

First record of *Squamanita schreieri* (*Agaricales*) in the Czech Republic

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The paper reports on the first collection of *Squamanita schreieri* in the Czech Republic, namely at an interesting locality in North Bohemia. Photographs of the only one fresh fruitbody discovered are included, and the authors present its macro- and microscopic description. Ecology and distribution of this very rare agaric are summarised and a brief overview of finds of other representatives of the genus *Squamanita* s.l. in the Czech Republic is provided.

Key words: *Amanita strobiliformis*, *Dissoderma*, *Basidiomycota*, ecology, distribution, North Bohemia.

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Článek informuje o prvním nálezu příživnice Schreierovy – *Squamanita schreieri* v České republice, a to na zajímavé lokalitě v severních Čechách. Připojeny jsou fotografie jediné objevené čerstvé plodnice, autoři článku předkládají její makroskopický a mikroskopický popis. Jsou shrnuty poznatky o ekologii a rozšíření této velmi vzácné lupenaté houby a připojen je stručný přehled o nálezech dalších zástupců rodu *Squamanita* s.l. v České republice.

INTRODUCTION

Continued mycological survey of even well-known localities can provide unexpected results. The second author of this paper became convinced of this during last year's visit to a forest in the vicinity of the town of Roudnice nad Labem (North Bohemia, Czech Republic), where he lives. A few years after his discovery of *Queletia mirabilis* Fr. (see Kříž et Zíta 2016) he found another very rare fungus, *Squamanita schreieri* Imbach – at a distance of about 1 km from the locality of *Q. mirabilis*. The very interesting genus *Squamanita* s.l. comprises of parasites of other *Agaricales* and all its representatives are rarities. There was no

doubt about the identification, because *S. schreieri* has an unmistakable appearance and produces the largest fruitbodies of the genus in Europe (e.g. Redhead et al. 1994, Ludwig 2001, Cetto 2005, Læssøe 2008, Holec et al. 2012, Henrici 2013, Kibby 2020). Boccardo et al. (2008) state that its pileus may have a width of up to 12 cm.

The aim of this paper is to report on the probably first collection of this extremely rare agaric in the Czech Republic and thus to further complete the mosaic of our knowledge about the extraordinarily rich funga of North Bohemia.

MATERIAL AND METHODS

The macroscopic characters described below were studied on the only one fresh young fruit-body. Microscopic mounts were made from dried material in Melzer's reagent, ammoniacal Congo Red and a 5% KOH solution and studied under an Olympus CX21 light microscope with an oil-immersion lens at a magnification of 1000×. The size of thirty randomly selected spores measured is presented in the form of a subjectively determined main range, complemented with extreme values in parentheses. Q_{av} is the average value of spore length/width ratios.

Half of the herbarium specimen has been deposited in the Mycological Department of the National Museum, Prague (PRM) and the other half in the Moravian Museum, Brno (BRNM). Abbreviations of public herbaria follow Thiers (on-line). Data on geological conditions were taken from maps and descriptions at www.geologicke-mapy.cz (Bokr on-line).

RESULTS

Squamanita schreieri Imbach, Mitt. Naturf. Ges. Luzern 15: 81, 1946 Figs 1–5

Macroscopic characters. Pileus 38 mm wide, flattened in the middle and involute at margin; surface yellow-ochre, covered with somewhat darker appressed fibrillose scales, pileal cuticle peelable. Lamellae adnate, rather distant, partly convex, low, white, with concolorous, uneven to crenate edge. Stipe ca 70 × 50 mm, the lower part belonging to the host fungus and the upper part belonging to the parasite itself. The lower part of the stipe is robust, swollen and rooting, separated from the upper part by a sharply cut rim, whitish to greyish white. The upper part is much shorter, narrower, cylindrical to somewhat swollen below, pale yellowish, with two bands of erect, pointed remnants of yellow-ochre veil below, the lower band being more pronounced. Context fleshy, elastic, white, not changing colour when cut but turning orange after drying. Smell disagreeable; taste indistinct.

Microscopic characters. Basidiospores (5.0)5.8–7.5(9.0) × (3.5)3.7–4.5(5.0) μm, $Q = 1.36–2.08$, $Q_{av} = 1.60$, ellipsoid to oval, colourless, smooth, slightly thick-walled, neither amyloid nor dextrinoid, with small but distinct hilar appendix. Basidia mostly 24–42 × 7–9 μm, clavate, 4-spored, rarely with a different



Fig. 1. *Squamanita schreieri*, Krabčice (North Bohemia, Czech Republic), on *Amanita strobiliformis*, 16 July 2022, leg. D. Marounek (PRM 958893, BRNM 840318). Photo D. Marounek.



