

Micropeziza curvatispora sp. nov., *M. fenniae* sp. nov. and *M. zottoi* sp. nov. (Helotiales) – three new species of the genus *Micropeziza* from Western Siberia, Finland, Germany and Belgium

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Summary: Three *Micropeziza* species, *Micropeziza fenniae*, *M. curvatispora* and *M. zottoi*, collected in Western Siberia, Finland, Germany and Belgium are described as new to science. The similarities and differences from the known *Micropeziza* species are discussed. A key to the accepted species of *Micropeziza* is provided. *M. zottoi* is dedicated to the German mycologist Hans-Otto Baral who celebrated his 60th birthday in 2014.

Keywords: Ascomycota, Dermateaceae, *Micropeziza*, *Rhododendron tomentosum*, *Oxycoccus palustris*, *Comarum palustre*, taxonomy.

In honour of Hans-Otto Baral

Introduction

Following the revision of the genus *Micropeziza* by HELLEMAN *et al.* (2013) two new interesting collections of *Micropeziza* came to the knowledge of the authors of the former study: one from Finland and one from Western Siberia, both growing on dead leaves of *Rhododendron tomentosum* Harmaja (syn. *Ledum palustre* L.), but with clearly different microscopical characters. It was soon realized that both species represent an undescribed *Micropeziza* species. In the course of the work on the species on *R. tomentosum* it was possible to re-examine a *Micropeziza* species which was found in 2011 in Belgium and 2013 in Germany on *Comarum palustre* L. [syn. *Potentilla palustris* (L.) Scop.] (cf. HELLEMAN *et al.*, 2013: 133). Although the microscopic characters are very similar to *Micropeziza filicina* Helleman, U. Lindemann & Yeates, there are still a number of differences requiring description of this *Micropeziza* species as a separate taxon.

On occasion of the 60th birthday of the German mycologist Hans-Otto Baral it was decided to dedicate one of these new *Micropeziza* species to him.

Methods

The collections were examined from living material in tap water using a Leica DMLB microscope with Planfluotar 40x/1.00 Oil immersion and Planapo 100x/1.40 Oil immersion objectives (for *M. fenniae*), a Zeiss Axiostar microscope with Achromat 40/0.65 objective (dry) and Achromat 100/1.25 Oil immersion objective (for *M. curvatispora*), a Zeiss Standard 16 microscope with a 100/1.25 Oil immersion objective, a Olympus BH-2 microscope with Olympus SPlan 40PL/0,70 and Zeiss Planapo 100x/1.30 Oil immersion, a BMS D1 e-plan trinokular with e-Plan High-Resolution 40x/0.65 (dry) and 100x/1.25 Oil immersion (for *M. zottoi*). The iodine reaction was tested with Lugol's solution (IKI = ~1 % I₂, 2 % KI, in H₂O). Aqueous Cresyl Blue (CRB) was applied to test staining of vacuoles and gel sheaths. For the better observation of the croziers the preparation was dyed with Congo Red. Photographic images (macro- and microphotos) were obtained using a Canon EOS 1100D, a Canon PowerShot A495 and A620, a Fuji FinePix S100FS, a Nikon Coolpix E4500, an Imagingsource DFK 72AUC02 digital camera and an Axio-Cam ERC5s digital camera. Measurements were generally obtained from living cells (indicated by the sign “*”). If the cells are dead it is indicated by the sign “†”. The volume of the oil content of the ascospores

is indicated as OCI (Oil Content Index) with a scale from 0 to 5 where 0 = 0% and 5 = 80%.

The holotypes of *M. curvatispora* and *M. fenniae* are deposited in the herbarium of the University of Leipzig (LZ P-7125 and LZ P-7126). The isotype of *M. fenniae* is deposited in the private herbarium of Marja Pennanen (M.P.140711), the isotypes of *M. curvatispora* in the Komarov Botanical Institute (Saint Petersburg) (LE294900) and the private herbarium of Nina Filippova (Kh-4471). The holotype of *M. zottoi* is deposited in the herbarium of the Centraalbureau voor Schimmelcultures (CBS H-21976).

Taxonomy

Micropeziza curvatispora N. Filippova, U. Lindemann, Helleman, *sp. nov.* — Mycobank 810388

Holotype: Russia, Western Siberia, Khanty-Mansiysk region, 20 km east of Khanty-Mansiysk town, Mukhrino bog on the left terrace of Irtys river, 60°53'31.0"N, 68°40'46.7"E, 16.VI.2014, alt. 31 m, *leg.* Nina Filippova, on dead leaves of *Rhododendron tomentosum* submerged between shoots of *Sphagnum fuscum* (Schimp.) H. Klinggr.; Herbarium of the University of Leipzig (LZ) P-7125; isotypes: Komarov Botanical Institute, Saint-Petersburg, LE294900 and private herbarium of Nina Filippova, Kh-4471.

Etymology: *curvatispora* = after the curved ascospores of the species

Apothecia turbinate to cupulate, sessile, brown, reddish-brown at base, blackish when dry, hymenium light brown, up to 250 µm high, 400 µm broad, solitary or gregarious on both leaf surfaces, up to 20–60 apothecia on one leaf. The development of the primordia was under a scutum of brown radiating hyphae (100–150 µm broad) through which the apothecia break during growth.

Asci 8-spored, clavate, arising from simple septa, with euamyloid apical ring of the *Calycina*-type blue in IKI (bb), at the base with a basal protrusion, *75–100 × 8.3–13 µm (n = 30), † 50–65 × 7.5–9 µm.

Ascospores small ellipsoid-fusoid, more or less curved, with many small oil drops (OCI = 4), *13.8–20.3 × 2.9–4 µm, mean: *16.7–3.5 µm (n = 40), † 11–14.5(–16) × 3.2–3.8 µm. **Paraphyses** multiseptate, apically gradually swollen into a clavate head, terminal up to 4 µm, lower cells 2 µm, rarely branched, swollen apices contain in the living state a large, elongate, hyaline refractive vacuolar body (VB)

