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## Taxonomic revision of the genus *Cheilymenia* – 7. A reassessment of the sections *Paracheilymeniae* and *Raripilosae*.

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Moravec J. (2003): Taxonomic revision of the genus *Cheilymenia* – 7. A reassessment of the sections *Paracheilymeniae* and *Raripilosae*. – *Czech Mycol.* 54: 113–133

Two of the sections of the genus *Cheilymenia* Boud., sect. *Paracheilymeniae*, and sect. *Raripilosae*, originally proposed in the infrageneric arrangement published in Moravec (1990) were reassessed. The section *Paracheilymeniae* is newly subdivided into three series: ser. *Paracheilymeniae* (introduced in detail in Moravec 1992), ser. *Raripilosae* (Moravec 1990) stat. n. (originally the separate section *Raripilosae*) and the here newly proposed monotypical ser. *Glabrae* ser. n. Two species of the ser. *Raripilosae*, *Cheilymenia raripila* (W. Phillips) Dennis, *Cheilymenia coprogena* (Berk. et Broome) Rifai and the type species of the new ser. *Glabrae* ser. n., *Cheilymenia bohémica* (Velen.) J. Moravec, are treated in details. All the taxa are illustrated with line drawings, photographs and SEM photomicrographs. Examination of the type material [K(M)] has revealed that *Lasiobolus dubius* Starbäck is a later synonym of *Cheilymenia raripila*.

**Key words:** *Cheilymenia*, section *Paracheilymeniae*, series *Paracheilymeniae*, series *Raripilosae*, series *Glabrae* ser. n., section *Micropilosae*, taxonomic revision, Discomycetes: Pezizales, Pyronemataceae.

Moravec J. (2003): Taxonomická revize rodu *Cheilymenia* – 7. Nové hodnocení sekcí *Paracheilymeniae* a *Raripilosae*. – *Czech Mycol.* 54: 113–133

Jsou přehodnoceny dvě ze sekcí rodu *Cheilymenia* Boud., sect. *Paracheilymeniae* a sect. *Raripilosae* původně navržené autorem ve vnitrodruhovém uspořádání rodu (Moravec 1990). Sekce *Paracheilymeniae* je zde rozdělena do tří serií: ser. *Paracheilymeniae* (podrobně představená v revizi Moravec 1992), ser. *Raripilosae* (Moravec 1990) stat. n. (původně samostatná sekce) a zde nově navržená ser. *Glabrae* ser. n. Dva druhy ser. *Raripilosae* – *Cheilymenia raripila* (W. Phillips) Dennis a *Cheilymenia coprogena* (Berk. et Broome) Rifai a typový druh ser. *Glabrae* ser. n. – *Cheilymenia bohémica* (Velen.) J. Moravec jsou detailně představeny. Všechny druhy jsou vyobrazeny kresbami mikroznaků a SEM mikrofotografiemi askospor. Revize typového materiálu odhalila, že *Lasiobolus dubius* Starbäck je pozdější synonymum *Cheilymenia raripila*.

The present paper follows the previously published contributions within the framework of the author's taxonomic revision of the genus *Cheilymenia* Boud. and presents other sections of the genus.

#### MATERIAL AND METHODS

Material from the herbaria listed below was examined with the usual methods. Only few specimens were examined on fresh material. Their ascospore size measured *in vivo* was in the range of those examined on the rehydrated material. Dried apothecia were rehydrated in distilled water for studying and measuring of ascospores. Any aggressive liquids which always destroy the outermost ascospore membrane (such as lactophenol), were strictly avoided for the rehydration and staining. As premature ascospores are usually more swollen, only fully mature ascospores (with yellow refractive colour when stained in C<sup>4</sup>B) which ripened in normal eight-spored asci were measured. Extremely large mature ascospores, which occasionally are present together with aborted ones within the ascus, were considered abnormal and their size is given in brackets. The ascospores were stained with cotton blue C<sup>4</sup>B ("Geigy s. 123" from an old supply) which stains directly without heating the slides. Using C<sup>4</sup>B with the direct staining effect is necessary for studying the ascospore ornamentation in *Cheilymenia* in order to avoid destruction of the outermost, easily loosening perispore membrane. For studying of the anatomy, median sections through apothecia were mostly rehydrated with 1 % of KOH and washed in distilled water before staining with C<sup>4</sup>B in lactic acid or trypan blue.

#### Acronyms:

BHU	Museum für Naturkunde der Humboldt-Universität zu Berlin.
BRA	Botany Department, Slovak National Museum, Bratislava, Slovak Republic
BRNM	Botanical Department of the Moravian Museum, Brno, Czech Republic.
CO (formerly CONC)	Herbier Crouan, Department of Marine Biology, Museum National d'Histoire Naturelle, Concarneau, France.
CUP	Department of Plant Pathology, Cornell University, Ithaca, New York, U.S.A.
LPS	Instituto de Botánica C. Spegazzini, La Plata, Argentina.
K(M)	The Herbarium (Mycological) of the Royal Botanic Gardens, Kew, England, Great Britain.

- PRM Mycological Department of the National Museum, Prague, Czech Republic.
- S Naturhistoriska Riksmuseet, Section for Botany, Stockholm, Sweden.
- WAG-W Herbarium Vadense, Biological Station Wijster, The Netherlands.
- WELTU Herbarium of the Victoria University of Wellington, New Zealand.
- J. Mor. Private herbarium (Discomycetes) of J. Moravec, Adamov, Czech Republic.

## TAXONOMIC RESULTS

Nine sections of the genus *Cheilymenia* were established in the infrageneric arrangement originally proposed in Moravec (1990). However, the classification was modified after further studying. Thus, *C. insignis* (H. Crouan et P. Crouan) Boud., which I originally classified as a species of the monotypical section *Insigniae* J. Moravec (1990), was later revised by me and for the presence of rooting apothecial hairs and well differentiated excipular layers proved to be a member of the typical section *Cheilymenia*. Consequently (Moravec 1993), the rank of the formerly separate section was reassessed and was recombined as ser. *Insignes* (J. Moravec) ( grammatically correct form of the previously used name "*Insigniae*") of the typical section *Cheilymenia*. A more recent study of the sect. *Paracheilymeniae* J. Moravec (1990) and sect. *Raripilosae* J. Moravec (1990) has resulted in the following modification of the infrageneric classification.

A synopsis of the two sections treated here - out of the 7 sections of the genus *Cheilymenia* Boud. (previously 9 sections within the infrageneric arrangement in Moravec, Mycotaxon 28: 475, 1990):

Genus **Cheilymenia** Boud., Bull. Soc. Mycol. France. 1: 105, 1885

Sect. 5. **Paracheilymeniae** J. Moravec, Mycotaxon 28: 475, 1990.

Type species: *Ascobolus pulcherrimus* H. Crouan et P. Crouan, Ann. Sci. Nat. (Bot.), ser. 4, 10: 196, 1858.

Ser. a. *Paracheilymeniae*

Species:

*Cheilymenia pulcherrima* (H. Crouan et P. Crouan) Boud., Hist. Class. Disc. Eur. 63, 1907 (type species of the section and series).

*C. lacteoalba* Arnolds et J. Moravec in J. Moravec, Czech Mycol. 47: 36, 1993.

*C. aurantiacorubra* Thind et Kaushal, Indian Phytopath. 33: 428, 1980.

*C. lundqvistii* J. Moravec, Mycotaxon 44: 67, 1992.

Ser. b. *Raripilosae* (J. Moravec) J. Moravec stat. n.

Basionym: sect. *Raripilosae* J. Moravec, Mycotaxon 28: 475, 1990.

Type species: *Ascobolus raripilus* W. Phillips, Grevillea 7: 23, 1878.

## Species:

*Cheilymenia raripila* (W. Phillips) Dennis, Kew Bull. 14: 428, 1960.

*C. coprogena* (Berk. et Broome) Rifai, Verh. Koninkl. Nederl. Akad. Wetensch., Nat., Tweede Reeks, 57: 136, 1968.

Ser. c. *Glabrae* J. Moravec ser. n.

Series generis *Cheilymenia* Boud., sect. *Paracheilymeniae* J. Moravec, Mycotaxon 28: 475, 1990. Apothecia habitu *C. raripilae*, sed extus glabra. Typus (species typica et unica): *Fimaria bohemica* Velen., Mon. Discom. Boh. Pragae 1: 332, 2: Tab. 24, fig. 16, 1934.