Fig. 2. *Squamanita schreieri*, Krabčice (North Bohemia, Czech Republic), on *Amanita strobiliformis*, 16 July 2022, leg. D. Marounek (PRM 958893, BRNM 840318). Photo D. Marounek.



Fig. 3. *Squamanita schreieri*, Krabčice (North Bohemia, Czech Republic), on *Amanita strobiliformis*, 16 July 2022, leg. D. Marounek (PRM 958893, BRNM 840318). Photo D. Marounek.



Fig. 4. *Squamanita schreieri*, Krabčice (North Bohemia, Czech Republic), on *Amanita strobiliformis*, 16 July 2022, leg. D. Marounek (PRM 958893, BRNM 840318). Photo D. Marounek.

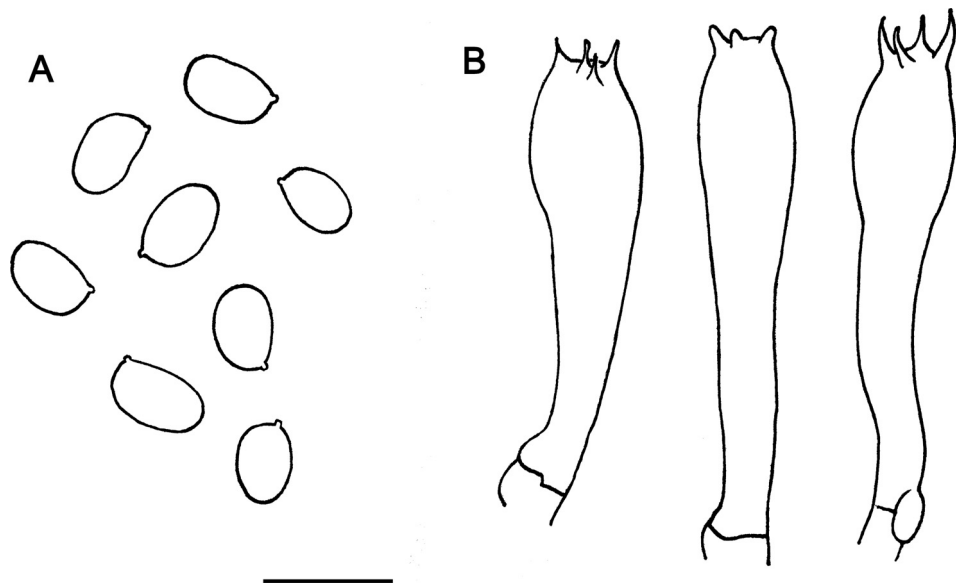


Fig. 5. *Squamanita schreieri* (PRM 958893, BRNM 840318). **A** – basidiospores, **B** – basidia. Scale bar = 10 μ m. Del. M. Kříž.

number of sterigmata (1-, 2-, 5- or even 8-spored), sporadically larger anomalous basidia of up to $52 \times 11 \mu\text{m}$ were observed. Hymenial cystidia not found. Chlamydospores at the basal host part of the stipe not found. Pileipellis of uneven thickness (in the fibrillose scales and between them), consisting of chains of cylindrical to slightly inflated, colourless to pale brownish yellow cells $25\text{--}220 \times 6\text{--}23(30) \mu\text{m}$ in size and with smooth wall. Clamp connections present.

Habitat. In moss in a scrubby place near the margin of a thermophilic deciduous forest on basic soil under *Tilia*, *Prunus spinosa*, *Malus* and *Fraxinus excelsior*, together with *Amanita strobiliformis* (Paulet ex Vittad.) Bertill. The geological bedrock consists of marlite with limestone concretions of the Bohemian Cretaceous Basin. Elevation ca 200 m a.s.l. Altogether two fruitbodies of *Squamanita*, one of them very old and blackened, grew close by the path. The vegetation of the adjacent forest corresponds to the habitat of Euro-Siberian steppic woods with *Quercus* spp. (Chytrý et al. 2010). The first report regarding the funga of this locality (in a broad sense) was published many years ago (Marounek 2002) and *Amanita strobiliformis* was one of the species mentioned.