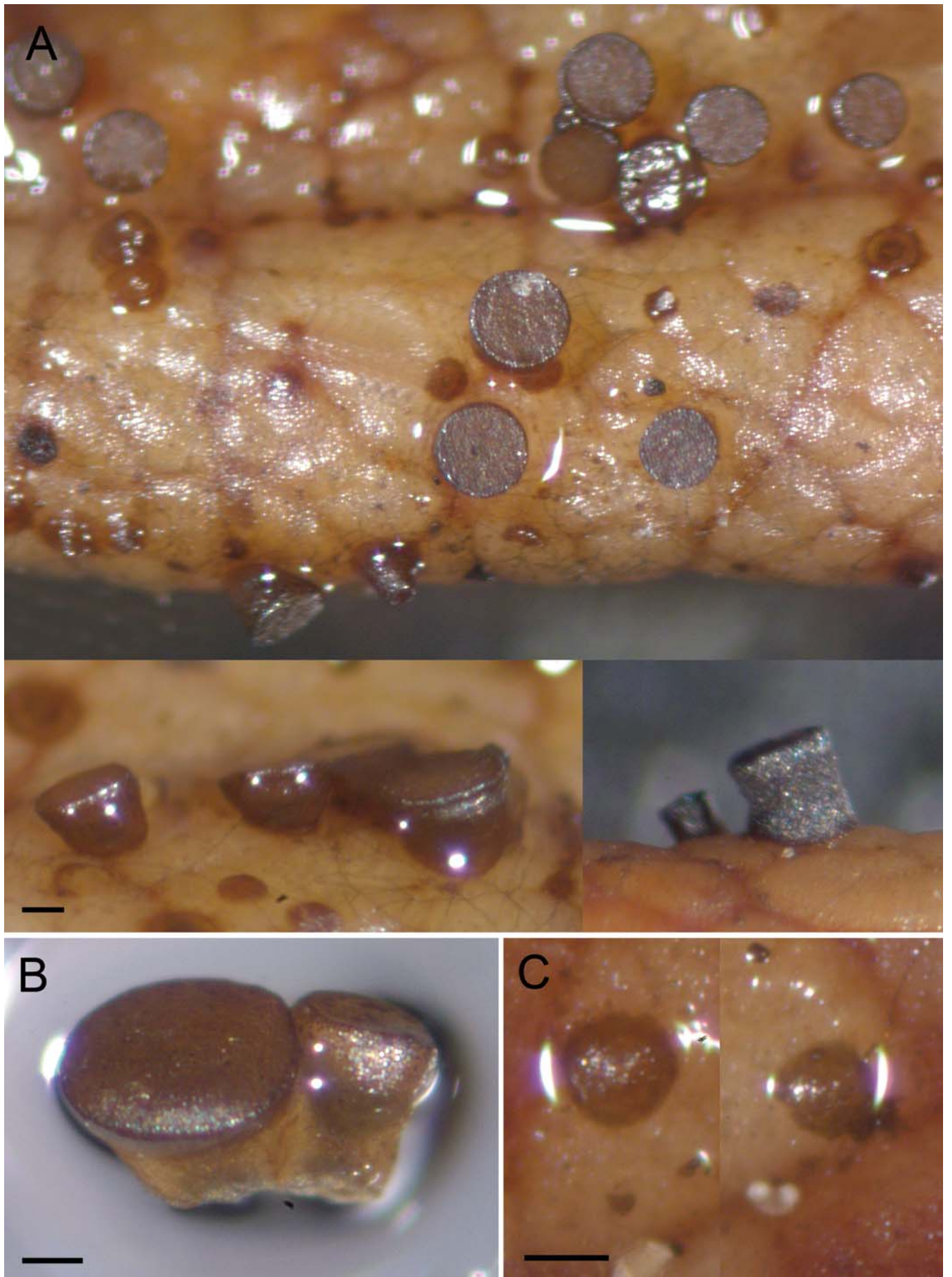


Plate 1. – *Micropeziza curvatispora*

Apothecia in fresh state: On dead leaves of *Rhododendron tomentosum* (from holotype, LZ P-7125). A: Upper and side views; B: Two mature apothecia; C: Initial stage of the apothecial development under a shield of radiating hyphae (cf. Plate 3H). Scale = 100 μ m.

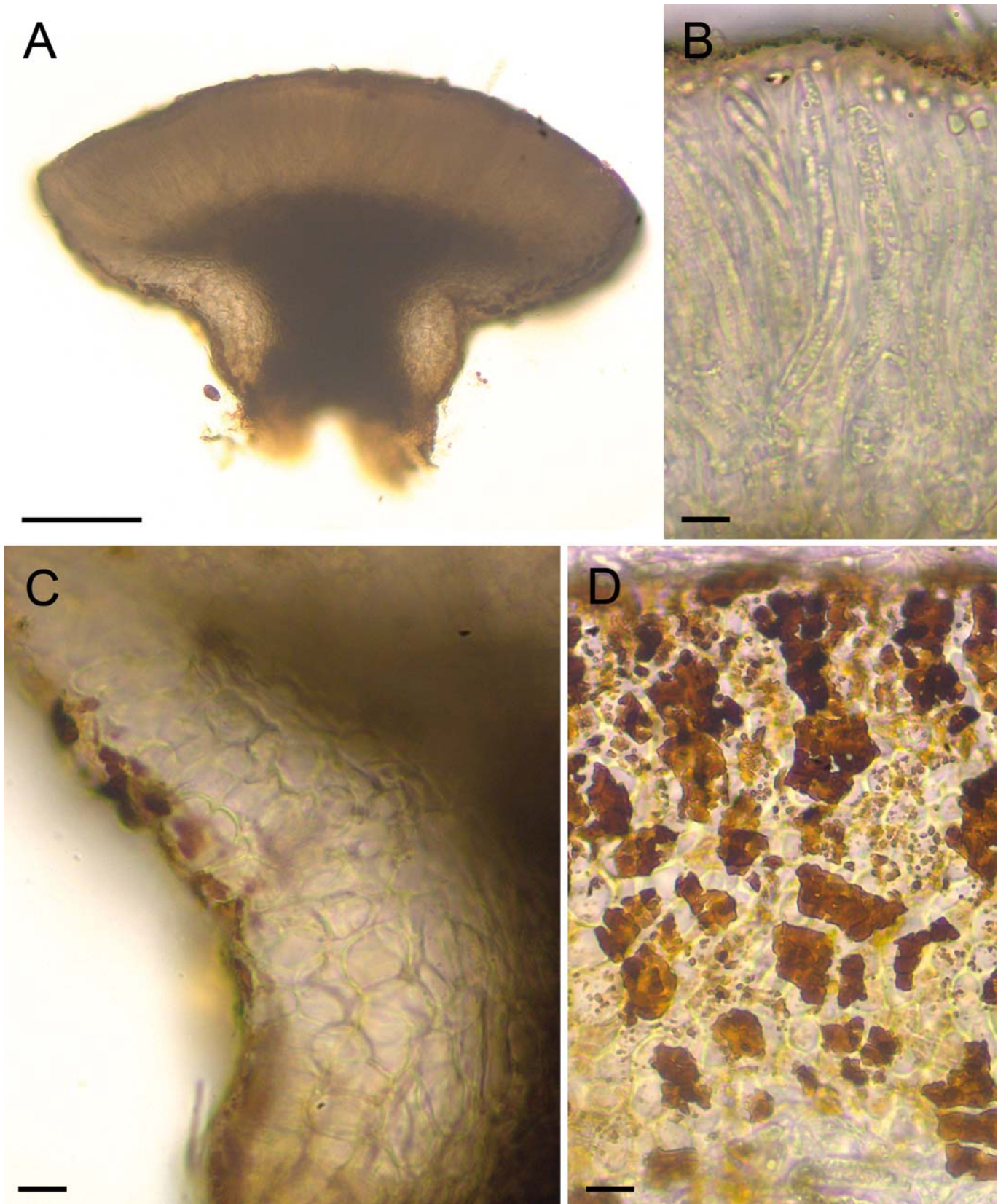


Plate 2 – *Micropeziza curvatispora*

A: Median section through the apothecium; B: Median section through the hymenium with asci and paraphyses, covered by pseudo-epithecium; C: Thick-walled cells of the ectal excipulum (middle flanks), covered by the exudation crust; D: Exudation crust (surface view). Scale = 10 μm (except A: Scale = 100 μm).

