bot. StSamml., Münch. 17: 422 (1981)

Index Fungorum number: IF1425; Facesoffungi number: FoF 18651, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Symbiotic or commensal on mosses. Sexual morph: see Döbbeler (1981). Asexual morph: Unknown.

Type species – *Dawsicola neglecta* Döbbeler

Notes – *Dawsicola* was introduced by Döbbeler (1981) with *Dawsicola neglecta* as the type species, discovered as an interlamellar inhabitant of *Dawsonia* mosses. It is characterised by extremely small (50–500 μm long), hyaline, fruiting bodies entirely immersed between the leaf lamellae of the host, lacking a distinct excipulum or with it highly reduced to remnants. The hymenium is exposed in lamella view, with broadly clavate, thin-walled asci containing eight aseptate, narrowly ellipsoid to fusiform ascospores (4–5 × 1–1.5 μm), smooth-walled and hyaline. Paraphyses are absent or poorly developed. Fruiting bodies are often only detectable after iodine staining, typically showing no reaction, except for a weak staining in subhymenial hyphae that does not change after KOH pretreatment – a reaction type not previously reported among bryophilous fungi. This genus is bryophilous within Helotiales, adapted to the narrow interlamellar habitat of *Dawsonia*, where the reduced or absent excipulum is likely compensated functionally by the lamellae themselves. The

type species is associated with an obligate symbiotic or commensal relationship, showing no visible pathogenic effect even under heavy infections, and occurs together with other bryophilous ascomycetes in the same host. No molecular data are currently available. The holotype of *D. neglecta* (M, specimen no. polyn. 500) was collected from *Dawsonia superba* var. *superba* in Mamaku, North Island, New Zealand, at 500 m elevation, by M. Fleischer on 7 July 1903.

Dawsicola neglecta Döbbeler, Mitt. bot. StSamml., Münch. 17: 422 (1981)

Index Fungorum number: IF111393; Facesoffungi number: FoF 18652

Description – Döbbeler (1981).

Material considered – Döbbeler (1981)

Distribution, ecological and economical importance

Bryophilous fungus occurring exclusively between the leaf lamellae of *Dawsonia* mosses, forming minute, reduced apothecia adapted to the interlamellar habitat; likely obligately symbiotic or commensal.

Known from Australasia, including New Zealand, New Guinea, Australia, and surrounding regions where *Dawsonia* species occur. The species appears host-specific to *Dawsonia* sect. *Superba*, particularly *D. superba* var. *superba*.

Figure – No original illustration available.

Didonia Velen., Monogr. Discom. Bohem. (Prague): 296 (1934)

Index Fungorum number: IF1543; Facesoffungi number: FoF 18653, 7 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on dead plant material. Sexual morph: see Velenovský (1934) and Svrček (1992). Asexual morph: Unknown.

Type species – *Didonia picea* Velen.

Notes – *Didonia* was introduced by Velenovský (1934) with *D. picea* as the type species. The genus is characterized by its saprobic lifestyle on dead plant material, especially decaying wood and leaves. Seven species were accepted by Svrček (1992), among which *D. picea* and *D. betulina* produce chalara-like anamorphs with sessile, phialidic conidiogenous cells on the apothecium, but without described conidia. Due to the absence of living cultures or DNA sequence data, *Didonia* was not included in recent phylogenetic analyses of chalara-like fungi and is currently listed under Pezizellaceae or as Leotiomycetes genera *incertae sedis* (Baral, 2002; Ekanayaka et al.,

2019; Johnston et al., 2019). The phylogenetic relationships of *Didonia* to other chalara-like taxa with aseptate conidia remain unresolved and require further study (Wu & Diao, 2023). No holotype specimen was designated in the original description.

Didonia picea Velen., Monogr. Discom. Bohem. (Prague): 297 (1934)

Index Fungorum number: IF274369; Facesoffungi number: FoF 18654

Description – Velenovský (1934) and Svrček (1992).

Material considered – Velenovský (1934) and Svrček (1992).

Distribution, ecological and economical importance

Species of *Didonia* are saprobic, participating in the decomposition of woody and foliar debris. The genus is primarily distributed in Europe, inhabiting temperate forest ecosystems.

Figure – No original illustration available.

Discomycella Höhn., Sber. Akad. Wiss. Wien, Math.-naturw. Kl., Abt. 1 121: 400 (1912)

Index Fungorum number: IF1660; Facesoffungi number: FoF 18657, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on decayed leaves. Sexual morph: see Höhnel (1912). Asexual morph: Unknown.

Type species – *Discomycella tjibodensis* Höhn.

Notes – *Discomycella* was established by Höhnel (1912) with *D. tjibodensis* from Java as the type species. The genus is characterised by superficial, disc-shaped ascomata with a delicate, gradually developed basal membrane. The excipulum is thin, fibrous, absent at the base but laterally developed as a cylindrical zone of parallel brown hyphae, slightly thickened and darker toward the margin, which is scarcely projecting. The hymenium becomes exposed early in development. The asci are clavate, sessile or shortly stipitate, broader and obtuse at the apex, with a moderately thickened wall and an iodine-blueing pore; eight-spored, (50–)60 × 13–14 μm. Ascospores are hyaline, aseptate, elongated-clavate to nearly fusiform, slightly narrowed and rounded at the ends, thin-walled, with homogeneous contents, usually 12 × 4–5 μm, biseriate within the ascus, containing abundant glycogen. Paraphyses are slender (ca. 1 μm wide), numerous, strongly branched above, forming a brownish epithecium; apices sometimes nearly spherical and up to 3 μm thick. Höhnel (1912) noted the uncertain systematic

placement of the genus, suggesting similarity to *Ascosorus*, *Leptoplyma*, and *Agyrium* in having a laterally developed excipulum, but differing from *Pezizella* and *Orbilia* in structure. The genus may represent a transitional form between gymnocarpous discomycetes and more completely developed apotheciate forms. No molecular data are currently available, and its phylogenetic placement within Helotiales remains unresolved. The holotype is based on material collected on decayed leaves of *Amomum* sp. in Tjibodas, Java (leg. v. Höhnel, 1908).

Discomycella tjibodensis Höhn., Sber. Akad. Wiss. Wien, Math.-naturw. Kl., Abt. 1 121: 401 (1912) Figure 3.210

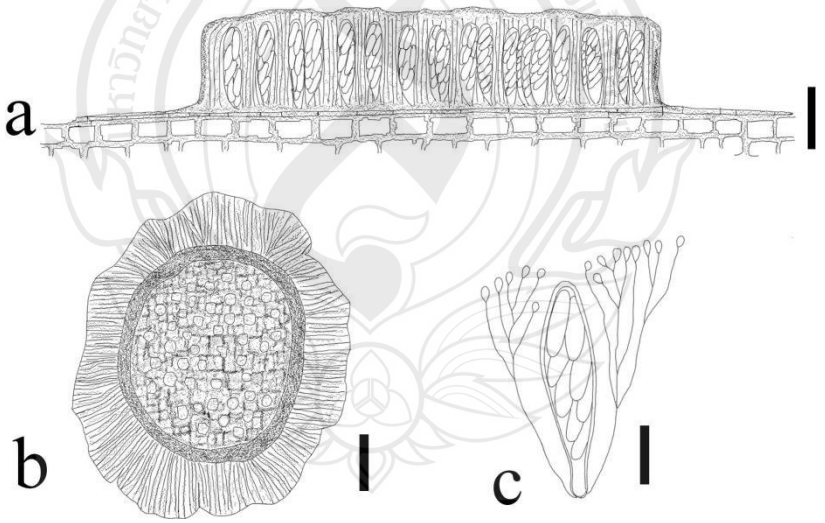
Index Fungorum number: IF180603; Facesoffungi number: FoF 18658

Description – Höhnel (1912).

Material considered – Höhnel (1912).

Distribution, ecological and economical importance

Currently known only from the type locality in Java, Indonesia, where it occurs as a saprobe on decayed leaves of *Amomum*. The genus is monotypic, with unresolved phylogenetic affinities in Helotiales, pending molecular data.



Source Redrawn from Höhnel (1912)

Note a Median section through the fungus. b The fungus seen from above. c An ascus with paraphyses. Scale bars: a = 50 µm, b = 100 µm, c = 20 µm

Figure 3.210 *Discomycella tjibodensis*

Encoeliopsis Nannf., Nova Acta R. Soc. Scient. upsal., Ser. 4 8(no. 2): 306 (1932)

Index Fungorum number: IF1785; Facesoffungi number: FoF 18659, 4 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprophytic or weakly parasitic on decaying plant material or the bark of angiosperms and conifers. Sexual morph: see Groves (1969), Ren and Zhuang (2016). Asexual morph: Unknown.

Type species – *Encoeliopsis rhododendri* (Ces.) Nannf.

Notes – *Velutarina* was introduced by Svrček (1962) with *V. rufoolivacea* as the type species. Members of the genus are characterized by small to medium-sized, cupulate to discoid apothecia, often with a distinct stipe; receptacle surface usually glabrous, sometimes with a velvety texture; hymenium light- to dark-colored, smooth; ectal excipulum composed of *textura prismatica* to *textura angularis*, sometimes with gelatinized outer layers; asci cylindric-clavate, 8-spored, with an amyloid apical apparatus; ascospores ellipsoid to fusiform, hyaline, aseptate, smooth; paraphyses filiform to slightly enlarged at the apex, occasionally containing pigment. Groves (1969) provided a detailed revision of the genus in North America, recognizing several species based on apothecial size, coloration, and spore morphology. The genus is morphologically similar to *Chlorencoelia* and *Crumenulopsis* but differs mainly in the excipular structure, absence of distinctly darkened apothecial margin, and ecology. Ren and Zhuang (2016) reported *Velutarina* sp. from China (HMAS 252886) as an unnamed taxon due to insufficient material. Species of *Velutarina* occur on both gymnosperm and angiosperm hosts, in temperate to boreal regions of the Northern Hemisphere, with records from Europe, North America, and Asia (Groves, 1969; Ribesalbes et al., 2016; Ren & Zhuang, 2016). The holotype of the type species (Herb. Rehm No. 4725) is preserved in B (Botanisches Museum Berlin).

Encoeliopsis rhododendri (Ces.) Nannf., Nova Acta R. Soc. Scient. upsal., Ser. 4 8(no. 2): 306 (1932) Figure 3.211

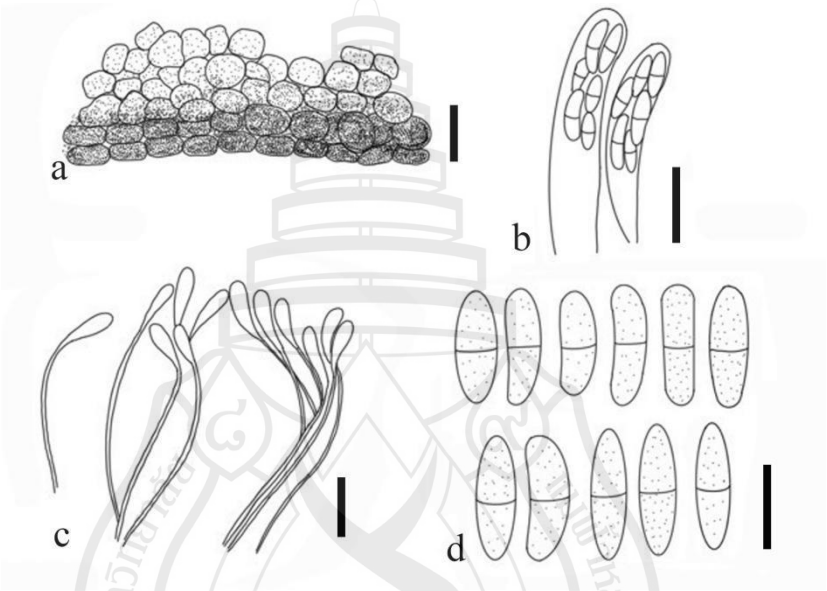
Index Fungorum number: IF197965; Facesoffungi number: FoF 18660

Description – Groves (1969).

Material considered – Groves (1969).

Distribution, ecological and economical importance

Although predominantly saprobic, some *Encoeliopsis* species may exhibit weak pathogenic tendencies, particularly on *Ribes* and *Rhododendron*. They produce apothecia that can remain closed for extended periods before maturing, enabling persistence in harsh or prolonged winter conditions (Sutton et al., 2014). *Encoeliopsis* species occur mainly in temperate to subalpine regions of the Northern Hemisphere, with confirmed records from North America, Europe, and Asia.



Source Redrawn from Ribes et al. (2016)

Note a Ectal excipulum at base. b Asci. c Parphyses. d Ascospores. Scale bars: a-c = 20 μm, d = 10 μm.

Figure 3.211 *Encoeliopsis rhododendri*

Gloeopeziza Zukal, Flora, Regensburg 74(1): 100 (1891)

Index Fungorum number: IF2084; Facesoffungi number: FoF 18661, 7 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on decaying plant material, occasionally bryophilous. Sexual morph: see Zukal (1891). Asexual morph: Unknown.

Type species – *Gloeopeziza rehmii* Zukal

Notes – *Gloeopeziza* was established by Zukal (1891) with *G. rehmii* as the type species, collected in Austria. Species of this genus are characterised by minute, nearly microscopic apothecia, laterally enclosed by a sheath formed from modified paraphyses,

and covered by a dome-shaped gelatinous mass. The receptacle lacks a pseudoparenchymatous cortex, a feature that separates *Gloeopeziza* from the morphologically similar genus *Ascophanus*. The ectal excipulum is poorly differentiated; the asci are clavate, distinctly stalked, (84–)84–90 × 8–10 µm, inoperculate, eight-spored, arising from simple septa. Ascospores are hyaline, smooth, ellipsoid to nearly ovoid, (10–)10–12 × 6–8 µm, aseptate, thin-walled, with homogeneous contents. Paraphyses are simple, septate, slightly clavate at the apex, enclosed within a narrow gelatinous sheath. Molecular data are not yet available for this genus, and its phylogenetic placement within Helotiales remains uncertain. No specimen number or depository was indicated in the protologue.

Gloeopeziza rehmii Zukal, Flora, Regensburg 74(1): 100 (1891)

Index Fungorum number: IF220160; Facesoffungi number: FoF 18662

Description – Zukal (1891).

Material considered – Zukal (1891).

Distribution, ecological and economical importance

Species of *Gloeopeziza* are saprobic, decomposing organic matter and contributing to nutrient cycling in terrestrial ecosystems. Some species are bryophilous, occurring on mosses or liverworts, where they may act as saprobes or weak parasites. They have been reported mainly from temperate regions of Europe and North America, but their global distribution is insufficiently documented. Notable records include *G. crozalsii* in the United Kingdom, found on decaying bryophytes, and *G. rehmii* from Austria on plant debris.

Figure – No original illustration available.

Godroniopsis Diehl & E.K. Cash, Mycologia 21(5): 243 (1929)

Index Fungorum number: IF2105; Facesoffungi number: FoF 18663, 2 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Pathogenic on woody, dicotyledonous hosts. Sexual morph: see (Johnston et al., 2014). Asexual morph: see (Johnston et al., 2014).

Type species – *Godroniopsis quernea* (Schwein.) Diehl & E.K. Cash

Notes – *Godroniopsis* was introduced by Diehl and Cash (1929) with *G. quernea* as the type species. Members of the genus are characterised by sessile to subsessile apothecia seated on a black, stromatic base; initially closed and subspherical, later

expanding to cupulate or patellate form. The exciple is corky-leathery to subcarbonaceous, bearing distinct vertical ridges running from the margin to the base. Asci are cylindric-clavate, eight-spored, opening by a pore, and contain hyaline, aseptate, ellipsoid spores. Paraphyses are septate, simple or occasionally branched, slightly to markedly inflated at the apices, forming a well-developed epithecium. Molecular data currently available include LSU and ITS sequences (Johnston et al., 2014). The type species, *G. quernea*, was collected from *Quercus alba* in Newfield, New Jersey, USA, in December 1879 by J.B. Ellis, originally distributed as *Cenangium turgidum* in Ellis & Everhart's *North American Fungi* No. 793 (NY, holotype).

Godroniopsis quernea (Schwein.) Diehl & E.K. Cash, Mycologia 21(5): 244 (1929) Figure 3.212

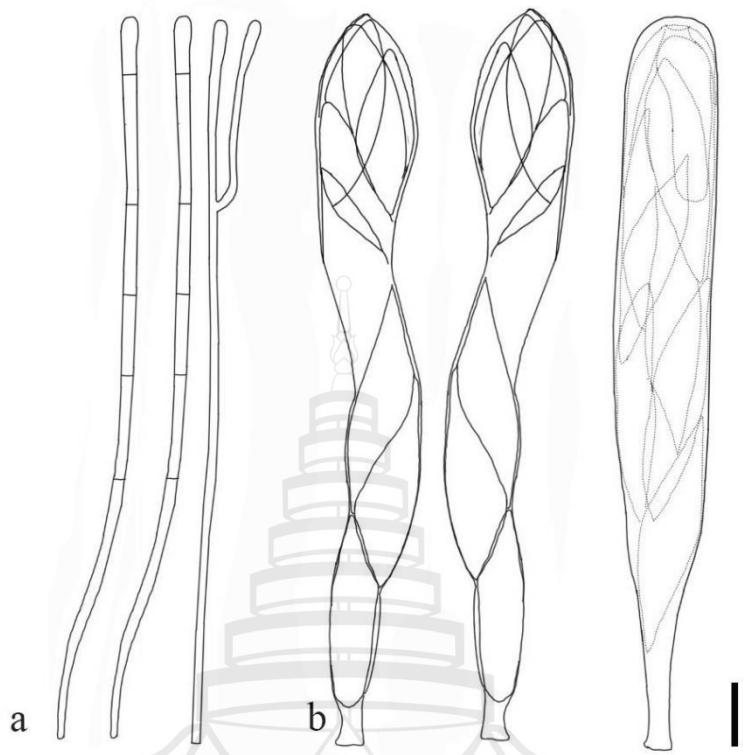
Index Fungorum number: IF209089; Facesoffungi number: FoF 18664

Description – Diehl and Cash (1929).

Material considered – Diehl and Cash (1929).

Distribution, ecological and economical importance

Species of *Godroniopsis* are primarily pathogens of deciduous woody hosts, especially *Quercus* spp., where they cause branch and twig dieback. Apothecia develop on dead or dying branches, often following host stress or injury. In addition to their pathogenic role, these fungi contribute to the decomposition of woody material, facilitating nutrient cycling in forest ecosystems. *Godroniopsis* has been recorded from temperate regions of North America, Europe, and Asia, particularly in association with oak-dominated forests.



Source Redrawn from Diehl and Cash (1929)

Note a Paraphyses. b Asci. Scale bars: 10 μm.

Figure 3.212 *Godroniopsis quernea*

Gorgoniceps (P. Karst.) P. Karst., Bidr. Känn. Finl. Nat. Folk 19: 15 (1871)

Index Fungorum number: IF2120; Facesoffungi number: FoF 18665, 28 morphological species (Species Fungorum, 2025), 2 species with molecular data.

Saprotrophic on decaying wood and bark, often associated with conifers. Sexual morph: see Filippova (2012). Asexual morph: Unknown.

Type species – *Gorgoniceps aridula* (P. Karst.) P. Karst.

Notes – The genus *Gorgoniceps* was introduced by Karsten (1871) with *G. aridula* as the type species. Members of *Gorgoniceps* are characterised by sessile to shortly stipitate apothecia, often convex and immarginate, with a bluish-hyaline to pale greyish epithecium that may darken with age. The hymenial surface is smooth and may exhibit a pruinose appearance when fresh. Asci are clavate, arising from croziers, measuring (82–)90–130 × 11–14 μm, with an apical apparatus faintly blue in iodine. Ascospores are bacilliform, arcuate to flexuous, hyaline, multi-septate (commonly with 8–20 septa), measuring 50–88 × 2–2.5 μm. Paraphyses are filiform, 1.5–2 μm thick,

slightly attenuated at the apex, often containing refractive vacuolar bodies. The excipulum is of *textura intricata* to *textura prismatica*, with a darker outer layer. Molecular markers available for the genus include LSU and ITS sequence data (Filippova, 2012; Johnston et al., 2014). The type species *G. aridula* was originally described from Finland, growing on decaying wood of *Pinus* spp. No specimen number or depository institution was cited in the protologue, but subsequent collections are preserved in H (University of Helsinki Herbarium).

Gorgoniceps aridula (P. Karst.) P. Karst., Bidr. Känn. Finl. Nat. Folk 19: 185 (1871) Figure 3.213

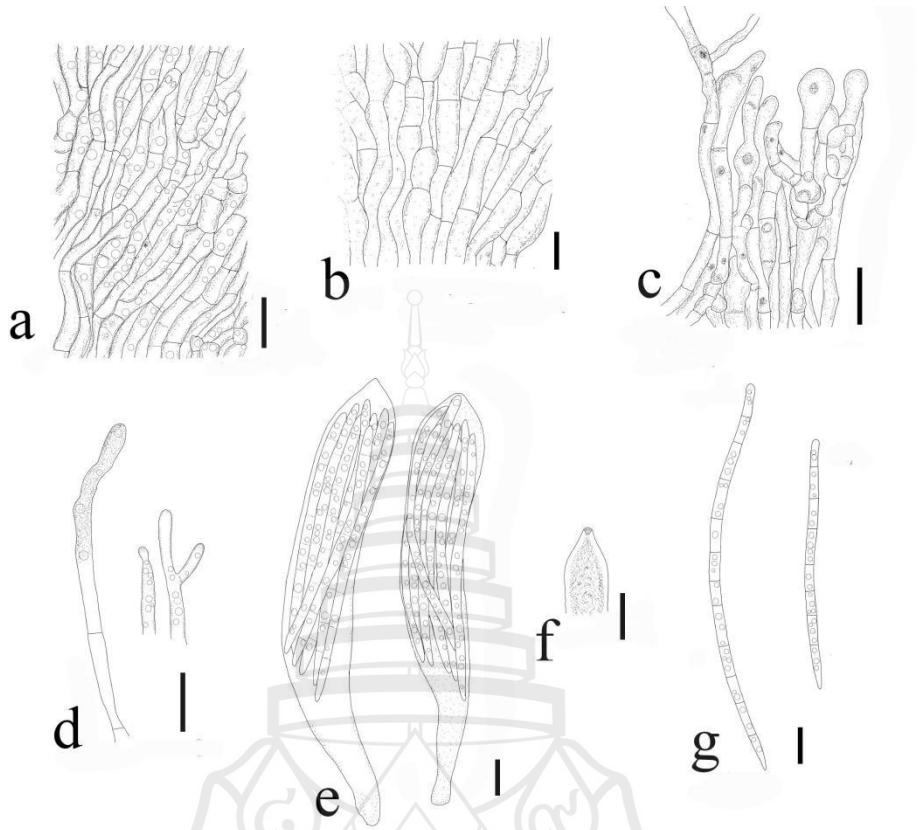
Index Fungorum number: IF165032; Facesoffungi number: FoF 18666

Description – Filippova (2012).

Material considered – Filippova (2012).

Distribution, ecological and economical importance

Gorgoniceps species are saprotrophic, contributing to the decomposition of lignocellulosic materials, particularly in coniferous forests. By breaking down complex plant polymers, they play a key role in nutrient cycling. They have been found primarily on wood and bark of *Pinus*, *Picea*, and occasionally hardwood hosts. The genus has a Holarctic distribution, recorded from boreal and temperate regions in Europe (Finland, Russia, Norway), Asia (Siberia, Russian Far East), and North America.



Source Redrawn from Asco-Sonneberg (2015)

Note a Ectal excipulum on the flank. b Basal ectal excipulum. c Marginal and terminal cells. d Paraphyses. e Asci. f ascal tip with IKIb. g Ascospores. Scale bars: a–f = 10 µm.

Figure 3.213 *Gorgoniceps aridula*

Grimmicola Döbbeler & Hertel, Sydowia 36: 34 (1983)

Index Fungorum number: IF25805; Facesoffungi number: FoF 18667, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Biotrophic parasite infecting mosses. Sexual morph: see Döbbeler and Hertel (1983). Asexual morph: Unknown.

Type species – *Grimmicola parasiticus* Döbbeler & Hertel

Notes – *Grimmicola* was introduced by Döbbeler and Hertel (1983) with *G. parasiticus* as the type species. This genus is characterised by minute, sessile, hyaline apothecia, 110–200 µm in diameter, doliiform to subglobose, seated directly on the host surface. The excipulum is composed of textura oblita with thick-walled, gelatinised

hyphae. Asci are unitunicate, clavate, 55–85 × 8–11 µm, gradually tapering into a distinct stalk, and dehiscing at the apex at maturity; the apical apparatus is faint and iodine-negative. Ascospores are ellipsoid, hyaline, aseptate, often biguttulate, 13–16.5 × 3–4 µm, with a smooth episporium. Paraphyses are filiform, up to 2 µm wide, sparsely branched at the base. Molecular data are currently unavailable for *Grimmicola*, and its phylogenetic placement within Helotiales remains unresolved. The genus is morphologically distinctive due to its moss-parasitic habit, minute hyaline apothecia, and excipular structure. The type species was described from *Grimmia kerguelensis* collected on small grey lava boulders on a ridge near Albatross Lakes, Marion Island (46°54′S, 37°52′E, 80 m elev.), on 9 May 1982 by H. Hertel (holotype M: H. Hertel 24565a).

Grimmicola parasiticus Döbbeler & Hertel, Sydowia 36: 34 (1983) Figure 3.214

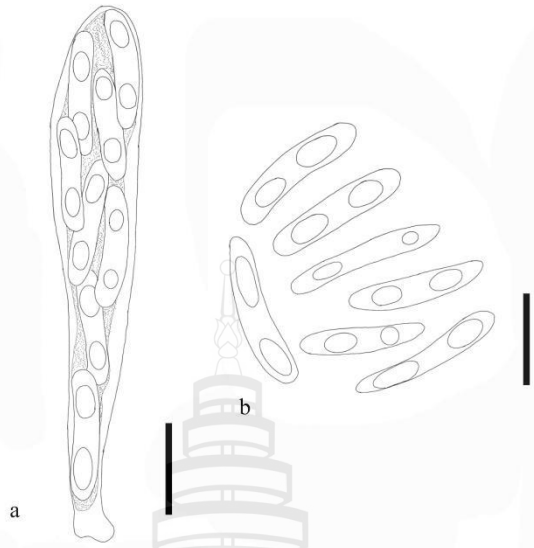
Index Fungorum number: IF124423; Facesoffungi number: FoF 18668

Description – Döbbeler and Hertel (1983).

Material considered – Döbbeler and Hertel (1983).

Distribution, ecological and economical importance

Grimmicola is a specialised biotrophic parasite of mosses, particularly *Grimmia kerguelensis*, where it grows intercellularly within leaf and stem tissues, extracting nutrients without causing visible host damage. This balanced parasitic relationship is typical of many bryophilous ascomycetes. The genus is currently only known from subantarctic Marion Island, with its distribution tightly correlated to that of its host, indicating a narrow ecological niche adapted to cold, moss-rich environments.



Source Redrawn from Döbbeler and Hertel (1983)

Note a Asci. b Ascospores. Scale bars: a, b = 10 µm.

Figure 3.214 *Grimmicola parasiticus*

Grovesia Dennis, Kew Bull. 14(3): 444 (1960)

Index Fungorum number: IF2142; Facesoffungi number: FoF 18669, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on decaying plant material. Sexual morph: see Dennis (1960). Asexual morph: Unknown.

Type species – *Grovesia pulchella* Dennis

Notes – *Grovesia* was established by Dennis (1960) with *G. pulchella* as the type species. The genus is characterised by erumpent to superficial, black apothecia with a striking coral-red disc, up to 5 mm in diameter. The excipulum is composed of *textura angularis*, becoming dark brown to black towards the base. Asci are cylindric to elongate-clavate, octosporous, measuring (240–)250–265(–270) × 9–11 µm, arising from croziers. Ascospores are hyaline, filiform-fusiform, straight to slightly curved, thin-walled, aseptate, smooth, measuring (75–)80–95(–102) × 3–4 µm, and often containing several small guttules. Paraphyses are filiform, septate, often branched below, slightly enlarged at the tips, and embedded in a gelatinous matrix. No molecular data are currently available for the genus. The holotype specimen (Dennis, 2455) was

collected from dead branches in cloud forest at Laguna Negra, Sierra de Santo Domingo, Mérida, Venezuela, on 1 August 1958, and is deposited in K.

Grovesia pulchella Dennis, Kew Bull. 14(3): 444 (1960)

Index Fungorum number: IF331526; Facesoffungi number: FoF 18670

Description – Dennis (1960).

Material considered – Dennis (1960).

Distribution, ecological and economical importance

Grovesia is saprobic, decomposing woody substrates and contributing to nutrient cycling in forest ecosystems. Its conspicuous apothecia may aid in spore dispersal in humid environments. The genus is currently known only from tropical montane cloud forests of Venezuela, but similar habitats in other Neotropical regions may harbour undiscovered species. Given its limited documentation, further field surveys and molecular studies are necessary to clarify its phylogenetic placement and diversity.

Figure – No original illustration available.

Helicocentralis Sri-indr., Chuaseehar., Boonyuen, K. Yamag., Suetrong & C.K.M. Tsui, in Sri-indrasutdhi, Tsui, Chuaseeharonnachai, Yamaguchi, Suetrong, Okane, Nakagiri & Boonyuen, Mycol. Progr. 14(no. 81): [3] (2015)

Index Fungorum number: IF811729; Facesoffungi number: FoF 18671, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Aero-aquatic on semi-submerged wood in freshwater habitats. Sexual morph: Unknown. Asexual morph: see Sri-indrasutdhi et al. (2015).

Type species – *Helicocentralis hyalina* Sri-indr., Chuaseehar., Boonyuen, K. Yamag., Suetrong & C.K.M. Tsui

Notes – *Helicocentralis* was introduced by Sri-indrasutdhi et al. (2015) with *H. hyalina* as the type species. This genus is characterised by branched, septate hyphae and hyaline, micronematous to semi-macronematous conidiophores. Conidiogenous cells are monoblastic, terminal, determinate, and conical to cylindrical. Conidia are holoblastic, hyaline, solitary, dry, acrogenous, simple, circinate, and centrifugally coiled 2–3 times clockwise or counterclockwise. The conidial filament is non-hygroscopic, smooth-walled, and septate. Molecular markers available include SSU, LSU, and ITS sequence data. The type species was described from Chiang Mai

Province, Thailand. The holotype (BBH27889) was collected on semi-submerged wood in Ang Ka Nature Trail, Doi Inthanon National Park, on 12 February 2009 by V. Sri-indrasutthi, C. Chuaecharoennachai, N. Boonyuen & K. Yamaguchi. Isotypes include BBH39849 and BBH39850, and the ex-holotype culture is BCC36782.

Helicocentralis hyalina Sri-indr., Chuaseehar., Boonyuen, K. Yamag., Suetrong & C.K.M. Tsui, in Sri-indrasutdhi, Tsui, Chuaseeharonnachai, Yamaguchi, Suetrong, Okane, Nakagiri & Boonyuen, Mycol. Progr. 14(no. 81): [6] (2015) Figure 3.215

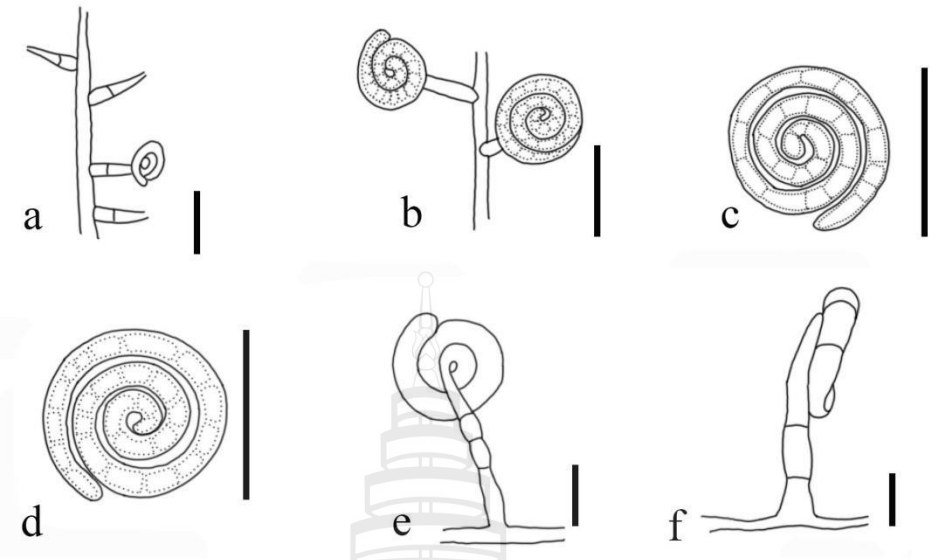
Index Fungorum number: IF811730; Facesoffungi number: FoF 18672

Description – Sri-indrasutdhi et al. (2015).

Material considered – Sri-indrasutdhi et al. (2015).

Distribution, ecological and economical importance

Helicocentralis plays an ecological role as an aero-aquatic fungus, occurring on semi-submerged woody substrates in freshwater streams. Its decomposition activity contributes to nutrient cycling in aquatic systems. The helicoid conidia are adapted for dispersal and survival under fluctuating water levels, enabling persistence in both aquatic and aerial phases—a trait typical of aero-aquatic fungi. Currently, *Helicocentralis* is only known from its type locality in Doi Inthanon National Park, Chiang Mai Province, Thailand (Sri-indrasutdhi et al., 2015).