Material examined

Czech Republic. Bohemia. Krabčice near Roudnice nad Labem town (North Bohemia, Dolnooharská tabule plateau), near the solitude of Kalešov, under *Tilia* and other broadleaved trees, together with *Amanita strobiliformis*, 16 July 2022, leg. D. Marounek, det. J. Borovička (PRM 958893, BRNM 840318).

DISCUSSION

Variability of microscopic characters

Unfortunately, the only fresh young fruitbody observed does not allow us to make a more thorough comparison with descriptions in the literature. We did not find any cheilocystidia as depicted by Breitenbach et Kränzlin (1995) for Swiss collections and then taken over from their drawing by Ludwig (2001). We assume that the allegedly up to 80 µm long cheilocystidia are actually abnormal basidio-lae corresponding to the sporadic oversized basidia which we observed (see description above). Basidia are usually mentioned to be shorter, e.g. up to 30 µm (Breitenbach et Kränzlin 1995, Červenka et Kautmanová 2007).

Ecology and distribution

The hosts of *Squamanita schreieri* are thought to be *Amanita strobiliformis* and *A. echinocephala* (Vittad.) Quél. (e.g. Michael et Hennig 1964, Wasser 1993, Henrici 2013, Læssøe et Petersen 2019, Liu et al. 2021, Saar et al. 2022), which are thermophilous, calciphilous and mycorrhizal with various deciduous trees. Although we have recorded the occurrence of both these species in the forest near the settlement of Kalešov, only *A. strobiliformis* grew directly at the site of *S. schreieri*.

Squamanita schreieri is a very rare species occurring in Europe, but absent in many countries and often red-listed if present. It was included in the IUCN Red List (Kautmanová 2019) with occurrence reported from the following countries: Austria, Belgium, France, Germany, Greece, Hungary, Italy, Slovakia, Switzerland and Ukraine. Its distribution in Europe is also summarised by Červenka et Kautmanová (2007) along with information on its first finds in Slovakia, namely at two localities in the territory of the city of Bratislava. Hagara (2014) published photos from both mentioned Slovak localities.

***Squamanita* s.l. in the Czech Republic**

Based on phylogenetic analysis of ITS and partial nuc 28S rDNA data, Saar et al. (2022) revealed that the genus *Squamanita* in its previous concept was polyphyletic, splitting into two monophyletic groups, which they recognise as the genera *Squamanita* Imbach (s.str.) with type species *S. schreieri*, and *Disso-derma* (A.H. Sm. et Singer) Singer with type species *D. paradoxum* (A.H. Sm. et Singer) Singer. In the light of this modern taxonomy, we would like to provide a brief overview of the very few records of these mycoparasitic fungi in the Czech Republic.

Concerning the genus *Squamanita* s.str., the only other recorded species known to us is *S. odorata* (Cool) Imbach, mentioned for the first time from

Boubínský prales virgin forest in the Šumava Mts by Kubička (1960), as *Coolia odorata* (Cool) Huijsman (leg. J. Herink, without date). Kubička surprisingly listed this species among lignicolous fungi (growing on lying trunks of *Abies alba*). It has not been found here recently (Holec et al. 2015). However, occurrence of *S. odorata* in the Czech Republic has been confirmed by a recent unpublished find in the Brdy Mts (West Bohemia): Strašice, Ostrý vrch hill, 29 Sept. 2019 leg. P. Souček, 30 Sept. 2019 leg. L. Hejl; very young fruitbodies grew under *Picea abies* at the edge of a forest path along with a number of fruitbodies of *Hebeloma mesophaeum* (Pers.) Quéf.

As far as we know, the genus *Dissoderma* is represented by only one species in the Czech Republic, namely *D. galerinicola* I. Saar. It has been published including colour photographs by Kříž et al. (2017) as *Squamanita contortipes* (A.H. Sm. et D.E. Stuntz) Heinem. et Thoen, the concept of which is newly restricted to a North American species with the current name *D. contortipes* (A.H. Sm. et D.E. Stuntz) I. Saar et Thorn, differing from the similar-looking European *D. galerinicola* in ITS sequence and somewhat larger basidiospores (Saar et al. 2022).

We propose including *Squamanita schreieri* into the next edition of the Red list of macromycetes of the Czech Republic and classifying it in the Critically Endangered (CR) category. In addition, the other two mentioned species, i.e. *S. odorata* and *D. galerinicola*, should undergo an analogous process.

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