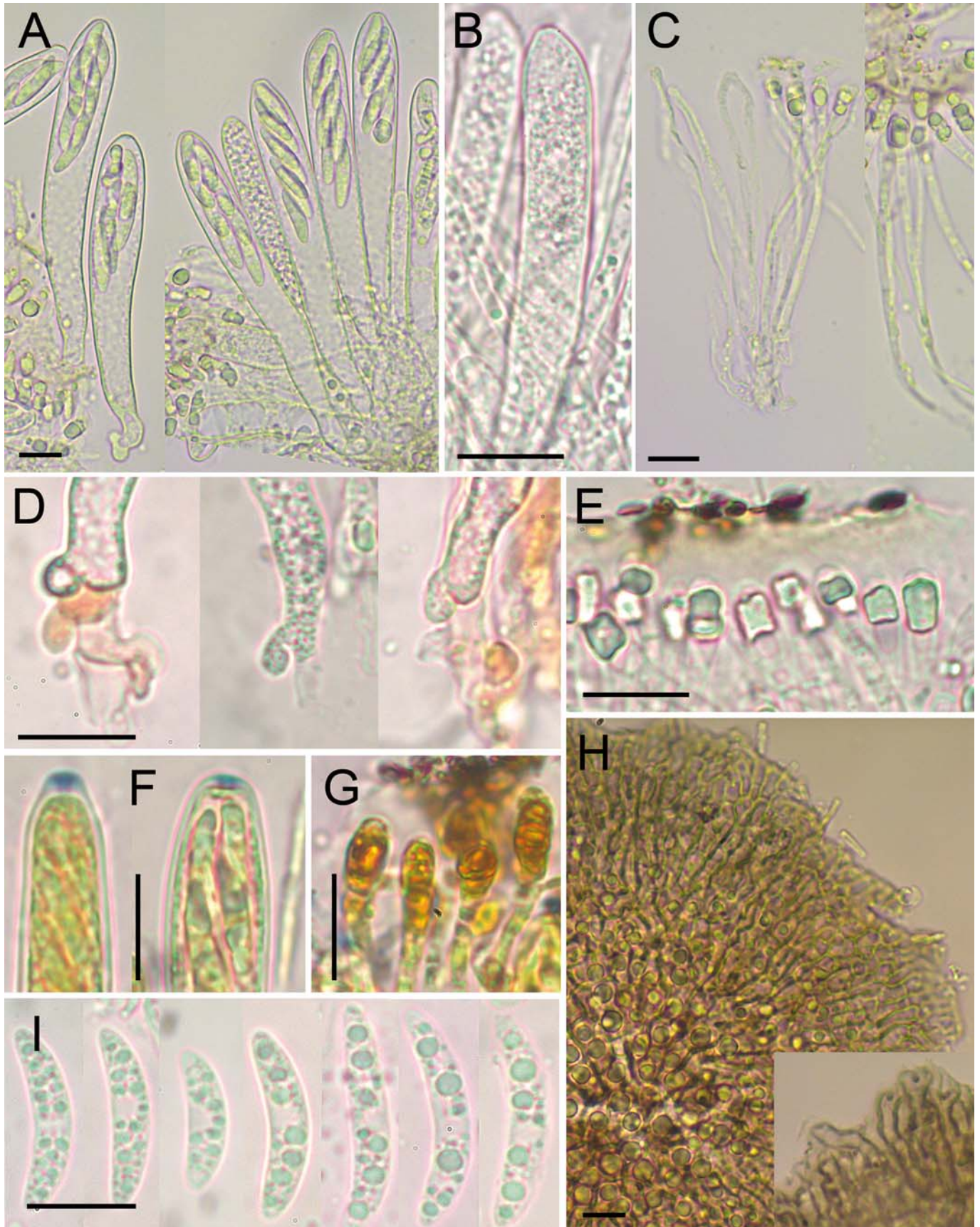


Plate 3 – *Micropeziza curvatispora*

A: Asci (living state); B: Immature ascus with fusion nuclei; C: Paraphyses (living state), apical cell with a greenish-yellowish VB; D: Basal protrusion of the asci; E: Tips of paraphyses (living state), covered by the pseudo-epithecium; F: Ascus apical thickening with amyloid ring (in IKI, dead state); G: Paraphyses in IKI (dead state, VBs stained copper-orange); H: Shield of radiating hyphae; I: Ascospores (living state). Scale = 10 μ m.



Plate 4 – Collection site of the holotype of *Micropeziza curvatispora* (Russia, Western Siberia, Khanty-Mansiysk region, near to Khanty-Mansiysk town, Mukhrino bog on the left terrace of Irtysh river)

and often a separate elongated VB below, copper-orange to dark brown in IKI, in dead paraphyses these vacuolar bodies are lost. The swollen tips of the paraphyses are embedded in a hyaline gelatinous substance, forming in the upper part an incrustated epithecium. **Ectal excipulum** about 60 µm thick at the apothecium base, thinner to the margin, made from several rows of more or less thick-walled hyaline cells (*15 × 10 µm) of *textura prismatica*, outer walls of cells covered by brown incrustations, which become more pronounced to the margin of apothecium (appearing as areas of a fragmented brownish crust), excipular cells becoming smaller inside, the very base is of labyrinthian arranged hyphae. **Medullary excipulum** well pronounced in fully mature apothecia, about 100 µm thick, comprised of amorphous colored (brown) hyphae, not gelatinized of *textura intricata*. **Subhymenium** not differentiated. **Scutum** of radiating hyphae with lobose ends at the shield edge, brown, about 3 µm broad at the shield edge.

Micropeziza fenniae U. Lindemann, Helleman & Pennanen, *sp. nov.* — Mycobank 810389

Holotype: Finland, North Karelia, Outokumpu, Rikkaranta, Eskola, 62°46'2"N 28°45'40"E, alt. 120 m, 03.VII.2014, *leg.* Marja Pennanen, on dead leaves of *Rhododendron tomentosum*, lying on the ground; Herbarium of the University of Leipzig (LZ) P-7126; isotype in the private herbarium of Marja Pennanen, M.P.140711. Additional collection: Finland, North Karelia, Outokumpu, Suonsilmät, ETRS89, 62°44'46"N 28°56'50"E, alt. 128 m, 01.VII.2014, *leg.* Marja Pennanen; in the private herbarium of Marja Pennanen, M.P.140703.

Etymology: *fenniae* = after the Latin name for Finland where the species was first collected.

Apothecia 0.1–0.25(–0.5) mm, first turbinate, then discoid, when old more or less pulvinate, sessile, solitary to gregarious, developing with the formation of a scutum of brown radiating hyphae (170–185 µm broad) through which the apothecia break during growth. **Hymenium** greyish-brown when fresh; when old with a greenish-yellowish tint, with a dark brown margin, dark brown also on the outside due to brown granules of an exudate crust and remnants of the scutum which cover the exterior. **Asci** 8-spored, arising from croziers, euamyloid apical ring of the Calycina-type, staining very strong dark blue in IKI (bb), no round refractive globule beneath the pars sporifera observed, *(57–)60–75(–80) × 11–14 µm, †57–72 × 9.8–10.3 µm. **Ascospores** *12.7–14.7(–16.5) × 4.5–5.5 µm, ellipsoid-fusoid with obtuse ends, hyaline, smooth, oil index (OCI) 4–5, 2–3 big and many minor oil drops in the living state, one or two large

oil globules when dead (by confluence), overmature 1-septate, later greyish to light-brown with a slightly thickened wall of the ascospore. **Paraphyses** multiseptate, often branched near the upper septum but also in their lower parts, apically gradually to abruptly swollen into a clavate head, terminal cell *4–5 µm, lower cells *1.8–2.8 µm wide, swollen apices contain in the living state a large, globose to elongate, yellow-greenish refractive vacuolar body (VB) and often a separate elongated VB below, and several little yellow-greenish VBs in the lower part (0.4–1 µm); VBs not staining in CRB, copper-orange to dark brown in IKI, in dead paraphyses these VBs are lost. The swollen tips of the paraphyses are embedded in a hyaline gelatinous substance, forming a pseudo-epithecium. The shape of dead paraphyses is similar to the living state, while their width is reduced to †3–4 µm. **Ectal excipulum** thin-walled, hyaline, of *textura globulosa-angularis*, one-layered, measuring diam. *5–6.5 µm at the upper flanks and diam. *7.5–9.5 µm at the middle flanks, while in surface view they appear more or less round in outline. The cells of the ectal excipulum of the flanks are fused with a fragmented brownish crust from the crumbled scutum of radiating hyphae. At the base of the apothecium a *textura globulosa-angularis* (diam. *4–5.5 µm) of the ectal excipulum is wider; at the very base of the apothecia brown labyrinthian arranged hyphae. **Medullary excipulum** of an ill-defined hyaline layer, non-gelatinized. **Subhymenium** not differentiated.



