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A new Chaetosphaeria with a Dictyochaeta anamorph

MARTINA RÉBLOVÁ

Institute of Botany, Academy of Sciences, 252 43 Průhonice, Czech Republic

Réblová M. (1998): A new Chaetosphaeria with a Dictyochaeta anamorph. – Czech Mycol. 50: 151–159

Chaetosphaeria montana spec. nov. with a *Dictyochaeta* anamorph was found on rotten wood of *Fagus sylvatica* in the Czech Republic. The new species are described and illustrated. Relationships of *C. montana* with *C. pulchriseta*, *C. callimorpha* and other taxa are discussed. The diagnostic characters of *Chaetosphaeria montana*, *C. pulchriseta* and *C. callimorpha* and their anamorphs are given.

Key words: Ascomycotina, Lasiosphaeriaceae, systematics.

Réblová M. (1998): Nový druh Chaetosphaeria s anamorfou z rodu Dictyochaeta. – Czech Mycol. 50: 151–159

Z území České republiky je popsán nový druh *Chaetosphaeria montana* spec. nov. s anamorfou z rodu *Dictyochaeta*, nalezený na tlejícím dřevu *Fagus sylvatica*. Jsou diskutovány vztahy mezi nově popsaným druhem a nejblíže příbuznými druhy *Chaetosphaeria pulchriseta* a *C. callimorpha* a dalšími zástupci rodu *Chaetosphaeria*. Diagnostické znaky druhů *Chaetosphaeria montana*, *C. pulchriseta* a *C. callimorpha* jsou uvedeny v tabulkách.

INTRODUCTION

The genus *Chaetosphaeria* Tul. et C. Tul. was introduced by Tulasne and Tulasne (1863), who based its description on *Sphaeria innumera* Berk. et Broome. Booth (1957, 1958) re-established the generic concept of *Chaetosphaeria* on the basis of six British species having superficial, sessile, globose to conical, papillate ascomata seated on the surface of bark or wood or developing on a thin layer of pseudoparenchymatous hypostroma. The hamathecium consits of periphyses and persistent, apically free paraphyses, asci are cylindric to clavate, 8-spored, ascospores are two– or multi-celled, cylindrical to broadly fusoid and hyaline. Booth (1957, 1958) considered three hyphomycetous genera to be the associated anamorphs, *Chloridium* Link: Fr., *Dictyochaeta* Speg. and *Menispora* Pers.: Fr. Although Tulasne and Tulasne (1863) described setose ascomata for the type species,

Chaetosphaeria innumera (Berk. et Broome) Tul. et C. Tul., they actually observed conidiophores of a *Chloridium* anamorph. Ascomata of *Chaetosphaeria* species lack simple setae that grow out of the perithecial wall but they can be clothed with both conidiophores and setae of the anamorph when the associated anamorph possesses setae [e.g. *Catenularia cuneiformis* (Richon) Mason anamorph of *Chaetosphaeria cupulifera* (Berk. et Broome) Sacc., *Catenularia* sp. anamorph of *C. novae-zelandiae* S. Hughes et al., *Dictyochaeta* sp. anamorph of *C. callimorpha* (Mont.) Sacc. and the *Dictyochaeta* sp. anamorph of *C. pulchriseta* S. Hughes et al.]. The setae of the anamorph arise among the conidiophores and have sterile, blunt or strongly pointed apicies which may develop into a conidiogenous cell.

Presently, *Chaetosphaeria* is recognized as a member of the Lasiosphaeriaceae Nannf. (Barr 1990) and accommodates a group of species associated with twelve hyphomycetous genera that produce enteroblastic-phialidic conidia. These are *Catenularia* Grove, *Chaetopsis* Grev., *Chalara* (Corda) Rabenh. , *Chloridium* Link: Fr., *Custingophora* Stolk et al., *Dictyochaeta* Speg., *Gonytrichum* Pers.: Fr., *Kylindria* DiCosmo et al., *Menispora* Pers.: Fr., *Phialophora* Medlar, *Stachybotrys* Corda and *Zanclospora* S. Hughes et B. Kendrick. DiCosmo et al. (1983) concluded that these anamorphic genera, however different in habit, have a number of common morphological and ecological characters and that they may well be closely related.

According to the large number of anamorphic genera, *Chaetosphaeria* is considered to be a large, heterogenous taxon. Species of the genus have similar ascoma morphology and consequently can be recognized only on the basis of ascospore morphology and especially on their anamorphs. The anamorphs are of great significance in differentiating species when the teleomorphs are hardly distinguishable. Mycelia and conidiophores of the anamorphs may accompany ascomata forming dense colonies on the substrate, but more often we can find both the teleomorph and the anamorph independently of each other. The separate occurrence of both morphs makes identification more difficult, therefore, culture studies are essential. For instance, among the species possessing two-celled ascospores there are some, e.g. *Chaetosphaeria aspergilloides* M.E. Barr et Crane, *C. aterrima* (Fuckel) Réblová , *C. bramleyi* C. Booth , *C. brevispora* Shoemaker, *C. dingleyae* S. Hughes et al., *C. lentomita* W. Gams et Hol.-Jech., *C. chloroconia* W. Gams et Hol.-Jech., ascomata, asci and ascospores of which are similar in size. Without knowledge of the anamorphs their identification is virtually impossible. On the other hand, anamorphs connected to the *Chaetosphaeria* species mentioned above (*Chloridium*, *Custingophora, Dictyochaeta, Gonytrichum* and *Zanclospora*) are found to be regularly associated with the ascomata. The opposite case is found among the *Menispora* species, which seldom accompany ascomata of their teleomorphs *Chaetosphaeria ovoidea* (Fr.) Constant. et al. and *C. pulviscula* (Currey) C. Booth.

Species of *Chaetosphaeria* and their anamorphs are lignicolous saprobes; although the genus is cosmopolitan in distribution, the majority of species is known to occur in the temperate zones of both hemispheres. They occur mostly on strongly decayed wood but also on bark, inner surface of the bark and wood in different stages of decay. Two species are known from aquatic habitats on submerged wood (Kohlmeyer 1963; Fisher and Petrini 1983).

MATERIAL AND METHODS

Dry herbarium specimens were briefly rehydrated in 3 % KOH and subsequently studied in 100 % lactic acid, cotton blue in lactic acid, Congo Red or Melzer's reagent. Two types of microscopy were used in this study. These are indicated in the legends to the illustrations as bright field (BF) and phase contrast (PC). Photographs were taken in Congo Red or in Melzer's reagent. Abbreviations of the herbaria and institutes which kindly lent material are cited in accordance with Index Herbariorum (Holmgren et al. 1990).

DESCRIPTIONS AND DISCUSSION

Four species of *Chaetosphaeria* with *Dictyochaeta* anamorphs have been described, namely *C. dingleyae* S. Hughes et al. and *C. pulchriseta* S. Hughes et al., both from New Zealand, *C. talbotii* S. Hughes et al. from Australia and *C. callimorpha* (Mont.) Sacc. which is cosmopolitan (Booth 1957; Hughes and Kendrick 1968). A new *Chaetosphaeria* and its *Dictyochaeta* anamorph was collected on rotten wood of *Fagus sylvatica* in the Czech Republic. Among these taxa the new species is most closely related to *Chaetosphaeria pulchriseta* and *C. callimorpha*. Nevertheless, it could not be identified with those species, nor with any of the hitherto described species of *Chaetosphaeria*.

Chaetosphaeria montana Réblová, spec. nov. Figs 1-5., 13 a,b,e.

Ascomatibus nigris, laevibus, 200-250 μm altis et 170-240 μm latis, ascis 100-130 × 10.5-12.5 μm, paraphysibus apice liberis, interdum anastomosantibus, septatis, strangulatis, 4-6.5(-7) μm crassis, ascosporis ellipsoideis usque fusoideis (18.5)19-25 × 5.5-7 μm, hyalinis, laevibus sed postea subtiliter verrucosis, 2-(4)-cellularibus, a *Chaetosphaeria pulchriseta* discrepat.

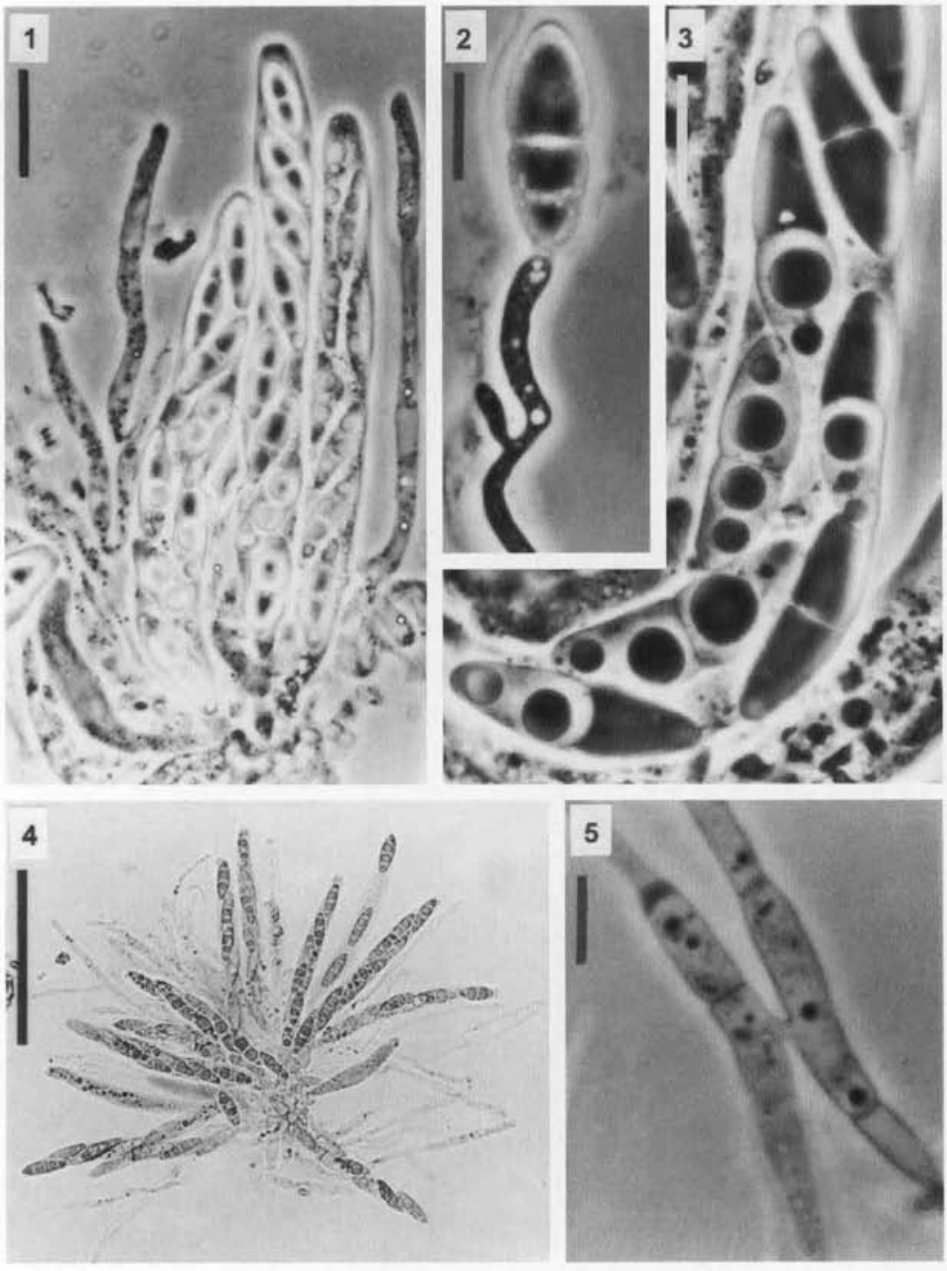
Ascomata in societate hyphomycetis generis *Dictyochaeta*, quid conidiophoris 30-52 μm longis, 5-6 μm medio crassis, pallide brunneis, setis 7-10 septatis, obscure brunneis, apicem versus pallidioribus, cellula apicali obtusa vel clavato-dilatata (3.5-4 μm) nonnumquam phialide terminatis, phialosporis 22-26(-29) × 3-4 μm magnis, a *Dictyochaeta* anamorpha *Chaetosphaeriae pulchrisetae* diversa est.

Holotypus: Bohemia meridionalis, montes Novohradské hory, silva virginea Žofínský prales apud Pivonice; ad lignum putridum *Fagi sylvaticae*, 20.V.1997, leg. M. Réblová (PRM 842969).

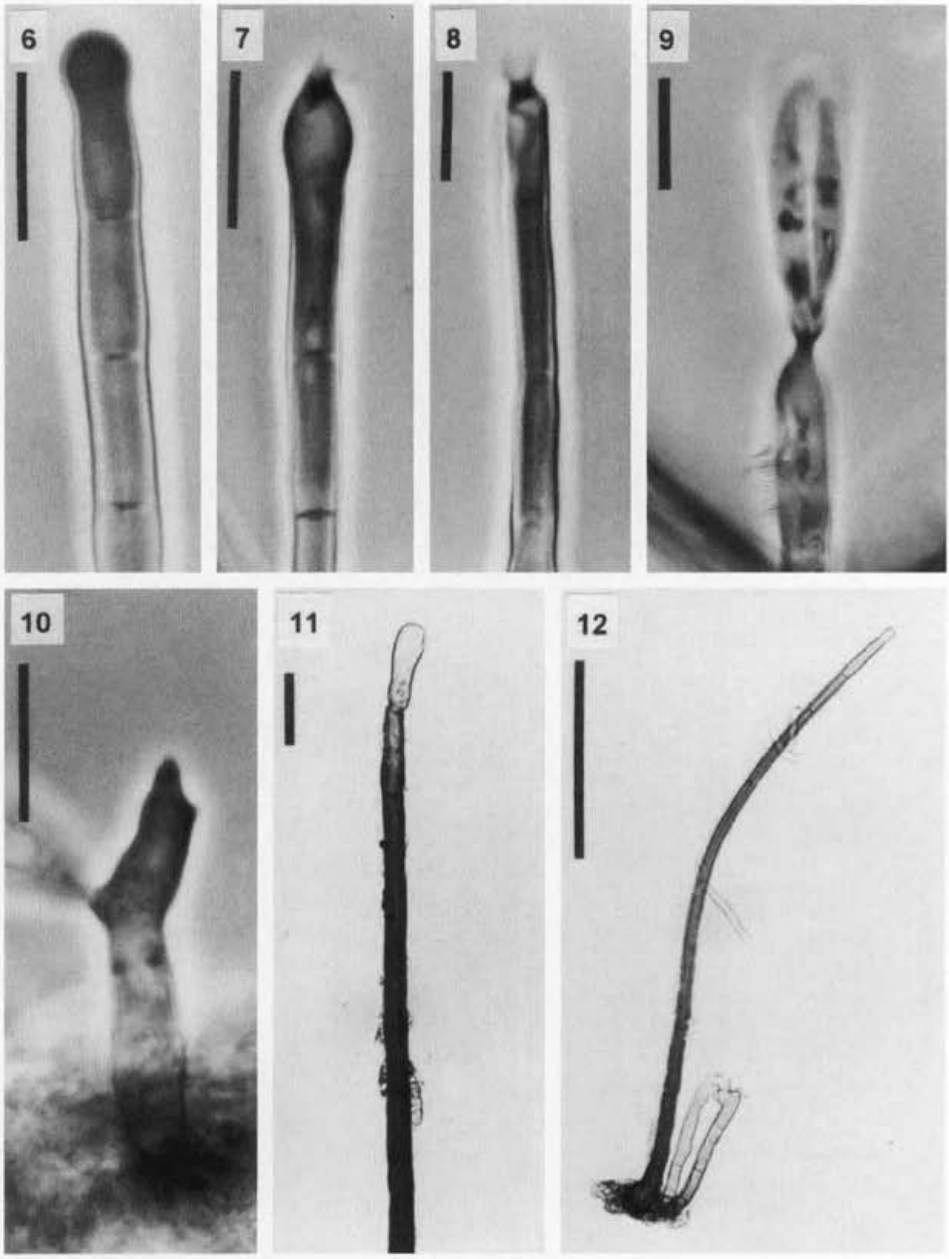
Ascomata superficial, scattered in small groups or densely crowded and forming a dark crust, base slightly immersed, globose, 200-250 μm high and 170-240 μm wide, papillate, black, glistening, smooth, covered by sterile anamorph setae and conidiophores. Ascomatal wall fragile, carbonaceous, in surface view a *textura epidermoidea*, the lateral wall 35-45 μm thick, *textura prismatica*, consisting of two layers. The outer layer of thick-walled, dark brown pseudoparenchymatous cells; the inner layer of thin-walled, subhyaline, compressed cells. Asci unitunicate, 8-spored, numerous in a broad hymenium arising from repeating croziers, 100-130 × 10.5-12.5 μm, cylindrical, shortly stipitate, truncate at the apex, ascal apex non-amyloid with a delicate, refractive apical annulus. Paraphyses numerous among the asci and exceeding them, simple, persistent, filiform, sometimes anastomosing, thin-walled, 4-6.5(-7) μm wide, septate, constricted at the septa, cells conspicuously inflated. Ascospores ellipsoid to fusiform, (18.5-)19-25 × 5.5-7 μm, hyaline, when young smooth-walled and filled with four prominent oil drops, at maturity with a median transverse septum, slightly constricted, the wall smooth or slightly verrucose, rarely two additional septa may develop, obliquely monostichous to distichous in the ascus.

Dictyochaeta anamorph of **Chaetosphaeria montana** Réblová Figs 6-12., 13c-d.

Colonies effuse, black, whitish-grey when sporulating, composed of conidiophores, sterile setae and ascomata. Sterile setae arising from partly immersed mycelia or from peridia of ascomata, straight, septate with 7-10 septa, dark brown, paler towards the apex, thick-walled, to 320 μm long, 4-5 μm wide in the middle, 9-10 μm wide at base, 3.5-4 μm wide at the apex; apical cell rounded and sometimes somewhat inflated, subhyaline and often ending with a phialide or polyphialide. Conidiophores mononematous, macronematous, erect, straight or slightly flexuous, unbranched, arising singly or in small groups, often scattered among the sterile setae and sometimes growing out of peridia of the ascomata, cylindric, 1-4-septate, pale brown, darker at the basal part and paler towards the apex, 30-52 μm long and 5-6 μm wide in the middle part, the terminal of each conidiophore comprising a single phialide; phialides mono– or polyphialide, with a terminal narrow neck and collarette, after successive sympodial proliferation with up to 3 collarettes in the upper part. Collarette funnel-shaped, hyaline, 1.5-3 μm wide and 2 mm deep, inconspicuous, quickly disappearing. Phialoconidia hyaline, one-celled, fusiform, falcate with pointed ends, 22-26(-29) × 3-4 μm, short subulate setula at each end, 1.5-2 μm long, multiguttulate, accumulating in slimy fascicles on the phialides.



Figs 1-5. *Chaetosphaeria montana* Réblová (PRM 842969 – holotype).
1. Asci with ascospores and paraphyses; 2. Germinating ascospore; 3. Ascospores; 4. Asci with ascospores and paraphyses; 5. Paraphyses. Figs 1-5: PC. Scale bars: 1-3. 5 = 10 μm; 4 = 100 μm.



Figs 6-12. *Dictyochaeta* anamorph of *Chaetosphaeria montana* Réblová (PRM 842969 – holotype).
6. Anamorphic seta with inflated apex; 7,8. Anamorphic seta with the apex developed into a phialide; 9. Conidiophore with phialoconidia; 10. Conidiophore apex with sympodial proliferation; 11. Anamorphic seta with inflated apex; 12. Anamorphic seta with inflated apex and conidiophores. Figs 6-10: PC; 11, 12: BF. Scale bars: 6-11 = 10 μm; 12 = 100 μm.

Material examined. 1) Type material. Czech Republic: Southern Bohemia, Novohradské hory Mts., virgin forest Žofínský prales near Pivonice; on rotten wood of *Fagus sylvatica*, 20.V.1997, leg. M. Réblová (holotype – PRM 842969).

2) Additional material. Czech Republic: Southern Bohemia, Šumava Mts., the gl acial cirque of the lake Čertovo jezero near Železná Ruda; on rotten wood of a trunk of *Fagus sylvatica*, 25.V.1996, leg. M. Réblová (Herb. M. Réblová 768/96); ibid., Šumava Mts., virgin forest Boubínský prales near Zátoň; on rotten wood of a trunk of *Fagus sylvatica*, 16.IX.1982, leg. V. Holubová-Jechová (*Dictyochaeta* anamorph, PRM 828868); ibid., Novohradské hory Mts., virgin forest Žofínský prales near Pivonice; on rotten wood of a branch of *Fagus sylvatica*, 29.VI.1971, leg. V. Holubová-Jechová (*Dictyochaeta* anamorph, PRM 826870).

Notes on the anamorph. Holubová-Jechová (1984: 432, Fig. 10: 3a-c).
Habitat. On rotten wood of a deciduous tree (*Fagus sylvatica*).
Distribution. Europe, Czech Republic.

Within *Chaetosphaeria, C. montana, C. callimorpha* and *C. pulchriseta* are superficially similar but differ in many ways (Tables 1., 2.). The collections of *C. pulchriseta* with the associated *Dictyochaeta* anamorph preserved in the PDD, DAOM and BPI herbaria and those of *C. callimorpha* in the K herbarium were examined and compared with the recent finds of *C. montana* described above.

Material examined of *Chaetosphaeria pulchriseta*.
New Zealand: Auckland Prov., Cornwallis; on *Leptospermum scoparium*, 3.I.1963, leg. S. Hughes (holotype – PDD 26228; isotype – DAOM 93528b). – French Guiana: Saint Laurent, Piste Balate, 12 km from Saint Laurent; on dead branch, 19.XI.1986, leg. A. Rossman, C. Feuillet and L. Skog (BPI 622098).

Material examined of *Chaetosphaeria callimorpha*.
France: Meudon; on *Rubus* sp., leg. Montagne (holotype of *Sphaeria callimorpha* Mont. – K 49557). – Great Britain: Esher, West End Common; on dead stem of *Rubus fruticosus* in litter, 22.XI.1996, leg. B.M. Spooner (K 44768); Great Britain: Ossetts Hole; on dead stem of *Rubus fruticosus*, 8.VIII.1970, leg. M.C. Clark (K 46879).

C. pulchriseta can be distinguished from *C. montana* by its dark brown ascomata clothed with sterile anamorphic setae that have strongly pointed apices, the smaller size of its asci and ascospores, and ascospores that are smooth-walled and that have three septa. The *Dictyochaeta* anamorph of *C. pulchriseta* was defined as possessing straight, sterile, up to 13-septate anamorphic setae that have pointed apices and the penultimate cell 36-81 μm long and usually a dark, almost

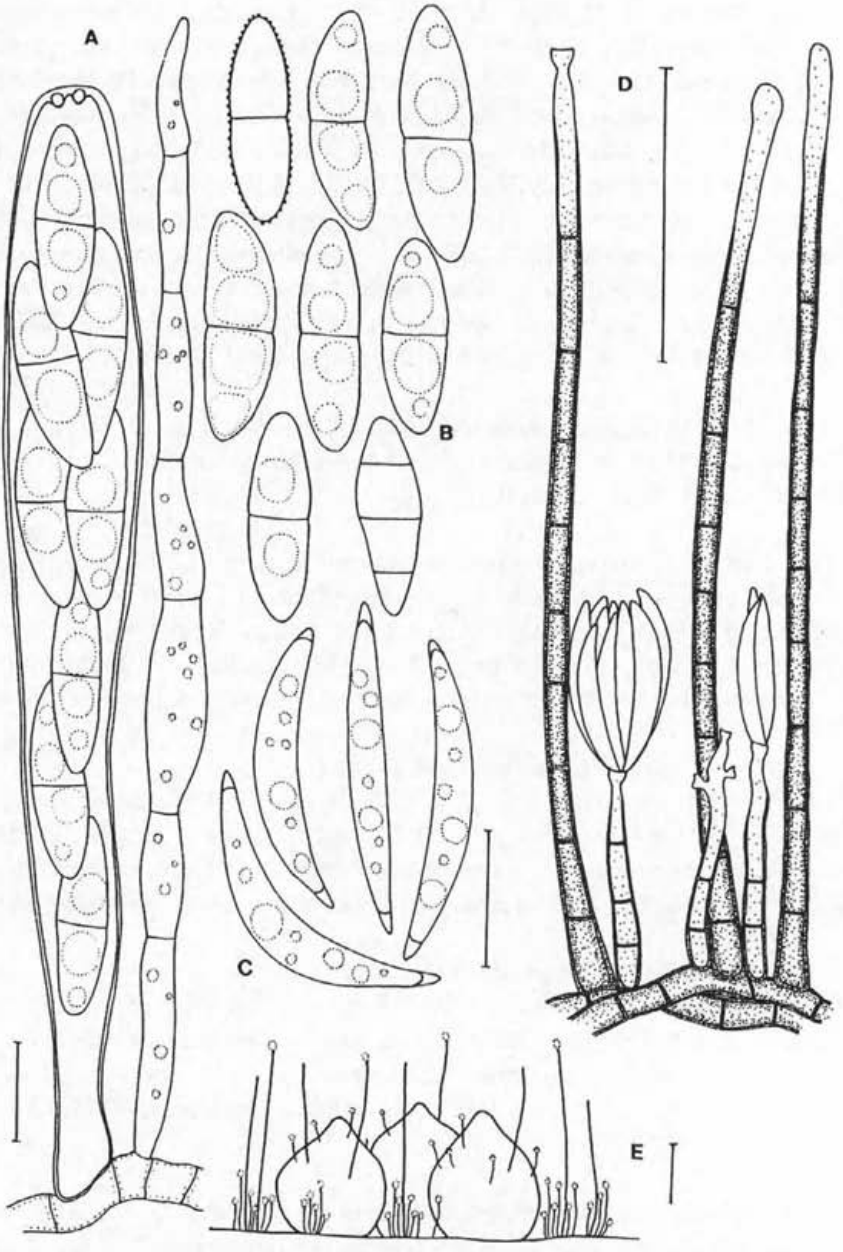


Fig. 13A-E. *Chaetosphaeria montana* Réblová and the *Dictyochaeta* sp. anamorph (PRM 842969 – holotype).
A. Ascus with ascospores and paraphyses; B. Ascospores; C. Phialoconidia; D. anamorphic setae, sterile or ending in a phialide, and conidiophores; E. Habit sketch of ascomata. Scale bars: a-c = 10 μm; d-e = 100 μm.

Table 1. Morphological characters of *Chaetosphaeria pulchriseta, C. callimorpha* and *C. montana*.

Species	Ascoma	Ascus	Ascospores
C. pulchriseta (PDD 26228)	250-300 μm high 220-300 μm wide	65-80 × 7-12 μm (stalk 10-15 × 3-4 μm)	12-18 × 4-6 μm ellipsoidal to fusiform, 4-celled
C. callimorpha (K 44768)	150-200 μm high 150-190 μm wide	60-80 × 6-8 μm (stalk 10-20 × 3-4 μm)	11-16 × 3-4 μm ellipsoid, 2-celled, rarely 4-celled
C. montana (PRM 842969)	200-250 μm high 170-240 μm wide	100-130 × (9.5-) 10.5-12.5 μm	(18.5-)19-25 × 5.5– 7 μm ellipsoid to fusiform, 2-celled, rarely 4-celled

Table 2. Morphological characters of the *Dictyochaeta* anamorphs of *Chaetosphaeria pulchriseta, C. callimorpha* and *C. montana*.

Species	Sterile setae	Conidiophores	Phialospores
Dictyochaeta of *C. pulchriseta* (PDD 26228)	to 360 μm long to 13-septate pointed at the apex never ending in a phialide	26-38 μm long 4-4.4 μm wide above the base	23-29 × 2.4-3 μm
Dictyochaeta of *C. callimorpha* (K 44768)	to 270 μm long rounded at the apex sometimes ending in a polyphialide	80-90 μm long 4.5-5 μm wide above the base	10-15.5 × 2-3 μm
Dictyochaeta of *C. montana* (PRM 842969)	to 320 μm long with 7-10 septa rounded or somewhat inflated at the apex, sometimes ending in a phialide or polyphialide	30-52 μm long 5-6 μmm wide above the base	22-26(-29) × 3-4 μm

opaque contents (Hughes and Kendrick 1968). The anamorphic setae in the Czech collections of *C. montana* are rounded or somewhat inflated at the apical end and can often develop into a phialide. In the Czech material, the darker contents have never been observed in apical cells of the anamorphic setae. On the contrary, the setae were found to be paler towards the apex, and the conidiophores were observed to be longer and broader.

The differences in anamorph morphology between the New Zealand and Czech collections were also cited by Holubová-Jechová (1984), who based her observations on two finds on rotten wood of *Fagus sylvatica*; in neither case the teleomorph was present. Despite these differences Holubová-Jechová identified the Czech finds as the anamorph of *Chaetosphaeria pulchriseta* and added that the dark, anamorphic setae with pointed apices are probably connected to the teleomorph. This assumption could not be confirmed, for in our material, coming also from the Czech Republic and containing both the anamorph and the teleomorph, the apical ends of the anamorphic setae were rounded or somewhat inflated. In addition, their sizes and those of the conidiophores were similar to those found in two former collections (Holubová-Jechová 1984). The *Dictyochaeta* anamorph of *C. pulchriseta* and the *Dictyochaeta* anamorph of *C. montana* have morphologically almost indistinguishable phialoconidia, but they are easily recognizable by the sterile anamorphic setae and the conidiophores.

The closely allied *C. callimorpha* resembles the new *Chaetosphaeria* in having similar ellipsoid, two-celled ascospores which rarely develop two additional septa, but it differs in the smaller size of asci and ascospores and in the associated *Dictyochaeta* anamorph. Phialoconidia of *C. callimorpha* are one-celled, curved, asymmetrical, bluntly rounded at the distal end and proximally tapered with an inconspicuous basal scar. Also the conidiogenous cells are entirely different.

Although *Chaetosphaeria montana* has not apparently been grown in culture, and my attempts to cultivate the species have been unsuccessful, the regular association of the teleomorph and the anamorph makes the connection highly probable.

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Revision of three Melanomma species described by L. Fuckel

MARTINA RÉBLOVÁ

Institute of Botany, Academy of Sciences, 252 43 Průhonice, Czech Republic

Réblová, M. (1998): Revision of three Melanomma species described by L. Fuckel. – Czech Mycol. 50: 161–179

Fuckel introduced the genus *Melanomma* for non-stromatic pyrenomycetes possessing both hyaline and dark coloured ascospores. Two out of five species having hyaline ascospores have been transferred to *Chaetosphaeria*. The present paper deals with the remaining three species, viz. *Melanomma aterrima, M. conica* and *M. papillata*. Examination of their type and other material and culture studies have shown that *Melanomma aterrima* is another species belonging to the genus *Chaetosphaeria* associated with a *Custingophora* anamorph. A new combination, *Chaetosphaeria aterrima* comb. nov., is proposed. *Melanomma conica* and *M. papillata* are regarded as conspecific with *Chaetosphaeria ovoidea* and *C. pulviscula*, respectively. Ascospore culture of *C. pulviscula* produced *Menispora caesia* and synanamorph similar to *Phialophora* sp. Type and recent material of *Melanomma fallax* and *Chaetosphaeria glauca* have also been studied. Both species are identical with *Chaetosphaeria ovoidea* and are included in its synonymy. *Chaetosphaeria aterrima, C. pulviscula* and *C. ovoidea* are listed with their full synonymy and notes on their previous descriptions and illustrations.

Key words: Ascomycotina, Lasiosphaeriaceae, *Chaetosphaeria, Custingophora*, systematics.

