

Notes on corticioid fungi of the Czech Republic. III. *Scytinostromella humifaciens* (*Russulales*)

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The article presents the first record of the very rare corticioid species *Scytinostromella humifaciens* in the Czech Republic. Macro- and microscopic characters of the species are described and supplemented with photographs of basidiomata and habitat, line drawings and a microphotograph of microscopic characters as well as a discussion on its ecology and distribution.

Key words: crust fungi, distribution, Europe, rare species.

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Článek představuje první nález velmi vzácné kornatcovité houby *Scytinostromella humifaciens* v České republice. Jsou popsány makro- a mikromorfologické znaky doplněné fotografiemi plodnic a biotopu, kresbami a mikrofotografií mikroskopických znaků a je diskutována ekologie a rozšíření druhu.

INTRODUCTION

Scytinostromella Parmasto is a small genus of resupinate corticioid basidiomycetes, including eight valid combinations and six accepted species listed in Index Fungorum (<https://www.indexfungorum.org>). The major microscopic characteristics of the genus are its dimitic hyphal system, the presence of SA⁺ gloeocystidia, and its small amyloid spores (Bernicchia & Gorjón 2010). In the original conception of Parmasto (1968), *Scytinostromella* included species with ornamented spores only, but Ginns & Lefebvre (1993) introduced the smooth-spored *Corticium olivaceoalbum* Bourdot & Galzin [as *Scytinostromella olivaceoalba*

(Bourdot & Galzin) Ginns & Lefebvre] into the genus. In the type species *Scytinostromella heterogenea* (Bourdot & Galzin) Parmasto, conspicuous incrusted pseudocystidia are present, whereas they are absent from other species (Hjortstam & Ryvarden 1980, Ginns & Freeman 1994).

In 2022, during an inventory survey in Břehyně-Pecopala National Nature Reserve (North Bohemia, Czech Republic), the first author encountered conspicuous athelioid basidiomata spread over an area of several square metres on the ground in a water-logged Norway spruce (*Picea abies*) forest. Upon microscopic examination, the collection was identified as the very rare species *Scytinostromella humifaciens* (Burt) G.W. Freeman & R.H. Petersen. Since corticioid species are still often neglected by field mycologists and we are not aware of any published photographs or sequences of the species, we decided to present the species to a wider audience.

MATERIAL AND METHODS

The macroscopic descriptions are based on fresh material supplemented with colour photographs. Reactions with KOH were observed after applying a drop of 5% aqueous solution of KOH on fresh hymenium. Microscopic characters were observed in Melzer's reagent and Congo Red in ammonia on dried herbarium specimens. Heated cotton blue in lactophenol was used to observe cyanophilic reactions, while a 5% aqueous solution of KOH was used to describe the colour of spores and other microscopic characters. A sulphovanilline reaction (Cléménçon 2009) was performed on dried material. Measurements and microscopic drawings are based on Melzer's reagent (Cléménçon 2009) preparations in oil immersion at 1000× magnification. Spore measurements (excluding ornamentation) were obtained from at least 30 spores not attached to basidia, using an optical micrometer. Clearly abnormal or immature spores were excluded from the measurements.

The specimens were dried in a portable dryer within 24 hours after collection at 40 °C. Herbarium voucher specimens are deposited in the herbarium of the Museum of Eastern Bohemia (HR) and the private herbarium of the first author (herb. L.Z.). Major Czech herbaria (BRNM, CB, HR, PRM) were searched for herbarium material of *Scytinostromella* spp. during the first half of 2023. For herbarium acronyms, see Thiers (on-line). Plant names follow Kaplan (2019).

A sequence of ITS segment was obtained from specimen HR B023249 (see Sochorová et al. 2022 for more detailed methods used) and compared with available data in GenBank (<https://www.ncbi.nlm.nih.gov/genbank/>) and UNITE (<https://unite.ut.ee/analysis.php>).

Abbreviations used: det. – identified by, leg. – collected by, Q – measured length/width ratio of spores, Q_{avg} – average Q values in individual collections.