Plate 5 – Collection site of the holotype of *Micropeziza fenniae* (Finland, North Karelia, Outokumpu, Rikkaranta, Eskola)

Micropeziza zottoi Helleman, U. Lindemann, L.G. Krieglst., L. Bailly, *sp. nov.* — Mycobank 810488

Holotype: Germany, North Rhine-Westphalia, District Euskirchen, Schleiden, Nationalpark Eifel, Dreiborner Hochfläche, „Mühlenbachtal“, 50°32'15.82"N 6°22'11.95"E, alt. 534 m, 22.VI.2013, *leg.* L. Krieglsteiner, on the underside of dead previous years leaves of *Comarum palustre*; Herbarium of Centraalbureau voor Schimmelcultures (CBS), H-21976. Additional collection: Belgium, Vielsalm, province Luxembourg, Réserve naturelle domaniale de la Grande Fange de Bihain, 50°14'35.5"N 5°46'43.5"E, alt. 557 m, 13.VIII.2011, *leg.* L. Bailly.

Etymology: *zottoi* = substantival epithet after Hans-Otto Baral's nickname "Zotto" to whom the new species is dedicated.

Apothecia ≤ 0.2 mm in diameter, broadly sessile, turbinate, growing singly to gregariously on the underside of the dead detached leaves of the host plant *Comarum palustre* from whose epidermis they arise by breaking through a shield of radiating hyphae which bursts during growth. **Hymenium** light-brown when fresh with a darker margin and outside, due to a crust of exudate and remnants of the crumbled shield adhered to the excipulum. **Asci** broadly cla-

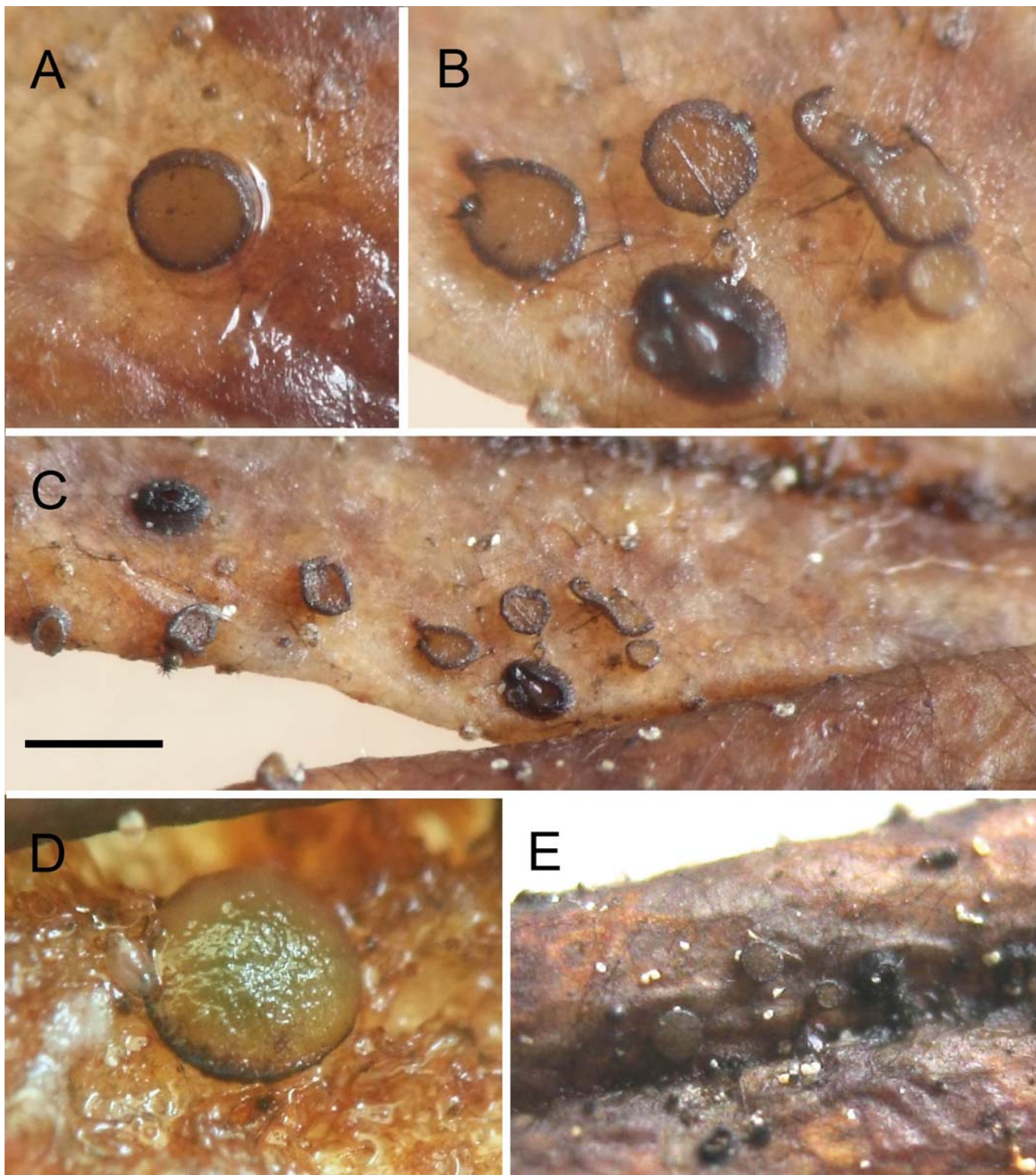


Plate 6 – *Micropeziza fenniae*

A: Apothecia in fresh state: On dead leaves of *Rhododendron tomentosum* (from holotype: LZ P-7126); B: idem, together with a hysterothecium of *Lophodermium sphaerioides* (Alb. & Schwein.) Duby; C: idem. Scale = 0.5 mm; D: Overmature apothecium with pulvinate hymenium of greenish-yellowish tint; E: Apothecia in fresh state (from additional collection M.P.140703).