Réblová, M. (1998): Revize tří druhů rodu Melanomma popsaných L. Fuckelem. – Czech Mycol. 50: 161–179

Fuckel zařadil do rodu *Melanomma* nestromatické druhy pyrenomycetů s hyalinními i tmavě zbarvenými výtrusy. Z pěti druhů s hyalinními výtrusy byly již dva přeřazeny do rodu *Chaetosphaeria*. Tento článek pojednává o zbývajích třech druzích, *Melanomma aterrima, M. conica* and *M. papillata*. Na základě revize typového a dalšího herbářového materiálu a kultivačních studií bylo zjištěno, že *M. aterrima* patří do rodu *Chaetosphaeria* a je doprovázena anamorfou z rodu *Custingophora* je navržena nová kombinace, *C. aterrima* comb. nov. Na základě revize typového a dalšího materiálu je druh *M. conica* ztotožněn s druhem *Chaetosphaeria ovoidea* a druh *Melanomma papillata* s druhem *Chaetosphaeria pulviscula*. Byl rovněž studován typový a další herbářový materiál druhů *Melanomma fallax* a *Chaetosphaeria glauca*. Oba druhy jsou ztotožněny s druhem *Chaetosphaeria ovoidea* a jsou zahrnuty do jeho synonymiky. Druhy *Chaetosphaeria aterrima, C. pulviscula* a *C. ovoidea* jsou uvedeny s plnou synonymikou a s údaji o jejich předchozích popisech a vyobrazeních v literatuře.

INTRODUCTION

The genus *Melanomma* Nitschke ex Fuckel was introduced by Fuckel (1870) for lignicolous pyrenomycetes with superficial, small, black ascomata, 2-3-septate or rarely non-septate ascospores and was placed by the author in the Lophiostomae of the Sphaeriacei. In the genus, species with both brown and hyaline ascospores were mixed. Apart from six species with dark coloured ascospores, the genus accommodates another five species possessing hyaline ascospores (Fuckel 1870, 1872), namely *Melanomma aterrima* Fuckel, *M. conica* Fuckel,

M. ovoidea (Fr.) Fuckel, *M. papillata* Fuckel and *M. pomiformis* (Pers.: Fr.) Nitschke. These species, except for the latter, were transferred by Saccardo to the genus *Zignoella* (Sacc.) Sacc. *Zignoella* was described by Saccardo (Michelia 1: 346, 1878) as a subgenus of *Melanomma* and later (Saccardo, Syll. Fung. 2: 214, 1883) as a genus. Saccardo (1878) gave a list of twenty-seven species of *Zignoella* without indicating type species. The type was selected later by Clements and Shear (1931), who chose *Zignoella pulviscula* (Currey) Sacc. Saccardo (1883) comprehensively defined *Zignoella* for a group of fungi having non-stromatic, carbonaceous ascomata, 8-spored asci, paraphyses and hyaline, multi-septate ascospores and divided it into four subgenera: *Trematostoma*, desribed as: perithecia majuscula, dein late pertusa, typice basi insculpta, and three others, which have the following description in common: perithecia minuta, vix pertusa, sublitera, but differ in the number of septa in the ascospores: *Eu-Zignoella* with 3-septate ascospores, *Zignaria* with at first 1-septate ascospores and *Zignoina* possessing 1-celled ascospores, often multiguttulate when young.

Winter (1885) did not accept the genus *Zignoella* and preferred to accommodate the species placed in *Trematostoma* by Saccardo, in *Trematosphaeria* Fuckel. He also followed Fuckel's placement of species with hyaline ascospores (Saccardo's *Eu-Zignoella, Zignaria* and *Zignoina*) in *Melanomma*.

Munk (1957) acknowledged *Zignoella* and mentioned two species from Denmark, *Zignoella fallax* (Sacc.) Sacc. and *Zignoella pulviscula* (Currey) Sacc. The author placed *Zignoella*, together with *Ceratosphaeria* Niessl, *Debaryella* Höhnel, *Endoxyla* Fuckel, *Lentomita* Niessl and *Rhamphoria* Niessl, in the Rhamphorioideae Munk of the Diaporthaceae Höhn. ex Wehm. (= Valsaceae Tul. et C. Tul., Eriksson and Hawksworth 1993).

Booth (1957, 1958) studied anamorph-teleomorph connections of two *Zignoella* species and transferred them to *Chaetosphaeria* Tul. et C. Tul. In the genus, Booth placed the type species *Zignoella pulviscula* under *Chaetosphaeria pulviscula* (Currey) C. Booth with the anamorph *Menispora caesia* Preuss. Hence *Zignoella* becomes a synonym of *Chaetosphaeria* in the broader sense (Booth 1957; Müller 1987). Booth (1957) also brought *Zignoella ostioloidea* (Cooke) Sacc. under the synonymy of *Chaetosphaeria myriocarpa* C. Booth. It has the anamorph *Chloridium clavaeforme* (Preuss) W. Gams et Hol.-Jech. (Gams and Holubová-Jechová 1976).

Dennis (1978) included both *Chaetosphaeria*, with hyaline, 1-septate ascospores, and *Zignoella*, with hyaline, 3-septate ascospores, in the Trichosphaeriaceae Winter.

Cannon, Hawksworth and Sherwood-Pike (1985) recognized both genera and reported eleven species of *Zignoella* and ten of *Chaetosphaeria* both of the Trichosphaeriaceae from Great Britain.

According to Barr (1990b) *Chaetosphaeria* belongs to the Lasiosphaeriaceae Nannf. emend. Lundq. and *Zignoella* is mentioned as a synonym. According to the author the Lasiosphaeriaceae accommodate a group of species with superficial or immersed becoming erumpent ascomata; ascomatal walls of relatively large, pseudoparenchymatous cells, at times containing Munk pores; relatively wide, delicate, deliquescent paraphyses if present; basal asci narrow, with an amyloid or non-amyloid apical annulus; hyaline, light brown or versicoloured ascospores; an enteroblastic-phialidic arrangement of the conidia. Therefore, *Chaetosphaeria* is better placed in this family than in the Trichosphaeriaceae, in which species are included having superficial ascomata; ascomatal walls of compressed rows of cells; narow, thin walled paraphyses; asci basal or peripheral with shallow, with a non-amyloid apical annulus; hyaline or lightly pigmented ascospores; a holoblastic arrangement of the conidia (Barr 1990b).

Constantinescu et al. (1995) transferred two other *Zignoella* species to *Chaetosphaeria: Chaetosphaeria ovoidea* (Fr.) Constant. et al. with the synanamorphs *Menispora glauca* Pers.: Fr. and *Phialophora* sp. (Holubová-Jechová 1973; Constantinescu et al. 1995) and *Chaetosphaeria pygmaea* (P. Karst.) Constant. et al. with the anamorph *Phialophora phaeophora* W. Gams. The authors noted that the position of several species referred to *Zignoella* is not yet clear.

Zignoella is a very heterogeneous taxon with a broad generic concept in which the presence of hyaline, transversely septate ascospores was considered as the main delimiting character in the past. Partial studies on some *Zignoella* species have showed that different taxa were erroneously placed in the genus. Some species having unitunicate asci and hyaline multi-septate ascospores have already been transferred to other genera, e.g. *Ceratosphaeria* (Munk 1957; Teng 1996), *Chaetosphaeria* (Booth 1957, 1958; Holubová-Jechová 1973; Barr 1991; Barr et al. 1986; Barr et al. 1996; Constantinescu, Holm and Holm 1995), *Discostroma* Clem. (Barr et al. 1986), *Saccardoella* Speg. (Berlese 1894; Hyde 1992; Barr 1994) and *Vialaea* Sacc. (Müller and Arx 1962). Several species were found to have bitunicate asci and were consequently excluded from *Zignoella* and accomodated in other genera, e.g. *Exarmidium* (Barr and Boise 1985), *Massarina* Sacc. (Holm 1957), *Pseudotrichia* Kirschst. (Barr 1990), *Teichosporella* (Sacc.) Sacc. (Barr 1981), *Thyridaria* Sacc. (Barr 1990) and *Trematosphaeria* Fuckel (Winter 1885; Holm 1957). Based on literature data and experience with recent and type material of some *Zignoella* species it is obvious that the genus includes rather unrelated taxa and requires a critical revision. Following Booth' s (Booth, Mycol. Pap. 68: 10, 1957) and Müller's (Müller, Systema Ascomycetum 6: 156, 1987) acceptance of *Zignoella* as a synonym of *Chaetosphaeria*, for the taxa remaining to be placed in that genus, Cooke's generic name *Zignoina* Cooke has to be reinstated, at least as an interim measure (Eriksson and Hawksworth 1987).

MATERIAL AND METHODS

Single ascospores of *Chaetosphaeria aterrima, C. pulviscula* and *C. ovoidèa* were isolated with the aid of a single-spore isolator on CMA agar. Colony characters were taken from PCA cultures grown at 10 °C and 25 °C under 10 days darkness and 10 days under cool white fluorescent light. The resulting culture of *C. aterrima* is deposited under No. 3027 in the Culture Collection of Fungi (CCF) at Charles University in Prague.

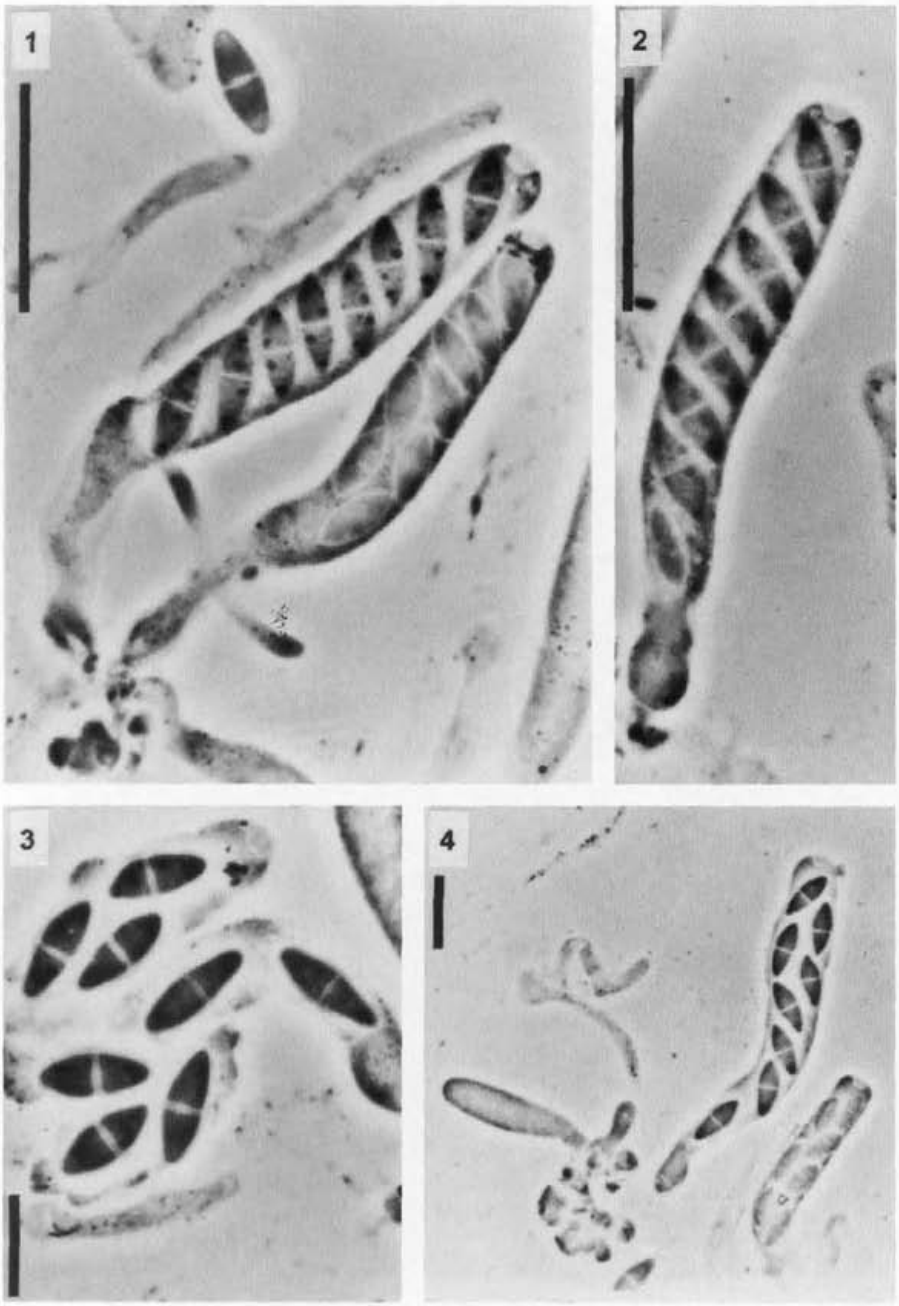
Dry herbarium specimens were briefly rehydrated in 3% KOH and subsequently studied in 100% lactic acid, cotton blue in lactic acid, Congo Red (aq.) or Melzer's reagent. Two types of microscopy were used in this study. These are indicated in the legends to the illustrations as bright field (BF) and phase contrast (PC). Photographs were taken with the specimens in Melzer's reagent and Congo Red (aq.). The abbreviations of the herbaria and institutes which kindly lent the material are cited in accordance with the Index Herbariorum (Holmgren et al. 1990).

M.R. is the abbreviation for M. Réblová in the lists of material examined.

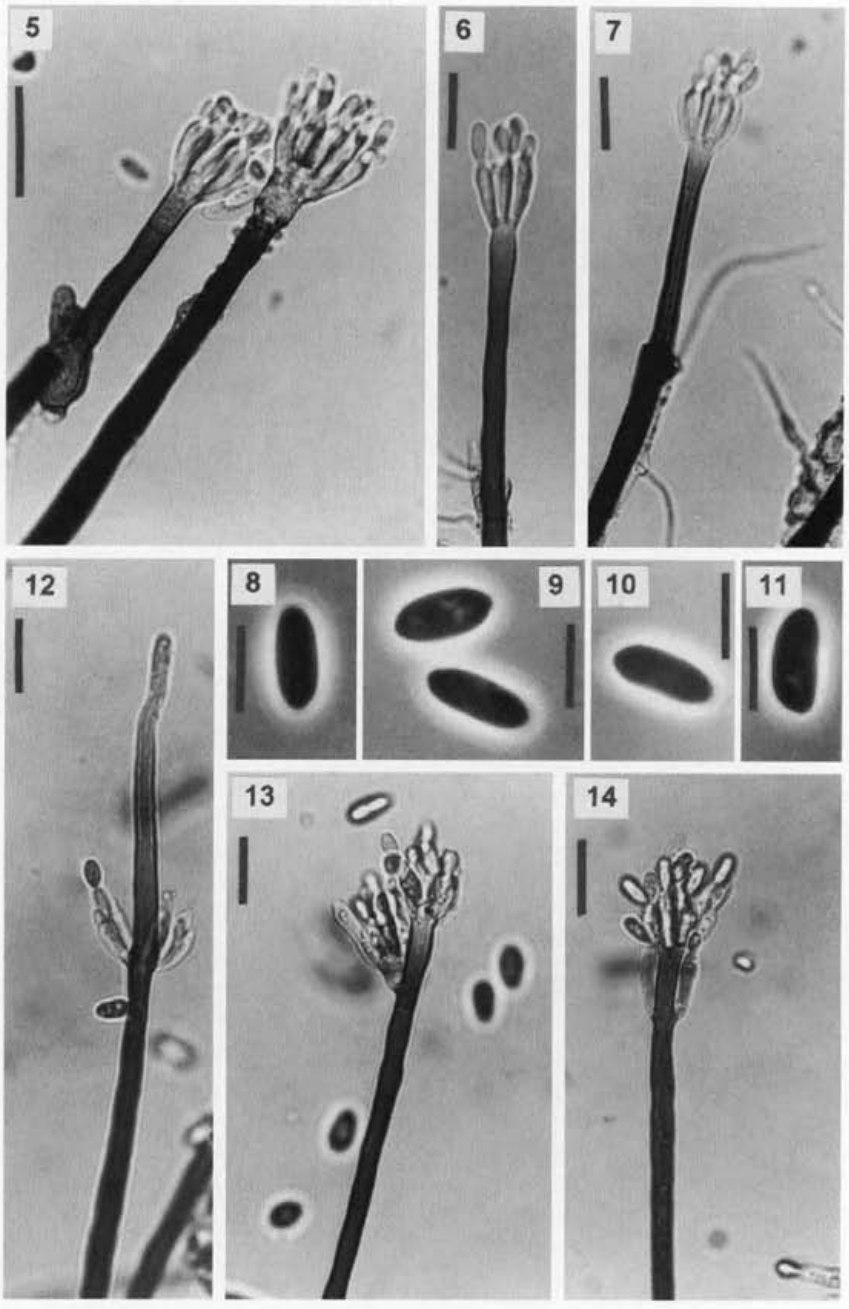
RESULTS AND DISCUSSION

The examination of the original and recent material of *Melanomma aterrima, M. conica* and *M. papillata* revealed that *Melanomma aterrima* is another species in the genus *Chaetosphaeria* associated with a *Custingophora* anamorph, a new combination, *Chaetosphaeria aterrima* (Fuckel) comb. nov., is proposed. The teleomorph-anamorph connection was proved by culture studies. The recent material of *Melanomma conica* and *M. papillata* was collected during the years 1990-1997 on wood and decayed bark of different kinds of deciduous trees. These two *Melanomma* species are conspecific with *Chaetosphaeria ovoidea* and *Chaetosphaeria pulviscula*, respectively. Ascospore cultures of *C. ovoidea* produced synanamorphs *Menispora glauca* and *Phialophora* sp. as described by Constantinescu et al. (1995). Ascospore culture of *C. pulviscula* produced synanamorphs *Menispora caesia* and *Phialophora* sp., the latter is described here. *Chaetosphaeria aterrima, C. pulviscula* and *C. ovoidea* are listed with their full synonymy and references to previous descriptions and illustrations.

Several other species are considered. The type collection of *Chaetosphaeria glauca* was examined and it was concluded that it is correctly placed in the synonymy of *Chaetosphaeria ovoidea*, as suggested by Constantinescu et al. (1995). Two exsiccatae from Petrak's Flora Bohemiae et Moraviae exsiccata labelled as *Zignoella papillata* (Fuckel) Sacc. and *Zignoella ovoidea* (Fr.) Sacc. have also been examined. Both are mentioned in the synonymy of *Chaetosphaeria pulviscula* and *C. ovoidea*, respectively. In the present paper, *Melanomma fallax* Sacc.



Figs 1-4. *Chaetosphaeria aterrima* (Fuckel) Réblová. 1, 2. Asci with ascospores; 3. Ascospores; 4. Ascus with ascospores. Figs 1-4: PC. Figs 1-4 from G – holotype. Scale bars: 1, 2 = 20 μm; 3, 4 = 10 μm.



Figs 5-14. *Custingophora* sp. anamorph of *Chaetosphaeria aterrima* (Fuckel) Réblová. 5-7. Apex of the conidiophores with phialides and phialoconidia; 8-11. Phialoconidia; 12-14. Apex of the conidiophores with phialides and phialoconidia. Figs 5-7, 12-14: BF; 8-11: PC. Figs 5-11 from nature (Herb. M.R. 871/96); 12-14 from living culture, cultivated on PCA agar (CCF 3027). Scale bars: 5-7, 12-14 = 20 μm; 8-11 = 10 μm.

(Saccardo 1877) is also involved. The type material of *M. fallax* has not been examined. A very common lignicolous fungus was described under this name, which according to the characters observed on the recent material, well conforms to the descriptions given by Saccardo (1877), Winter (1885), Munk (1957) and Dennis (1978) and those of *Melanomma conica, Chaetosphaeria glauca* and *C. ovoidea* (Fuckel 1870; Holubová-Jechová 1973). *Melanomma fallax* is therefore identical with *Chaetosphaeria ovoidea* and is reduced to its synonymy.

Of five *Melanomma* species with hyaline, transversely septate ascospores described by Fuckel (1870), two have been already transferred to *Chaetosphaeria*. *Melanomma pomiformis* with a *Stachybotrys* anamorph (Booth 1957) was transferred by Müller (Müller and Arx 1962) and *Melanomma ovoidea* by Constantinescu et al. (1995). *Chaetosphaeria pomiformis* (Fuckel) E. Müll. should be excluded from the genus as was already suggested by Barr (1990b) and retained in *Melanopsamma* Niessl. in the Niessliaceae Kirschst. It can be distinguished from other species of *Chaetosphaeria* by the collabent ascomata; soft-textured, three-layered ascomatal wall, presence of periphysoides and the morphology of the ascus and ascospore which reminds that of the Hypocreales. Also the anamorph *Stachybotrys* is rather hypocreaceous than sphaeriaceous (Barr 1990b).

LIST OF REVISED SPECIES

Unless otherwise indicated, the accepted names are preceded by an asterisk.

1. *Melanomma aterrima* Fuckel, Jahrb. Nassau. Ver. Naturk. 25-26, Nachtr. 1: 304, 1872. – basionym.

≡ *Zignoella aterrima* (Fuckel) Sacc., Michelia 1: 346, 1878.

* ≡ **Chaetosphaeria aterrima** (Fuckel) Réblová, comb. nov.

Figs 1-4; 15a-c.

Ascomata superficial with the base slightly immersed, solitary or in groups of 2-4, globose to subglobose, ostiolate, papillate, 230-270 μm wide and 250-350 μm high, glistening, black, glabrous, bearing conidiophores identical with those arising from the substrate surface. Ascomatal wall 33-37 μm thick, *textura prismatica*, consisting of two layers. Outer layer of thick-walled, melanised cells; inner layer of hyaline, compressed, elongated cells. Ostiolar canal periphysate. Paraphyses abundant among the asci, branching, anastomosing, septate, hyaline, 2-3 μm wide. Asci unitunicate, 8-spored, (54-)56-65(-74) × 7-8(-9) μm, arising from a broad hymenium, cylindrical, shortly stipitate, truncate to broadly rounded at the top, ascal apex non-amyloid with a well visible apical annulus. Ascospores fusiform, 10-13 × 3-4 μm, 2-celled, with a thick, refringent wall and a median septum, non-constricted or slightly constricted, hyaline, smooth-walled, each cell filled with 1-2 oil drops, 1-2-seriate in the ascus.

Anamorph. *Custingophora* sp. Figs 5-14; 16a-c; 17a-b.

Characteristics in culture. Colonies on CMA, MEA, OA and PCA grow slowly, attaining a diameter of about 8-12 mm within 10 days at 25 °C. Colonies on the three former media have a yeast-like character, whitish to ivory, not sporulating. Colonies on PCA whitish, aerial hyphae densely developed, sporulating. Parallel sets of colonies on those media were cultivated in darkness and under cool white fluorescent light for another 10 days at 25 °C and all attained a diameter of about 20-22 mm. Colonies on CMA, MEA and OA media sporulated in 14 days, those growing in darkness sporulated more poorly. Sporulation on PCA is more pronounced compared to other used media. Sporulation on OA is better than on CMA and MEA. Conidiophores arising all over the colony in the aerial mycelium. In culture conidiophores were simple or sympodially branched by successive, single proliferation. Proliferations arise subapically from the vesicle or from the conidiophore, developing successively up to 3 per conidiophore. Conidiogenous cells as under natural conditions. Phialoconidia were of the same size as under natural conditions but more conspicuously truncate and apiculate at the proximal end.

On the natural substrate conidiophores were sparsely scattered, solitary or fasciculate, arising from the substrate surface or covering the ascomata. Conidiophores macronematous, unbranched, septate, erect, with one to occasionally three percurrent proliferations per conidiophore, up to 220 μm high, (5-)6-7 μm wide in the middle and 15-16 μm wide at the base, dark brown, paler towards the apex and enlarging apically to form a more or less distinct vesicle. The vesicle pale brown to subhyaline, clavate, smooth, roughened with increasing age, 7-11 μm wide and 11-14 μm high, bearing phialides in the upper part. Phialides (12-)14-16(-19) × 4-6 μm, uniseriate, hyaline, parallel, cylindrical to clavate, straight or curved from the edge of the vesicle, collarettes indistinct. Phialoconidia forming slimy heads at the top of the conidiophore, (8-)9-13 × (3-)4-5 μm, hyaline, smooth, elliptic, slightly truncate at the proximal end, with two large vacuoles. The placement of the vacuoles in the conidium recalls a median septum. The thin, non-refractive median septum was seen in several mature conidia in the recent material (Herb. M.R. 871/96; Fig. 16b). Those conidia were not joined in the slimy head at the top of the conidiophore but were found attached to the ascomatal surface or the basal part of the conidiophore, so the median septum may develop much later.

Material examined. 1) Type material. Germany: Aepfelbach, on a branch of *Fagus sylvatica*, autumn, leg. Fuckel (G – holotype of *Melanomma aterrima*).

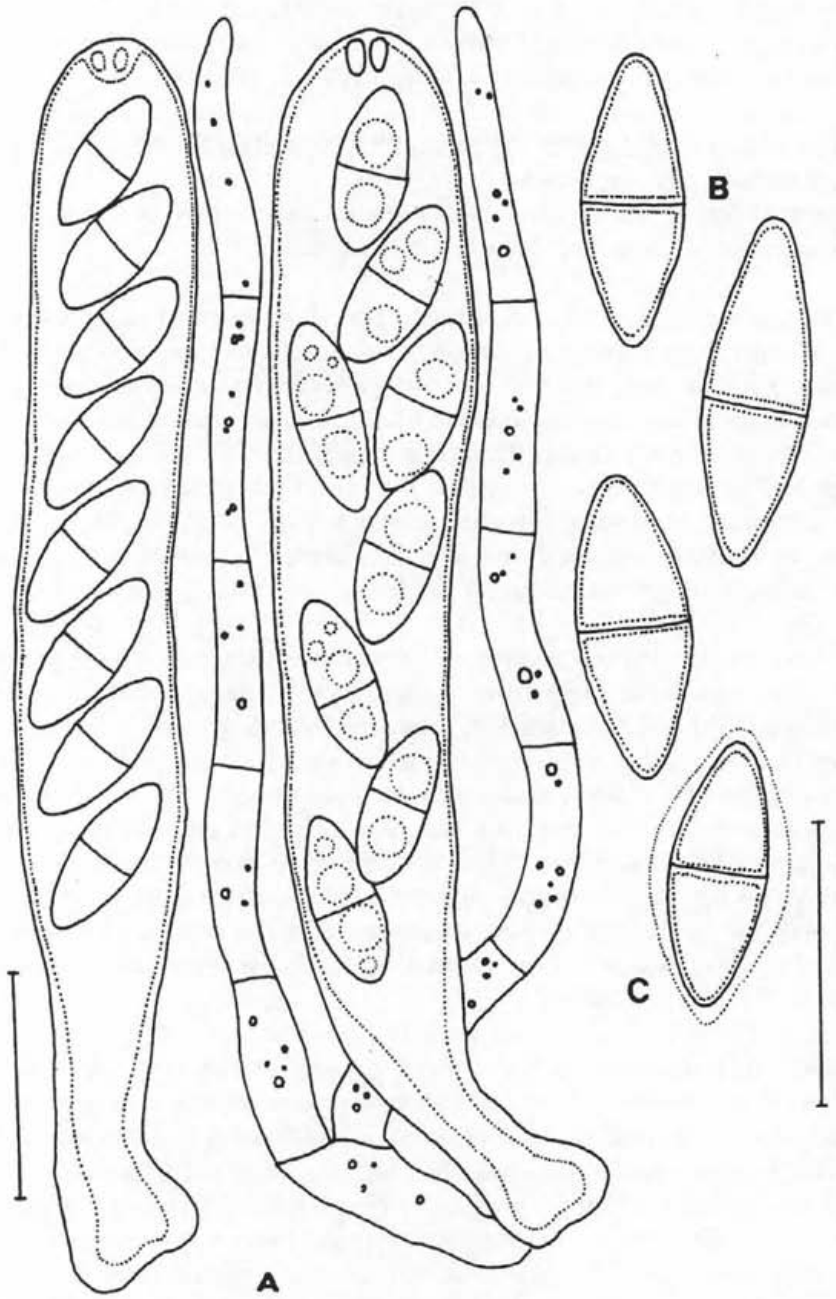


Fig. 15A-C. *Chaetosphaeria aterrima* (Fuckel) Réblová.
A. Asci with paraphyses and ascospores; B. Ascospores; C. Ascospores with a thin hyaline sheath. A-C from G – holotype. Scale bars: A-C = 10 μm.

2) Additional material. Czech Republic: Southern Bohemia, Šumava Mts., glacial cirque of the lake Černé jezero near Železná Ruda, on a decayed stump of *Fagus sylvatica*, 23.X.1996, leg. M. R. (Herb. M. R. 871/96).

Descriptions. Fuckel (1872: 304); Saccardo (1883: 216); Winter (1885: 245).
Known host. *Fagus sylvatica*.
Habitat. Saprobe on the bare, decorticated wood of a deciduous tree.
Distribution. Europe: Germany, Czech Republic.

The asci treated by a solution of Congo Red show a distinct thickening at the top where the apical annulus is placed. The apical annulus appears to be indistinct and does not stain in Congo Red, whereas when treated by Melzer's reagent the apical annulus is well visible, refractive, the ascal apex without any mark of the subapical space or thickening. The mature ascospores treated by a solution of Congo Red appear to be enclosed in a 1-1.5 μm thick gelatinous sheath which later disappears, as examined in phase contrast (Figs. 1-4; 15c). The ascospores treated by Meltzer's reagent do not show any mark of a gelatinous sheath when examined in both light microscopy or phase contrast – they appear smooth-walled (Fig. 15a-b).

C. aterrima most closely resembles *Chaetosphaeria aspergilloides* M.E. Barr et Crane (Barr and Crane 1979) found on wood in a tropical greenhouse in Mexico, also associated with a *Custingophora* anamorph. *Chaetosphaeria aspergilloides* is almost identical in the morphology of the ascomata (275 μm wide and 330 μm high), asci (50-64 × 7.5-9 μm) and two-celled ascospores (9-11 × 4-5 μm) with *Chaetosphaeria aterrima*, but they can be clearly distinguished by characters of the associated anamorphs. The *Custingophora* anamorph of *Chaetosphaeria aspergilloides* possesses taller conidiophores, larger vesicles and phialides; however, the phialoconidia of both *Custingophora* species are similar in size. The type material of *Chaetosphaeria aspergilloides* could not be examined, for the type material (NY) was not located.

The *Custingophora* anamorph found in the recent material (Herb. M.R. 871/96) associated with ascomata and also found growing in culture is identical with that found in the type material of *Melanomma aterrima*. It is of interest that the character of sympodially and subapically proliferating conidiophore, typical of *Custingophora* Stolk et al., was observed in culture only. Natural material shows conidiophores without any marks of sympodial proliferations but with 1-3 percurrent proliferations per conidiophore. Barr and Crane (1979) neither observed the sympodial and subapical proliferation of the conidiophore. Only simple, non-proliferating conidiophores were described in the protologue. The *Custingophora* anamorph of *Chaetosphaeria aspergilloides* was not cultivated.

