

Revision of the genus *Cotylidia* (Basidiomycota, *Hymenochaetales*) in the Czech Republic

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To date, three species of the genus *Cotylidia* have been identified in the Czech Republic: *C. muscigena*, *C. pannosa*, and *C. undulata*. The occurrence of *Cotylidia undulata* in the Czech Republic was already confirmed and a new locality is published here. The other two species are newly reported from the Czech Republic. The remaining two European *Cotylidia* species are not yet known from the area studied: *C. carpatica* and the badly known Mediterranean *C. marsicana*. Finally one specimen found during the study of herbarium material does not correspond well to any known European species. The genus was reviewed based on fresh and herbarium specimens. The species of *Cotylidia* are described and an identification key is added. All three species are rarely reported fungi.

Key words: hymenochaetoid clade, taxonomy, distribution, threatened fungi, Europe.

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Tři druhy rodu lupénka (*Cotylidia*) byly potvrzeny z České republiky: *Cotylidia muscigena*, *C. pannosa* a *C. undulata*. Výskyt lupénky vlnité (*C. undulata*) v České republice byl potvrzen a je publikována nová lokalita. Další dva druhy lupének jsou nově uváděny z České republiky. Zbývající dva evropské druhy jsou stále neznámé z našeho území: *C. carpatica* a málo známý mediteránní druh *C. marsicana*. Navíc jedna položka nalezená v herbáři neodpovídá dobře žádnému známému evropskému druhu. Rod byl podroben revizi na základě čerstvých sběrů i herbářových položek. Druhy jsou popsány a uspořádány do určovacího klíče. Celkově jde o řídce zaznamenávané druhy.

INTRODUCTION

The genus *Cotylidia* P. Karst. includes some less known species of both interesting and beautiful stipitate stereoid fungi. It is well delimited and characterised by the following characters: infundibuliform or spatulate, stipitate, light-coloured basidiomata, hymenophore smooth or rugose, flesh pale; hyphal system monomitic, hyphae without clamps, cystidia present and projecting beyond

basidia, basidia with four sterigmata, basidiospores ellipsoid, hyaline, smooth, inamyloid; habitat muscicolous, terricolous or lignicolous (Reid 1965).

The genus was formerly placed in *Aphylllophorales* (e.g. Vesterholt 1997), but current phylogenetic studies (Moncalvo et al. 2002, Sjökvist et al. 2012) exclude *Cotylidia* from its traditional position in the *Podoscyphaceae* family (*Polyporales*) and place it together with the agaricoid genus *Rickenella* Raithehl. in the hymenochaetoid clade. Despite the external differences, the genera are connected by at least their bryophilous ecology (Larsson et al. 2006, Redhead et al. 2002).

Reid (1965) monographed stipitate stereoid species including *Cotylidia* which resembles two other genera, namely *Podoscypha* Pat. and *Stereopsis* D.A. Reid. However, these genera differ mainly in microscopic features: while *Podoscypha* species are dimitic and moreover possess generative hyphae with clamps, those of the genus *Stereopsis* do not have any cystidia. In addition, as shown by recent studies based on molecular taxonomy (Sjökvist et al. 2012), both genera belong to groups unrelated to *Cotylidia*. For the coherence, the species of the genus *Stereum* Hill ex Pers. are dimitic fungi without a stipe and with amyloid spores, belonging to the russuloid clade (e.g. Larsson & Larsson 2003).

Currently the IndexFungorum database (www.indexfungorum.org) contains about eleven accepted species in the genus *Cotylidia* in the world. *Cotylidia* species occur abundantly in the tropics, but up to six species are also known from Europe. Moreau et al. (2008) included four species in their monograph: *C. carpatica* (Pilát) Huijsman, *C. muscigena* L. Remy, *C. pannosa* (Sowerby) D.A. Reid, and *C. undulata* (Fr.) P. Karst. together with one yet undescribed species. The same four species are also included in a recent publication by Bernicchia & Gorjón (2010). Lonati (2000) described the new species *C. marsicana* Lonati, however this species was not studied by any of the above mentioned authors of later treatments of the genus. In the latest edition of *Funga Nordica*, Vesterholt (2012) includes three species, *C. muscigena*, *C. pannosa* and *C. undulata*.

