

## Notes on corticioid fungi of the Czech Republic. II. *Athelidium caucasicum* (*Stephanosporaceae*, *Agaricales*)

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The corticioid fungus *Athelidium caucasicum* (*Stephanosporaceae*) was found in central Europe (Czech Republic), being the second published record since the type collection was made. A description of macro- and micromorphological characters based on the recent collection is provided as well as notes on its ecology, variability and taxonomic position.

**Key words:** Basidiomycota, distribution, rare species.

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Kornatcovitá houba *Athelidium caucasicum* (*Stephanosporaceae*) byla nalezena ve střední Evropě (Česká republika) jako druhý publikovaný nález od sběru typové položky. Je poskytnut popis makro- a mikroskopických znaků založených na recentním nálezu stejně jako poznámky k jeho ekologii, variabilitě a taxonomickému postavení.

### INTRODUCTION

*Athelidium* Oberw. is a small genus of corticioid fungi originally created to accommodate the sole species *Xenasma aurantiacum* M.P. Christ. *Athelidium aurantiacum* (M.P. Christ.) Oberw. is characterised by among others the orange-yellow colour of the hymenial surface, clampless septa, cylindrical to clavate, slightly constricted basidia, and thin-walled, smooth, inamyloid spores (Eriksson & Ryvarden 1973, Bernicchia & Gorjón 2010). Other species have been combined into the genus, namely *Xenasma pyriforme* M.P. Christ. and later *Athelia phycophila* Jülich, but their inclusion remains controversial. The only other

widely accepted species of *Athelidium* is the recently described *A. caucasicum* Yurchenko (Ghobad-Nejhad & Yurchenko 2012). The aim of this contribution is to present the first record of the latter species from the Czech Republic and possibly also central Europe.

#### MATERIAL AND METHODS

The macroscopic description is based on fresh material and is supplemented with colour photographs. Microscopic characters were observed in Melzer's solution (Clemençon 2009) on dried herbarium specimens using a Carl Zeiss Jena Amplival microscope. Heated cotton blue in lactophenol was used to observe cyanophilic reactions and a 5% aqueous solution of KOH to describe the colour of spores and other microscopic structures. Measurements and microscopic drawings are based on Melzer's solution preparations under oil immersion at 1000× magnification. Spore measurements (excluding ornamentation) were obtained from at least 30 spores detached from basidia in preparations, using an optical micrometre. Clearly aberrant or immature spores were not included in the measurements.

The specimen was dried in a portable dryer within 24 hours after collection. The voucher specimen is deposited in the herbarium of the Museum of Eastern Bohemia (HR). For herbarium acronyms, see Thiers (on-line). Data on the distribution in the Czech Republic is supplemented with codes of phytogeographical districts (Skalický 1988). Plant names follow Kubát (2002). Square brackets in the Specimens examined section denotes data added by the authors (i.e. not present on the original herbarium label).

Abbreviations used: avg. – average value, det. – identified by, leg. – collected by, PLA – Protected Landscape Area (CHKO in Czech), Q – length/width ratio of spores,  $Q_{\text{avg}}$  – average Q value.

#### RESULTS

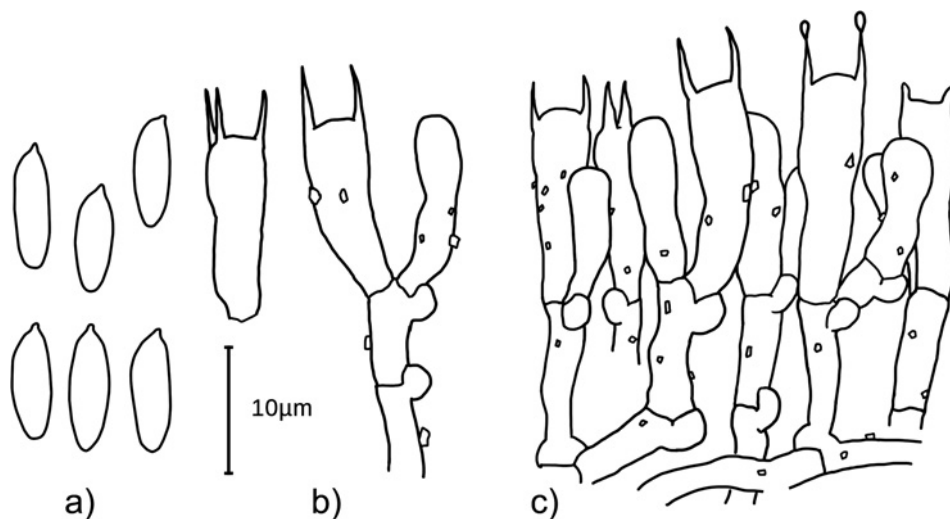
***Athelidium caucasicum*** Yurchenko, in Ghobad-Nejhad & Yurchenko, Syn. Fung. (Oslo) 30: 6, 2012 Figs. 1, 2

**Description.** Basidiocarp a patch of 14 × 6 mm, effused, adnate, porulose, light yellow-orange, margin diffuse. Not discolouring in exsiccate.