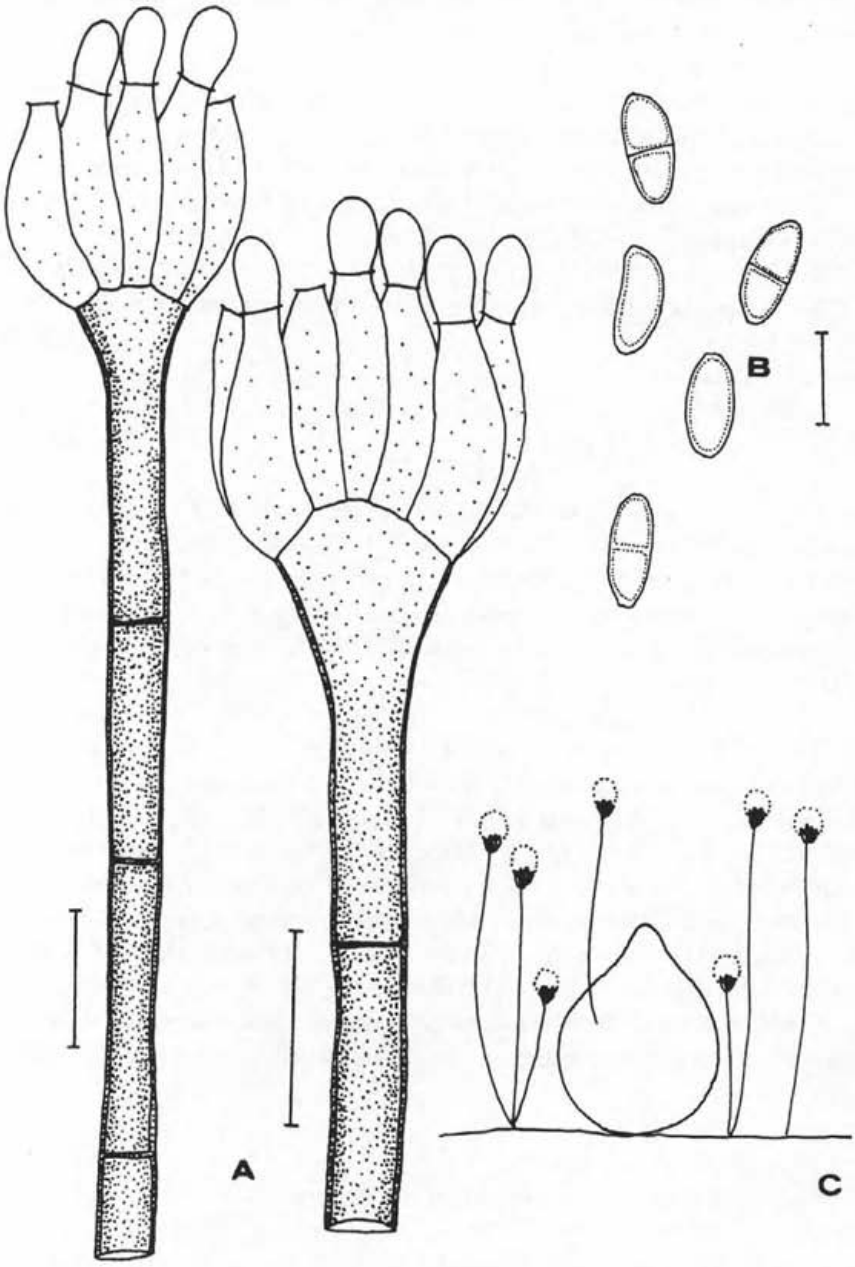


Fig. 16A-C. *Custingophora* sp. anamorph of *Chaetosphaeria aterrima* (Fuckel) Réblová. A. conidiophores with vesicles and phialides; B. Phialoconidia; C. Habit sketch of the ascomata and conidiophores. A-C from nature (Herb. M. R. 871/96). Scale bars: A, B = 10 μm.

The present collection of *C. aterrima* apparently represents the first record of this species since its description by Fuckel (1870).

2. *Melanomma papillata* Fuckel, Jahrb. Nassau. Ver. Naturk. 23-24: 159, 1870.
≡ *Zignoella papillata* (Fuckel) Sacc., Michelia 1: 346, 1878.
= *Sphaeria pulviscula* Currey, Trans. Linn. Soc. Lond. 12: 320, 1859.
≡ *Melanomma pulviscula* (Currey) Sacc., Myc. Ven. Spec. p. 114, 1873.
≡ *Zignoella pulviscula* (Currey) Sacc., Michelia 1: 346, 1878.
≡ *Psilosphaeria pulviscula* (Currey) Stevenson, Mycologia Scotica, p. 387, 1879.
* ≡ **Chaetosphaeria pulviscula** (Currey) C. Booth, Naturalist 1958: 88, 1958. Fig. 19a,b.

Synanamorphs. *Menispora caesia* Preuss, Linnea 24: 119, 1851. Fig. 19c,e.
Phialophora sp. described here. Fig. 19d,f.

Characteristics in culture. Ascospores of one specimen of *Chaetosphaeria pulviscula* (Herb. M.R. 1124/97) were isolated. The ascospores germinate rapidly and branched or unbranched hyphae emerge within 24 hours from the end or intercalary cells of the ascospore. Several ascospores gave rise to the synanamorph *Menispora caesia* and others to the synanamorph *Phialophora* sp. Mixed colonies of *Menispora caesia* and *Phialophora* sp. growing from one ascospore were not observed. Both *Menispora caesia* and *Phialophora* sp. were cultivated at 10 °C under 12 h darkness alternating with 12 h cool white fluorescent light. Colonies of *Menispora caesia* are greyish to dark brown on PCA, grow slowly, attaining a diameter of about 8-10 mm within 20 days at 10 °C, aerial hyphae densely developed, margins of the colony fimbriate. Colonies of *Phialophora* sp. are whitish to greyish on PCA, attaining a diameter of about 10-13 mm within 20 days at 10 °C, aerial hyphae densely developed, margins of the colony fimbriate. Both synanamorphs sporulated well in 1-2 month cultivated on CMA and PCA, preserved at 10 °C under 12 h darkness alternating with 12 h cool white fluorescent light. Conidiophores of both synnamorphs arising from the center towards the margins all over the whole colony in the aerial mycelium. Exudate and diffusible pigment absent.

Phialophora sp. synanamorph.

The conidiogenous cells are phialides, borne directly on the aerial hyphae or, seldom supported by a cylindric, erect cell. They are slightly pigmented with a darker collarete, 7-25 μm long and 2-3 μm wide in the middle. Phialoconidia formed in slimy heads, hyaline to slightly pigmented and darker in mass, ellipsoidal to cylindrical, straight or slightly curved, rounded at the distal end and apiculate at the proximal end, (5-)6-7.5 × 1-1.5 μm.

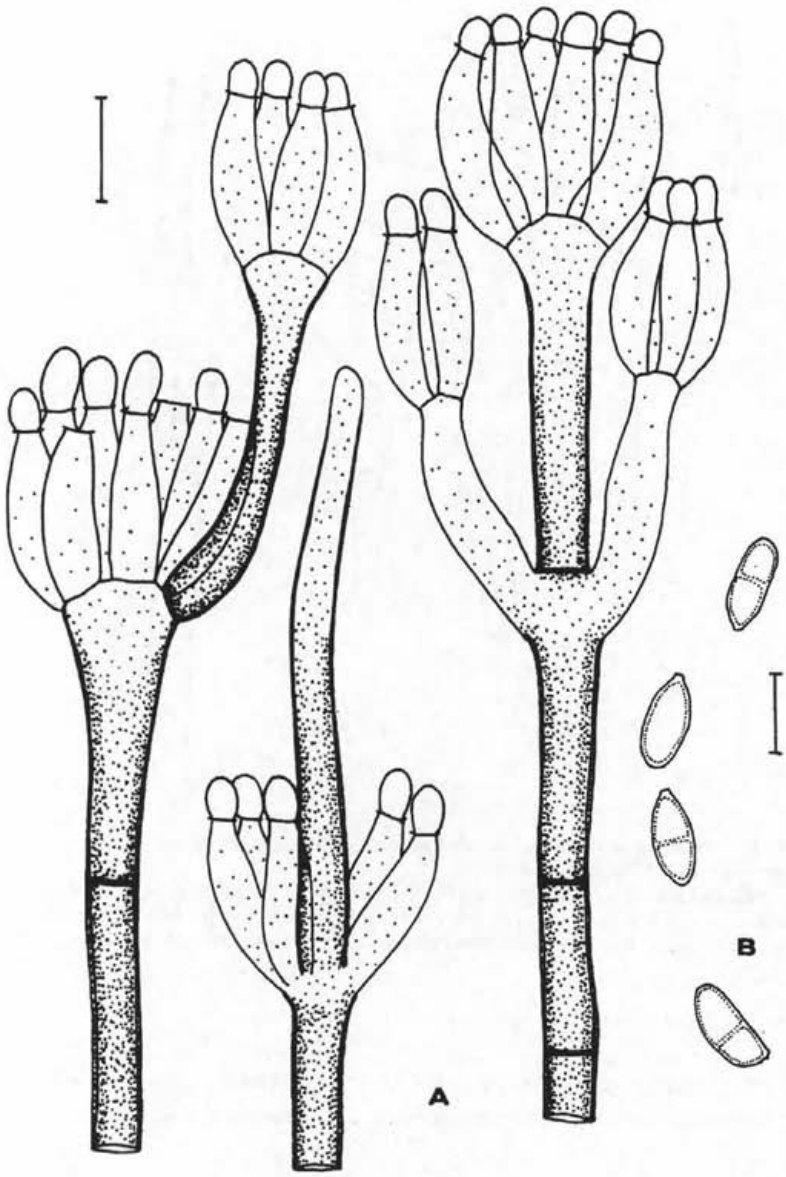


Fig. 17A, B. *Custingophora* sp. anamorph of *Chaetosphaeria aterrima*.
A. Conidiophores with vesicles and phialides; B. Phialoconidia. A, B from living culture, cultivated on PCA agar (CCF 3027). Scale bars: A, B = 10 μm.

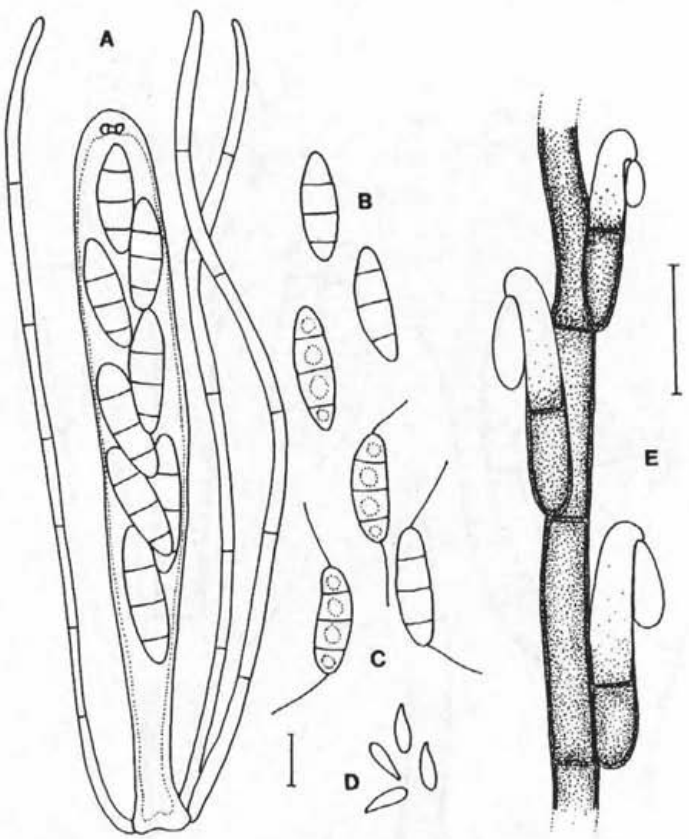


Fig. 18A-E. *Chaetosphaeria ovoidea* (Fr.) Constant. et al. and its synanamorphs *Menispora glauca* Pers.: Fr. and *Phialophora* sp.
A. Ascus with ascospores and paraphyses; B. Ascospores; C. Phialoconidia of *Menispora glauca*; D. Phialoconidia of *Phialophora* sp.; E. Part of conidiophore with phialides of *Menispora glauca*. A, B from Herb. M.R. 1060/97; C-E from living culture, cultivated on PCA agar. Scale bars: A-E = 10 μm.

The *Phialophora* sp. synanamorph of *Chaetosphaeria pulviscula* differs in the larger phialoconidia from the *Phialophora* sp. synanamorph of *Chaetosphaeria ovoidea*.

Menispora caesia Preuss synanamorph.

Conidiophores macronematous, mononematous, arising on aerial hyphae, straight or slightly flexuous with 2 or 4 lateral side branches, brown, paler towards the apex, septate, up to 140 μm long and (3.5-)4-5 μm wide in the

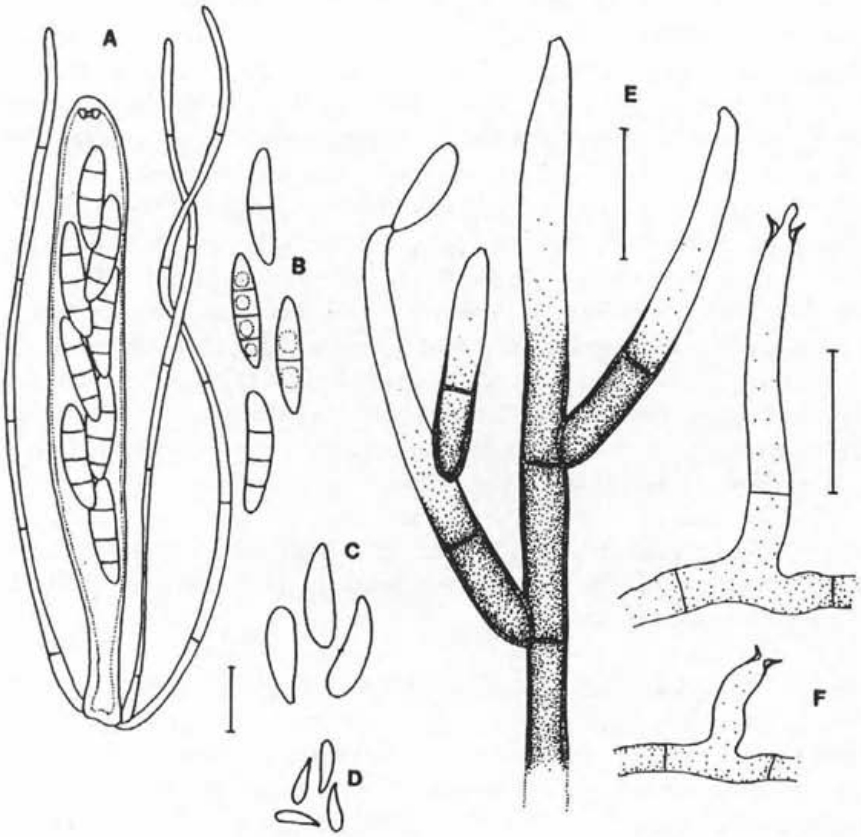


Fig. 19A-F. *Chaetosphaeria pulviscula* (Currey) C. Booth and its synanamorphs *Menispora caesia* Preuss and *Phialophora* sp.
A. Ascus with ascospores and paraphyses; B. Ascospores; C. Phialoconidia of *Menispora caesia*; D. Phialoconidia of *Phialophora* sp.; E. part of conidiophore with phialides of *Menispora caesia*; F. Phialides of *Phialophora* sp. A, B from Herb. M.R. 1124/97; C-F from living culture, cultivated on PCA agar. Scale bars: A-F = 10 μm.

middle. Branches directed upward, often bearing secondary and tertiary branches. Solitary phialides develop at the end of the main conidiophore and on its lateral branches. Phialides are one-celled, cylindrical, subhyaline, straight, 20-40 μm long and 3-4.5 μm wide, tapering towards the apex and slightly curved towards the conidiophore, terminating in an open end. Phialoconidia form slimy colourless heads around the apex of the phialide; hyaline, cylindrical to oval, slightly curved, narrowly rounded at the distal end and more tapered at the proximal end, non-septate, 15-20 × 2.5-3.5(-4)μm, lacking setulae.

Material examined. 1) Exsiccatae. Fuckel's Fungi rhenani, No. 2166 (G – as *Melanomma papillata*). – Petrak's Flora Bohemiae et Moraviae exsiccata, No. 2097, Lfg. 42; (Czech Republic: Moravia, Podhoří near Hranice na Moravě, on *Fagus sylvatica*, 2.X.1924, leg. F. Petrak; PRM 482574 – as *Zignoella papillata*).

2) Type material. Germany: Mühlwiese near Hattenheim, on decayed wood of *Quercus* sp., spring, leg. Fuckel (G – holotype of *Melanomma papillata*).

3) Additional material. Czech Republic: Central Bohemia, Ploskov near Lány, on *Alnus glutinosa*, 26.V.1994, leg. M.R. (Herb. M.R. 534/94); nature reserve Týřovické skály, Týřovice near Rakovník, on *Quercus robur*, 12.IX.1993, leg. M.R. (Herb. M.R. 380/93); Southern Bohemia, Novohradské hory Mts., virgin forest Žofínský prales near Pivonice, on *Fagus sylvatica*, 20.V.1997, leg. M.R. (Herb. M.R. 920/97); Šumava Mts., glacial cirque of the lake Černé jezero near Železná Ruda, on *Fagus sylvatica*, 27.VIII.97, leg. M.R. (Herb. M.R. 1089/97, 1103/97); Moravia, river-side virgin forest Cahnov near Lanžhot, on *Quercus* sp., 15.X.1997, leg. M.R. (Herb. M.R. 1124/97).

Descriptions and illustrations. Winter (1885: 244); Saccardo (1883: 214; 1891: 860); Booth (1957: 10, Fig. 4; 1958: 88, Figs. i-j); Munk (1957: 190); Holubová-Jechová (1973: 331, Fig. 2.2).

Known hosts. *Acer campestre, Alnus glutinosa, Fagus sylvatica, Populus nigra, Quercus robur, Quercus* sp., *Robinia pseudoacacia.*

Habitat. A lignicolous saprobe on bark, inner surface of bark and decorticated wood of many kinds of deciduous trees at different stages of decay. The ascomata are sometimes accompanied by mycelium of the anamorph forming greyish-brown, cushion-like, velvety colonies. Frequently both teleomorph and anamorph occur independently of each other.

Distribution. Cosmopolitan in the temperate zone.

It is a commonly collected fungus, clearly distinguishable from other species of *Chaetosphaeria* by its 1-3-septate, fusiform, 18-23(-25) × 3-4 μm ascospores and the *Menispora caesia* anamorph. During the study of fresh and herbarium material an interesting character of the asci, ascospores and elements of the hamathecium has been observed. All examined specimens, including the type of *Melanomma papillata*, had the paraphyses, asci and ascospores containing a large amount of tiny colourless oil drops. Masses of them also occurred loosely among the paraphyses. In the asci, the oil guttules were aggregated especially in their upper parts. The guttules become reddish-brown when treated with Melzer's reagent (dextrinoid reaction) and stain brick-red in a solution of Congo Red. This character has never been observed in *Chaetosphaeria ovoidea*, which seems to be the closest species, nor in any other *Chaetosphaeria* species. The delayed formation

of the transverse septa, which develop in the sequence 2:1:2 is typical of the genus *Chaetosphaeria*. This feature is well visible in *C. pulviscula*.

3. *Melanomma conica* Fuckel, Jahrb. Nassau. Ver. Naturk. 23-24: 160, 1870.
≡ *Zignoella conica* (Fuckel) Sacc., Michelia 1: 346, 1878.
= *Sphaeria ovoidea* Fr., Syst. Mycol. 2: 459, 1822.
≡ *Melanomma ovoidea* (Fr.) Fuckel, Jahrb. Nassau. Ver. Naturk. 23-24: 159, 1870.
≡ *Zignoella ovoidea* (Fr.) Sacc., Michelia 1: 346, 1878.
* ≡ **Chaetosphaeria ovoidea** (Fr.) Constant. et al., Mycol. Res. 99: 586, 1995. Fig. 18a, b.
= *Melanomma fallax*, Sacc., Michelia 1: 41, 1877.
≡ *Zignoella fallax* (Sacc.) Sacc., Michelia 1: 346, 1878.
= *Chaetosphaeria glauca* Hol.-Jech., Folia Geobot. Phytotax. 8: 322, 1973.

Synanamorphs. *Menispora glauca* Pers.: Fr., Syst. Mycol. 3: 450, 1832. Fig. 18c-e.
Phialophora sp., Constant. et al., Mycol. Res. 99: 586, 1995. Fig. 18d.

Characteristics in culture. Ascospores of four specimens of *Chaetosphaeria ovoidea* (Herb. M.R. 1013/97, 1060/97, 1135/97, 1136/97) were isolated. The ascospores germinate rapidly and branched or unbranched hyphae emerge within 24 hours from the end or intercalary cells of the ascospore. In all cases several ascospores gave rise to the synanamorph *Menispora glauca* and others to the synanamorph *Phialophora* sp. Mixed colonies of *Menispora glauca* and *Phialophora* sp. growing from one ascospore were not observed. Both *Menispora glauca* and *Phialophora* sp. were cultivated at 10 °C under 12 h darkness alternating with 12 h cool white fluorescent light. Colonies of *Menispora glauca* are greyish to dark brown on PCA, grow slowly, attaining a diameter of about 8-12 mm within 20 days at 10 °C, aerial hyphae densely developed, margins fimbriate. Colonies of *Phialophora* sp. are ivory to whitish or in various shades of grey on PCA, grow slowly, attaining a diameter of about 12-15 mm within 20 days at 10 °C, aerial hyphae densely developed, margins fimbriate. Both synanamorphs sporulated well in 1-2 month cultivated on CMA and PCA, preserved at 10 °C under 12 h darkness alternating with 12 h cool white fluorescent light. The *Phialophora* synanamorph sporulated usually 7-14 dayes later than the *Menispora glauca* synanamorph. Bright orange diffusible pigment present around each colony in 2-month-old culture on CMA preserved at 4-6 °C in darkness. The size and morphology of the conidiophores, conidiogenous cells and phialoconidia of both synanamorphs agree well with those given by Constantinescu et al. (1995) and Hughes and Kendrick (1963).

Constantinescu et al. (1995) reported the scarce mycelium of the *Phialophora* sp. synanamorph from 10-18 month-old slant cultures on 1 % MA preserved at 6-8 °C in darkness.

Material examined. 1) Exsiccatae. Petrak's Flora Bohemiae et Moraviae exsiccata, No. 855, Lfg. 18; (Czech Republic: Moravia, Hrabůvka near Hranice na Moravě, on wood, 29.X.1913, leg. F. Petrak; PRM 797145 – as *Zignoella ovoidea*).

2) Type material. Germany: Oestrich, on a decorticated branch of *Sambucus racemosa*, spring, leg. Fuckel (G – holotype of *Melanomma conica*). – Czech Republic: Central Bohemia, Jevanské lesy near Vyžlovka, on the bark of a trunk of *Quercus petraea* (*Menispora glauca* associated), 9.V.1967, leg. V. Holubová-Jechová (PRM 714763 – holotype of *Chaetosphaeria glauca*).

3) Additional material. Czech Republic: Central Bohemia, nature reserve Týřovické skály, valley of the brook Úpořský potok near Skryje, on a branch of *Fagus sylvatica* (*Menispora glauca* associated), 12.IX.1993, leg. M. R. (Herb. M. R. 370/93); ibid., on a trunk of *Quercus petraea* (*Menispora glauca* associated), 22.X.1964, leg. V. Holubová-Jechová (PRM 887143); Lánská obora, Ploskov near Lány, on a trunk of *Carpinus betulus* (*Menispora glauca* associated), 26.V.1994, leg. M. R. (Herb. M. R. 541/94); Lánská obora, Kouglova ohrádka near Lány, on a trunk of *Carpinus betulus*, 26.IV.1995, leg. M. R. (Herb. M. R. 565/95); Southern Bohemia, Blanská kotlina, valley of the river Malše near Blansko, on a branch of *Corylus avellana*, 20.III.1971, leg. R. Podlahová (PRM 731875); Šumava Mts., on the slopes of Mt. Spáleniště (949 m a.s.l.) near Stožec, on a branch of *Fagus sylvatica* (*Menispora glauca* associated), 5.V.1995, leg. M. R. (Herb. M. R. 616/95); Šumava Mts., on the slopes of Mt. Spáleniště (949 m a.s.l.) near Stožec, on a branch of *Acer pseudoplatanus*, 5.V.1995, leg. M. R. (Herb. M. R. 613/95); Šumava Mts., on the slopes of Mt. Černý les (1007 m a.s.l.) near Záhvozdí, on the inner surface of bark of *Fagus sylvatica*, 6.V.1995, leg. M. R. (Herb. M. R. 601/95); Šumava Mts., nature reserve Medvědice, Černý Kříž near Volary, on *Acer pseudoplatanus*, 18.IX.1997, leg. M.R. (Herb. M.R. 1013/97), Šumava Mts., glacial cirque of the lake Černé jezero near Železná Ruda; on *Fagus sylvatica*, 27.VIII.97, leg. M.R. (Herb. M.R. 1060/97, 1135/97, 1136/97), Moravia, Bílé Karpaty Mts., on the slopes of Mt. Velká Javořina (970 m a.s.l.) near site called "Kamenná bouda" (c. 660 m a.s.l.), on a branch of *Fagus sylvatica*, 27.VII.1970, leg. V. Holubová-Jechová (PRM 720914). – Finland: Turku, Ruissalo, on *Quercus* sp., summer, 1869, leg. P. A. Karsten (H 4508); Turku, Ruissalo, on bark, 1.IX.1868, leg. P. A. Karsten (H 4509); Turku, Ruissalo, on wood of *Quercus* sp., summer, 1869, leg. P. A. Karsten (H 4510). – Slovak Republic: Central Slovakia, site called "Tri vody" near Lubietová, on a branch of *Fagus sylvatica*, 27.V.1971, leg. R. Podlahová (PRM 731896);

on the slopes of Mt. Hrb (1250 m a.s.l.) near Lubietová, on a branch of *Fagus sylvatica*, 26.V.1971, leg. R. Podlahová (PRM 731895). – Ukraine: Carpathian Mts., Bliznica near Rachiv, on *Fagus sylvatica*, 29.VI.1997, leg. M.R. (Herb. M.R. 937/97).

Descriptions and illustrations. Berlese (1894: Tab. 94, Fig. 2); Saccardo (1883: 214, 215); Winter (1885: 244); Munk (1957: 189, Fig. 70a); Dennis (1978: 368, Fig. 14b); Holubová-Jechová (1973: 322, Fig. 1.1).

Known hosts. *Acer pseudoplatanus, Alnus glutinosa, Carpinus betulus, Corylus avellana, Cotoneaster integerrimus, Fagus sylvatica, Hippophae rhamnoides, Sambucus nigra, Quercus petraea, Quercus* sp.

Habitat. The fungus occurs on bark, on the inner surface of bark and on wood at different stages of decay. Sometimes the *Menispora glauca* anamorph is associated, forming effuse, cushion-like, velvety, greyish to brown colonies and surrounds the dark, minute ascomata. Frequently both teleomorph and anamorph occur independently of each other. The best time for fructification of the teleomorph seems to be from May to August.

Distribution. Cosmopolitan in the temperate zone.

Chaetosphaeria ovoidea is widespread in the temperate zone on different kinds of deciduous trees and shrubs. It is, together with *C. pulviscula*, the most common species of *Chaetosphaeria* in this region. The species is variable in the size of the ascospores, which I found to be 22-29(-30) × 4-4.5(-6.2) μm. In some cases, the presence of the longer ascospores is connected to a larger size of the asci, but it does not prove to be regular. As mentioned above, the delayed formation of septa is typical of *Chaetosphaeria*. The young ascospores of *C. ovoidea* usually contain one septum, and two other distinct, refractive septa develop at maturity. The longer ascospores [27-29(-30) μm long] may occasionally contain four septa, but this character appeared very irregularly and no correlation with the size of the ascospores or asci and the occurrence of the fourth septum could be found. The variability of the ascospore size could be one of the reasons for the long list of synonyms.

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Rhodocollybia giselae, a new species from the Mediterranean region in Europe

VLADIMÍR ANTONÍN[1] and PIERRE NEVILLE[2]

[1]Moravian Museum, Dept. of Botany, Zelný trh 6, CZ–659 37 Brno, Czech Republic

[2]Université d'Aix-Marseille III, Laboratoire de Morphogenèse Végétale, Av. Escadrille Normandie-Niémen, F-13397 Marseille Cedex 20, France

Antonín V. and Neville P. (1998): Rhodocollybia giselae, a new species from the mediterranean region in Europe.– Czech Mycol. 50: 181–184

Rhodocollybia giselae Neville & Antonín is described as a new species from the Mediterranean region of Europe (Italy, France). It grows in thermophilous forests with *Quercus ilex, Arbutus unedo* and *Pinus*. Its features and differences from other members of the *R. butyracea* group are discussed.

Key words: Basidiomycetes, Tricholomataceae, *Rhodocollybia*, Italy, France

Antonín V. a Neville P. (1998): Rhodocollybia giselae, nový druh z mediteranní oblasti Evropy. – Czech Mycol. 50: 181–184

Druh *Rhodocollybia giselae* Neville & Antonín je popsán jako nový pro vědu z mediteranní oblasti Evropy (Itálie, Francie). Roste v teplomilných lesích s *Quercus ilex, Arbutus unedo* a *Pinus*. Jsou diskutovány jeho znaky a rozdíly od dalších druhů z okruhu *R. butyracea*.

During an excursion of the 4th Congress of C.E.M.M. (Confederatio Europaea Mycologiae Mediterranensis) held in Poggibonsi near Siena (Tuscany, Italy) on November 4–9, 1996, Gisèle Riousset found carpophores of a fungus resembling a small *Rhodocollybia butyracea*. They grew on strongly decayed wood in a *Quercus ilex* forest with *Pinus* near Cala Violina (Livourne distr.), at a distance of c. 500 m from the sea coast, at an altitude of c. 10 m. Later on, another three specimens from the Hyères Islands (Var, France) were send to us by Pierre Roux (Sainte-Sigolène, France). All specimens were studied by both of us, confirming that such a combination of features (see below) is not present in any known European and extra-European *Rhodocollybia* species. Therefore, we decided to describe it as a new species named after the collector, the well-known French mycologist Gisèle Riousset.

Microscopical features are described from material mounted in Melzer's reagent, Congo Red, and NH_4OH. For the basidiospores the following symbols are used: x (average of spore size), E (quotient of length and width in any one spore), and Q (mean of E-values).

Rhodocollybia giselae Neville & Antonín, sp. nov.

Pileus 6–40 mm latus, subsemiglobatus, deinde convexus vel plano-convexus, hygrophanus, humidus et sublubricus, primum atrobrunneus usque nigrobrunneus, adultus rubrobrunneus. Lamellae liberae vel plus minus late adnatae, albidae vel cremeae. Stipes 16–66 × 3–10 mm, cylindricus, basim versus incrassatus, basi acutatus, striatus, colore pileo simili, sed dilutiore (brunneolo, apicem versus albido-brunneolo). Basidiosporae 6.9–9.6(–10.5) × 3.5–5.0(–5.4) μm, ellipsoideae vel sublacrymiformes, tenuitunicatae et simul non dextrinoideae vel leviter crassotunicatae et dextrinoideae. Cheilocystidia conspicua, 31.0–70.0 × 3.8–6.9 × 1.5–3.8 μm, anguste lageniformia vel subcylindrica. Pileipellis admodum ixocutis constructa, e hyphis cylindraceis. Caulocystidia cylindrica vel clavata, 11.5–32.5 × 4.6–9.2(–15.5) μm, tenui- vel leviter crassotunicata.

Holotypus: Italia, Tuscia: Cala Violina, 7. XI. 1996, leg. G. Riousset, in herbario P. Neville, No. 96.11.05.18 asservatur; isotypi in herbaria P. Neville, No. 96.11.05.19 et BRNM, No. 612543 asservatur.

Pileus 6–40 mm broad, subhemispherical when young, later convex to applanate-convex, slightly reflexed when old, hygrophanous, not or only slightly translucently striate at margin when wet, slightly greasy when wet; very dark brown, sooty brown to blackish-brown (Kornerup & Wanscher, 7–12F2–4), sometimes with some paler patches, pallescent to sooty brown or reddish-brown (7D5–7, as much as 9C8) with paler patches when old. Lamellae almost free to broadly adnate, rather close, slightly ventricose, up to 4 mm broad at centre; whitish to creamy, with pubescent, non-serrulate edge; reaction with $FeSO_4$ slightly pinkish (similar to *R. butyracea*) or none. Stipe 16–66 × 3–10 mm, subcylindrical, distinctly broadened at base, distinctly longitudinally striate, with white basal tomentum, hollow, singly growing carpophores often with a small sharp appendix at base, carpophores growing in small groups (of 2–4) seemingly form a joint base; colour similar as pileus but paler, slightly brownish to brownish-whitish at apex. Context whitish, or slightly sooty-brownish to brownish-reddish under pileus and stipe surface; smell and taste fungoid.