Source Redrawn from Sri-indrasutdhi et al. (2015)

Note a Young conidia with conidiophores. b Conidiophores and conidia. c, d Conidia. e Solitary and aggregate conidia. f Solitary and aggregate conidia. Scale bars: a–d = 20 µm; e, f = 5 µm.

Figure 3.215 *Helicocentralis hyalina*

Hemiglossum Pat., Revue mycol., Toulouse 12(no. 47): 135 (1890)

Index Fungorum number: IF2281; Facesoffungi number: FoF 18673, 3 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Terrestrial or saprotrophic on decomposing plant material. Sexual morph: see Patouillard 1890. Asexual morph: Unknown.

Type species – *Hemiglossum yunnanense* Pat.

Notes – *Hemiglossum* was introduced by Patouillard (1890) with *H. yunnanense* as the type species, based on material from Yunnan, China. Members of this genus are characterised by gelatinous to leathery, stipitate fruiting bodies, often simple or branched, tongue-shaped, flabelliform, or convolute. The hymenium is unilateral, occupying one side of the fertile head, while the opposite side is sterile, distinguishing *Hemiglossum* from morphologically similar genera such as *Leotia*, which have a hymenium covering the entire surface. The asci are elongated, cylindrical to clavate, arising from croziers, and open by an apical pore. Paraphyses are filiform, simple, occasionally slightly enlarged at the apex. Ascospores are small, hyaline, ellipsoid to

ovoid, smooth, and uniseriate in the ascus. Galán (1959) provided a more detailed description of *H. yunnanense* and discussed its affinities within Leotiaceae, noting that the genus may represent a transitional form between fully cupulate apothecia and distinctly unilateral hymenial types. No molecular sequence data are currently available for the genus.

Hemiglossum yunnanense Pat., Revue mycol., Toulouse 12(no. 47): 135 (1890) Figure 3.216

Index Fungorum number: IF188747; Facesoffungi number: FoF 18674

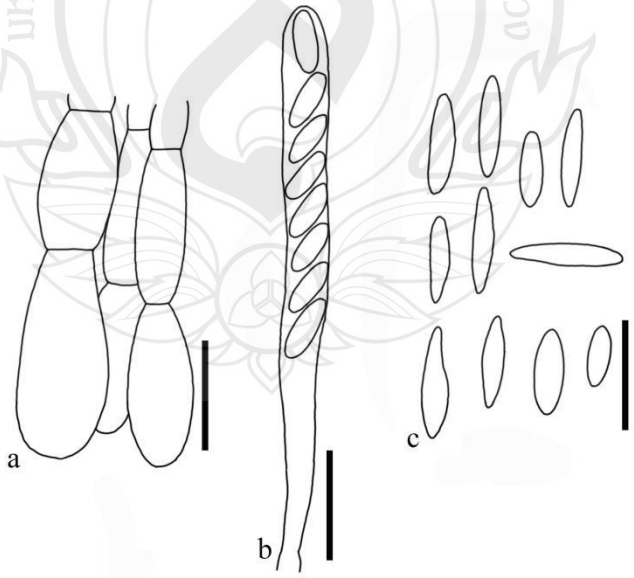
Description – Patouillard (1890).

Material considered – Patouillard (1890).

Distribution, ecological and economical importance

Hemiglossum species are saprotrophic, growing on decomposing plant material in humid forest ecosystems. They contribute to nutrient cycling by degrading lignocellulosic substrates and enriching the forest floor with organic matter.

The genus has been recorded from Yunnan (China) and the Congo (Africa), occurring in montane to lowland forests with high humidity. The disjunct distribution suggests that *Hemiglossum* may be more widespread in tropical and subtropical regions but is rarely collected, possibly due to its small and inconspicuous fruiting bodies.



Source Redrawn from IUCN Red List (Year)

Note a Extal excipulum. b Ascus. c Ascospores. Scale bars: a–c = 10 µm.

Figure 3.216 *Hemiglossum yunnanense*

Hysteronaevia Nannf., Nordic J. Bot. 4(2): 227 (1984)

Index Fungorum number: IF25811; Facesoffungi number: FoF 18675, 12 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprophytic on decaying plant material, particularly on monocotyledons. Sexual morph: see Nannfeldt (1984). Asexual morph: Unknown.

Type species – *Hysteronaevia holoschoeni* (De Not.) Nannf.

Notes – *Hysteronaevia* was introduced by Nannfeldt (1984) to accommodate mollisioid discomycetes within Dermateaceae that are adapted to grass-like hosts. The genus is characterised by small, black, erumpent apothecia, often gregarious, developing beneath the epidermis of host culms or leaves, and rupturing the surface by radiating or longitudinal slits. Apothecia are initially closed, later exposing a dark brown to blackish disc. Asci are clavate to broadly clavate, I– in Melzer's reagent, containing eight, large, hyaline, ellipsoid to fusiform ascospores, mostly 0–1(–3)-septate, without a germ pore. Paraphyses are filiform, often with apices slightly enlarged or bent, sometimes encrusted or embedded in gelatinous material. The ectal excipulum is of *textura angularis* to *textura prismatica*, with marginal hyphae ending at different levels, contributing to the irregular hymenial margin. The genus occurs on senescent or dead culms and leaves of *Cyperaceae*, *Juncaceae*, and *Poaceae*, and is morphologically distinct from related genera such as *Naevia* by its slit-like dehiscence and adaptation to narrow, elongated host substrates. Molecular data are available only for a few species (e.g., LSU, ITS), limiting phylogenetic resolution. No specific specimen number or depository institution was mentioned in the original publication.

Hysteronaevia holoschoeni (De Not.) Nannf., Nordic J. Bot. 4(2): 236 (1984) Figure 3.217

Index Fungorum number: IF106908; Facesoffungi number: FoF 18676

Description – Nannfeldt (1984).

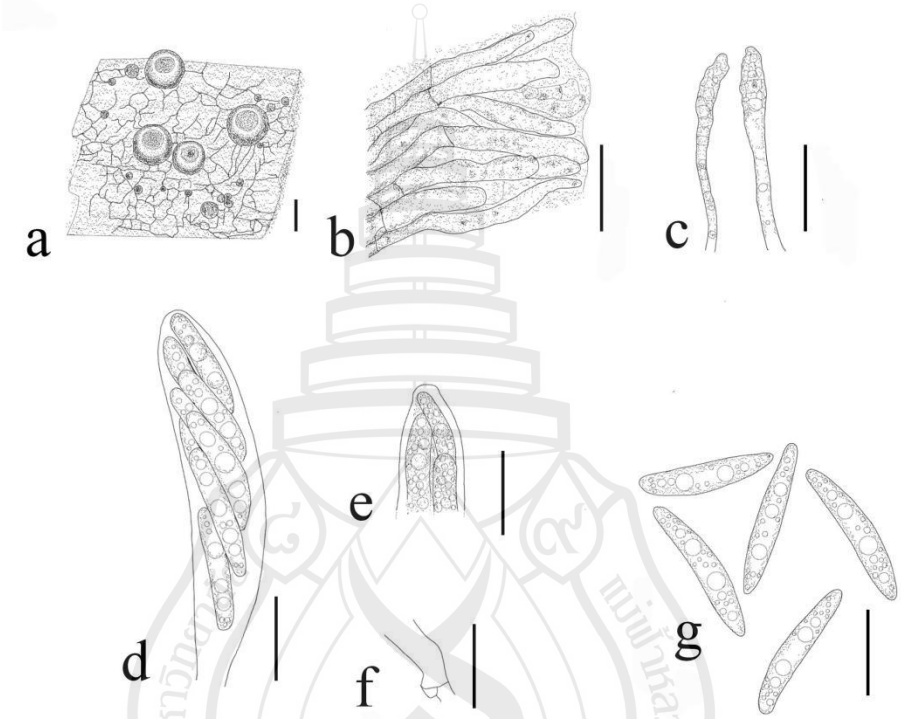
Material considered – Nannfeldt (1984).

Distribution, ecological and economical importance

Hysteronaevia species are saprophytes that decompose plant tissues, especially in wetland and grassland ecosystems dominated by *Cyperaceae*, *Juncaceae*, and *Poaceae*. By breaking down culms and leaves, they contribute to nutrient recycling and

the maintenance of soil organic matter. Their small, erumpent apothecia are adapted to the linear architecture of host organs, facilitating spore release in humid environments.

The genus is mainly distributed in temperate to subarctic zones of the Northern Hemisphere, with records from Europe, North America, and Asia, often in habitats with high moisture and slow decomposition rates.



Source Redrawn from Centro de Estudios Micológicos Asturianos (2024)

Note a Apothecia. b Marginal cells. c Paraphyses. d Asci. e Ascal tip in IKI–. f Croziers +. g Ascospores. Scale bars: a = 200 µm, b–g = 20 µm.

Figure 3.217 *Hysteronaevia scirpina*

Involucroscypha Raitv., Mycotaxon 81: 46 (2002)

Index Fungorum number: IF28600; Facesoffungi number: FoF 18677, 1 morphological species (Species Fungorum, 2025),0 species with molecular data.

Saprobic on decaying stems of Ericaceae. Sexual morph: see Kunze and Schmidt 1823. Asexual morph: Unknown.

Type species – *Involucroscypha involucrata* (B. Erikss.) Raitv.

Notes – *Involucroscypha* was established by Raitviir (2002) to accommodate *I. involucrata*, previously described as *Dasyscyphus involucratus* B. Erikss. (Eriksson,

1970) and later treated under the same name by Remler (1979). This genus is morphologically distinct from *Lachnum* s.l. (=*Dasyscyphus*) and the Hyaloscyphaceae, despite possessing lanceolate paraphyses and rough hairs. The ectal excipulum is composed of textura globulosa, with thin, pale yellowish walls, and is densely covered by fascicles of adpressed, clavate brown hairs. The medullary excipulum consists of thick-walled, hyaline cells, dextrinoid in MLZ, sometimes turning light reddish-brown to rose-coloured. Apothecia are superficial, shortly stipitate, often involucrate, with a new apothecium proliferating from the centre of the old apothecial shell, forming a persistent involucre. Asci are cylindrical-clavate, arising from croziers, 8-spored, with an apical pore blue in MLZ. Ascospores are hyaline, aseptate, ellipsoid-fusoid, often slightly clavate and inequilateral, containing two large polar lipid globules. The involucrate growth and dense hair covering distinguish *Involucroscypha* from morphologically similar genera in Dermateaceae such as *Coronellaria*. The holotype specimen (*TAA 165831*) was collected on dead stems of *Calluna vulgaris* in Finland.

Involucroscypha involucrata (B. Erikss.) Raitv., Mycotaxon 81: 47 (2002) Figure 3.218

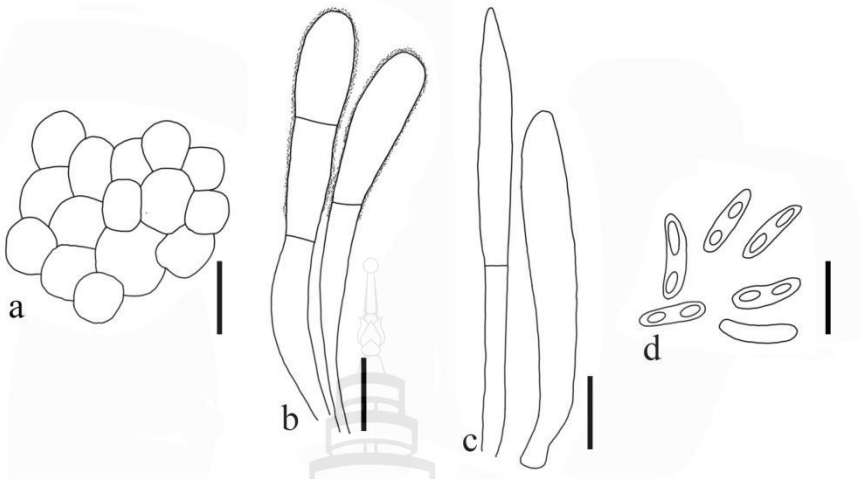
Index Fungorum number: IF484678; Facesoffungi number: FoF 18678

Description – Raitviír (2002).

Material considered – Raitviír (2002).

Distribution, ecological and economical importance

Involucroscypha is a saprobic genus specialising on decayed stems of Ericaceae, contributing to the decomposition of lignified plant tissues and nutrient cycling in heathland and boreal ecosystems. It has been reported from Europe, with records from Finland and Austria, and is likely restricted to cool-temperate regions where its ericaceous hosts occur.



Source Redrawn from Raitviír (2002)

Note a Ectal excipulum. b Marginal hairs. c Paraphysis and two asci. d Spores. Scale bars: a–d = 10 µm.

Figure 3.218 *Involucroscypha involucrata*

Korfia J. Reid & Cain, Mycologia 55(6): 783 (1963)

Index Fungorum number: IF2583; Facesoffungi number: FoF 18679, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Foliar pathogen of conifers. Sexual morph: see Reid and Cain (1963). Asexual morph: Unknown.

Type species – *Korfia tsugae* (E.K. Cash & R.W. Davidson) J. Reid & Cain

Notes – *Korfia* was introduced by Reid and Cain (1963) in honour of Dr. R. P. Korf, with *K. tsugae* as the type species, transferred from *Phacidium tsugae* Cash and Davidson (1940). The genus is characterised by hypophyllous, subepidermal, simple apothecia that develop within conifer needles, particularly *Tsuga*. The epidermis ruptures circumscissilely, exposing a disciform hymenium that is light-coloured when moist and nearly black when dry. The excipulum is poorly developed, composed of dark-walled, septate hyphae. Asci are broad-clavate or subfusoid, narrowing abruptly into a short stalk, rounded at the apex, and turning blue in iodine in the apical region; they are inoperculate and 8-spored. Ascospores are hyaline and 1-celled when young, occasionally becoming brown and septate (up to 3-septate) at maturity, ellipsoid, straight to slightly curved, and obtuse at both ends. Paraphyses are filiform, septate,

branched and recurved at the tips, agglutinated into a yellowish mucilaginous epithecium. Reid and Cain (1963) noted that the occurrence of brown, septate spores outside the asci may represent either mature spores that initially develop as hyaline and aseptate or senescent spores, as observed in other Hemiphacidiaceae (Korf, 1962). The holotype is deposited in BPI under the accession number F.P. 72,022 (BPI, holotype).

Korfia tsugae (E.K. Cash & R.W. Davidson) J. Reid & Cain, Mycologia 55(6): 784 (1963)

Index Fungorum number: IF332754; Facesoffungi number: FoF 18680

Description – Reid and Cain (1963).

Material considered – Reid and Cain (1963).

Distribution, ecological and economical importance

Korfia is a foliar parasite of *Tsuga* species, developing apothecia beneath the epidermis of needles and emerging via circumscissile rupture. It may cause localized necrosis or contribute to premature needle drop, but is likely an opportunistic pathogen whose development is influenced by environmental conditions such as humidity and temperature. The genus is known from North America in association with *Tsuga* and may occur in other temperate forest regions where the host is present.

Figure – No original illustration available.

Lemalis Fr., Syst. orb. veg. (Lundae): 93 (1825)

Index Fungorum number: IF2721; Facesoffungi number: FoF 18681, 6 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Sexual morph: see Fries (1825). Asexual morph: Unknown.

Type species – *Lemalis alismatis* (Pers.) Fr.

Notes – *Lemalis* was introduced by Fries (1825) with *Lemalis aurea* originally indicated, but subsequent treatments (Fries, 1849) list *Lemalis alismatis* as the type species. The genus is characterised by a waxy-gelatinous, sometimes leathery, cupulate receptacle, slightly marginate, with a smooth upper hymenium that becomes pruinose as spores mature. Ascus and ascospore structures are rudimentary in the original description, and detailed microscopic features were not provided. Morphologically, *Lemalis* shows similarities to *Patellaria*, *Sictis betuli*, and *Tremella disciformis*, particularly in its cupulate form and hymenial surface changes, though these resemblances are likely due to morphological convergence rather than close

phylogenetic relationship. Molecular markers for *Lemalis* are currently not available, and its systematic placement remains uncertain within Leotiomycetes. No type specimen number or depository institution was cited by Fries (1825), and the type material is not currently traceable in major herbaria.

Lemalis alismatis (Pers.) Fr., Summa veg. Scand., Sectio Post. (Stockholm): 360 (1849)

Index Fungorum number: IF173227; Facesoffungi number: FoF 18682

Description – Fries (1825).

Material considered – Fries (1825).

Distribution, ecological and economical importance

The ecological role of *Lemalis* is not clearly documented. Based on morphological features and the original collection context, it may be saprobic, decomposing organic matter, or associated with aquatic or wetland plants such as *Alisma*. Distribution records are scarce; historical descriptions indicate its occurrence in temperate regions, but no modern molecular or morphological reassessments have been published.

Figure – No original illustration available.

Leohumicola N.L. Nick., Hambl. & Seifert, in Hambleton, Nickerson & Seifert, Stud. Mycol. 53: 41 (2005)

Index Fungorum number: IF500248; Facesoffungi number: FoF 18683, 7 morphological species (Species Fungorum, 2025), 7 species with molecular data.

Soil-dwelling fungi often associated with burned ecosystems. Sexual morph: Unknown. Asexual morph: see Hambleton et al. (2005).

Type species – *Leohumicola verrucosa* N.L. Nick., Hambl. & Seifert

Notes – *Leohumicola* was introduced by Hambleton et al. (2005) with *L. verrucosa* as the type species. Members of this genus are characterised by slow-growing colonies on PDA, often producing sterile mycelia with pigments ranging from yellow to reddish brown. Conidia are typically two-celled, comprising a dark brown, globose to ovate terminal cell—often verrucose or echinulate—and a hyaline to pale brown, cupulate or cylindrical basal cell. Conidiogenous cells are reduced to single denticles or proliferate sympodially to form small clusters. Chlamydospores may be intercalary or terminal. Many *Leohumicola* species are heat-resistant and occur in soils from

burned or thermally disturbed habitats, and some are endophytes of plant roots, particularly in Ericaceae and Orchidaceae. Molecular markers available for this genus include ITS and Cox1, which are useful for species delimitation (Nguyen & Seifert, 2008). The holotype of *L. verrucosa* is preserved in DAOM (DAOM 226889), with a living ex-type culture in CCFC.

Leohumicola verrucosa N.L. Nick., Hambl. & Seifert, in Hambleton, Nickerson & Seifert, Stud. Mycol. 53: 44 (2005) Figure 3.219

Index Fungorum number: IF500249; Facesoffungi number: FoF 18684

Description – Hambleton et al. (2005).

Material considered – Hambleton et al. (2005).

Distribution, ecological and economical importance

Species of *Leohumicola* are primarily saprobic, contributing to organic matter decomposition, and are frequently recovered from post-fire soils. Some species, including *L. verrucosa*, also function as endophytes in roots of various plants, such as *Pleione yunnanensis* (Orchidaceae) (Chen et al., 2009). The genus is known from North America, South Africa, Australia, China, and other regions, occurring in habitats ranging from coniferous forest soils and ericaceous shrublands to agricultural fields. *L. verrucosa* has been reported from Canada, Puerto Rico, and China, with Chinese isolates matching the Canadian type in ITS sequence (100% similarity; GenBank AY706322), but differing slightly in colony morphology (Chen et al., 2009).



Source Redrawn from Chen et al. (2009)

Note Showing conidiogenous hyphae, conidia, and ornamentation of the terminal cell. Scale bars: 10 µm.

Figure 3.219 *Leohumicola verrucosa*

Leptodophora Koukol & Maciá-Vicente, Czech Mycol. 74(1): 60 (2022)

Index Fungorum number: IF842106; Facesoffungi number: FoF 18685, 4 morphological species (Species Fungorum, 2025), 4 species with molecular data.

Endophytic in plant roots. Sexual morph: Unknown. Asexual morph: see Braun and Cook (2012).

Type species – *Leptodophora orchidicola* (Sigler & Currah) Koukol & Maciá-Vicente

Notes – *Leptodophora* was established by Koukol and Maciá-Vicente (2022) to accommodate endophytic fungi with hyphomycetous asexual morphs, previously assigned to *Cadophora* but differing in conidiogenesis and phylogenetic position. Conidiogenous cells are mono- or polyblastic, producing aseptate conidia in chains of strongly constricted cells, sometimes aggregated into complex tuft-like structures. No sexual morph is known. The genus is placed in Helotiales (Leotiomycetes) based on combined ITS, LSU, *RPB2*, and *TEF1* sequence analyses. The type species, *L. orchidicola*, was originally isolated from roots of *Platanthera hyperborea* collected in 1985 at the Devonian Botanic Garden, Alberta, Canada. The ex-type strain is UAMH 5422.

Leptodophora orchidicola (Sigler & Currah) Koukol & Maciá-Vicente, Czech Mycol. 74(1): 62 (2022) Figure 3.220

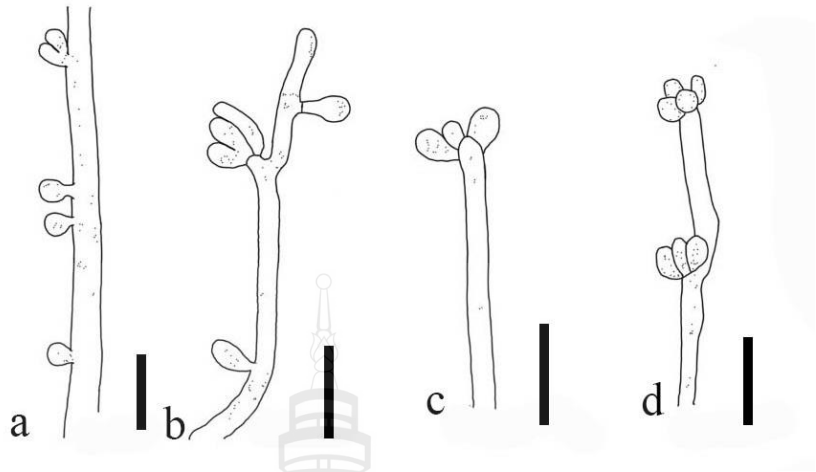
Index Fungorum number: IF842107; Facesoffungi number: FoF 18686

Description – Koukol and Maciá-Vicentek (2022).

Material considered – Koukol and Maciá-Vicentek (2022).

Distribution, ecological and economical importance

Species of *Leptodophora* are root-associated endophytes inhabiting living roots without causing disease symptoms. They differ from *Cadophora*, which includes saprobes and pathogens, by their restricted endophytic ecology and distinct conidial morphology. These fungi may influence root microbial communities and potentially contribute to host plant fitness. *Leptodophora* has been recorded from diverse habitats, including grasslands in the Netherlands and subalpine ecosystems in Canada, reflecting a broad ecological amplitude within temperate and subarctic regions (Koukol & Maciá-Vicente, 2022).



Source Redrawn from Koukol and Maciá-Vicentek (2022)

Note a Fertile hyphae with laterally born conidia. b Conidia born individually or in clusters on fertile hyphae. c-d Terminal and intercalary clusters of sympodially produced conidia. Scale bars: a–d = 10 µm.

Figure 3.220 *Leptodophora orchidicola*

Libartania Nag Raj, Can. J. Bot. 57(13): 1390 (1979)

Index Fungorum number: IF8768; Facesoffungi number: FoF 07431, 4 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on dead or decaying plant material. Sexual morph: Unknown. Asexual morph: see Nag Raj (1979), Lee and Crous (2003).

Type species – *Libartania laserpitii* (Bres.) Nag Raj

Notes – *Libartania* was introduced by Nag Raj (1979) with *L. laserpitii* as the type species, transferred from *Stagonospora laserpitii* Bres. The genus is characterised by pycnidioid, stromatic, unilocular conidiomata that are initially closed and globose, later longitudinally dehiscent at the apex. The conidiomata wall is composed of textura angularis to textura globulosa, dark brown to black in outer layers and hyaline to pale brown internally. Conidiogenous cells are discrete or integrated, ampulliform to lageniform, hyaline, phialidic, and sometimes proliferating percurrently. Conidia are fusiform to cylindrical-fusiform, 1–3-septate, hyaline, and typically provided with tubular appendages. The apical appendage is single or occasionally branched, arising as a continuation of the conidial axis and separated by a septum; basal appendages are rare, short, and simple. Morphologically, *Libartania* resembles some members of

Phoma-like coelomycetes, but the presence of distinct tubular appendages readily distinguishes it (Nag Raj, 1979; Lee & Crous, 2003). The holotype of *L. laserpitii* was collected on dead stems of *Laserpitium siler* in Maranza, Trento, Italy, by G. Bresadola in 1890 and is deposited in BPI.

Libartania laserpitii (Bres.) Nag Raj, Can. J. Bot. 57(13): 1390 (1979) Figure 3.221

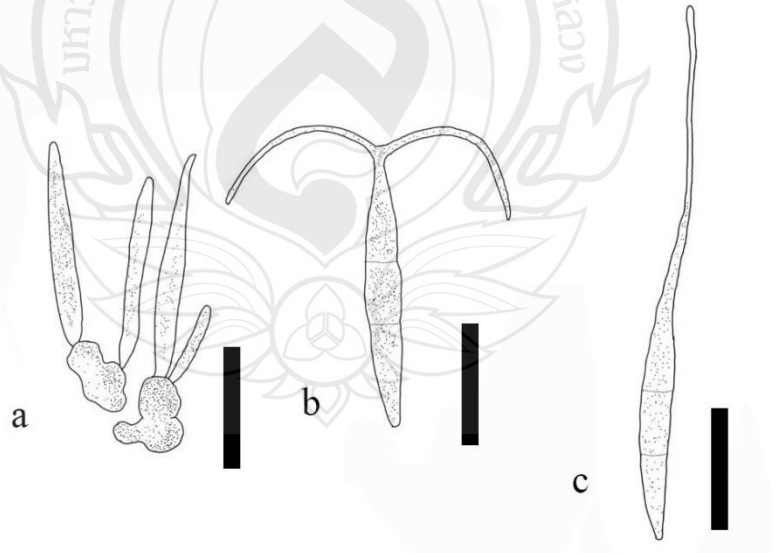
Index Fungorum number: IF316883; Facesoffungi number: FoF 18687

Description – see Nag Raj (1979).

Material considered – Nag Raj (1979).

Distribution, ecological and economical importance

Species of *Libartania* are saprobic, colonising and decomposing dead or decaying stems and leaves of herbaceous and woody plants. They have been reported from various hosts including *Laserpitium siler* (Apiaceae) in Italy, *Themeda australis* (Poaceae) in Australia, and *Phragmites* spp. (Poaceae) in Canada and Latvia (Lee & Crous, 2003). The genus has been recorded in Europe (Italy, Latvia), Australasia (Australia), and North America (Canada), as well as in South Africa, indicating a broad but sporadic distribution closely tied to the availability of suitable host substrates.



Source Redrawn from Nag Raj (1979)

Note a Conidiogenous cells with developing conidia. b, c Mature conidia. Scale bars: a–c = 10 µm.

Figure 3.221 *Libartania laserpitii*

Masseea Sacc., Syll. fung. (Abellini) 8: 488 (1889)

Index Fungorum number: IF3021; Facesoffungi number: FoF 18688, 3 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on dead branches. Sexual morph: see Saccardo (1889). Asexual morph: Unknown.

Type species – *Masseea quisquiliarum* (Berk. & M.A. Curtis) Sacc.

Notes – *Masseea* was introduced by Saccardo (1889) with *Masseea quisquiliarum* as the type species. Members of the genus are characterised by subcarnose, scutellaria-like, sessile apothecia, often resembling those of *Humaria*. The asci are terete-clavate, paraphysate, and eight-spored. Ascospores are fusiform, slightly curved, 3–4-septate, and hyaline. The type species produces yellow, crateriform, sessile apothecia with an inflexed margin. Ascospores measure about 25 × 6–7 µm and are smooth-walled. The original description was based on material collected in Cuba on dead branches. No specific specimen number or depository institution was indicated in the protologue.

Masseea quisquiliarum (Berk. & M.A. Curtis) Sacc., Syll. fung. (Abellini) 8: 488 (1889)

Index Fungorum number: IF189228; Facesoffungi number: FoF 18689

Description – Saccardo (1889).

Material considered – Saccardo (1889).

Distribution, ecological and economical importance

Species of *Masseea* are saprotrophic, occurring on dead branches where they contribute to wood decomposition. The type species, *M. quisquiliarum*, is known from Cuba. Additional distribution records for the genus are lacking in the original literature, and its overall biogeographic range remains poorly documented.

Figure – No original illustration available.

Miricatena Punith. & Spooner, Kew Bull. 66(4): 637 (2011)

Index Fungorum number: IF580230; Facesoffungi number: FoF 18690, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Parasitic on living leaves of *Prunus serotina*. Sexual morph: Unknown. Asexual morph: Punithalingam and Spooner (2011).

Type species – *Miricatena prunicola* Punith. & Spooner

Notes – *Miricatena* was introduced by Punithalingam and Spooner (2011) to accommodate *M. prunicola*, a foliar parasite of *Prunus serotina* in the UK. Colonies are immersed to superficial, with branched, septate, hyaline to pale brown mycelium. Conidiophores are macronematous to semi-macronematous, solitary, hyaline, septate, arising from a basal bulbous cell. Conidiogenous cells are polyblastic, hyaline, with apical and lateral loci. Conidia are complex, hyaline, composed of nearly symmetrical primary and secondary (rarely tertiary) acropetal chains of globose to subglobose conidial cells, each cell (except the apical one) functioning as a conidiogenous cell. Terminal conidial cells are ampulliform to lageniform or obpyriform and non-proliferative. Molecular data (ITS, LSU) place *Miricatena* within Helotiales, but its familial position remains unresolved and it is currently treated as Helotiales *incertae sedis* (Crous et al., 2023). The holotype of *M. prunicola* is preserved at Kew (K(M) 155328).

Miricatena prunicola Punith. & Spooner, Kew Bull. 66(4): 638 (2011) Figure 3.222

Index Fungorum number: IF580231; Facesoffungi number: FoF 18691

Description – see Punithalingam and Spooner (2011).

Material considered – Punithalingam and Spooner (2011).

Distribution, ecological and economical importance

Miricatena is monotypic, with *M. prunicola* parasitizing leaves of *Prunus serotina*, causing conspicuous circular or irregular leaf spots (2–10 mm diam.), often coalescing, whitish in the centre and surrounded by a dark slate-blue halo, later becoming reddish- to chestnut-brown with a purplish border. The fungus has so far been recorded only from the type locality in Surrey, UK, on naturalised *P. serotina* growing at the edge of partially wooded heathland. Although lesions may reduce photosynthetic area, there is no evidence of significant economic damage (Punithalingam & Spooner, 2011).



Source Redrawn from Crous et al. (2023)

Note a Conidiogenous cells giving rise to secondary conidia. b Secondary conidia. c Primary conidia. d Primary conidia giving rise to secondary conidia. Scale bars: a–d = 10 μm.

Figure 3.222 *Miricatena prunicola*

Mitrulinia Spooner, Biblthca Mycol. 116: 244 (1987)

Index Fungorum number: IF25111; Facesoffungi number: FoF 18692, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on blackened, stromatic wood. Sexual morph: see Spooner (1987). Asexual morph: Unknown.

Type species – *Mitrulinia ushuaiae* (Rehm) Spooner

Notes – *Mitrulinia* was introduced by Spooner (1987) to accommodate *Mitrula ushuaiae* Rehm, a species originally described from Tierra del Fuego, Argentina (Rehm, 1899). The genus is monotypic and is characterized by stipitate-capitate apothecia arising from substratal or sclerotial stromatic tissue. The apothecia are elliptic to oval, with an obtuse-rounded apex and attenuated base, distinctly delimited from the cylindrical, glabrous stipe. Asci are cylindrical, eight-spored, and ascospores are cylindric-fusiform, straight or slightly curved, 1-celled, hyaline, measuring 5–5.5 × 1.5 μm. Paraphyses are filiform and hyaline, about 1.5 μm wide. In the absence of molecular data in the original description, Spooner (1987) retained the species in *Mitrulinia* within Helotiales *incertae sedis*. The holotype was collected from rotting trunks in Ushuaia, Argentina, and is preserved in herbarium BPI.

Mitrulinia ushuaiae (Rehm) Spooner, Biblthca Mycol. 116: 246 (1987)

Index Fungorum number: IF130978; Facesoffungi number: FoF 18693

Description – Spooner (1987).

Material considered – Spooner (1987).

Distribution, ecological and economical importance

Mitrulinia ushuaiae is saprobic on blackened, stromatic wood, contributing to the decomposition of lignified substrates. It is known from Tierra del Fuego, Argentina (Rehm, 1899), and has also been recorded from New Zealand (Spooner, 1987).

Figure – No original illustration available.

Monochaetiellopsis B. Sutton & DiCosmo, Can. J. Bot. 55(19): 2536 (1977)

Index Fungorum number: IF8973; Facesoffungi number: FoF 07451, 2 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Pathogenic infects grasses (*Poaceae*). Sexual morph: Unknown. Asexual morph: see Sutton and DiCosmo (1977).

Type species – *Monochaetiellopsis themedae* (M. Kandasw. & Sundaram) B. Sutton & DiCosmo.