## Species:

*Cheilymenia bohemica* (Velen.) J. Moravec, Mycotaxon 38: 476, 1990.

The section *Paracheilymeniae* J. Moravec was originally proposed (Moravec 1990) for two species, *Cheilymenia pulcherrima* (H. Crouan et P. Crouan) Boud. and *C. aurantiacorubra* Thind et Kaushal. Later, *C. lundqvistii* J. Moravec (1992) was described and classified as a member of the section *Paracheilymeniae*. Simultaneously, all the species of the section were introduced in detailed descriptions and data (J. Moravec 1992). Finally, I treated *C. lacteoalba* Arnolds et J. Moravec in J. Moravec (1993) based on *Cheilymenia pallida* Arnolds (1982), [illegitimate homonym of *C. pallida* Bell et Dennis (1971)], as a species of the section *Paracheilymeniae*. The section *Paracheilymeniae* thus comprised four species characterised by small, turbinate to columniform apothecia of a simple anatomy and possessing short, superficial hairs. The receptacular hairs are not different from the marginal ones. The excipulum consists of a textura globulosa-angularis throughout, with the medullary layer not clearly differentiated, possessing only occasional hyphoid elements, and a thin hypothecium. The ascospores are small to large, with a nearly smooth to minutely warted perisporium (Moravec 1990, 1992, 1993). Regarding the type species, I have reexamined the holotype (CO) of *Ascobolus pulcherrimus* H. Crouan et P. Crouan, which was transferred into the genus *Cheilymenia* by Boudier (1907), but a detailed description was for the first time introduced by Brummelen (1986). A detailed description based on further material recently examined, as well as illustrations including SEM photomicrographs of the ascospore ornamentation, were given in Moravec (1992).

A further revision of the genus *Cheilymenia* has confirmed that the establishment of the section *Paracheilymeniae* to comprise the above mentioned species is justified but also that three species of the previously independent section *Raripilosae* J. Moravec (1990) – *C. raripila* (W. Phillips) Dennis, *C. coprogena* (Berk. et Broome) Rifai and *C. bohemica* (Velen.) J. Moravec, especially due to their similar excipular structure, should be accommodated in the section *Paracheilymeniae*. Two of them, *C. raripila* and *C. coprogena*, also possess apothecial hairs of a similar shape as those in the sect. *Paracheilymeniae*. Although

the originally separate status of the section *Raripilosae* proved to be superfluous, *C. raripila* and *C. coprogena* are distinguished by the shape of ripe apothecia which are more saucer-shaped and bearing a more distinct marginal collar; *C. bohémica* is, moreover, hairless. Therefore they deserve to be accommodated in two separate series of the section *Paracheilymeniae*.

The series *Raripilosae* is characterised by small apothecia of a simple anatomy, with the ectal layer consisting of a *textura globulosa-angularis*, whereby the medullary excipulum of a *textura angularis* is not distinctly differentiated from the ectal layer. The apothecia are sessile, first obconical, cup-shaped to saucer-shaped, possessing gentle but conspicuous, hyaline, indistinctly fissured marginal collar, externally sparsely covered by inconspicuous, pale, short, superficial to hyphoid hairs, a yellow to orange hymenium, large asci and large ascospores. The ascospores bear a separable outermost membrane (perisporium) which is covered by elongate, densely connected cyanophilic warts and crests, forming an incomplete to almost complete irregular reticulum on mature ascospores. The two species of the ser. *Raripilosae* differ from those of the typical series, ser. *Paracheilymeniae*, particularly by more discoid apothecia (they are flatter especially at maturity), in contrast to more constantly turbinate and barrel-shaped apothecia of the species of the ser. *Paracheilymeniae*. The apothecial hairs are of a very similar shape in both sections but those in species of the ser. *Paracheilymeniae* originate from abortive excipular cells, whilst those in the ser. *Raripilosae* are occasionally connected with excipular cells, which resemble short root germs. Unlike the ascospores of the ser. *Paracheilymeniae* which bear an almost smooth or finely isolate-warted perisporium, the ascospores of the species of the ser. *Raripilosae* and ser. *Glabrae* J. Moravec ser. n. bear a perisporium covered with cyanophilic fine crests forming an irregular, mostly very incomplete reticulum.

*C. bohémica* possesses hairless apothecia and therefore, the new monotypical series *Glabrae* J. Moravec ser. n. is proposed here to accommodate this species.

#### DESCRIPTIONS

Species of the series a. *Paracheilymeniae* (under a separate section) were treated in Moravec (1992) and supplemented in the additional note in Moravec (1993).

Species of the ser. b. *Raripilosae*

*Cheilymenia raripila* (W. Phillips) Dennis (Figs. 1-12; 24-25).

≡ *Ascobolus raripilus* W. Phillips, Grevillea 7: 23, 1878.

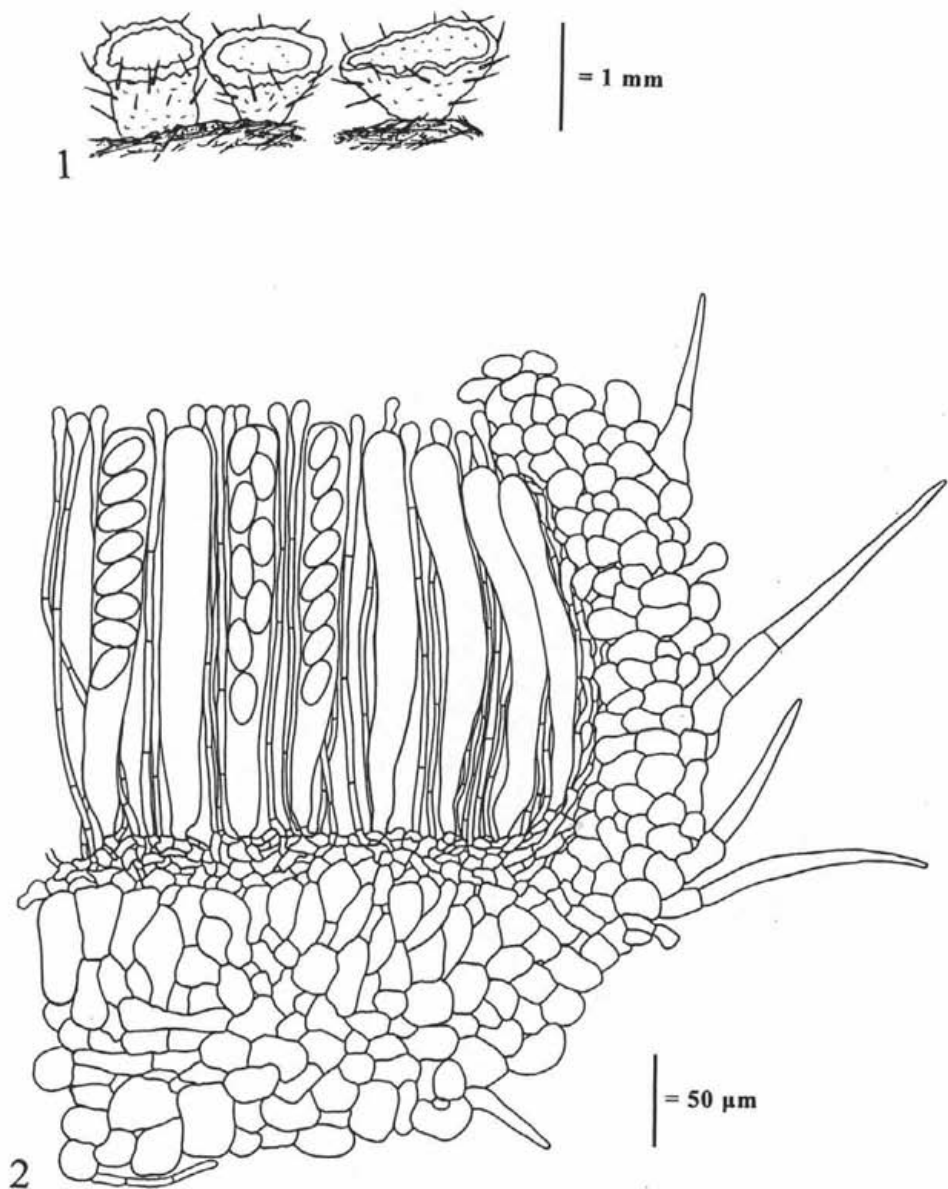
≡ *Lasiobolus raripilus* (W. Phillips) Saccardo, Syll. Fung. 8: 537, 1889.