Spores 6.9–9.6(–10.5) × 3.5–5.0(–5.4) μm, x = 8.3 × 4.3 μm, E = 1.7–2.1(–2.4), Q = 2.0, ellipsoid to sublacrymoid, hyaline, thin-walled and non-dextrinoid or slightly thick-walled and then mostly dextrinoid, smooth. Basidia 21.5–31.0(–34.0) × 6.2–8.1 μm, 4-spored, clavate; sclerobasidia present. Basidioles 13.0–34.5 × 3.0–9.2 μm, cylindrical to clavate. Cheilocystidia 31.0–70.0 × 3.8–6.9 (at base) × 1.5–3.8 (neck) μm, narrowly lageniform, awl-shaped to subcylindrical, sometimes septate, sometimes subcapitate or with clavate top, obtuse, thin- to slightly thick-walled. Hyphae cylindrical to subinflated, thin-walled, non-dextrinoid, hyaline, up to 15 μm wide. Pileipellis an ixocutis, made up of radially arranged,

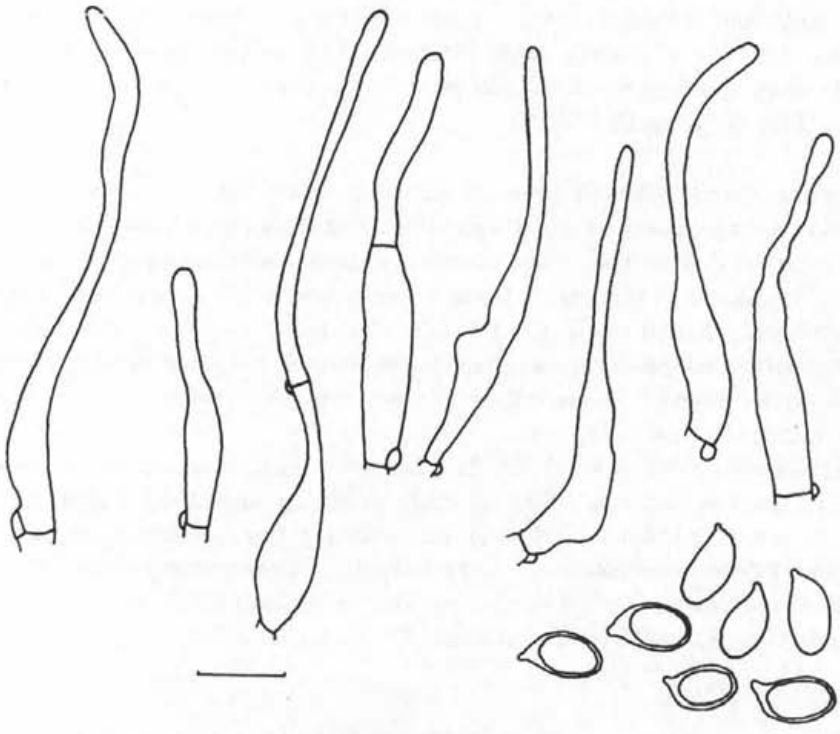

Fig. 1 *Rhodocollybia giselae* Neville et Antonín: spores and cheilocystidia. Scale bar = 10 μm.

±cylindrical, ±thin-walled, non-dextrinoid hyphae, smooth or dark brown incrusted (in NH_4OH), up to 7 μm wide; terminal cells appressed to erect, cylindrical to clavate, simple or slightly coralloid, obtuse, up to 9.5 μm wide. Subpileipellis coarsely dark brown incrusted. Stipitipellis a cutis, of parallel, cylindrical, slightly thick-walled, finely incrusted, non-dextrinoid, up to 6.5 μm wide hyphae. Caulocystidia 11.5–32.5 × 4.6–9.2(–15.5) μm, in form of lateral projections of stipitipellis hyphae or appressed to erect cylindrical to clavate terminal cells, thin- to slightly thick walled, obtuse. Clamps common in all tissues.

Ecology. Single or in poor clusters; on soil, litter or strongly decayed wood; in thermophilous Mediterranean forests with *Quercus ilex, Arbutus unedo* and *Pinus*, at an altitude of c. 10–100 m. It fructificates in late autumn to early winter (November to December).

Specimens revised. ITALY: Tuscany, Cala Violina, 7 Nov. 1996 leg. G. Riousset (Holotype: herb. P. Neville no. 96.11.05.18, Isotypes: herb. P. Neville no.

96.11.05.19 and BRNM 612543). – FRANCE: Hyères Islands, Var, Porquerolles, 11 Nov. 1993 leg. D. Salvat (herb. P. Roux 93.11.18.79). – ditto, 27 Dec. 1995 leg. J. Astier (herb. P. Roux 95.12.24.99). – ditto, Port-Cros, 12 Nov. 1993 leg. D. Salvat (herb. P. Roux 93.11.18.91).

Having a dark coloured pileus, a pileipellis in the form of an ixocutis, and at least partly ellipsoid to sublacrymoid dextrinoid spores, *Rhodocollybia giselae* belongs to the *R. butyracea* group. However, it distinctly differs especially in having small carpophores (which seems to be a constant feature), a very dark brown to black brown coloured pileus when young, that turns red-brown when old, and distinct narrowly lageniform, awl-shaped or subcylindrical cheilocystidia. The form of the cheilocystidia is rather unique in this group (Antonín & Noordeloos 1997; Halling 1983; Lennox 1979).

Rhodocollybia butyracea (Bull.: Fr.) Lennox f. *butyracea* represents the only similar European taxon. It differs especially in having larger carpophores, a paler, dark brown to red-brown coloured pileus and rather inconspicuous, clavate, irregular, lobate to subcoralloid, 15–35 × 3–10 μm large cheilocystidia.

Rhodocollybia giselae is known from three localities in Italy and France, and may represent a Mediterranean species.

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Plate 1. *Rhodocollybia giselae* Neville et Antonín: France: Hyères Islands, Var, Porquerolles, 11 Nov. 1993 leg. D. Salvat (P. Roux 93.11.18.79). Photo P. Roux.

Revival of Oyster mushroom (Pleurotus spp.) strains after mineral oil preservation

SANGITA DIGHE and S. M. KULKARNI

Mycology Group, Agharkar Research Institute, G. G. Agarkar Road,
Pune 411 004, India

Dighe S. and Kulnari S. M. (1998): Revival of Oyster mushroom (Pleurotus spp.) strains after mineral oil preservation. – Czech Mycol. 50: 185–188

Twenty four strains of oyster mushrooms (*Pleurotus* spp.) were preserved in paraffin oil at room temperature over a period ranging from 1 year and 7 months to 10 years and 2 months. Twenty two strains could be revived by the described method, with an overall revival rate of 90 %. The mycelial morphology and vigour was unaffected after preservation and revival. Six strains had produced asexual spores in vitro before preservation and 4 of them retained these characteristics. Basidioma primordia were produced, in vitro, by 6 of the 22 strains that were revived. Ten years was the optimum period. Storage at about 24 °C did not affect the viability of the strains.

Key words: *Pleurotus* spp., mushrooms, mineral oil preservation, revival, culture characters.

Dighe S. a Kulnari S. M. (1998): Oživení kmenů Pleurotus spp. po konzervaci pod minerálním olejem. – Czech Mycol. 50: 185–188

Jsou popisovány podmínky konzervace kmenů hlív přechovávaných pod parafinovým olejem při pokojové teplotě. Dále jsou popsány metody oživení kultur a jednotlivé znaky kmenů in vitro.

Fungal cultures are preserved by different methods. Optimum cooling rate, age of mycelium, lyophilization and storage under liquid nitrogen at ultra-low temperatures have facilitated long term preservation and high recovery rates. However, the hyphae of cultures belonging to mushrooms (Agaricales, Basidiomycetes) were found to be sensitive to the stress of lyophilization and cryogenic storage. Basidiomycetes cultures require specific cooling rates, cryoprotectants, age of the mycelium and storage temperature to obtain high recovery (Morrison et al. 1988). Preservation at ultra-low temperatures has been successfully employed in mushrooms in recent years (Jong and Davis 1986, Smith and Onions 1983 and Davis 1993). Empirically, cryogenic preservation is the best method for all fungi, however, it is both infrastructural and operational cost-intensive (Heckly 1978).

Alternative methods of preservation are active sub-culturing, storage in mineral oil, water or silica gel, and cryogenic preservation (Li and Chen 1981, Kobayashi 1984, Sathe and Dighe 1987). These result in varying revival rates in mushrooms. In a few cases they have proved to be useful for the retention of viability and other characteristics (Smith 1993).

The optimum recommended period for preservation by storage in mineral oil is 6–8 and 8–10 years. The cultures of three species of *Pleurotus* survived 15 to 30

years preservation in mineral oil. It has been used with a success rate of 85 % in most of the filamentous fungi. However, they had lost the ability to develop the sexual state, various structures and biochemical properties. Since mushrooms are commercially cultivated, their mycelial vigour and the development of reproductive structures are of importance.

MATERIALS AND METHODS

The method of culture preservation has been described earlier (Sathe and Dighe 1987). Each vial contained 3 mycelium-agar punches submerged in paraffin oil. These vials were wrapped in non-absorbent cotton wool, 10 vials of 1 strain formed one set, 4 to 6 such sets were placed in a polyethylene bread box, partitioned by a 20 mm thick polystyrene foam. The bread boxes were stored in a wall cupboard at about 24 °C.

The cultures were revived on Wheat (malt) Extract Agar by the following method: 38 gm of wheat was boiled in 1 litre of water for two hours and allowed to settle overnight. It was filtered through polypropylene (screen printing mesh) fabric. The volume was made up to 1 litre, 17.5 gm of Agar powder was added to it and the pH was adjusted to 5.8. The mixture was melted and 20–25 ml was dispensed in 25 × 150 mm borosilicate glass test tubes, plugged with non-absorbent cotton wool and sterilized at 15 psi for 20 minutes. Agar slopes with ca. 2 square inch surface were prepared. MEA-mycelium punches preserved under paraffin oil were examined and those with a visible mycelium were transferred to the above revival medium. The cultures were incubated at room temperature of about 24 °C and ambient humidity conditions 60–80 %. Mycelial growth was recorded after 1 week and every 3 days thereafter to record development of spores and basidioma primordia.

Source of the strains

42 strains of *Pleurotus* exist in our culture collection, from which 24 representative strains from various sources were selected. These sources were Centraalbureau voor Schimmelcultures, Baarn, The Netherlands (CBS 411.71, 593.82 and 804.85), Building Research Establishment, Princess Risborough, U. K. (BRE-66), Indian Agricultural Research Institute, New Delhi, India (ITCC–1724, 1725, 2572, 3046 and 3049), Punjab Agricultural University, Ludhiana, India (PAU) and forests in a 200 square kilometre area around this laboratory which were surveyed for *Pleurotus* species. The specimens were isolated in pure culture on MEA and identified up to species level ('wild' and from 'local' source of commercial cultivation) as listed in Table 1.

Table 1. Performance of *Pleurotus* strains during revival

Species	Strain No.	Source	Period Y, m	Characters on Revival[c]		
				Mycelium	Fruiting	Spores
P. cystidiosus	01	Wild	10, 2	(–)	(–)	(–)
P. cystidiosus	41	Wild	8, 9	++	(–)	+[a]
P. cystidiosus	251	Wild	2, 7	+++	(–)	+++[a]
P. cystidiosus	267	Wild	1, 6	++	(–)	(–)
P. milleri	57	Wild	8, 6	++	(–)	+++[a]
P. dryinus	196	CBS804.85	6, 4	+++	(–)	+[b]
P. eous	253	Wild	2, 7	++++	(–)	(–)
P. eous	263	Wild	1, 7	(–)	(–)	(–)
P. flabellatus	27	ITCC-1724	9, 3	++++	+++	(–)
P. flabellatus	34	Wild	9	+++	(–)	(–)
P. flabellatus	64	RRL	8, 6	++++	(–)	(–)
P. flabellatus	266	Wild	1, 7	++++	+	(–)
P. eryngii	29	ITCC-3046	9, 4	++	(–)	(–)
P. euosmus	145	BRE-66	7, 6	+[d]	(–)	(–)
P. ostreatus	25	ITCC-2572	9, 3	++++	(–)	(–)
P. ostreatus	70	CBS411.71	8, 4	++++	(–)	(–)
P. ostreatus	97	PAU	8, 3	++++	(–)	(–)
P. ostreatus var. floridanus	72	CBS593.82	8, 4	++++	(–)	(–)
P. ostreatus cv. 'florida'	96	PAU	8, 3	++++	(–)	(–)
P. pulmonarius	03	LOCAL	10, 2	++++	+	(–)
P. sajor caju	28	ITCC-1725	9, 3	++++	+++	(–)
P. sajor caju	95	PAU	8, 3	++++	+++	(–)
P. sajor caju	214	ITCC-3049	1, 7	++++	++	(–)
P. shivapurense	49	Wild	8, 8	+	(–)	(–)

[a]– Conidiospores of *Antromycopsis* stage. [b]– Chlamydospores (reddish brown) [c]– Incubated for 3–4 weeks after transfer on Agar slopes for revival. [d]– Recorded after 8 weeks. (–) indicates no revival. +, ++, +++, ++++ indicate relative abundance with + = ±10 mm growth.
Y, m- Correspond to Years and months of preservation.

RESULTS AND DISCUSSION

The agar punch nearest to the meniscus showed maximum growth and revival. Mycelial characters were similar to those observed in culture prior to preservation. Amongst the strains preserved *P. euosmus* (M-145) was the slowest growing strain, which survived preservation retaining this character. *Pleurotus eous* (M-263) could not be revived even after the short period of 1 year and 7 months, probably due to low vigour. *P. cystidiosus* (M-1) could not be revived in the present study. It was, however, found to be viable after 9 years' preservation.

The occurrence of the imperfect stage *Antromycopsis* is characteristic of the strains of the *P. cystidiosus* complex and was produced by 3 of the 4 cultures that revived. Typical reddish brown chlamydospores were produced by the strain belonging to *P. dryinus*. During the above in vitro studies, mushroom primordia were produced by all the strains of *P. pulmonarius*, by 1 out of 6 strains of *P. flabellatus* and by 1 strain of *P. eryngii*.

The isolates of Basidiomycotina survived liquid nitrogen storage for a period ranging from 2–13 years and had a 86–92 % revival rate (Smith 1982). Revival of Basidiomycete cultures after 9 years of cryogenic storage did not affect their radial growth rate or the pattern of the colony (Hwang et al. 1976). The success rate was less favourable at 53 % for agarics and 0 to 100 % for the species of *Pleurotus* following cryogenic storage (Chvostová et al. 1995). The overall success rate for Pleurotus strains was $\geq$ 90 % in this experiment. Von Arx and Schipper (1978) observed failures among the Agaricales, following preservation by the oil-seal method and ten years was found to be the optimum storage period for this method, in general. Similarly, preservation at about 24 °C did not affect the viability of the strains.

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Taxonomic revision of the genus Cheilymenia – 6 Cheilymenia polaripustulata sp. nov. – a new species of the section Striatisporae

JIŘÍ MORAVEC

P. O. Box 17/A, CZ-679 04 Adamov u Brna, Czech Republic

Moravec J. (1997): Taxonomic revision of the genus Cheilymenia – 6. Cheilymenia polaripustulata sp. nov. – a new species of the section Striatisporae. – Czech Mycol. 50: 189–200

Cheilymenia polaripustulata sp. nov., belonging to the section *Striatisporae* J. Mor., ser. *Tenuistriatae* J. Moravec (1990, is described from Moravia, Czech Republic. The new species is distinguished by its smaller ascospores and by conspicuous cyanophilic pustules which are situated on the ascospore poles. The polar pustules, proved also by SEM photomicrographs demonstrated here, represent a unique feature in the genus. Relations of species of the series *Tenuistriatae*, their taxonomic value and position in the section *Striatisporae* and the delimitation of the section in the genus *Cheilymenia* is discussed. The author stresses that only the use of such a staining method which strictly avoids heating the slides, allows to recognize and examine the ornamentation of the separable perisporium of ascospores in *Cheilymenia* under the optical microscope. In an additional note, the author elucidates that the term "protype" (passed as Art 7.9bis), used in J. Moravec (1993) in the typification of *Cheilymenia stercorea*, should be substituted by the legitimate term epitype (Art.9.7, ICBN,1994).

Key words: *Cheilymenia polaripustulata* sp. nov., section *Striatisporae*, series *Tenuistriatae*, Discomycetes, taxonomy.

Moravec J. (1997): Taxonomická revize rodu Cheilymenia – 6. Cheilymenia polaripustulata sp. nov. – nový druh sekce Striatisporae. – Czech Mycol. 50: 189–200

Cheilymenia polaripustulata sp. nov., je popsána z Moravy v České republice, a zařazena do sekce *Striatisporae* J. Mor. ser. *Tenuistriatae* J. Moravec (1990). Nový druh je odlišen menšími askosporami a nápadnými cyanofilními bradavkami, umístěnými na pólech. Tyto polární bradavky, které jsou ojedinělým znakem v rodě *Cheilymenia*, byly prokázány též použitím elektronové mikroskopie a jsou zde demonstrovány SEM mikrofotografiemi askospor. Jsou diskutovány vzájemné příbuzenské vztahy a taxonomická hodnota druhů ser. *Tenuistriatae* a umístění a vymezení obou sérií i sekce *Striatisporae* v rodě *Cheilymenia*. Autor zdůrazňuje, že jedině použití správné metody barvení mikroreparátů, která se striktně vyhýbá ohřevu podložních skel s preparátem, dovoluje rozpoznat a zkoumat ornamentiku oddělitelného perisporu askospor u rodu *Cheilymenia* optickým mikroskopem. V dodatečné poznámce, autor upřesňuje, že termín „protype" jím použitý (J. Moravec 1993) při typifikaci *Cheilymenia stercorea* podle původního doporučení (Art 7.9bis) má být nahrazen konečným správným termínem epitype (Art.9.7, ICBN,1994).

The section *Striatisporae* J. Mor. was proposed in J. Moravec (1990) to accommodate species of the genus *Cheilymenia* which are characterized by yellow to orange-yellow apothecia with hairs possessing a bulbous, multituberous to obtusely rooting base in combination with a cyanophilic longitudinal rib-like

striation which covers the delicate separable outermost sheath (perisporium) of the ascospores. The section is divided into two series – ser. *Striatisporae* J. Mor. and ser. *Tenuistriatae* J. Mor.

Ser. *Striatisporae* is represented by two species, *Cheilymenia theleboloides* (Alb. et Schw.: Fr.) Boud. (the type species of the section) and *Cheilymenia lemuriensis* Le Gal., while ser. *Tenuistriatae* was created for *Cheilymenia oligotricha* (Karst.) J. Mor. [= *Cheilymenia vitellina* (Pers.: Fr.) Dennis, a correct name for the type species of the series], *Cheilymenia pediseta* (Clem.) J. Mor. and *Cheilymenia citrinella* (Velen.) Svr.

The delimitation of the two series in the section is particularly founded on three important characters: 1. – thickness of the ribs which form the perisporial ascospore striation; 2. – length and form of the apothecial hairs; 3. – differences in the medullary layer of the excipulum.

ad 1. The separable ascospore perisporium of species of the ser. *Striatisporae* possesses a cyanophilic longitudinal striation similar to that of species of the section *Coprobiae* J. Mor., which is well visible under a lens of the optical microscope and consists of low longitudinal ribs which are often anastomosing and occasionally thickened or interrupted in the form of longitudinal chains of elongated warts [see Figs 19 a, b, c, and SEM Figs 31-32 in J. Moravec (1990)], whilst that of the ser. *Tenuistriatae* bears longitudinal ribs which are much finer and more densely arranged and hence hardly visible, observable only under an oil immersion lens, but proved by SEM and clearly scanned on SEM microphotographs [see Figs 20 a, b, c, and SEM Fig. 33 and Fig. 36 in J. Moravec (1990)].

2. The apothecial hairs of the species of the section, although seemingly of a different shape in each series, are in reality of the same type. We can find hairs with the same shape of their base as well as with various intermediate forms in both series. Nevertheless, the hairs of species in ser. *Striatisporae* are much scarcer or very sparsely distributed or even sometimes missing on the external surface and margin of the apothecia. They are short, hypha-like and flexuous to almost stiff and straight, superficial, thin-walled with walls up to 2 μm thick, pale to yellow, often with a bulbous base [(see Figs. 7 a, b, in J. Moravec (1990)], whilst these of the ser. *Tenuistriatae* are in general much longer and stiffer, often pseudorooting with a bulbous, simple or multituberous base (hairs on the lower surface of apothecia) or with the obtusely rooting multifurcate base of rigid, thick-walled yellow-brown marginal and submarginal hairs [see Figs 8 a, b, c, in J. Moravec (1990)].

3. Concerning the construction of the apothecia, the ectal excipulum of both series (just as in all species of *Cheilymenia*) is composed of a textura globulosa to textura angularis. However, a delimiting feature is the structure of the medullary excipulum (medulla) which is only inconspicuously differentiated in the ser. *Striatisporae*, with only occasional, mostly inflated hyphae admixed into prevailing

angular cells (textura angularis to textura subintricata) in the medullary layer, whilst the medulla in the ser. *Tenuistriatae* consists of a textura subintricata to textura intricata, as such hyphae are denser and commonly present there [compare Fig. 2 to Fig. 3 in J. Moravec (1990) and see Fig. 1 of the present paper].

Regarding the individual species of the series *Tenuistriatae*, I consider worth adding some important notes including their taxonomy and nomenclature.

Due to the unclear typification of *C. vitellina*, particularly because Cooke (1876) illustrated *Peziza vitellina* Pers. with roughly ornamented ascospores, I considered *P. vitellina* a nomen dubium (J. Moravec 1990). This opinion was supported by the fact that the type material of *Peziza vitellina* * *sabulosa* Pers. from Mougeot's Herbarium, erroneously designated by Cooke as the type of *Peziza vitellina* (now deposited in K), possessed warted ascospores and refers to *Scutellinia umbrorum* (Fr.) Lamb. as proved by Schumacher (1988) and confirmed in J. Moravec (1990). Consequently, in the cited paper I proposed the name *Cheilymenia oligotricha* (Karst.) J. Mor., based on examination of the type of *Peziza oligotricha* Karst., to be used for the fungus commonly known as *Cheilymenia vitellina*. Now, I agree with Nannfeldt (1946) and Yao and Spooner (1996) that the type specimen of *Peziza vitellina* is that which comes from Persoon's herbarium under No 910, 261-823, and that Persoon's diagnosis of *Peziza vitellina* Pers. can be demonstrative enough for this fungus, and that the name *Cheilymenia vitellina* (Pers.:Fr.) Dennis can be a well established name for the discomycete in the currently accepted concept of the species with yellow apothecia and a terrestrial habitat.

C. vitellina is a very common species and was collected frequently by me in the Czech Republic and Slovakia. I have also examined a number of collections from other herbaria (K, PC, H, UPS, PAN, VELTU and others) and according to my examination, the ascospore size of *C. vitellina* is (14-)15.5-18(-20) × 7.5-10.5 μm (mostly 17 × 8.5 μm). For instance, ascospores of the type (K) of *Peziza dalmeniensis* Cooke [= *Cheilymenia dalmeniensis* (Cooke) Boud. = syn. of *C. vitellina*] measure 14.5-17(-18.5) × 7.5-9.7(-10.2) μm, those of the type of *Peziza oligotricha* P. Karst. [= *Cheilymenia oligotricha* (P. Karst.) J. Mor. = syn. of *C. vitellina*] measure 15-18.5(-20) × 8-10.5 μm. The apothecial hairs of *C. vitellina*, are notably long – 200-750-1000 × 10-24-30 μm with walls 0.5-3 μm thick. The paraphyses are slightly enlarged (up to 6 μm) at their apex. It is a species of a terrestrial habitat found mostly on forest paths, and its frequent occurrence under *Urtica dioica* mentioned by Svrček (1947) is really conspicuous. The apothecia fructify on soil and also on debris of putrid twigs and among moss under *Urtica* without any sign of pollution by excrements and according to my opinion and experiences, *C. vitellina* is a strictly "terrestrial", non-coprophilous discomycete which may be confined to *Urtica* or incidentally to other plants by a kind of symbiosis.

Two other species, *Cheilymenia pediseta* (Clem.) J. Moravec (1990) and *Cheilymenia citrinella* (Velen.) Svrček (1977) were considered to be members of this series and distinct from *C. vitellina*. Nevertheless, after further examination of many collections of *C vitellina*, in respect to its certain, though modest variability, I have concluded that these two species differ only slightly from *C. vitellina*, which may be obvious from the following comments:

A part of the type collection of *Sepultaria pediseta* Clem. (a section of an apothecium mounted on a slide covered by cover glass with "*Lachnea pediseta*" written on it), Nebraska, on horse dung, Sept. 4, 1895 leg. F. E. Clements, marked "type" (NY) is packed together with a specimen of *Cheilymenia coprinaria* (Cooke) Boud. and this may explain why Denison (1954) synonymized *Lachnea pediseta* (Clem.) Sacc. with *C. coprinaria*. The hairs of the type (of the section on the slide) measure 100-675 × 10-30 μm and are thus shorter than but of the same type as those of *C. vitellina*. [compare Figs. 8 b and 8 c in J. Moravec (1990)]. The ascospores measure 15.5-19(-22) × 8-9 μm and so they are somewhat more elongated than those of *C. vitellina*. In addition, the paraphyses are not or only very slightly enlarged (up to 4.5 μm). These differences, including the true coprophilous habitat of *C. pediseta*, has prevented me from a satisfied conclusion that it is merely a form of *C. vitellina*.

Analogously, also *C. citrinella* is very close to *C. vitellina*. The holotype of *Lachnea stercorea* var. *citrinella* Velenovský (1934), Bohemia, Struhařov prope Mnichovice, on cow dung, VIII. 1925 leg. Velenovský (PRNM 147289) consists of a single apothecium only and the hairs are of the same type as those of *C. vitellina*, including shape of their bases [see Fig. 8 a in J. Moravec (1990)] and the thickness of their walls (1-3 μm), but they are conspicuously shorter as they measure 120-280 × 12-29 μm [250-350 × 12-17 μm according to Svrček (1949)] and are absent from the margin of the lemon-coloured apothecium. The ascospores measure (15.5-)16.5-19.5(-21.5) × (7.5-)8-9(-10.5) μm and the paraphyses are apically not or only very slightly enlarged – 3-3.5(-4) μm. These differences as well as the growth on dung may sufficiently distinguish *C. citrinella* from *C. vitellina*. It is, however, closer to *C. pediseta* particularly due to the coprophilous habitat, elongated ascospores and inconspicuously enlarged paraphyses, but it differs by much shorter hairs which are absent from the margin of the apothecia.

Another species which increases the number of species of the section *Striatisporae* ser. *Tenuisriatae* is described as a new taxon here.

Cheilymenia polaripustulata J. Moravec, sp. nov. Figs 1-4.

Apothecia 4-7 mm diam., sessilia, profunde patellaria, margineque undulata vix lobata et pilis brevibus vel medio-longis luteo-fuscis, sparsis obsita, extus et

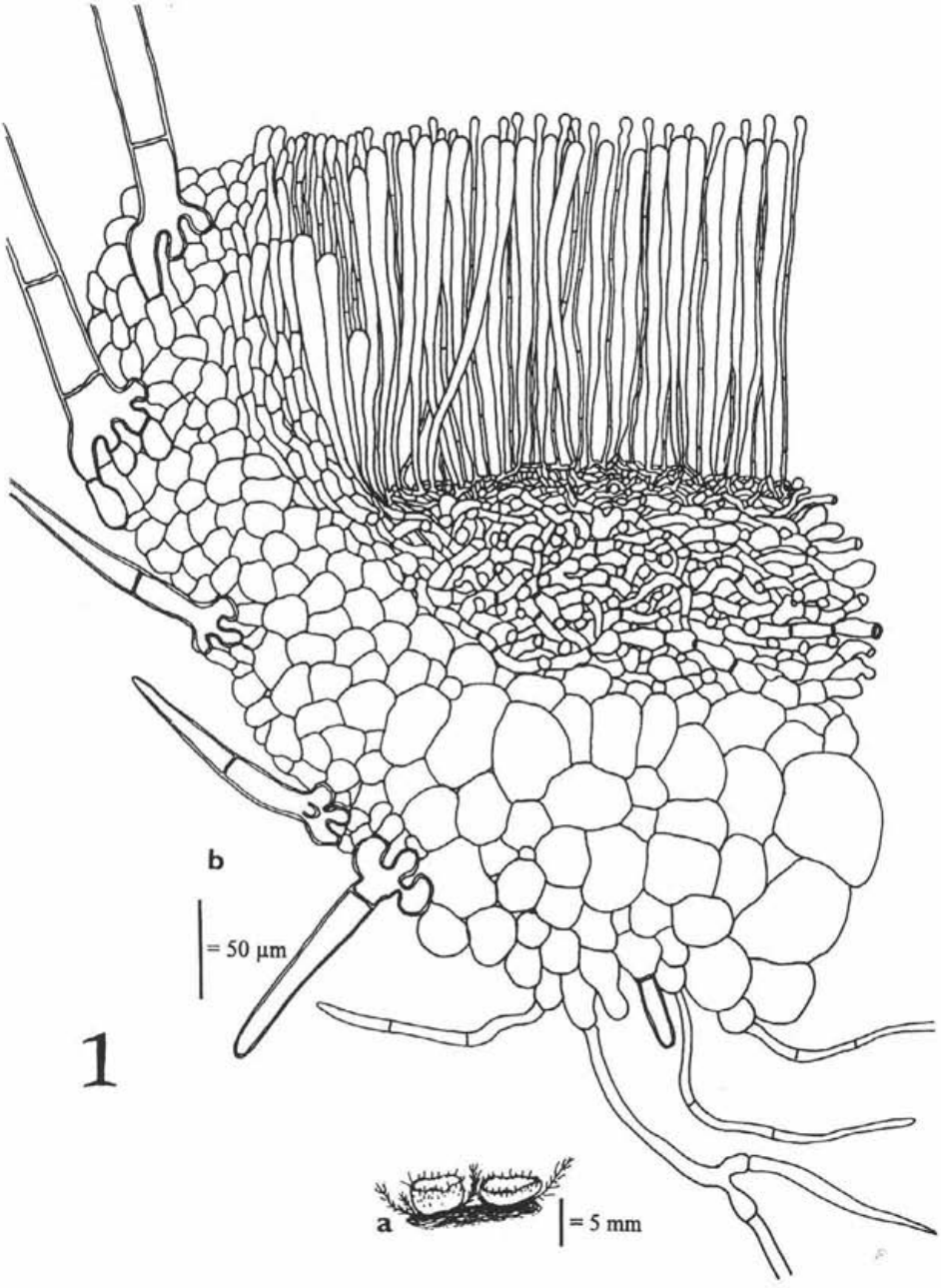

Fig. 1. *Cheilymenia polaripustulata* sp. nov.: a. apothecia; b. section of the marginal part of the apothecium. Holotype BRNM.