Notes – *Monochaetiellopsis* was introduced by Sutton and DiCosmo (1977) to accommodate *Monochaetiella themedae* and related species previously placed in *Monochaetiella*. The segregation was based on distinct differences in acervular structure, conidiogenesis, and conidial morphology. The genus is characterised by pale brown, separate or confluent, subepidermal acervuli composed of pale brown, isodiametric to irregular pseudoparenchymatous cells. Conidiophores are short, hyaline, smooth, cylindrical, one- to two-septate, and branched at the base, arising from the upper cells of the acervulus. Conidiogenous cells are holoblastic, synchronous or sympodial, integrated or discrete, indeterminate, cylindrical or lageniform, hyaline, and smooth-walled. Conidia are hyaline, smooth, straight or slightly curved, fusiform, one- to two-euseptate; the median cell is longer and contains cytoplasmic contents, while the basal and apical cells are smaller and lack cytoplasmic contents. The apical cell bears an unbranched, flexuous appendage without cytoplasmic contents. The genus is morphologically distinct from *Monochaetiella* by its holoblastic (rather than phialidic) conidiogenesis and by the presence of septate conidia lacking an apical cellular appendage. The type species, *Monochaetiellopsis themedae*, was collected from *Themeda tremula* in Wynaad, Madras, India, by N.V. Sundaram on 23 December 1955. The holotype is preserved as IMI 62200.

Monochaetiellopsis themedae (M. Kandasw. & Sundaram) B. Sutton & DiCosmo, Can. J. Bot. 55(19): 2541 (1977)

Index Fungorum number: IF317834; Facesoffungi number: FoF 18694

Description – Sutton and DiCosmo (1977).

Material considered – Sutton and DiCosmo (1977).

Distribution, ecological and economical importance

Monochaetiellopsis is a plant pathogenic genus infecting members of Poaceae, causing leaf spot diseases. The pathogen produces subepidermal acervuli that rupture the host epidermis to release conidia, aiding in disease spread. Infections result in necrotic leaf lesions that may coalesce, reducing photosynthetic efficiency. The genus has been recorded from tropical and subtropical regions, including India, Australia, and Tanzania (Sutton & DiCosmo, 1977).

Figure – No original illustration available.

Natara Kovalova, Yurkov & Baschien, Index Fungorum 573: 1 (2024)

Index Fungorum number: IF25111; Facesoffungi number: FoF 18695, 6 morphological species (Species Fungorum, 2025), 76 species with molecular data.

Obligate biotrophic on members of the *Rosaceae* family. Sexual morph: Unknown. Asexual morph: see Baschien et al. (2024), Wang et al. (2015).

Type species – *Natara antarctica* (M.M. Wang & Xing Z. Liu) Kovalova, Yurkov & Baschien

Notes – *Natara* was introduced by Kovalova, Yurkov AND Baschien (2024) as a nomen novum to replace the illegitimate generic name *Psychrophila* M.M. Wang & Xing Z. Liu, which was preoccupied by the plant genus *Psychrophila* (DC.) Bercht. & J. Presl (*Ranunculaceae*). The name "Natara" derives from Latin meaning "swim, float", referring to the ecology and habitat of these fungi. The genus is characterised by hyaline, globose to subglobose conidia produced from flask-shaped, phialidic conidiogenous cells with a bottleneck-like constriction at the apex. Conidiophores are short or reduced, hyaline, arising from slow-growing colonies that are cream-white to yellowish or dark-olive, with sparse aerial mycelium. Molecular markers available include ITS, LSU, *TEF*1, and *TUB* sequence data. Four new combinations were proposed in *Natara*: *N. antarctica*, *N. lutea*, *N. olivacea*, and *N. lagodekhiensis.* The holotype of *N. antarctica* is a dried culture from Antarctic soil collected at Great Wall Station (62°12′ S, 58°57′

W) in January 2011 by T. Zhang, deposited as HMAS 242437, with living culture ex-type CGMCC 3.15133 (ANT92) (Wang et al., 2015).

Natara antarctica (M.M. Wang & Xing Z. Liu) Kovalova, Yurkov & Baschien, Index Fungorum 573: 1 (2024)

=*Psychrophila antarctica* M.M. Wang & Xing Z. Liu, in Wang, Jiang, Wu, Hao, Su, Cai, Xiang & Liu, Persoonia 34: 106 (2014)

Index Fungorum number: IF901614; Facesoffungi number: FoF 18696

Description – see Wang et al. (2015).

Material considered – Baschien et al. (2024), Wang et al. (2015).

Distribution, ecological and economical importance

Natara species are psychrophilic fungi adapted to extreme cold environments. They contribute to organic matter decomposition and nutrient cycling in alpine and polar ecosystems. Their growth at low temperatures indicates an ecological role in sustaining microbial diversity in cold habitats. The genus has been reported from high-altitude and polar regions, including the Qinghai–Tibet Plateau, the Caucasus Mountains (*N. lagodekhiensis*), and Antarctica (*N. antarctica*, *N. lutea*, *N. olivacea*). These records highlight their adaptation to cold terrestrial environments and their importance in such ecosystems.

Figure – No original illustration available.

Neonematogonum Crous & Akulov, in Crous et al., Persoonia 51: 385 (2023)

Index Fungorum number: IF850608; Facesoffungi number: FoF 18697, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprotrophic on dead branches of *Carpinus betulus* in forest environments. Sexual morph: Unknown. Asexual morph: see Crous et al. (2023).

Type species – *Neonematogonum carpinicola* Crous & Akulov

Notes – *Neonematogonum* was introduced by Crous & Akulov with *Neonematogonum carpinicola* as the type species. Neonematogonum is characterised by erect, unbranched, subcylindrical conidiophores that are pale brown, granular, and flexuous, lacking rhizoids at the base. The conidiophores are 3–6-septate and terminate in clavate vesicles with several flattened lateral loci. Conidia are produced in unbranched chains, aseptate, pale brown, smooth, and granular. Primary conidia are obovoid, while secondary conidia in short chains are ellipsoid to globose, with slightly

protruding basal hilum. The holotype is CBS H-25227, with ex-type cultures CPC 45250 = CBS 150059.

Neonematogonum carpinicola Crous & Akulov, in Crous et al., Persoonia 51: 385 (2023) Figure 3.223

Index Fungorum number: IF850609; Facesoffungi number: FoF 18698

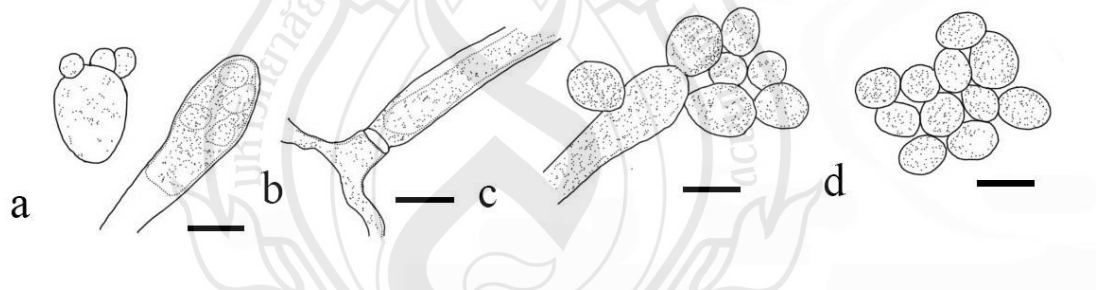
Description – Crous et al. (2023).

Material considered – Crous et al. (2023).

Distribution, ecological and economical importance

Neonematogonum is a saprotrophic fungus, primarily involved in the decomposition of plant material. It was isolated from dead branches of *Carpinus betulus*, suggesting a role in nutrient recycling within forest ecosystems.

Neonematogonum has been documented in Ukraine, where it was found on dead branches in temperate forests. Its exact geographical range remains unknown, but it is likely associated with similar forested habitats across Europe and other temperate regions.



Source Redrawn from Crous et al. (2023)

Note a Clavate vesicles giving rise to conidia. b Conidiophore foot cell. c Vesicles forming conidia. d Conidia. Scale bars: a–d = 10 µm.

Figure 3.223 *Neonematogonum carpinicola*

Neobelonopsis Itagaki & Hosoya, MycoKeys 99: 56 (2023)

Index Fungorum number: IF843851; Facesoffungi number: FoF 18699, 8 morphological species (Species Fungorum, 2025), 8 species with molecular data.

Saprotrophic on dead branches of *Carpinus betulus* in forest environments. Sexual morph: see Itagaki and Hosoya (2023). Asexual morph: see Itagaki and Hosoya (2023).

Type species – *Neobelonopsis multiguttata* Itagaki & Hosoya

Notes – *Neonematogonum* was introduced by Crous and Akulov (2023) with *N. carpinicola* as the type species. It is characterised by erect, unbranched, subcylindrical conidiophores that are pale brown, granular, flexuous, and 3–6-septate, without rhizoids at the base. The conidiophores terminate in clavate vesicles bearing several flattened lateral loci. Conidia are produced in unbranched chains, aseptate, pale brown, smooth, and granular. Primary conidia are obovoid, while secondary conidia in short chains are ellipsoid to globose, with slightly protruding basal hilum. The genus is phylogenetically placed in Helotiales, but its familial affiliation remains unresolved (*incertae sedis*). The holotype specimen (CBS H-25227) was collected in Ukraine from dead branches of *Carpinus betulus*, with ex-type cultures CPC 45250 = CBS 150059.

Neobelonopsis multiguttata Itagaki & Hosoya, MycoKeys 99: 67 (2023) Figure 3.224

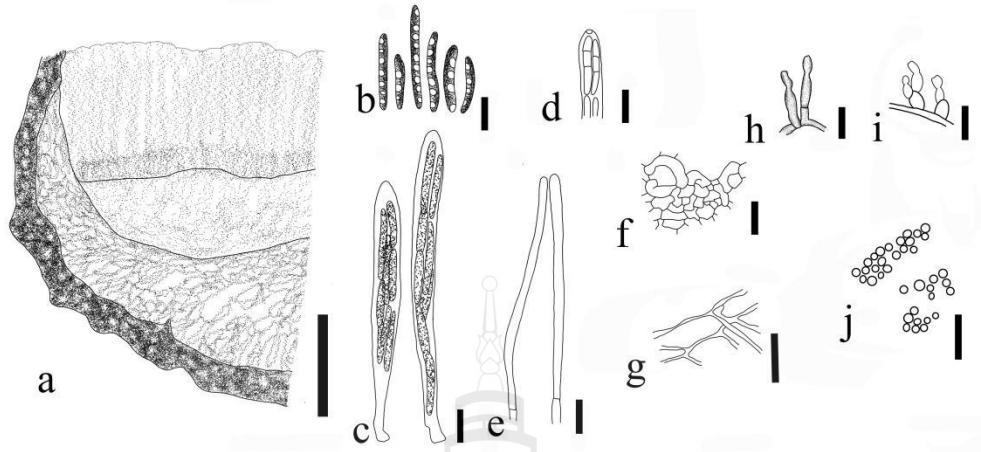
Index Fungorum number: IF842635; Facesoffungi number: FoF 18700

Description – Itagaki and Hosoya (2023).

Material considered – Itagaki and Hosoya (2023).

Distribution, ecological and economical importance

N. carpinicola is a saprotrophic species that decomposes woody material, contributing to nutrient cycling in forest ecosystems. It was described from Ukraine, where it was found on dead branches of *Carpinus betulus* in temperate forest habitats. Its distribution is currently only confirmed from the type locality, but it may occur in similar habitats across Europe.



Source Redrawn from Itagaki and Hosoya (2023)

Note a Vertical section of apothecium. b Ascospores. c Asci with asxospores. d Apicl pore of ascus (in Melzer's solution). e Paraphyses. f Texture of stroma. g Subicular hyphae. h, i Conidiophores. j conidia. Scale bars: a, g = 50 µm; b–f, h–j = 10 µm.

Figure 3.224 *Neobelonopsis multiguttata*

Neosatchmopsis Crous, M.A. Delgado & R.K. Schumach., in Visagie et al., Fungal Systematics and Evolution 13: 469 (2024)

Index Fungorum number: IF854317; Facesoffungi number: FoF 18701, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on decaying Eucalyptus leaf litter. Sexual morph: Unknown. Asexual morph: Visagie et al. (2024).

Type species – *Neosatchmopsis ogrovei* Crous, M.A. Delgado & R.K. Schumach.

Notes – *Neosatchmopsis* was introduced by Visagie et al. (2024) with *N. ogrovei* as the type species. The genus is characterised by subcylindrical to ellipsoid, hyaline conidiogenous cells, smooth-walled, phialidic, with inconspicuous collarettes, and hyaline, aseptate, smooth, ellipsoid to fusiform conidia produced in slimy heads. Colonies are fast-growing, white to cream, flat to slightly raised, and lack soluble pigments and exudates. Molecular markers available for the genus include ITS and LSU sequence data (Visagie et al., 2024). The holotype is deposited in CBS (CBS H-25326), with the ex-type culture preserved as CBS 150890 (CPC 45705).

Neosatchmopsis ogrovei Crous, M.A. Delgado & R.K. Schumach., in Visagie et al., Fungal Systematics and Evolution 13: 469 (2024) Figure 3.225

Index Fungorum number: IF854319; Facesoffungi number: FoF 18702

Description – Visagie et al. (2024).

Material considered – Visagie et al. (2024).

Distribution, ecological and economical importance

Species of *Neosatchmopsis* are saprobic, occurring on decomposing leaf litter. The type species, *N. ogrovei*, was isolated from decaying *Eucalyptus* leaves, indicating its role in the decomposition of plant material and nutrient cycling in forest floor ecosystems. No pathogenicity or commercial significance has been reported for the genus (Visagie et al., 2024). Currently, *Neosatchmopsis* is known only from Spain, where the type species was collected.



Source Redrawn from Visagie et al. (2024)

Note a Conidiophores and conidiogenous cells giving rise to conidia. b Conidia. Scale bars: a, b = 10 μm.

Figure 3.225 *Neosatchmopsis ogrovei*

Orbiliopsis (Sacc. & D. Sacc.) Syd. & P. Syd., Annls mycol. 22(3/6): 308 (1924)

Index Fungorum number: IF3631; Facesoffungi number: FoF 18703, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Parasitic on the leaves of plants. Sexual morph: see Sydow (1924). Asexual morph: Unknown.

Type species – *Orbiliopsis coleosporioides* (Sacc. & D. Sacc.) Syd. & P. Syd.

Notes – *Orbiliopsis* was introduced by Sydow and Sydow (1924) for parasitic fungi on living leaves, with *O. coleosporioides* as the type species (originally placed in

Orbilia by Saccardo). The genus is characterised by amphigenous, sessile, disciform to slightly convex apothecia, 0.5–1 mm diam., sometimes confluent up to 2 mm, initially developing beneath the host cuticle and covered by it, later rupturing the cuticle into fragments that may remain attached to the apothecia. The surface is moist, tremellose, bright orange, and immarginate. The excipulum is absent or almost so, composed of a gelatinous plectenchyma; hypothecium hyaline, c. 100 μm thick. Asci are cylindrical to cylindric-clavate, apex rounded, sessile, 90–110 × 20–22 μm, 8-spored. Ascospores are oblong-cylindrical to subfusiform, hyaline, smooth, aseptate, with slightly attenuated ends, straight or rarely slightly curved, 24–28 × 7–8 μm, surrounded by a hyaline gelatinous sheath 2–3 μm thick. Paraphyses numerous, filiform, 1–1.5 μm wide, often slightly thickened and gelatinous at the apex. Molecular data are unavailable for the genus. The type species, *O. coleosporioides*, was described from living leaves of *Veronica subalpina* in Otago, New Zealand (Lake Harris Track), collected on 6 May 1921 by W.D. Reid (no. 996). The holotype is preserved in Sydow's herbarium, without barcode designation.

Orbiliopsis coleosporioides (Sacc. & D. Sacc.) Syd. & P. Syd., Annls mycol. 22(3/6): 308 (1924)

Index Fungorum number: IF431872; Facesoffungi number: FoF 18704

Description – Sydow (1924).

Material considered – Sydow (1924).

Distribution, ecological and economical importance

Orbiliopsis is an obligate parasitic fungus that develops beneath the host cuticle, obtaining nutrients from host tissues without producing conspicuous lesions. The mucilaginous sheath around the spores is likely an adaptation for moisture retention and spore dispersal in alpine habitats. The genus is currently known only from alpine and subalpine regions of New Zealand, where *O. coleosporioides* occurs on *Veronica subalpina*. Its distribution is probably limited by the range of its host plant, indicating a highly specialised ecological niche.

Figure – No original illustration available.

Otwaya G.W. Beaton, in Beaton & Weste, Trans. Br. mycol. Soc. 71(2): 219 (1978)

Index Fungorum number: IF3658; Facesoffungi number: FoF 18705, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprotrophic on decaying wood of *Nothofagus cunninghamii*. Sexual morph: see Beaton and Weste (1978). Asexual morph: Unknown.

Type species – *Otwaya verruculospora* G.W. Beaton

Notes – *Otwaya* was introduced by Beaton (1978) with *O. verruculospora* as the type species, collected from the Otway Ranges, Victoria, Australia. The genus is characterised by small, jade-green apothecia, 0.5–2 mm diam., cupulate to almost sessile, with a thin, entire margin and a tomentose receptacle densely covered with hyaline, thick-walled, septate hairs up to 50 µm long. The ectal excipulum comprises irregularly interwoven hyaline hyphae, while the medullary excipulum consists of subparallel hyphae. Asci are cylindrical, tapering at the base, 8-spored, with a strongly amyloid apical ring in Melzer's reagent. Ascospores are ellipsoid, hyaline, uniseriate, 10–14 × 4–5 µm, ornamented with irregular, verrucose warts that stain deeply in cotton blue. Paraphyses are cylindrical, unbranched, with slightly thickened, rounded apices. Hymenial hairs are abundant throughout the hymenium. No molecular data are available. The holotype is deposited in MELU (G. Beaton 64).

Otwaya verruculospora G.W. Beaton, Trans. Br. mycol. Soc. 71(2): 219 (1978) Figure 3.226

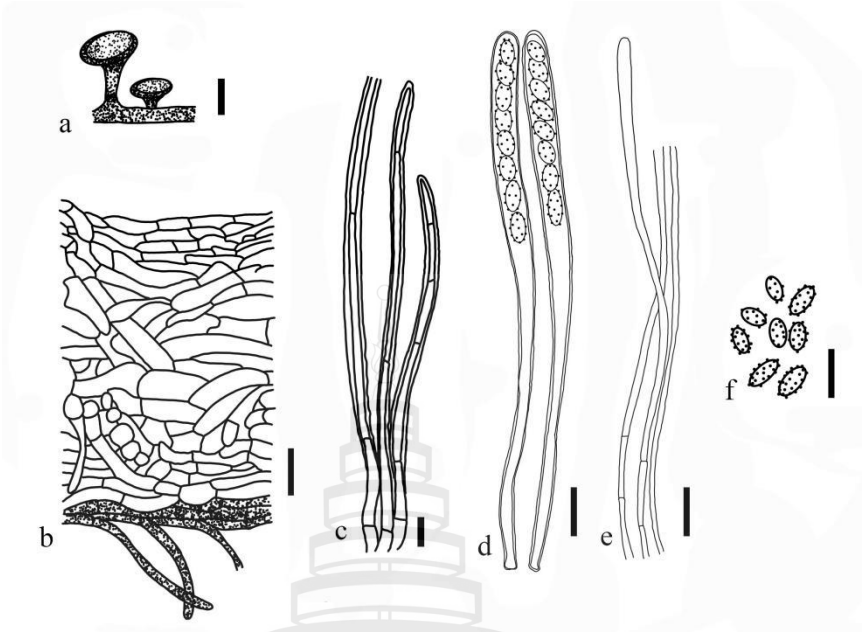
Index Fungorum number: IF319062; Facesoffungi number: FoF 18706

Description – Beaton and Weste (1978).

Material considered – Beaton and Weste (1978).

Distribution, ecological and economical importance

Otwaya is a saprotrophic wood-decay fungus contributing to nutrient cycling in cool temperate rainforest ecosystems. The type species occurs on decaying stumps and fallen branches of *Nothofagus cunninghamii*, often within enclosed cavities that maintain high humidity. It has been recorded only from Victoria, Australia, specifically the Otway Ranges and Tarra Valley National Park, with collections made during late summer and winter, suggesting adaptation to cool, moist microhabitats.



Source Redrawn from Beaton and Weste (1978)

Note a Apothecia. b Ectal excipulum with pigmented superficial hyphae and hairs. c Hairs from marginal area. d Asci. e Paraphyses. f Ascospores. Scale bars: a = 3mm, b–f = 10 μm.

Figure 3.226 *Otwaya verruculospora*

Pachydisca Boud., Bull. Soc. mycol. Fr. 1: 112 (1885)

Index Fungorum number: IF3667; Facesoffungi number: FoF 18707, 32 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on soil, possibly lichenized with *Gloeocapsa*-like cyanobacteria. Sexual morph: see Dumont (1975). Asexual morph: Unknown.

Type species – *Pachydisca guernisacii* (P. Crouan & H. Crouan) Boud.

Notes – *Pachydisca* was established by Boudier (1885) for *Helotium guernisacii* Crouan & Crouan, later treated inconsistently by various authors: accepted by Nannfeldt (1932) and Grelet (1947), but synonymized under *Rutstroemia* by Le Gal (1953) and omitted by Durand (1900), Clements and Shear (1931), and Korf (1973). Dumont (1975), after re-examining the type specimen, confirmed the distinctiveness of *Pachydisca* within Helotiales (not Sclerotiniaceae). A notable feature is the presence of algal cells, probably *Gloeocapsa*, embedded in the stipe tissue, suggesting possible lichenization, though the nature of this association remains uncertain. Apothecia

turbinate, fleshy, white to flesh-coloured, 1–2 cm diam., becoming convex and thin when dry, with a finely dentate margin; stipe short and broad. Asci cylindrical, 8-spored, (90–)100–125 × 7–10 µm, with thin to thick walls and slightly expanded apical pores, strongly amyloid in Melzer's reagent. Ascospores ellipsoid to subreniform, 10–12(–14) × 3–4.5 µm, hyaline, smooth, mostly aseptate with occasional 1-septate forms, containing large guttules. Paraphyses hyaline, smooth, slightly expanded at apex (up to 3 µm wide). The subhymenium is narrow; ectal excipulum of interwoven hyphae in a gelatinous matrix. No specific specimen number or depository institution was mentioned in the original publication.

Pachydisca guernisacii (P. Crouan & H. Crouan) Boud., Hist. Class. Discom. Eur. (Paris): 94 (1907)

Index Fungorum number: IF431945; Facesoffungi number: FoF 18708

Description – Boudier (1885), Dumont (1975).

Material considered – Boudier (1885), Dumont (1975).

Distribution, ecological and economical importance

Species of *Pachydisca* are saprobic on soil or decomposing plant material, possibly involved in mutualistic relationships with cyanobacteria. They contribute to nutrient cycling in terrestrial ecosystems. The genus has a primarily European distribution, with confirmed records from France (type locality) and other scattered localities.

Figure – No original illustration available.

Parencoelia Petr., Sydowia 4(1-6): 349 (1950)

Index Fungorum number: IF3726; Facesoffungi number: FoF 18709, 4 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Biotrophic parasites on living leaves. Sexual morph: see Petrak (1950). Asexual morph: Petrak (1950).

Type species – *Parencoelia andina* Petr.

Notes – *Parencoelia* was introduced by Petrak (1950) with *P. andina* as the type species, collected from Bolivia on leaves of *Panicum* infected by *Phyllachora* sp. The genus is characterised by small, initially closed apothecia that later become disc-shaped to convex, often aggregated or confluent, and developing on the stromata of larger pyrenomycetous fungi (e.g., *Phyllachora*). The excipulum is thick, pseudoparenchymatous

at the base, becoming more prosenchymatous towards the surface. The hypothecium is hyaline to pale grey-brown. Asci are clavate to cylindrical, thin-walled, tapering into a long stalk, 8-spored. Ascospores are globose to broadly ovoid or ellipsoid, hyaline, aseptate, smooth-walled. Paraphyses are numerous, filiform, simple, and not forming an epithecium. The asexual morph, as described by Petrak (1950), produces small conidiostromata bearing hyaline, aseptate, globose to ellipsoid conidia. No molecular data are currently available for this genus. The holotype of *P. andina* is deposited in W.

Parencoelia andina Petr., Sydowia 4(1-6): 350 (1950)

Index Fungorum number: IF302291; Facesoffungi number: FoF 18710

Description – Petrak (1950).

Material considered – Petrak (1950).

Distribution, ecological and economical importance

Parencoelia species are biotrophic parasites that inhabit the stromata of pyrenomycetous fungi, especially *Phyllachora* spp., on living leaves of Poaceae and other hosts. By producing apothecia on the host stromata, they may interfere with the reproductive capacity of the host fungus. The asexual morph facilitates persistence and dispersal under suitable environmental conditions. The genus was first described from Bolivia, but subsequent records indicate its occurrence in other parts of tropical South America and North America, suggesting a broader geographical range associated with the distribution of its host fungi.

Figure – No original illustration available.

Patinellaria P. Karst., Acta Soc. Fauna Flora fenn. 2(no. 6): 153 (1885) [1881-1885]

Index Fungorum number: IF3770; Facesoffungi number: FoF 18711, 2 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on decaying wood. Sexual morph: see Karsten (1885). Asexual morph: Unknown.

Type species – *Patinellaria sanguinea* (Pers.) P. Karst.

Notes – *Patinellaria* was introduced by Karsten (1885) with *P. sanguinea* as the type species. The genus is characterised by sessile or shortly stipitate, plano-scutellate apothecia that often become contorted when dry. The apothecia are small, blackish, sometimes with a tomentose base, and have a subcarbonaceous to thinly membranous

excipulum. The asci are clavate, obtuse, 8-spored, containing oblong to elongate, simple, eguttulate, hyaline ascospores. Paraphyses are filiform, coalescent, slightly thickened at the apex, and the epithecium is dark brown. No holotype specimen or depository institution was specified in the protologue, and no molecular data are currently available for the genus.on.

Patinellaria sanguinea (Pers.) P. Karst., Acta Soc. Fauna Flora fenn. 2(no. 6): 153 (1885) [1881-1885] Figure 3.227

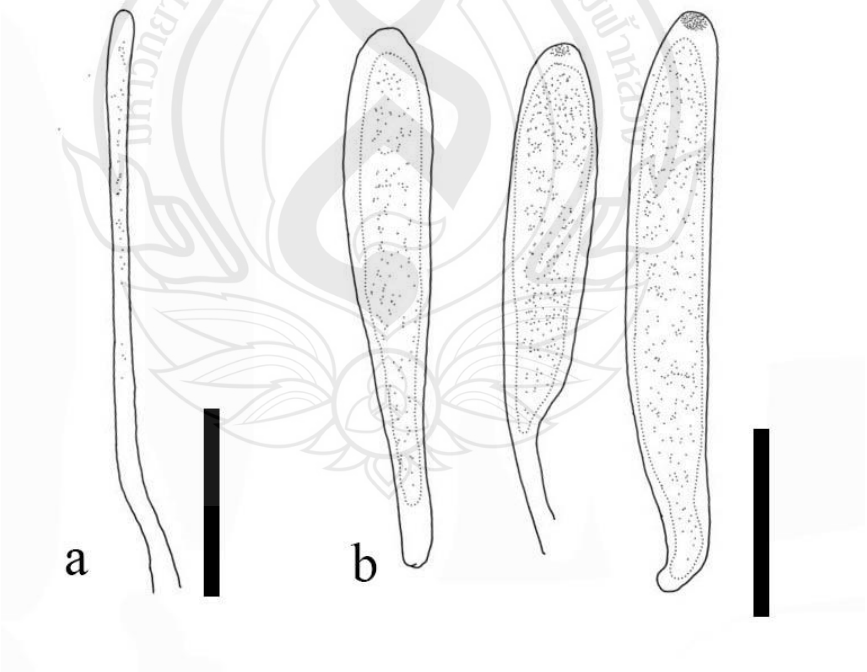
Index Fungorum number: IF431991; Facesoffungi number: FoF 18712

Description – Karsten (1885).

Material considered – Karsten (1885).

Distribution, ecological and economical importance

Patinellaria is a saprobic genus that contributes to the decomposition of woody substrates, thereby participating in nutrient cycling within forest ecosystems. It typically colonizes decaying branches and logs of broadleaf trees such as *Alnus incana*. The genus is primarily found in temperate and boreal forests and has been reported from various localities in Europe, particularly Finland, where it appears in early spring.



Source Redrawn from Mycopedia (2024)

Note a Paraphyses. b Asci. Scale bars: a, b = 10 μm.

Figure 3.227 *Patinellaria sanguinea*

Peltigeromyces Möller, Bot. Mitt. Trop. 9: 310 (1901)

Index Fungorum number: IF3796; Facesoffungi number: FoF 05894, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on decaying dicotyledonous wood. Sexual morph: see Dennis 1958. Asexual morph: Unknown.

Type species – *Peltigeromyces microsporus* Möller

Notes – *Peltigeromyces* was introduced by Möller (1901) based on *P. microsporus* from Brazil. The genus is characterised by sessile, leathery, deeply lobed apothecia up to 3 cm in diameter, with a whitish disc and a dark brown to black receptacle that is minutely furfuraceous. The excipulum comprises cuboid to subglobose cells, with the outer layer thick-walled and brown. Asci are cylindric-clavate, truncate at the apex, and 8-spored, containing biseriate, subglobose ascospores measuring 1.5–2 × 1 µm. Paraphyses are filiform, about 1 µm thick. Dennis (1958) confirmed the diagnostic features described by Möller and placed the genus in the Helotiales based on the apothecial morphology. No specific specimen number or depository institution was mentioned in the protologue.

Peltigeromyces microsporus Möller, Bot. Mitt. Trop. 9: 310 (1901)

Index Fungorum number: IF147547; Facesoffungi number: FoF 18713

Description – Kunze and Schmidt 1823, Braun and Cook (2012).

Material considered – Kunze and Schmidt 1823, Braun and Cook (2012).

Distribution, ecological and economical importance

Peltigeromyces is a saprobic genus involved in the decomposition of woody plant material, thereby contributing to nutrient cycling in forest ecosystems. It colonizes decaying dicotyledonous wood in humid tropical habitats. The genus is currently known only from tropical South America, with the type species collected in Brazil.

Figure – No original illustration available.

Pezomela Syd., Annls mycol. 26(1/2): 121 (1928)

Index Fungorum number: IF3867; Facesoffungi number: FoF 18714, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic or weakly necrotrophic on living leaves of *Saxegothaea conspicua*. Sexual morph: see Sydow (1928).v. Asexual morph: Unknown.

Type species – *Pezomela saxegothaeae* Syd.

Notes – *Pezomela* was introduced by Sydow (1928) with *P. saxegothaeae* as the type species, based on collections from *Saxegothaea conspicua* in Chiloé, Chile. The genus is characterised by erumpent, pulvinate stromata, brown to dark brown, containing subglobose to pyriform perithecia immersed in the stroma, each with a single ostiole. Asci are cylindrical, 8-spored, unitunicate; ascospores ellipsoid, hyaline, smooth, 1-septate, becoming brown at maturity. The familial placement of *Pezomela* within Helotiales remains uncertain (*incertae sedis*). No molecular data are available for the genus. The holotype (no. 1752) was collected by H. Sydow on 2 December 1924 in Cordillera de Piuchué, Chiloé, Chile.

Pezomela saxegothaeae Syd., Annls mycol. 26(1/2): 121 (1928) Figure 3.228

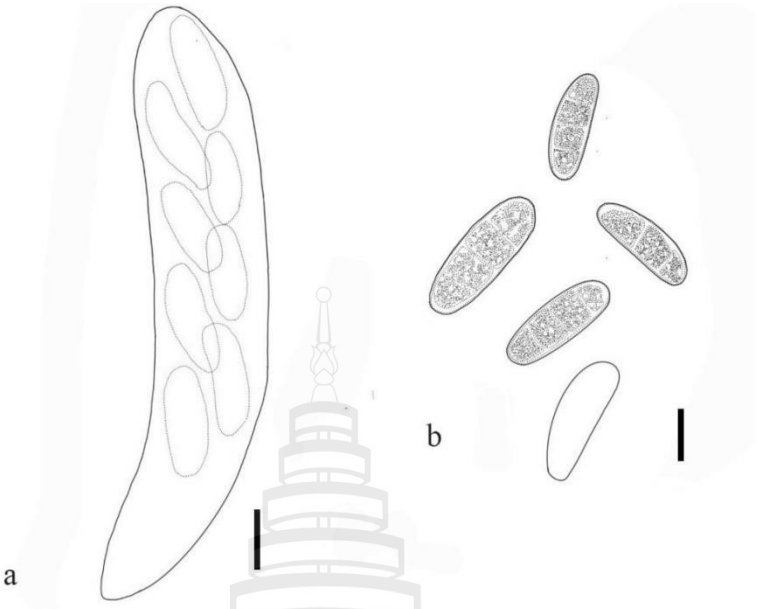
Index Fungorum number: IF277539; Facesoffungi number: FoF 18715

Description – Sydow (1928).

Material considered – Sydow (1928).