≡ *Patella raripila* (W. Phillips) Seaver, N. Am. cup fungi (Operc.) 173, 1928.

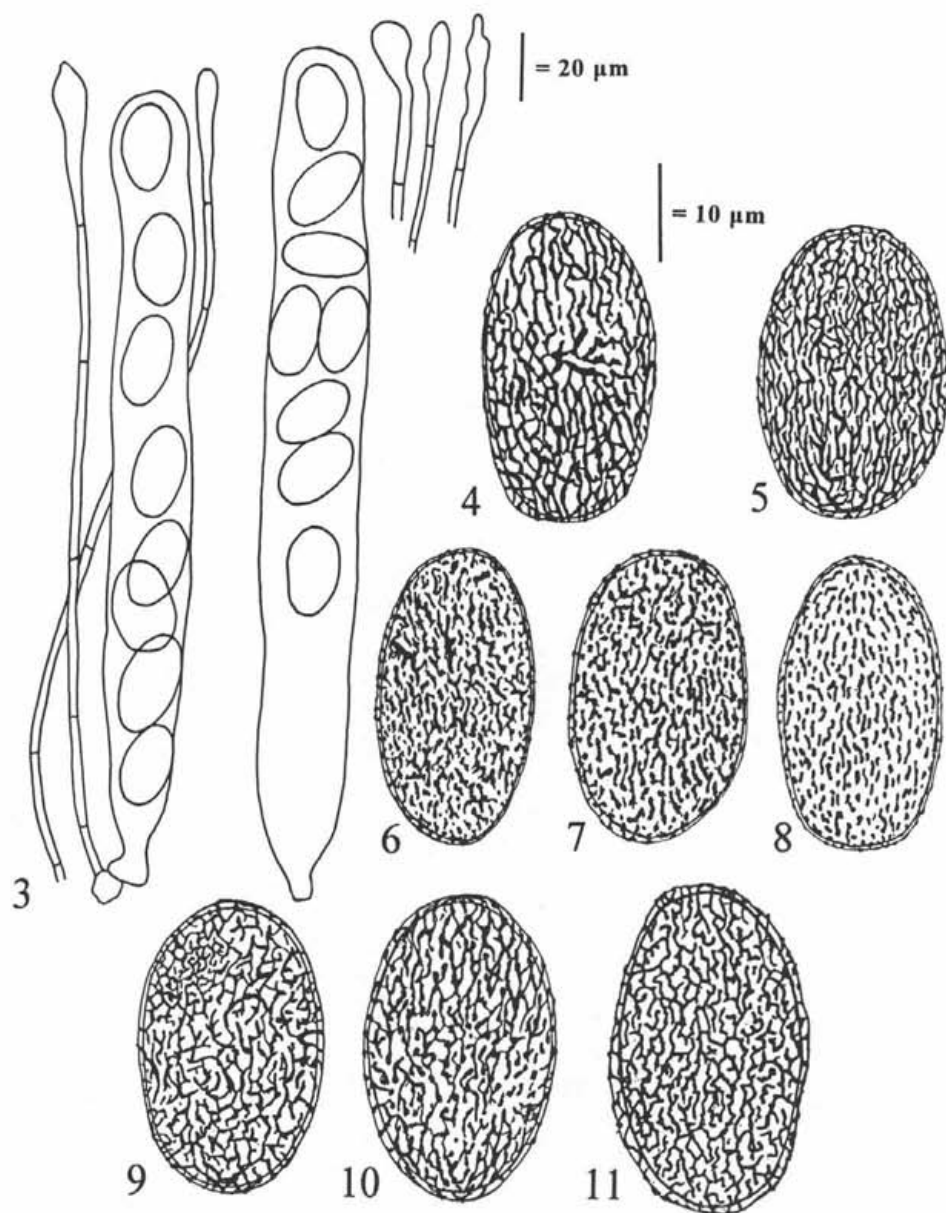
- ≡ *Cheilymenia raripila* (W. Phillips) Dennis, Kew Bull. 14: 428, 1960.
- = *Peziza hyalochaeta* Spegazzini, Ann. Soc. Cient. Arg. 10: 24, 1880.
- ≡ *Cheilymenia hyalochaeta* (Speg.) Gamundí, Lilloa 30: 326, 1960.
- = *Lasiobolus dubius* Starbäck, Ark. Bot. 2 (5): 2, 1904.
- = *Cheilymenia notabilispora* J. Moravec, Čes. Mykol. 22: 36, 1968.

Apothecia small, 0.3–1.5(–2.0) mm diam., scattered to densely gregarious, first obconical with a flat hymenium, then saucer shaped with a more or less distinct, slightly fissured membranaceous marginal collar but usually flat hymenium, old apothecia rarely more expanded with elevated margin; hymenium ochre-yellowish to orange-yellow, outer surface paler, sparsely covered with inconspicuous but comparatively long pale hairs. Hairs 90–280(–350) × 10–22(–25)  $\mu\text{m}$  (width measured at the base), superficial; marginal hairs of the same shape as the receptacular ones but more rigid and thick-walled (walls 0.7–3.0  $\mu\text{m}$  thick), straight, sometimes with moderately wavy walls, with enlarged to bulbous base which originates from excipular cells; the base simple, rarely with indistinct cell-like appendages; apex blunt, subacute or rarely acute, hyaline to pale brown; towards the base of the apothecia the hairs are shorter and with thinner walls, occasionally feeble, with the apical portion folded downwards. Ectal excipulum not clearly delimited from the medullary layer, composed of a *textura globulosa-angularis* throughout; ectal layer 40–80  $\mu\text{m}$  thick, narrower at the margin, composed of strongly cyanophilic, polygonal, mostly angular to subglobose cells 8–50(–65)  $\mu\text{m}$  diam., which are smaller and more isodiametric at the marginal zone and larger at the apothecial base, fluently passing into the medullary layer. Medulla 50–70  $\mu\text{m}$  thick, consisting of more elongated and irregularly horizontally to mostly vertically oriented polygonal cells 10–25  $\mu\text{m}$  diam., rarely some of them more elongated (up to 35  $\mu\text{m}$ ) thus resembling hyphal elements. Hypothecium sharply differentiated, 20–40  $\mu\text{m}$  thick, composed of much smaller, irregular, angular to elongated cells 2–9  $\mu\text{m}$  diam., passing into hyphae towards the lateral margins of the hymenium. Hymenium 200–250(–260)  $\mu\text{m}$  thick. Asci 180–230(–260) × 23–30  $\mu\text{m}$ , operculate, broadly cylindrical with rounded to blunt apex, abruptly constricted at base, eight-spored (occasionally some of the ascospores aborted and then the ascus contains only six or four mature ascospores). Ascospores ellipsoid, (21.5–)24.0–29.0(–31.5) × 12.0–16.5(–18.5)  $\mu\text{m}$ , mostly 27 × 15  $\mu\text{m}$ , uniseriate to occasionally biseriate, hyaline, eguttulate (with small drops observed *in vivo*), mature ascospores with yellow refractive colour when stained with C<sup>4</sup>B in lactic acid, bearing a loosening perispodium which is ornamented with cyanophilic, irregular fine crests forming a dense irregular and mostly incomplete reticulum. Paraphyses filiform, 3–4  $\mu\text{m}$  thick, unbranched, straight to moderately flexuous, septate, apices moderately to distinctly clavate-dilated, 6–12(–15)  $\mu\text{m}$ , occasionally obtusely lanceolate, with yellow to pale orange granular pigment.





Figs. 1-2. *Cheilymenia raripila*. 1. apothecia; 2. part of medial section through apothecium (from Wellington, J. Mor.).



**Figs. 3–11.** *Cheilymenia raripila*. 3. asci and paraphyses [from holotype K(M)]; 4–11. ascospores, under oil immersion, stained with C<sup>4</sup>B: 4. from holotype [K(M)]; 5. Wellington (J. Mor.); 6–7. Tucumán [K(M) ex T 3401]; 8. from the same specimen but premature ascospore; 9. from isotype of *C. notabilispora* (J. Mor.); 10. from holotype of *Lasiobolus dubius* [K(M)]; 11. from holotype of *C. hyalochaeta* (LPS).