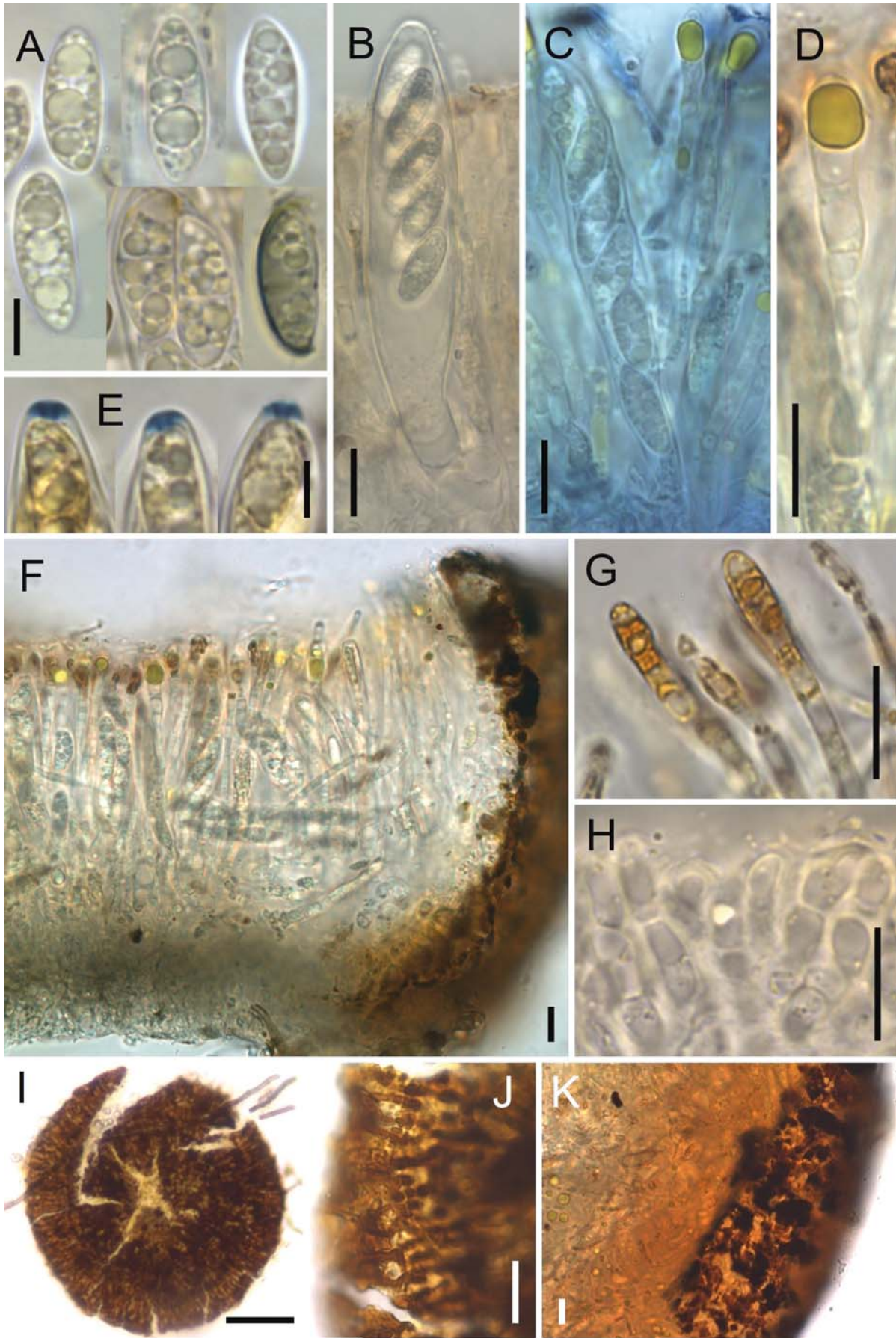


Plate 7 – *Micropeziza fenniae*

A: Mature ascospores (living state), overmature with one septum; B: Mature asci in the hymenium (living state) with crozier at the ascus base; C: Ascus (dead state) and paraphyses (living state) in CRB (VBs not stained); D: Paraphysis (living state), apical cell with a greenish-yellowish VB; E: Ascus apical thickening with amyloid ring (in IKI, dead state); F: Median section of an apothecium; G: Paraphyses in IKI (dead state, VBs stained copper-orange); H: Margin (surface view); I: Shield of radiating hyphae; J: Margin of the shield; K: Exudate crust on the ectal excipulum (margin of the apothecium, surface view). Scale = 10 μm (except for A+ E = 5 μm and I = 50 μm).

vate, unstalked or very short stalked containing 8 ascospores, arising from croziers, the euamyloid apical ring is of the *Calycina*-type which is staining dark blue in IKI (bb), *39–50 × 9.5–11 μm, †31–41 × 7.5–9.5 μm. Only few asci are mature at the same time, prior to spore-discharge the asci stretch and break through the pseudo-epithecium, reaching a length up to 60 μm. **Ascospores** ellipsoid-fusoid with obtuse ends *11–12.5 × 3–3.5, †(7.5)10–13(14) × 2–2.5 μm, filled with small oil drops except for an empty region in the middle, becoming biguttulate when dying due to confluence of the lipid drops, OCI = 4. **Paraphyses** cylindrical on average 2 μm wide with apically up to 3.5 μm wide swollen tips which contain spherical to somewhat elongated yellowish-green VBs that are staining copper-brown in IKI, in KOH the dead paraphyses contain a smoky-brown color as a residue of the coloured VBs, they are branched below the swollen heads and/or at the base with a septum below the branchings. The heads which exceed the immature asci are embedded in a hyaline exudate gel partly covered by a brown crust, thus forming a protective pseudo-epithecium. **Ectal excipulum** made up of a brown walled gelatinized short-celled *textura prismatica* †6–10 × 3–5.5 μm somewhat elongated at the margin. **Medullary excipulum** is not differentiated.

Discussion

Micropeziza curvatispora, *M. fenniae* and *M. zottoi* fit morphologically very well with the generic concept of *Micropeziza* as it was presented in HELLEMAN *et al.* (2013). The morphological and ecological similarities to and differences from the known *Micropeziza* species

will be discussed in detail in following parts. For an overview of all *Micropeziza* species a synoptic table is provided (see below).

a) *M. curvatispora*

Characteristic for *M. curvatispora* are the large, more or less curved ascospores. *M. cornea* (Berk. & Broome) Nannf. has ascospores with a similar length, but they are straight. Another feature that distinguishes *M. curvatispora* from *M. cornea* is the oil content of the ascospores in the living state: OCI = 4 for *M. curvatispora*, OCI = 1–2 for *M. cornea*.

The asci of *M. curvatispora* arise from simple septa. Only one species of *Micropeziza* has asci without croziers: *M. umbrinella*. However, not merely the form of the ascospores of *M. umbrinella* and the inamyloid apex of the asci are clearly different from *M. curvatispora*, in addition the asci of *M. curvatispora* have a conspicuous basal protrusion while the base of the asci of *M. umbrinella* are unbowed. A further difference from *M. umbrinella* is the primordial development of the apothecia of *M. curvatispora* under a shield of radiating hyphae, through which they break during growth. In contrast, *M. umbrinella* lacks a shield.

Like *M. fenniae*, *M. curvatispora* grows on dead leaves of *Rhododendron tomentosum*. But in regard to the micro-morphological features both species are clearly different (cf. description of *M. fenniae*; compare Plate 3 and 7).

M. curvatispora is well characterized as a separate species in the genus *Micropeziza* by a unique combination of micro-morphological features: more or less curved ascospores, asci arising from simple septa and having a basal protrusion.