Distribution, ecological and economical importance

Pezomela is presumed to be saprobic or weakly necrotrophic, developing on leaves of *Saxegothaea conspicua*. Its ecological role and life history are poorly documented. Known distribution is limited to southern South America, with the type collection from Chile. The genus appears rare, and its broader distribution remains unknown due to limited sampling and study.



Source Redrawn from Bladmineerders (2024)

Note a Asci. b Ascospores. Scale bars: a, b = 10 μm.

Figure 3.228 *Pezomela saxegothaeae*

Phaeofabraea Rehm, Annls mycol. 7(6): 541 (1909)

Index Fungorum number: IF3915; Facesoffungi number: FoF 18716, 4 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Fungicolous (hyperparasitic) and epiphyllous on stromata of foliicolous Ascomycetes. Sexual morph: see Pfister (1977). Asexual morph: see Sydow (1927).

Type species – *Phaeofabraea miconiae* Rehm

Notes – *Phaeofabraea* was established by Rehm (1909) with *P. miconiae* as the type species. Members of this genus form small to minute, solitary or gregarious apothecia that develop directly on the stromata of foliicolous Ascomycetes. The hymenium is brownish to black, with an exposed whitish to brownish, downy or furfuraceous margin. The medullary excipulum consists of *textura intricata* of hyaline hyphae, sometimes encrusted with refractive granules or crystals, while the ectal excipulum is composed of *textura angularis* to *globulosa* of dark brown to black cells. Asci are subcylindrical, thick-walled when young, 8-spored, J-, inoperculate, and unitunicate. Ascospores are ellipsoid, occasionally slightly allantoid, unicellular, dark brown, with a characteristic hyaline band encircling them latitudinally (Pfister, 1977).

Molecular data are not yet available for the genus. The holotype of *P. miconiae* was collected by S. J. Theissen in 1908 and is preserved in herbarium S. Additional collections from Venezuela on *Miconia ambigua* and *M. ambiguae* were made by H. Sydow in 1928 and are preserved in FH.

Phaeofabraea miconiae Rehm, Annls mycol. 7(6): 541 (1909)

Index Fungorum number: IF184819; Facesoffungi number: FoF 18717

Description – Rehm (1909).

Material considered – Rehm (1909).

Distribution, ecological and economical importance

Phaeofabraea species are fungicolous and epiphyllous, usually developing on stromata of foliicolous Ascomycetes, and may also occur saprobically on decaying plant material. The ability of their apothecia to dry, revive, and discharge spores is considered an adaptation to fluctuating humidity on leaf surfaces. The genus is recorded mainly from South America (Brazil, Venezuela) with an additional report from India.

Figure – No original illustration available.

Podophacidium Niessl, in Rabenhorst, Bot. Ztg. 26: 558 (1868)

Index Fungorum number: IF4281; Facesoffungi number: FoF 18718, 2 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on soil in coniferous forests, often among mosses and plant debris. Sexual morph: see Seaver (1939). Asexual morph: Unknown.

Type species – *Podophacidium xanthomelum* (Pers.) Kavina

Notes – *Podophacidium* was introduced by Niessl (1868) with *P. terrestre* as the type species. Because of its peculiar apothecial dehiscence, Saccardo later transferred it to *Urnula* as *U. terrestris*, while Boudier (1907) established *Melachroia* based on *Peziza xanthomela* Pers., also transferring *P. terrestre* to his new genus. Subsequent authors generally maintained *P. terrestre* and *P. xanthomela* as separate, but Seaver (1939) demonstrated they are conspecific, with *Podophacidium* having nomenclatural priority over *Melachroia*. The genus is characterized by substipitate, obconic to turbinate apothecia opening with a laciniate margin, with a bright yellow hymenium often tinged olive, contrasting with a dark brown to nearly black exterior. The asci are clavate, inoperculate, 8-spored, 90–125 × 7–9 µm; ascospores are ellipsoid, slightly attenuated at the ends, hyaline, usually containing two oil drops, (5–)6–7 × 10–

17 µm; paraphyses are very slender and branched. Molecular data for the genus remain scarce, with only one species represented in sequence databases. No specific specimen number or depository institution was mentioned in the original publication.

Podophacidium xanthomelum (Pers.) Kavina, Crypt. Czech. Exsicc.: no. 217 (1936) Figure 3.229

≡ *Peziza xanthomela* Pers., *Syn. Fung.*: 665 (1801)

≡ *Peziza xanthomela* Pers., *Myc. Eur.* 1: 296 (1822)

≡ *Podophacidium terrestre* Niessl, in Rabenhorst, *Fungi Eur.* 1153 (1868)

≡ *Aleuria xanthomela* (Pers.) Gillet, *Champ. Discom.*: 207 (1886)

≡ *Humaria xanthomela* (Pers.) Sacc., *Syll. Fung.* 8: 128 (1889)

≡ *Urnula terrestris* (Niessl) Sacc., *Syll. Fung.* 8: 550 (1889)

≡ *Melachroia xanthomela* (Pers.) Boud., *Hist. Class. Discom.*: 97 (1907)

≡ *Melachroia terrestris* (Niessl) Boud., *Hist. Class. Discom.*: 97 (1907)

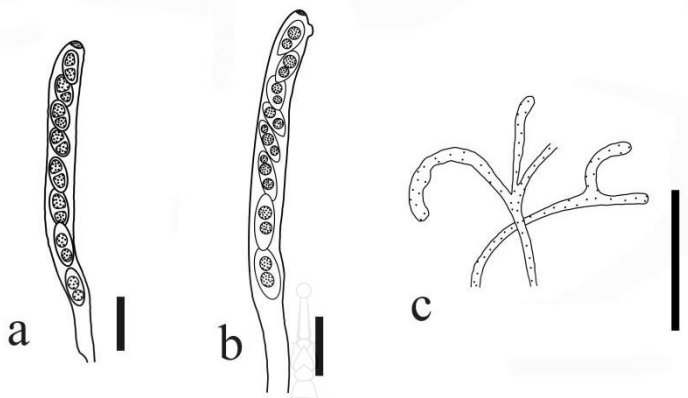
Index Fungorum number: IF282171; Facesoffungi number: FoF 18719

Description – Rabenhorst (1868), Seaver (1939).

Material considered – Rabenhorst (1868), Seaver (1939).

Distribution, ecological and economical importance

Podophacidium is saprobic, decomposing coniferous leaf litter, mosses, and other plant debris, and plays a role in nutrient cycling in forest soils. It typically grows on soil in coniferous forests, often among mosses. The species has been reported from Europe (Bulgaria, Slovenia, Czech Republic) and North America (Canada: Ontario, Quebec; USA: Wisconsin, Washington, New York). In Bulgaria, it is considered rare, recorded from spruce and pine forests in the Central Balkan Range (Gyosheva et al., 2018).



Source Redrawn from Flickr (2017)

Note a, b Asci, ascospores, apicl pore of ascus (in Melzer's solution). c Paraphyses. Scale bars: a–c = 20 μm.

Figure 3.229 *Podophacidium xanthomelum*

Polyphilus D.G. Knapp, Ashrafi, W. Maier & Kovács, in Ashrafi, Knapp, Blaudez, Chalot, Maciá-Vicente, Zagyva, Dababat, Maier & Kovács, Mycologia 110(2): 292 (2018)

Index Fungorum number: IF823756; Facesoffungi number: FoF 18720, 2 morphological species (Species Fungorum, 2025), 2 species with molecular data.

Root endophyte with a broad ecological range. Sexual morph: Unknown. Asexual morph: see Ashrafi et al. (2018).

Type species – *Polyphilus sieberi* D.G. Knapp, Ashrafi, W. Maier & Kovács

Notes – *Polyphilus* was introduced as a novel root-associated genus within Helotiales, with *P. sieberi* designated as the type species (Ashrafi et al., 2018). Colonies are sterile, slow-growing, radially striate, bright grey to white, and lack both sexual and asexual spores. No fruiting bodies are formed in culture. Phylogenetically, the genus is placed *incertae sedis* within Hyaloscyphaceae. Molecular data available include ITS, LSU, and *RPB2* sequences. Metabolomic studies have revealed that *Polyphilus* species can produce bioactive secondary metabolites, such as omnipolyphilins A and B (chlorinated cyclotetrapeptides) and naphtho-α-pyranones, some of which show antibacterial activity (Wennrich et al., 2024). The holotype of *P. sieberi* is deposited in herbarium H.

Polyphilus sieberi D.G. Knapp, Ashrafi, W. Maier & Kovács, in Ashrafi, Knapp, Blaudez, Chalot, Maciá-Vicente, Zagyva, Dababat, Maier & Kovács, Mycologia 110(2): 293 (2018)

Index Fungorum number: IF823757; Facesoffungi number: FoF 18721

Description – Ashrafi et al. (2018).

Material considered – Ashrafi et al. (2018).

Distribution, ecological and economical importance

Polyphilus is a globally distributed, cryptic root endophyte detected in a wide range of habitats, including semiarid grasslands, forest soils, and agricultural fields. It colonizes plant roots and has also been isolated from nematode eggs and truffle ascomata (Ashrafi et al., 2018). Some isolates are capable of colonizing cysts of plant-parasitic nematodes, indicating potential for biocontrol applications. Its production of bioactive secondary metabolites further suggests possible ecological roles in antagonism against other microorganisms (Wennrich et al., 2024). The genus has been recorded from multiple continents, reflecting its broad ecological amplitude.

Figure – No original illustration available.

Populomyces Hern.-Restr., in Crous et al., Fungal Systematics and Evolution 7: 319 (2021)

Index Fungorum number: IF838712; Facesoffungi number: FoF 14115, 2 morphological species (Species Fungorum 2025), 2 species with molecular data.

Saprobic. Sexual morph: Unknown. Asexual morph: see Crous et al. (2021).

Type species – *Populomyces zwinianus Hern.-Restr.*

Notes – *Populomyces* was introduced by Hernández-Restrepo et al. (2021) with *P. zwinianus* as the type species. Members of this genus are characterized by micronematous conidiophores, mostly reduced to solitary conidiogenous cells, which are monophialidic, aggregated in small groups, hyaline, smooth, cylindrical to lageniform, and bearing a distinct cylindrical collarette. Conidia are hyaline, aseptate, cylindrical, solitary, and guttulate. Phylogenetically, *Populomyces* clusters near *Calloria* and *Tricellula*, but is distinguishable by its solitary conidia, rather than the stauroconidia or chains of conidia produced by those genera (Crous et al., 2021). Molecular markers available for the genus include ITS and LSU sequence data. The holotype of *P. zwinianus* (CBS H-24737) was collected from soil in Yerseke, Zeeland

Province, the Netherlands, on 11 June 2019 by W. Vercousteren, S. Meas, and R. Verhije (isolate NL19_076; ex-type culture CBS 147307).

Populomyces zwinianus Hern.-Restr., in Crous et al., Fungal Systematics and Evolution 7: 321 (2021) Figure 3.230

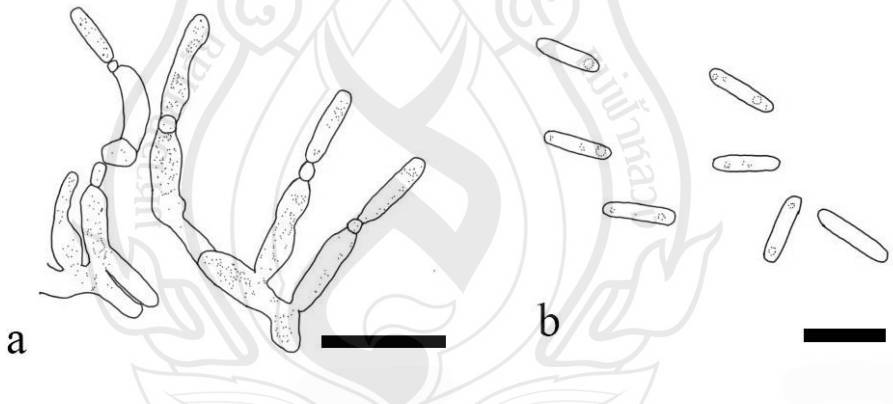
Index Fungorum number: IF838713; Facesoffungi number: FoF 14116

Description – Crous et al. (2021).

Material considered – Crous et al. (2021).

Distribution, ecological and economical importance

Populomyces is presumed to be saprobic, contributing to the decomposition of organic matter in soil habitats. The production of solitary, guttulate conidia suggests a potential for efficient asexual dispersal under suitable environmental conditions, possibly playing a role in nutrient cycling in terrestrial ecosystems. To date, the genus is known only from soil in the Netherlands, and its global distribution remains uncertain due to limited sampling (Crous et al., 2021).



Source Redrawn from Crous et al. (2021)

Note a Conidiophores. b Conidia. Scale bars: a, b = 10 μm.

Figure 3.230 *Populomyces zwinianus*

Potridiscus Döbbeler & Triebel, Hoppea 61: 72 (2000)

Index Fungorum number: IF28684; Facesoffungi number: FoF 18722, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Obligate bryophilous, specifically associated with Polytrichaceae (mosses). Sexual morph: see Döbbeler and Hertel (2013). Asexual morph: Unknown.

Type species – *Potridiscus polymorphus Döbbeler & Triebel*

Notes – *Potridiscus* was introduced by Döbbeler and Triebel (2000) with *P. polymorphus* as the type species, based on bryophilous material collected on leaves of *Polytrichum* spp. The genus is characterised by superficial, roundish to irregular and laterally confluent apothecia, light to dark brown, glabrous, 70–200 μm in diameter. The excipulum is composed of cylindrical to slightly clavate cells embedded in a gelatinous matrix. Paraphyses are filiform, often exceeding the asci in length. Asci are ellipsoid to cylindrical, 43–70 × 11–15 μm, 8-spored, without an iodine reaction (Lugol's negative). Ascospores are ellipsoid, brown, 1-celled, 11–15 × 5–7.5 μm. Molecular markers available include LSU and ITS sequences (Döbbeler & Hertel, 2013). The holotype is deposited in M (M-0052212).

Potridiscus polymorphus Döbbeler & Triebel, Hoppea 61: 72 (2000)

Index Fungorum number: IF484996; Facesoffungi number: FoF 18723

Description – Döbbeler and Triebel (2012).

Material considered – Döbbeler and Triebel (2012).

Distribution, ecological and economical importance

Potridiscus is an obligate bryophilous fungus, colonising the lamellae of *Polytrichaceae* leaves, where it likely functions as a biotrophic or weakly necrotrophic parasite. It may influence host vitality and is part of the specialised microfungal community inhabiting moss leaves. The genus exhibits an austral–subantarctic distribution, recorded from southern South America (Chile, Argentina) and Australasia (New Zealand) (Döbbeler & Hertel, 2013).

Figure – No original illustration available.

Pseudolachnum Velen., Monogr. Discom. Bohem. (Prague): 263 (1934)

Index Fungorum number: IF4445; Facesoffungi number: FoF 18724, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Obligate biotrophic on conifer bark (recorded from *Pinus sylvestris*). Sexual morph: see Velenovský (1934). Asexual morph: Unknown.

Type species – *Pseudolachnum lateritium* Velen.

Notes – *Pseudolachnum* was introduced by Velenovský (1934) as morphologically close to *Lachnum*, but differing in having a parenchymatous excipulum of large cells (grandicellular), thick-walled and pigmented, with the outer

surface covered by ovate, thick-walled cells forming rigid, elongated setae. The apothecia are caespitose-fasciculate, rupturing the bark, rigid, coriaceous, and lateritium (brick-red) in colour. The hypothecium is well-developed. Asci are inoperculate, clavate, (30–)43–50 × 5–6 µm, containing eight spores. Ascospores are 6–8 µm long, narrowly acicular, thin-walled, and hyaline. No molecular data are currently available for the genus. The holotype specimen was collected by Tympanis Tautziana Ruhl. on fallen twigs of *Pinus sylvestris* in a humid pine forest near Mnichovice, Czech Republic, July 1925, and is preserved in PR.

Pseudolachnum lateritium Velen., Monogr. Discom. Bohem. (Prague): 263 (1934)

Index Fungorum number: IF269054; Facesoffungi number: FoF 18725

Description – Velenovský (1934).

Material considered – Velenovský (1934).

Distribution, ecological and economical importance

The genus is known only from the type locality in the Czech Republic, on decorticated twigs of *Pinus sylvestris* in humid pine forests. Its ecological role is presumed to be biotrophic on conifer bark, possibly associated with weakened or recently dead tissues.

Figure – No original illustration available.

Pseudopeltis L. Holm & K. Holm, Bot. Notiser 131(1): 102 (1978)

Index Fungorum number: IF4468; Facesoffungi number: FoF 18726, 3 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on dead fern laminae. Sexual morph: see Holm and Holm (1978). Asexual morph: Unknown.

Type species – *Pseudopeltis filicum* L. Holm & K. Holm

Notes – *Pseudopeltis* was introduced by Holm and Holm (1978) with *P. filicum* as the type species. It is characterized by sparse, amphigenous, subcuticular, discoid apothecia (0.1–0.3 mm in diameter, ca. 50 µm high), with a radiately fissured scutellum composed of serially arranged subquadrate cells (ca. 5 µm wide). Asci cylindric-clavate, very shortly stipitate, ca. 40 × 10 µm, 8-spored, with an apical annulus turning bluish in iodine and KOH, and slightly acute thickened apices. Ascospores narrowly ellipsoid, mostly 10–12 × 3.5–4 µm, bicellular, hyaline, multi-guttulate. Paraphyses uni- or bi-

septate, often branched, with thickened apices. Excipulum absent, hypothecium poorly developed. No molecular data are available, and the genus is currently of uncertain taxonomic placement within Helotiales. The holotype (*P. filicum*) is deposited in UPS (UPS F-115801), collected on *Dryopteris filix-mas* in Sweden (20 November 1976, L. Holm & K. Holm).

Pseudopeltis filicum L. Holm & K. Holm, Bot. Notiser 131(1): 102 (1978)

Index Fungorum number: IF321855; Facesoffungi number: FoF 18727

Description – Holm and Holm (1978).

Material considered – Holm and Holm (1978).

Distribution, ecological and economical importance

Pseudopeltis is saprobic on dead fern laminae, contributing to the decomposition of pteridophyte foliage in forest ecosystems (Holm & Holm, 1978). The genus is rarely recorded, with confirmed collections from Sweden on *Dryopteris filix-mas*, *Athyrium filix-femina*, and *Dryopteris spinulosa*. Its full geographic range remains unknown.

Figure – No original illustration available.

Pseudotryblidium Rehm, Rabenh. Krypt.-Fl., Edn 2 (Leipzig) 1.3(lief. 33): 370 (1890) [1896]

Index Fungorum number: IF4499; Facesoffungi number: FoF 18728, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Obligate biotrophic on *Abies* species (Pinaceae). Sexual morph: see Suija et al. (2020). Asexual morph: Unknown.

Type species – *Pseudotryblidium neesii* (Körb.) Rehm

Notes – *seudotryblidium* was established by Rehm (1890) for *P. neesii*, an obligate bark-inhabiting discomycete associated with fir trees (*Abies* spp.). Ascomata are dark reddish-brown to almost black, initially erumpent and later sessile, substipitate at the base, with a rounded to slightly undulate margin, often radially striate when young. The consistency is leathery to sub-horny. The epihymenium is dark brown with coarse granules, the hymenium yellowish to brownish, and the subhymenium composed of yellowish, interwoven hyphae. The excipulum and hypothecium are brown to dark brown, with *textura globulosa* to *textura prismatica*, and a deep red pigment dissolving in KOH. Paraphyses are hyaline, filiform, simple to bifurcate, septate, slightly swollen

at the tips. Asci are inamyloid, cylindric-clavate, short-stipitate, 8-spored. Ascospores are (1–)2–4-celled, ellipsoid to oblong to ovoid, hyaline when young, becoming yellowish to brownish with age, biseriate in the ascus. Molecular markers available for the genus include ITS and LSU sequence data (Suija et al., 2020). The lectotype of *P. neesii* is H 9218 6991 (H), with isolectotypes in C, CWU, BG.

Pseudotryblidium neesii (Körb.) Rehm, Rabenh. Krypt.-Fl., Edn 2 (Leipzig) 1.3(lief. 33): 370 (1890) [1896] Figure 3.231

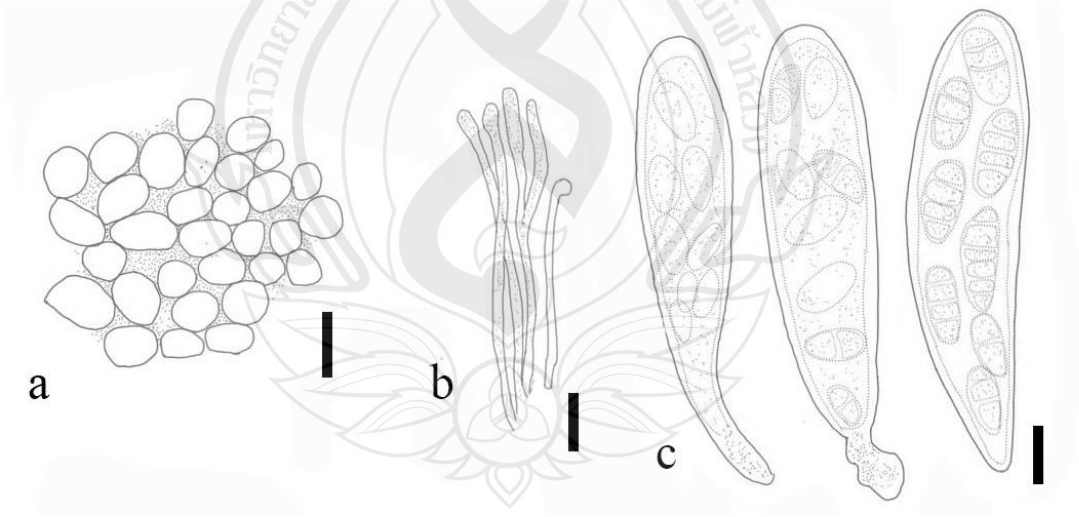
Index Fungorum number: IF209660; Facesoffungi number: FoF 18729

Description – Rehm (1890), Suija et al. (2020).

Material considered – Rehm (1890), Suija et al. (2020).

Distribution, ecological and economical importance

Pseudotryblidium neesii is non-lichenized but often develops ascomata that break through corticolous crustose lichen thalli such as *Loxospora elatina* and *Phlyctis argena*. It occurs exclusively on *Abies* bark—primarily *A. alba* in Central Europe (Austria, Germany, Estonia, Norway, Switzerland) and on *A. grandis* in North America (Idaho, Montana, Oregon, Washington) (Suija et al., 2020).



Source Redrawn from Suija et al., 2020 and Olariaga et al. (2020)

Note a Surface view of the ectal excipulum cells. b Paraphyses. c Asci. Scale bars: a–c = 10 µm.

Figure 3.231 *Pseudotryblidium neesii*

Psilophana Syd., Annls mycol. 37(4/5): 399 (1939)

Index Fungorum number: IF4511; Facesoffungi number: FoF 18730, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic or weakly parasitic on leaves. Sexual morph: see Sydow and Sydow (1939). Asexual morph: Unknown.

Type species – *Psilophana andina* Syd.e

Notes – *Psilophana* was established by Sydow (1939) with *P. andina* as the type species. The genus is characterised by a free, thin, arachnoid mycelium composed of hyaline hyphae. Apothecia are irregular to somewhat scattered, often loosely disposed and sometimes concentrically arranged, occasionally becoming confluent, very shortly stipitate, initially globose, then plane-cupulate, and finally strongly convex. They are pale to carnose-ceraceous in colour, with stipe tissue pseudoparenchymatous; the hypothecium is finely fibrous-cellulose, and no distinct lateral excipulum is present. Asci are clavate, long-stipitate, arising at different levels, 2–4-spored. Ascospores are elongate-clavate to fusoid, strongly curved, pluriseptate, hyaline, with the apices often attenuated; paraphyses are sparsely developed, filiform, simple or branched.

Molecular data for the genus are currently unavailable. The type collection was made on living leaves of *Boehmeria caudata* in Ecuador (Tungurahua, Baños, Hacienda San Antonio) on 1 Dec. 1937 (Sydow 415, holotype S).

Psilophana andina Syd., Annls mycol. 37(4/5): 399 (1939)

Index Fungorum number: IF256798; Facesoffungi number: FoF 18731

Description – Sydow and Sydow (1939).

Material considered – Sydow and Sydow (1939).

Distribution, ecological and economical importance

Psilophana is likely a saprobe or weak parasite on leaves, possibly forming an intraepidermal stromatic stage before producing apothecia. It may contribute to the decomposition of foliage or exhibit an endophytic phase. The genus is rarely reported, with confirmed records only from Ecuador (Tungurahua Province), where *P. andina* was collected on *Boehmeria caudata*.

Figure – No original illustration available.

Pteromyces E. Bommer, M. Rousseau & Sacc., in Saccardo, Annls mycol. 3(6): 507 (1906) [1905]

Index Fungorum number: IF4538; Facesoffungi number: FoF 18732, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic or necrotrophic on keratinous substrates. Sexual morph: see Saccardo (1906). Asexual morph: Unknown.

Type species – *Pteromyces ambiguus* E. Bommer, M. Rousseau & Sacc. ex Sacc.

Notes – *Pteromyces* was introduced by Bommer, Rousseau and Saccardo (1906) with *Pteromyces ambiguus* as the type species. The genus is characterized by depressed-globose, sessile, thin-fleshed ascomata, pale-coloured, dehiscing apically by a circular slit to expose a paler disc. The margin is entire to slightly irregular, neither reflexed nor distinctly delimited. The excipulum is composed of a very thin pseudoparenchymatous layer. Asci are clavate, subsessile, 8-spored, arising in fascicles from basal hyphae. Paraphyses are bacilliform, slightly thickened apically, sometimes surpassing the asci. Ascospores are ovoid, hyaline, aseptate, and arranged biseriately. No molecular data are currently available, and the phylogenetic placement of *Pteromyces* remains uncertain. The type species was described from quill shafts of pheasant feathers collected in La Panne, Furnes, Belgium, in March 1904. No type material was designated.

Pteromyces ambiguus E. Bommer, M. Rousseau & Sacc. ex Sacc., in Saccardo, Annls mycol. 3(6): 508 (1906) [1905]

Index Fungorum number: IF230330; Facesoffungi number: FoF 18733

Description – Saccardo (1906).

Material considered – Saccardo (1906).

Distribution, ecological and economical importance

Pteromyces is a saprobic or possibly keratinophilic fungus growing on keratin-rich substrates such as bird feathers. The occurrence of *P. ambiguus* under the cuticle or membrane of pheasant feather shafts suggests a role in keratin degradation and organic matter decomposition. The genus is known only from Belgium (La Panne, Furnes), where the type species was collected on pheasant (*Phasianus* sp.) feathers in 1904.

Figure – No original illustration available.

Pubigera Baral, Gminder & Svrček, in Gminder, Z. Mykol. 80(2): 646 (2014)

Index Fungorum number: IF550642; Facesoffungi number: FoF 18734, 1morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on fallen needles of *Picea abies*. Sexual morph: see Lüderitz et al. (2014). Asexual morph: Unknown.

Type species – *Pubigera subvillosula* (Rehm) Baral, Gminder & Svrček

Notes – *Pubigera* was introduced by Baral, Gminder, and Svrček (Gminder, 2014) to accommodate *P. subvillosula*, previously placed in *Omphorbia*, *Dasycyphella*, and *Ciboria*. The genus is characterised by long-stipitate, cyathiform apothecia with a denticulate to hairy margin, bearing fasciculate, soft, puberulo-pilose to villose marginal hairs; the excipulum is of textura *prismatica-porrecta*, covered by pigmented cortical cells and weakly gelatinised. Asci are cylindrical, unitunicate, with a conical base and a thin amyloid apical ring; paraphyses are numerous, filiform, flexuous, with apices encrusted by pigment or gelatinous material. Ascospores are oblong to ellipsoid-fusoid, hyaline, aseptate, with fine longitudinal ornamentation. No molecular data are currently available. No holotype was designated in the original publication.

Pubigera subvillosula (Rehm) Baral, Gminder & Svrček, in Gminder, Z. Mykol. 80(2): 646 (2014) Figure 3.232

≡ *Omphorbia subvillosula* Rehm, in Rabenhorst, Kryptogamenflora von Deutschland, Österreich und der Schweiz 1(3): 479 (1891)

≡ *Dasycyphella subvillosula* (Rehm) Höhn., Sitzungsber. K. Akad. Wiss. Wien, Math.-Nat. Kl., Abt. 1 127 (4–5): 358 (1918)

≡ *Ciboria subvillosula* (Rehm) Svrček, Česká Mykol. 5: 45 (1951)

Index Fungorum number: IF550643; Facesoffungi number: FoF 18735

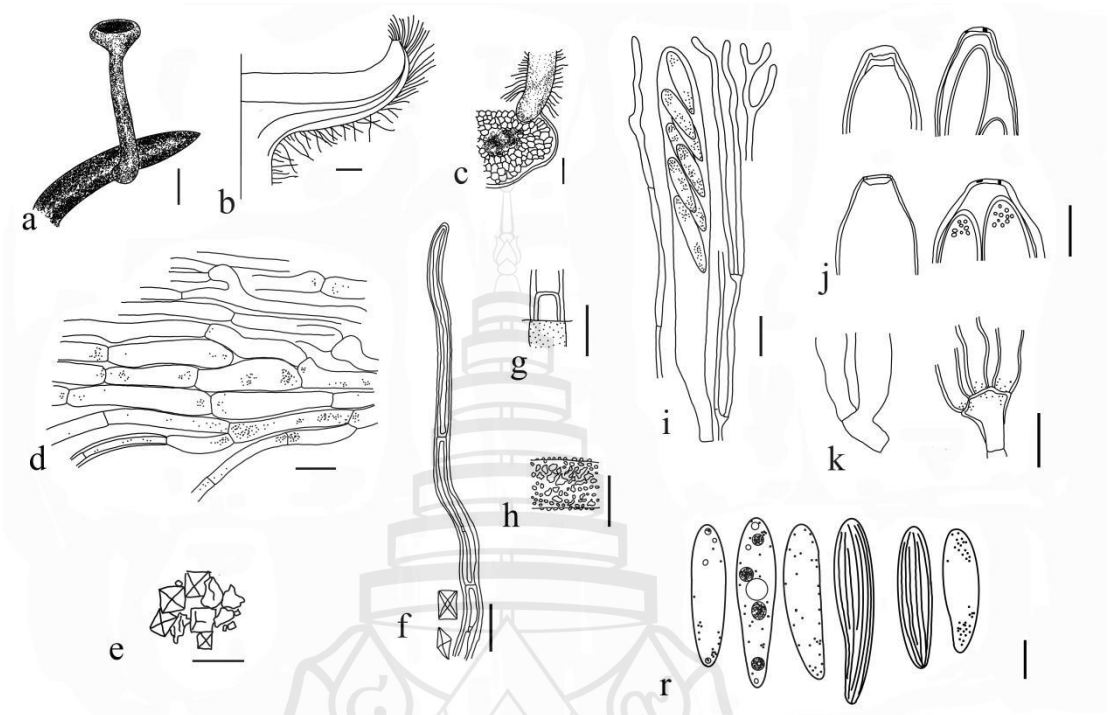
Description – Lüderitz et al. (2014).

Material considered – Lüderitz et al. (2014).

Distribution, ecological and economical importance

Pubigera is a saprobe on fallen needles of *Picea abies*, occasionally also on *Abies alba* or *Pinus* spp., contributing to needle litter decomposition and nutrient cycling in coniferous forests. It occurs in temperate regions of Central and Eastern Europe, including the Czech Republic, Germany, Poland, and Austria, in habitats from

200 to 800 m elevation. Fruiting is mainly in early spring (February–April), but collections have also been made in late autumn.



Source Redrawn from Baral et al. (1995)

Note a Fresh apothecia. b Radial section of receptacle. c Radial section of stalk, basal part, and cross sectiong of needle. d Radial section of ectal excipulum giving rise to hairs, and part of outer medullary excipulum, lower flanks. e Groups of octaedric crystals on exterior of stalk. f Upper part of hair with octaedric crystals. g Detail. h Part of medullary hypha, surface view. i Ascus and paraphyses. j Apices of asci with amyloid ring. k Ascus bases with simple septa. r Ascospores. Scale bars: a = 1 mm; b = 100 µm; c = 200 µm; d–f, i, k = 10 µm; g, h, j, r = 5 µm.

Figure 3.232 *Pubigera subvillosula*

Radotinea Velen., Monogr. Discom. Bohem. (Prague): 298 (1934)

Index Fungorum number: IF4642; Facesoffungi number: FoF 18736, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on bark (cortex) of Cornus species. Sexual morph: see Velenovský (1934). Asexual morph: Unknown.

Type species – *Radotinea caudata* Velen.

Notes – *Radotinea* was established by Velenovský (1934) with *R. caudata* as the type species. It is morphologically close to *Olla*, differing in having minute, sessile, cupulate apothecia with an emarginate base, externally covered with short, rigid, deciduous hairs; the ectal excipulum consists of dense parenchymatous tissue. Paraphyses are branched and covered by an epithecium. Ascospores are ellipsoid, tapering into an aristate base. Molecular data are not available for the genus. The type species was collected on the bark of *Cornus mas* in warm, sunny, and dry slopes above Radotín (Czech Republic) in March 1927. No specimen number or herbarium depository was indicated in the protologue.