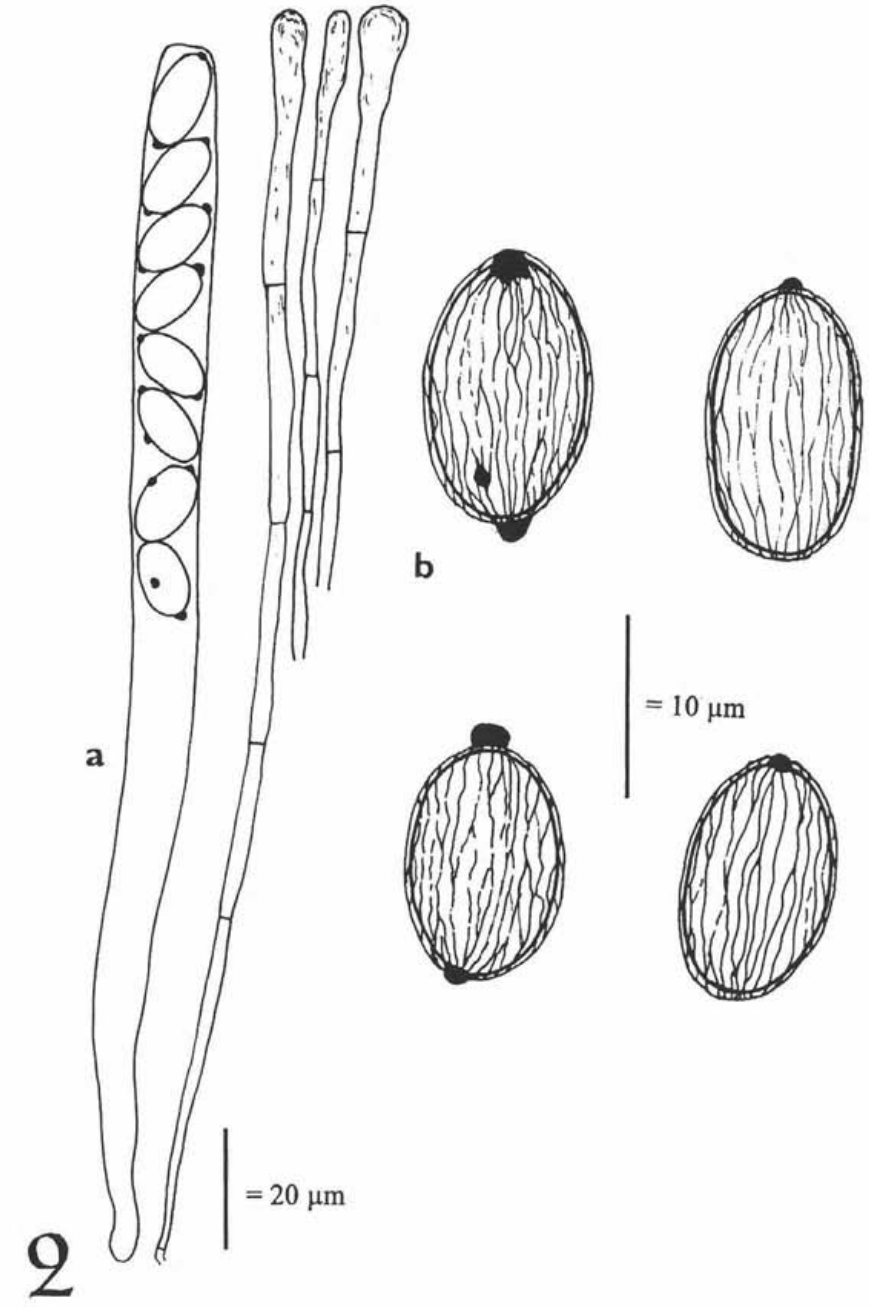

Fig. 2. *Cheilymenia polaripustulata* sp. nov.: a. ascus and paraphyses; b. ascospores (oil immersion). Holotype BRNM.

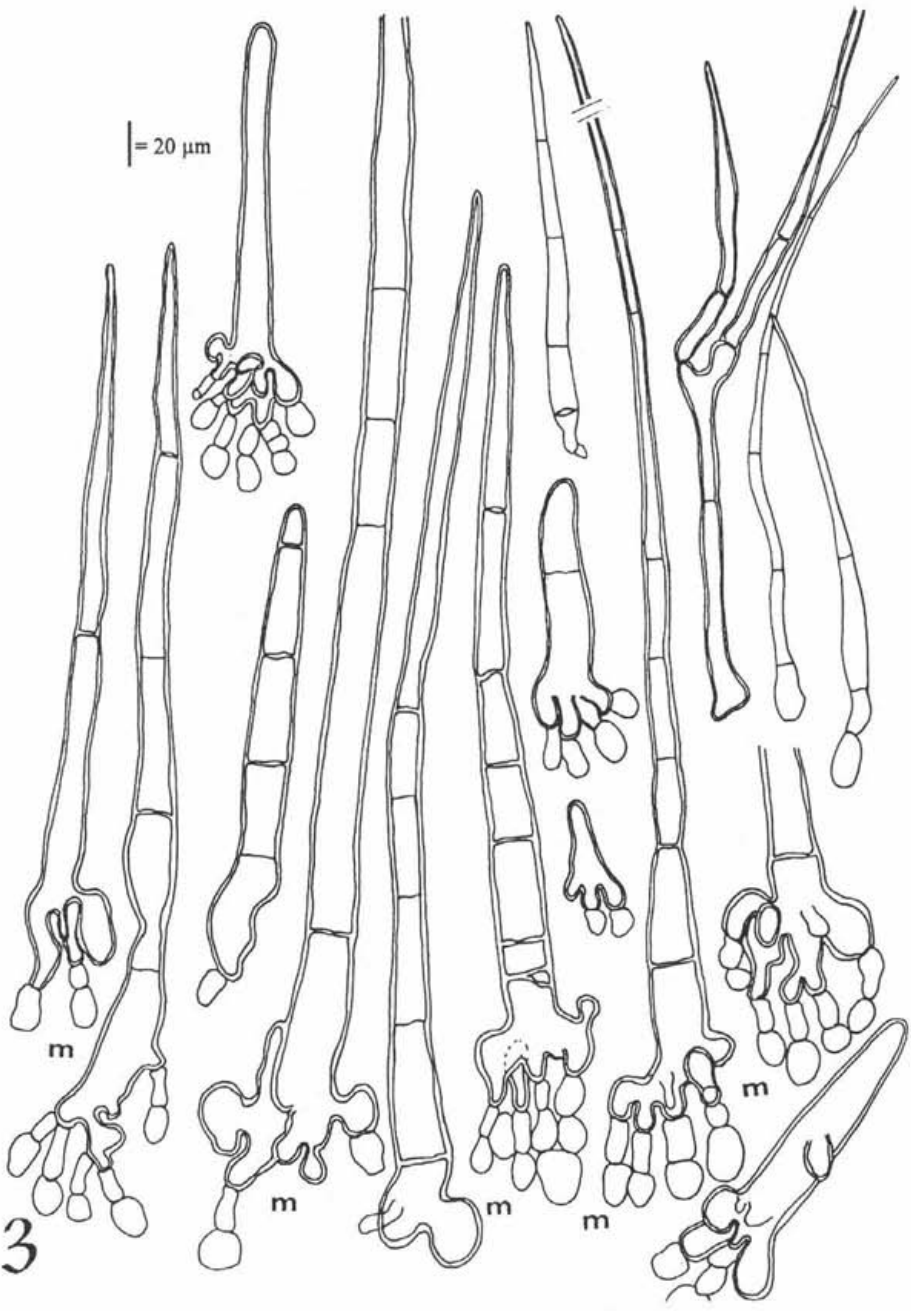

Fig. 3. *Cheilymenia polaripustulata* sp. nov.: apothecial hairs (m = marginal hairs). Holotype BRNM.

in hymenio luteo-aurantiaca, parte externa pilis brevibus luteolis crebre obsita. Excipulum externum e textura globuloso-angulari. Excipulum internum (medulla) e textura subintricata usque intricata. Pili 60-540 × 12-27 μm, basi tuberosi, multituberosi, subradicantes, usque bulboso-radicantes et bulboso-furcati vel obtuse multifurcati, apice obtusi vel subacuti, septati, crasse tunicati, luteo-brunnei. Asci 180-210 × 9.5-10.5 (-12) μm, cylindracei, octospori. Ascosporae ellipsoideae, (11-) 12-15 (-16.5) × 7.5-9 (-9.7) μm (plerumque 13.6 × 8 μm), perisporio separabile, subtiliter dense longitudinaliter striato cum costis cyanophilis, tenuibus et humilibus, irregulariter anastomosantibus et saepe cum pustulis magnis, cyanophilis ad polis donatae. Paraphyses filiformes, 3.5-4 μm crassae, apice sensim vel clavato-incrassatae (4-9 μm).

Habitat: Moravia, Třebíč, ad terram humosam cum excrementa gallinaria mixta, inter muscos ad viam in horto in urbe, 10. VIII. 1986 leg. Jiří Moravec. Holotypus BRNM, duplicatum in herbario privato J. Moravecii (J. Mor.) asservantur.

Apothecia 4-7 mm diam., sessile, cupulate, yellow-orange with an undulate or nearly lobed margin; the margin and outer surface are sparsely covered with inconspicuous, short to average-sized hairs. Excipulum differentiated. Ectal excipulum of a textura globulosa-angularis, composed of globose, subglobose to angular cells which are 15-45-65 μm in diam. Medulla of a textura subintricata to textura intricata composed of angular to elongated cells which are intermixed with hyphoid cells or septate, often inflated interwoven hyphae 4-7.5 μm in diam. Hypothecium of a textura subintricata of smaller cells and hyphal elements. Hairs 60-540 × 12-27 μm, those on the lower surface of the apothecia are superficial, with a tuberous base, usually thin-walled and pale yellow, the marginal hairs yellow to yellow-brown, straight, rigid, septate, with obtuse or almost pointed apex, thick-walled (the walls 1-4 μm thick), with tuberous to multituberous or widely, obtusely rooting, multifurcate base. Asci 180-210 × 9.5-10.5 (-12) μm, cylindrical, with a blunt apex, eight-spored, operculate. Ascospores (11-) 12-15 (-16.5) × 7.5-9 (-9.7) μm (mostly 13.6 × 8 μm, only spores developed in 4 – 6-spored asci may reach up to 16.5 × 9.7 μm), ellipsoid, eguttulate, hyaline, with a yellow refractive colour when stained with CB, with a separable delicate outer sheath which is covered by a longitudinal, very fine cyanophilic rib-like striation consisting of thin and very low ribs which are densely arranged and occasionally anastomosing, the fine ribs converge on the ascospore poles of the sheath and concentrate into large and conspicuous cyanophilic pustules situated on one or on both poles. Paraphyses filiform, 3.5-4 μm thick, with a slightly enlarged or more clavate apex (4-9 μm), septate, with a yellowish content.

Habitat: Třebíč, Czech Republic (Moravia), on moist mineral-rich soil mixed with hen excrements among dense moss cover on a path between a garden and

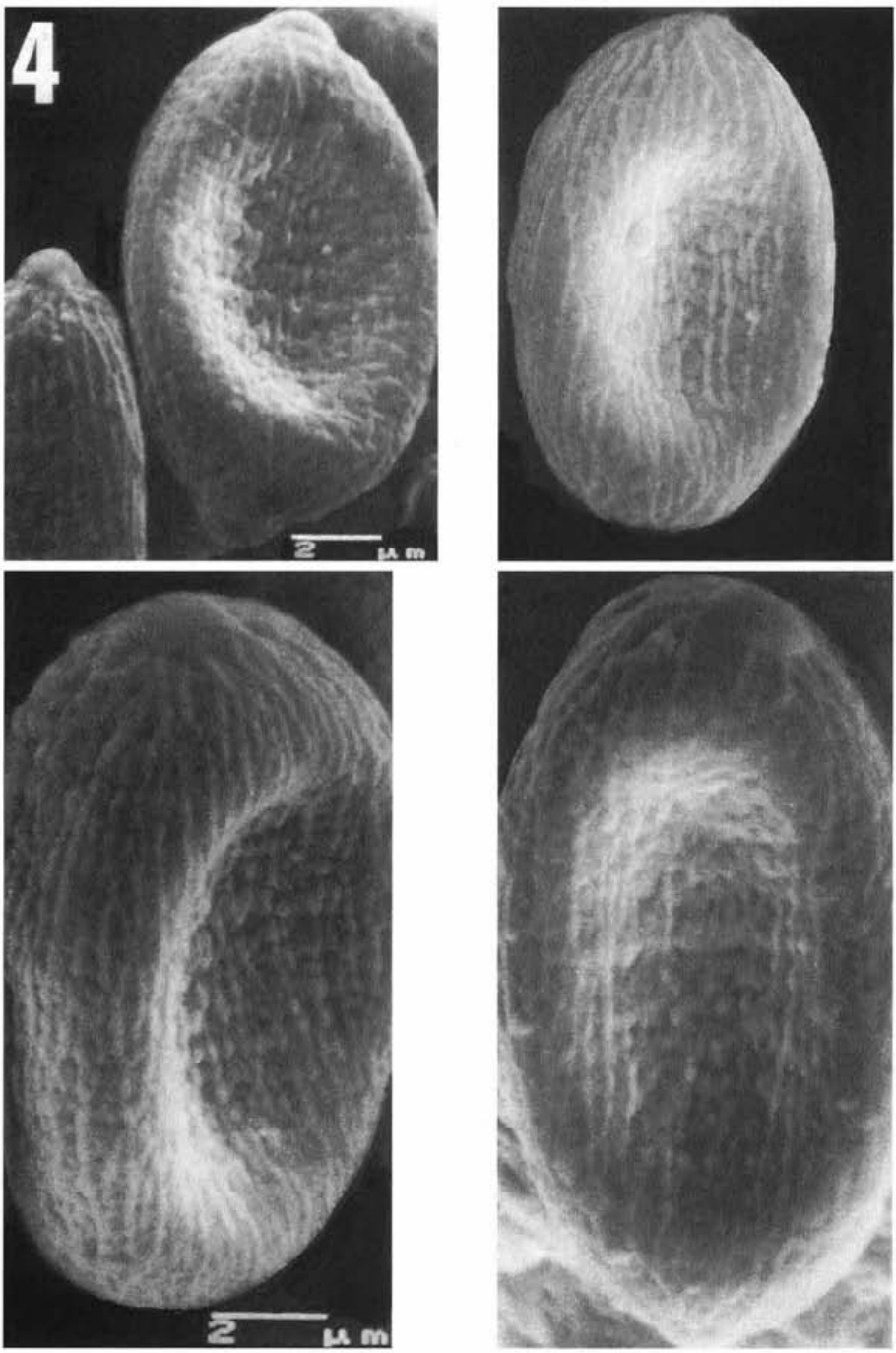

Fig. 4. *Cheilymenia polaripustulata* sp. nov.: SEM photomicrographs of ascospores. Holotype BRNM.

houses in the suburb of the town, 10. VIII. 1986 leg. Jiří Moravec. Holotype BRNM, isotype in herb. J. Mor.

C. polaripustulata is a natural member of the section *Striatisporae*, ser. *Tenuistriatae* discussed above. It is undoubtedly close to *C. vitellina*, especially due to the similar colour of the hymenium, the same type of apothecial construction, the same type of apothecial hairs, the shape of their base, and for the fine rib-like striation of the separable outer ascospore sheath (perisporium). It differs, however, by a smaller ascospore size, and by the presence of the strongly cyanophilic large pustules on the perisporium, which are situated on one or both ascospore poles and where the fine longitudinal ribs concentrate. The latter feature is unique in the genus and has never been seen by me on the ascospore perisporium of other species of *Cheilymenia*. It has been proved also by SEM prepared on samples taken directly from the dried hymenium without any treatment of ascospores by any liquid (SEM Fig. 4.). As proved after examinations of many collections, the fine ribs in *C. vitellina* converge on the ascospore poles but do not form any abscesses. Moreover, the ribs on the perisporium of *C. polaripustulata* are slightly thicker and more irregular, often irregularly interrupted and more anastomosed, and thus the striation is intermediate between that on the ascospore perisporium of species of the ser. *Striatisporae* and that of the ser. *Tenuistriatae*. Nevertheless, the striation in the ser. *Striatisporae* is formed by even thicker and not so densely arranged ribs which can be occasionally thickened or interrupted forming longitudinal chains of elongated warts, but never forming such large pustules on the ascospore poles. [Compare all cited SEM Figs. in J. Moravec (1990)]. Also, the paraphyses of *C. polaripustulata* are often clavate above, thus being more enlarged than those of other species of the series.

Cheilymenia lemuriensis Le Gal (1953) known merely from the type collection from Madagascar (also examined) possesses even smaller ascospores bearing much coarser ribs, and also for all its other features, belongs in the series *Striatisporae*. [see illustration in Le Gal (1953) and J. Moravec (1990)].

On this occasion, I wish to stress here the importance of using the proper staining method in which the slides are not heated, since this is necessary for examination under the optical microscope of the original ascospore ornamentation which covers the very delicate outermost sheath (perisporium) of the ascospores in *Cheilymenia*.

The original ornamentation of the separable outermost sheath of ascospores in *Cheilymenia* has usually not been recognized by even recent authors. This is obviously caused by using a wrong staining method, especially when lactophenol is used and the slides with micro-sections are heated. Such drastic treatment, as well as any violent way of dehydration of the apothecia usually destroys the very delicate separable outermost sheath of the ascospores (perisporium) – the

sheath can easily be damaged, deformed and consequently secondary wrinkled, or completely separated from the proper ascospore wall, and thus the ascospores may appear smooth or with secondary artefacts. As stressed in J. Moravec (1989a, 1989b,1993), the original cyanophilic ornamentation on the perisporium of ascospores in *Cheilymenia* is clearly seen and well recognizable under the optical microscope when cotton blue, which stains promptly without heating the slides, is used (CB Geigy s 123). The perisporial ascospore ornamentation in *Cheilymenia* has also been proved by SEM (J. Moravec 1987), but also the SEM samples must be taken only from the dried hymenium or ascospores spontaneously released from it may directly be coated by gold, and these must not be treated with any aggressive liquid, for the same reason as mentioned above.

Yao and Spooner (1996) mentioned that the British material of *C. vitellina* showed "a fine punctate ornamentation on some ascospores whilst the others are smooth". This observation must have been caused by using the wrong staining method. In fact, there are no punctations on the outermost sheath of the ascospores of *C. vitellina*, but some secondary artefacts can be seen (also on the epispore or endospore!) after the ascospore perisporium is damaged or separated by heating the slides. The fine rib-like striate ornamentation on the non-deformed and tense ascospore perisporium of *C. vitellina* is well seen by using an oil immersion lens when the sections are correctly stained without heating the slides, and of course much more clearly scanned on SEM photomicrographs.

Besides, Yao and Spooner (1996) have mentioned that ascospores of *C. vitellina* were illustrated in J. Moravec (1990) as having a "punctate-striate" ornamentation. This statement was obviously caused by a wrong interpretation of the figures in my paper. As is evidently seen in the line drawings in Fig. 20 a, and SEM Figs 33 and 36 in J. Moravec (1990), the illustration of the ascospores of *C. oligotricha* (= *C. vitellina*) clearly show the very fine longitudinal striation as discussed above.

Even if commonly neglected and underestimated, the perisporial ascospore ornamentation is one of the very significant characters important in the delimitation of species and infrageneric taxa of the genus *Cheilymenia* and correlates with other features of species of individual sections and thus represents one of the leading characters used for the infrageneric classification in J. Moravec (1990).

ADDITIONAL NOTE

Regarding the type species of the genus *Cheilymenia* and simultaneously the type species of the typical section (sect. *Cheilymenia*), *Cheilymenia stercorea* (Pers.:Fr.) Boud., I wish to add an important note on the nomenclature and typification.

Having rejected Denison's (1964) lectotypification of *Peziza stercorea,* I chose (J. Moravec 1990), on kind advice of Prof. R. P. Korf (Ithaca), Bulliard's figure of *Peziza ciliata* Bull., Herb. France 109: t. 438, f. 2, 1790, cited by Fries in his sanctioning work (Fries, Systema Mycologicum 2: 87, 1822), as illustrative of *P. stercorea* Pers.:Fr., to be the LECTOTYPE of *P. stercorea* Pers.:Fr. Simultaneously, as that illustration is demonstrably ambiguous, I designated (J. Moravec 1993) a specimen from the S herbarium which comes from Sweden, the country of Fries to be the "PROTYPE" to support that lectotype illustration, as provided under Article 7.9bis at that time.

In the cited paper we used the term "protype" as originally proposed for adoption by the International Botanical Congress in Tokyo in 1993 and made it clear that "protype" was a provisional designation of the term that was passed as the "Art 7.9bis (which may bear a different designation when the code is published)", becoming Art.9.7, ICBN, 1994. The final term adopted for "protype" by the Editorial Board of the Code is "epitype", and thus readers should substitute the term epitype where ever we used "protype" in J. Moravec (1993), and the selected collection from the S herbarium should be designated as an epitype of *Peziza stercorea* Pers.: Fr.

In this respect, the selection of another "epitype" made by Yao and Spooner (1996) has been superfluous as the authors do not take into consideration the reasons we stressed earlier (J. Moravec 1993). Moreover, in my opinion the type of *Humaria alpina* Fuckel designated by the cited authors as "holoepitype" of *C. stercorea* cannot serve for such typification since it represents a distinct form – f. *alpina* (Fuck.) J. Moravec (1990) – which differs from the typical form f. *stercorea,* as stated in J. Moravec (1993).

ACKNOWLEDGEMENTS

I am grateful to Dr. Zdeněk Pouzar (Prague) for reviewing the paper and to curators of the herbaria quoted in the paper for the loans of type and other material in the course of my revision of the section.

My special thanks belong to Mr. Jiří Lhotecký (Brno), who kindly prepared the SEM photomicrographs and to Prof. Dr. Richard P. Korf (Ithaca) for his kind note regarding the term "epitype".

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The taxonomy of Pholiota aurivella and Pholiota adiposa – a return to Batsch and Fries

JAN HOLEC

Mycological Department, National Museum, Václavské nám. 68, 115 79 Praha 1, Czech Republic

Holec J. (1998): The taxonomy of *Pholiota aurivella* and *Pholiota adiposa* – a return to Batsch and Fries. – Czech Mycol. 50: 201–222

The paper presents a new opinion on the delimitation of *Pholiota aurivella* and *Pholiota adiposa*, which, however, corresponds to original descriptions of Batsch and Fries. The conclusions are based on careful studies of fresh as well as herbarium material from the Czech Republic, Slovakia, Sweden, Finland and Austria. The true *Pholiota aurivella* (Batsch: Fr.) P. Kumm. proved to be a species growing on *Salix* and having a subviscid to dry and mat pileus surface, thick dark scales, predominantly clavate cheilocystidia, spores with a broad germ pore and abundant chrysocystidia. The true *Pholiota adiposa* (Batsch: Fr.) P. Kumm. is a fungus occurring on *Fagus* and many other deciduous trees, occasionally also on conifers, and has a strongly glutinous, lustrous pileus with thin scales, cheilocystidia of a different shape, spores with a narrower germ pore and rare chrysocystidia. A new neotype is being designated here for *Pholiota aurivella* instead of the neotype chosen by Jacobsson which proved to be in conflict with Fries' protologue. Revision of the holotype of *Pholiota cerifera* (P. Karst.) P. Karst. showed that this species is identical with *Pholiota aurivella*.

Key words: Agaricales, *Pholiota aurivella, Pholiota adiposa, Pholiota cerifera*, taxonomy, new delimitation, neotypification.

Holec J. (1998): Taxonomie druhů *Pholiota aurivella* a *Pholiota adiposa* – návrat k původnímu pojetí. – Czech Mycol. 50: 201–222

V článku je publikován nový pohled na vymezení druhů *Pholiota aurivella* a *Pholiota adiposa*, který je ovšem v souladu s původními popisy u Batsche a Friese. Je podložen studiem rozsáhlého materiálu jak čerstvých plodnic, tak herbářových položek z České republiky, Slovenska, Švédska, Finska a Rakouska. Pravá *Pholiota aurivella* (Batsch: Fr.) P. Kumm. se ukázala být druhem rostoucím na *Salix* a majícím jen mírně slizký až suchý a matný klobouk s tlustými tmavými šupinami, převážně kyjovité cheilocystidy, výtrusy s širokým klíčním pórem a početné chrysocystidy. Pravá *Pholiota adiposa* (Batsch: Fr.) P. Kumm. je naproti tomu druh rostoucí převážně na *Fagus* a mnoha dalších listnáčích, méně často i na jehličnanech, který má silně slizký, za sucha lesklý klobouk s tenkými šupinami, cheilocystidy jiných tvarů, užší klíční pór a řídce se vyskytující chrysocystidy. Pro jméno druhu *Pholiota aurivella* byl vybrán nový neotyp namísto neotypu zvoleného Jacobssonem, který je v rozporu s Friesovým protologem. Revize holotypu *Pholiota cerifera* (P. Karst.) P. Karst. ukázala, že tento druh je totožný s *Pholiota aurivella*.

INTRODUCTION

In the period 1992–1996 I studied the taxonomy of *Pholiota* species growing in Central Europe as the subject of my doctoral thesis (Holec 1997a). Some results have been published (Holec 1995a,b; 1996a,b; 1997a,b). During this period

I studied many collections of *Pholiota* from the section *Adiposae* Konrad et Maubl. Field observations as well as study of microcharacters led me to another view on the taxonomy of *Pholiota adiposa* and *P. aurivella* than that in works of recent *Pholiota*–specialists (Kuyper and Tjallingii-Beukers 1986; Tjallingii-Beukers 1987; Jacobsson 1987, 1990). In this paper concepts of *Pholiota aurivella* (Batsch: Fr.) P. Kumm. and *Pholiota adiposa* (Batsch: Fr.) P. Kumm. are presented that are in a much better agreement with those of Batsch (1786) and Fries (1821, 1838, 1874).

MATERIAL AND METHODS

Descriptions of macrocharacters are based on the author's own finds, the given microcharacters are based on all specimens mentioned in the paragraphs "Material examined". Microcharacters have been analysed using a 5 % solution of KOH and an aqueous solution of Congo Red. Fruitbodies collected by the author are deposited in the PRM herbarium (Mycological Department, National Museum, Praha) and marked by the initials JH followed by a number. Several specimens were kindly provided by curators of the following herbaria: BRNM, CB, H, GB, S, UPS, W.

RESULTS AND DISCUSSION

Original description of **Pholiota adiposa** and **P. aurivella** by Batsch

The species *Pholiota adiposa* and *P. aurivella* were described as *Agaricus adiposus* Batsch, Elench. fung., Cont. prima: 147, 1786 and *A. aurivellus* Batsch, Elench. fung., Cont. prima: 154, 1786. The main differences between these species resulting from Batsch's description are summarised in the following table:

Table 1.

description by Batsch (1786)	*Agaricus adiposus*	*Agaricus aurivellus*
presence of slime	pileus glutinous ("tota pilei vere adiposa")	the whole fruitbody is dry ("siccus")
scales on pileus	rusty, appressed, only at centre somewhat flaring	pileus finely lanate, the covering breaks up into crowded appressed ochre scales
substrate	unknown tree	basal part of a *Tilia* stem ("ad tiliae radicem; am untern Ende eines Lindenstamms")

Batsch's figure 113 shows *Agaricus adiposus* as a fungus with a light yellow pileus covered by appressed yellow-rusty scales. On the other hand, the figures 115 a,b depict *Agaricus aurivellus* as a more robust fungus with a yellow pileus covered by darker (yellow-ochre to ochre-orange) and more prominent scales than in *A. adiposus*.

Descriptions by Fries

Fries (1821) sanctioned both names as *Agaricus* (*Pholiota*) *adiposus* Batsch: Fries and *Agaricus (Pholiota) aurivellus* Batsch: Fries, respectively. In his sense, *Agaricus adiposus* is a species with a yellow, strongly viscid, shining pileus and ferrugineous concentrically arranged scales. The stipe is viscid. The fungus occurs frequently on *Fagus*. *Agaricus aurivellus* was described as a fungus with a yellow to brown pileus, covered by scattered appressed scales. There is no mention of a viscid or glutinous pileus and stipe surface in Fries' description of *Agaricus aurivellus*. According to Fries, the species grows on stems of *Betula* and *Salix*. The main differences between both species resulting from Fries' descriptions are summarised in Table 2:

Table 2.

description by Fries (1821)	*Agaricus adiposus*	*Agaricus aurivellus*
colour of pileus	yellow	yellow to brown
pileus surface	strongly viscid, shining	not described
scales on pileus	ferrugineous, concentrically arranged	scattered, appressed
substrate	frequently on *Fagus*	stems of *Betula, Salix*

Fries refers to Batsch's figures 113 (*A. adiposus*) and 115 (*A. aurivellus*). Under *A. adiposus*, Fries mentions also Batsch's figure 114, which, according to my opinion, represents the true *Pholiota squarrosa*. However, the description of *A. adiposus* by Fries clearly excludes *P. squarrosa* with the statement that the pileus is "valde viscidus" and the fungus is "diversissimus ab *Agarico squarroso*".

Later, Fries (1838, 1874) somewhat changed his descriptions of *A. adiposus* and *A. aurivellus*. However, the delimitation of both species does not differ from the delimitation in Systema mycologicum. Under *A. adiposus*, Fries (1838, 1874) writes that the pileus is shining when dry but otherwise glutinous, that the fungus grows on living *Fagus* stems and is common in the northern part of Europe ("in Europa boreali"). The description of *A. aurivellus* is supplemented by the indication that the pileus surface is subviscid. The fungus should grow on wood of deciduous trees ("ad truncos arborum frondosarum"), thus, the preference for *Betula* and *Salix* is not mentioned.

Results of personal observations

Careful field and microscopic study of numerous collections of the *Pholiota adiposa-aurivella* group (based on material from the Czech Republic, Slovakia, Sweden, and Finland) led me to the conclusion that there are in these areas three different species within this group.

1) A species with relatively narrow spores [(4–5.3(-5.8) μm], a golden yellow, glutinous pileus with rusty-ochre to rusty brown appressed scales, growing mainly on stems of *Alnus* and *Betula*. This fungus is known as *Pholiota limonella* (Peck) Sacc. and was originally described from North America. Using compatibility tests, Farr et al. (1977) proved that *P. limonella* is a good biological species, morphologically distinguishable from *P. adiposa* by its narrower spores. Later Jacobsson (1987) confirmed the conspecifity of North American and European strains of this fungus. Therefore, Jacobsson was the first to prove the occurrence of *Pholiota limonella* in Europe.

2, 3) Two different fungi with broader spores (the width of most spores in each fruitbody reaches 5–6.5 μm). In my opinion, these two fungi are identical with *Pholiota aurivella* and *Pholiota adiposa* in the original sense of Batsch (1786) and Fries (1821, 1874). They can be distinguished by the characters given in Table 3.

The most important observation leading me to the present conclusion is the fact that the cheilocystidia of fruitbodies collected on *Salix* always had a shape differing from those of fruitbodies growing on other substrata (Figs. 1, 2). The second constant difference is the width of the germ pore which is larger in fruitbodies from *Salix*. Thus, there are three independent characters – ecology, shape of cheilocystidia and width of the germ pore – that are different from those of fruitbodies growing on *Fagus* and other substrata. Moreover, several other differences can be found (see Table 3) that are not so important but altogether support my opinion that the fungus on *Salix* represents another species than the fungus growing above all on *Fagus* but also many other tree species. Concerning the general appearance (habitus) of the fruitbodies of these two species, those of the taxon on *Salix* are more robust, with a thicker and shorter stipe, generally more drier, mat and more scaly (the scales on pileus and stipe are thicker) than those of the taxon on *Fagus* etc.

After searching in literature for names for these two species, I found that already Fries (1821) distinguished them in nearly the same way as I do, namely, under the names *Agaricus aurivellus* and *A. adiposus* (see Table 2). Also Fries' descriptions (Fries 1821, 1874) mention the correlation of different substrata (*A. aurivellus: Betula, Salix; A. adiposus: Fagus*) with the nature of the pileus surface (*A. aurivellus*: at most subviscid; *A. adiposus*: strongly viscid, shining). Therefore, I consider Fries' *Agaricus aurivellus* to be conspecific with my fungus

Table 3: Differences between *Pholiota aurivella* and *P. adiposa* based on personal observations (characters in bold print are the most important ones).

	Pholiota aurivella	*Pholiota adiposa*
shape of the cheilocystidia	clavate to broadly clavate, ellipsoid, obovoid, subglobose to sphaeropedunculate (see Figs 1, 2)	very variable – fusiform, cylindrical, narrowly clavate, narrowly lageniform, obovoid when young, often all these types present on one edge (see Fig. 5)
width of the germ pore	(1-)1.2–1.5(-1.8) μm	0.8–1.2 μm
substrate	*Salix*	*Fagus* and various other deciduous trees, sometimes also conifers
pileus surface	viscid (not strongly glutinous) in moist weather, in dry weather dry, mat	strongly glutinous in moist weather, after drying somewhat lustrous (glimmer)
scales on pileus surface (in well developed fruitbodies)	numerous, thick, fibrillose-tomentose (resembling those of *Sarcodon imbricatus*), at centre more or less recurving, old breaking up into a great number of small fibrillose scales covering almost the whole pileus surface.	scantly to numerous, thin, appressed or tips turning upwards, in moist weather covered by a glutinous layer or somewhat swollen up in the slime, often missing after rainfall, after drying sometimes forming darker patches on the pileus surface
abundance of chrysocystidia	abundant	scattered to rare
spore size	7.5–10.5(-11.5) × 5–6.5(-7) μm	(7-)7.5–9.5(-11) × (4.5-)5–6.2(-6.5) μm

growing on *Salix* and Fries' *Agaricus adiposus* with the species from *Fagus* and other substrata. This opinion is supported by the fact that Swedish material of *Pholiota* growing on *Salix*, on loan from the herbaria S, U and G, proved to be conspecific with my material from the Czech Republic and Slovakia. Similarly, Swedish specimens of *Pholiota adiposa* well agrees with material from Central Europe.