Little is known about the ecology of *Cotylidia* species. They are often referred to as terricolous or muscicolous, but any evidence of their trophic status is lacking. As pointed out above, the genus *Cotylidia* clusters with some other muscicolous species, e.g. *Contumyces rosellus* (M.M. Moser) Redhead, Moncalvo, Vilgalys & Lutzoni, *Cantharellopsis prescotii* (Weinm.) Kuyper, and *Rickenella mellea* (Singer & Cléménçon) Lamoure (Moncalvo et al. 2002, Redhead et al. 2002), and some fungal anatomical structures suggesting biotrophic parasitism were found in *Mnium* thalli in connection with *Cotylidia carpatica* (Moreau & Audet 2008). However, no association with mosses is reported for other species (e.g. *C. pannosa*).

Although most of the species are widespread in Europe, they are never abundant and included in many Red lists of European countries, e.g. Croatia (Anonymus 1), Denmark (Wind & Pihl 2010), Finland (Rassi et al. 2010), the Netherlands (Anonymus 2, 2008), Norway (Bendiksen et al. 1998), Slovakia (Lizoň 2001), Switzerland (Senn-Irlet et al. 2007) or United Kingdom (Evans et al. 2006). So far, only one species was recorded in the Czech Republic – *Cotylidia undulata*, mentioned by Pouzar as a critically endangered species in the Red List of Czech Macromycetes (Holec & Beran 2006).

This report summarises information on the genus *Cotylidia* in the Czech Republic. In 2010, the former author received collections of *Cotylidia pannosa* not known from the Czech Republic to date. The latter author provided descriptions of fresh specimens of *C. undulata* and *C. muscigena*. The revision of dried material of *Cotylidia* loaned from the main Czech herbaria (PRM, BRNM) revealed some new data on the distribution of *Cotylidia* species in the country.

MATERIAL AND METHODS

Descriptions in the present paper are exclusively based on specimens from the Czech Republic. For macroscopic descriptions, fresh material of *C. pannosa*, *C. muscigena* and *C. undulata* was used supplemented by colour photographs. In the case of the unidentified *Cotylidia* specimen (BRNM), the macroscopic description is based on dried material. For microscopic descriptions voucher specimens from the major Czech herbaria (PRM, BRNM, CB) were used. Sadly, older herbarium specimens have often shown to be difficult to identify, as their hymenium often collapses with age. Hitherto, their informational value has proven to be limited. The fresh specimens studied have been dried and deposited in PRM, CB, and the Mycological Herbarium of the Department of Biology, University of West Bohemia (abbreviated KBI here). For acronyms of public herbaria, see Thiers (2012).

Microscopic examinations were performed in Melzer's reagent or a 5% solution of KOH using an Olympus BX 51 light microscope using dried material. An oil immersion lens of 100× magnification was used for all measurements. About 20 well-developed spores and 10 cystidia from each specimen were measured in the most recent collections. As noted above, most older voucher specimens loaned from the public herbaria were in a such poor state that no such numbers could be attained, therefore the number of elements measured in those cases was significantly lower.

The sample for the scanning electron microscope (SEM) was mounted on stub, coated by gold, and photographed using a JEOL JSM-7401F microscope at the Institute of Parasitology, Biology Centre, ASCR in České Budějovice.

RESULTS AND DISCUSSION

Cotylidia muscigena L. Remy

Fig. 1

Description. Basidiomata pileate, flabelliform to semi-infundibuliform, then longitudinally often deeply incised, semi-translucent, stipitate, up to 0.8 cm tall; pileus circular to semicircular, very thin, up to 0.8 cm wide, pale yellowish to brownish, darker in the centre, sometimes zonate, pileal surface smooth, finely pruinose by hyaline pileocystidia, margin fimbriate, undulating, pale; stipe tiny, only up to 0.5 cm long and up to 0.5 mm wide, eccentric to lateral, greyish to whitish, darker towards base, pruinose, completely covered by prominent caulocystidia; hymenophore smooth, translucent; flesh very thin, membranous. Hyphal system monomitic; generative hyphae without clamps, up to 3 μm wide, hyaline; hymenial cystidia of tramal origin, 43–70 \times 6–10 μm , projecting above the hymenium for about 20 μm , aseptate, cylindrical, with blunt apex, pileocystidia 40 \times 7–9 μm , caulocystidia 40–70 \times 6–10 μm ; basidia clavate, 4-sterigmate; basidiospores (5)6–8 \times (2)2.5–2.8 μm (up to 4 μm in BRNM 666513), ellipsoid, hyaline, smooth, inamyloid.