Radotinea caudata Velen., Monogr. Discom. Bohem. (Prague): 298 (1934)

Index Fungorum number: IF260117; Facesoffungi number: FoF 18737

Description – Velenovský (1934).

Material considered – Velenovský (1934).

Distribution, ecological and economical importance

Radotinea is a saprobe on the bark of *Cornus mas*, found in warm, sun-exposed, dry slopes. It was described from the type locality above Radotín, Czech Republic. No additional records are known.

Figure – No original illustration available.

Rhizocladosporium Crous & U. Braun, in Crous, Braun, Schubert & Groenewald, Stud. Mycol. 58: 50 (2007)

Index Fungorum number: IF504440; Facesoffungi number: FoF 18738, 1morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on decayed myxomycetes and other organic substrates. Sexual morph: Unknown. Asexual morph: see Crous et al. (2007).

Type species – *Rhizocladosporium argillaceum* (Minoura) Crous & U. Braun

Notes – *Rhizocladosporium* was introduced by Crous and Braun (2007) with *R. argillaceum* as the type species. It is characterised by macronematous, subcylindrical, erect conidiophores with a somewhat inflated, lobed or rhizoid base. Conidiogenous cells are terminal, monoblastic, determinate, tapering towards a flat-tipped locus, sometimes geniculate, occasionally with two loci. Conidia are produced in branched acropetal chains; ramoconidia are subcylindrical to narrowly ellipsoidal, straight to

geniculate-sinuous, medium brown, smooth-walled, with broadly truncate bases. Secondary ramoconidia and conidia are aseptate, hyaline, guttulate, ellipsoidal with obtuse ends, with inconspicuous, non-pigmented, non-refractive, and non-thickened hila. The genus is phylogenetically placed in Helotiales, *incertae sedis*. The holotype was collected from Japan (Yoku Island) on decayed myxomycete, 21 Oct. 1961, K. Tubaki No. 4262, and is preserved as culture ex-type CBS 241.67.

Rhizocladosporium argillaceum (Minoura) Crous & U. Braun, in Crous, Braun, Schubert & Groenewald, Stud. Mycol. 58: 50 (2007) Figure 3.233

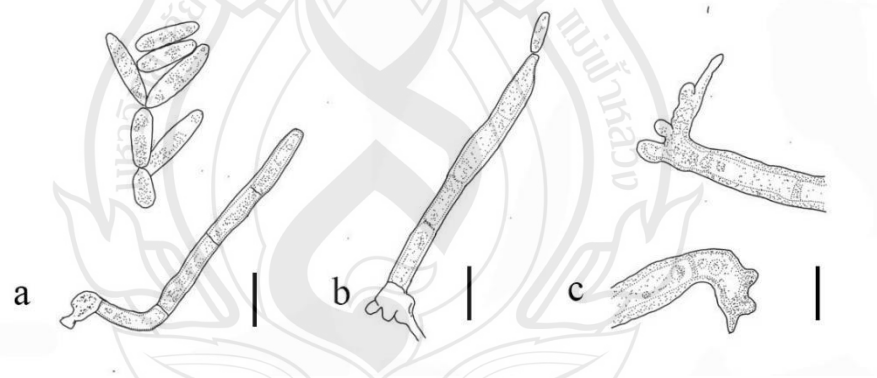
Index Fungorum number: IF504441; Facesoffungi number: FoF 18739

Description – Crous et al. (2007).

Material considered – Crous et al. (2007).

Distribution, ecological and economical importance

Rhizocladosporium is saprobic on decayed myxomycetes, likely contributing to fungal degradation and nutrient recycling. Currently only known from the type locality in Japan. (Crous et al., 2007).



Source Redrawn from Crous et al. (2007)

Note a, b Conidiophores with pigmented ramoconidia and hyaline conidia. c Rhizoids forming at the foot cells of macroconidiophores. Scale bars: a–c = 10 μm.

Figure 3.233 *Rhizocladosporium argillaceum*

Rhizothyrium Naumov, Bull. Soc. mycol. Fr. 30(3): 429 (1915)

Index Fungorum number: IF9733; Facesoffungi number: FoF 18740, 2 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic or possibly endophytic on living and senescent conifer leaves. Sexual morph: Unknown. Asexual morph: see Naumov (1915).

Type species – *Rhizothyrium* abietis Naumov

Notes – *Rhizothyrium* was introduced by Naumov (1915) with *R. abietis* as the type species. Members of the genus are characterised by superficial, flattened pycnothyria forming subcircular, inverted, dimidiate scutella, which are plano-convex, membranous, and lacking an ostiole. The scutella are composed of a radiating network of brown, non-ramified hyphae, forming a resistant, protective structure. Conidiophores are simple, bearing cylindrical, septate, hyaline conidia. The central columella consists of densely aggregated, parallel filaments that extend into the host tissue, forming a sclerotioid body. Molecular data are not yet available for the genus. The original description did not designate a specific type specimen or depository.

Rhizothyrium abietis Naumov, Bull. Soc. mycol. Fr. 30(3): 429 (1915)

Index Fungorum number: IF196956; Facesoffungi number: FoF 18741

Description – Naumov (1915).

Material considered – Naumov (1915).

Distribution, ecological and economical importance

Rhizothyrium is associated with needles of *Abies* spp., possibly as a saprobe or endophyte. Its biology suggests a role in epiphytic colonisation and/or needle litter decomposition. The genus is poorly known, with confirmed records primarily from Siberia (Russia), the type locality of *R. abietis*.

Figure – No original illustration available.

Rommelaarsia Baral & Haelew., in Baral & Haelewaters, Ascomycete.org 7(6): 323 (2015)

Index Fungorum number: IF814656; Facesoffungi number: FoF 18742, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on dead stems of *Equisetum arvense*. Sexual morph: see Baral and Haelewaters (2015). Asexual morph: see Baral and Haelewaters (2015).

Type species – *Rommelaarsia flavovirens* Baral, Tanchaud & Romm.

Notes – *Rommelaarsia* was introduced by Baral and Haelewaters (2015) with *R. flavovirens* as the type species. The genus is characterised by small (0.3–0.8 mm diam.), sessile apothecia with pale cream to yellowish-olivaceous discs, often turning greenish-yellow with age. The receptacle is concolorous, externally covered with cortical hyphae producing a greenish-yellow exudate that aggregates into small warts. The margin is lined with smooth, flexuous, yellowish hairs (up to 40 µm long). The ectal excipulum is of *textura prismatica*, with cells elongated perpendicular to the surface. The asci are clavate, (86–)92–108(–112) × 8.5–10.5 µm, 8-spored, with a strongly amyloid apical ring in Melzer's reagent. Ascospores are subcylindrical to fusoid, (15.5–)16.5–18.5(–19.5) × (3.4–)3.7–4.1(–4.3) µm, hyaline, smooth, thin-walled, and aseptate. Paraphyses are cylindrical to lanceolate, slightly enlarged at the tips, without refractive vacuoles. The asexual morph produces sporodochia with multiguttulate, pale brown, 1–3-septate phragmoconidia formed holoblastically. Molecular data available for the genus include ITS and LSU rDNA sequences. The holotype of *R. flavovirens* is deposited in H (H 003043336), with an isotype in PH (PH 00304333).

Rommelaarsia flavovirens Baral, Tanchaud & Romm., in Baral & Haelewaters, Ascomycete.org 7(6): 323 (2015) Figure 3.234

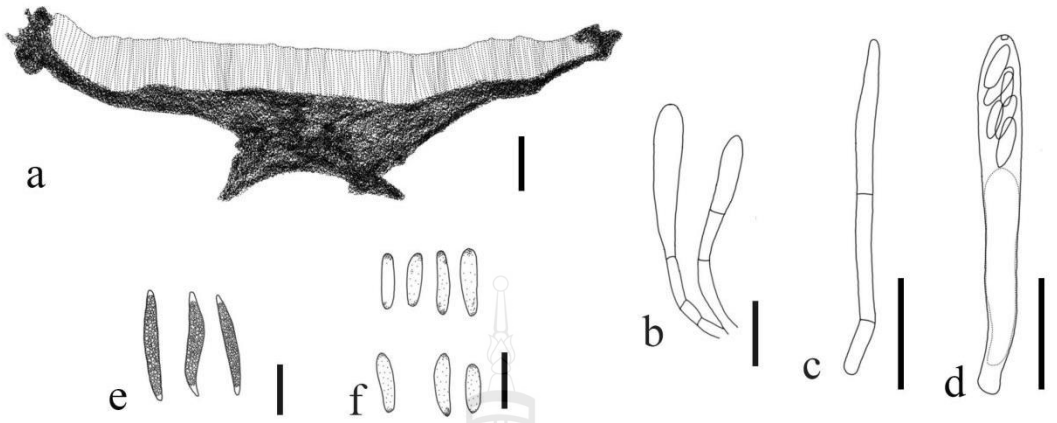
Index Fungorum number: IF814657; Facesoffungi number: FoF 18743

Description – Baral and Haelewaters (2015).

Material considered – Baral and Haelewaters (2015).

Distribution, ecological and economical importance

Rommelaarsia is saprobic on dead stems of *Equisetum arvense*, where it likely contributes to the decomposition of plant material in riparian and wetland ecosystems. It is a rarely collected genus, with confirmed records from Western Europe, including the Netherlands and France, in lowland habitats with moist soils.



Source Redrawn from Réblová et al. (2021)

Note a Apothecium in median section. b Conidiophores. c Paraphyses. d Asci. e Squash mount of conidioma with mature conidia. f Ascospores. Scale bars: a = 100 µm, b–d = 20 µm, e = 50 µm, f = 10 µm.

Figure 3.234 *Rommelaarsia flavovirens*

Sarcomyces Massee, J. Mycol. 6(4): 178 (1891)

Index Fungorum number: IF4852; Facesoffungi number: FoF 18744, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on wood. Sexual morph: see Massee (1891). Asexual morph: Unknown.

Type species – *Sarcomyces vinosus* Massee

Notes – *Sarcomyces* was introduced by Massee (1891) with *S. vinosus* as the type species. The genus is characterized by a semi-gelatinous (subgelatinous), sessile to subsessile, erumpent receptacle attached by a narrow base. The hymenium is convex, even, with a sharply defined margin. The asci are cylindrical, 8-spored, containing uniseriate, pigmented, muriformly septate ascospores. Paraphyses are numerous, linear, hyaline, and not thickened at the tips, equal in length to the asci. No molecular data are available for the genus, and type specimen details were not provided in the original description.

Sarcomyces vinosus Massee [as 'vinosa'], J. Mycol. 6(4): 178 (1891)

Index Fungorum number: IF144641; Facesoffungi number: FoF 18745

Description – Massee (1891).

Material considered – Massee (1891).

Distribution, ecological and economical importance

Saprobic on wood, contributing to wood decomposition and nutrient cycling. Known from Venezuela and South Carolina (USA).

Figure – No original illustration available.

Sclerocrana Samuels & L.M. Kohn, Sydowia 39: 210 (1987) [1986]

Index Fungorum number: IF25135; Facesoffungi number: FoF 18746, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic or weakly parasitic on rotting wood, decaying caudices of tree ferns, and in soil among mosses. Sexual morph: see Samuels and Kohn (1986). Asexual morph: see Samuels and Kohn (1986).

Type species – *Sclerocrana atra* Samuels & L.M. Kohn

Notes – *Sclerocrana* was introduced by Samuels and Kohn (1986) with *S. atra* as the type species. *Sclerocrana* is characterised by stipitate apothecia arising from a sclerotium or expanded stipe base, with a dark brown to black discoidal or cylindrical hymenophore. The asci are cylindrical to narrowly clavate, with a blue iodine-positive apical ring, and the ascospores are elliptical to subfusiform, unicellular, and hyaline. Paraphyses are numerous, clavate to subglobose at the tip, and encrusted with amorphous brown material. The anamorphic state is synnematous, arising from the apothecial stipe or a separate stipe, producing ellipsoidal, hyaline phialoconidia. Molecular markers for *Sclerocrana* are currently not available. The type species, *Sclerocrana atra* Samuels & Kohn, was collected in New Zealand, Auckland, Waitemata City, Waitakere Ranges, Cascades, on rotting caudex of tree fern and on decaying log, 16 July 1980, leg. Samuels & Johnston (PDD 46958, holotype; CUP, isotype).

Sclerocrana atra Samuels & L.M. Kohn, Sydowia 39: 210 (1987) [1986] Figure 3.235

Index Fungorum number: IF130899; Facesoffungi number: FoF 18747

Description – Samuels and Kohn (1986).

Material considered – Samuels and Kohn (1986).

Distribution, ecological and economical importance

Sclerocrana is a saprobe or weak parasite, contributing to the decomposition of woody debris and tree fern caudices, and occasionally occurring in soil rich in organic

matter among mosses. It is known only from New Zealand, with confirmed records from forested areas such as the Waitakere Ranges and Waipoua State Forest.



Source Redrawn from Samuels and Kohn (1986)

Note a, b Apothecia. c Longitudinal section through apothecia. d Longitudinal section through stipe showing cortex and medulla. e Paraphyses. f Asci (Melzer's reagent). g Ascospores. h Diagram of a synnematous conidioma. i Phialides. j conidia. Scale bars: a, b = 1cm; c, d, h = 100 µm.; e–g, i, j= 10 µm.

Figure 3.235 *Sclerocrana atra*

Scutulopsis Velen., Monogr. Discom. Bohem. (Prague): 89 (1934)

Index Fungorum number: IF4981; Facesoffungi number: FoF 18748, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on decaying roots and resinous wood of *Pinus* and *Picea*. Sexual morph: see Velenovský (1934). Asexual morph: Unknown.

Type species – *Scutulopsis pinacea* Velen.

Notes – *Scutulopsis* was introduced by Velenovský (1934) with *Scutulopsis pinacea* as the type species. *Scutulopsis* is characterized by sessile, initially patelliform apothecia that later become convex and globose, with a dark, tough, and thickened parenchymatous texture. The hypothecium is well-developed. Asci are thickly clavate, with capillary paraphyses that are branched and do not cohere with the asci. The epithecium is strongly pigmented. Asci stain positively with iodine. Spores are arranged in a distichous manner, narrowly and obtusely cylindrical, bicellular, initially hyaline but turning brown with maturity. No specific specimen number or depository institution was mentioned in the original publication.

Scutulopsis pinacea Velen., Monogr. Discom. Bohem. (Prague): 90 (1934)

Index Fungorum number: IF274478; Facesoffungi number: FoF 18749

Description – Velenovský (1934).

Material considered – Velenovský (1934).

Distribution, ecological and economical importance

Scutulopsis functions as a saprobe, primarily decomposing dry, resinous roots and woody substrates of conifers such as *Pinus* and *Picea*. Its presence on exposed and weathered wood suggests a role in the early stages of wood decay, breaking down organic material and contributing to nutrient cycling in forest ecosystems.

The genus *Scutulopsis* is rarely reported and appears to have a restricted distribution. It has been documented in Europe, specifically in Czech forests, where it was collected from exposed pine and spruce roots (Velenovský, 1934).

Figure – *Scutulopsis pinacea.* No original illustration available.

Scytalidium Pesante, Annali Sper. agr., N.S. 11(2, Suppl.): cclxiv (1957)

Index Fungorum number: IF9862; Facesoffungi number: FoF 16699, 29 morphological species (Species Fungorum, 2025), 17 species with molecular data.

Saprobic, plant pathogenic, or opportunistic human pathogenic. Sexual morph: Unknown. Asexual morph: see Pesante (1957).

Type species – *Scytalidium lignicola* Pesante

Notes – *Scytalidium* was introduced by Pesante (1957) with *S. lignicola* as the type species. The genus is characterized by micronematous, simple or branched conidiophores producing arthroconidia that are cylindrical to ellipsoid, catenulate, hyaline to pale brown, with thin cell walls. Sexual morphs are unknown, although some

species have been linked phylogenetically to teleomorphic states within Leotiomycetes. Molecular markers used in phylogenetic studies include ITS, LSU, 18S rDNA, and *RPB2* (Chen et al.,2019). Some members are saprotrophs on wood and plant debris, while others are important pathogens. For example, *S. auriculariicola* causes slippery scar disease in cultivated *Auricularia polytricha*, resulting in up to 40 % yield losses in affected production areas of China. The original description of *S. lignicola* did not specify a specimen number or depository.

Scytalidium lignicola Pesante [as 'lignicolum'], Annali Sper. agr., N.S. 11(2, Suppl.): cclxv (1957) Figure 3.236

Index Fungorum number: IF305704; Facesoffungi number: Fo 18750

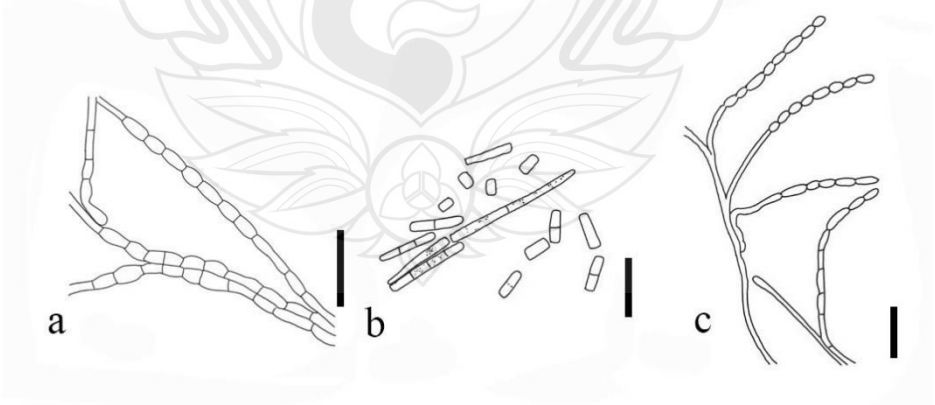
Description – Pesante (1957).

Material considered – Pesante (1957).

Distribution, ecological and economical importance

Some species decompose wood and plant debris, contributing to organic matter recycling, while others, like *Scytalidium auriculariicola*, are plant pathogens causing diseases such as slippery scar disease in cultivated fungi. Additionally, certain species, such as *Scytalidium dimidiatum*, are opportunistic pathogens in humans, leading to skin and nail infections.

The genus has a global distribution, with species reported in tropical and subtropical regions, particularly in Asia, South America, and Africa (Chen et al., 2019).



Source Redrawn from Peng et al. (2014)

Note a Catenate and thick-walled chlamydoconidia. b Conidia of variable length. c Branched hyphae developing chamydoconidia. Scale bars: a–c = 10 µm.

Figure 3.236 *Scytalidium lignicola*

Stamnaria Fuckel, Jb. nassau. Ver. Naturk. 23-24: 309 (1870) [1869-70]

Index Fungorum number: IF25342; Facesoffungi number: FoF 07601, 7 morphological species (Species Fungorum, 2025), 3 species with molecular data.

Host-specific and obligate parasites or saprobes on *Equisetum* species. Sexual morph: see Haelewaters et al. (2018). Asexual morph: see Haelewaters et al. (2018).

Type species – *Stamnaria persoonii* (Moug.) Fuckel

Notes – *Stamnaria* is characterised by apothecia erumpent through the epidermis of the host, arising from a well-developed subiculum, with a strongly gelatinised ectal excipulum containing yellow–orange carotenoid pigments. Apothecia are typically pale orange to yellowish, disc-shaped to slightly convex, with a distinct, sometimes scarious margin. The asci are cylindrical to clavate, 8-spored, with an amyloid apical apparatus; paraphyses are filiform, occasionally branched, often enlarged at the apex; ascospores are ellipsoid to fusiform, hyaline, smooth, often containing one or two large oil droplets. (Haelewaters et al., 2018; Hosoya et al., 2013). Members of *Stamnaria* are host-specific, growing on species of *Equisetum* (horsetails). The asexual morph was previously classified under *Titaeospora* but is now synonymised under *Stamnaria* (Johnston et al., 2014). Molecular markers available for *Stamnaria* include ITS and LSU sequence data, forming a distinct lineage within Helotiales (Baral & Haelewaters, 2015; Haelewaters et al., 2018). No specific specimen number or depository institution was mentioned in the original publication.

Stamnaria persoonii (Moug.) Fuckel, Jb. nassau. Ver. Naturk. 23-24: 309 (1870) [1869-70] Figure 3.237

Index Fungorum number: IF232421; Facesoffungi number: FoF 18751

Description – Haelewaters et al. (2018).

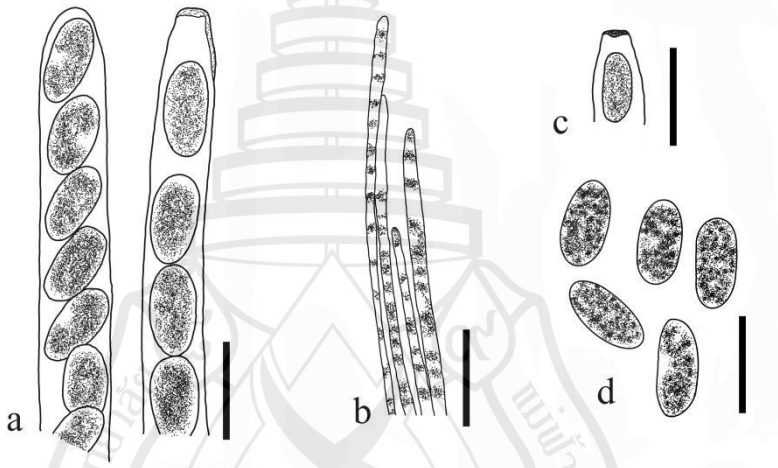
Material considered – Haelewaters et al. (2018).

Distribution, ecological and economical importance

Stamnaria species are host-specific to *Equisetum* (horsetails), with some functioning as weak parasites on living stems and others as saprobes on dead or decaying material. They play a role in the natural decomposition of horsetails, contributing to nutrient cycling in riparian and wetland ecosystems. The presence of a strongly gelatinised ectal excipulum and yellow–orange carotenoid pigments in their

tissues may represent adaptations to persist in moist habitats (Haelewaters et al., 2018; Hosoya et al., 2013).

The genus has a global but fragmented distribution, occurring mainly in temperate and boreal regions where *Equisetum* species are abundant. Documented records include North America, Europe, and Asia, with notable findings from Western Siberia, Turkey, Japan, and Germany. For example, *S. americana* has been reported on living stems of *E. hyemale*, whereas *S. yugrana* occurs on fallen stems of *E. sylvaticum* in post-fire habitats of Western Siberia (Haelewaters et al., 2018).



Source Redrawn from CEMAS (2014)

Note a Part of Asci. b Paraphyses. c Asci with IKI b. d Ascospores. Scale bars: a–d = 20 µm.

Figure 3.237 *Stamnaria persoonii*

Tetracladium De Wild., Ann. Soc. Belge Microscop. 17: 39 (1893)

Index Fungorum number: IF10191; Facesoffungi number: FoF 18752, 1 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Aquatic hyphomycetes (Ingoldian fungi) primarily inhabiting freshwater ecosystems, where they play an important role in decomposing submerged leaf litter. Sexual morph: Unknown. Asexual morph: see Anderson et al. (2020); Goh et al. (2022).

Type species – *Tetracladium marchalianum* De Wild.

Notes – *Tetracladium* was established by De Wildeman (1893) with *T. marchalianum* as the type species. It is currently placed in the phylum Ascomycota, class

Leotiomycetes, order Helotiales, but remains *incertae sedis* at the family level. While previously associated with Helotiaceae or Vandijckellaceae, recent multi-gene phylogenetic studies (ITS, LSU, SSU, *RPB1*, *RPB2*) have shown that *Tetracladium* forms a distinct, well-supported monophyletic lineage within the "Han Clade 9 / Stamnaria lineage / Vandijckellaceae clade", but without clear affinity to any formally recognized family (Anderson et al., 2020; Lazar et al., 2024).

Morphologically, species are characterised by hyaline, septate, branched hyphae and conidiophores producing distinctive tetraradiate conidia with four tapering arms arising from a central point, an adaptation for aquatic dispersal and substrate attachment in flowing water. Some taxa also form globose or ellipsoidal alternative conidia, especially in cold or terrestrial habitats (Baerlocher & Kendrick, 2002; Goh et al., 2022). No confirmed sexual morph has been documented. The genus is also recognised for its ecological versatility, with certain species functioning as root endophytes in terrestrial plants, including crops and wild vegetation. No specific specimen number or depository institution was mentioned in the protologue.

Tetracladium marchalianum De Wild., Ann. Soc. Belge Microscop. 17: 39 Figure 3.238

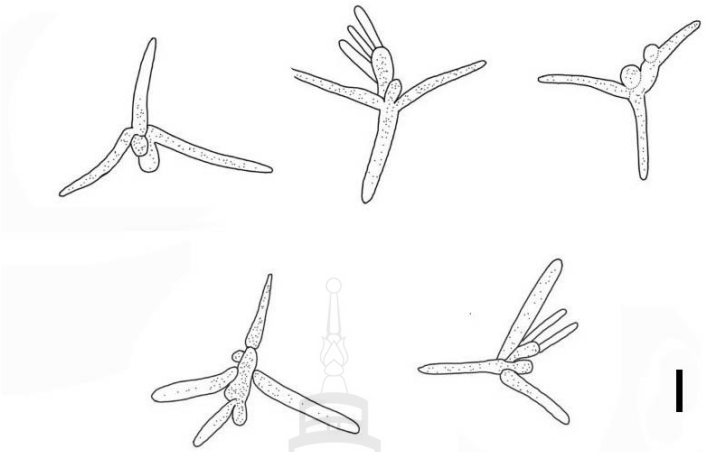
Index Fungorum number: IF243554; Facesoffungi number: FoF 18753

Description – see Anderson et al. (2020), Goh et al. (2022).

Material considered – Anderson et al. (2020), Goh et al. (2022).

Distribution, ecological and economical importance

Species of *Tetracladium* are important saprobes in freshwater ecosystems, decomposing submerged leaves and contributing to nutrient cycling. Beyond aquatic habitats, several species are widespread root endophytes that may enhance plant nutrient uptake and tolerance to environmental stress (Lazar et al., 2024). The genus has a cosmopolitan distribution, recorded from temperate streams, Arctic and alpine soils, glaciers, riparian zones, grasslands, and agricultural fields across Europe, North America, Asia, and New Zealand (Anderson et al., 2020; Lazar et al., 2024; Baerlocher & Kendrick, 2002). Its ability to thrive in both aquatic and terrestrial environments reflects a high degree of ecological plasticity.



Source Redrawn from Goh et al. (2022)

Note Conidia. Scale bars: 10 μm.

Figure 3.238 *Tetracladium marchalianum*

Tovariella Syd., Annls mycol. 28(1/2): 172 (1930)

Index Fungorum number: IF5507; Facesoffungi number: FoF 18754, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Tovariella is an obligate biotrophic fungus on living leaves. Sexual morph: see Sydow (1930). Asexual morph: Unknown.

Type species – *Tovariella pittieriana* Syd.

Notes – *Tovariella* was introduced by Sydow (1930) based on *T. pittieriana* from Venezuela. The genus is characterised by minute apothecia that originate beneath the epidermis of the host leaf, later becoming erumpent. Apothecia are associated with a distinct hypostroma, with numerous hypostromatic processes extending into the mesophyll. The hypostroma and excipulum are subhyaline to pale yellow-brown, with a microplectenchymatous textura. Asci are clavate, 8-spored. Ascospores are filiform-fusoid, multiseptate, and hyaline. Paraphyses are numerous, filiform, and branched. No molecular data are available for the genus. The type material was collected by H. Pittier on living leaves of *Psychotria riparia* (Palicoureae, Rubiaceae) in Colonia Tovar, Venezuela (syntype material, Sydow, 1930; Rossman, 1975).

Tovariella pittieriana Syd., Annls mycol. 28(1/2): 172 (1930)

Index Fungorum number: IF274663; Facesoffungi number: FoF 18755

Description – Sydow (1930).

Material considered – Sydow (1930).

Distribution, ecological and economical importance

Tovariella is known from tropical regions of the Neotropics. The type species, *T. pittieriana*, was described from Venezuela on leaves of *Psychotria riparia*. It is a leaf-parasitic fungus that develops within living host tissues, potentially affecting photosynthetic function of the infected leaves. The genus appears to be rare, with few subsequent collections or reports since its original description (Rossman, 1975).

Figure – No original illustration available.

Urceolella Boud., Bull. Soc. Mycol. France 1: 119 (1885)

Index Fungorum number: IF5683; Facesoffungi number: FoF 18756, 12 morphological species (Species Fungorum, 2025), 1 species with molecular data.

Saprobic on decaying herbaceous stems, fallen leaves, and rachises of ferns, contributing to litter decomposition in temperate forests. Sexual morph: Raschle (1977), Hosoya and Otani (1997). Asexual morph: Unknown.

Type species – *Urceolella crispula* (P. Karst.) Boud.

Notes – *Urceolella* was introduced by Boudier (1907) with *Urceolella crispula* as the type species. The genus is characterised by minute, sessile to substipitate apothecia with thin-walled, hyaline, non-septate, glassy hairs that are fragile and often dissolve or lose their refractive structure in KOH, a key diagnostic feature separating *Urceolella* from morphologically similar genera such as *Hyalopeziza* and *Unguicularia* (Raschle, 1977). The ectal excipulum is thin-walled, composed of *textura prismatica*, and the medullary excipulum consists of loosely arranged hyphae. Asci are cylindrical to clavate, eight-spored, with inamyloid to weakly amyloid apical rings. Ascospores are hyaline, smooth, ellipsoid to clavate, aseptate, and non-guttulate. Molecular markers available for this genus include LSU and ITS sequence data (Hosoya & Otani, 1997; Baral et al., 2009). The type species was originally described from Finland by Karsten as *Peziza crispula*, later transferred to *Urceolella* by Boudier; the original publication did not specify a specimen number or depository institution.

Urceolella crispula (P. Karst.) Boud., Hist. Class. Discom. Eur. (Paris): 130 (1907) Figure 3.239

Index Fungorum number: IF120257; Facesoffungi number: FoF 18757

Description –Raschle (1977), Hosoya and Otani (1997).

Material considered –Raschle (1977), Hosoya and Otani (1997).

Distribution, ecological and economical importance

Species of *Urceolella* are saprobic, decomposing plant debris such as dead leaves, herbaceous stems, and fern rachises, and forming part of the microfungal community involved in nutrient cycling in forest ecosystems. They are not known to be pathogenic or economically significant, with their primary value lying in ecological and taxonomic contexts (Raschle, 1977; Hosoya & Otani, 1997). The genus has a cosmopolitan but scattered distribution, reported from Europe (Finland, Switzerland, Germany), Asia (Japan), and North America, typically in moist, temperate forest habitats, with fruiting often occurring during autumn.



Source Redrawn from CEMAS (2014)

Note a Excipular cells. b Bent hairs. c Asci and Asci with IKI b. d Ascospore. Scale bars: a–d = 10 µm.

Figure 3.239 *Urceolella crispula*

Waltonia Saho, Trans. Mycol. Soc. Japan 11(1): 5 (1970)

Index Fungorum number: IF5761; Facesoffungi number: FoF 18758, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on dead or dying twigs. Sexual morph: Unknown. Asexual morph: see Saho and Takahashi (1970).

Type species – *Waltonia pinicola* Saho

Notes – *Waltonia* was introduced by Sahō (1968) with *W. pinicola* as the type species and formally described by Saho and Takahashi (1970). It is currently classified in the class Leotiomycetes, order Helotiales, but remains *incertae sedis* at the family level. The genus is characterised by sessile to shortly stipitate apothecia developing on branches of *Pinus* spp., with a dark outer layer and a well-developed hymenium. Asci are clavate, 8-spored, hyaline, containing ellipsoid to oblong, aseptate ascospores, while paraphyses are filiform and septate. The asexual morph, observed both in culture and in nature, produces stalked conidiophores bearing hyaline, one-celled conidia. *Waltonia* differs from morphologically similar genera such as *Pragmopora* in the morphology of conidiomata and conidia. No molecular data are currently available. The type species *W. pinicola* was collected on twigs of *Pinus strobus* in the University of Tokyo Hokkaido Forest on August 30, 1967, by H. Saho and I. Takahashi (holotype: TUFH-3968; isotype: TUFH-3971, deposited in the Mycological Herbarium, Tokyo University Forest in Hokkaido, Japan).

Waltonia pinicola Saho, Trans. Mycol. Soc. Japan 11(1): 6 (1970)

Index Fungorum number: IF325538; Facesoffungi number: FoF 18759

Description – Saho and Takahashi (1970).

Material considered – Saho and Takahashi (1970).

Distribution, ecological and economical importance

Waltonia is a saprobic genus found on dead or dying twigs of *Pinus* spp., contributing to the decomposition of woody material in coniferous forests. Although primarily saprobic, it has occasionally been associated with minor twig blight symptoms in *Pinus* plantations. The genus is only known from Japan, specifically from the University of Tokyo Hokkaido Forest, where it was recorded on *Pinus strobus*, *P. monticola*, and *P. resinosa*.

Figure – No original illustration available.

Woodiella Sacc. & P. Syd., in Sydow, Hedwigia 38(Beibl.): (133) (1899)

Index Fungorum number: IF5796; Facesoffungi number: FoF 18760, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on fallen leaves. Sexual morph: see Sydow (1899). Asexual morph: see Sydow (1899).