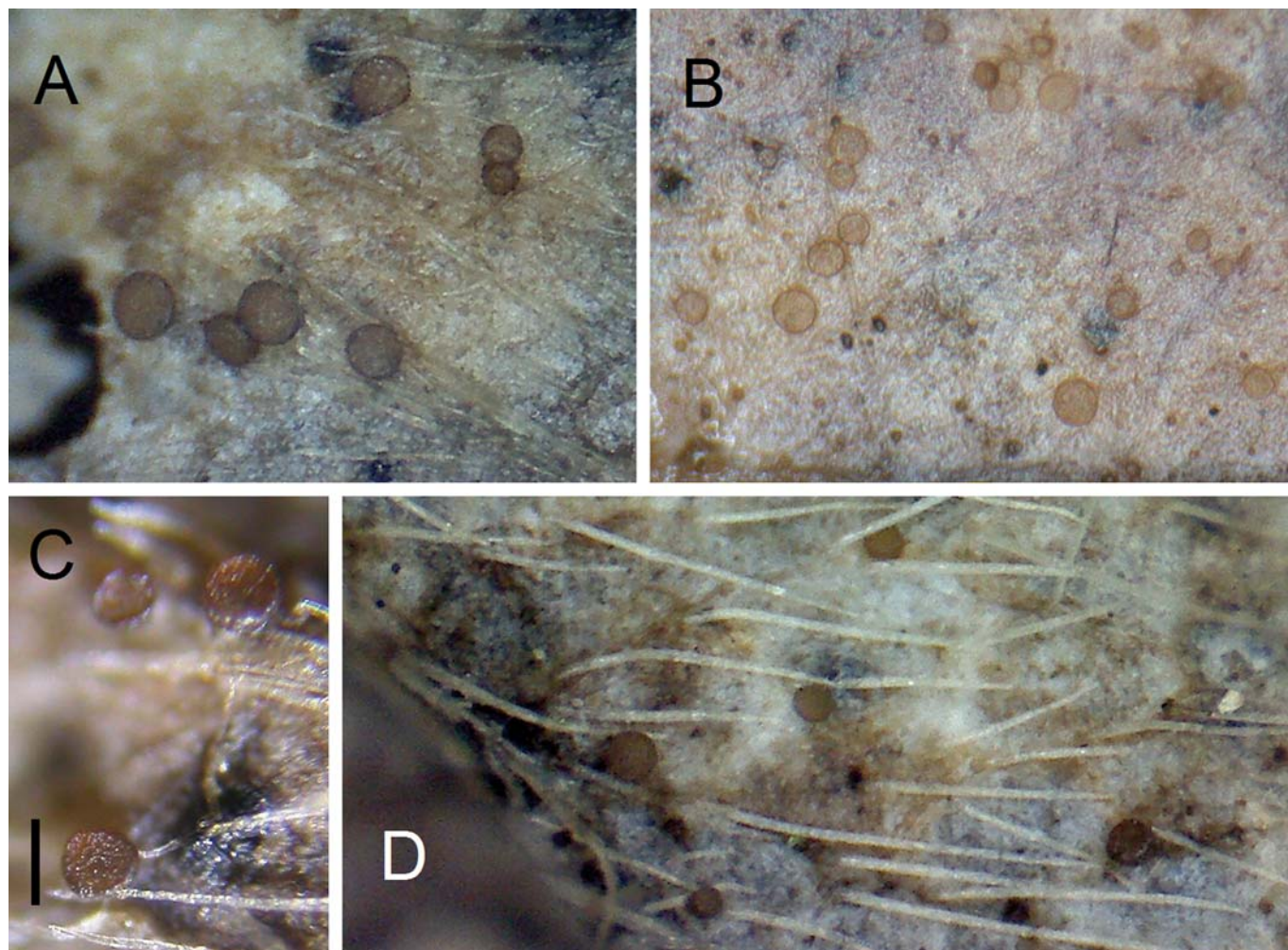


Plate 8 – *Micropeziza zottoi*

A & D: Apothecia in fresh state: On dead leaves of *Comarum palustre* (from holotype: CBS H-21976); B: Apothecia from Vielsalm, Belgium in living state; C: Rehydrated apothecia from holotype. Scale = 100 μm. A, B & D no scale.

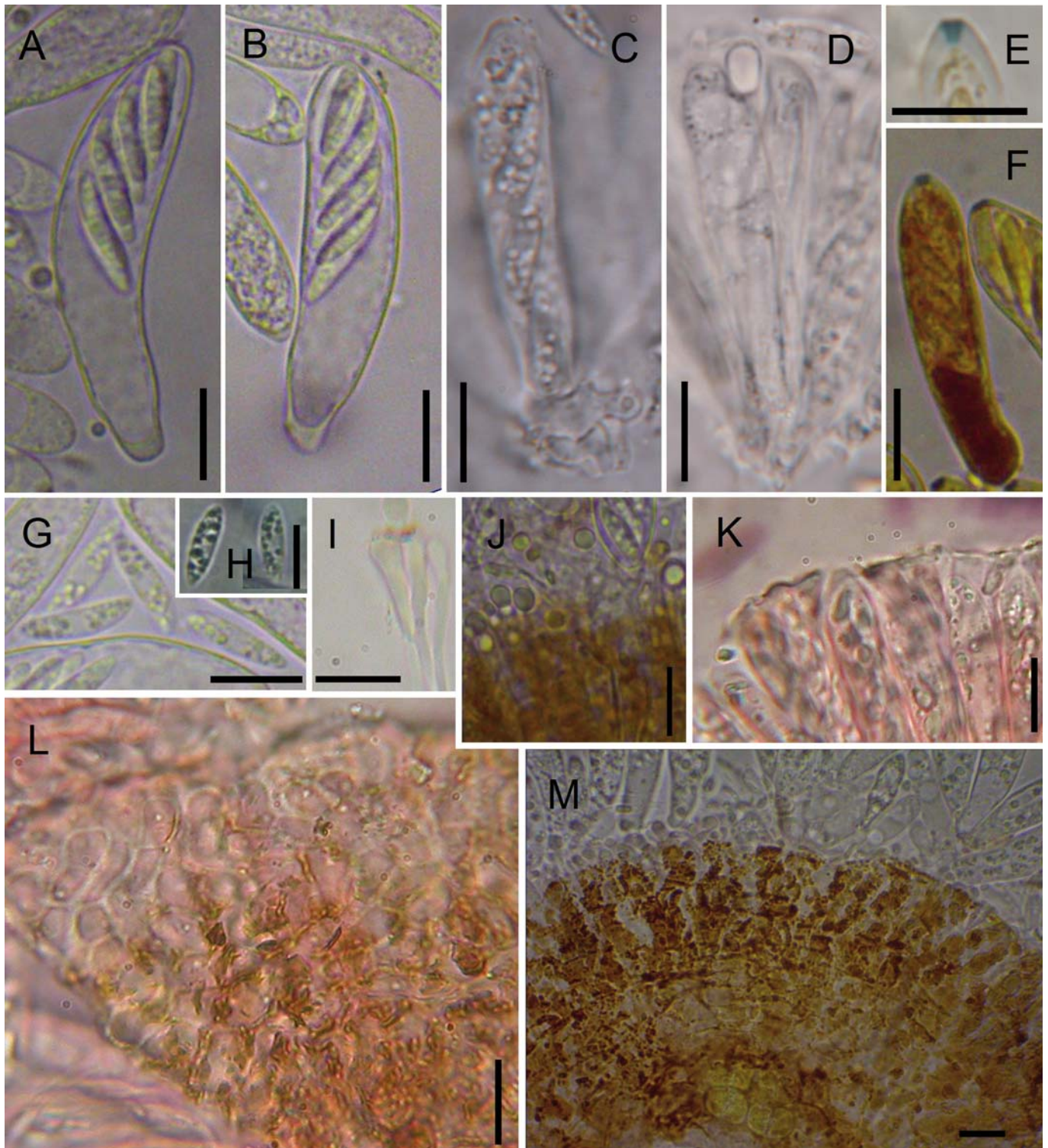


Plate 9 – *Micropeziza zottoi*

A & B: Mature asci (living state); C: Ascus with crozier; D: Fusion nucleus within an ascus; E: Ascus apical thickening with amyloid ring (in IKI, dead state); F: Ascus (dead state) in IKI; G & H: Mature ascospores (living state); I: Paraphyses in KOH; J: VBs in paraphyses (living state); K: Pseudo-epithecium in Congo Red; L: Ectal excipulum in Congo Red (surface view); M: Excipular crust. All photos except H (which is from Vielsalm, Belgium) from holotype. Scale = 10 µm.