Ecology. In the Czech Republic, all specimens were found in lowland to colline altitudes (up to 400 m a.s.l.) on base-rich bedrock (limestone, tertiary volcanic rock, possibly loess). The habitats could be classified (Chytrý et al. 2010) as narrow-leaved dry grasslands (T3.3), thermophilous oak forests (L6) or oak-hornbeam forests (L3). All basidiomata were found on living mosses (*Mnium*, *Bryum*, *Brachythecium*). Probably autumnal species as the collection dates range from September to December.

There is little data available in the literature concerning the ecology of this species. It was first described from an alpine habitat in France by Remy (1964). However, this species has been recently reported outside alpine vegetation (Arenal et al. 2008), so its observed restriction to thermophilous vegetation is apparently not restricted to the Czech Republic.

Distribution. Probably a rare species in Europe, so far recorded from France (type locality, Remy 1964), Finland (Eriksson & Ryvarden 1975, as *Cotylidia* sp.), the Canary Islands (Arenal et al. 2008), Norway (Bernicchia & Gorjón 2010), Sweden, and Denmark (Vesterholt 2012).

The species had not yet been reported from the Czech Republic. The first collection is from Moravia, dated 2001, and was originally identified as *C. undulata* (BRNM 666513). Other specimens of *C. muscigena* from the Czech Republic were recently recorded in the České středohoří Protected Landscape Area (Ústí nad Labem District, Církvice, under Deblík hill, steppe habitat, in mosses, 20. XII. 2008 leg. M. Kříž, det. M. Kříž et Z. Pouzar, PRM 860260) and Pálava Protected Landscape Area (PRM 899349). That raises the interesting question whether the spe-



Fig. 1. Basidiomata of *Cotylidia muscigena*. Czech Republic, Milovická stráň Nature Reserve, 22 Oct. 2011 (PRM 899349). Photo by Lucie Zíbarová.



Fig. 2. Basidiomata of *Cotylidia pannosa*. Czech Republic, Zlín, about 2 km NE of the town, Štákovy paseky, 11 Sep. 2010 (PRM 860825). Photo by Karel Tejkal.



Fig. 3. Basidiomata of *Cotyldia pannosa*. Czech Republic, Libochovka Nature Reserve, 30 Aug. 2010 (CB). Photo by Pavel Špinar.



Fig. 4. Basidiomata of *Cotyldia undulata*. Czech Republic, fly ash deposit approx. 1 km N of Stará Chodovská, 30 Sep. 2009 (CB 16304). Photo by Anna Lepšová.