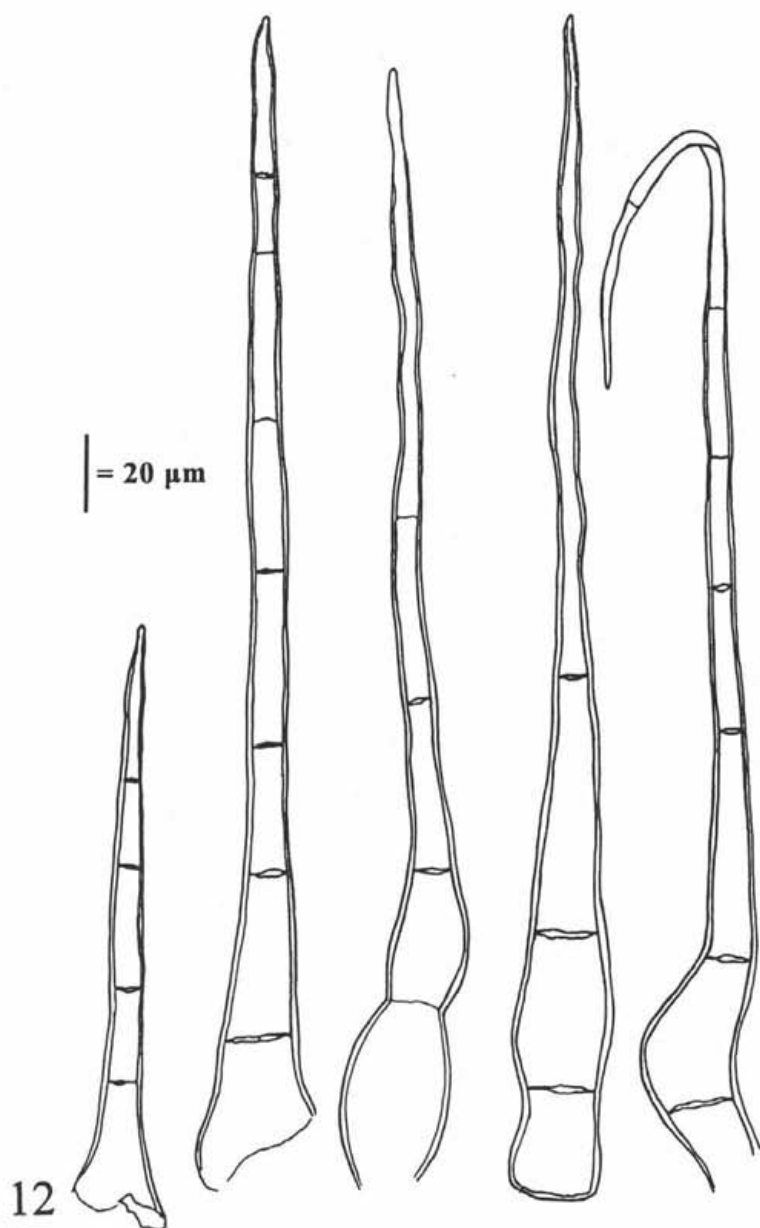


Fig. 12. *Cheilymenia raripila* - apothecial hairs (from Branžež, J. Mor.).

Habitat. On dung of cow, sheep and *Opossum*. Cosmopolitan distribution. Type locality: California. In North America it also occurs in Iowa (Seaver 1928). Besides the countries listed below, *C. raripila* occurs on the British Isles (Dennis 1972, 1979, 1981, Hawksworth 1976, Clarke 1980, Kirk et Spooner 1984) and in Australia (Rifai 1968). It is very interesting that it was not previously recorded from Bohemia neither by Velenovský (1934) nor Svrček (1948). Apothecia usually grow on last year's dung lying on pastures in early spring, sometimes immediately after snow melting; the other main (but less frequent) occurrence is in autumn.

*C. raripila* does not seem to be so rare as previously considered, it is rather easily overlooked due to its small apothecia.

#### Type material examined

North America: U. S. A.: California, On cow dung, s. dat., Harkness 509 [K(M), holotype of *Ascophanus raripilus* W. Phillips]. According to Yao and Spooner (1996), the holotype is "apparently exhausted and a neotype may be required". Fortunately, the holotype consists of at least two fully mature apothecia.

#### Other material examined

Argentina: Rio Cochun, Depto Chicligasta, Tucumán, on dung, 1 VI. 1959 leg. A. Türpe, det. R. Singer [K(M) ex T 3401]; Buenos Aires - Recoleta, sobre estiércol de vaca (in fimo vaccino), 5. V. 1880 leg. Spegazzini, as *Cheilymenia hyalochaeta* (Speg.) Gamundí (LPS 27338 - holotype of *Peziza hyalochaeta* Speg.), rev. J. Moravec; In Delta fluminis Paraná, ad fimum bovinum, 6. IX. 1894 (S - holotype of *Lasiobolus dubius* Starbäck).

New Zealand: South Island: Orinoco Valley near Motueca, on sheep excrements in a margin of pasture and forest, 4. III. 1993 leg. et det. Jiří Moravec (J. Mor., CUP); Marlborough, on cow dung, 12. V. 1978 leg. et det. Ann Bell (WELTU 305); Marlborough, on sheep dung, 4. VI. 1981 leg. et det. Ann Bell (WELTU 329). North Island: near Wellington, on cow dung at a farm, 27. II. 1993, leg et det. Jiří Moravec (J. Mor., CUP); Wellington, Orongorongo Valley, on *Opossum* dung, 20. X. 1970 leg. et det. Ann Bell (WELTU 54); Wellington, near DSIR Field Station, on dung of *Opossum*, 12. III. 1971 leg. et det. Ann Bell (WELTU 64); Wellington, near DSIR Field Station, on dung of *Opossum*, 24. VI. 1971 leg. et det. Ann Bell (WELTU 103); Wainuiomata Road, on cow dung, 22. VIII. 1971 leg. et det. Ann Bell (WELTU 109); Lake Ponuoui, on cow dung, s. dat., leg. et det. Ann Bell (WELTU 151); Wellington, Ohariu Valley Rd., 20. V. 1980 leg. et det. Ann Bell (WELTU 312); Wellington, Ohariu Valley Rd., 26. IV. 1981 leg. et det. Ann Bell (WELTU 335).

Czech Republic: Bohemia, prope Branžež, district Mladá Boleslav, in fimo vaccino in societate *Ascophani brunnescentis*, 17. III. 1967 leg. J. Moravec (holotype of

*Cheilymenia notabilispora* J. Moravec, PRM 628981, isotype J. Mor., BRNM, BRA, CUP); Branžež, 20. III. 1967, leg. et det. J. Moravec (J. Mor.); Branžež prope Kněžmost, 8. XI. 1987 leg. et det. J. Moravec (J. Mor., CUP); Branžež prope Mnichovo Hradiště, ad fimis vaccinis in prato, 29. X. 1988 leg. et det. J. Moravec (J. Mor., CUP).

Germany: Potsdam: Golmer Luch, Intensivweide nördlich Golm auf Rindermist, 5. XI. 1989 leg. et det. D. Benkert (as "*C. cf. pulcherrima*"), det. J. Moravec (BHU); Rügen: Weidefläche am Rande des Schlossparks Ralswiek auf Rindermist, 11. IX. 1988 leg. et det. D. Benkert (as "*C. cf. pulcherrima*"), det. J. Moravec (BHU); Demmin: Wiesen im Peenetal bei der Vorwerker Schweiz auf Rindermist, 31. X. 1982 leg. et det. D. Benkert (as "*C. cf. pulcherrima*"), det. J. Moravec (BHU).

The Netherlands: Dwingeloo, Noordenveld (illegibly handwritten label), 17. XI. 1976 (determined by Arnolds as "*C. fimicola*" - teste Arnolds (1982), det. J. Moravec (WAG-W, A 3774).

Azores: Monte Brasil, Terceira, in fimo vaccino, 24. III. 1975 [K(M)] - holotype of *Cheilymenia thelebolooides* var. *microspora* Dennis (the name based on a mixture of different fungi, the apothecia of *C. raripila* are densely aggregated together with *C. granulata*, *C. insignis*, *Lasiobolus* sp. and other discomycetes.