RESULTS AND DISCUSSION

Scytinostromella humifaciens (Burt) G.W. Freeman & R.H. Petersen, *Mycologia* 71(1): 86, 1979

Basionym: *Peniophora humifaciens* Burt, *Annals of the Missouri Botanical Garden* 12: 225, 1926

Synonym: *Amylosporomyces humifaciens* (Burt) S.S. Rattan, *Bibliotheca Mycologica* 60: 245, 1977

Macroscopic characters (Figs 1–2). Fresh basidiomata resupinate, reticulate at first but soon pellicular (athelioid), widely effused, individual patches of up to several dm² in size covering an area of ca 3 × 4 m, soft, loosely attached to the substrate, hymenium whitish to cream; hymenophore initially smooth, becoming folded to merulioid; margin byssoid, without rhizomorphs, odour none. Underlying substrate with numerous whitish fragile rhizomorphs. Dried basidiomata cream to pale ochre, fragile, becoming cracked in parts.



Fig. 1. Basidioma of *Scytinostromella humifaciens* (HR B023249). Scale bar = approx. 1 cm. Photo L. Zíbarová.

Microscopic characters (Figs 3–4). Hyphal system dimitic in subiculum, monomitic in subhymenium. Hyphae in subhymenium densely arranged, more or less perpendicular to the surface, branched at sharp angles, smooth, thin-walled, 1.5–2.5 µm in diameter, septa with clamps, crystals mostly absent. Skeletal hyphae in subiculum loosely arranged, parallel to the surface, single or forming fascicles, unbranched or sparsely branched, smooth or finely incrustated with more or less rhomboid crystals, thick-walled, but lumen continuous, 1.5–2(2.5) µm in diameter, without septa. Generative hyphae in subiculum loosely arranged, with a random orientation or parallel, thin-walled, 2–8.5 µm in diameter, sparsely



Fig. 2. Basidioma of *Scytinostromella humifaciens* (HR B023249). Scale bar = approx. 1 cm.
Photo L. Zibarová.

branched, septa with clamps, frequently guttulate, rhomboid crystals sometimes present. Peculiar terminal elements of generative hyphae present both in subiculum and rhizomorphs, such elements are straight or bent, with short side branches, up to 78 μm long. Rhizomorphs dimitic. Generative hyphae in core of rhizomorphs parallel, tightly packed, sparsely branched, 2.5–5.5 μm in diameter, thin-walled, septa with clamps. Peripheral generative hyphae loosely interwoven with skeletal hyphae, 2–4 μm in diameter, thin-walled, often with short side branches or excrescences. Skeletal hyphae in rhizomorphs similar to subicular ones, present in peripheral area.

Gloeocystidia of subhymenial or hymenial, rarely subicular origin, scattered to numerous, mostly fusiform, rarely cylindrical or narrowly clavate, with sub-acute, less often acute or obtuse apex, rarely with a schizopapilla, thin-walled, non-septate, not or slightly incrusted, filled with varying fractions of pale yellowish granular or finely guttulate content, sulphovanilline reaction negative (in dried material), 26–80 $\times$ 5–8 μm , mostly projecting (up to 35 μm) above hymenium but some enclosed. Basidia clavate to cylindrical, frequently slightly constricted in the middle, sessile to somewhat stalked, terminal, clamped, with 4 sterigmata, 15.5–24 $\times$ 4.75–6.5 μm (avg. 19.88 $\times$ 5.42 μm). Basidiospores subglobose to broadly