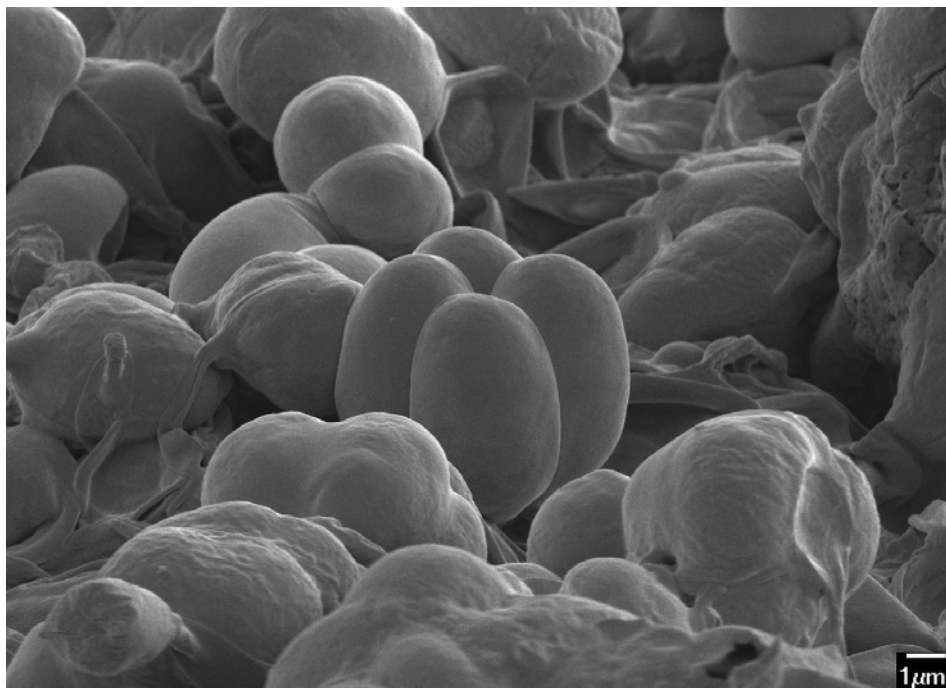


Fig. 5. *Cotylidia pannosa*. SEM photo of basidiospores (PRM 860825). Photo by Michal Mergl.

cies recently migrated to our area of interest as a consequence of climatic or land use change or had just been overlooked due to its minute basidiomata.

Specimens examined.

Czech Republic. Moravia. Brno-venkov District, Mokrý u Brna, Mokerský forest (quarry area), 400 m a.s.l., under *Carpinus* and *Quercus* on mosses (*Bryum capillare*, *Brachythecium velutinum*), 12. IX. 2001 leg. et det. V. Antonín as *Cotylidia undulata* (BRNM 666513). – Pálava Protected Landscape Area, Břeclav District, Milovice, Milovická stráž Nature Reserve, 250 m a.s.l., on *Mnium*, 22. X. 2011 leg. Z. Egertová, det. Z. Pouzar (PRM 899349).

Comments. *Cotylidia muscigena* is characterised by minute, often deeply longitudinally incised basidiomata, long spores and its connection to thalli of living mosses. *C. undulata* differs by smaller spores (up to 5 µm) and infundibuliform, not incised basidiomata. *C. carpatica*, similar in size and typically found in montane habitats, also has smaller spores and its basidiomata are more distinctively flabelliform or spatulate (Huijsman 1954) when compared to the almost infundibuliform basidiomata of *C. muscigena*. Remy (1964) distinguished *C. guttulata* L. Remy with biguttulate spores, however Jülich (1984) synonymised it with *C. muscigena*. Moreau et al. (2008) consider it a form of *C. muscigena* f. *guttulata* (Rémy) P.-A. Moreau, Wuilb. & Courtec.

In both specimens studied the spores were generally broader than described in the literature (2–2.5 µm in Bernicchia & Gorjón 2010, Vesterholt 2012), the most notably in the BRNM specimen (up to even 4 µm!). However, as other macro- and microscopic characters are in concordance with data from the literature, we somewhat reluctantly assign the discussed specimen to *C. muscigena*, realising that an additional study may be needed.

Cotylidia pannosa (Sowerby) D.A. Reid

Figs. 2, 3, 5

= *Thelephora pannosa* (Sowerby) Fr.

= *Thelephora pallida* (Pers.) Pers.

Description. Basidiomata pileate, infundibuliform, often in groups becoming confluent, stipitate, (1.5)3–4.5 cm high, (1)1.5–2 cm wide; pileal surface bright red-orange at the margin (all basidiomata when young), ochre towards the centre, become rose to cream, fibrillose, not pruinose; stipe short, up to 1.5 cm long and up to 0.5 cm wide, central, whitish to cream, at the base with mycelial mat; hymenophore smooth to rugose. Hyphal system monomitic; generative hyphae without clamps, up to 6 µm wide, hyaline; hymenial cystidia of tramal origin, 70–160 × 10–14 µm, remarkably projecting up to 60 µm and covered by spores, aseptate, tubular, with blunt apex; basidia with 4 sterigmata; basidiospores 8–10 × 4–4.6 µm, ellipsoid, apiculate, hyaline, smooth, thin-walled, non-amyloid.