A problematic fact is Fries' statement that also *Betula* is a substrate of his *Agaricus aurivellus*. According to Jacobsson's (1987, 1990) and my own results (Holec 1996b, 1997a), it is particularly *Pholiota limonella* (Peck) Sacc. that grows on *Betula* and rarely also *P. adiposa*. Hitherto, I do not know the fungus with clavate cheilocystidia, broad germ pore and relatively dry pileus surface (*Pholiota aurivella* in my sense) from *Betula*. However, this does not change the fact that in Fries' opinion the *Pholiota* growing on *Salix* differs from the *Pholiota* growing on

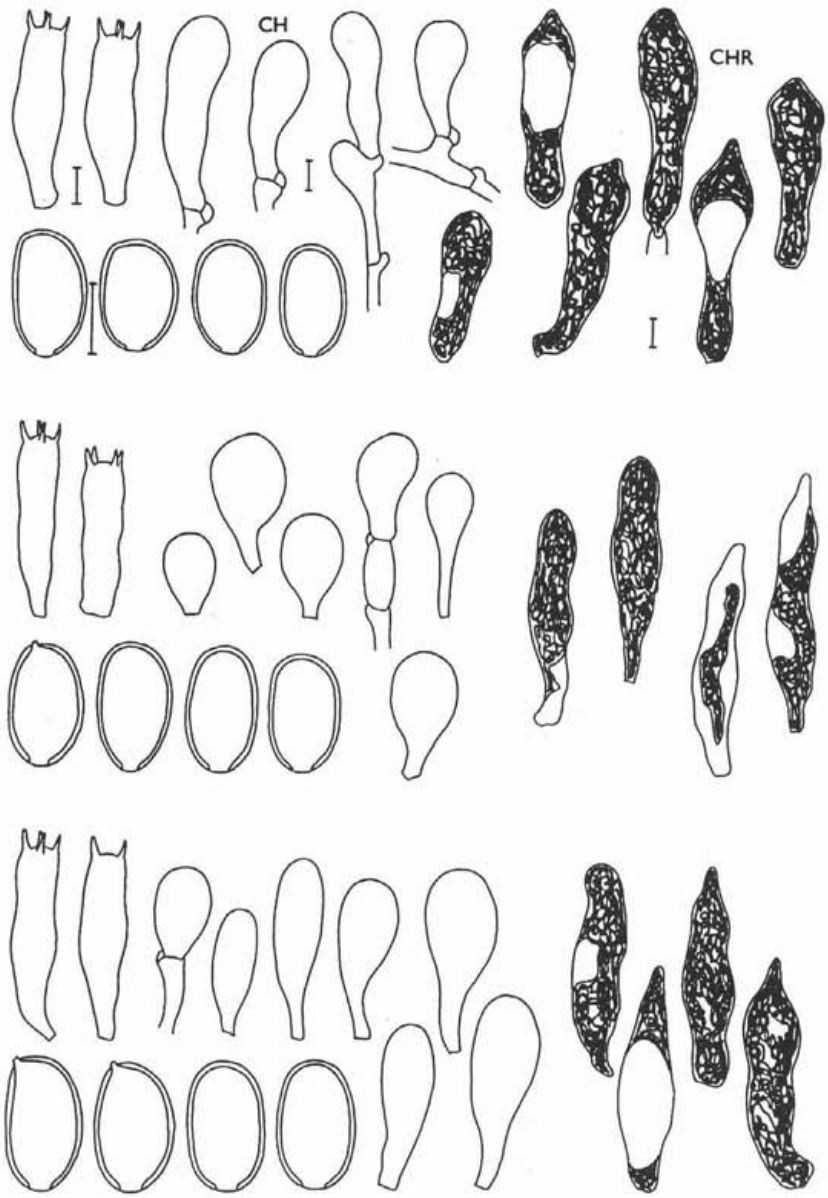

Fig. 1. *Pholiota aurivella* (Batsch: Fr.) P. Kumm. (spores, basidia, cheilocystidia, chrysocystidia).
– Czech Republic, Velký Osek, Libický luh, *Salix*, 7 Oct.1992, JH 326/94 (PRM).
– Czech Republic, Praha, Prokopské údolí valley, *Salix*, 2 Oct.1994, JH 317/94 (PRM).
– Czech Republic, Praha, Máslovická rokle valley, *Salix fragilis*, 12 Oct.1994, JH 340/94 (PRM), the fresh fruitbody is depicted in Fig. 3.
Abbreviations: CH: cheilocystidia, CHR: chrysocystidia. Scale bar = 5 μm. Ill. J. Holec.

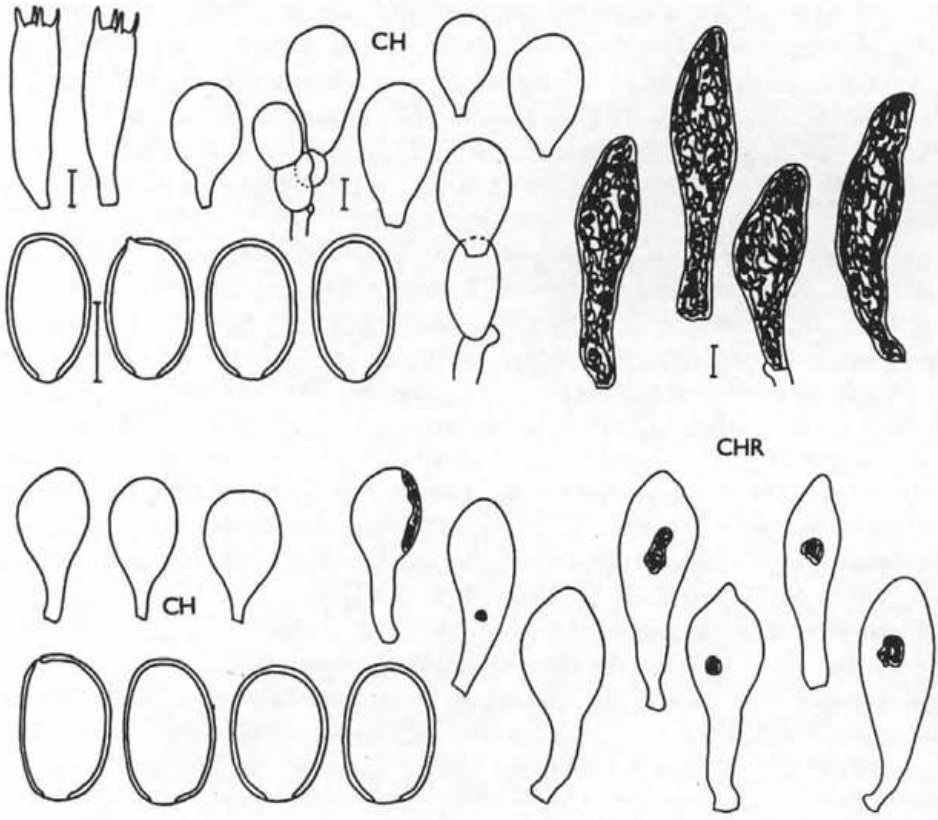

Fig. 2. *Pholiota aurivella* (Batsch: Fr.) P. Kumm. (spores, basidia, cheilocystidia, chrysocystidia).
– Sweden, Uppsala, Botaniska trädgarden, *Salix pentandra*, 30 Sep. 1950, J. A. Nannfeldt (UPS – neotype of *Pholiota aurivella* selected in this paper).
– Finland, Mustiala, *Salix pentandra*, P. A. Karsten (H, herbarium P. A. Karsten, No. 2935, holotype of *Pholiota cerifera* (P. Karst.) P. Karst.).
Abbreviations: CH: cheilocystidia, CHR: chrysocystidia. Scale bar = 5 μm. Ill. J. Holec.

Fagus. In addition, Fries' concept of *Agaricus aurivellus* really covers the fungus from *Salix*, as appears from the literature and the figures he refers to. Batsch (1876) shows the appearance of his *Agaricus aurivellus* on fig. 115. This figure perfectly fits the fungus from *Salix* I know (robust fruitbody, thick, dense and dark scales). The same counts for plate 2074 in Flora Danica (Flora Danica, vol. 12, fasc. 35, 1832) and plate 209 in Schaeffer (Fungi Bavar. Palat. nasc., vol. 3, 1771) depicting old fruitbodies with small tomentose scales (all these figures are cited by Fries 1821). Moreover, Fries also mentions Schumacher's species *Agaricus salicinus*

(Schumacher 1801: 262) which grows on *Salix* and has broad, dark brown scales ("striis interruptis squamisque latis obscure badiis sparsis"). The whole description of *A. salicinus* perfectly agrees with my observations of the fungus from *Salix*. In addition, Schumacher himself writes that his *A. salicinus* is identical with Batsch's *A. aurivellus* and refers to Batsch's table 115 (Batsch 1786). This discussion can be concluded with the statement that Fries' *Agaricus aurivellus* is clearly conspecific with my fungus growing on *Salix* with the characters summarised in Table 3.

However, there is still a problem concerning the conspecifity of Batsch's and Fries' *Agaricus aurivellus*. Batsch found his *Agaricus aurivellus* on a stem of *Tilia*. This substrate is neither mentioned by Fries (1821, 1874) in his description of *A. aurivellus*, nor found by me in any collection of the *Pholiota* with clavate cheilocystidia, broader germ pore etc. The only substrate hitherto known for this fungus (*Pholiota aurivella* in my sense) is *Salix*. However, in my opinion, this single fact does not contradict all the other arguments (see Table 3 and the discussion below the table) for considering Batsch's and Fries' *A. aurivellus* as conspecific. Moreover, if *Pholiota aurivella* is neotypified in accordance with the conclusions in this paper, support can be found in article 7.8 of the Tokyo Code (Greuter et al. 1994) that says that "typification of names adopted in one of the works specified in Art. 13.1(d), and thereby sanctioned (Art. 15), may be affected in the light of anything associated with the name in that work". This means *Pholiota aurivella* can be neotypified in accordance with Fries' data in Systema mycologicum. Thus, *Pholiota aurivella* (Batsch: Fr.) P. Kumm. becomes the correct name for the *Pholiota* with clavate cheilocystidia and broad germ pore, growing on *Salix*. As the neotype a specimen collected on *Salix* in Sweden is chosen below. Such a typification will stabilise the usage of the name *Pholiota aurivella* and consequently also of *Pholiota adiposa* (Batsch: Fr.) P. Kumm. and *Pholiota limonella* (Peck) Sacc.

Pholiota aurivella (Batsch: Fr.) P. Kumm. Figs 1, 2, 3, 4.

Agaricus aurivellus Batsch, Elench. fung., Cont. prima: 154, 1786. – *Agaricus aurivellus* Batsch: Fries, Syst. mycol. 1: 242, 1821. – *Pholiota aurivella* (Batsch: Fries) P. Kummer, Führer Pilzk.: 83, 1871.

Syn.: *Agaricus salicinus* Schumacher, Enumeratio plantarum 1: 262, 1801. – *Agaricus ceriferus* P. Karst., Bidrag Kännedom Finlands Natur Folk 25: 369, 1876. – *Pholiota cerifera* (P. Karst.) P. Karst., Bidrag Kännedom Finlands Natur Folk 32: 297, 1879.

Typus. Uppsala, Botaniska trädgarden, in trunco *Salicis pentandrae* vivae, 30 Sep. 1950, leg. J. A. Nannfeldt, det. S. Lundell as *Pholiota aurivella* (UPS)

(neotype, selected here to replace the neotype chosen by Jacobsson, Windahlia 19: 26, 1990, which is in conflict with the protologue of Fries (1821)).

Misidentification of *P. aurivella: Pholiota adiposa* (Batsch: Fr.) P. Kumm. sensu Jacobsson (1987) p.p. (collections from *Salix*)

Misapplication of the name *P. aurivella: Pholiota aurivella* (Batsch: Fr.) P. Kumm. auct. non Fries: Ricken p. p. (1915, = *P. adiposa*); J. E. Lange p. p., Fl. agaric. danic., vol. 3: 55, 1938 (= *P. adiposa*); Kühner and Romagnesi p. p. (1953, = *P. adiposa*); Moser p. p. (1953, 1955, 1967, 1978, 1983, = *P. adiposa*); etc.

Selected illustrations. Batsch (1786): fig. 115. – Schaeffer, Fungi Bavar. Palat. nasc., vol. 3: tab. 209, 1771. – B. Dvořák, Mykologia 4: tab. *P. aurivella*, 1927.

Short characteristics. fasciculately growing fungus with large robust and fleshy fruitbodies; pileus yellow, yellow-ochre, yellow-rusty, slightly viscid in moist weather, otherwise dry, mat, covered by dark thick scales (almost brown-black when old). Spores 7.5–10.5(-11.5) × 5–6.5(-7) μm, germ pore very distinct, 1–1.5(-1.8) μm broad, cheilocystidia mostly clavate to broadly clavate, chrysocystidia abundant. Growing on living and dead stems and branches of *Salix*, mostly *Salix fragilis*.

Description. Fruitbodies growing fasciculately. Pileus 3–15(-20) cm, hemispherical or broadly conical with obtuse apex, margin slightly involute, at maturity convex to plano-convex with inflexed margin, fleshy, scaly. Pileus cuticle viscid (not strongly glutinous) in moist weather, in dry weather dry, mat, light yellow to yellow at margin, yellow-ochre at centre, yellow-rusty to rusty-ochre when old. Scales numerous, densely arranged, approximately triangular, 0.2–1.0 cm broad, thick, fibrillose-tomentose (resembling scales of *Sarcodon imbricatus*), at centre more or less recurved, ochre, rusty to brown, almost brown-black when old, towards the margin appressed, ochre, in moist weather somewhat dissolving in a thin layer of slime. In old fruitbodies the original scales break up into a great number of smaller fibrillose scales covering almost the whole pileus surface. Lamellae crowded, with lamellulae (l=1–3), 0.4–1.0 cm broad, even or slightly ventricose, near the stem slightly emarginate with small decurrent tooth, light beige-yellow when young, then yellow-ochre, at maturity yellow-brown to brown, sometimes with an olive tinge, edge finely unregularly undate to serrate, somewhat paler than the surface. Stipe 5–15(-18) × 0.5–2 cm, cylindrical, often curved, towards the base somewhat clavate or subbulbous with obconical base, quite dry, with appressed yellow ring when young, later with fibrillose-tomentose ring zone, above the zone light yellow, then yellow to rusty-yellow, minutely floccose, below the zone yellow, yellow-ochre, rusty-yellow, at the base rusty-ochre to rusty-brown, with recurved golden yellow fibrillose-tomentose scales. The stem turns brown on touching. Context firm, fleshy, whitish, light yellow to yellow in pileus and upper part of stem, rusty-yellow to rusty brown in stipe base. Taste mild, smell

indistinct but in the lamellae like smoked meat and in the context aromatically vegetable-like. Spore print brown (Breitenbach and Kränzlin 1995: p. 27, colour no. 57).

Spores 7.5–10.5(-11.5) × 5–6.5(-7) μm, ellipsoid to slightly ovoid, sometimes slightly phaseoliform in side view, smooth, with thick brown wall, germ pore very distinct, (1-)1.2–1.5(-1.8) μm broad. Basidia 25–32 x 7.5–9.5 μm, cylindrical or narrowly clavate, in central part often slightly narrower, 4-spored, sterigmata 4–5 μm long. Chrysocystidia 40–60 x 8.5–13 μm, numerous on lamellae surface, rare at the edge, cylindrical, fusiform or narrowly clavate, mostly tapering to mucronate, in central part often somewhat narrower, often incurved, wholly filled with a refractive inclusion colouring yellow to yellow-rusty in KOH or NH_4OH solution. Cheilocystidia 19–45 × 7.5–20 μm, forming a sterile band on the edge, clavate to broadly clavate, ellipsoid, obovoid, subglobose to sphaeropedunculate (Figs 1, 2), mostly hyaline, exceptionally with a yellow inclusion. Pleurocystidia: see chrysocystidia. Lamellar trama regular, made up of parallel hyphae 3.5–24 μm broad, subhymenium gelatinous. Hyphae of velum (in scales on pileus surface) parallel to flexuous, made up of cylindrical or narrowly ellipsoid cells 5–20 μm broad, with yellow vacuolar pigment and incrustations. Pileus cuticle a cutis, 2-layered, upper layer made up of parallel to slightly flexuous hyphae 3–13 μm broad, slightly gelatinising, with yellow-brown vacuolar, membranal and encrusting pigment, lower layer made up of densely arranged parallel to slightly flexuous hyphae 4–11 μm broad, with slightly yellow membranal pigment, locally with yellow incrustations. Stipe cuticle a cutis formed by parallel hyphae 3–5 μm broad, strongly yellow-ochre coloured, with membranal, vacuolar as well as encrusting pigment. Clamp connections present in all tissues.

Fructification. Jun., Aug.-Nov., most frequently Sept.-Oct.

Ecology. *Pholiota aurivella* grows as a parasite on living trees and later as a saprophyte on dead wood. Up to now the species has been found only on *Salix*. If the *Salix* species was mentioned on herbarium labels or determined in the field, mostly *Salix fragilis* and less frequently *Salix pentandra* was recorded. *Pholiota aurivella* grows above all on stems or branches high above the ground, often in dense clusters. In the Czech Republic and Slovakia the species occurs from the lowlands up to the submontane belt. It grows in flood plain forests, *Salix*–stands on river and stream banks or around ponds, and also in parks or on solitary standing willows. The preference of *Pholiota aurivella* for *Salix* is very striking. Up to now, the occurrence of this species on other tree genera is not known to me. In one case *Pholiota limonella* has been found on *Salix* (JH 898/97, deposited in PRM). The fruitbodies had a somewhat lustrous pileus surface, the cheilocystidia were cylindrical to narrowly lageniform and the spore width reached 4.5–5 μm only.

Fig. 3. *Pholiota aurivella* (Batsch: Fr.) P. Kumm. Fruitbody with prominent dark scales.
– Czech Republic, Praha, Máslovická rokle valley, *Salix fragilis*, 12 Oct.1994, JH 340/94 (PRM). Microcharacters of this fruitbody are depicted in Fig. 1. Photo J. Holec.
Fig. 4. *Pholiota aurivella* (Batsch: Fr.) P. Kumm. Typical robust fruitbody with thick dark scales and dry mat pileus surface.
– Czech Republic, Praha-Suchdol, Tiché údolí, *Salix fragilis*, 23 Oct.1997, JH 888/97 (PRM). Photo J. Holec.

Distribution. To know the real distribution of *Pholiota aurivella*, a careful revision of herbarium material is necessary together with searching for it on *Salix* in the field. In almost all recent publications the species is reported together with *Pholiota adiposa* under the name *Pholiota aurivella* (see Misapplications). In the work of Jacobsson (1987), the species is included in *Pholiota adiposa*.

Pholiota aurivella seems to be common in the Czech Republic and Slovakia (Holec 1996b, 1997a), especially in regions with an abundant occurrence of old stems of *Salix*. In addition, its occurrence in Sweden, Finland and Austria is proved (see Material examined). Jacobsson (1987) gives *Salix* as the second most frequent host tree of his *Pholiota adiposa* in northern Europe. These records probably represent *Pholiota aurivella* in my sense, because the true *Pholiota adiposa* is not known to me from *Salix*. Similarly, W. G. Smith (1908: 127), Konrad and Maublanc (Icon. select. fung.: tab. 74, 1926) and Kreisel (1987: 185) report the occurrence of *Pholiota aurivella* s. l. (= *P. adiposa* + *P. aurivella* in the present concept) on *Salix*. Also these records most probably represent the true *Pholiota aurivella*. Therefore, it is very likely that *Pholiota aurivella* grows also in Great Britain, Germany and France or Switzerland. Consequently, I suppose *Pholiota aurivella* s. str. to occur in most European countries. It is to be found in regions with an occurrence of *Salix*, especially in flood plain forests and *Salix* stands on river banks. However, all these assumptions have to be verified by field records as well as a revision of herbarium material in the individual European countries.

Concerning the occurrence of *Pholiota aurivella* s. str. in North America, careful revision of herbarium and fresh material from *Salix* is also necessary. A separate species *Pholiota aurivelloides* has been described by Overholts (1927: 151), the characters of which seem to be identical with the European *Pholiota aurivella* s. str. According to Smith and Hesler (1968) *P. aurivelloides* grows on wood of *Salix, Alnus* and *Betula*, which also indicates the possibility that it is the same as *P. aurivella* s. str.

Discussion. The concept of *Pholiota aurivella* presented in this paper differs from those of all mycologists in the 20th century. However, it is supported by many data from fresh material as well as herbarium specimens.

The most important character of *Pholiota aurivella* in the present sense are the mostly clavate shape of the cheilocystidia (Figs 1, 2), the spores with a (1-)1.2–1.5(-1.8) μm broad germ pore and a substrate preference for *Salix*. Moreover, the fungus has a dry and mat, at most subviscid pileus surface, prominent thick scales, somewhat larger spores than *P. adiposa* and abundant chrysocystidia. In all these characters the fungus from *Salix* differs from *Pholiota adiposa*, a fungus growing on *Fagus* and many other substrata (see Table 3).

A return to the Friesian concept of *Pholiota aurivella* as well as *P. adiposa* agrees with the present taxonomic conclusions and seems to be necessary.

Jacobsson (1990) designated a neotype for *P. aurivella* using a specimen collected on *Fagus*, which in fact represents *P. adiposa*. However, Jacobsson's neotype is in conflict with Fries' protologue (where *Betula* and *Salix* are mentioned as the substrate of *Agaricus aurivellus*) and with my observations. According to Article 9.13.b of the ICBN (Greuter et al. 1994), a faulty selected neotype can be replaced by a new one. This is done in the present paper (see paragraph Typus).

Jacobsson (1987: 8, 1989: 110) reported that single-spore mycelia of collections from *Fagus* (SJ 80307, SJ 83119) and *Salix* (SJ 84131 obtained from collection GB 84131, which is a true *P. aurivella* – see Material examined) are intercompatible with each other. These results suggest conspecifity of *P. aurivella* and *P. adiposa*. Unfortunately, this conclusion is based on pairings of three cultures only. It will be necessary to repeat these experiments with a higher number of single-spore strains. For me it is hard to accept the conspecifity of two taxa differing in so many characters (see Table 3). Even if Jacobsson's observations on the intercompatibility of *P. aurivella* s. str. and *P. adiposa* proved to be quite reliable, it is in my opinion still important to distinguish these two taxa on subspecies or variety level.

Material examined. AUSTRIA: Bad Völlau, Gainfarn, *Salix*, 5 Oct.1975, U. Passauer (W). CZECH REPUBLIC: Praha, Prokopské údolí, *Salix* sp., 2 Oct.1994, JH 316/94, 317/94 (PRM). – Praha, Braník, *Salix*, 26 Oct.1993, K. Spěváková (PRM). – Praha, Podhoří, *Salix*, 29 Sep. 1935, J. Herink (PRM). – Praha, Máslovická rokle, *Salix fragilis*, 12 Oct.1994, JH 340/94 (PRM). – Praha, Suchdol, Tiché údolí, *Salix fragilis*, 17 Sep. 1996, Z. Pouzar (PRM); 7 Oct.1996, J. Holec (PRM). – Velký Osek, Libický luh, *Salix*, 7 Oct.1992, JH 531/92, 508/92; 5 Oct.1994, JH 326/94 (PRM). – Veselí n. Lužnicí, Frahelž, dike of the pond Naděje, *Salix*, 31 Oct.1997, JH 902/97 (PRM). – Třeboň, *Salix fragilis*, 13 Oct.1964, J. Kubička (PRM). – Třeboň, Mokré louky, *Salix pentandra*, 28 Sep. 1980, L. Kubičková (PRM, as *P. squarroso-adiposa*). – České Budějovice, Roudné, wood of *Salix*, R. Mašek (CB, as *P. adiposa*). – Morava, Omice, *Salix* sp., 4 Nov.1952, Vostrčil (BRNM, as *P. adiposa*). – Morava, Kuřineč, *Salix* stump, 28 Oct.1942, F. Šmarda (BRNM). – Morava, Kuřim, *Salix*, 29 Aug.1945, F. Šmarda (BRNM). – Brno, Pisárky, *Salix*, 2 Oct.1965, A. Vágner (BRNM). – Dolní Věstonice, *Salix*, 26 Sep. 1954, F. Šmarda (BRNM). – SLOVAK REPUBLIC: Oravské vrchy, Oravské Veselé, *Salix fragilis*, 6 Sep. 1979, L. Kubičková (PRM). – Západné Tatry, Liptovský Hrádok, *Salix fragilis*, 10 Sep. 1979, L. Kubičková (PRM, as *P. adiposa*). – Turňa n. Bodvou, Zadielská dolina, *Salix* sp., 8–14 Oct.1934, A. Pilát (PRM, as *P. adiposa*). – SWEDEN: Stockholm, Djurgarden, *Salix* sp., 18 Oct.1976, A. Strid (S). – Stockholm, Södra Djurgarden, *Salix fragilis*, 3 Nov.1975, N. Suber (S). – Stockholm, Norr Mälarstrand, *Salix fragilis*, A. Anderberg (S). – Uppland, Lovö, Drottningholm, *Salix* sp., Sep. 1895, H. Kugelberg (S). – Uppsala, Botaniska trädgarden, *Salix pentandra*, 10 Sep. 1943, E. Narfström (UPS). – Uppsala,

Botaniska trädgarden, *Salix*, Sep. 1935, S. Lundell (UPS). – Uppsala, Botaniska trädgarden, *Salix pentandra*, 30 Sep. 1950, J. A. Nannfeldt (UPS). – Uppland, Bondkyrka, *Salix fragilis*, 8 Sep. 1943, E. Narfström (UPS). – Kristianstad, Lingenäset, *Salix fragilis*, 7 Oct.1984, S. Jacobsson (GB 84131). – FINLAND: Turku, Asemapuisto, *Salix fragilis*, 13 Sep. 1935, M. Laurila (H, as *P. heteroclita*). – Mustiala, *Salix pentandra*, P. A. Karsten (H, herbarium P. A. Karsten, No. 2935, holotype of *Pholiota cerifera* (P. Karst.) P. Karst.). – UZBEKISTAN: Samarkand, Kara Tepe, *Salix* sp., 1. Juni 1959, A. Pilát (PRM).

Results of a type study of **Pholiota cerifera** (P. Karst.) P. Karst.

Holotype: Herbarium P. A. Karsten, no. 2935, Mustiala, in *Salice pentandrae*, Sep., leg. P. A. Karsten, det. as *Agaricus (Pholiota)* n. sp. *ceriferus* (H).

The holotype consists of one very young and not well preserved fruitbody – overdried, and too much pressed.

Macrocharacters of the herbarium specimen: pileus 1,6 cm, pressed, lamellae hardly accessible (covered by pileus margin), stipe cylindrical, incurved, 0.5 cm broad, at base somewhat thicker, with rusty-brown scales, velum present between pileus margin and stipe, yellow.

Microcharacters (see also Fig. 2): Spores (8-)8.3–9.2(-9.8) × 5.8–6.1(-6.4) μm (20 spores measured), broadly ellipsoid, with thick brown wall, germ pore very distinct, 1.5–1.8 μm broad. Basidia not found. Basidioles cylindrical to narrowly clavate, 23–31 × 6 μm. Chrysocystidia abundant, narrowly clavate to clavate, in some cases slightly mucronate, with a small refractive inclusion colouring yellow to yellow-rusty in KOH or NH_4OH solution, sometimes completely hyaline. Cheilocystidia hardly visible, clavate to broadly clavate, 26–29 × 14–15 μm, hyaline. Pleurocystidia: see chrysocystidia. Hyphae of velum flexuous, made up of cylindrical to narrowly fusiform cells 6–15 μm broad, hyaline. Pileus cuticle a slightly gelatinised cutis, 2-layered, upper layer made up of densely arranged parallel to slightly flexuous hyphae 3–4.5 μm broad, yellow-brown encrusted, lower layer made up of densely arranged hyaline hyphae 3–5 μm broad. Pileus context consists of interwoven hyaline or slightly yellow-brown encrusted hyphae 3–9 μm broad. Stipe cuticle a cutis of densely arranged parallel hyphae 3–6 μm broad, hyaline. Stipe context made up of densely arranged parallel hyphae 4.5–9 μm broad, hyaline. Clamp connections present in all tissues.

A revision of the holotype proved that *Pholiota cerifera* (P. Karst.) P. Karst. originally collected on *Salix pentandra* is identical with *P. aurivella* s. str. (see also Fig. 2). Therefore, the name *Pholiota cerifera* (P. Karst.) P. Karst. can not be used as the correct name for a species found mostly on *Fagus* and having glutinous pileus surface as was proposed by Kuyper and Tjallingii-Beukers (1986), and must be regarded a synonym of *Pholiota aurivella* (Batsch: Fr.) P. Kumm.

Pholiota adiposa (Batsch: Fr.) P. Kumm. Fig. 5

Agaricus adiposus Batsch, Elench. fung., Cont. prima: 147, 1786. – *Agaricus adiposus* Batsch: Fries, Syst. mycol. 1: 242, 1821. – *Pholiota adiposa* (Batsch: Fr.) P. Kummer, Führer Pilzk.: 83, 1871.

Misidentifications of *P. adiposa*: *Pholiota aurivella* (Batsch: Fr.) P. Kumm. sensu Ricken (1915) p.p.; sensu J. E. Lange p.p., Fl. agaric. danic., vol. 3: 55, 1938; sensu Kühner and Romagnesi (1953) p.p.; sensu Moser (1953, 1955, 1967, 1978, 1983) p.p.; etc.

Misapplications of the name *P. adiposa: Pholiota adiposa* (Batsch: Fr.) P. Kumm. auct. non Batsch et Fries: Ricken (1915, = *P. jahnii*); Konrad et Maublanc, Icon. select. fung., vol. 1, fasc. 4: tab. 75, 1928 (= *P. jahnii*); J. E. Lange, Fl. agaric. danic., vol. 3: 54, 1938 (= *P. jahnii*); Kühner and Romagnesi (1953, = *P. jahnii*); Moser (1953, 1955, 1967, 1978, 1983, = *P. jahnii*); etc.

Selected illustrations. Batsch (1786): fig. 113. – Cooke, Ill. Brit. fung.: tab. 353, 1884. – B. Dvořák, Mykologia 3: tab. *Pholiota adiposa*, 1926. – Bresadola, Icon. mycol., vol. 14: tab. 699, 1930. – J. E. Lange, Fl. agaric. danic., vol. 3: fig. 108D, 1938. – Breitenbach and Kränzlin (1995): fig. 421.

Short characteristics. fasciculately growing fungus with large fleshy fruitbodies, pileus yellow, strongly glutinous in moist weather, after drying somewhat lustrous, with thin rusty-ochre to rusty-brown scales. Spores (7-)7.5–9.5(-10.7) × (4.5)–5––6.2(-6.5) μm, germ pore 0.8–1.2 μm broad, chrysocystidia scattered to rare, cheilocystidia of various shape: fusiform, cylindrical, narrowly clavate, narrowly lageniform, obovoid when young, often all these types present on one edge. Growing on stems or on branches of living and fallen trees, mostly *Fagus sylvatica*, but also on various other deciduous trees, sometimes also conifers.