Type species – *Woodiella natalensis* Sacc. & P. Syd.

Notes – *Woodiella* was introduced by Saccardo and Sydow (1899) with *W. natalensis* as the type species, based on material collected in Durban, South Africa, on leaves of *Pavetta obovata*. It is characterised by a superficial, black, radiating stroma (subiculum) bearing applanate-disciform to subangulose ascomata. The excipulum is obsolete and lacks a distinct margin. Asci are elongate-clavate, eight-spored. Ascospores are ovate-oblong, one-septate, fuliginous, and smooth-walled. Paraphyses are abundant, forming a brown layer, with apices blue-tinged in KOH. The asexual morph produces similar fuliginous, ovate-oblong, aseptate conidia, occasionally in chains. Molecular data are currently unavailable for this genus. No specimen number or repository was indicated in the original description.

Woodiella natalensis Sacc. & P. Syd., in Sydow, Hedwigia 38(Beibl.): (133) (1899)

Index Fungorum number: IF141590; Facesoffungi number: FoF 18761

Description – Sydow (1899).

Material considered – Sydow (1899).

Distribution, ecological and economical importance

Woodiella is a saprobic genus that decomposes fallen leaves, contributing to nutrient cycling in forest floor ecosystems. It was originally described from subtropical coastal forest in Durban, South Africa, where it was found on leaves of *Pavetta obovata*. To date, the genus is only known from the type locality, and no subsequent collections have been confirmed.

Figure – No original illustration available.

Xeromedulla Korf & W.Y. Zhuang, Mycotaxon 30: 189 (1987)

Index Fungorum number: IF25215; Facesoffungi number: FoF 18762, 3 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on leaf blades of plants. Sexual morph: see Zhuang and Korf (1987). Asexual morph: Unknown.

Type species – *Xeromedulla leptospora* W.Y. Zhuang & Korf

Notes – *Xeromedulla* was introduced by Korf and Zhuang (1987) with *X. leptospora* as the type species, based on collections from Luzon, Philippines. The genus is characterised by small, discoid to flat, stipitate apothecia, pallid to light-colored when dry, turning white or yellow upon rehydration. The receptacle surface is

smooth, minutely downy, or slightly tomentose, often with short, hyaline, thin-walled, granulate, unicellular hyphal protrusions. The ectal excipulum is of *textura angularis*, with hyaline, thick- and glassy-walled cells, often gelatinised; the medullary excipulum consists of *textura intricata*, non-gelatinised, with loosely interwoven hyphae. Asci are subcylindrical to clavate, inoperculate, eight-spored, with apical pores J+ in Melzer's reagent after KOH pretreatment. Ascospores are filiform, hyaline, aseptate, and smooth. Paraphyses are filiform, with blunt or pointed apices. The genus has been reported only from tropical forest leaf litter in the Philippines, mainly on burseraceous hosts (Zhuang & Korf, 1987). Molecular data for *Xeromedulla* are currently unavailable. The holotype of *X. leptospora* is CUP-SA 952, with isotypes in Korf & Gruff's *Discomycetes Exsiccati*.

Xeromedulla leptospora W.Y. Zhuang & Korf, Mycotaxon 30: 190 (1987)

Index Fungorum number: IF132789; Facesoffungi number: FoF 18763

Description – Zhuang and Korf (1987).

Material considered – Zhuang and Korf (1987).

Distribution, ecological and economical importance

Xeromedulla leptospora is saprobic on leaf blades, contributing to decomposition and nutrient cycling in tropical forest ecosystems. Known from Luzon, Philippines, on burseraceous hosts (*Canarium* or *Santiria* spp.), it may have a wider but under-documented distribution in similar habitats.

Figure – No original illustration available.

Zugazaea Korf, Iturr. & Lizoň, in Iturriaga, Korf & Lizoň, Mycologia 90(4): 697 (1998)

Index Fungorum number: IF27899; Facesoffungi number: FoF 18764, 1 morphological species (Species Fungorum, 2025), 0 species with molecular data.

Saprobic on decorticated wood and stumps. Sexual morph: see Iturriaga et al (1998). Asexual morph: see unknown.

Type species – *Zugazaea agyrioides* Korf, Iturr. & Lizoň

Notes – *Zugazaea* was established by Iturriaga et al. (1998) to accommodate *Z. agyrioides*, a lignicolous species described from the Canary Islands. The genus is characterised by small (1–2 mm diam.), dull orange apothecia that are sessile, turbinate to discoid, and embedded in a gelatinous to resinous matrix. Apothecia often occur

gregariously, and in some cases young apothecia develop directly on older or collapsed ones. The ectal excipulum is of *textura intricata* to *porrecta*, containing abundant resinous crystalline deposits, while the medullary excipulum is of *textura intricata* in a gelatinous matrix. Asci are unitunicate, narrow-clavate, eight-spored, arising from croziers, with a thickened apex. Ascospores are fusoid, hyaline to yellowish, initially aseptate and biguttulate, becoming (1–)3(–5)-septate and multiguttulate at maturity, arranged uniseriately to partially biseriately. Paraphyses are filiform, septate, branched, yellowish, and exceed the asci to form an epithecium. Molecular sequence data are currently unavailable. The holotype of *Z. agyrioides* was collected by R.P. Korf on 25 August 1993 on a decorticated log (possibly *Eucalyptus*) between Las Raíces and Montaña del Dornajo, Tenerife, Canary Islands, Spain (CUP-MM 2844, holotype; TFC, isotype).

Zugazaea agyrioides Korf, Iturr. & Lizoň, in Iturriaga, Korf & Lizoň, Mycologia 90(4): 697 (1998) Figure 3.240

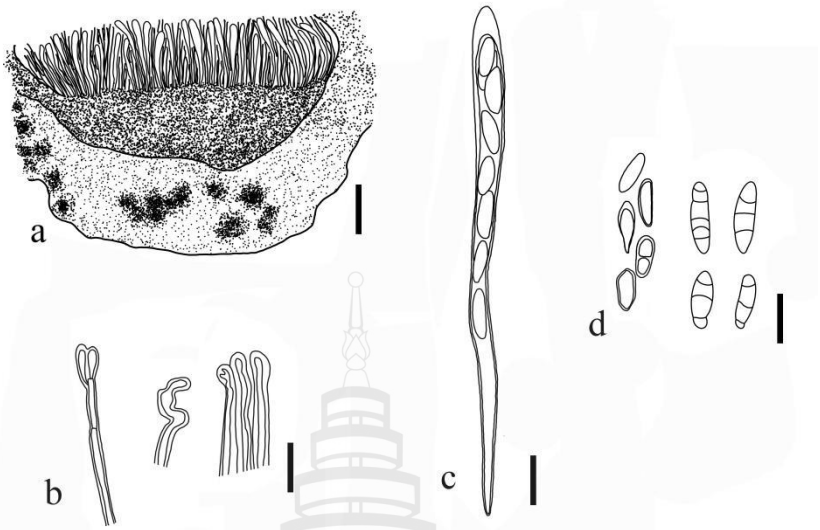
Index Fungorum number: IF445525; Facesoffungi number: FoF 18765

Description – Iturriaga et al. (1998).

Material considered – Iturriaga et al. (1998).

Distribution, ecological and economical importance

Zugazaea is saprobic on decorticated wood and stumps, contributing to lignocellulose decomposition. Its gelatinous-resinous matrix likely aids in moisture retention and structural protection in its lignicolous habitat. This genus is known only from the Canary Islands (Tenerife, Gomera, and Hierro) (Iturriaga et al., 1998).



Source Redrawn from Iturriaga et al. (1998)

Note a Longitudinal median section of marure apothecium. b Paraphysis. c Asci. d Ascospores. Scale bars: a = 100 µm, b–d = 10 µm.

Figure 3.240 *Zugazaea agyrioides*

3.3 Discussion

3.3.1 Research Background and General Overview

Building upon the historical context summarized in Chapter 1, this discussion synthesizes the morphological and molecular evidence generated in the present study to refine family- and genus-level concepts within Helotiales. Rather than reiterating general background, we emphasize how fresh collections from southwestern China and northern Thailand—analyzed using multilocus datasets (ITS, LSU, *RPB2*, *TEF1-α*, *β-tubulin*)—clarify the placement of problem genera, reveal cryptic diversity, and stabilize familial boundaries. A 15-gene framework for Leotiomycetes, with type-linked data where available (Johnston et al., 2019), served as a backbone against which our new data were tested, while recent multilocus studies informed the recognition and circumscription of several families (e.g., Patellariopsidaceae, Tricladiaceae).

Collectively, our results corroborate the monophyly of most major lineages within Helotiales, including Amicodiscaceae, Amorphothecaceae, Arachnopezizaceae, Cenangiaceae, Chlorociboriaceae, Dermateaceae, Discinellaceae, Drepanopezizaceae,

Erysiphaceae, Godroniaceae, Mitrulaceae, Neolauriomycetaceae, Patellariopsidaceae, Vandijckellaceae, and Vibrisseaceae, with strong statistical support (ML ≥ 90%, BPP ≥ 0.95). This congruence between micromorphological features (excipular architecture, hair morphology, amyloid apical rings) and multilocus topologies strengthens confidence in the circumscription of these families.

Conversely, *Hamatocanthoscyphaceae*, *Hyaloscyphaceae*, *Myxotrichaceae*, and *Tricladiaceae* exhibit polyphyly, with member genera scattered across multiple lineages. These non-monophyletic patterns suggest that further taxon sampling, particularly of type species, is needed to clarify familial limits.

Our analyses also refine generic placements, transferring *Clathrosphaerina* Beverw. to *Arachnopezizaceae* and *Didymascella* Maire & Sacc. to *Cenangiaceae*. These taxonomic adjustments resolve earlier ambiguities reported by Beverwijk (1951) and Maire and Saccardo (1919), thereby stabilizing the family-level framework.

Collectively, these results (i) confirm monophyly for key hair-bearing and dark-walled cup lineages when micromorphology is interpreted alongside sequence evidence; (ii) reduce phylogenetic uncertainty by providing defensible placements and narrowing competing hypotheses; and (iii) highlight priority targets for recollection and epitypification in subtropical and montane forests where Helotiales diversity remains concentrated. This integrated framework provides practical guidance for future taxonomic revisions and ecological investigations.

3.3.2 Morphological and Ecological Diversity of Different Families

3.3.2.1 Hairy Cup-like Forms — Amicodiscaceae, Arachnopezizaceae, and Hamatocanthoscyphaceae

Members of Amicodiscaceae bear minute discoid apothecia densely clothed in rigid hairs; the ectal excipulum typically comprises *textura angularis* to *textura prismatica*, with a looser medullary layer. Asci are mostly eight-spored, J(+) or occasionally J(–), and spore number can be reduced. Our multigene analyses (ITS, LSU, SSU, *TEF1-α*, *RPB2*; Figure 3.2) recovered *Amicodiscaceae* as a strongly supported monophyletic family (ML = 100%, BPP = 1.00), distinct from *Hyaloscyphaceae* and *Arachnopezizaceae* (Ekanayaka et al., 2019; Johnston et al., 2019).

Arachnopezizaceae is characterized by cupulate apothecia with conspicuous, often septate and rough-walled marginal hairs and an arachnoid subiculum. In our ITS

+ LSU phylogenetic tree (Figure 3.6), *Arachnopezizaceae* forms a robust, single monophyletic lineage (ML = 100%, BPP = 1.00), encompassing *Arachnopeziza*, *Eriopezia*, and *Thamnochortomyces*. The transfer of *Clathrosphaerina zalewskii* into this family is also supported (ML = 100%), consistent with its multiseptate hairs, *textura prismatica* excipulum, and unitunicate asci with croziers. These results corroborate previous multigene frameworks (Johnston et al., 2019; Kosonen et al., 2021) and confirm that *Arachnopezizaceae* represents a stable, morphologically coherent clade within Helotiales.

In contrast, *Hamatocanthoscyphaceae* exhibits polyphyly in our analyses (Figure 3.93). Species assigned to *Hamatocanthoscypha* are distributed in two separate clades, one clustering with *Xenopolyscytalum* (ML = 91%, BPP = 0.91) and another grouping near *Constrictochalara* and *Infundichalara* (ML = 89–95%). Other associated genera (*Cylindrochalara*, *Hyalodendriella*, *Stipitochalara*) form distinct, well-supported lineages (ML ≥ 95%), confirming that this family, as presently defined, is not monophyletic. Morphological convergence—particularly in hair surface texture, apothecial form, and cortical vacuolation—likely underlies the historical confusion among these lineages (Ekanayaka et al., 2019; Crous et al., 2023).

Take-home message: Our multilocus phylogenies (Figure 3.2, Figure 3.6, Figure 3.93) demonstrate that *Amicodiscaceae* and *Arachnopezizaceae* are cohesive, monophyletic lineages characterized by rigid to rough-walled hairs and distinct excipular structures, whereas *Hamatocanthoscyphaceae* comprises multiple independent clades united only by superficial hair morphology. Hair architecture (length, wall ornamentation, septation) and the amyloid reaction of asci, interpreted alongside phylogenetic data, provide reliable diagnostic markers for delimiting these "hairy-cup" fungi within Helotiales.

3.3.2.2 Dark-walled Cup Forms — Cenangiaceae, Dermateaceae, Godroniaceae, and Drepanopezizaceae

The dark-walled cup families of Helotiales are unified by the presence of thickened, pigmented ectal excipula and frequently exhibit pathogenic associations with woody hosts. Despite these shared features, they differ in apothecial architecture, host range, and ecological strategies.

Cenangiaceae typically forms small, dark brown to blackish apothecia that erupt through the host epidermis. The ectal excipulum is distinctly pigmented and thick-walled, often composed of prismatic cells. Our multilocus phylogenetic analyses (ITS + LSU; Figure 3.13) recovered *Cenangiaceae* as a well-supported monophyletic lineage (ML = 100%, BPP = 1.00) distinct from *Dermateaceae* and *Godroniaceae*, congruent with the results of Baral et al. (2014), Pärtel et al. (2017), and Perić et al. (2019, 2020). Within the family, *Cenangium*, *Encoelia*, *Neomelanconium*, and *Trochila* form stable subclades consistent with their excipular anatomy and substrate preference (Voglmayr et al., 2020; Gómez-Zapata et al., 2021). The inclusion of *Didymascella* as a sister lineage to the *Rhabdocline–Meria* clade (ML = 100%) extends the familial concept and indicates adaptive radiation toward conifer-associated niches (Perić et al., 2020; Johnston et al., 2019).

Dermateaceae is characterised by leathery to fleshy, dark-walled apothecia with a globose to angular ectal excipulum and a medullary layer of interwoven hyphae (Nauta & Spooner, 1999). Multigene phylogenetic analyses (ITS, LSU, *RPB2*, *TUB*; Figure 3.31) confirmed *Dermateaceae* as a strongly supported monophyletic group (ML = 100%, BPP = 1.00), clearly distinct from *Mollisiaceae* and *Rutstroemiaceae* (Ekanayaka et al., 2019; Iliushin & Kirtsideli, 2023; Gao et al., 2024). The family comprises several well-supported genera, including *Dermea*, *Pezicula*, *Neofabraea*, and *Phlyctema*, encompassing both saprobic and pathogenic species (Chen et al., 2016; Suija et al., 2020; Zheng & Zhuang, 2022). The *Pezicula–Neofabraea* complex forms the core lineage responsible for fruit- and leaf-rot diseases in *Rosaceae*, whereas *Dermea* and *Rhizodermea* occupy basal positions, indicating an evolutionary shift from bark saprobes to host-specific pathogens (Aguilar et al., 2018; Gao et al., 2024).

Godroniaceae forms a distinct clade (ITS + LSU; Figure 3.88) with maximum support (ML = 100%, BPP = 1.00) and includes the genera *Godronia*, *Grovesiella*, and *Gremmeniella* (Baral, 2015; Johnston et al., 2019). The type genus *Godronia* comprises necrotrophic pathogens of ericaceous hosts, while *Gremmeniella* and *Grovesiella* represent a derived conifer-associated lineage (ML = 100%, BPP = 1.00) (EFSA, 2017; Mirzwa-Mróz et al., 2023). These genera are morphologically united by pigmented *textura prismatica* excipula, amyloid or inamyloid asci, and filiform paraphyses (Baral, 2015). *Gremmeniella abietina* remains one of the most

destructive forest pathogens in boreal ecosystems, confirming the ecological importance of this family in conifer disease complexes (EFSA, 2017; Johnston et al., 2019).

Drepanopezizaceae is composed of hemibiotrophic foliar pathogens that infect leaves of *Rosaceae* and related families (Johnston et al., 2019). Phylogenetic analyses (ITS + LSU; Figure 3.61) confirmed the family as a robust monophyletic lineage (ML = 100%, BPP = 1.00), comprising *Diplocarpon*, *Drepanopeziza*, *Pseudopeziza*, *Blumeriella*, *Thedgonia*, and *Filosporella* (Rossman et al., 2018; Khodadadi et al., 2022; Yang et al., 2024). The *Diplocarpon–Drepanopeziza* complex includes several agronomically important species such as *D. coronariae* (Marssonina apple blotch) and *D. rosae* (rose black spot), while *Blumeriella hiemalis* and *B. kerriae* form a distinct clade associated with *Prunus* and *Kerria* (Yang et al., 2024). These results indicate diversification of *Marssonina*-type leaf-spot pathogens within Helotiales and clarify the evolutionary basis of teleomorph–anamorph connections (Johnston et al., 2019; Zhu et al., 2023).

Take-home message: Integrating morphological characters—particularly the structure of dark-walled ectal excipula, ascospore septation, and apothecial pigmentation—with multilocus phylogenetic evidence (Figures 3.13, 3.31, 3.88, 3.61; Johnston et al., 2019; Ekanayaka et al., 2019; Yang et al., 2024)—provides a robust framework for circumscribing the dark-walled cup families of Helotiales. Phylogenetic analyses confirm that *Cenangiaceae*, *Dermateaceae*, *Godroniaceae*, and *Drepanopezizaceae* each represent well-supported, monophyletic lineages that differ in host specificity and ecological adaptation. Collectively, they illustrate the evolutionary spectrum of dark-walled Helotiales—ranging from saprobic decomposers (*Dermateaceae*) to wood- and leaf-infecting pathogens (*Godroniaceae* and *Drepanopezizaceae*)—reflecting convergent evolution toward melanised tissues and host-adapted pathogenic lifestyles in temperate ecosystems.

3.3.2.3 Brightly Pigmented and Aquatic Cups Cups — Chlorociboriaceae, Mitrulaceae, and Vibrisseaceae

The brightly pigmented and aquatic cup families of Helotiales illustrate striking morphological and ecological adaptations. They are unified by vividly colored

apothecia and ecological specialization to wood or freshwater habitats, but differ in pigment chemistry, fruiting morphology, and spore architecture.

Chlorociboriaceae is well known for its vivid pigmentation. *Chlorociboria* produces bright green to blue-green apothecia on decaying wood due to the naphthoquinone pigment xylindein, a compound historically prized in marquetry and intarsia (Blanchette et al., 1992). The recently established genus *Brahmaculus*, characterised by bright yellow to orange, often branched apothecia and lacking xylindein, nonetheless clusters within the family, thereby broadening its morphological and ecological diversity (Johnston et al., 2021). In the phylogenetic tree based on ITS sequences (Figure 3.27), *Chlorociboriaceae* forms a well-supported monophyletic clade (ML = 100%, BPP = 1.00) within Helotiales. *Chlorociboria* and *Brahmaculus* are recovered as distinct sister lineages, indicating an evolutionary transition from xylindein-producing wood decomposers to non-xylindein litter-inhabiting taxa. In the broader Helotiales phylogeny (Figure 3.178), *Chlorociboriaceae* occupies a basal, early-diverging position, near *Pezizellaceae* and *Helotiaceae*, consistent with multigene analyses (Ekanayaka et al., 2019; Johnston et al., 2019, 2021).

Mitrulaceae (represented by *Mitrula*) comprises aquatic fungi with conspicuous yellow-to-orange, clavate apothecia bearing amyloid apical rings. Species typically inhabit shallow streams, seeps, and wetlands. Integrative studies combining culture, morphology, and multigene analyses (Wang et al., 2005; Cho et al., 2022) have clarified their life history, species boundaries, and phylogenetic placement, confirming *Mitrulaceae* as a distinct lineage within Helotiales. In the multigene tree based on ITS and LSU sequences (Figure 3.134), all *Mitrula* species cluster together with strong support (ML = 100%, BPP = 1.00), confirming the monophyly of *Mitrulaceae*. In the comprehensive Helotiales phylogeny (Figure 3.178), the family forms a sister relationship with Hydrocinaceae and Godroniaceae, suggesting a shared evolutionary origin among aquatic, brightly coloured cup fungi. These findings expand the understanding of the family beyond earlier morphological classifications based solely on *M. paludosa* and related taxa (Wang et al., 2005).

Vibrisseaceae extends pigment diversity into aquatic habitats, including genera such as *Vibrissea*, *Chlorovibrissea*, and *Leucovibrissea*. These fungi bear vividly coloured apothecia with filiform, multiseptate ascospores, colonising

submerged wood and water-saturated substrates and playing a critical role in freshwater decomposition. New discoveries, such as *Chlorovibrissea chilensis* from Chile (Sandoval-Leiva et al., 2014) and additional Chinese taxa (Zheng & Zhuang, 2017), refined generic concepts and extended the known biogeographic range of the family. Our combined ITS–LSU phylogeny (Figure 3.177) reveals that *Vibrisseaceae* forms two subclades: the *Vibrissea* group and the *Chlorovibrissea* group, separated by *Otrocera* and *Amorphotheca*. This topology suggests that *Vibrisseaceae* sensu lato may be polyphyletic, as also indicated in the full Helotiales tree (Figure 3.178), where *Vibrisseaceae* appears in two distant positions, separated by *Amorphothecaceae*. Nonetheless, both subclades share similar morphology (long-stipitate apothecia, filiform spores, aquatic habit) and can be provisionally retained in the same family pending additional gene sampling (Ekanayaka et al., 2019; Karunarathna et al., 2020).

Take-home message: Pigment chemistry, aquatic fruiting morphologies, and spore adaptations represent convergent strategies for colonisation of wood and freshwater substrates across Helotiales. *Chlorociboriaceae* shows pigment-driven diversification in wood-decomposing lineages; *Mitrulaceae* represents aquatic cup fungi with vivid hymenia and stable monophyly; *Vibrisseaceae* displays parallel aquatic evolution and partial polyphyly.

Multilocus phylogenies corroborate the distinctiveness of these families, underscoring their ecological and evolutionary innovation within Helotiales.

3.3.2.4 Cleistothecial, Gymnothecial, and Asexual Lineages — Amorphothecaceae, Myxotrichaceae, Vandijckellaceae, and Neolauriomycetaceae

Several families within Helotiales deviate from the typical cupulate apothecia, producing closed or gymnothecial fruiting bodies, or existing solely as asexual lineages. These families highlight both the morphological plasticity and evolutionary reduction in the order, reflecting multiple transitions from open apothecia to closed or simplified reproductive structures.

Amorphothecaceae, typified by *Amorphotheca resinae* (the sexual morph of the “kerosene fungus”), comprises closed, cleistothecial ascomata with inoperculate asci and a *Cladosporium*-like anamorph. The asci are unitunicate and evanescent, containing eight unicellular, hyaline to brown, thick-walled ascospores. The conidial morph, known as *Hormoconis resinae*, produces pigmented, verrucose conidiophores

bearing acropetally developing chains of ameroconidia. Phylogenetic analyses based on ITS data (Figure 3.136) recovered *Amorphotheca resinae* isolates as a well-supported monophyletic clade (MLBP = 77%, BPP = 1.00), clearly separated from *Myxotrichum* and *Oidiodendron*. Within the broader Helotiales phylogeny (Figure 3.178), *Amorphothecaceae* forms a distinct lineage closely allied to *Myxotrichaceae* and *Neolauriomycetaceae*, representing the cleistothecial–gymnothecial evolutionary complex of the order. Ecologically, *A. resinae* is a well-known hydrocarbon-degrading fungus, colonising petroleum-based fuels and contaminated soils (Parbery, 1969; Seifert et al., 2007). Genomic and transcriptomic studies have revealed pathways for furfural and hydroxymethylfurfural degradation, underscoring its importance in biodecotification and industrial microbiology (Wang et al., 2015; Yi et al., 2019; Krohn et al., 2021).

Myxotrichaceae comprises fungi with gymnothecia composed of reticulate hyphae and dark setae, producing ascomata that often contain evanescent asci and striate, fusiform ascospores. Asexual morphs, classified in *Oidiodendron*, form arthroconidial chains, and several species establish ericoid mycorrhizal associations with *Ericaceae* (Dalpé, 1989). Multigene phylogenetic analyses (ITS, LSU, *RPB2*, and MCM7; Figure 3.136) confirmed the monophyly of *Myxotrichaceae*, with two principal clades: a *Myxotrichum* lineage (*M. chartarum, M. setosum, M. limonium*) and an *Oidiodendron* lineage (*O. maius, O. mellicola, O. atrovirens*) (Okubo et al., 2025). These results support the family's independent placement within Helotiales (Hambleton et al., 1998; Wang et al., 2006). Ecologically, members inhabit forest soils, peat bogs, and acidic substrates, with several taxa adapted to boreal, alpine, or xeric conditions. Some species exhibit symbiotic associations with ericaceous roots, linking the family to both saprobic and mycorrhizal life strategies.

Vandijckellaceae, typified by *Vandijckella johannae*, represents a distinct hyphomycetous lineage producing long-necked, flask-shaped phialides that generate chains of hyaline, thin-walled conidia. Colonies are buff to ochreous, radially folded, with abundant aerial mycelium aggregated into hyphal ropes. The sexual morph remains unknown. Phylogenetic analyses based on combined ITS and LSU sequences (Figure 3.173) confirmed *Vandijckellaceae* as a strongly supported monophyletic clade (MLBP = 99%, BPP = 1.00) within Helotiales. The family forms an isolated lineage

distinct from *Helotiaceae* and *Myxotrichaceae*, belonging to the asexual-reduced morph assemblage of Helotiales. Species are saprobic on soil and decomposing organic matter, with no confirmed host association (Sandoval-Denis et al., 2017). These morphological reductions and asexual strategies suggest secondary loss of apothecial morphs, representing adaptive simplification within the order.

Neolauriomycetaceae accommodates exclusively asexual chalara-like genera, including *Neolauriomyces*, *Exochalara*, *Lareunionomyces*, and *Minichalara*. These fungi possess phialidic conidiogenous cells with a basal venter and elongate cylindrical collarette, producing hyaline, aseptate, obclavate conidia extruded in slimy heads. No sexual morphs have been observed. Multigene analyses (ITS–LSU, Figure 3.140) recovered *Neolauriomycetaceae* as a robust monophyletic clade (MLBP = 100%, BPP = 1.00), forming a sister relationship to *Amorphothecaceae* within Helotiales. The family represents an advanced asexual derivative lineage, showing convergent evolution toward morphological reduction.

Ecologically, its species are saprobes on decaying leaves, twigs, and woody litter, particularly from *Eucalyptus* and other tropical–subtropical trees (Crous et al., 2018; Wu & Diao, 2023). They contribute to nutrient cycling in forest litter and illustrate a transitional step in the evolution from phialidic conidiation to cleistothecial reproductive modes.

Take-home message: The coexistence of cleistothecial, gymnothecial, and purely asexual lineages in Helotiales underscores the remarkable morphological and reproductive plasticity of this order. Phylogenetic evidence suggests repeated evolutionary reductions from apothecial to closed or phialidic forms, often correlated with adaptation to extreme or low-nutrient habitats. DNA-based analyses continue to refine the taxonomic boundaries of these families, linking sexual and asexual morphs, and revealing the hidden evolutionary diversity within Helotiales.

3.3.2.5 Other Distinct Families — Hyaloscyphaceae, Patellariopsidaceae, Tricladiaceae, Discinellaceae, and Erysiphaceae

Beyond the better-known hairy-cup and dark-walled lineages, several additional families illustrate the morphological and ecological extremes of Helotiales — from convergent minute hairy cups to aquatic specialization and obligate biotrophy.

Hyaloscyphaceae historically served as a catch-all for small, hairy cup fungi. Members typically produce discoid apothecia with conspicuous marginal hairs or nodose setae and asci with iodine-reactive apical rings. However, rDNA and multilocus phylogenies revealed that these features have evolved repeatedly, confirming the polyphyly of Hyaloscyphaceae sensu lato. As a result, numerous taxa have been reassigned to other lineages such as Lachnaceae and Chaetomellaceae (Wang et al., 2006; Han et al., 2014).

Patellariopsidaceae is characterized by sessile, dark-brown, discoid apothecia with amyloid apical structures and multiseptate ascospores. Its asexual morphs produce distinctive palmate conidia. Combined-gene phylogenies consistently support its recognition at family rank, underscoring the importance of integrating sexual and asexual morph characters in taxonomic revisions (Karunarathna et al., 2020).

Tricladiaceae comprises aquatic hyphomycetes specialized for freshwater habitats. They produce branched, sigmoid, or helical conidia that enhance attachment to submerged substrates, while sexual morphs are small, glabrous, or sparsely hairy apothecia. Multigene phylogenetic analyses recovered a monophyletic clade containing *Tricladium* and related genera, justifying its recognition as a distinct family (Johnston et al., 2020). These fungi exemplify ecological specialization and morphological convergence in aquatic systems.

Discinellaceae is distinguished by gelatinous to leathery apothecia and a prismatic ectal excipulum. Species typically inhabit humid or semi-aquatic microhabitats, where their structural adaptations may enhance survival under fluctuating moisture regimes. Classical monographs (Baral & Krieglsteiner, 1985) and subsequent molecular phylogenies confirmed its placement as an independent lineage within Helotiales.

Erysiphaceae (powdery mildews) represents the only obligate biotrophic family within Helotiales. Members form superficial mycelia on living plants and closed chasmothecia, whose appendage morphologies remain essential for generic delimitation. Recent advances in genomics and effector biology have greatly improved understanding of host–pathogen interactions, with significant implications for sustainable crop protection (Bradshaw et al., 2023).

Take-home message: From minute hairy cups to obligate biotrophic powdery mildews, these families exemplify the evolutionary breadth of Helotiales. Their stable delimitation requires integration of ascocarp and excipulum architecture, ascus traits, ecological strategies (aquatic versus terrestrial), and multilocus phylogenetic frameworks, ensuring a natural classification across diverse ecological contexts.

3.3.2.6 Genera *Incertae Sedis*— Unplaced Lineages in Helotiales

Genera with uncertain placement (*incertae sedis*) remain one of the most challenging components in Helotiales, accounting for nearly one quarter of described genera. Their unresolved status reflects both the repeated evolution of convergent traits and the scarcity of molecular data, thereby impeding efforts to establish a stable familial framework (Johnston et al., 2019; Baral, 2016; Hyde et al., 2020; Wijayawardene et al., 2022).

Morphology. *Incertae sedis* genera usually produce minute apothecia (< 2 mm in diameter), which may be cupulate, discoid, or turbinate, and are sessile or short-stipitate. Hymenial pigmentation ranges from pale to brightly colored. Examples include *Phragmocalloria*, with yellow–orange apothecia; *Kukwaea pubescens*, forming brown cups with greyish hairs; and *Aquapoterium pinicola*, with whitish discs. The ectal excipulum is generally composed of *textura intricata* or *textura prismatica*; in *Aquapoterium* it is reduced to a thin layer of parallel hyaline cells. Marginal hairs are sparse and simple, paraphyses are present but undifferentiated, and asci are unitunicate, thin-walled, and usually inamyloid, containing four to eight ascospores. Spores range from aseptate and hyaline (*Kukwaea*) to multiseptate and filiform (*Phragmocalloria*), often multiguttulate. Asexual morphs remain largely undocumented.

Phylogeny. Phylogenetic relationships among Helotiales *incertae sedis* genera remain poorly resolved due to both incomplete taxon sampling and limited multigene data. Several families and genera within Helotiales still appear paraphyletic or weakly supported in current phylogenetic frameworks (Johnston et al., 2019; Baral, 2016). Most *incertae sedis* taxa are represented only by ITS or LSU sequences, which provide insufficient resolution for higher-level relationships. Consequently, these genera frequently emerge as isolated branches or unresolved clades within Helotiales trees. Furthermore, homoplasy in key diagnostic characters—such as hair

ornamentation, ascus amyloidity, and ascospore septation—has evolved repeatedly in unrelated lineages, obscuring morphological signals of affinity. The absence of protein-coding loci (e.g. *RPB2*, *TEF1-α*, *β-tubulin*) for most taxa prevents robust multigene analyses and hinders accurate familial assignment. As a result, Helotiales *incertae sedis* represents a heterogeneous assemblage of morphologically convergent but phylogenetically distinct lineages, awaiting reclassification through expanded sampling and integrative taxonomy.