Hyphal system monomitic, poorly differentiated into a subiculum and a subhymenium. Subicular hyphae 3.5–4.5 µm in diameter, sparse, parallel to the substrate, thin-walled, with scattered irregular crystals, septa with conspicuous clamps. Subhymenial hyphae 2.5–4 µm in diameter, more or less perpendicular to the



**Fig. 1.** Basidioma of *Athelidium caucasicum* (HR B000023). Scale bar = approx. 1 cm. Photo L. Zíbarová.



**Fig. 2.** Microscopic characters of *Athelidium caucasicum* (HR B000023): a – spores, b – basidia, c – part of hymenium. Scale bar = 10 μm. Del. L. Zíbarová.

substrate, thin-walled, with small scattered crystals, septa numerous, with clamps. No cystidia present. Basidia 16–18 × 5–5.5 µm, (sub)clavate, occasionally constricted in middle part, clamped at base, without inclusions, rarely with small scattered crystals, mostly with 2, but not infrequently also 1, 3 or 4 sterigmata. Spores 8–10(12) × 3–3.5 µm (avg. 9.1 × 3.2 µm),  $Q = 2.4–3.4$  ( $Q_{avg} = 2.83$ ), subcylindrical to subfusoid, hyaline, thin-walled, without conspicuous inclusions, occasionally glued in groups of 2–3, inamyloid, not cyanophilous.

#### Specimens examined

##### *Athelidium caucasicum*

Czech Republic. Northwest Bohemia, České středohoří PLA, Chraberce (Louny District), saddle between Oblík and Srdov hills, 370 m a.s.l., thermophilous scrub vegetation, on twig of *Fraxinus excelsior* lying on the ground, 26 Oct. 2017, leg. & det. L. Zibarová (HR B000023).

##### *Athelidium aurantiacum*

Slovakia. [Spišská Magura Mts.] Vyšné Ružbachy (Stará Lubovňa District), spa park, 660 m a.s.l., on branch of *Aesculus hippocastanum* lying on the ground, 16 Oct. 1997, leg. & det. L. Hagara (BRA CR30516).

## DISCUSSION

### Taxonomy

*Athelidium* is a member of the *Stephanosporaceae* Oberw. & E. Horak together with other (mostly) corticioid genera *Lindtneria* Pilát and *Cristinia* Parmasto (Larsson 2007). However, apart from its yellow-orange basidiomata, it is rather distinct from other members of the family by its smooth spores, and absence of cyanophilous granulation in immature basidia. These features might correspond to its basal and isolated position within the *Stephanosporaceae* clade (Lebel et al. 2015). On the other hand, the analysis of Koukol (2016) places *Athelidium aurantiacum* in the basal position of the *Cristinia* clade, therefore encompassing all smooth-spored species of the family in a single, well-supported clade. Major distinguishing characters of *Athelidium* from superficially similar athelioid genera seem to be the bright colour of the hymenium surface and somewhat constricted basidia.

*Athelidium caucasicum* was described based on an old collection by E. Parmasto from Teberda Nature Reserve, Caucasus, Russia (Ghobad-Nejhad & Yurchenko 2012). It shares a orange-yellow colour of the hymenial surface and more or less cylindrical-subfusiform spores with *A. aurantiacum*. However, it differs by presence of clamps at the septa and mostly bisporic basidia, while *A. aurantiacum* is tetrasporic and simple-septate (Eriksson & Ryvarden 1973). Ghobad-Nejhad & Yurchenko (2012) also mention somewhat narrower subicular hyphae in

*A. caucasicum*, but we cannot confirm this for our specimen, as the recorded values overlap with those given by Eriksson & Ryvarden (1973) for *A. aurantiacum*. On the other hand, we can reassert the presence of crystalline material on the hyphae, described in the protologue, as another distinguishing character.