Description. Fruitbodies fasciculate. Pileus 4–14(-20) cm, hemispherical to slightly campanulate when young, with involute margin, convex to plano-convex at maturity, in some fruitbodies with low obtuse umbo and inflexed margin, fleshy, scaly. Pileus cuticle strongly glutinous in moist weather, after drying somewhat lustrous (glimmering), golden yellow in young fruitbodies, at maturity yellow to ochre-yellow, in some fruitbodies light yellow-ochre to lemon yellow or, on the contrary, dark yellow-ochre to ochre brown towards the centre, in old fruitbodies completely brown-ochre (often covered with spore dust). Scales scattered to dense, 0.3–0.7(-1) cm broad, thin, approximately triangular, appressed or slightly ascending, in moist weather covered by a glutinous layer or somewhat swollen up in the slime, often missing after rainfall, after drying sometimes forming darker patches on pileus surface, colour rusty-ochre to rusty-brown. Lamellae crowded, with lamellulae (l=1–3), 0.5–1.2 cm broad, subventricose, near the stem slightly emarginate with small decurrent tooth or adnate, yellow-ochre when young,

then yellow-brown to ochre-brown, edge somewhat paler. Stipe 5–20 × 0.8–2.5 (-3) cm, cylindrical, towards the base sometimes slightly broadened or thickened, often curved, scaly, dry or at most slightly viscid, with indistinct annular zone disappearing with age, above this zone light yellow or yellow, smooth, below it yellow-ochre to rusty-ochre at the base, scales appressed or flaring, yellow-ochre, rusty-ochre to rusty-brown. Context firm, light yellow, in stipe base rusty-ochre. Taste mild, smell indistinct or like smoked meat. Spore print brown (Breitenbach and Kränzlin 1995: 27, colour no. 57).

Spores (7-)7.5–9.5(-11)×(4.5-)5–6.2(-6.5) μm, ellipsoid to slightly ovoid, smooth, with thick brown wall, germ pore distinct, 0.8–1.2 μm broad. Basidia 25–35 × × 6.5–9.5 μm, cylindrical or narrowly clavate, with 4 (exceptionally 2 or 3) sterigmata, 3.5–4 μm long. Chrysocystidia 25–56 x 7.5–11 μm, scattered to rare, cylindrical or narrowly clavate, often curved, tapering, in some cases slightly mucronate, partly or wholly filled with a refractive inclusion colouring yellow to yellow-rusty in KOH or NH_4OH solution, present on lamellae surface and rarely also on the edge. Cheilocystidia 20–50 × 5–17 μm, variously shaped – fusiform, cylindrical, narrowly clavate, narrowly lageniform, obovoid when young (Fig. 3), often all these types present on one edge, their wall thin but exceptionally slightly thickened, mostly colourless, sometimes with a yellow inclusion. Lamellar trama regular, made up of parallel hyphae 5–15 μm broad, near the subhymenium only 2–4.5 μm broad, individual cells cylindrical or slightly fusiform, subhymenium gelatinous, made up of branched 2–4 μm broad hyphae. Hyphae of velum (from scales on pileus surface) flexuous, 6–15 μm broad, hyaline, made up of cylindrical, narrowly ellipsoid to barrel-shaped cells. Pileus cuticle an ixocutis, 3-layered, upper layer thin, gelatinous, strongly pigmented, made up of parallel to slightly flexuous hyphae 1.5–4.5 μm broad, pigment membranal, vacuolar and encrusting, middle layer strongly gelatinous, made up of flexuous hyphae 3–8(-12) μm broad, with indistinct light yellow membranal pigmentation, lower layer made up of hyaline, densely arranged parallel 3–11 μm broad hyphae with light yellow membranal pigment, not soluble in KOH. Stipe cuticle made up of parallel cylindrical hyphae 3–6 μm broad, partly slightly gelatinous, strongly yellow-ochre pigmented, the pigment vacuolar, membranal and encrusting. Clamp connections present in all tissues.

Fructification. Apr., Aug.-Dec., most frequently Sept.-Oct.

Ecology. *Pholiota adiposa* grows as a parasite on stems and branches of living trees, later also as a saproparasite or saprophyte on fallen stems and dead wood. It typically grows several meters above the ground, contrary to the related species *Pholiota jahnii* that typically grows on stem bases, roots and wood buried in the ground. The most frequent substrate is wood of *Fagus sylvatica*. In the PRM herbarium (National Museum Praha) finds from the following tree species are represented also: *Aesculus hippocastanum, Acer pseudoplatanus, Acer platanoides, Celtis occidentalis, Juglans regia, Malus pumila, Populus tremula,*

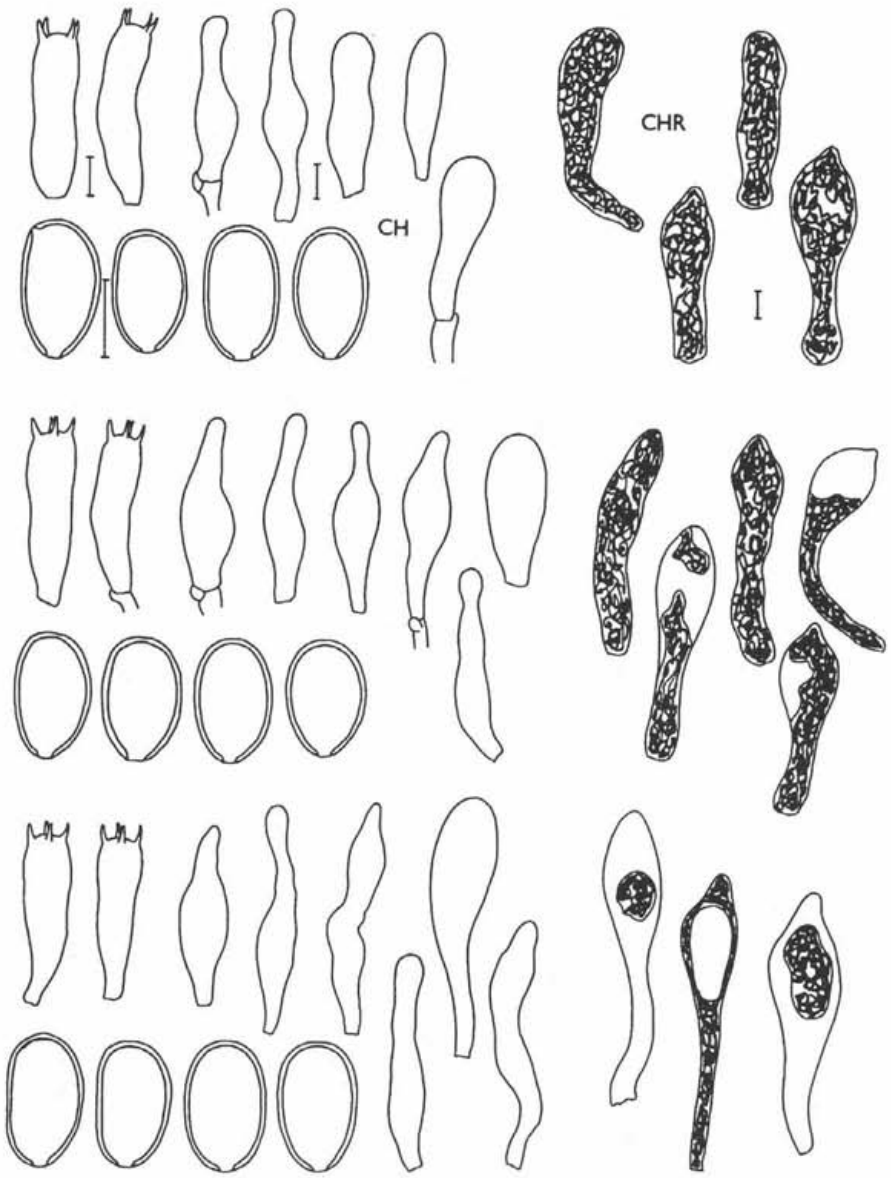

Fig. 5. *Pholiota adiposa* (Batsch: Fr.) P. Kumm. (spores, basidia, cheilocystidia, chrysocystidia).
– Czech Republic, Šumava mountains, Dobrá, Medvědice nature reserve, *Fagus sylvatica*, 28 Oct.1992, JH 647/92 (PRM).
– Czech Republic, Stříbrná Skalice, Studený vrch, *Fagus sylvatica*, 12 Oct.1992, JH 555/92 (PRM).
– Sweden, Sibbarp, 500 m S Grytsjön, *Fagus*, 16 Oct.1980, S. Jacobsson (GB 80307, neotype of *Pholiota adiposa* (Batsch: Fr.) Kumm. selected by Jacobsson 1987).
Abbreviations: CH: cheilocystidia, CHR: chrysocystidia. Scale bar = 5 μm. Ill. J. Holec.

Sorbus aucuparia, Quercus sp., *Tilia cordata, Tilia* sp. and also *Abies alba* a *Picea abies*. Jacobsson (1987) mentions also one find on *Betula*.

Distribution. Common in all parts of Europe as well as in North America (Smith and Hesler 1968).

Discussion. *Pholiota adiposa* is clearly recognisable by the characters given in Table 3 and in the paragraph Short characteristics. The most important characters are the shape of the cheilocystidia (Fig. 3), width of the germ pore and substrate preference. The pileus is strongly glutinous in moist weather and after drying somewhat lustrous. The related species *P. aurivella* differs by the characters summarised in Table 3. On wood of *Fagus* also grows *Pholiota jahnii* which species differs from *P. adiposa* by its numerous, dark brown to brown black scales on pileus surface, growth at the bases of trees, on roots or wood covered by soil and above all by its smaller spores [(4.5-)5–7(-7.5) × 3.3–4.0(-4.5) μm] with a minute germ pore (spore measurements according to Holec 1997a). This species had for a long time (nearly the whole 20th century) been included in *Pholiota adiposa.* The taxonomy and nomenclature of *Pholiota jahnii* is thoroughly discussed by Kuyper and Tjallingii-Beukers (1986).

Pholiota limonella, discovered for Europe by Jacobsson (1987), looks very similar and differs from *P. adiposa* by its slightly smaller, especially narrower spores [6.5–9(-10) × 4–5.3(-5.8) μm; Holec 1997a] and partly also by substrate preference (mostly *Alnus, Betula* but also *Picea, Abies* and various deciduous trees, see Jacobsson 1987, 1990; Holec 1997a). Reliable identification of *P. limonella* is possible only on the basis of spore width. It is necessary to measure at least 10 spores to establish the prevailing values (less than 6 μm: *P. limonella*, more than 6 μm : *P. adiposa* and *P. aurivella*).

The change of the original concept of *Pholiota adiposa* (to a small-spored species, named *P. jahnii* at present) was started by Ricken (1915). Consequently, the name *Pholiota aurivella* has erroneously been used for the true *P. adiposa* sensu Fries. However, the erroneous concept of *P. aurivella* and *P. adiposa* has been applied by almost all leading mycologists in the 20th century except for Bresadola (1930: Tab. 699), who correctly interpreted *Pholiota adiposa* as a species with 5–6 μm broad spores growing above all on beech stems.

Jacobsson (1987) restored the original Friesian concept of *Pholiota adiposa* and selected a neotype for this name – viz. a specimen from Sweden collected on *Fagus* (GB 80307). I studied this specimen and found it to represent the true *Pholiota adiposa* in the original sense of Batsch and Fries. However, Jacobsson included collections from *Salix* in *Pholiota adiposa* and placed the name *Pholiota aurivella* in the synonymy of *P. adiposa*.

Later, Jacobsson (1990) changed his original opinion on the nomenclature and neotypification of *P. adiposa*. He named the fungus on *Fagus Pholiota aurivella* and designated a new neotype for it (specimen GB 83119 collected on *Fagus*).

A very curious situation resulted from this change. The name *Pholiota adiposa* rehabilitated and neotypified by Jacobsson in 1987 was then (Jacobsson 1990) proposed to be placed on the list of nomina rejicienda and replaced by the name *Pholiota aurivella*! This change was caused by the fact that some mycologists (e. g. T. Kuyper, see Jacobsson 1990: 28) did not agree with the rehabilitation of the original concept of *Pholiota adiposa* by Jacobsson in 1987. In their opinion, the name *P. adiposa* had for a long time been used for the species recently named *Pholiota jahnii* Tjall.-Beuk. et Bas and therefore is a source of confusion. On the other hand, Kuyper means (according to Jacobsson 1990: 28) that the name *Pholiota aurivella* has been used in the same sense since Fries (1821). However, my results clearly showed that the true *Pholiota aurivella* is another fungus having different characters and growing on *Salix*.

In addition, Kuyper and Tjallingii-Beukers (1986) noticed the difference between the characters of the fungus growing on *Fagus* and other substrata (erroneously named *Pholiota aurivella* in the 20th century) and Fries' description of *Agaricus aurivellus*. There is no mention of the strongly glutinous pileus surface in the description of Fries (1821), which is, however, one of the most important characters of "*Pholiota aurivella*" (= *P. adiposa* in this paper) sensu authors of the 20th century. Consequently, Kuyper et Tjallingii-Beukers (1986) proposed to use the name *Pholiota cerifera* (P. Karst.) P. Karst. for this species. However, the original *Pholiota cerifera* was described according to one small fruitbody growing on a living stem of *Salix pentandra* (P. Karsten, Bidrag Kännedom Finlands Natur Folk 25: 369, 1876, as *Agaricus ceriferus*). Revision of the holotype of *P. cerifera* clearly showed that the specimen is identical with *Pholiota aurivella* in the sense of Fries and the results published in this paper. Therefore, the name *Pholiota cerifera* (P. Karst.) P. Karst. must be placed into the synonymy of *Pholiota aurivella* (Batsch: Fr.) P. Kumm.

In my opinion, this complicated situation must be solved by restoring the original concept of *P. adiposa* (as a fungus with a glutinous pileus and growing mainly on *Fagus*) by returning to Jacobsson's neotypification of this name (Jacobsson 1987) and by rejecting Jacobsson's neotypification of *P. aurivella* (Jacobsson 1990), because this is in conflict with the protologue of that species. In addition, the new neotype for *P. aurivella* proposed in this paper restricts then the use of that name for the taxon growing on *Salix* and having clavate cheilocystidia and a broader germ pore. Consequently, the application of the names *Pholiota adiposa* and *Pholiota aurivella* will be in agreement both with the data of the original authors and the new taxonomic conclusions presented in this paper.

Material examined. CZECH REPUBLIC: Northern Bohemia, Staré Křečany near Rumburk (=Altehrenberg), *Tilia cordata*, 15 Oct.1943, H. Marschner (PRM, as *P. aurivella*). – Ibid., *Aesculus hippocastanum*, 2 Nov.1944, H. Marschner

(PRM, as *P. aurivella*). – Ibid., *Acer pseudoplatanus*, 9 Oct.1965, H. Marschner (PRM, as *P. aurivella*). – Šluknov, Vlčí hora (=Wolfsberg), *Picea*, 23 Oct.1944, H. Marschner (PRM, as *P. aurivella*). – Vlašim, Křesín, *Malus pumila*, 12 Oct. 1957, M. Deyl (PRM, as *P. aurivella*). – Kladno, Lány, Lánská obora, *Fagus sylvatica*, 22 Oct.1967, L. Kotlabová (PRM, as *P. aurivella*). – Křivoklátsko, Kamenné Žehrovice, hájovna Ploskov-Polesí, *Fagus sylvatica*, 10 Oct.1993, M. Réblová (PRM). – Křivoklátsko, nature reserve Vůznice, Janův vrch hill, *Quercus* sp., 22 Oct.1992, JH 610/92 (PRM). – Křivoklátsko, nature reserve Kohoutov, *Acer platanoides*, 15 Oct.1992, JH 563/92 (PRM). – Karlštejn, Bubovický potok stream–waterfalls, *Acer platanoides*, Sep. 1949, M. Svrček (PRM, as *P. aurivella*). – Mníšek pod Brdy, Voznice, *Abies alba*, 17 Oct.1948, M. Svrček (PRM, as *P. aurivella*). – Praha, Královská obora, *Aesculus hippocastanum*, 21 Nov.1942, J. Herink (PRM, as *P. aurivella*). – Praha, Stromovka, *Fagus sylvatica*, 9 Oct.1992, JH 534/92 (PRM). – Praha, Petřín, Nebozízek, *Acer pseudoplatanus*, 5 Sep. 1966, E. Wichanský (PRM, as *P. aurivella*). – Praha, Kinského sady, *Acer platanoides*, 2. Dec.1961, E. Wichanský (PRM, as *P. aurivella*). – Praha, Břevnov, *Populus*, Oct.1935, J. Herink (PRM, as *P. aurivella*). – Praha, Bohnice, *Juglans regia*, 20 Oct.1944, B. Vošoust (PRM, as *P. aurivella*). – Jevany, Voděradské bučiny, *Fagus sylvatica*, 24 Sep. 1993, JH 229/93 (PRM). – Stříbrná Skalice, Studený vrch, *Fagus sylvatica*, 12 Oct.1992, JH 552/92, 559/92, 549/92, 555/92, 539/92 (PRM). – Blatná, Bělčice, Bělčická hora, *Populus tremula*, 29 Sep. 1975, F. Kotlaba (PRM, as *P. aurivella*). – Šumava, Dobrá, Medvědice, *Abies alba*, 28 Oct.1992, JH 648/92; *Fagus sylvatica*, 28 Oct.1992, JH 646/92, 647/92 (PRM). – Stožec, *Picea abies*, 14 Oct.1995, JH 384/95 (PRM). – Lenora, Boubínský prales, *Picea abies*, 18 Sep. 1948, J. Herink (PRM). – Zátoň, Pažení mountain, *Abies alba*, 12 Sep. 1946, J. Herink (PRM). – between Horní Vltavice and Strážný, *Acer platanoides*, 10 Oct.1993, Z. Palice (PRM). – between Filipova Huť and Modrava, *Sorbus aucuparia*, 13 Oct.1995, JH 363/95 (PRM). – Česká Třebová, Třebovské stěny, *Fagus sylvatica*, 20 Oct.1994, JH 386a/94 (PRM). – SLOVAK REPUBLIC: Bratislava, Vajnorská cesta, *Celtis occidentalis*, 4 May 1989, 5 Oct.1995, J. Paclt (PRM). – LIECHTENSTEIN: Mauren, Schaanwald, *Fagus sylvatica*, 5 Oct.1995, F. Kotlaba (PRM, as *P. aurivella*). – SWEDEN: Stockholm, Bellevue-parken, *Tilia*, 3 Nov.1955, R. Schöldström (UPS, as *P. aurivella*). – Västmanland, Kolbäck par., Strömsholm, *Tilia*, 5 Oct.1986, H. Kaufmann (UPS). – Silvakra, Stensoffa, *Fagus*, 26 Oct.1983, S. Jacobsson (GB 83119, neotype of *Pholiota aurivella* (Batsch: Fr.) Kumm. designated by Jacobsson 1990). – Sibbarp, 500 m S Grytsjön, *Fagus*, 16 Oct.1980, S. Jacobsson (GB 80307, neotype of *Pholiota adiposa* (Batsch: Fr.) Kumm. designated by Jacobsson 1987).

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Records of new, rare or overlooked lichens from the Czech Republic

JANA KOCOURKOVÁ – HORÁKOVÁ

National Museum, Václavské nám. 68, 115 79 Praha 1, Czech Republic

Kocourková-Horáková J. (1998): Records of new, rare or overlooked lichens from the Czech Republic. – Czech Mycol. 50: 223–239

A list of 26 species of lichens and 2 lichenicolous fungi from the Czech Republic with comments is given. 11 species are new for the country: the lichens *Absconditella delutula, Aspicilia moenium, Bacidina chloroticula, Epigloea medioincrassata, Lecanora pseudistera, Micarea botryoides, Phaeocalicium compressulum, Trapeliopsis pseudogranulosa, Xanthoria calcicola* and the lichenicolous fungi *Endococcus pseudocarpus* and *Zwackhiomyces sphinctrinoides*; 4 lichens are new for Bohemia (*Agonimia tristicula, Bacidina arnoldiana, Buellia epigaea, Endocarpon psorodeum*) and 1 for Moravia (*Absconditella lignicola*). *Belonia incarnata* is new for the Šumava Mts. *Diploicia canescens, Parmelia glabra* and *Parmelia revoluta*, species which had been missing in the Czech Republic for a long period of time, were recently rediscovered. Other included lichens are very rarely found and are known from only a few localities in the Czech Republic. A large number of records are from the Protected Landscape Area Křivoklátsko, in the Rakovník District.

Key words: Czech Republic, Křivoklátsko, lichens and lichenicolous fungi, distribution, rare species.

Kocourková-Horáková J. (1998): Nové, vzácné nebo přehlížené lišejníky z České republiky. – Czech Mycol. 50: 223–239

Z České republiky je zmiňováno 26 zajímavých druhů lišejníků a 2 lichenikolní houby. Jedenáct druhů je nových pro republiku – lišejníky *Absconditella delutula, Aspicilia moenium, Bacidina chloroticula, Epigloea medioincrassata, Lecanora pseudistera, Micarea botryoides, Phaeocalicium compressulum, Trapeliopsis pseudogranulosa, Xanthoria calcicola* a lichenikolní houby *Endococcus pseudocarpus* a *Zwackhiomyces sphinctrinoides*; čtyři lišejníky jsou nové pro Čechy – *Agonimia tristicula, Bacidina arnoldiana, Buellia epigaea, Endocarpon psorodeum* a jeden pro Moravu – *Absconditella lignicola*. *Belonia incarnata* je nový druh pro Šumavu. *Diploicia canescens, Parmelia glabra* a *Parmelia revoluta* představují nedávno zjištěné druhy, které byly po velmi dlouhou dobu nezvěstné v České republice. Další uvedené lišejníky jsou velmi zřídka sbírané, známé pouze z několika málo lokalit. Velký počet uvedených druhů byl zjištěn na okrese Rakovník v chráněné krajinné oblasti Křivoklátsko.

INTRODUCTION

The majority of localities, in which the treated species were collected, are situated in Central Bohemia in the Protected Landscape Area Křivoklátsko (Biosphere Reserve) in the districts Rakovník and Beroun. Several localities of species collected in these districts are situated outside the Biosphere Reserve. The other collected species originate from various localities in the Czech Republic.

The nomenclature is mostly according to Wirth (1995). The names of several other species are according to Döbbeler (1984), Grube and Hafellner (1990), Santesson (1993) and Vězda (1959).

The four-digit numbers preceding the dates signify coordinate squares of 10 to 6 minutes (MTB grid). Species marked * are reported from the Czech Republic for the first time. Specimens of all listed species are deposited in the herbarium of the Mycological Dept. of the National Museum Prague (PRM). The other used abbreviations are used for the collectors, J. K. or J. H. = Jana Kocourková-Horáková, Pavel Kocourek = P. K., and to emphasize occurrence with apothecia = with ap.!

SPECIES LIST

***Absconditella delutula** (Nyl.) Coppins et Kilias

CENTRAL BOHEMIA, Distr. Rakovník, Přílepy, near house on old wooden beams, together with *Thelocarpon laureri,* 340 m, 5847; 3.9.1995, leg. J. H. and P. K., det. J. H. (PRM 890427).

Even if *Absconditella delutula* seems usually to occur on shaded stones, compacted soil or turf (Purvis and al. 1992: 57), our specimen was found on old wooden roof beams, which had been lying in a place exposed to the sun for two years. According to Santesson (1993:7) this species was also collected on wood in Sweden. My specimen corresponds well in almost all features with the specimen found on stone from Vězda's exsiccate collection Lichenes Rariores Exsiccati no. 41; PRM 876528) which I studied. The apothecia are only more concave, which is probably caused by the difference in substrate, which is softer. The true excipulum consists of weakly conglutinated parallel hyphae; the paraphyses are longer than the asci, not conglutinated, 0.8–1.2 μm wide, sometimes branched at the apices, which are slightly swollen up to 3.2 μm. The asci are 2-spored, 35–50 x 7–10 μm large, spores 1-septate, 10–14 × 4–5.5 μm.

The species was observed again on the mentioned sites last spring (1997), but due to the proceeding succession there a more extensive covering of the beams by *Saccomorpha icmalea* and *Trapeliopsis flexuosa* was found. Apothecia of *Absconditella delutula* were observed rarely and in an initial state of development only. Further observation is necessary, as this species could possibly be characterized as ephemerous or weak in competition.

Another specimen probably of the same species was collected in the Czech Republic by Z. Palice, but a more detailed study of its anatomy is needed (pers. comm.).

Absconditella lignicola Vězda et Pišút

CENTRAL BOHEMIA, Distr. Rakovník, Bukov, near Liščí skály, at a tributary of the Očihovecký potok, on rotten stump, 420 m, 5847, 22.2.1997, leg. J. H. and P. K., det. J. H. (PRM 890426). – EASTERN BOHEMIA, Krkonoše Mts., Velká

Úpa, in the valley Vavřincův důl, near a forest track, on a lying decaying trunk, 5360, 810 m, 4.5.1997, leg. et det. J. K. (PRM 890822). – WESTERN MORAVIA, Distr. Jihlava, below top of the hill Vysoký Kámen, on a lying decaying trunk, 640 m, 6559, 14.10.1996 leg. et det. J. H. (PRM 890845). – SOUTHERN MORAVIA, Hostýnské vrchy Mts., below nature reserve Smrdutá, on stump near the brook Bystřička, 660 m, 6672; 13.5.1995, leg. J. H. (PRM).

The species had previously been reported only once from the Czech Republic and concerned a collection by Z. Palice from the Šumava Mts. in Southern Bohemia, distributed by A. Vězda (1995) in Lichenes Rariores Exsiccati no. 191. Recently the species has been collected by Z. Palice in a number of other localities in the Šumava Mts. and several collections have also been made on other sites in Bohemia including Central Bohemia.

It seems that the species is widely distributed even in polluted areas and not so rare as supposed. The species is often overlooked due to the minute size of its apothecia and their practical invisibility when wet. It usually occurs in shaded situations on the upper parts of lying decorticated trunks or the flat surface of stumps exposed to wet conditions for long periods during the year.

The species is new for Moravia.

Absconditella sphagnorum Vězda et Poelt

CENTRAL BOHEMIA, Distr. Rakovník, Podbořánky, by the pond Horní rybník, in peat bog, on mossy overhang with *Vaccinium myrtillus*, overgrowing an old rotten stump, on *Sphagnum denticulatum*, 490 m, 5946, 4.8.1995, leg. J. H. and P. K., det. J. H. (PRM 886281). – Ibid.: 23.9.1995, leg. J. H. and P. K., det. J. H. (PRM 886508). – Ibid.: 23.9.1996, leg. J. H. and P. K., det. J. H. (PRM 890441).

The species was typically collected on *Sphagnum denticulatum* in a small peat bog. The second collection of the same locality is partly intermixed with an unidentified species of *Micarea* in pycnidial state.

The species is new for Central Bohemia.

Agonimia tristicula (Nyl.) Zahlbr.

CENTRAL BOHEMIA, Distr. Rakovník, Krakovec, below the Krakovec castle, on soil and on dead mosses, 435 m, 5947; 17.9.1997, leg. P. K., det. J. K. (PRM 891434). – Distr. Rakovník, Protected Landscape Area Křivoklátsko, near the village Roztoky and the settlement Višňová, on rhyolite near road by the river Berounka, on mosses, 250 m, 5949; 28.9.1997, leg. J. K. and P. K., det J. K. (PRM 891433). – Distr. Beroun, Protected Landscape Area Křivoklátsko, near the village Trubín on the S slope of Trubínský vrch, on diabasic rocks, on mosses, 320 m, 6050; 23.3.1997,

leg. J. H. and P. K., det. J. H. (PRM 890442). – Distr. Beroun, near the village Sv. Jan pod Skalou-Sedlec, on slope of the Sedlecké skály rocks, on diabasic soil on bryophytes, 330 m, 6050; 22.4.1993, leg. J. H. (PRM 891432).

Another collected specimen:

GERMANY, BAVARIA, Frankenalb, between Eichhofen and Eilsbrunn, on dolomite, on mosses, 20.8.1995, leg. R. Türk and J. Horáková (PRM 886282).

The thallus of *Agonimia tristicula* is composed of minute grey-green or sometimes brownish-grey lobed squamules and large black perithecia up to 0.5 mm diam. with a plicate ostiolum. In microscopical thin cross-sections the one cell thick cortical layer was seen having globose papillae on cells of the upper surface of the thalli typical of this species. A detailed description of this species is given by Coppins (1978).

The species was reported from the Czech Republic only twice by A. Vězda (1959: 48, 1960: 260) from the Jeseníky Mts. It is widely distributed in Western Europe and it is also known from Central and Mediterranean Europe including the Azores and Canary Islands. According to Wirth (1995: 128) the species is therefore characterized as an atlantic boreal-mediterranean geographic element. It grows on bark and on mosses on old broad-leaved trees or on soil and on mosses on rocks. In the localities of the Czech Republic it was found growing on mosses or on soil among mosses covering loose stones in the lower part of xerothermic slopes of diabase, spilite and rhyolite rocks. These places are often partly shaded, wet, nutrient-rich and become basic due to numerous calcite filling in cracks in lower parts of these rocks. The calcite fillings originate from the content of calcite in the substrate, which have dissolved by rain water soaking through the rocks and are consequently being redeposited in cracks or as incrustations of mosses. *Aspicilia hoffmanii, Cladonia pocillum, Leprolomma* sp., *Peltigera didactyla,* and *Physcia caesia* were closely associated species in the above mentioned finds. On soil in cracks of rocks often the calciphilous lichens *Catapyrenium rufescens, Collema tenax, Endocarpon pusillum, Toninia sedifolia* occurred. No occurrence of *Agonimia tristicula* was observed as corticolous.

Agonimia tristicula is probably more common in the Czech Republic, especially in xerothermic limestone areas, but overlooked.

The species has recently also been collected during a BLAM field trip in Bavaria by R. Türk and J. Horáková in the above mentioned locality.

New for Bohemia.

Anaptychia ciliaris (L.) Körber ex Massal.

SOUTHERN BOHEMIA, Třeboň, on dike of the lake Vyšehrad, on bark of *Quercus robur,* 6955, c. 350 m, 11.7.1996, leg. J. H. and P. K., det. J. H. (PRM). – WESTERN MORAVIA, Českomoravská vrchovina, between Žďár nad Sázavou and

Velké Meziříčí, 2,5 km N of Záseka, on bark of *Acer platanoides*, 550 m, 6561, 22.5.1996, leg. and det. J. H. and P. K. (PRM).

In Western Moravia the species was observed in a number of about 20 living thalli in the locality, on the bark of three solitary standing maples. Only one damaged thallus was seen in the locality near Třeboň on an oak in the Protected Landscape Area Třeboňsko in Southern Bohemia.

This species is presently very rare in the Czech Republic. Its considerable decrease in the Czech Republic was already recorded by Anders in Northern Bohemia around 1935 (Anders 1936: 484), where it still had a rich occurrence in the twenties of this century. The species has been missing from Northern Bohemia for a long time.

The decrease of this species is caused mainly by a high degree of air pollution and acid rain, which have greatly affected the natural environment. Therefore, it was listed among the threatened lichen species of the Czech Republic and classified as vulnerable by Liška and Pišút (1995) due to the great decrease in its occurrence in this country.

For further information on its current distribution in the Czech Republic see Liška (1990: 44, 1994: 16).

***Aspicilia moenium** (Vainio) Thor et Timdal

CENTRAL BOHEMIA, Distr. Rakovník, Hořovičky, on banks of the brook Očihovecký potok, near pond, on concrete, 345 m, 5847, 20.1.1996 (PRM 887765). – Distr. Rakovník, Nový Dvůr u Chrášťan, on concrete by pond, 380 m, 5848, 27.6.1996, leg. J. H. and P. K., det. J. H. (PRM) – Distr. Rakovník, Chrášťany, at forest margin near gamekeeper's lodge Bory, on vertical mortar-stone wall, 380 m, 5848, 17.8.1996, leg. J. H. and P. K., det. J. H. (PRM). – Distr. Rakovník, in the town Rakovník, on concrete wall at the railway station, 320 m, 5948, 17.8.1997, leg. et det. P. K. (PRM 891428). – SOUTHERN BOHEMIA, Šumava Mts., Distr. Klatovy, in valley of the brook Hamerský potok, c. 900 m, 6947, 20.9.1990, leg. J. H. (PRM). – EASTERN BOHEMIA, Krkonoše Mts., Benecko, on vertical surface of wall, on concrete, 790 m, 5359, 10.9.1989, leg. et det. J. H. (PRM 756791). – Orlické hory Mts., Bartošovice v Orlických horách, by road, on mortar-stone wall, 595 m, 20.4.1996, leg. J. H. (PRM 887773). – SOUTHERN MORAVIA, Distr. Blansko, Křtiny, in valley of the brook Křtinský potok, on vertical wall of bridge pillar, 400 m, 2.3.1989, leg. J. Horáková and A. Vězda, det. A. Vězda (PRM).