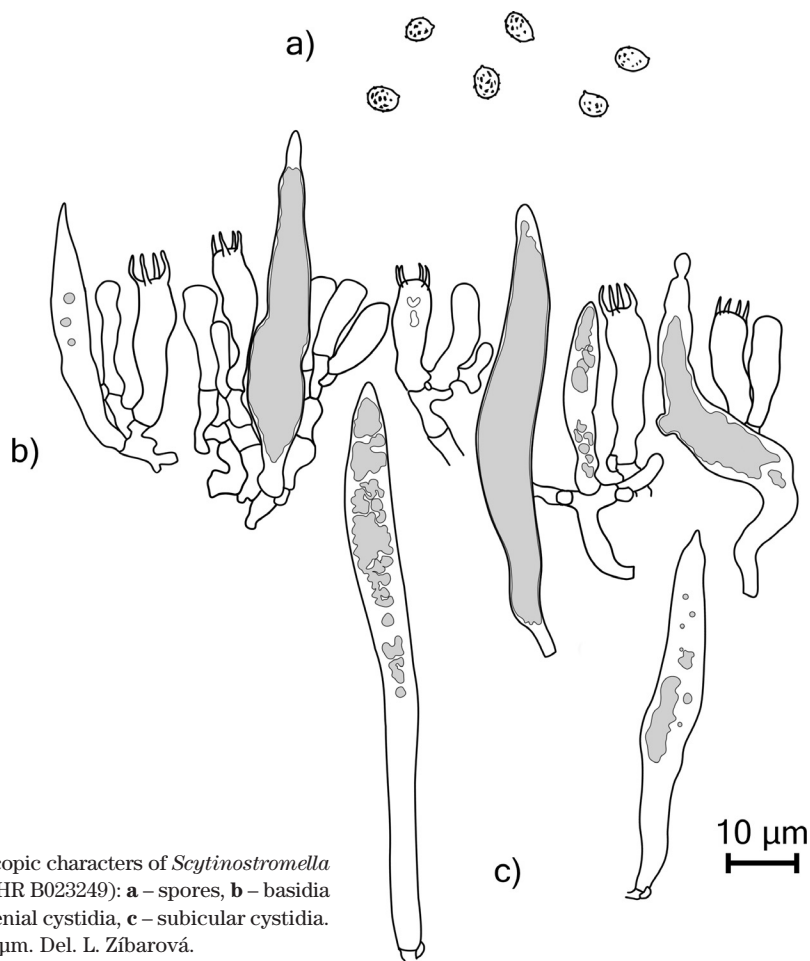


Fig. 3. Microscopic characters of *Scytinostromella humifaciens* (HR B023249): **a** – spores, **b** – basidia and (sub)hymenial cystidia, **c** – subicular cystidia. Scale bar = 10 µm. Del. L. Zíbarová.

ellipsoid, without prominent apiculus, thin-walled, ornamented with elongated warts, hyaline to pale yellowish, strongly amyloid, non-cyanophilous, $3.25\text{--}4.5 \times 2.5\text{--}3.5 \mu\text{m}$ (avg. $3.79 \times 3.08 \mu\text{m}$), $Q = 1.10\text{--}1.46$, $Q_{\text{avg}} = 1.24$).

Molecular analysis. A sequence including ITS1 and 5.8S was generated for the specimen (HR B023249) of *Scytinostromella humifaciens* (GenBank accession number: PZ158428). There is no reference sequence of *S. humifaciens* in public databases, but the closest matches in GenBank (96.67% identity to KP814335.1) and UNITE (97.34% identity to UDB07673545) are sequences labelled as *Scytinostromella heterogenea*. The unanswered question is whether the material from Europe and North America, respectively, represent a single species with a Holarctic distribution or two similar species. Since there is some variability

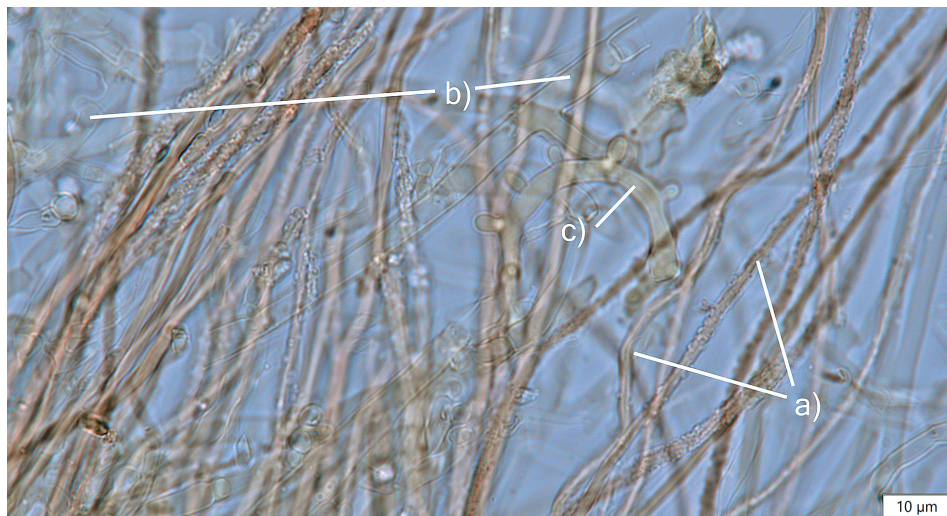


Fig. 4. Structure of subiculum of *Scytinostromella humifaciens* (HR B023249, Melzer's reagent): **a** – skeletal hyphae, **b** – generative hyphae, **c** – terminal element of subicular hypha. Scale bar = 10 µm. Photo L. Zibarová.