#### Remarks

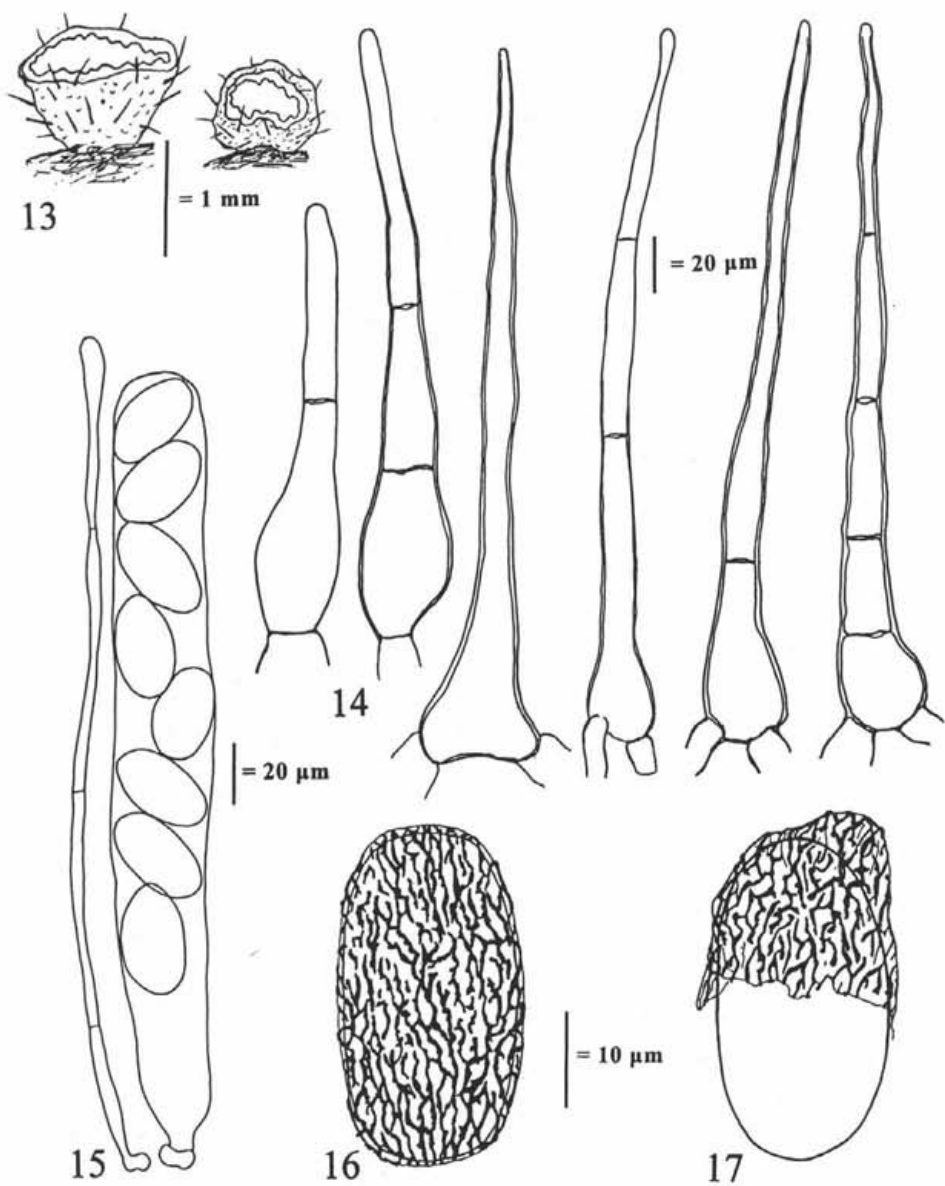
The type species of the series *Raripilosae*, *Cheilymenia raripila* (W. Phillips) Dennis, was for the first time introduced in detail by Rifai (1968) and later by Brummelen (1986). These authors stated the ascospore size somewhat smaller than measured by me in the holotype [K(M)] and all other specimens. They mentioned also the loosening and wrinkling outermost sheath on the ascospores of this species but considered the reticulate ornament on the outermost membrane to be a deformation of the sheath as a consequence of staining in lactic acid or in lactophenol. Nevertheless, although the outermost secondary membrane (perisporium), when heated in lactophenol, is easily deformed and separated from the ascospore, the ornamentation represents an important diagnostic feature of ascospores in *C. raripila* and *C. coprogena* as the cyanophilic ornamentation is reliably recognisable also when the perisporium is evenly stretched, not deformed. The subreticulate ornamentation was already recognised by Gamundí (1960) on ascospores of *C. raripila* (treated by her under the synonym *C. hyalochaeta*), in detail illustrated and also proved by SEM in Moravec (1990) and here. The different pattern of the ascospore ornamentation on non-deformed perisporium in many species of *Cheilymenia* was proved by SEM and discussed many times, lately in Moravec (1998). In contrast, Yao et Spooner (1996: 364) were unable to find the ornamentation and the outermost perisporial membrane (neither in other species of *Cheilymenia* treated by them), and argued that the presence of the

loosening perispore "may prove to have little diagnostic value in *Cheilymenia*". In fact, the loosening outermost membrane is one of the fundamental features of the genus which was recognised and mentioned by all authors who examined species of *Cheilymenia* during the long history of the taxonomy of the genus. As already discussed (Moravec 1998), such a discrepancy in observations is obviously based on inappropriate staining with lactophenol which involves heating of slides and causes the destruction of the perisporium that is afterwards separated from the ascospores, which consequently appear smooth. The perisporial ornamentation is developed in the course of ascospore maturing as the perisporium on premature ascospores bears isolate coarse warts or large pustules that at maturity change into irregular crests forming the subreticulate ornament. When the ascospores are stained with C<sup>4</sup>B in lactic acid without heating, the ornament is relatively constant and well recognisable even on ascospores of old dissections after they have repeatedly been stained. Nevertheless, even in properly stained dissections, we can always find some ascospores with a deformed and partly separated perisporium (Fig. 17).

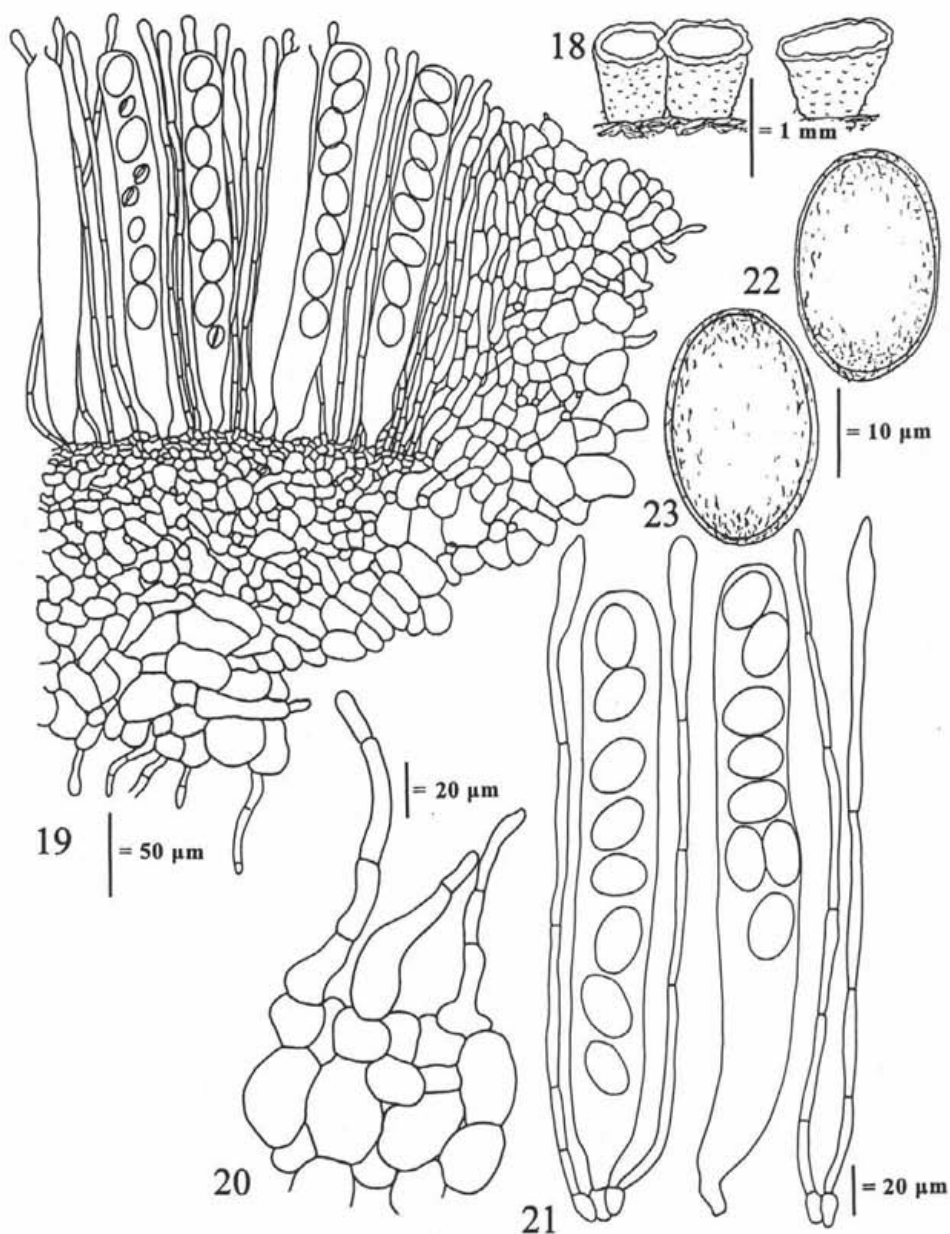
The examination of the holotype (LPS) of *Cheilymenia hyalochaeta* (Speg.) Gamundí (1960), a taxon already supposed to be a synonym of *C. raripila* by Brummelen (1986), as well as the reexamination of the holotype (PRM) of *Cheilymenia notabilispora* J. Moravec (1968), confirmed the identity with *C. raripila* (see also Moravec 1990).