M. curvatispora was found in the Western Siberian plain, Khanty-Mansiysk region, in vicinity of Khanty-Mansiysk town (20 km), Mukhrino bog. The Mukhrino bog is located on the left terrace of the Irtysch river and covers an area of about 10 km². The collection was made in the central part of the bog, approximately 1 km distance from the forest. The vegetation at the site forms an ombrotrophic (= raised) bog with a pattern of wooded areas and open graminoid-sphagnum areas. The collection was made in a woody environment

(Pine-dwarf shrub-*Sphagnum fuscum* bog). The tree population was dominated by *Pinus sylvestris* L. (stunted bog form). Well-developed dwarf shrub communities are composed of *Rhododendron tomentosum*, *Chamaedaphne calyculata* (L.) Moench, *Andromeda polifolia* L. and *Vaccinium uliginosum* L. Plants lesser represented are *Rubus chamaemorus* L., *Vaccinium oxycoccos* L. and *Eriophorum vaginatum* L. The *Sphagnum* carpet is composed of *Sphagnum fuscum* Klinggräff on hummocks and *S. angustifolium* (C.E.O. Jensen ex Russow)

C.E.O. Jensen, *S. magellanicum* Brid. in depressions. This plant community is classified as a *Ledo-Sphagnetum fuscum* community association (class *Oxycocco-Sphagnetum*) in floristic classification of bogs in the region (LAPSHINA, 2010). The bog water level is comparatively low (30–50 cm below the *Sphagnum* surface) and the pH-value of the bog water is acidic (about 3–4). The apothecia of *M. curvatispora* were collected from leaves of *Rhododendron tomentosum* submerged between shoots of *Sphagnum fuscum* (and therefore in wet conditions but not saturated with water), on high and medium hummocks. On one occasion the species was fruiting on fallen leaves of *V. oxycoccus* (a few apothecia on two leaves). That means that *V. oxycoccus* is an alternative host, at least when its leaves are intermingled with those of *Rhododendron tomentosum*. *M. curvatispora* was fruiting at the type location from the middle of June to the end of August.

The type location of *M. curvatispora* is situated in the central Taiga zone of West Siberia. The vegetation of the region is characterized by coniferous forests (*Pinus sibirica* Du Tour, *P. sylvestris*, *Abies sibirica* Ledeb., *Picea obovata* Ledeb.) and their secondary formations. Peatlands and especially bogs cover near one third of central Taiga area (ILYNA *et al.*, 1985). The climate is subarctic, with short, cool summers and long, cold winters. The mean annual temperature is -1.3°C , with the mean temperature of the coldest month (January) being -19.8°C and the temperature of the warmest month (July) being 18°C . The total annual precipitation is 553 mm (BULATOV *et al.*, 2007).

b) *M. fenniae*

M. fenniae has the broadest ascospores of all taxa included in the present concept of *Micropeziza*: $*4.5\text{--}5.5\ \mu\text{m}$. Concerning the width, only *M. umbrinella* is comparable to *M. fenniae*: $3.7\text{--}5\ \mu\text{m}$, but the length of the ascospores differs: $*12.5\text{--}15\text{--}(16.5)$ for *M. fenniae* and $*13\text{--}19\text{--}(21)$ for *M. umbrinella*. Further differences are the euamyloid apical ring of *M. fenniae*, the inamyloid asci apices of *M. umbrinella* and the primordial development of the apothecia of *M. fenniae* under a shield of radiating hyphae, whereas *M. umbrinella* lacks a shield. Concerning the length of the ascospores, *M. mollisioides* (Höhn.) Baral, Helleman & U. Lindem. is also similar to *M. fenniae*. But while the ascospores of *M. mollisioides* are narrower, only $*3\text{--}4.3\text{--}(4.8)\ \mu\text{m}$, the oil content of the ascospores is different as well: OCI = $4\text{--}5$ for *M. fenniae*, OCI = $1\text{--}2$ for *M. mollisioides*. The ascospores of *M. filicina* ($*10\text{--}12.5 \times 3\text{--}3.5\ \mu\text{m}$) and of *M. zottoi* ($*11\text{--}12.5 \times 3\text{--}3.5\ \mu\text{m}$) are distinctly smaller than those of *M. fenniae* ($*12.5\text{--}15\text{--}(16.5) \times 4.5\text{--}5.5\ \mu\text{m}$). Those of *M. cornea* ($*15\text{--}21\text{--}(24) \times (2.8\text{--})3\text{--}3.5\text{--}(4)\ \mu\text{m}$) and of *M. curvatispora* ($*14\text{--}20 \times 2.9\text{--}4\ \mu\text{m}$) are distinctly longer than those of *M. fenniae*.

Furthermore, *M. fenniae* is distinguished from most of the other species of *Micropeziza* by its host plant: *M. cornea* grows on culms and leaves of monocots, *M. filicina* on rachises of ferns, *M. mollisioides* on dead leaves of *Quercus* spp., *M. umbrinella* on herbaceous stems of angiosperms and — as far as we know — *M. zottoi* is restricted to the dead leaves of *Comarum palustre*. Only *M. curvatispora* was also found on dead leaves of *Rhododendron tomentosum*, but the micro-morphological features are clearly different to *M. fenniae* (cf. description of *M. curvatispora*; compare Plate 3 and 7).

An interesting feature of *M. fenniae* which was not previously observed on any other species of *Micropeziza*, is that overmature ascospores change color from hyaline to greyish-brown and become one-septate.

Although the micro-morphological differences from similar species of *Micropeziza* are not as distinctive as in *M. curvatispora*, they are nevertheless sufficient that we consider *M. fenniae* a well-characterized separate taxon.

In July 2014, *M. fenniae* was found almost simultaneously at two different places in Finland, North Karelia. The first time, *M. fenniae* was collected on 01.VII.2014 (cf. the data of the additional collection). Two days later, on 03.VII.2014, it was found twelve kilometers east from the first locality (this collection was assigned as holotype). A third time it was found on 17. VIII. 2014 again at the type location after a period of warm weather without rain.

The environmental conditions at both places are very similar: forested swamp borders with shrubs. The trees at the places include sparsely growing *Pinus sylvestris* L., *Picea abies* (L.) H. Karst. and *Betula* spp. Besides *Rhododendron tomentosum* the shrubs include *Vaccinium uliginosum* L., *V. myrtillus* L., *V. vitis-idaea* L., *Empetrum nigrum* L., *Calluna vulgaris* (L.) Hull, *Chamaedaphne calyculata* (L.) Moench and *Rubus chamaemorus* L. The fruitbodies of *M. fenniae* grow on former year leaves of *Rhododendron tomentosum* which had fallen on a shady ground and thus kept in moisture. On some leaves *Lophodermium sphaerioides* (Alb. & Schwein.) Duby and *Fuscolachnum* sp. are associated with *M. fenniae*.