in reported morphological characters (see below), a broader taxonomic study is necessary, encompassing the whole genus including additional molecular markers and, most importantly, sequencing North American material, including the type.

Taxonomic notes. *Scytinostromella humifaciens* seems to be well characterised by its fragile athelioid basidioma loosely attached to the substrate, dimitic hyphal system, more or less subulate and projecting (gloeo)cystidia, absence of pseudocystidia and small amyloid ornamented spores. *Scytinostromella heterogenea* is to some extent similar in macroscopical aspects but can be easily distinguished by its numerous enclosed incrustated pseudocystidia.

There is an inconsistency in the descriptions of *S. humifaciens* in the literature regarding its cystidia to be gloeocystidia. American authors (Freeman & Petersen 1979, Ginns & Freeman 1994) mention the presence of just cystidia (although presence of oil globules is mentioned), while explicitly denying the presence of gloeocystidia. In contrast, Eriksson et al. (1984) describe them as “cystidia (gloeocystidia)” based on the studied holotype. Also, Jülich & Stalpers (1980) call the cystidia in *S. humifaciens* gloeocystidia. We believe this to be just a matter of how broadly the term gloeocystidium is applied. Since the majority of the cystidia in our specimens are at least partly filled with a refractive granular or globular substance and therefore meet the broad definition of gloeocystidium (Larsson & Ryvarden 2021), we think it is somewhat confusing to declare that there are no gloeocystidia present in *S. humifaciens*. We were not able to perform

a sulphovanilline reaction of gloeocystidia in fresh material, therefore the observed negative reaction in dried specimens is of limited value.

Also the measured spore dimension varies between authors to some degree, while some (Eriksson et al. 1984, Spirin 2002) are comparable to our data, other ones have somewhat lower values [Liberta (1968): $2.5\text{--}3.5 \times 2.5\text{--}3 \mu\text{m}$; Freeman & Petersen (1979): $3\text{--}4 \times 2\text{--}3 \mu\text{m}$; Ginns & Freeman (1994): $3.0\text{--}3.8 \times 2.6\text{--}3.2 \mu\text{m}$; Boidin et al. (1997): $3.2\text{--}4 \times 2.5\text{--}3.5 \mu\text{m}$], which come closer to those in the original description by Burt (1925): about $2.5 \times 2 \mu\text{m}$. Since the descriptions by both Eriksson et al. (1984) and Liberta (1968) are based on the same type material, it is probable that the discrepancies in measurements are the result of a different methodology rather than any meaningful variability in the material.

We observed incrustation with fine rhomboid crystals in some skeletal hyphae (Fig. 4) both in the subiculum and rhizomorphs. The incrustation is very abundant in some microscopic preparations and virtually absent in other ones, even from different parts of the same specimen. It should be noted that such incrustated hyphae are not mentioned in the original description (Burt 1925) nor in the results of a re-examination of the type material (Eriksson et al. 1984). However, Freeman & Petersen (1979) mention “scattered incrustations” and Spirin (2002) observed granular incrustations in the subiculum and rhizomorphs. In our opinion, the abundance of hyphal incrustations in *S. humifaciens* might be more connected to the age of the basidiomata rather than being of taxonomic value.