Ecology. In the Czech Republic, all specimens come from middle altitudes (350–450 m a.s.l.) on various, acidic to base-rich bedrock. The habitats could be classified (Chytrý et al. 2010) as herb-rich beech forests (L5.1) and oak-hornbeam forests (L3). On bare soil or litter of deciduous trees. Aestival to autumnal – collection dates range from June to October.

Habitat characteristics in the Czech Republic correspond well to those mentioned in the literature (Bernicchia & Gorjón 2010, Breitenbach & Kränzlin 1986, Krieglsteiner 2000, Vesterholt 2012) – on the ground in deciduous or mixed forests (*Fagus*, *Abies*, *Picea*). Connection with *Fagus sylvatica* is the most often mentioned, however no *Cotylidia* species has been reported to be mycorrhizal and such a trophic status is indeed rare among *Hymenochaetales* (e.g. Tedersoo et al. 2010).

Distribution. *Cotylidia pannosa* is a rare species known mostly from Europe, but also Asia and North America (Burt 1920, Reid 1965, Ryvarden 2010). In Europe, the species is known from Germany (Schilling & Dobbitsch on-line, Krieglsteiner 2000), Sweden (Vesterholt 2012), Switzerland (Breitenbach & Kränzlin 1986), the United Kingdom (Evans et al. 2006), Spain, France, Belgium, Denmark, the Netherlands, Italy, Finland, Poland, Slovenia, Bosnia and Herzegovina, Croatia, Bulgaria, Ukraine, and Russia (Bernicchia & Gorjón 2010).

Reid (1965) nor Bernicchia & Gorjón (2010) mention this species from the Czech Republic, nor were there any specimens in the main Czech herbaria (PRM

and BRNM) labelled under this name. However, we finally revealed one older specimen of the species from the Czech Republic labelled as *C. undulata* (PRM 709545) and identified it also at new localities in Moravia. *C. pannosa* can thus be considered to be a species new to the Czech Republic. Moreover, other localities have in the meantime been discovered in South Bohemia: Tábor District, Pacova hora Nature Reserve, beech forest, on soil, 10. IX. 2010 leg. et det. P. Špinar (CB); České Budějovice District, Libochovka Nature Reserve (beech forest), 400 m a.s.l., 49°05'0.25" N, 14°28'21.3" E, 20. VIII. 2012 leg. M. Klimeš, det. P. Špinar, and 425 m a.s.l., 49°04'56.1" N, 14°29'26.7" E, 30. VIII. 2012 leg. et det. P. Špinar, both in CB).

Specimens examined

Czech Republic. Bohemia. Praha-západ District: vicinitas Řevnice, montes Hřebený, in silva inter m. Babka et Moklický potok (ap. viam) in Pageto sylvaticae muscoso, cca 400 m a.s.l., 21. VI. 1970, leg. F. Soukup, det. Z. Pouzar (PRM 709545, as *C. undulata*). – Moravia. Zlín District, Hostýnské vrchy Mts., about 2 km N of the village of Držková, part called Hutě, 450 m a.s.l., beech forest, sandy soil in road edge, 8. VIII. 2010 leg. K. Tejkal, det. J. Kout (too young, herb. KBI). – Vicinity of Zlín, about 2 km NE of the town, Štákovy paseky (two microlocalities), 350 m a.s.l., mixed forest (mainly oak and beech), on the ground, 11. IX. 2010 and 28. X. 2010, both leg. K. Tejkal, det. J. Kout (PRM 860825 and herb. KBI).

Slovakia. Svätý Jur (originally as Hungaria, in sylvis frondosis prope St. Georgium), m. Sept., leg. J. Lütkenmüller et A. Zahlbruckner (PRM 5471, as *Thelephora pallida*).

Germany. Leipzig, Sept. 1858 (PRM 775910, as *Thelephora pannosa*). – Donnstetten auf Württemb. Alp, auf Laubwaldboden, im Octbr. 1873, leg. Kemmler (PRM 776010, as *Thelephora pannosa*).