Representative genera. *Kukwaea pubescens*, a lichenicolous fungus on *Cetraria islandica*, superficially resembles Hyaloscyphaceae, but molecular data exclude it from that family (Zhurbenko & Kukwa, 2010). *Aquapoterium pinicola*, collected from submerged pine needles in Florida, exhibits distinctive excipular anatomy and gelatinous-sheathed spores but lacks affinity with any established family (Shearer & Crane, 1971). *Phragmocalloria*, with multiseptate filiform spores and inamyloid asci, remains unresolved despite available ITS and LSU data (Baral, 2016). In some cases, *incertae sedis* status has proven temporary; for instance, *Fulvoflamma* was subsequently assigned to a defined family once multigene data became available (Johnston et al., 2019). Together, these examples underscore the heterogeneity of incertae sedis taxa, spanning lichenicolous, aquatic, and saprobic lifestyles, yet united by insufficient phylogenetic resolution.

Comparisons. Hyaloscyphaceae typically bears conspicuous marginal hairs and hyaline aseptate spores; Mollisiaceae produces pigmented excipula of *textura globulosa*; and Helotiaceae often forms stromatic bases or fleshy apothecia. By contrast, incertae sedis genera overlap partially with these traits but lack the full suite of diagnostic features required for confident familial assignment.

Future perspectives. The persistence of *incertae sedis* taxa stems from: (i) insufficient molecular data, particularly multilocus and genome-scale datasets; (ii) morphological convergence leading to homoplasy; (iii) deterioration of type specimens hindering DNA recovery; and (iv) limited ecological sampling. Resolving these lineages requires recollection from type localities, epitypification, and sequencing of multiple loci (e.g., *RPB1*, *RPB2*, *TEF1-α*). Genome-scale phylogenetics and environmental metabarcoding will be crucial to reduce the proportion of unplaced genera and clarify evolutionary relationships within Helotiales.

Take-home message. *Incertae sedis* taxa highlight the limitations of morphology alone for systematics in Helotiales. Fresh recollections and integrated multilocus sequencing will be decisive for resolving their placement. Genome-scale approaches promise to greatly reduce the number of unplaced lineages and reveal hidden evolutionary diversity across the order.

3.3.2.7 Newly Collected Helotiales— Morphological, Phylogenetic, and Ecological Insights

Recent collections from southwestern China and northern Thailand substantially enrich the morphological, phylogenetic, and ecological framework of Helotiales. These discoveries refine generic boundaries, document sexual morphs for poorly known lineages, and highlight subtropical and montane forests as key reservoirs of diversity.

Morphological and Phylogenetic Characteristics

Fresh specimens revealed several noteworthy taxa. In *Dicephalospora*, *D. tengyueica* and *D. rufocornea* show clear diagnostic variation in pigmentation and spore size, distinguishing them from closely related congeners. *Hymenoscyphus kunmingensis*, although superficially similar to *H. microserotinus*, is confirmed by molecular analyses as an independent lineage. *Erioscyphella xizangensis* and *Proliferodiscus foliicola* are consistently resolved as well-supported clades, corroborating their distinct morphology. Within *Rodwayella*, *R. xishuangbannaensis* and *R. lignicola* diverge sharply from *R. sessilis* in apothecial architecture and ascospore septation, with robust bootstrap support (≥95%) validating their status as separate taxa. The genus *Bloxamia* is particularly significant, as sexual morphs are recorded for the first time in *B. elegans*, *B. discedens*, *B. elongata*, and *B. leucophthalma*, offering critical insights into its taxonomy and life cycle. In pigment-producing groups, *Chlorociboria daliensis* (Laojun Mountain, 3823 m) and *C. poutoensis* (Xishuangbanna, 1755 m) extend the known distribution of the genus in China, with multiguttulate ascospores and phylogenetic affinities confirmed by type-derived sequences. Additional new material includes *Crumenulopsis laojunshanensis*, a novel species producing minute yellowish to ochraceous apothecia and forming a distinct molecular lineage apart from *C. sororia*, and *Chlorencoelia torta*, whose distinctive grey to

purplish-black apothecia align with reference strains from North America and New Zealand.

Geographic Distribution and Ecology

The newly collected taxa span altitudes of 500–4000 m and habitats ranging from lowland evergreen forests to alpine mixed conifer–broadleaf systems. Ecological preferences illustrate fine-scale niche partitioning: *Dicephalospora* and *Hymenoscyphus* occur primarily on decayed wood or soil; *Proliferodiscus* and *Nagrajchalara* colonize fallen leaves and litter; *Rodwayella* and *Bloxamia* associate with twigs and woody substrates; *Chlorociboria* is distinguished by its blue-green apothecia and role in wood decomposition; and *Crumenulopsis* and *Chlorencoelia* are restricted to bark and decayed branches at higher elevations. These observations emphasize the ecological plasticity of Helotiales and suggest that Asian subtropical and montane forests function as hotspots of diversity, where habitat heterogeneity fosters specialization and diversification.

Taxonomic Significance and Future Prospects

These discoveries include the description of new taxa (*Crumenulopsis laojunshanensis*, *Erioscyphella xiangensis*, *Rodwayella rishuangbamensis*, *Proliferodiscus follicola*, *Chlorociboria daliensis* and *C. poutoensis*) and several documentation of sexual morphs. Together, these findings substantially expand the morphological and molecular framework of Helotiales by establishing new lineages and confirming family-level affinities through multi-locus phylogenies (ITS, LSU, *RPB2*, *TEF1-α*). Several genera (*Chlorociboria*, *Crumenulopsis*, *Chlorencoelia*) were recorded from new localities in China and northern Thailand, thereby extending their known geographic ranges and revealing unexpected diversity in montane ecosystems. The integration of type-linked molecular data and detailed morphological observations has stabilized generic concepts and clarified long-standing taxonomic ambiguities. The recognition of *Crumenulopsis laojunshanensis* as a novel, bark-inhabiting lineage from high-elevation forests exemplifies the taxonomic and ecological value of fresh collections, particularly in resolving previously obscure relationships within Helotiales. These results collectively emphasize that subtropical and montane forests of Asia represent critical centers of diversification, where habitat heterogeneity promotes speciation and morphological adaptation. Future research should adopt an integrative,

genome-scale phylogenetic approach, combining morphology, ecology, and multi-gene datasets to refine the classification of unresolved lineages, especially those currently assigned to *incertae sedis*. Targeted sampling in underexplored regions will continue to uncover cryptic diversity and clarify evolutionary processes driving the diversification of Helotiales.

Take-home message. The newly collected taxa from southwestern China and northern Thailand demonstrate that subtropical and montane forests of Asia serve as global hotspots of Helotiales diversity. The discovery of new species, new sexual morphs, and novel type-linked sequences decisively advances the taxonomic resolution of the order. Ecological heterogeneity across these regions likely acts as a major driver of speciation and adaptive diversification in Helotiales.

3.3.3 Summary of Main Findings in This Monograph

This monograph provides an updated synthesis of Helotiales diversity, integrating morphology, phylogeny, ecology, and applied perspectives. The main findings can be summarized as follows:

3.3.3.1 Morphological diversity and ecological adaptations

Helotiales demonstrates extraordinary morphological heterogeneity, spanning minute hairy cups, thick-walled dark apothecia, closed cleistothecia, gelatinous discs, and vividly pigmented aquatic forms. These morphological innovations correspond to distinct ecological strategies, including saprobic decomposition, plant pathogenicity, endophytism, aquatic specialization, and obligate biotrophy. For example, pigment production in Chlorociboriaceae and Vibrisseaceae (e.g., xylindein) is associated with wood colonization and may serve as an ecological signal, while the development of closed fruiting bodies in Myxotrichaceae and clavate apothecia in Mitrulaceae reflects adaptation to nutrient-poor soils and aquatic environments.

Take-home message: Morphological innovations in Helotiales underpin adaptive radiation, enabling colonization of substrates ranging from decayed wood and leaf litter to aquatic systems and living plant tissues.

3.3.3.2 Phylogenetic refinements and family delimitations

Multigene datasets (ITS, LSU, *RPB2*, *TEF1-α*, *β-tubulin*), particularly when anchored by type-derived sequences, have clarified the circumscription of historically

heterogeneous families such as Hyaloscyphaceae and Dermateaceae. They confirm the monophyly of newly recognized families (Patellariopsidaceae, Tricladiaceae, Vandijckellaceae, Neolauriomycetaceae) and provide robust support for Amicodiscaceae and Arachnopezizaceae. Importantly, purely asexual lineages (e.g., Neolauriomycetaceae) can now be reliably placed within the order using DNA evidence, revealing hidden diversity that morphology alone could not detect.

Take-home message: A congruent framework integrating morphology and multilocus phylogenies now provides unprecedented stability for family-level taxonomy in Helotiales.

3.3.3.3 Asian mountains as centers of diversification

Fieldwork in southwestern China and northern Thailand yielded numerous new taxa and records (e.g., *Nagrajchalara laojunshanensis*, *Dicephalospora tengyueica*, sexual morphs of *Bloxamia*), occurring across habitats from evergreen lowlands to alpine meadows above 3,500 m. These findings confirm that Asian montane ecosystems are hotspots of Helotiales diversity. Geographic isolation, fine-scale microhabitat heterogeneity, and ecological specialization appear to act as powerful engines of speciation in these regions (Hosoya et al., 2021).

Take-home message: Subtropical and montane forests of Asia are not only regional reservoirs but also global centers of diversification for Helotiales.

3.3.3.4 Applied potential and future perspectives

Beyond taxonomy, Helotiales fungi hold significant ecological and applied value. Pigment-producing taxa such as *Chlorociboria* (xylindein) have potential in woodcraft and material sciences; pathogenic lineages in Erysiphaceae remain major threats to global agriculture; aquatic taxa such as *Mitrula* contribute to organic matter turnover in freshwater ecosystems; and asexual families with actinomycete-like morphologies may influence soil nutrient cycling. Despite these broad functions, systematic exploration of functional traits and biotechnological potential remains limited. Future research should move beyond taxonomy to integrate ecology, chemistry, functional genomics, and applied sciences, ensuring that the ecological services and economic potential of Helotiales are systematically assessed.

Take-home message: The applied potential of Helotiales is considerable but underexplored; cross-disciplinary research will be crucial to translate taxonomic advances into ecological and economic applications.

3.3.4 Research Limitations and Future Perspectives

While this monograph advances our understanding of Helotiales, several limitations constrain the robustness of current taxonomic and ecological conclusions. Addressing these gaps will be essential for future studies to build a more stable and comprehensive framework.

3.3.4.1 Gaps in Molecular Data

Although this study integrates extensive ITS and LSU datasets, many species still lack critical protein-coding loci (e.g., *RPB2*, *TEF1-α*, *β-tubulin*). The scarcity of such markers continues to hinder robust resolution of backbone phylogenies and weakens tests of family delimitations. Expanding multi-gene datasets and incorporating type-derived sequences will be decisive for stabilizing higher-level concepts. In addition, the application of high-throughput sequencing (HTS), genome skimming, and phylogenomic approaches should be prioritized to overcome the limitations of single- or few-locus analyses.

Take-home message: Future taxonomic stability requires broader integration of protein-coding loci and genome-scale datasets.

3.3.4.2 Linking Sexual and Asexual Morphs

The persistent disjunction between sexual and asexual morphs remains a major challenge in Helotiales. In many groups, asexual morphs cannot yet be reliably linked to their sexual counterparts, complicating species delimitation and obscuring life history strategies. Culture experiments, single-spore isolations, and fruiting-body induction often yield low success rates, reflecting significant technical bottlenecks. Future opportunities lie in combining culture-based work with molecular validation, genomic comparisons, and environmental sequencing (e.g., metabarcoding) to achieve more reliable connections.

Take-home message: Bridging sexual and asexual morphs will be decisive for robust species delimitation and for clarifying life cycles in Helotiales.

3.3.4.3 Re-evaluation of Type Material

Many genera and species continue to rely on outdated or incomplete type descriptions, often lacking DNA evidence. Re-collecting type species and producing modern integrated descriptions that combine morphology and molecular data are essential for stabilizing generic and familial concepts. However, practical challenges include locating accession numbers, dealing with fragile or aged specimens, restrictions on destructive sampling, and cases where taxa exist only as names without valid descriptions. Advances in specimen digitization, non-destructive DNA extraction, and target enrichment techniques offer promising solutions to overcome these obstacles.

Take-home message: Revisiting type material with integrated morphological and molecular tools is essential for stabilizing generic and familial concepts in Helotiales.

3.3.4.4 Ecological and Functional Knowledge Gaps

Despite significant progress in taxonomy, the ecological roles and functional traits of Helotiales remain poorly understood. Their contributions to wood decomposition, plant pathogenicity, mycorrhizal symbiosis, and secondary metabolite production are still largely unexplored. Defining functional guilds and linking taxonomy with ecological data would greatly improve our understanding of their roles in ecosystems. Future studies should integrate ecological fieldwork, precise host association data, and functional genomics or metabolomics to illuminate the ecological and biotechnological significance of Helotiales.

Take-home message: Expanding ecological and functional studies will be critical to unlocking both the ecosystem services and applied potential of Helotiales.

CHAPTER 4

CONCLUSIONS

4.1 Overall Conclusion

This study presents the first comprehensive monographic treatment of Helotiales, integrating morphological observations, type re-examinations, and multigene phylogenetic analyses (ITS, LSU, *RPB2*, *TEF1-α*, and *β-tubulin*). The combined datasets generated from extensive fresh collections in southwestern China and northern Thailand, together with historical herbarium materials, have greatly improved the taxonomic clarity and phylogenetic framework of the order.

A total of 22 families and 231 genera were documented, including 22 newly described species and 18 new records supported by multi-gene phylogenies and detailed morphological analyses. Updated morphological descriptions were provided for **13 species** with specimens preserved in international herbaria, and detailed taxonomic notes were compiled for 19 families and 231 genera, including 94 genera formerly treated as incertae sedis. Newly generated DNA sequence data from all examined fresh collections have been deposited in GenBank, substantially expanding the molecular database available for Helotiales.

Phylogenetic analyses confirm that families such as Amorphothecaceae, Myxotrichaceae, Vandijckellaceae, and Neolauriomycetaceae represent distinct and well-supported lineages within Helotiales. Multiple genera previously assigned as *incertae sedis* have been reclassified into appropriate families, contributing to a more stable and natural system. These results also demonstrate repeated transitions between sexual and asexual morphs and highlight extensive morphological convergence within the order, reflecting its ecological adaptability across aquatic, terrestrial, and endophytic niches.

Geographically, new collections from Yunnan (southwestern China) and northern Thailand extend the known distribution of several genera (*Chlorociboria*, *Crumenulopsis*, *Chlorencoelia*, *Rodwayella*, and *Bloxamia*), revealing Asian montane

forests as biodiversity hotspots and key centers of diversification for Helotiales. The unique karst landscapes and humid montane climates of these regions appear to promote lineage radiation and morphological innovation within the order.

Overall, this monograph provides an updated and integrative framework for Helotiales, refining familial and generic boundaries, stabilizing taxonomic concepts, and enhancing the global molecular and morphological dataset. It establishes a solid foundation for future systematic, ecological, and evolutionary studies on Leotiomycetes, exemplifying how integrative taxonomy can bridge classical morphology and modern phylogenomics to advance fungal systematics.

4.2 Research Advantages

4.2.1 Overview

As the first comprehensive Helotiales monograph, this study establishes a rigorous and reproducible polyphasic framework that integrates morphology, phylogeny, and ecology. Compared with fragmented earlier treatments, it demonstrates distinct advantages in data quality, methodological standardization, and broader scientific impact.

4.2.2 Data and Material Strengths

This study incorporates one of the most extensive and curated datasets for Helotiales to date.

4.2.2.1 Sampling and Collections

Extensive fresh collections were made from southwestern China (Yunnan, Guizhou) and northern Thailand, encompassing a wide ecological gradient from lowland evergreen forests to high-elevation montane systems (500–4000 m).

Specimens include both sexual and asexual morphs, minimizing historical sampling bias.

4.2.2.2 Molecular and Herbarium Resources

All molecular sequences (ITS, LSU, *RPB2*, *TEF1-α*, *β-tubulin*) have been deposited in GenBank, and corresponding voucher specimens preserved in HKAS, MFLU, and other recognized fungal collections.

These contributions significantly expand the molecular and morphological resources available for Helotiales and ensure long-term accessibility and reproducibility of the data.

4.2.3 Methodological Integration and Standardized Workflow

This monograph is the first to apply a standardized polyphasic workflow to Helotiales, combining morphological characterization (high-resolution imaging, detailed illustrations, and morphometric measurements for all described taxa), multi-locus phylogeny (integration of ITS, LSU, *RPB2*, *TEF1-α*, and *β-tubulin* datasets analyzed with RAxML and MrBayes), and cross-validation using congruence testing between morphological traits and molecular topology to support taxonomic conclusions.

Workflow Overview

The workflow spans the entire research process: field collection → specimen preservation → culture isolation → DNA extraction → PCR amplification → sequence analysis → phylogenetic inference → taxonomic decision, forming a replicable pipeline for future fungal monographs. This systematic integration strengthens taxonomic reliability and sets a benchmark for future research in fungal systematics.

4.2.4 Taxonomic Value

Through this standardized approach, the study delivers the most up-to-date classification of Helotiales, documenting 22 families and 231 genera, including 22 new species and 18 new geographical records. Revisions of several poorly known or misclassified families, such as Amorphothecaceae, Myxotrichaceae, Vandijckellaceae, and Neolauriomycetaceae, resolve long-standing taxonomic uncertainties, correct historical misinterpretations, and clarify their phylogenetic placement within Helotiales. The reassignment of 94 genera previously treated as *incertae sedis* into well-supported familial clades further stabilizes family-level concepts, strengthens the phylogenetic framework, and enhances the comparability and reliability of future taxonomic and ecological studies. Altogether, these achievements provide a robust reference system that supports ongoing and future taxonomic revisions across the order.

4.2.5 Data Contribution and Broader Impact

The research significantly enhances global fungal databases by contributing hundreds of new DNA sequences to GenBank, registering voucher specimens in internationally recognized herbaria, and linking molecular data with curated

morphological documentation, thereby improving data traceability and comparability across studies. This combined dataset forms a reliable foundation for future meta-analyses, phylogenomic projects, and biodiversity assessments within Leotiomycetes.

4.2.6 Applications and Broader Scientific Relevance

Beyond taxonomy, the refined framework has implications across multiple disciplines:

4.2.6.1 Ecology and Biogeography

Identifies subtropical montane forests in Asia as key diversification hotspots for Helotiales, providing insights into lineage radiation, ecological adaptation, and the biogeographical processes shaping the evolution of the order.

4.2.6.2 Conservation Biology

Offers a molecularly supported baseline for fungal biodiversity assessment and conservation planning in montane ecosystems, improving the accuracy of species delimitation and ecological evaluations.

4.2.6.3 Applied Mycology and Biotechnology

Lays the foundation for bioactive compound discovery and enzyme screening by clarifying the phylogenetic positions of ecologically and industrially important taxa, thereby facilitating targeted exploration of functional traits.

Collectively, this monograph serves as both a scientific cornerstone for Helotiales taxonomy and a springboard for interdisciplinary research, linking systematics with ecology, conservation, and applied mycology.

4.3 Future Directions

While this monograph makes significant strides in elucidating the taxonomy and phylogeny of Helotiales, it also reveals several critical avenues for future investigation. Building upon the foundation established here, forthcoming research should adopt a holistic and interdisciplinary approach integrating genomics, morphology, ecology, and metabolomics to further advance our understanding of this diverse fungal order.

4.3.1 Genomic and Phylogenomic Expansion

The next frontier in Helotiales systematics lies in the transition from traditional multilocus analyses to genome-scale datasets. High-throughput sequencing techniques—such as genome skimming, target gene capture, and whole-genome sequencing—can generate hundreds or thousands of loci, greatly improving the resolution of deep evolutionary relationships.

These genomic resources will be essential for rigorously testing the monophyly of families and the order itself, resolving ambiguous backbone nodes, and clarifying the placement of orphan and incertae sedis lineages**.** Phylogenomic frameworks also enable molecular-clock dating and ancestral-area reconstructions, providing a temporal and biogeographic context for diversification within Helotiales.

Establishing reference genomes for key taxa will form the basis of a new, genome-informed phylogenetic classification that ensures long-term stability and global comparability.

4.3.2 Linking Sexual and Asexual Morphs

A persistent challenge in Helotiales taxonomy is the incomplete connection between sexual (teleomorphic) and asexual (anamorphic) states. Many genera are known from only one morph, obscuring comprehensive species concepts and life cycle understanding. Future research should integrate controlled culture experiments, such as single-ascospore isolation and in vitro induction of conidiation or teleomorph formation, comparative genomics, matching genomic identity across morphs to confirm conspecific relationships, and environmental DNA (eDNA) metabarcoding, detecting fungal DNA from soil, litter, or water to associate anamorphic sequences with known teleomorphs. Bridging these life-history stages will not only refine species delimitation but also illuminate ecological and epidemiological dynamics, clarifying how Helotiales fungi disperse, persist, and interact within ecosystems.

4.3.3 Re-examination of Type Material

Despite major progress, many Helotiales names remain anchored to historic type specimens that lack molecular data or clear illustrations. Future taxonomic refinement requires revisiting these types with modern, non-destructive DNA extraction and high-resolution digital imaging to retrieve sequence data and document key characters. When original types are missing or inadequate, epitypification with newly collected, sequenced material should be implemented. In cases where type

specimens are unavailable or cannot be accessed in herbaria, the establishment of well-documented reference specimens becomes essential. Such reference collections—supported by high-quality morphology, ecology, and molecular data—provide reliable proxies that enable consistent species interpretation and reduce taxonomic ambiguity. Expanding the global herbarium survey initiated in this study—already involving 193 institutions—will help recover overlooked or misidentified types. Such coordinated international efforts will stabilize generic and familial boundaries, ensuring that every taxon is anchored by both classical and molecular evidence.

4.3.4 Ecological and Functional Investigations

A major research frontier lies in linking taxonomy to ecological and functional roles. Most Helotiales are recognized as saprobic decomposers, plant pathogens, or mutualists, yet the precise ecological functions of many newly described species remain uncharacterized. Future studies should conduct field-based ecological surveys, systematically recording substrates, host associations, and microhabitats to infer host specificity and environmental adaptation, undertake long-term monitoring in subtropical montane hotspots to track phenology and responses to climatic variables, apply functional genomics and metabolomics to uncover genes and compounds associated with lignocellulose degradation, secondary metabolism, and stress tolerance, and foster collaboration with forest ecologists and plant pathologists to define the ecological guilds of Helotiales, including decomposers, endophytes, pathogens, and mycorrhizal partners. Such integrative approaches will clarify the ecosystem functions, biogeographic patterns, and biotechnological potential of Helotiales, linking taxonomy directly to applied science.

4.3.5 Concluding Remarks

The future of Helotiales research depends on a holistic, interdisciplinary paradigm that unites genomics, life-cycle biology, classical taxonomy, and ecological function. By combining genome-scale analyses, morph-connection studies, type-based revisions, and functional investigations, mycologists can achieve a more complete and evolutionarily grounded framework for the order. These efforts will not only refine systematic understanding but also bridge taxonomy with application, enhancing the relevance of Helotiales studies to biodiversity conservation, ecosystem sustainability, and biotechnology.

4.4 Publication

First Author

Luo, L., Wei, D. P., Zhao, Q., & Chethana, K. W. T. (2024). Unveiling the diversity: A novel species of *Dicephalospora* (Helotiaceae, Helotiales) discovered in China. *Phytotaxa, 652*(1), 59–68. https://doi.org/10.11646/phytotaxa.652.1.5

Luo, L., Chethana, K. W. T., Zhao, Q., Thiyagaraja, V., Al-Otibi, F., & Hyde, K. D. (2025). Unveiling fungal diversity: A novel species of *Proliferodiscus* (Lachnaceae, Helotiales) discovered in China. *Phytotaxa, 682*(3), 227–239. https://doi.org/10.11646/phytotaxa.682.3.3

Luo, L., Chethana, K. W. T., Zhao, Q., Su, H. L., Li, C. J. Y., Thiyagaraja, V., . . . Hyde, K. D. (2025). Four new species of *Erioscyphella* (Leotiomycetes, Helotiales) from southwestern China. *MycoKeys, 114*, 29–48. https://doi.org/10.3897/mycokeys.114.138647

Luo, L., Chethana, K. W. T., Zhao, Q., Thiyagaraja, V., Khongphinitbunjong, K., Al-Otibi, F., Hyde, K. D. (2025). Three new species of *Dicephalospora* (Leotiomycetes, Helotiales) from northern Thailand and southwestern China. *MycoKeys, 115*, 67. https://doi.org/10.3897/mycokeys.115.143994

Luo, L., Chethana, K. W. T., Zhao, Q., Thiyagaraja, V., Khongphinitbunjong, K., Al-Otibi, F., Hyde, K. D. (2025). Two new and one new morph record of *Calycina* (Pezizellaceae, Helotiales) species from southwestern China. *MycoKeys, 122*, 13–33. https://doi.org/10.3897/mycokeys.122.158883

REFERENCES

Baral, H. O., & Rämä, T. (2015). Morphological update on *Calycina marina* (Pezizellaceae, Helotiales, Leotiomycetes), a new combination for *Laetinaevia marina*. *Botanica Marina*, *58*(6), 523-534.

Berbee, M. L. (2001) The phylogeny of plant and animal pathogens in the Ascomycota. *Physiological and Molecular Plant Pathology, 59*(4), 165–187.

Calatayud, V., Navarro-Rosinés, P., & Hafellner, J. (2002). A synopsis of *Lichenostigma* subgen. *Lichenogramma* (Arthoniales), with a key to the species. *Mycological Research, 106*(10), 1230–1242.

Capella-Gutiérrez, S., Silla-Martínez, J. M., & Gabaldón, T. (2009). trimAl: A tool for automated alignment trimming in large-scale phylogenetic analyses. *Bioinformatics, 25*(15), 1972–1973.

Carbone, I., & Kohn, L. M. (1999). A method for designing primer sets for speciation studies in filamentous ascomycetes. *Mycologia, 91*, 553–556.

Carpenter, S. E. (1988). Leotiales, a name to replace Helotiales Ascomycotina. *Mycologia, 80*(1), 127-130.

Checa, J., Barrasa, J. M., Martinez, A. T., Blanco, M. N., & Lado, C. (1996). *Bicornispora exophiala*, a new genus and species of the Coryneliales and its black yeast anamorph. *Mycological Research*, *100*(4), 500-504.

Crous, P. W., Quaedvlieg, W., Hansen, K., Hawksworth, D. L., & Groenewald, J. Z. (2014). *Phacidium* and *Ceuthospora* (Phacidiaceae) are congeneric: Taxonomic and nomenclatural implications. *Ima Fungus, 5*(2), 173–193. https://doi.org/10.5598/imafungus.2014.05.02.02

Crous, P. W., Wingfield, M. J., Burgess, T. I., Carnegie. A. J., Hardy, G. E. St J., Smith, D., . . . Groenewald, J. Z. (2017). Fungal planet description sheets: 625–715. *Persoonia, 39*, 270–467. https://doi.org/10.3767/persoonia.2017.39.11

Dai, Y. S. (1992). A new species of *Chloroscypha*. *Acta Mycologica Sinica, 11*(3), 207-209. (in Chinese)

Dennis, R. W. G. (1968). *British Ascomycetes*. J. Cramer.

Díaz-Escandón, D., Tagirdzhanova, G., Vanderpool, D., Allen, C. C., Aptroot, A., Češka, O., . . . Spribille, T. (2022). Genome-level analyses resolve an ancient lineage of symbiotic ascomycetes. *Current Biology*, *32*(23), 5209-5218.

Doyle, J. J., & Doyle, J. L. (1987). A rapid DNA isolation procedure for small quantities of fresh leaf tissue. *Phytochemical Bulletin, 19*(1), 11–15.

Ekanayaka, A. H., Hyde, K. D., Gentekaki, E., McKenzie, E. H. C., Zhao, Q., Bulgakov, T. S., . . . Camporesi, E. (2019). Preliminary classification of Leotiomycetes. *Mycosphere, 10*(1), 310–489.

Eriksson, O. E., & Winka, K. (1997). Supraordinal taxa of Ascomycota. *Myconet, 1*, 1–16.

Eriksson, O. E. (2005). Outline of Ascomycota. *Myconet, 11*, 1–113.

Eriksson, O. E., Baral, H. O., Currah, R. S., Hansen, K., Kurtzman, C. P., Læssøe, T., . . . Rambold, G. (2003). Notes on ascomycete systematics Nos 3580–3623. *Myconet*, *9*, 91-103.

Gardes, M., & Bruns, T. D. (1993). ITS primers with enhanced specificity for basidiomycetes-application to the identification of mycorrhizae and rusts. *Molecular Ecology, 2*(2), 113–118.

Gargas, A., Trest, M. T., Christensen, M., Volk, T. J., & Blehert, D. S. (2009). *Geomyces destructans* sp. nov. associated with bat white-nose syndrome. *Mycotaxon*, *108*(1), 147-154.

Haelewaters, D., Park, D., & Johnston, P. R. (2021). Multilocus phylogenetic analysis reveals that Cyttariales is a synonym of Helotiales. *Mycological Progress, 20*(10), 1323–1330.

Hall, T. (1999). BioEdit: A user-friendly biological sequence alignment editor and analysis program for Windows 95/98/NT. *Nucleic Acids Symposium Series, 41*, 95–98.

Hambleton, S., & Sigler, L. (2005). Meliniomyces, a new anamorph genus for root-associated fungi with phylogenetic affinities to *Rhizoscyphus ericae* (â%¡ *Hymenoscyphus ericae*), Leotiomycetes. *Studies in Mycology*, *53*(1), 1-27.

Han, J.-G., Hosoya, T., Sung, G.-H., & Shin, H.-D. (2014). Phylogenetic reassessment of Hyaloscyphaceae sensu lato (Helotiales, Leotiomycetes) based on multigene analyses. *Fungal Biology, 118*(2), 150–167.

Hempattarasuwan, N., Untong, A., Christakos, G., & Wu, J. (2021). Wetland changes and their impacts on livelihoods in Chiang Saen Valley, Chiang Rai Province, Thailand. *Regional Environmental Change*, *21*(4), 115.

Hibbett, D. S., Binder, M., Bischoff, J. F., Blackwell, M., Cannon, P. F., Eriksson, O. E., . . . Zhang, N. (2007). A higher-level phylogenetic classification of the Fungi. *Mycological Research*, *111*(5), 509-547.

Hofstetter, V., Miądlikowska, J., Kauff, F., & Lutzoni, F. (2007). Phylogenetic comparison of protein-coding versus ribosomal RNA–coding sequence data: A case study of the Lecanoromycetes (Ascomycota). *Molecular Phylogenetics and Evolution, 44*, 412–426.

Holst-Jensen, A., Kohn, L. M., Jakobsen, K. S., & Schumacher, T. (1997). Molecular phylogeny and evolution of *Monilinia* (Sclerotiniaceae) based on coding and noncoding rDNA sequences. *American Journal of Botany*, *84*(5), 686-701.

Hustad, V. P., & Miller, A. N. (2011). Phylogenetic placement of four genera within the Leotiomycetes (Ascomycota). *North American Fungi, 6*(9), 1–3.

Hyde, K. D., Noordeloos, M. E., & Savchenko, K. G. (2024). The 2024 Outline of Fungi and fungus-like taxa. *Mycosphere, 15*(1), 5146-6239.

Index Fungorum. (2024). Available from: http://www.indexfungorum.org/

Iturriaga, T., LoBuglio, K. F., & Pfister, D. H. (2017). *Bulgariella pulla*, a Leotiomycete of uncertain placement, with an uncommon type of ascus opening. *Mycologia, 109*(6), 900–911.

Jaklitsch, W., Baral, H. O., Lücking, R., & Lumbsch, H. T. (2016). *Syllabus of plant families – A. Engler's Syllabus der Pflanzenfamilien* (Part 1/2). *Herzogia 29*(1), 207-208.

Jaklitsch, W. M. (2009). European species of *Hypocrea* part I: The green-spored species. *Studies in Mycology, 63*, 1–91.

Jayasiri, S. C., Hyde, K. D., Ariyawansa, H. A., Bhat, J., Buyck, B., Cai, L., . . . Promputtha, I. (2015). The faces of fungi database: Fungal names linked with morphology, phylogeny and human impacts. *Fungal Diversity, 74*, 3–18.

Johnston, P. R., & Baschien, C. (2020). Tricladiaceae fam. nov. (Helotiales, Leotiomycetes). *Fungal Systematics and Evolution, 6*(1), 233–242.

Johnston, P. R., Quijada, L., Smith, C. A., Baral, H. O., Hosoya, T., Baschien, C., . . . Townsend, J. P. (2019). A multigene phylogeny toward a new phylogenetic classification of Leotiomycetes. *IMA Fungus, 10*, 1–22.

Katoh, K., Rozewicki, J., & Yamada, K. D. (2019). MAFFT online service: Multiple sequence alignment, interactive sequence choice and visualization. *Briefings in Bioinformatics*, *20*(4), 1160-1166.

Kirk, P. M. C. P., Cannon, P., Minter, D., & Stalpers, J. (2008). *Ainsworth and Bisby's dictionary of the fungi* (10th ed.). Commonwealth Agricultural Bureaux [for the] Commonwealth Mycological Institute.

Korf, R. P., & Zhuang, W. Y. (1985). Some new species and new records of discomycetes in China. *Mycotaxon, 22*(2), 483–514.

Korf, R. P. (1958). Japanese discomycete notes I–VIII. *Science Reports of the Yokohama National University, 7*, 7–35.