Ecology. The microlocality of *S. humifaciens* in the Czech Republic has the character of a relatively young Norway spruce (*Picea abies*) water-logged forest (Fig. 5). Only spruce was present at least 20 m around the basidiomata, some black alder (*Alnus glutinosa*) trees were present at a larger distance. Old aerial photographs (Zeměměřický úřad on-line) show a relatively open spruce forest at the microlocality in 1938, gradually increasing in density up to 1975. In 2003, only scattered small *Picea* individuals are evident in the photographs (Zeměměřický úřad on-line), so the forest had probably been cut in the meantime. Nowadays, the surrounding forests are suffering from a bark beetle (*Ips typographus*) outbreak, therefore a significant portion is clear-cut or consists of dead trees. Due to the relatively young stand age, the microlocality itself is only marginally affected, as only the oldest trees here show signs of beetle infestation. The ground is covered by a thick layer of needle litter (reinforced by shedding of bark-beetle infested trees) and both the herb (dominated by *Oxalis acetosella* and *Dryopteris carthusiana* agg.) and moss layers are therefore very sparse. The basidiomata of *S. humifaciens* partially covered several square metres of ground, growing mostly on thick needle litter but also covering spruce cones, small twigs, bark fragments, living moss, an old, almost fully decayed stump and even on bark on the base of living spruce trees.



Fig. 5. Microlocality of *Scytinostromella humifaciens* (7 Nov 2022). Photo L. Zíbarová.

Macrofungi recorded in the vicinity of basidiomata of *S. humifaciens* during both visits to the microlocality (23 Oct and 7 Nov 2022) included mostly terrestrial saprotrophs associated with the thick layer of accumulated needle litter: *Chlorophyllum olivieri* (Barla) Vellinga, *Clitocybe vibecina* (Fr.) Quél., *Cystoderma carcharias* (Pers.) Fayod, *Entoloma waverenii* Dima, O.V. Morozova & Noordel., *Leucoagaricus nympharum* (Kalchbr.) Bon, *Mycena galopus* (Pers.) P. Kumm., *Mycena metata* (Fr.) P. Kumm., *Mycena sanguinolenta* (Alb. & Schwein.) P. Kumm., *Paralepista flaccida* (Sowerby) Vizzini, *Phaeoclavulina flaccida* (Fr.) Giachini.

There is little knowledge about the ecology of *S. humifaciens*. In the original description Burt (1925) gives a strongly rotten *Tsuga* log as the substrate. The species is mostly mentioned from wood of conifers and (to a lesser extent) broadleaved trees by various authors. For example, Ginns & Freeman (1994) mention *Pseudotsuga menziesii*, *Thuja plicata*, *Tsuga heterophylla*, and unspecified conifer and deciduous wood, Lindtner et al. (2006) *Acer saccharum*, *Populus tremuloides*, and *Tsuga canadensis*, and Spirin (2002) *Picea*. Ginns & Petersen (1994) note that it occurs on the underside of wood, while both records by Spirin (2002) are from butts of old trees. The wide range of hosts, frequent occurrence close to the ground as well as the peculiar mode of growth in our specimens suggest that *S. humifaciens* is a soil saprotroph or has another, unknown trophic status.

The species was recently included in the Red List of Macromycetes of the Czech Republic (Zíbarová et al. 2024) in the Data Deficient (DD) category.

Distribution. *Scytinostromella humifaciens* was originally described (Burt 1925) from the west coast of the U.S.A. (Washington state). Further records from North America (U.S.A., Canada) are given by Ginns & Lefebvre (1993), all of them concentrated in the western states. The first published record of the species from Europe (France) is given by Boidin et al. (1997). Later, it was published from the European part of Russia (Spirin 2002). In Germany, there is a single record from its northernmost part (Schleswig-Holstein; DGfM on-line). In addition, there are two localities known in Denmark (Danish Mycological Society on-line), one in Sweden (<https://artfakta.se>), and one in Norway (<https://www.artsdatabanken.no>).

In the Czech Republic, the species is known from a single locality in North Bohemia which is part of the Mesophyticum phytogeographical region (Skalický 1988).

Specimens studied

Czech Republic. North Bohemia, Doksy (Česká Lípa District), Břehyně-Pecopala NNR, 275 m a.s.l., ca 20-yr old water-logged spruce forest; on the ground – spruce litter, cones, twigs, moss, and strongly decayed remnants of stumps, 23 Oct 2022, leg. et det. L. Zíbarová (herb. L.Z. 12982). – ibid., 7 Nov 2022, leg. et det. L. Zíbarová (HR B023249; duplicate: HR B023255).

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