USA. Ohio (PRM 775909, as *Thelephora pallida*).

Comments. *Cotylidia pannosa* is characterised by relatively large-sized and fleshy basidiomata with a remarkable bright red-orange colour in the upper part of the pileus (margin). It is one of the most robust species of the genus and may resemble *Podoscypa multizonata* (Berk. & Broome) Pat., but these species are well distinguished under the microscope by their hyphal systems. Moreover none of the *Podoscypa* species has been recorded in the Czech Republic yet.

Cotylidia undulata (Fr.) P. Karst.

Fig. 4

= *Stereum undulatum* (Fr.) Masee

Description. Basidiomata pileate, infundibuliform, rarely somewhat laterally incised, semi-translucent, solitary, seldom few basidiomata confluent, stipitate, up to 1 cm tall; pileus circular, deeply infundibuliform, very thin, up to 1.2 cm wide, buff to brownish, darker in the centre, sometimes slightly zonate, pileal surface smooth, finely pruinose by hyaline pileocystidia, margin fimbriate, often strongly undulating, pale; stipe tiny, up to 0.5 cm long and up to 0.1 cm wide, central to eccentric, greyish to almost black at the base, pruinose, completely covered by caulocystidia; hymenophore smooth to slightly wrinkled, translucent; flesh very thin, membranous. Hyphal system monomitic; generative hyphae without clamps, up to 3 µm wide, hyaline; hymenial cystidia of tramal origin, 60–92 ×

6–9 µm, projecting above hymenium up to 28 µm, aseptate, more or less cylindrical, with blunt apex, thin-walled to somewhat thick-walled in median part, pileocystidia 30–64 × 6–8 µm, aseptate or rarely with single septum, cylindrical to narrowly clavate, thin-walled, caulocystidia 40–82 × 4–8 µm, aseptate or with single septum, cylindrical, thin-walled or often somewhat thick-walled (up to 1 µm) in median part; basidia clavate, 13–18 × 4–6 µm, with 4 sterigmata; basidiospores 4–5 × 2–2.5 µm, ellipsoid, hyaline, smooth, thin-walled, inamyloid.

Ecology. Both studied specimens from the Czech Republic were found in strongly human-influenced habitats on anthropogenic substrata (fly ash/sand mixture, iron slag). Specimens from other, more natural habitats originally identified as *C. undulata* have proven to be different species – either *C. pannosa* (specimen from Řevnice) or a yet unidentified species (specimen from Soběšice, see *Cotylidia* sp. below). In both cases the surrounding vegetation was in a very early successional stage, dominated by low mosses. The basidiomata were found on the ground among the mosses, but not visibly connected to their living thalli.

The ecology of *C. undulata* in the Czech Republic does not appear to be much different from data in the literature (Bernicchia & Gorjón 2010, Breitenbach & Kränzlin 1986, Krieglsteiner 2000, Versteht 2012) – dry habitats among low mosses are often mentioned. The only deviating feature might be the highly artificial nature of the substrata in the Czech Republic, although this does not seem to be much out of place, as *C. undulata* is also reported from burnt sites. The preference for disturbed habitats suggests a species evades competition or, assuming its muscicolous ecology, such preference in its host.

Distribution. *Cotylidia undulata* is distributed mainly in the Holarctic area: North America (Burt 1920, Ryvar den 2010), Asia (Dai 2011) and Europe: Germany (Krieglsteiner 2000, Schilling & Dobbitsch on-line), Switzerland (Breitenbach & Kränzlin 1986), the United Kingdom (Evans et al. 2006), Spain, Belgium, the Netherlands, Italy, Denmark, Norway, Sweden, Finland, Poland, and Slovakia (Bernicchia & Gorjón 2010). However in the latter nor in any other source data from the Czech Republic are included, although the species has supposedly been known here for a long time (see e.g. Antonín & Vágner 1994, Pouzar 2006). However, we discovered that both specimens mentioned in Pouzar (2006) belong to another species (see above). Recently it has been recorded also in Australia (Robinson 2006).