Furthermore, the examination of the holotype of *Lasiobolus dubius* Starbäck (1904) deposited in the S herbarium has revealed that this taxon is also identical with *C. raripila*.

My examination of collection N° 2382 Dennis from the herbaria VEN and K(M), reported by Dennis (1960) from Venezuela under the name *C. raripila* with his new combination of this taxon into the genus *Cheilymenia*, has revealed that the collection paradoxically represents a distinct species of *Cheilymenia*, belonging to the section *Pseudoscutellinae* J. Moravec (1990). Moreover, my examination of the holotype [K(M)] of *C. theleboloides* var. *microspora* Dennis in Dennis, Reid et Spooner (1977) disclosed that the description of the taxon was based upon apothecia in fact belonging to several different species growing together on a common portion of cow dung (Moravec 1992, 1993). One of the species, the apothecia of which shared the substrate, was identified by me as *C. raripila*. Similarly, one of the collections erroneously reported as *C. fimicola* by Arnolds (1982), A 3774 (WAG-W), represents in fact *C. raripila*.



Figs. 13-17. *Cheilymenia coprogena*. 13. apothecia; 14. apothecial hairs; 15. ascus and paraphysa; 16. ascospore under oil immersion, stained with  $C^4B$ ; 17. ascospore with partly separated perisporium [all from holotype K(M)].



Figs. 18-23. *Cheilymenia bohemica*. 18. apothecia; 19. part of medial section through apothecium (from WAG-W, A 981); 20. hyphae arising from cells of ectal excipulum; 21. asci and paraphyses; 22. ascospore under oil immersion stained with C<sup>4</sup>B (from holotype PRM); 23. ascospore from WAG-W, A 981.



**Cheilymenia coprogena** (Berk. et Broome) Rifai

(Figs. 13-17)

- ≡ *Peziza* (*Lachnea*) *coprogena* Berk. et Broome, Trans. Linn. Soc. Lond. II. 2: 69, 1882.
- ≡ *Lachnea coprogena* (Berk. et Broome) Saccardo, Syll. Fung. 8: 181, 1889.
- ≡ *Scutellinia coprogena* (Berk. et Broome) Kuntze, Rev. Gen. Pl. 2: 869, 1891.
- ≡ *Cheilymenia coprogena* (Berk. et Broome) Rifai, Verh. Koninkl. Nederl. Akad. Wetensch., Nat., Tweede Reeks, 57: 136, 1968.

Apothecia small, 0.3-1.5 mm diam. (0.2-0.5 mm when dried), scattered, first obconical with broad base and flat to shallowly concave hymenium, distinctly braided with fissured, mostly inward oriented marginal collar, then more broadly saucer shaped; hymenium pale orange ["subaurantiaca" according to Berk. & Broome (1882)], outer surface paler, sparsely covered with inconspicuous pale hairs. Hairs superficial, hyaline to pale brown; marginal and receptacular hairs of the same shape; the receptacular hairs thin-walled (walls 0.5  $\mu\text{m}$  thick), marginal hairs either thin-walled or rarely thick-walled (walls 0.7-1.5(-3)  $\mu\text{m}$  thick), sparsely septate, straight, usually with moderately sinuous walls, 80-280(-310)  $\times$  10-25(-30)  $\mu\text{m}$  (the width measured at enlarged base), arising from excipular cells; the base enlarged to bulbous, simple or usually with elongate cell-like appendages resembling root germs; apex rounded, or narrowed but blunt, rarely subacute, only exceptionally acute. Excipulum composed of a textura globulosa-angularis throughout (similar to that in *C. raripila*), not clearly differentiated from the medullary layer, ectal layer composed of polygonal, mostly angular to subglobose, strongly cyanophilic cells 10-60  $\mu\text{m}$  diam., smaller and more isodiametric in marginal zone, larger at the apothecial base, fluently passing into a medullary layer. Medulla consisting of similar, more elongated and irregularly oriented polygonal cells which measure 10-25  $\mu\text{m}$  diam. but are occasionally more elongated up to 50  $\mu\text{m}$  in length, thus indistinctly resembling hyphal elements. Hypothecium rather sharply differentiated, composed of much smaller irregular, angular to elongated cells 4-10  $\mu\text{m}$  diam., towards the lateral margins passing into marginal hyphae. Hymenium about 180-240  $\mu\text{m}$  thick. Asci (170-)190-235(-240)  $\times$  (20-)25-30(-34)  $\mu\text{m}$ , operculate, broadly cylindrical with rounded apex, abruptly constricted at base into a short stipe, eight-spored, (occasionally some of the ascospores aborted and then one ascus may contain only six or four mature ascospores). Ascospores ellipsoid, (24.0-)25.0-33.5(-36)  $\times$  (12.0-)13.5-19.0(-20.0)  $\mu\text{m}$ , mostly 30.0  $\times$  17.0  $\mu\text{m}$ , uniseriate or occasionally some ascospores within the ascus biseriate, hyaline, eguttulate; mature ascospores with yellow refractive colour when stained with C<sup>4</sup>B in lactic acid, bearing a loosening perisporium, which has the same ornamentation as that on the perisporium of *C. raripila*, consisting of cyanophilic, fine irregular

crests which form a dense irregular and mostly incomplete reticulum. Paraphyses filiform, 3-4  $\mu$  thick, unbranched, straight to moderately flexuous, septate, apices moderately to distinctly clavate-dilated to 5-8(-10)  $\mu$ m diam.

Habitat. On cow dung in Brisbane, Australia, known only from the holotype.

#### Type material examined

Australia: Brisbane (Queensland), on cow dung, s. dat., F. M. Balley N° 205 - holotype of *Peziza (Lachnea) coprogena* Berk. et Broome [K(M)] - about 18 apothecia aggregated on a fragment of cow dung - the apothecia 0.2-0.5 mm diam. when dried.

#### Remarks

The species was well introduced and properly transferred to the genus *Cheilymenia* by Rifai (1968). He considered it closely related to *C. raripila* but kept it separate on the basis of its much larger ascospores and fewer, more delicate thin-walled hairs. However, as is seen from the description above, the examination of the holotype of *C. coprogena* [K(M)] revealed several differences, especially the presence of thick-walled hairs. The extreme size of the ascospores given by Rifai (1968) probably belongs to those which were developed within the asci with a reduced number of ascospores. Nevertheless, also the ascospores in normally eight-spored asci are larger than those in *C. raripila*. Moreover, although I found the thick-walled hairs also in *C. coprogena*, their apex is usually more rounded, and the paraphyses are of a simpler clavate shape and not so distinctly enlarged and variously shaped as those in *C. raripila*.