There is a possibility that both above-mentioned *Athelidium* species are an apomictic / out-crossing pair of forms of a single biological species. However, apomictic forms are usually bisporic and clampless, while out-crossing ones are tetrasporic and have clamps on the hyphae as it is seen in e.g. the pair *Haasiella venustissima* (Fr.) Kotl. & Pouzar / *H. splendidissima* Kotl. & Pouzar (*Tricholomataceae*; Vizzini et al. 2012). The situation in *Athelidium* is just the opposite – the mostly bisporic *A. caucasicum* possesses clamps, while the tetrasporic *A. aurantiacum* is clampless. A molecular analysis would help to solve this puzzle, but could not be carried out as a part of this article due to the small amount of Czech material (less than 1 cm<sup>2</sup>). Scarcity of material is possibly a common feature in *Athelidium*, as it is also mentioned by Eriksson & Ryvarden (1973) for their material of *A. aurantiacum*. Likewise, the specimen of *A. aurantiacum* from the BRA herbarium is very scanty, which may be the reason why species of this genus are seldom collected [only single sequence of *Athelidium* has been published (EU118606.1)].

Oberwinkler (1965) originally included also the white-coloured *Xenasma pyriforme* M.P. Christ. – mostly known as *Athelia pyriformis* (M.P. Christ.) Jülich – in *Athelidium*, but molecular evidence shows that it must be placed in the family *Hygrophoraceae* Lhotsy, in the new monotypic genus *Eonema* Redhead, Lücking & Lawrey, created to accommodate it (Lawrey et al. 2009). Later Zmitrovich (2004) transferred *Athelia phycophila* Jülich to *Athelidium* without much justification in a footnote to his article. Judging from the original description (Jülich 1972), *A. phycophila* shares clampless hyphae with *A. aurantiacum*; additionally, basidia are depicted by the author as being slightly constricted, but the basidiomata completely lack bright colours.

The mycelial cords at the margin of the basidioma in the Czech collection (Fig. 1) most probably belong to another fungal species. They consist of uniform yellowish, slightly thick-walled simple-septate hyphae 3.5–5 µm in diameter. In proximal parts they are partly covered by a basidiocarp of *A. caucasicum*, but its hyphae are very different (thin-walled, hyaline, clamped) from those of the mycelial cords and we did not observe any physical connection between them. In other regards the Czech material agrees well with the original description.

### Ecology and distribution

No member of the genus *Athelidium* was previously known from the Czech Republic, but *Athelidium aurantiacum* was recorded from all neighbouring

countries: Austria (Dämon & Krisai-Greilhuber 2016), Germany (Oberwinkler 1965, Ostrow & Dämmrich 2010), Poland (Wojewoda et al. 1985) and Slovakia (Hagara 2014) in different habitats and therefore, given enough time and effort, it will possibly also be found in the Czech Republic. We examined the specimen of *A. aurantiacum* from Slovakia (BRA), but the material was so scanty that it did not allow for a full study of its morphology.

*Athelidium caucasicum* was found at the foot of Oblík hill (most of which has been protected as a National Nature Reserve since 1967), an exceptionally dry and warm locality with many species of xerophilic biota (including macrofungi – see Kříž 2015 for an overview of the literature) and conditions there approach a Mediterranean climate (Holec et al. 2016). This is rather different from the habitat of the type collection (*Acer* forest at 1550 m a.s.l.; Ghobad-Nejhad & Yurchenko 2012), but also from the habitat (“in very moist habitats”) of *A. aurantiacum* in Nordic countries given by Knudsen (2012).

The present collection of *A. caucasicum* was recorded on an annual shoot (ca 8 mm in diameter) of ash (*Fraxinus excelsior*) still in bark lying on the ground, among other thin branches and litter under scrub vegetation (*Crataegus* sp., *Cornus sanguinea*, *Viburnum* sp., *Rosa canina* agg., *Fraxinus excelsior*, *Prunus avium*). The ash trees in the region are frequently damaged by *Hymenoscyphus fraxineus*, which causes dieback of their terminal shoots. The substrate on which *A. caucasicum* was found probably originated in that way. The type of *A. caucasicum* was collected on a dead twig of *Salix* (Ghobad-Nejhad & Yurchenko 2012). For comparison, *A. aurantiacum* has been found on decayed wood of *Alnus*, *Salix* (Eriksson & Ryvarden 1973) and fallen spruce needles (Wojewoda et al. 1985).

*Athelidium caucasicum* was collected outside the actual Oblík National Nature Reserve, but the locality is part of the Special Area of Conservation “Oblík – Srdov – Brník” and the České středohoří Protected Landscape Area. Therefore, its locality is not under direct threat of destruction at the moment. Inclusion of the fungus into the national Red List is therefore not a priority.

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