Specimens examined

Czech Republic. Bohemia. North-Western Bohemia, Sokolov District, desiccated deposits from fly ash waste pond at Vřesová coal power plant, approx. 1 km N of Stará Chodovská, 450 m a.s.l., on soil partially covered by mosses (*Dicranella* aff.) among very sparse early-successional/ruderal vegetation (*Calamagrostis epigejos*, *Epilobium* sp., *Rumex* sp., *Senecio* sp.), 30. IX. 2009 leg. A. Lepšová, det. L. Zíbarová (CB 16304). – Moravia. Ostrava, strue metallica, “Halda Hrabůvka”, dicta in muscis stadia *Funarion hygrometricae*, 10. IV. 1971 leg. J. Veselský (PRM 803314, as *Thelephora carbonaria*) and dicta in *Bryo argenteo* 8. V. 1971 leg. J. Veselský (PRM 803315, as *Cotylidia*).

Germany. – Pirsch Heide bei Potsdam, ad terram, 15. IX. 1966 leg. D. Benkert, det. Z. Pouzar (PRM 803313).

***Cotylidia* sp.**

Description. Basidioma pileate, infundibuliform, light-coloured, ochraceous with orange tint, stipitate, 2 cm tall, apically 1.3 cm wide; pileus thin, radially fibrillose, zonate; stipe 1 cm long, 0.2 cm wide, central, whitish velutinous, with bulbous base; hymenophore smooth, pale ochraceous. Hyphal system monomitic; generative hyphae without clamps, 3.2–5.1 μm wide, thin-walled, hyaline; hymenial cystidia of tramal origin, scattered, 30–40 \times 4.1–6.6 μm , up to 16 μm projecting above hymenium, smooth, occasionally minutely incrustated, obtuse, hyaline; basidia slightly clavate, 4-sterigmate; basidiospores 5 \times 3–3.2 μm , ellipsoid with prominent apiculus, hyaline, smooth, thin-walled, inamyloid.

Specimen examined.

Czech Republic. Moravia. Brno-město District, near the village of Soběšice, Zaječí hill, on the ground in mosses under *Pinus sylvestris* and *Quercus* sp., 8. X. 1981 leg. et det. A. Vágner, rev. K. Čížek (BRNM).

Comments. This specimen was originally identified as *Cotylidia undulata* (Antonín & Vágner 1994). However, its fleshy habitus does not correspond well with the usually thin-fleshed basidiomata of *Cotylidia undulata*. Also microscopical features of the spores (prominent apiculus, width at least 3 μm) and basidia (length about 30 μm , in Antonín & Vágner 1994) are significantly different from those described by Bernicchia & Gorjón (2010) and Moreau et al. (2008). The wider spores could point to *C. diaphana* (Schwein.) Lentz or *C. pannosa*, but both possess larger hymenial cystidia; *C. diaphana* has moreover pallid basidiomata (Reid 1965). Micro- and partly macroscopical characters fit reasonably well with the description of *C. marsicana* (Lonati 2000). However, we are reluctant to ascribe the discussed specimen to a poorly known Mediterranean and carbonicolous species not acknowledged by authors of modern treatments of the genus (Bernicchia & Gorjón 2010, Moreau et al. 2008). Therefore we can conclude that a further study is needed to resolve this question, most suitably using molecular methods.

The following dichotomic key provides a basis for identification of the species hitherto identified in the Czech Republic. The key is based on material from the Czech Republic and partly on keys by Vesterholt (2012), Bernicchia & Gorjón (2010), Eriksson & Ryvarden (1975) and Reid (1965).

Key to the species of *Cotylidia* known from the Czech Republic

- 1a Basidiomata fleshy, mostly over 3 cm tall, often caespitose and with some shade of orange, hymenial cystidia prominent, up to 160 µm long, pileocystidia absent *C. pannosa*
- 1b Basidiomata thin-fleshed, (much) less than 3 cm tall, solitary, buff to greyish, hymenial cystidia less than 120 µm long, pileocystidia present (pileal surface pruinose) 2
- 2a Spores on average more than 6 µm long, basidiomata often laterally split or almost spatulate *C. muscigena*
- 2b Spores on average less than 5 µm long, basidiomata mostly infundibuliform *C. undulata*

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