The following table shows the variability of the ascospore size based on several collections of *C. raripila* in comparison with the closely related *C. coprogena*. The commonly used term "average size" is not used by me in the statement of the ascospore size. Instead, I used "mostly" which means the mostly occurring ascospore size in each individual collection. This much better reflects the genuine size of most ascospores than the artificially counted "average size".

As showed on the table, the ascospores (normally developed within eight-spored asci) of *C. raripila* mostly do not exceed 29  $\mu$ m in length whilst those of *C. coprogena* reach 33.5  $\mu$ m. The exceptional size (in parenthesis) of ascospores (which ripened within asci with a reduced number of ascospores due to the fact that some of them aborted during their development), does not exceed 30  $\mu$ m in *C. raripila*. An exception is the holotype of the synonymous *C. hyalochaeta*, where such abnormal ascospores reach 31.5  $\mu$ m of length but do not yet reach the length of such abnormal ascospores in *C. coprogena* (36  $\mu$ m). Therefore, regarding the different ascospore size and also the other slightly different features mentioned above, I follow Rifai (1968) and keep *C. raripila* as a separate species here.

Table 1.

species and collection	ascospore size
<i>C. raripila</i> , holotype [K(M)]	(22.0-)24.0-28.5(-30.0) × 12.0-16.5(-18.0) μm - mostly 27.0 × 15.0 μm
<i>C. raripila</i> , Tucumán [K(M) ex T 3401]	(22.5-)24.0-28.5(-30.0) × 12.0-16.5(-18.0) μm - mostly 27.0 × 15.0 μm
<i>C. raripila</i> , Wellington (J. Mor.)	(22.0-)23.0-28.5(-30.0) × 12.0-16.5(-18.0) μm - mostly 27.0 × 15.0 μm
<i>C. raripila</i> , holotype of <i>C. hyalochaeta</i> (LPS)	(22.5-)24.0-29.5(-31.5) × 12.0-16.5(-18.5) μm - mostly 28.5 × 16.5 μm
<i>C. raripila</i> , holotype of <i>C. notabilispora</i> (PRM)	(22.0-)24.0-28.5(-30.0) × 12.0-17.0(-18.0) μm - mostly 27.0 × 16.0 μm
<i>C. raripila</i> , holotype of <i>Lasiobolus dubius</i> (S)	(22.0-)23.0-28.5(-30.0) × 13.5-16.0(-17.0) μm - mostly 27.0 × 15.0 μm
<i>C. coprogena</i> , holotype [K(M)]	(24.0-)25.0-33.5(-36.0) × 12.0-19.0(-20.0) μm - mostly 30.0 × 17.0 μm

*Humaria coprogena* Saccardo (1914) is a species of the genus *Peziza* Dill. ex L: Fr. (teste Brummelen 1995).

Ser. c. *Glabrae* J. Moravec ser. n.

**Cheilymenia bohémica** (Velen.) J. Moravec (Figs. 18-23; 27).

≡ *Fimaria bohémica* Velenovský, Mon. Discom. Boh. 1: 332, 2: tab. 24, fig. 16, 1934.

≡ *Coprobia bohémica* (Velen.) Svrček, Čes. Mykol. 31: 69, 1977.

≡ *Cheilymenia bohémica* (Velen.) J. Moravec, Mycotaxon 38: 476, 1990.

Apothecia gregarious, small, [according to Velenovský (1934) 1-2 mm diam.], 0.1-0.6 mm diam. when dried, sessile, first columniform-obconical, slightly attenuated towards base, with flat hymenium, thinly braided with whitish membranaceous marginal collar; orange ["tota splendide aurantia" according to Velenovský (1934)], dried apothecia ochraceous ["whitish, almost white" according to Svrček (1979)], outer surface nearly glabrous with only indistinct sparse hyphal outgrowths near the base of apothecia; hyphae 30-80 μm long and 7-15 μm wide at their bulbous base, hyaline. Excipulum composed of a textura globulosa-angularis throughout, not clearly differentiated from the medulla; ectal layer 60-100 μm thick, usually narrower in the marginal zone, composed of polygonal, angular to globose, strongly cyanophilic cells 15-45(-60) μm diam., fluently passing into the medullary layer, which is 60-80 μm thick and consists of similar, but mostly smaller cells 10-25(-35) μm diam. Hypothecium only very indistinctly differentiated, very thin, composed of smaller irregular, angular to elongate cells 4-15 μm diam., towards the lateral margins passing into hyphae which separate the inner margin of the hymenium from the excipular margin. Hymenium 170-220 μm thick. Asci (160-)205(-220) × 22.5-27.0(-30) μm,

operculate, broadly cylindrical with rounded apex, abruptly constricted at base into a short stipe, eight-spored, occasionally some ascospores within the ascus aborted. Ascospores ellipsoid, (20.0-)21.0-27.0(-28.5) × (12.0-)13.5-16.5(-19.0) μm, mostly 23.5 × 15 μm, uniseriate or occasionally some ascospores within the same ascus biseriata, hyaline, eguttulate, mature ascospores with yellow refractive colour when stained with C<sup>4</sup>B in lactic acid, bearing a loosening perisporium which under an optical microscope appears almost smooth, with only few recognisable wrinkles; SEM photomicrographs show fine irregular ornaments consisting of low and blunt, delicate to more distinct crests. Paraphyses filiform, 3.5-4.0 μm thick, unbranched, straight to moderately flexuous, septate, apices not to moderately enlarged (4.5-8.0 μm), occasionally the dilated apex is constricted above.

Habitat. On cow dung in the Czech Republic (type locality) and in the Netherlands.

#### Type material examined

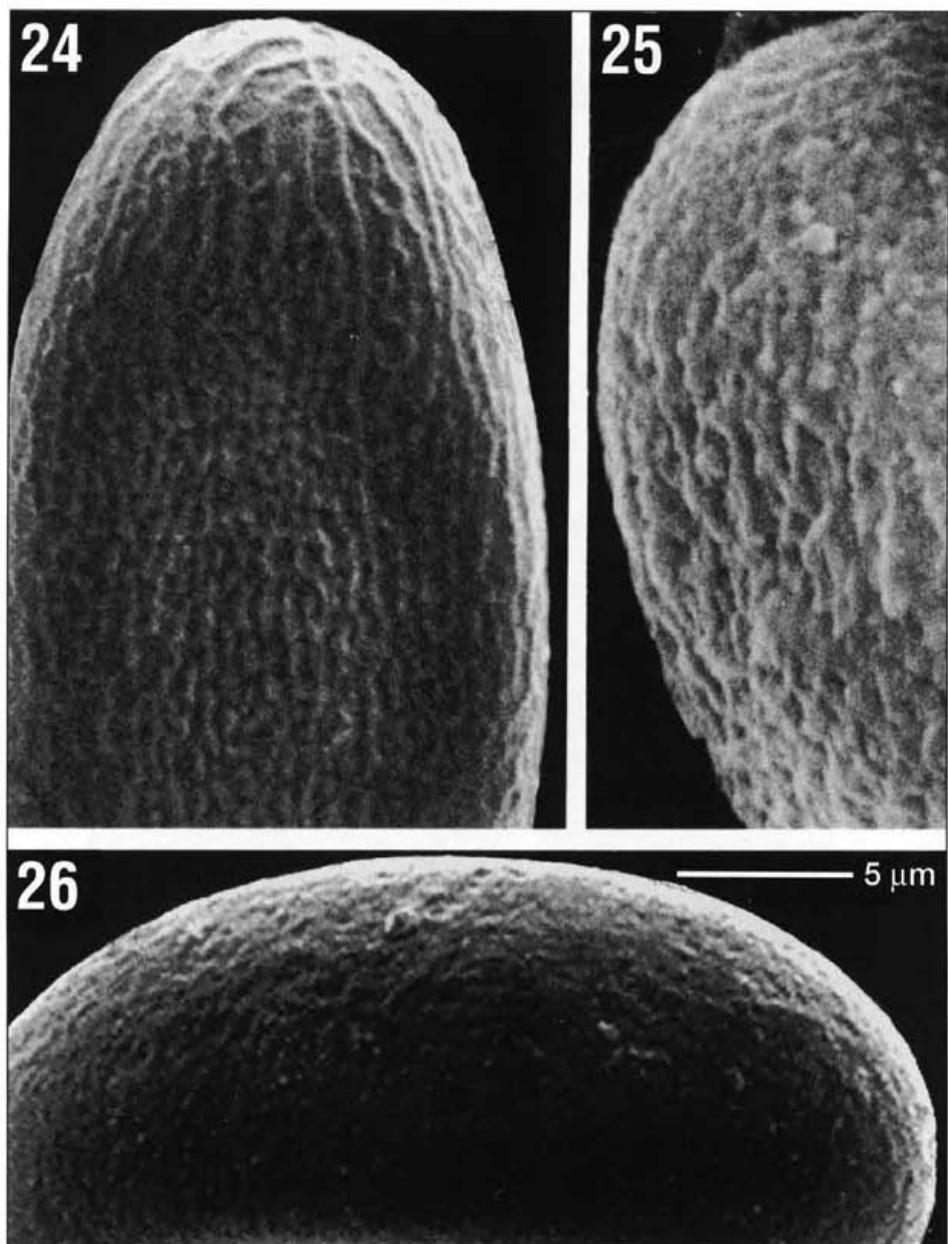
Prope Kostomlaty pod Milešovkou (Bohemia), ad excrementa vaccina, leg. Jan Šimr, det. J. Velenovský (originally labelled with the unpublished invalid herbarium name "*Humaria macrospora* Velen.") - holotype of *Fimaria bohémica* Velen. (PRM 149767). The apothecia are difficult to be recognised on the excrement fragment, they appear to be of an indefinite shape and are probably incomplete.