The species had earlier not been reported from the Czech Republic, although a number of localities have been known for a longer time and the species is considered widespread and common here. It occurs in wet situations or nearby water, often on vertical mortar-stone walls in landscape depressions or on bridges over brooks.

Bacidina arnoldiana (Körber) V. Wirth et Vězda

CENTRAL BOHEMIA, Distr. Rakovník, Kolešovice, in depression near railway station, on *Salix alba*, (with ap.!), 5847, 31.3.1996, leg. J. H. and P. K., det. J. H. (PRM 887671).– Distr. Rakovník, Bukov, near Liščí skály rocks, by a tributary of the brook Očihovecký potok, on rotten stump, 420 m, 5847, 1.6.1996, leg. J. H. (PRM). – Protected Landscape Area Křivoklátsko, Distr. Rakovník, below Čertova skála rock, on bark of *Robinia pseudoacacia,* (with ap.!), 275 m, 6048, 26.5.1996, leg. J. H. and P. K., det. J. H. (PRM). – Distr. Rakovník, Protected Landscape Area Křivoklátsko, below castle Týřov, on bark of *Acer campestre,* 6048, 360 m, 5.7.1996 (PRM). – Distr. Rakovník, Protected Landscape Area Křivoklátsko, between Křivoklát and Městečko, in valley of the brook Rakovnický potok, on *Salix* sp., 270 m, (with ap.!), 5949, 11.4.1996, leg. J. H. (PRM 887766). – Distr. Rakovník, Slabce, in valley SE of the village, near pond, on bark of *Salix* sp., (with ap.!), 310 m, 6048, 27.4.1996, leg. J. H. and P. K., det. J. H. (PRM 890494, 890495, 890496, 890497, 890499). – Prague, Zbraslav, in orchard near the oxbow Krňák of the Vltava river, on bark of *Salix alba,* 220 m, 6052, 25.3.1996, leg. J. H. and P. K., det. J. H. (PRM 887679).

The generic name *Bacidina* Vězda has recently been proposed for conservation (Ekman 1996).

The species was previously reported from the Czech Republic only from Moravia by Kovář (1905). It is particularly characterized by white conspicuous pycnidia and the dark coloured red-brown hypothecium distinguishing it from other species of this genus growing on the bark of trees.

Bacidina arnoldiana, as it now seems, could be considered a common species, but is easily overlooked, especially when lacking developed fruitbodies. It was often observed occurring in rather shaded situations in more polluted areas. It prefers bark of old mossy leaning trunks of *Salix* spec.div. especially lining brooks, but is also found in rather open habitats. The species is often observed in pycnidial state only. Although the species should prefer calcareous substrate no such find has been made by me.

New for Bohemia.

***Bacidina chloroticula** (Nyl.) Vězda et Poelt

CENTRAL BOHEMIA, Prague, Zbraslav, in an orchard near the oxbow Krňák of the Vltava river, on bark of *Malus domestica* on tree base and on small stones, 195 m, 6052, 23.3.1996, leg. J. H. and P. K., det. J. H. (PRM 890429, 890430). – Prague, Podhoří, in deciduous forest, on west exposed stony slope, on slate, 230 m s.m., 5852, 24.10.1997, leg. et det. J. K. (PRM). – Prague, Troja, on wall of Botanical Garden, on concrete, 250 m, 5852, 27.10.1997, leg. et det. J. K. (PRM).

The species seems to be toxitolerant just like the above mentioned *Bacidina arnoldiana*. It can be distinguished in having a much more inconspicuous thallus, which is thin, scurfily granular, dull to dark green, with minute apothecia 0.1–0.2 mm in diam., which become pale grey to brown yellow, often growing closely together, but it is primarily recognized by its pale hypothecium. The true excipulum is colourless, composed of swollen cells with up to 7 μm large lumina.

The species was found in rich quantities on slate stones on the bank of an oxbow of the Vltava river. In other localities it was seen growing on concrete and also on bark of *Malus* in lower parts close to the ground.

Belonia incarnata Th. Fr. et Graewe ex Th. Fr.

SOUTHERN BOHEMIA, Šumava Mts., between Horská Kvilda and Kvilda, in peat bog near Jezerní slať, on mosses, 990 m, 6947, 2.10.1990, leg. J. H. (PRM 886330). – Šumava Mts., near Horská Kvilda, in the peat bog Horskokvildská slať, 1070 m, 6947, 6.6.1993, leg. J. H. (PRM 886352).

The distribution of this species in the former Czechoslovakia was given by Vězda (1959 and 1970: 314–316). In the first contribution it was cited as *Belonia russula* var. *terrigena* (Eitn.) Keissl. The known distribution in the Czech Republic includes Sudeti occident. (Krkonoše) and Sudeti orient. (Jeseníky).

The above quoted collection of *Belonia incarnata* was discovered in the Šumava Mts., in an old trench used for military purposes years ago. It was growing on mosses covering wooden logs. In its close proximity were the lichens *Bryophagus gloeocapsa* and *Baeomyces rufus* with thalli modified by the parasitic lichen *Arthrorhaphis grisea* and associated with *Thelocarpon epibolum* (Horáková 1998 in press), and with the bryophytes *Nardia scalaris, Dicranella heteromalla* and *Pohlia nutans*.

The species is new for the Šumava Mts.

Buellia epigaea (Pers.) Tuck.

CENTRAL BOHEMIA, Prague, Velká Chuchle, nature reserve Homolka, on top of limestone rocks, on compacted soil among mosses, 280 m, 5952, 3.1.1994, leg. J. H. (PRM).

Buellia epigaea is similar to *Buellia asterella* Poelt et Schulzer. Both species are growing on dry basic soil.

Buellia epigaea is easily distinguished by the much larger and spores verrucose from the beginning and regulary 8-spored asci contrary to 4-spored asci in *Buellia asterella*. Another distinguishing character is the K – negative reaction of the thallus in *B. epigaea*.

According to Wirth (1995: 195–196) *B. epigaea* prefers soils on gypsum or overgrows mosses often together with *Fulgensia bracteata* in a gypsum variety of

the association Toninio-Psoretum. It was found in the above mentioned locality at the top of a small natural terrace filled with humus on limestone rock together with *Toninia sedifolia*. *Buellia asterella* occurs on dry, basic soil in cracks on limestone or dolomite from the lowlands to the mountains.

The only previously known locality of this species in the Czech Republic on conglomerate rocks on Tábor hill close to Moravský Krumlov in SW Moravia is given by Poelt and Schulzer (1974).

The species is new for Bohemia.

Cetraria sepincola (Ehrh.) Ach.

WESTERN BOHEMIA, Krušné hory Mts., about 2 km NE of the village Hora Sv. Šebestiána, in the peat bog Novoveské polesí with *Betula* and *Alnus*, on a branch of *Salix*, 750 m, 5445, 17.5.1996, leg. J. H. (PRM 890505). – **Southern Bohemia,** Českomoravská vrchovina Mts., Distr. Pelhřimov, Pelec, 630 m, on bark of *Prunus avium*, 6656, 24.7.1986, leg. J. H. (PRM 886399).

This formerly widespread lichen in uplands and mountain areas is presently very rare in the Czech Republic because of air pollution. It was nevertheless found in one of the very polluted and for foliose epiphytic lichens inhospitable areas of this country, in Western Bohemia, in the Krušné hory Mts. Not only *Hypogymnia physodes*, but also original spruce forests are now completely missing there. This lichen was collected on an open plateau exposed to air pollution in a small landscape depression, at the margin of a peat bog overgrown by heavily damaged trees of *Betula, Alnus* and *Salix*. Among the other associated species seen were: *Hypogymnia physodes, Parmeliopsis ambigua* and *Platismatia glauca*. *Lecanora subaurea*, an interesting saxicolous species, was also observed, together with *Lecanora soralifera* and *Stereocaulon nanodes* on metal-rich, siliceous stones along the margin of the peat bog.

The locality of *Cetraria sepincola* in the Českomoravská vrchovina Mts. mentioned by Liška and Pišút (1995) is the same as given above.

The species is listed here because of its strong decrease in localities as mentioned in the Red Book of Lichens of the Czech and the Slovak Republic, where it is placed in the category of vulnerable species. The present distribution of this species is given by Liška (1996).

Diploicia canescens (Dickson) Massal.

CENTRAL BOHEMIA, Distr. Rakovník, below steep W exposed wall of the Čertova skála rock, on spilite rocks, 285 m, 6048, 1.6.1996, leg. J. H. and P. K., det. J. H. and P. K. (PRM 890501).

The species has recently been rediscovered in the lower part of the western wall of Čertova skála. It is confirmed at this known locality, where it had been collected

by J. Suza in 1939 (Suza 1950). *Diploicia canescens* is listed in the Red Book of Lichens of the Czech and the Slovak Republic and classified as rare (Liška and Pišút 1995). The above mentioned locality is the only one currently known, but probably it still occurs in other localities discovered in the past, where it grew on rocks.

Endocarpon psorodeum (Nyl.) Blom. et Forss.

CENTRAL BOHEMIA, Distr. Rakovník, on steep slope of Čertova skála rock, on soil in spilite rock slot, 280 m, 6048, 27.5.1996, leg. J. H. and P. K., det. J. H. (PRM 890428). – Distr. Rakovník, Křivoklát, on vertical rock by a road, on volcanic rock, 280 m, 5949, 13.4.1996 (PRM 887778).

This lichen has also recently been discovered in the Czech Republic by B. Gruna in S Moravia, in the National Park Podyjí. The species resembles *Endocarpon adscendens,* but has more regularly placed overlapping squamules, which are not turned upwards. *Endocarpon psorodeum* grows on acidic rocks contrary to *Endocarpon adscendens*.

The species is new for Bohemia.

***Endococcus pseudocarpus** Nyl.

CENTRAL BOHEMIA, Protected Landscape Area Křivoklátsko, Distr. Rakovník, on steep slope of the Čertova skála rock, on soil in spilite rock slot, on *Peltula euploca*, 280 m, 6048, 10.4.1996, leg. J. H. and P. K., det. J. K. (PRM 891442, under *Zwackhiomyces sphinctrinoides*).

Endococcus cf. *pseudocarpus* Nyl. was found on *Peltula euploca*, the type host containing blue-green alga, together with the below mentioned *Zwackhiomyces sphinctrinoides* on *Lecanora pseudistera*, in the same collection on a small fragment of the rock. According to Triebel (1989: 97), who revised Nylander's holotypus, *Endococcus pseudocarpus* Nyl. could be considered as a synonym of *Endococcus perpusillus* Nyl. described from *Schaereria fuscocinerea*. It is the question, if both these taxa could belong to one lichenicolous fungus. The host *Schaereria fuscocinerea* contains a green chlorococcoid phycobiont (*Trebouxia)* as the symbiotic alga and occurs in high mountain and subalpine elevations, *Peltula euploca* contains blue-green alga and occurs in lowlands in xerothermic habitats. According to the differences in microscopical features of the revised specimens of the herbarium in Graz (GZU) we found, that *Endococcus perpusillus* occurs on a wide spectrum of hosts with a green chlorococcoid phycobiont, the current wide conception of that species and of the whole genus *Endococcus* needs a taxonomic revision.

The ascospores of our taxon are 1-septate; rather light chestnut brown, with the upper cells ellipsoid, shorter and wider than the lower ones, more round at apex

and at one-half to two thirds of the length to the septum the widest; the lower cells elongated, somewhat caudate; the septum a little thickened, up to 1 μm; contents of the spores with a lot of small drops; 15.5–20 × 5.5–6.5 μm diam.

***Epigloea medioincrassata** (Grumm.) Döbb.

CENTRAL BOHEMIA, Prague, in the valley Divoká Šárka, on plateau of Kozákova skála rock, on plant debris, 340 m, 5951, 28.10.1994, leg. J. H. (PRM 886591).

Epigloea medioincrassata was described in detail by Döbbeler (1984), who made the combination with the genus *Epigloea*. It is characterized by a thallus formed only by an inconspicuous gelatinous thin algal film, with sessile dark brown to black globose perithecia 110–190 μm diam., with a flattened apex. Perithecia are covered by a thin colourless, gelatinous layer; the apex is circularly swelling, 20 μm thick. The species is above all characterized by its 8-spored asci exhibiting a JJK+ positive reaction, dark blue in the apical part and medium blue in all the other parts, and ascospores which are 3-septate, ellipsoid to spindle-shaped, (18-)24–33(-38) × 3.5–5 μm diam., with apical thread-like appendages, which are up to 4 μm long. In the collected specimen a few ascospores with 5 septa were also found.

In our locality this species was associated with *Thelocarpon laureri* (Horáková 1998 in press).

***Lecanora pseudistera** Nyl.

CENTRAL BOHEMIA, Protected Landscape Area Křivoklátsko, Distr. Rakovník, 1 km NE of Nezabudice, Nezabudické skály rocks, on slate rocks, on loose stone, 320 m, 5948, 3.9.1997 (PRM 891435). – Distr. Rakovník, on steep slope of Čertova skála rock, on soil in spilite rock slot, 280 m, 6048, 10.4.1996, leg. J. H. and P. K., det. J. H. (PRM 891442, sub *Zwackhiomyces sphinctrinoides*). – Distr. Beroun, near the village of Trubín, on the SW slope of Trubínský vrch, on diabasic rocks, 340 m, 6050; 23.3.1997, leg. J. H. and P. K., det. J. H. (PRM 890445).

The species was collected in dry xerothermic localities on steep slopes of rather basic and nutrient-rich acid rocks. According to Wirth (1995: 481) and in correspondence with our observations *Lecanora pseudistera* occurs in habitats in communities with *Rhizocarpon disporum* and *Lecanora demissa*. In our localities it was found with the following accompanying lichens and lichenicolous fungi: *Agonimia opuntiella* (syn. *Phaeophyscia opuntiella* – see Vězda 1997), *Candelariella vitellina, Lecanora demissa, Lecanora garovaglii, Leproloma membranaceum, Melanelia loxodes, Peltula euploca* (with the above listed *Endococcus* cf. *pseudocarpus* on thallus squamules), *Phaeophyscia orbicularis, Rhizocarpon disporum, R. geographicum, Xanthoparmelia conspersa* and *Zwackhiomyces sphinctrinoides* on *Lecanora pseudistera*. *Endococcus* cf. *pseudocarpus* was mentioned above, *Zwackhiomyces sphinctrinoides* is listed below.

L. pseudistera is partly similar to *L. campestris*. In our localities it could be well distinguished by the orange-brown colour of its apothecia and by the light grey, greenish tinged colour of the thallus. Areoles of the thallus are frequently more squamulose than bullate, as is the case in *L. campestris*. The thalline excipulum of apothecia in mature state is generally persistent but becomes thinner with age, a true excipulum is developed and persistent. In the microscopical cross-section of apothecia *L. pseudistera* differs in the groups of large crystals in the medulla of the thalline excipulum which do not dissolve in a KOH solution contrary to the small crystals present in the excipulum of apothecia of *L. campestris*.

The species seems to be very rare. From Central Europe it is reported from Germany only and its distribution is characterized as boreal-central European with a more southern distribution. According to Clauzade and Roux (1985) it is missing in all of Western Europe, but it was recently found in Portugal (Alonso and Egea 1995).

The species is considered conspecific with *L. ripartii* sensu Poelt, but not sensu Nylander according to Wirth (1995: 481). Under that name it was recorded in Sardinia (Nimis, Poelt 1987).

***Micarea botryoides** (Nyl.) Coppins

WEST BOHEMIA, Krušné hory Mts., Nejdek, on slope of Blatenský vrch, in the Vlčí jámy pits, on vertical rock, on granite, 1000 m, 5642; 24.6.1993, leg. J. H. (PRM, 886910).

The species, collected in rich quantities in the mentioned locality is prepared to be issued in A. Vězda's Lichenes rariores exsiccati. The locality is exceptional due to the presence of ice covered walls of the pits until the summer.

Micarea botryoides is well characterized by minute stipitate black pycnidia. Up to 8 pycnidia were observed in the pycnidiophores. The growth of pycnidiophores is in fact enabled by the dying off of pycnidia situated below them and newly arrising pycnidia on the older ones. In our material anastomosing of pycnidiophores growing in close proximity to each other was observed.

This interesting species has been discovered quite recently in a number of localities in the Šumava Mountains by Z. Palice (in prep.). Localities situated closest to the territory of the Czech Republic were discovered by Berger and Türk (1993) in Upper Austria in the Danube valley.

Micarea lithinella (Nyl.) Hedl.

CENTRAL BOHEMIA, Distr. Rakovník, Bedlno, on S slope of Tobiášův vrch, on small stones on the ground among roots of fallen trunk, together with *Thelocarpon laureri*, 485 m, 5846, 19.3.1997, leg. J. H. (PRM 890450).

This species was observed typically growing with *Trapelia* sp. and *Thelocarpon laureri*. The apothecia in our collection are dull pink-yellow, the hypothecium is straw-yellow. Ascospores aseptate, 8–10 × 3,5–4.5(-5) μm, ovoid to fusiform-ellipsoid, paraphyses simple, up to 1,2 μm wide. Hymenium in cross-section K-, thallus C-.

According to literature data concerning the occurrence of lichen-forming fungi in the Czech Republic (Vězda 1980) this species was previously known from Železné hory Mts., Eastern Bohemia (Kalenský 1906). This specimen has not been seen by me. In the Czech Republic the species was recently also collected by Z. Palice (in press.).

The species is probably more common in the Czech Republic but overlooked.

Omphalina hudsoniana (Jenn.) Bigelow

CENTRAL BOHEMIA, Distr. Rakovník, Podbořánky, Bor forest near peat bog, on peat, 520 m, 5946, 7.7.1996, leg. J. H. and P. K., det. J. H. (PRM 890418).

Omphalina hudsoniana and *O. umbellifera* were found growing together in the same locality in rather open areas in a spruce forest.

This is one of the lowest situated localities of this otherwise well known and widespread species in mountains in the border areas of the Czech Republic.

The species had so far not been reported from Central Bohemia.

Omphalina umbellifera (L.:Fr.) Quélet

CENTRAL BOHEMIA, Distr. Rakovník, Podbořánky, Bor forest, on peat, 520 m, 5946, 7.7.1996 (PRM 890421). – Prague, in the valley Dolní Šárka, near the church of Sv. Matěj, on a N slope with *Calluna*, on the ground, 5852, 9.1994, leg. J. Váňa (PRM).

The species was found in the Podbořánky locality on an inconspicuous rather open place in a partly boggy spruce forest near a peat bog, growing together with *Omphalina hudsoniana* and some *Cladonia* species.

Parmelia glabra (Schaerer) Nyl.

NORTH-EASTERN MORAVIA, Protected Landscape Area Beskydy Mts., Horní Lomná, on bark of *Fraxinus excelsior*, 605 m, 6477, 28.10.1995, leg. J. H. and P. K., det. J. H. (PRM 887602).

The specimen represents the only currently known collection from the Czech Republic, although the observed thallus was about 20 cm in diam. The species was considered probably extinct in the Czech Republic. The species is similar to

P. acetabulum, but it is characterized by a darker brown, not dark greyish green-brown thallus. It is distinguished from other brown *Parmelia* species by the C+red reaction of the medulla and the echinulate margin of the apothecia.

The fact that in only two days of investigation in this area several presently rare species were found, is due to the only slight impact of air pollution. Other species observed here were *Parmelia acetabulum, Parmelia submontana, Parmelia tiliacea, Ramalina fraxinea, Ramalina fastigiata, Ramalina farinacea, Usnea filipendula, Usnea hirta, Physconia distorta, Physconia enteroxantha, Hypogymnia bitteri* and the below mentioned *Phaeocalicium compressulum.*

Parmelia glabra was still one of the most common epiphytic lichens in the fifties of this century in warmer regions of Moravia.

Parmelia revoluta Flörke

CENTRAL BOHEMIA, Distr. Rakovník, 1 km NE of Nezabudice, Nezabudické skály, on slate rocks, on loose stone, 320 m, 5949, 13.4.1996, leg. J. H. and P. K. (PRM 887769).

The species had not been seen in the Czech Republic for long a time. In 1996 it was collected on a steep slope of shale rocks above the river Berounka, where it probably occurred in the past on the bark of trees when the air was less polluted. This formerly widely distributed species is very likely extinct in all of the previously known localities in the Czech Republic. A small piece of thallus was collected to confirm that the species exhibits a C+ positive pink-red reaction of the medulla.

This is the only currently known locality of this species in the Czech Republic.

Parmelia submontana Nádv. ex Hale

EASTERN BOHEMIA, Železné hory Mts., Horní Bradlo, on bank of the Chrudimka river, on mossy bark of *Populus nigra,* 420 m, 6260, 8.5.1995, leg. J. H. (PRM 887609). – NORTH-EASTERN MORAVIA, Protected Landscape Area Beskydy Mts., Horní Lomná, on mossy bark of *Tilia,* 605 m, 6477, 28.10.1995, leg. J. H. (PRM 887470).

The species is very similar to *Parmelia sulcata* and *P. subrudecta.* From the former it differs by a combination of the following characters: loosely attached, more elongated, little branched lobes with involute lateral margins and raised apices, small orbicular soralia with isidia-like soredia and fewer rhizines that are simple or only rarely forked (Purvis et al. 1992). From the latter species it differs mainly by the dark lower surface of the thallus. *Parmelia sulcata* does not become so green when wet as *P. submontana.* It usually grows in lower parts of exposed mossy trunks of *Acer* and *Alnus*, preferably in moist conditions of mountain areas. It is distributed in upland and mountain areas of Central, Eastern and South-Eastern Europe, where it is relatively widely and rather commonly distributed.

The species is presently very rare in the Czech Republic because of air pollution. It currently occurs, except for the above mentioned localities, in one locality near Chudenice in Western Bohemia, in c. 5 recently discovered localities in the Šumava Mts. and in the Jihlavské vrchy Mts. and Jeseníky Mts. in Moravia in one locality each. In the Red Data Book of the Czech and Slovak Republics it is classified as an endangered species (Liška and Pišút 1995).

***Phaeocalicium compressulum** (Nyl. ex Vainio) A. Schmidt

NORTH-EASTERN MORAVIA, Protected Landscape Area Beskydy Mts., Horní Lomná, 2 km SW of the village, on bank of the Lomná brook, on twigs of *Alnus viridis*, 700 m, 6477, 28.10.1995, leg. J. H. and P. K., det. J. H. (PRM 887564).

Phaeocalicium compressulum occurs on thin living or dying twigs of *Alnus viridis* only. It was found when looking for the unlichenized species *Stenocybe pullatula*, another representative of the family Caliciaceae.

Phaeocalicium compressulum is characterized by compressed apothecia with a thicker stalk than *Stenocybe pullatula*. The asci are cylindrical, in the upper part with a thickened wall, the spores are uniseriately arranged in the asci, grey-brown, shorter and narrower than in *Stenocybe pullatula*, 9–14 × 4–5.5 μm diam.

Stenocybe pullatula has very subtile, slender apothecia up to 0,8 mm in height only without a distinct compression of the cups, cylindrical asci uniformly thickened at the apex and ascospores of the same colour as the preceding species, 13–18 × 4–5 μm large. It occurs on withered or dying slender twigs of *Alnus incana* and *Alnus glutinosa*.

Thelomma ocellatum (Körber) Tibell

SOUTHERN BOHEMIA, Šumava Mts., Filipova Huť, on upper part of fence post, 1130 m, 6947, 5.6.1993, leg. J. H. (PRM 89420). – Šumava Mts., Milná near Frymburk, on upper part of fence posts, 770 m, 7250, 13.5.1995, leg. J. H. and P. K., det. J. H. (PRM 887036).

This representative of the family Caliciaceae has recently been distributed in Lichenes rariores exsiccati no. 189 by Vězda (1995) as a species collected for the first time in the Czech Republic. Recently it was collected on logs of an older fence by a group of Czech and Moravian lichenologists investigating a number of localities in the Šumava Mts. The previously found specimens are those mentioned above.

***Trapeliopsis pseudogranulosa** Coppins et James

NORTHERN BOHEMIA, Lužické hory Mts., between Horní Podluží and Jířetín pod Jedlovou, on grassy slope, in upper part of phonolitic stone wall on terrace, on

mosses, 500 m, 5153, 17.4.1993, leg. J. H. (PRM 887057). – SOUTHERN BOHEMIA, Distr. Benešov, on slope of Mt. Velký Blaník, in beech forest, on soil, 540 m, 6355, 24.6.1995, leg. J. H. and P. K., det. J. H. (PRM 887061).

This species described by Coppins (1984) was not earlier reported from the Czech Republic. It should be common and widely distributed according to the distribution given in the mentioned paper. It may occur in Czech and Moravian herbaria under various names in collections made by earlier lichenologists.

Trapeliopsis pseudogranulosa is characterized by most usually green-grey thalli with farinose soralia, which can form up to 20 cm large patches. The yellow-orange patches of the thalli quickly turn purple after adding a KOH solution. Apothecia are usually absent. Both reported finds are sterile. The species grows on various acidic substrates in humid, shaded situations.

Umbilicaria subglabra (Nyl.) Harm.

SOUTHERN BOHEMIA, Šumava Mts., Mt. Valy, on rocky SW slope, on granite, 990 m, 6847, 1.6.1989. leg. J. Horáková and A. Vězda (PRM).

The above detailedly located site of this species is the one briefly mentioned by Liška et Pišút (1995). The distribution of this species in the former Czechoslovakia is given by Lisická (1980).

This is the second currently known Czech locality of this species classified as rare in the Red Data Book.

***Xanthoria calcicola** Oxner

CENTRAL BOHEMIA, Protected Landscape Area Křivoklátsko: Distr. Rakovník, Křivoklát, on upper part of old brick post in a fence, 270 m, 5949, 20.5.1997, leg. et det. J. K. (PRM 891431). – Distr. Beroun, Hudlice, near the village Stará Ves, on S slope of diabasic rocks, 340 m, 6049, 23.3.1997, leg. J. H. and P. K., det. J. H. (PRM 890432).

The species is characterized by a red-orange or red-brown thallus, the upper surface of which is formed by convex, coarse granules. Apothecia are developed rather rarely. It grows in dry, warm, open sites in lowland to submontainous areas, especially on calcareous rock or nutrient-rich stonework.

Regenerating damaged thalli of *Xanthoria parietina* can sometimes be confused with this species.

Zwackhiomyces sphinctrinoides Nyl.

CENTRAL BOHEMIA, Protected Landscape Area Křivoklátsko, Distr. Rakovník, on steep slope of Čertova skála, on soil in spilite rock slot, matrix: *Lecanora pseudistera*, 280 m, 6048, 10.4.1996, leg. J. H. and P. K., det. J. K. (PRM 891442).

A parasymbiotic fungus was observed on the areoles of the thallus *Lecanora pseudistera* collected on the above mentioned locality, most likely belonging to *Zwackhiomyces sphinctrinoides* (Zwackh) Grube et Hafellner, species of the genus established by Grube and Hafellner (1990) for a group of several species formerly placed in an ascomycete called "*Didymella*" *sphinctrinoides*. The genus *Zwackhiomyces* is above all characterized by a granular castaneous pigment intercellularly deposited in the wall of perithecioid subglobose ascomata composed of round bilaterally compressed cells; a hamathecium of filiform, richly branched and anastomosed elements; fissitunicate, cylindrical 4-, 6- or 8-spored asci with a wall of several layers with endotunica gradually thickened to apex; 1-septate, elongate-ellipsoid hyaline verruculose spores constricted at the septum and cells of somewhat different size with the upper cell larger, broader and rounder at apex than the lower. The size of asci 70–100 × 10.5–14 μm and ascospores 16–23 × 4.5–8 μm, given by Grube and Hafellner (1990: 328) for *Zwackhiomyces sphinctrinoides*, is somewhat larger compared with the measurements of our material, where asci with mature spores were only 53–60 × 10–12.5 μm in size and spores only close to the lower limit of 15–16.5 × 5.5–6.5 μm. The small size of the ascospores can be caused by the number of 8 spores observed in the asci, which should be more usually 6-spored. In all other features our material corresponds with the description given by Grube and Hafellner for this species. Until now the fungus had been known from the type locality only, where it was collected on several species of lichens, but originally described as growing on *Lecanora campestris*, which is closely related to *L. pseudistera* (Grube and Hafellner 1990: 327).

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Jiří Moravec fifty-five years old

VLADIMÍR ANTONÍN

Moravian Museum Dept. of Botany, Zelný trh 6, CZ-659 37 Brno Czech Republic

Jiří Moravec was born in Mladá Boleslav, Czech Republic, on 29 October 1942. In 1971 he moved to the city of Adamov near Brno, where he has lived until present. Working in machinery industry, he is an amateur in both mycology and entomology.

From his childhood Jiří has been connected with nature and wildlife. He is concerned with mycology and entomology, both on a high scientific level. In the field of entomology he is a specialist in the fam. Cicindelideae. However, he has spent more time on studies in mycology. In the beginning of his mycological activities, he started to study boletes, but very soon his attention changed to Discomycetes under advice and help of Dr. Mirko Svrček, CSc. and Prof. Richard P. Korf and other world top specialists in that group. Gradually Jiří became a worldwide high reputable specialist in the taxonomy of operculate Discomycetes. He has published widely on this group, but especially on the family Pyronemataceae. His research is based mostly on his own collections and on his examination of relevant type material. He has stressed the importance of the ascospore ornamentation when studied under light microscope but also SEM microphotographs of ascospores have accompanied his papers published during the last ten years. His papers on the genera *Marcelleina* and *Sowerbyella* are of a monographic character. However, his research has centred particularly on the delimitation of the genus *Cheilymenia* and the elucidation of its species. He discovered different types of the ornamentation on the separable outermost ascospore sheath of many species and this ornamentation was proved by SEM for the first time in his papers and used for the infrageneric classification. Jiří has published a large number of papers on *Cheilymenia* and its allies and become the world authority on this genus. He has described a number of new taxa in his papers, and several other new species and genera of Discomycetes were described in joint papers with M. Svrček (Prague), B. M. Spooner (Kew), T. Schumacher (Oslo), D. Benkert (Berlin), Cao Jin-zhong (Teiyuan) and R. Dougoud (Fribourg). His rich international collaboration has been also with other mycologists e.g. Ann Bell (Wellington), Irma Gamundí de Amos (San Carlos de Bariloche), S. C. Kaushal and R. Kaushal (Chandigarh), N. Lundquist (Stockholm), P. Blank (Thayngen), B. Kullman (Tartu), A. Raitviir (Tartu), R. W. G. Dennis (Kew), K. Furuya (Yokohama), H. Dissing (Copenhagen), J. van Brummelen (Leiden), R. Kristiansen (Torp) and others.

One new genus, *Moravecia* Benkert, Caillet & Moyne, and two new species, *Peziza moravecii* Svrček and *Octospora moravecii* Khare has been dedicated to Jiří.

His other hobby, travelling, is connected with both of his fields of interest. His field excursions are concerned especially with Africa (Egypt, Kenya, Tanzania, Zambia, Botswana, Namibia, and Madagascar). However, he also collected fungi in Europe, China, South-East Asia and New Zealand.

Besides activities held by the Czech Scientific Society for Mycology, he actively participated in several international and European mycological congresses, e.g. in Tokyo, including the Sanshi Imai Discomycete Workshop and Foray in Nikko (IMC3, 1983), Regensburg (IMC4, 1990), and Tallin (CEM, 1989). Jiří is also member of the Czech Scientific Society for Mycology, and the British Mycological Society.

On behalf of his friends and colleagues I wish him good health and successful mycological and entomological studies in the years to come.

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