North Karelia is the easternmost region of the continental European Union. It shares an approximately 300 km frontier with Russia. The region belongs to the boreal ecosystem. The climate is cold and continental. There is significant rainfall throughout the year. Even the driest month still has a lot of rainfall. The average annual temperature in Outokumpu, the closest town to the type location, is 2.5°C . The average annual rainfall is about 700 mm. The warmest month of the year is July with an average temperature of 16.5°C . In January, the coldest month of the year, the average temperature is -10.4°C (cf. <http://en.climate-data.org/location/9766/>). The climate is comparable to Western Siberia where *M. curvatispora* was found (cf. discussion of *M. curvatispora*).

c) *M. zottoi*

This species resembles *M. filicina* and *M. fenniae* in many aspects but differs from the first in a different L/W ratio of the living asci (shorter and broader in *M. zottoi*) and the non-cryptogamic host; the latter differs in much broader living ascospores. *M. zottoi* could be confused with macroscopically almost indistinguishable mature fruitbodies of *Mollisia minutella* P. Karst. (cf. KARSTEN, 1888: 15) [non *Mollisia minutella* (Fuckel) Nauta, nom. invalid., cf. NAUTA (2010) – a wood inhabiting species] which also grows on *Comarum palustre* leaves but differs microscopically in possessing eguttulate ascospores ($*6\text{--}7.5 \times 2.2\text{--}2.5\ \mu\text{m}$) and elongated asci ($*43\text{--}47.5 \times 5.5\text{--}6.2\ \mu\text{m}$) with a narrow conical apex. There is also a possible confusion with *Aivenia tantula* Svrček which also grows on *Comarum palustre*, as is the case in the type collection. That species has like *M. zottoi* very minute fruitbodies. Macroscopically the color of the apothecia is lighter, microscopically the differences are clear: different size and shape of the ascospores, lower oil content, paraphyses without VBs, no crust on the outside of the apothecia, no pseudo-epithelium covering paraphyses and asci.

Although the differences from the sibling species *M. filicina* are not very distinctive, they are nevertheless sufficient especially in regard to the host plant that we consider *M. zottoi* a well-characterized separate taxon.

Ecology of *M. zottoi*: on the underside of dead previous years leaves of *Comarum palustre* – in Germany in a *Caricetum rostratae* plant community with *Menyanthes trifoliata* L., in Belgium in a lower peat bog with *Dactylorhiza sphagnicola* (Höppner) Averyanov, *Menyanthes trifoliata* L., *Angelica sylvestris* L., *Cirsium palustre* (L.) Scop., *Narthecium ossifragum* (L.) Huds. Associated fungi are: *Venturia palustris* Sacc., E. Bommer & M. Rousseau, *Mycosphaerella ranunculi* (P. Karst.) Lind. (det. H. Lotz-Winter), *Gnomonia comari* P. Karst. and *Aivenia tantula* Svrček.

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Table 1 – Synoptical table of the main morphological and ecological features of the known *Micropeziza* species

	<i>M. umbrinella</i>	<i>M. curvatispora</i>	<i>M. filicina</i>	<i>M. zottoi</i>	<i>M. mollisioides</i>	<i>M. fenniae</i>	<i>M. cornea</i>	<i>M. castanea</i>
Asci								
with croziers	–	–	+	+	+	+	+	+
euamyloid apical ring	–	+	+	+	+	+	+	+
size (in living state) in μm	85–100 \times 8–12.5	75–100 \times 8.3–13	50–60 \times 8.5–10	39–50 \times 9.5–11	60–85 \times 8.5–10	60–75 \times 11–14	50–85 \times 8–11.5	45 \times 16 (fide SACCARDO 1882: 572), 35–40 \times 9 (fide DENNIS 1964: 38)
Ascospores								
shape	fusoid with obtuse ends with an inconspicuous gel sheet	narrow ellipsoid-fusoid	ellipsoid-fusoid with obtuse ends	ellipsoid-fusoid with obtuse ends	ellipsoid-fusoid with obtuse ends	ellipsoid-fusoid with obtuse ends	narrow ellipsoid-fusoid	ellipsoid
	straight	curved	straight	straight	straight	straight	straight	straight
oil content (in living state)	4–5	4	4–5	4	1–2	4–5	1–2	3–4 (?) (cf. picture in DENNIS 1964: 37, Fig. 10)
size (in living state) in μm	13–19 \times 3.7–5	13.8–20.3 \times 2.9–4	10–12.5 \times 3–3.5	11–12.5 \times 3–3.5	11–15 \times 3–4.3	12.5–15 \times 4.5–5.5	15–21 \times 3–3.5	11–14 \times 3–4 (fide SACCARDO 1882: 572 and DENNIS 1964: 38); dead: 10–12 \times 2.3–2.7 (cf. HELLEMAN <i>et al.</i> 2013: 135)
Shield	–	+	–	+(-)	+	+	+(-)	?
Host	herbaceous stems of angiosperms	leaves of <i>Rhododendron tomentosum</i> and <i>Vaccinium oxycoccos</i>	rachises of ferns	leaves of <i>Comarum palustre</i>	leaves of <i>Quercus</i> spp.	leaves of <i>Rhododendron tomentosum</i>	culms and leaves of monocots	living leaves of <i>Quercus laurifolia</i>
Location	Europe	Western Siberia	Germany, Great Britain	Belgium, Germany	Europe	Finland	Europe	North America (Florida)

Key to the accepted species of *Micropeziza* based on characters in living state

- 1 Asci with inamyloid apex; ectal excipulum with brown granules only near the margin; ascospores with two large and many minute oil drops (OCI = 4–5), *13–19(–21) \times 3.7–5 μm , on herbaceous stems of angiosperms..... ***M. umbrinella***
- 1* Asci with euamyloid apical ring; ectal excipulum at flanks and margin sparsely to densely clothed with a brown fragmented crust 2
- 2 Ascospores with only minute oil drops (OCI = 1–2) 6
- 2* Ascospores with many small and some medium- to large-sized oil drops (OCI = 4–5) 3
- 3 Ascospores more or less straight 4
- 3* Ascospores more or less curved, *14–20 \times 2.9–4 μm ; on leaves of *Rhododendron tomentosum* and *Oxycoccus palustris* ***M. curvatispora***
- 4 Ascospores max. 4 μm broad 5
- 4* Ascospores *12.5–15(–16.5) \times 4.5–5.5 μm ; on leaves of *Rhododendron tomentosum* ***M. fenniae***
- 5 Ascospores *10–12.5 \times 3–3.5 μm , asci *50–60 \times 8.5–10 μm ; on rachises of ferns ***M. filicina***
- 5* Ascospores *11–12.5 \times 3–3.5 μm , asci *39–50 \times 9.5–11 μm ; on leaves of *Comarum palustre* ***M. zottoi***
- 6 Ascospores *(10–)11–15(–17) \times 3–4.3(–4.8) μm ; on leaves of *Quercus* spp. ***M. mollisioides*** (compare to *M. castanea*) \diamond
- 6* Ascospores *15–21(–24) \times (2.8–)3–3.5(–4) μm ; on culms and leaves of monocots ***M. cornea* s.l.**

\diamond *Micropeziza castanea* (Sacc. & Ellis) Baral & Guy Garcia is very similar to *M. mollisioides*. But due to the lack of collections with descriptions of the living state, this species from the American continent is not included in the key. For further information about this taxon see HELLEMAN *et al.* (2013: 134f).

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