Korf, R. P. (1973). Discomycetes and Tuberales. In G. C. Ainsworth, F. K. Sparrow, & A. S. Sussman (Eds.), *The fungi: An advanced treatise* (Vol. IVA). Academic Press.

Korf, R. P., & Lizon, P. (2000). Validation of Nannfeldt's ordinal name Helotiales. *Mycotaxon, 75*, 501-502.

Lantz, H., Johnston, P. R., Park, D., & Minter, D. W. (2011). Molecular phylogeny reveals a core clade of Rhytismatales. *Mycologia, 103*, 57–74.

Lestari, A. S., & Chethana, K. W. (2024). Lambertella (Rutstroemiaceae, Helotiales) from Northern Thailand. New Zealand Journal of Botany, 62(2-3), 443-480. https://doi.org/10.1080/0028825X.2024.2344859

Li, C. J., Thilini Chethana, K. W., Eungwanichayapant, P. D., Zhou, D. Q., & Zhao, Q. (2024). Additional four species of *Tatraea* (Leotiomycetes, Helotiales) in Yunnan Province, China. *MycoKeys, 102*, 127–154. https://doi.org/10.3897/mycokeys.102.112565

Li, C. J. Y., Chethana, K. W. T., Eungwanichayapant, P. D., Luo, L., Yang, Z.-L., Dong, W.-J., . . . Zhao, Q. (2024). *Longistipes* gen. nov. and four novel species of Hyphodiscaceae along with six new collections of Leotiomycetes in Yunnan Province, China. *Mycosphere, 15*(1), 4744–4787. https://doi.org/10.5943/mycosphere/15/1/20

Liu, X. X., & Zhuang, W. Y. (2015). A new species of *Hymenoscyphus* (Helotiales) from tropical China. *Journal of Fungal Research, 13*(3), 129–131.

Liu, Y. J., Wheelen, S., & Hall, B. D. (1999). Phylogenetic relationships among ascomycetes: Evidence from an RNA polymerase II subunit. *Molecular Biology and Evolution, 16*, 1799–1808.

LoBuglio, K. F., & Pfister, D. H. (2010). Placement of *Medeolaria farlowii* in the Leotiomycetes, and comments on sampling within the class. *Mycological Progress, 9*, 361–368.

Lu, B. S., Hyde, K. D., Ho, W. H., Tsui, K. M., Taylor, J. E., Wong, K. M., . . . Zhou, D. Q. (2000). *Checklist of Hong Kong fungi* (pp. 1–207). Fungal Diversity Press.

Lukešová, T., Kohout, P., Větrovský, T., & Vohník, M. (2015). The potential of dark septate endophytes to form root symbioses with ectomycorrhizal and ericoid mycorrhizal middle European forest plants. *PLoS One*, *10*(4), e0124752.

Miller, M. A., Pfeiffer, W., & Schwartz, T. (2010). Creating the CIPRES Science Gateway for inference of large phylogenetic trees. *In 2010 Gateway Computing Environments Workshop (GCE)* (pp. 1–8). IEEE.

Miller, S. P., & Bever, J. D. (1999). Distribution of arbuscular mycorrhizal fungi in stands of the wetland grass Panicum hemitomon along a wide hydrologic gradient. *Oecologia*, *119*, 586-592.

Nannfeldt, J. A. (1932). Studien über die Morphologie und Systematik der nichtlichenisierten non-operculaten Discomyceten. *Nova Acta Regiae Societatis Scientiarum Upsaliensis, 48*, 1–368.

Nguyen, L.-T., Schmidt, H. A., von Haeseler, A., & Minh, B. Q. (2015). IQ-TREE: A fast and effective stochastic algorithm for estimating maximum-likelihood phylogenies. *Molecular Biology and Evolution, 32*, 268–274.

Nylander, J. A., Ronquist, F., Huelsenbeck, J. P., & Nieves-Aldrey, J. (2004). Bayesian phylogenetic analysis of combined data. *Systematic Biology, 53*(1), 47–67.

Pärtel, K., Baral, H. O., Tamm, H., & Põldmaa, K. (2017). Evidence for the polyphyly of *Encoelia* and Encoelioideae with reconsideration of respective families in Leotiomycetes. *Fungal Diversity, 82*, 183–219.

Pfister, D. H., & Kimbrough, J. W. (2001). Discomycetes. In D. J. McLaughlin, E. G. McLaughlin, & P. A. Lemke (Eds.), *The mycota VII, part A: Systematics and evolution*. Springer.

Phutthacharoen, K., Chethana, K. T., Lestari, A. S., Stadler, M., & Hyde, K. D. (2022). Three New Species of *Dicephalospora* (Helotiaceae, Helotiales) from Thailand. *Diversity, 14*(8), 645.

Phutthacharoen, K., Khalid, S. J., Schrey, H., Hyde, K. D., Stadler, M., & Ebada, S. S. (2023). Diaporphasines E and F: New polyketides from the saprotrophic fungus *Lachnum* sp. IW157 growing on the reed grass Phragmites communis. *ACS Omega, 8*(44), 41689-41695.

Phutthacharoen, K., Toshe, R., Khalid, S. J., Llanos-López, N. A., Wennrich, J. P., Schrey, H., . . . Stadler, M. (2024). Lachnuoic Acids A− F: Ambuic acid congeners from a saprotrophic *Lachnum* Species. *Chemistry & Biodiversity, 21*(4), e202400385.

Quandt, C. A., & Haelewaters, D. (2021). Phylogenetic advances in Leotiomycetes, an understudied clade of taxonomically and ecologically diverse fungi. *Encyclopedia of Mycology, 1*, 284–294.

Quijada, L., Matočec, N., Kušan, I., Tanney, J. B., Johnston, P. R., Mešić, A., . . . Pfister, D. H. (2022). Apothecial ancestry, evolution, and re-evolution in Thelebolales (Leotiomycetes, Fungi). *Biology, 11*(4), 583. https://doi.org/10.3390/biology11040583

Quijada, L., Tanney, J. B., Popov, E., Johnston, P. R., & Pfister, D. H. (2020). Cones, needles and wood: *Micraspis* (Micraspidaceae, *Micraspidales* fam. et ord. nov.) speciation segregates by host plant tissues. *Fungal Systematics and Evolution, 5*, 99–111. https://doi.org/10.3114/fuse.2020.05.05

QY. (1999). *List of the fungi in Taiwan*. Agriculture Committee, Taichung. (In Chinese)

Ren, F., & Zhuang, W.-Y. (2014a). A new species of the genus *Chlorencoelia* (Helotiales) from China. *Mycoscience, 55*(3), 227–230.

Ren, F., & Zhuang, W.-Y. (2014b). The genus *Chlorociboria* (Helotiales, Ascomycota) in China. *Mycosystema, 33*(4), 916–924.

Ren, F., & Zhuang, W.-Y. (2016a). The genus *Cenangiopsis* (Helotiales) from China. *Mycosystema, 35*(3), 241–245.

Ren, F., & Zhuang, W.-Y. (2016b). New taxa and new records of Helotiaceae in China. *Mycosystema, 35*(5), 511–522.

Ren, F., & Zhuang, W. Y. (2014). A new species of the genus Chlorencoelia (Helotiales) from China. *Mycoscience, 55*(3), 227-230.

Ren, F., & Zhuang, W. Y. (2016). The genus *Cenangiopsis* (Helotiales) from China. *Mycosystema, 35*(3), 241-246.

Robert, V., Vu, D., Amor, A. B., van de Wiele, N., Brouwer, C., Jabas, B., . . . Crous, P. W. (2013). MycoBank gearing up for new horizons. *IMA Fungus, 4*, 371–379. https://doi.org/10.5598/imafungus.2013.04.02.16

Ronquist, F., Teslenko, M., Van Der Mark, P., Ayres, D. L., Darling, A., Höhna, S., . . . Huelsenbeck, J. P. (2012). MrBayes 3.2: Efficient Bayesian phylogenetic inference and model choice across a large model space. *Systematic Biology, 61*, 539–542. https://doi.org/10.1093/sysbio/sys029

Schoch, C. L., Sung, G.-H., López-Giráldez, F., Townsend, J. P., Miadlikowska, J., Hofstetter, V., . . . Spatafora, J. W. (2009). Phylogeny clarifies the origin and evolution of fundamental reproductive and ecological traits. *Systematic Biology, 58*, 224–239. https://doi.org/10.1093/sysbio/syp020

Sivichai, S., Hywel-Jones, N. L., & Somrithipol, S. (2000a). Lignicolous freshwater Ascomycota from Thailand: *Melanochaeta* and *Sporoschisma* anamorphs. *Mycological Research, 104*, 478–485.

Somrithipol, S., Jones, E. G., Bahkali, A. H., Suetrong, S., Sommai, S., Chamoi, C., . . . Rungjindamai, N. (2017). *Lauriomyces*, a new lineage in the Leotiomycetes with three new species. *Cryptogamie, Mycologie, 38*(2), 259–273. https://doi.org/10.7872/crym/v38.iss2.2017.259

Song, R. Q., Xiang, C. T., Zhu, T. B., Yu, G. H., & Wen, B. L. (1997). A new species of *Tympanis*. *Bulletin of Botanical Research, 17*(2), 144–145. (in Chinese)

Stamatakis, A. (2014). RAxML version 8: A tool for phylogenetic analysis and post-analysis of large phylogenies. *Bioinformatics, 30*, 1312–1313.

Stiller, J. W., & Hall, B. D. (1997). The origin of red algae: Implications for plastid evolution. *Proceedings of the National Academy of Sciences, 94*, 4520–4525.

Sun, Y. R., Hyde, K. D., Liu, N. G., Jayawardena, R. S., Wijayawardene, N. N., Ma, J., . . . Wang, Y. (2024). Micro-fungi on medicinal plants in southern China and northern Thailand. *Fungal Diversity, 131*, 99–299. https://doi.org/10.1007/s13225-024-00549-4

Tai, F. L. (1979). *Sylloge fungorum sinicorum*. Science Press. (in Chinese)

Tehler, A., Little, D. P., & Farris, J. S. (2003). The full-length phylogenetic tree from 1551 ribosomal sequences of chitinous fungi, Fungi. *Mycological Research*, *107*(8), 901-916.

Tekpinar, A. D., & Kalmer, A. (2019). Utility of various molecular markers in fungal identification and phylogeny. *Nova Hedwigia, 109*(1-2), 187-224.

Teng, S. C. (1963). *Fungi of China*. Science Press. (in Chinese)

Trisurat, Y. (2006). Transboundary biodiversity conservation of the Pha Taem Protected Forest Complex: A bioregional approach. *Applied Geography*, *26*(3-4), 260-275.

Vilgalys, R., & Hester, M. (1990). Rapid genetic identification and mapping of enzymatically amplified ribosomal DNA from several *Cryptococcus* species. *Journal of Bacteriology, 172*, 4238–4246.

Voglmayr, H., Akulov, O. Y., & Jaklitsch, W. M. (2016). Reassessment of *Allantonectria*, phylogenetic position of *Thyronectroidea*, and *Thyronectria caraganae* sp. nov. *Mycological Progress, 15*, 921–937.

Wang, Y. Z., Wu, S. H., Zhou, W. N., Zhang, D. Z., Chen, G. Y., Chen, S. F., . . . Zang, M. (1983). *Fungi of Xizang*. Science Press. (in Chinese)

Wang, Z., Binder, M., Schoch, C. L., Johnston, P. R., Spatafora, J. W., & Hibbett, D. S. (2006b). Evolution of helotialean fungi (Leotiomycetes, Pezizomycotina): A nuclear rDNA phylogeny. *Molecular Phylogenetics and Evolution, 41*(2), 295–312. https://doi.org/10.1016/j.ympev.2006.05.031

Wang, Z., Johnston, P. R., Takamatsu, S., Spatafora, J. W., & Hibbett, D. S. (2006a). Toward a phylogenetic classification of the Leotiomycetes based on rDNA data. *Mycologia, 98*(6), 1065–1075. https://doi.org/10.3852/mycologia.98.6.1065

White, T. J., Bruns, T., Lee, S. J., & Taylor, J. (1990). Amplification and direct sequencing of fungal ribosomal RNA genes for phylogenetics. In M. A. Innis, D. H. Gelfand, J. J. Sninsky & T. J. White (Eds.), *PCR protocols: A guide to methods and applications* (pp. 315–322). Academic Press.

Wijayawardene, N. N., Hyde, K. D., Dai, D. Q., Sánchez-García, M., Goto, B. T., Saxena, R. K., . . . Thines, M. (2022). Outline of Fungi and fungus-like taxa – 2021. *Mycosphere, 13*(1), 53–453. https://doi.org/10.5943/mycosphere/13/1/2

Wortley, A. H., & Scotland, R. W. (2006). The effect of combining molecular and morphological data in published phylogenetic analyses. *Systematic Biology, 55*(4), 677-685.

Wu, S. H., Wang, Y. Z., & Chow, W. N. (1996). *Catalogue of fungal specimens and cultures of NMNS.* National Museum of Natural Science Taiwan. (in Chinese)

Wu, W., & Diao, Y. (2023). The *chalara*-like anamorphs of Leotiomycetes. *Fungal Diversity, 119*(1), 213–490.

Xiang, C. T., & Song, R. Q. (1988). Research on *Tympanis* in north-eastern China. *Bulletin of Botanical Research, 8*(1), 147–152. (in Chinese)

Zang, M., Li, B., Xi, J., & Zhang, D. (1996). *Fungi of Hengduan Mountains.* Science Press. (in Chinese)

Zhang, Y. H., & Zhuang, W. Y. (2002a). New species and new Chinese records of *Hymenoscyphus* (Helotiales). *Mycosystema, 21*(4), 493–496.

Zhang, Y. H., & Zhuang, W. Y. (2002b). Re-examinations of *Helotium* and *Hymenoscyphus* (Helotiales, Helotiaceae): specimens on deposit in HMAS. *Mycotaxon, 81*, 35–43.

Zhang, Y. H., & Zhuang, W. Y. (2004). Phylogenetic relationships of some members in the genus *Hymenoscyphus* (Ascomycetes, Helotiales). *Nova Hedwigia, 78*(3), 475–484.

Zhang, E., Wang, Y., Chen, S., Zhou, D., Shangguan, Z., Huang, J., . . . Bai, Y. (2024). Mycorrhizal symbiosis increases plant phylogenetic diversity and regulates community assembly in Grasslands. *Ecology Letters, 27*(9), e14516.

Zhaxybayeva, O., & Gogarten, J. P. (2002). Bootstrap, Bayesian probability and maximum likelihood mapping: exploring new tools for comparative genome analyses. *BMC Genomics, 3*, 1-15.

Zheng, H. D., & Zhuang, W. Y. (2011). Notes on the genus *Hymenoscyphus* from tropical China. *Journal of Fungal Research, 9*(4), 212–215.

Zheng, H. D., & Zhuang, W. Y. (2013a). Four new species of the genus *Hymenoscyphus* (Fungi) based on morphology and molecular data. *Science China Life Sciences, 56*(1), 90–100.

Zheng, H. D., & Zhuang, W. Y. (2013b). Four species of *Hymenoscyphus* (Helotiaceae) new to China. *Science China Life Sciences, 56*(1), 90–100. https://doi.org/10.1007/s11427-012-4429-1

Zheng, H. D., & Zhuang, W. Y. (2013c). A new species of *Roseodiscus* (Ascomycota, Fungi) from tropical China. *Phytotaxa, 105*(2), 51–57.

Zheng, H. D., & Zhuang, W. Y. (2013d). Three new species of *Hymenoscyphus* from tropical China. *Mycotaxon, 123*, 19–29.

Zheng, H. D., & Zhuang, W. Y. (2014). *Hymenoscyphus albidoides* sp. nov. and *H. pseudoalbidus* from China. *Mycological Progress, 13*(3), 625–638.

Zheng, H. D., & Zhuang, W. Y. (2015a). Current status and future prospects of research on the genus *Hymenoscyphus* (Leotiomycetes). *Mycosystema, 34*(5), 799–808. (in Chinese)

Zheng, H. D., & Zhuang, W. Y. (2015b). A new species and a new record of *Hymenoscyphus* from China. *Mycosystema, 34*(5), 961–965.

Zheng, H. D., & Zhuang, W. Y. (2015c). Four new species of *Crocicreas* (Helotiales, Leotiomycetes) from China. *Ascomycete.org, 7*, 394–402.

Zheng, H. D., & Zhuang, W. Y. (2015d). Five new species of *Hymenoscyphus* (Helotiaceae, Ascomycota) with notes on the phylogeny of the genus. *Mycotaxon, 130*(4), 1017–1038.

Zheng, H. D., & Zhuang, W. Y. (2016a). *Allophylaria* (Helotiales), a newly recorded genus from China. *Mycosystema, 35*(7), 802–806.

Zheng, H. D., & Zhuang, W. Y. (2016b). Two new species of *Crocicreas* (Helotiaceae, Ascomycota) revealed by morphological and molecular data. *Phytotaxa, 272*(2), 149–156.

Zheng, H. D., & Zhuang, W. Y. (2015). Current status and future prospects of research on the genus *Hymenoscyphus* (Leotiomycetes). *Mycosystema, 34*(5), 799-808.

Zheng, H. D., & Zhuang, W. Y. (2017). *Chlorovibrissea korfii* sp. nov. from northern hemisphere and *Vibrissea flavovirens* new to China. *MycoKeys, 26*, 1-11.

Zheng, H. D., & Zhuang, W. Y. (2021). The Genus *Chlorosplenium* (Helotiales, Leotiomycetes) from China with Notes on *C. chlora* Complex. *Life, 11*(11), 1167.

Zheng, H. D., & Zhuang, W. Y. (2022). Additions to the Knowledge of the Genus *Pezicula* (Dermateaceae, Helotiales, Ascomycota) in China. *Biology, 11*(10), 1386.

Zhuang, W. Y. (1998a). A list of discomycetes in China. *Mycotaxon, 67*, 365–390.

Zhuang, W. Y. (1998b). *Flora fungorum sinicorum. Vol. 8. Sclerotiniaceae et Geoglossaceae.* Science Press. (in Chinese)

Zhuang, W. Y. (2001). A list of discomycetes in China. Supplement I. *Mycotaxon, 79*, 375–381.

Zhuang, W. Y. (2003). A list of discomycetes in China. Supplement II. *Mycotaxon, 85*, 153–157.

Zhuang, W. Y. (2004). *Flora fungorum sinicorum. Vol. 21. Hyaloscyphaceae, Sarcoscyphaceae et Sarcosomataceae.* Science Press. (in Chinese)

Zhuang, W. Y., & Korf, R. P. (1989). Some new species and new records of discomycetes in China. III. *Mycotaxon, 35*(2), 297–312.

Zhuang, W. Y., Zeng, Z. Q., & Liu, X. X. (2016). Taxonomic revision of the genus *Dicephalospora* (Helotiales) in China. *Mycosystema, 35*(7), 791–801.

Zhuang, W., Li, Y., Zheng, H., Zeng, Z., & Wang, X. (2020). Threat status of non-lichenized macro-ascomycetes in China and its threatening factors. *Biodiversity Science, 28*(1), 26.

Zoller, S., Scheidegger, C., & Sperisen, C. (1999). PCR primers for the amplification of mitochondrial small subunit ribosomal DNA of lichen-forming ascomycetes. *The Lichenologist, 31*, 511–516.

APPENDIX A

CHEMICAL REAGENTS AND MEDIA

1. Malt Extract Agar (MEA) used for fungal culturing

Malt extract 30g

Agar 15 g

Soy peptone 3 g

Add the above ingredients to 1 L of distilled water and heat to dissolve, the 1/4 MEA will used malt extract （7.5 g), soy peptone (0.75 g), and agar 15 g. Adjust the pH to 5.6 ± 0.2. Sterilize at 121°C for 15 minutes.

2. Potato Dextrose Agar (PDA) used for fungal culturing

Potato 200 g

Dextrose 18 g

Agar 15 g

Weigh 200 grams of potatoes and cut them into small pieces. Boil thoroughly for 10 to 30 minutes, then filter to obtain the starch solution. Pour the starch solution back into the pot, bring it to a boil over low heat, then add 18 grams of glucose and 15 grams of agar powder. Stir quickly to fully dissolve the ingredients, and add water to make up the volume to 1 liter. Autoclave at 121 ℃ for 15 minutes.

3. Synthetic low-nutrient agar (SNA) used for induce fungi sporulation

Potassium dihydrogen phosphate 1 g

Potassium nitrate 1 g

Magnesium sulfate heptahydrate 0.5 g

Potassium chloride 0.5 g

Glucose 0.2 g

Sucrose 0.2 g

Agar 15 g

Add the above ingredients to 1 L of distilled water and heat to dissolve. Adjust the pH to 5.6 ± 0.2. Sterilize at 121°C for 15 minutes.

4. 75% Ethanol (EtOH) used for surface sterilization of endophytic fungi. Ethanol is an effective antiseptic. It disrupts microbial cell membranes and denatures proteins, leading to microbial death.

5. Lactophenol Cotton Blue is a widely utilized staining agent for visualizing fungal structures under a compound light microscope. It is particularly effective in highlighting pseudoparaphyses, septa, and ascus walls, offering excellent clarity and compatibility with a broad range of fungal taxa.

Phenol (crystals) 20 g

Lactic acid 16 ml

Glycerol 31 ml

Dissolve phenol in distilled water, add lactic acid, glycerol and 0.05 g of Poirrier's (cotton) blue or acid fuchsin.

6. Lactic acid is used to preserve fungal structures and to obtain true-color images of fungal spores and other structures without the use of stains. This is particularly beneficial for observing naturally pigmented organisms.

85% Lactic acid 100 ml

7. Indian ink used for observing appendages of ascospores in fungal species.

APPENDIX B

ABSTRACT OF PUBLICATIONS

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Unveiling the Diversity: A Novel Species of *Dicephalospora* (Helotiaceae, Helotiales) Discovered in China

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Abstract

Dicephalospora is a discomycete belonging to the fungus family Helotiaceae (Helotiales). In the present study, a new species of *Dicephalospora* is identified based on morphological characteristics and phylogenetic analyses of combined ITS and LSU sequences. *Dicephalospora xishuangbannanensis sp. nov.* is characterized by yellow-orange, stipitate apothecia, eight-spored, unitunicate, 106–134 × 8.2–12.2 µm, cylindrical to clavate, J- asci, and fusiform, 19–27 × 4–6 µm, guttulate ascospores with a gelatinous sheath at both ends. An updated key to the known species of *Dicephalospora* is provided.

Key words: 1 new species, discomycete, phylogeny, taxonomy, Yunnan Province

Introduction

The order Helotiales was introduced by Nannfeldt (1932). Helotiales is the largest order within Leotiomycetes, comprising 27 families (Wijayawardene *et al.* 2022). Multi-gene phylogenies have revealed that this order is polyphyletic (Wang *et al.* 2006). Ekanayaka *et al.* (2019) recognized 25 families in Helotiales. Of them, Helotiaceae is one of the most diverse families, including 32 genera (Ekanayaka *et al.* 2019). *Dicephalospora* is a genus of Helotiaceae established with *D. calochroa* as the type species (Spooner 1987). *Dicephalospora* species are usually saprobes on dead stems, leaf petioles, rotten wood, and twigs. *Dicephalospora* has historically been included in Rutstroemiaceae (Kirk *et al.* 2008), Helotiaceae, and Sclerotiniaceae (Liu *et al.* 2016). In recent decades, phylogenetic studies have clearly shown the affinities of *Dicephalospora* to Helotiaceae (Han *et al.* 2014, Zhao *et al.* 2016, Ekanayaka *et al.* 2019, Johnston *et al.* 2019), thus justifying its assignment.

Dicephalospora was described as having erumpent or superficial, stipitate, yellow, orange, red to blackish apothecia, an ectal excipulum of *textura prismatica* cells, a medullary excipulum composed of *textura intricata* cells, filiform asci, J+ or J- in Melzer's reagent, straight or slightly curved paraphyses, and hyaline, sub-ellipsoid to fusoid, guttulate ascospores, with or without a mucilaginous cap at the poles (Zhuang *et al.* 2016). Index Fungorum (2024) listed 18 species epithets for *Dicephalospora*, all of which were reported from Asia, except *Dicephalospora chrysotricha*, which was found in New Zealand (Zheng & Zhuang 2019). Furthermore, *Dicephalospora* species produce dicephalosterol, a promising secondary metabolite for the development of pharmaceuticals targeting prostatic hypertrophy (Hosoya *et al.* 1999). However, the applications of *Dicephalospora* species are rarely published due to the difficulty of obtaining pure cultures and their slow growth on artificial media (Zheng & Zhuang 2019).

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Research Article

Four new species of *Erioscyphella* (Leotiomycetes, Helotiales) from southwestern China

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Abstract

Erioscyphella is found across various regions and is part of the family Lachnaceae (Helotiales). It is distinguished by its white to orange disc-shaped apothecia, white to brown receptacles, and granulated hairs that contain amorphous or resinous material. These hairs lack swelling apices and crystals. Additionally, this genus is unique for its long ascospores. In the present study, we collected eight specimens from southwestern China. Morphological and phylogenetic analyses based on the combined LSU, ITS, mtSSU and *RPB2* dataset showed that our specimens represent four new species of *Erioscyphella*, including *E. ailaoensis*, *E. baimana*, *E. gelangheica* and *E. tengyueica*. Here, we provide complete morphological descriptions with illustrations and sequence data essential for future taxonomic and evolutionary research.

Key words: 4 novel species, Lachnaceae, morphology, phylogeny, taxonomy

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Introduction

The monophyletic genus *Erioscyphella* belongs to the family Lachnaceae (Dennis 1954; Spooner 1987; Cantrell and Haines 1997; Guatimosim et al. 2016; Tochihara and Hosoya 2022; Wijayawardene et al. 2020, 2022; Hyde et al. 2024) and includes 22 records (Index Fungorum 2024). The original description of *Erioscyphella* by Kirschstein (1939), which lacked typification, was inaccurately characterized based on traits that lack taxonomic significance, such as filiform, colored, and pigmented ascospores, as well as lanceolate paraphyses (Korf 1978; Perić and Baral 2014). It was not until Haines (1984) selected *E. longispora*, under which *Peziza abnormis* was later synonymized, as the lectotype of *Erioscyphella* that a more accurate characterization was established. These features are now recognized as insufficient for distinguishing this genus from related taxa. This genus was initially confused with the closely related genus *Lachnum*, but detailed morphological and molecular phylogenetic studies based on LSU, ITS, mtSSU and

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Research Article

Three new species of *Dicephalospora* (Leotiomycetes, Helotiales) from Northern Thailand and Southwestern China

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Abstract

Dicephalospora is a discomycetous genus belonging to the family Helotiaceae (Helotiales). The genus currently comprises 19 species. Among them, 17 species have been reported from Asia, of which 14 were reported from China. During a survey of Leotiomycetes, we collected six specimens of *Dicephalospora* species from southwest China and northern Thailand. The samples were examined based on the phylogenetic analyses of LSU and ITS sequence data, along with morphological characterization, and our results demarcate three new *Dicephalospora* species, viz., *D. tengyueica*, *D. maetaengica* and *D. menghaica*. *Dicephalospora tengyueica* **sp. nov.** formed a distinct clade closely related to *D. rufocornea*, *D. irregularis* and *D. sagerae*, whereas *D. maetaengica* **sp. nov.** clustered closer to *D. menghaica* **sp. nov.** with 100% ML and 1.00 BPP statistical support. All three species have similar apothecia sizes but differ in their coloration. *Dicephalospora tengyueica* has aseptate ascospores, while *D. menghaica* and *D. maetaengica* have 7-septate ascospores. The paraphyses in *D. menghaica* are branched, while they are unbranched in the other two species. An updated key to the known species of *Dicephalospora* is also provided.

Key words: 3 new species, Helotiaceae, morphology, phylogeny, taxonomy

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Introduction

Dicephalospora belongs to Helotiaceae (Helotiales) and was described by Spooner in 1987, with *D. calochroa* (Syd. and P. Syd.) Spooner as the type species (Spooner 1987; Hyde et al. 2024). The taxonomy of the Helotiales has undergone multiple revisions, driven largely by advances in molecular phylogenetics (Ekanayaka et al. 2019; Johnston et al. 2019). Two gene regions, ITS and LSU, have been primarily used in the phylogenetic analyses of Helotiales, further supporting the inclusion of *Dicephalospora* within Helotiaceae (Han et al. 2014; Zhao et al. 2016; Ekanayaka et al. 2019). Helotiaceae is the most heterogeneous family in Helotiales and is characterized by parallel hyphae, angular to isodiametric cells, interwoven hyphae, and margins and flanks

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Unveiling fungal diversity: a novel species of *Proliferodiscus* (Lachnaceae, Helotiales) discovered in China

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Abstract

Proliferodiscus is a discomycete genus belonging to the family Lachnaceae (Helotiales). In the present study, a new *Proliferodiscus* species is identified and introduced based on morphological characteristics and multi-loci phylogenetic analyses of the combined ITS and LSU sequences. *Proliferodiscus aduncatis sp. nov.* is characterized by yellow to creamy apothecia, a yellow to white receptacle surface with bushy hairs, filiform, aseptate, unbranched paraphyses with a rounded apex, eight-spored, *I*- asci with a tapered pedicel, and ascospores that are narrowly fusiform with acute ends, 4–6-septate, and smooth-walled. An updated key to the known species of *Proliferodiscus* is also provided.

Key words: 1 new species, discomycete, phylogeny, taxonomy, Yunnan Province

Introduction

The genus *Proliferodiscus* belongs to the family Lachnaceae, of Helotiales, Leotiomycetes (Haines & Dumont 1983, Wijayawardene *et al.* 2022) and comprises 11 species (Hyde *et al.* 2024). The genus was established to accommodate two species with proliferous hymenial discs, namely *Proliferodiscus inspersus* and *P. earoleuca* (Haines & Dumont 1983). *Proliferodiscus* is typically characterized by colorful proliferous apothecia with a short stipe, hyaline, thin-walled curled hairs that are densely granulated or covered by hyaline, amorphous material, an ectal excipulum consisting of cells of *textura prismatica*, filiform paraphyses, 8-spored asci and hyaline ascospores (Haines & Dumont 1983, Spooner 1987, Popov 2013, Ekanayaka *et al.* 2019). The only anamorph described in the genus is that of *P. ingens*, characterized by subglobose conidiomata, hyaline, septate, smooth-walled conidiophores, and cylindrical to ellipsoidal, hyaline, aseptate conidia (Bien & Damm 2020). *Proliferodiscus* species are distributed mainly in America, Asia, Australia, and Europe (Bien & Damm 2020, Han *et al.* 2014); only one species, *P. dingleyae*, has been reported in China (Zhuang *et al.* 2002). Current research seeks to clarify species boundaries and elucidate the phylogenetic relationships within the genus through morphological studies and DNA sequencing. This research contributes to accurate classification and discovery of new species.

During an investigation of helotialean taxa in China (Su *et al.* 2023, Luo *et al.* 2024, Li *et al.* 2022, 2024, Zeng *et al.* 2022, Thiyagaraja *et al.* 2024), a species was collected from a forest in Yunnan Province. The objective of the study was to identify this specimen using polyphasic methods, as suggested by Chethana *et al.* (2021), namely morphological observations coupled with phylogenetic analyses of the combined ITS and LSU sequences (Ekanayaka

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Research Article

Two new and one new morph record of *Calycina* (Pezizellaceae, Helotiales) species from Southwestern China

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Abstract

Calycina (Pezizellaceae, Helotiales) is a heterogeneous group, and the taxonomic classification is frequently revised due to unclear phylogenetic relationships. To date, a total of 35 species in this genus have been documented, with six recorded in China, including four species that are endemic to the country. *Calycina* species are reported in their sexual and asexual morphs, and the phylogenetic placements of several species remain unresolved due to the lack of molecular data. During a study on the fungal diversity of southwestern China, six specimens were collected and analyzed using both morphological characterizations and multi-gene phylogenetic analyses (LSU and ITS). The results revealed two new species, *C. botanica* and *C. xishuangbanica*, and the first sexual report of *C. brevipes*, with detailed morphological descriptions and phylogenetic trees.

Key words: Asexual morph, Leotiomycetes, morphology, phylogeny, sexual morph

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Introduction

Calycina was originally proposed as an infrageneric taxon of *Peziza*, including four species: *Peziza firma*, *P. herbarium*, *P. citrina*, and *P. bolaris* (Nees von Esenbeck 1817). Later, Gray (1821) raised *Calycina* to generic rank and retained *P. firma* and *P. herbarium*, while adding three new species: *P. subsimilis*, *P. succosa*, and *P. sulphurea*. Seaver (1934) initially designated *Peziza firma* as the type of *Calycina*, a species which was treated by Gray (1821). However, Seaver (1934) typification was not accepted as that study failed to select one of the four eligible species. Consequently, *C. herbarum* (= *Peziza herbarium*) was later designated as the type (Dumont 1972).

The familial placement of *Calycina* has been debated over the years. Han et al. (2014) placed *Calycina* within Hyaloscyphaceae, as *C. herbarum* was found to cluster with *Calycellina populina* in a strongly supported clade based on the phylogenetic analyses of ITS, LSU, *rpb2*, and mtSSU sequences. Morphologically, both genera possess hairs that are much shorter and indistinct from the extant

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