#### Other material examined

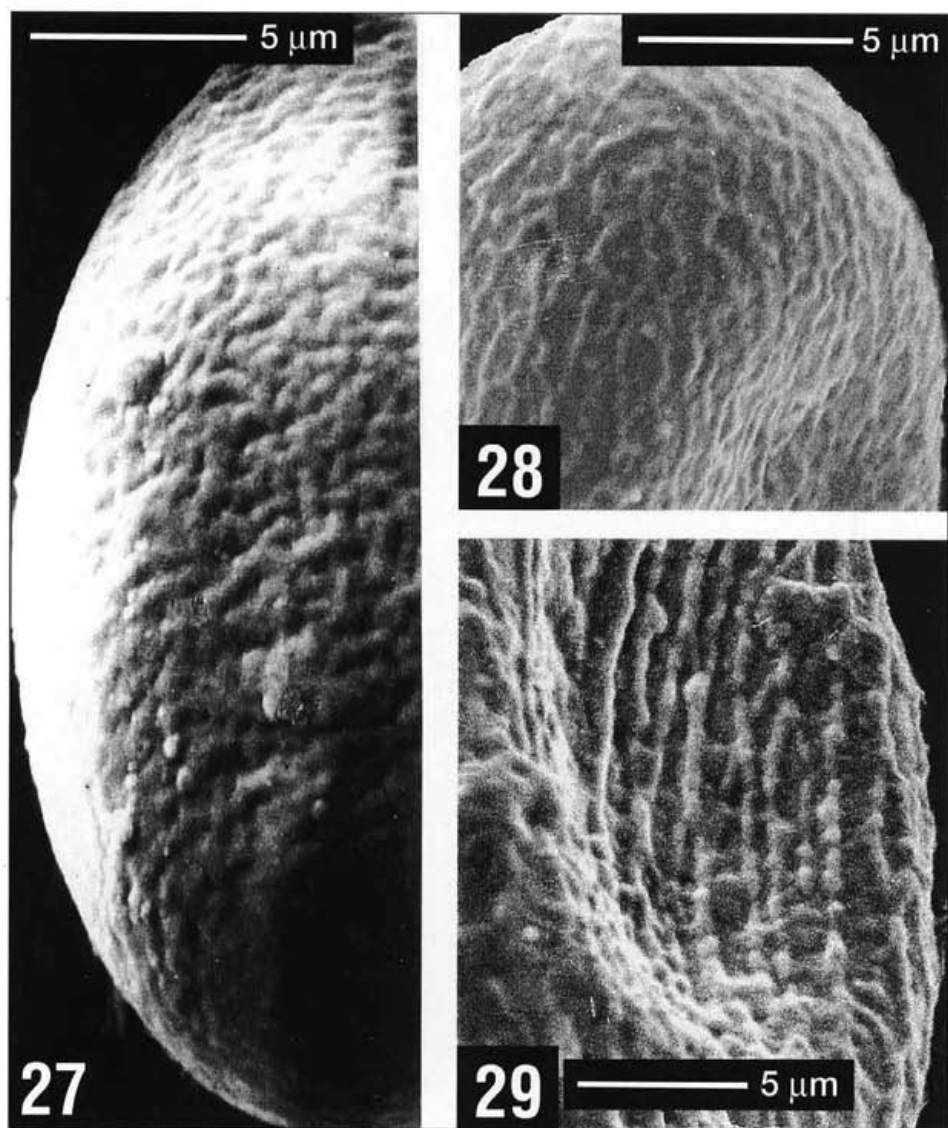
The Netherlands: Beilen, W of Wijster (illegible label), on cow dung, 17. X. 1973 (WAG-W, A 981) - erroneously identified by Arnolds (1982: figs. 244a, e, c) as *C. fimicola*, about 50 dried, ochraceous apothecia, 0.1-0.3 μm diam., densely crowded on a small fragment of cow dung.

#### Remarks

*C. bohémica*, type species of the series *Glabrae* J. Moravec ser. n. is certainly extremely rare and was known only from the holotype. Brummelen (1995) treated *Fimaria bohémica* as "very close to, or conspecific with *Cheilymenia raripila*". I managed to find one other collection which possesses hairless apothecia similar to the Velenovský's fungus. The collection was discovered during my examinations of individual specimens recorded by Arnolds (1982) under the name *C. fimicola* (De Not. et Bagl.) as I disclosed that they represented several different species. The collection WAG-W, A 981, illustrated by Arnolds (1982: figs. 244a, e, c) has certainly nothing to do with *C. fimicola* but in fact represent a species of the sect. *Raripilosae*. Especially its hairless apothecia and ascospore size well correspond with those of *C. bohémica*. Nevertheless, although the ascospores of Arnolds'



Figs. 24–26. SEM photomicrographs of ascospores. 24–25. *Cheilymenia raripila*. 24. from Wellington (J. Mor.); 25–26. from isotype of *C. notabilispora* (J. Mor.); 26. *Cheilymenia bohémica* (from holotype (PRM)).



**Figs. 27–29.** SEM photomicrographs of ascospores (details). 27. *Cheilymenia bohemica* (from holotype (PRM)). 28–29. *C. bohemica* (from WAG-W, A 981).



collection appear almost smooth under the optical microscope (Fig. 23, like those of the holotype of *C. bohémica*), SEM photomicrographs (Figs. 28-29) show the same subreticulate perisporium as that on the ascospores of *C. raripila*. On the other hand, only two ascospores in a condition suitable for SEM were obtained from the holotype of *C. bohémica* and therefore, the finer perisporial ornamentation on these probably premature ascospores (Figs. 26 and 27) is probably not such a decisive character. The possibility that these two collections represent two distinct species can also be regarded. Nevertheless, herein I consider them conspecific and provisionally distinguish *C. bohémica* as a species which is separated from *C. raripila* merely in having hairless apothecia and slightly smaller ascospores. I have not found (neither in the holotype nor in the WAG-W specimen) ascospores of such an extreme size,  $24-30 \times (13-15-19 \mu\text{m})$ , as stated by Velenovský (1934) and Svrček (1977), but these authors very probably measured premature ascospores which are more swollen and can be recognised by the absence of a yellow refractive colour. Brummelen (1995) stated the ascospore size in the holotype of *Fimaria bohémica*  $21.9-26.2 \times 13.0-14.7 \mu\text{m}$ , which corresponds well with my measurements. The species was transferred by Svrček (1977) to the genus *Coprobria* Boud. [= *Cheilymenia* sect. *Coprobriae* in Moravec (1990)] as *Coprobria bohémica* (Velen.) Svrček. However, all the species of the section *Coprobria* (correct form of the previously used name "*Coprobriae*") possess an even much simpler apothecial anatomy and a characteristic longitudinally striate perisporium of the ascospores. The rib-like longitudinal striation was also proved by SEM (Moravec 1987, 1990). Therefore they fundamentally differ from *C. bohémica* as well as from other species of the section *Paracheilymeniae*. *Fimaria bohémica* was transferred to the genus *Cheilymenia* in Moravec (1990).

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