

## TYPE STUDIES IN COPRINUS SUBSECTION LANATULI

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As a prelude to a monograph of the genus *Coprinus*, types were studied of a number of species said to belong to *Coprinus* subsection *Lanatul*i (*Coprinus alnivorus*, *C. alutaceivelatus*, *C. ammophilae*, *C. arachnoideus*, *C. asterophoroides*, *C. brunneistragulatus*, *C. bubalinus*, *C. citrinovelatus*, *C. colosseus*, *C. jonesii*, *C. lagopides*, *C. marcidus*, *C. pachydermus*, *C. palmeranus*, *C. roseistipitatus*, *C. scobicola*, *C. spadiceisporus*, *C. sylvicola*, *C. tectisporus*, *C. undulatus* and *C. xerophilus*). As a result *Coprinus alnivorus* and *C. lagopides* are transferred to subsection *Alachuani*.

Whilst preparing a series of monographic studies and a treatment of the genus *Coprinus* for the Flora agaricina neerlandica type collections were studied of a number of species described in subsect. *Lanatul*i, including those from other continents. The results have been published in the form of a revision of the subsection for the Netherlands (Uljé & Noordeloos, 1999; Uljé et al., 2000).

Since type material is often scanty and / or in bad condition, not all the desired characters were available. Type material of old names has usually not been preserved or is now lost. This is the case in *C. cinereus* J. Schaeff., *C. pseudoradiatus* Kühner & Joss. ex. Watling, *C. lagopus* Fr.: Fr., *C. funariarum* Métrod, *C. lagopus* var. *sphaerosporus* Kühner & Joss. and *C. erythrocephalus* (Lév.) Fr. Unfortunately a number of type collections were not received, even in the case of some recently described species. Some taxa have been excluded from this paper because they have been described and illustrated in full elsewhere. These are *Coprinus bicornis* Uljé & Horvers, *C. calosporus* Bas & Uljé, *C. spelaiophilus* Bas & Uljé, *C. ochraceolanatus* Bas, *C. geesterani* Uljé and *C. krieglsteineri* Bender (Bender, 1987; Uljé, 1992; Uljé & Bas, 1993). For species treated in the present paper, original descriptions have been included for a better understanding of the taxa concerned.

### PRESENTATION AND ABBREVIATIONS

The figures of basidiocarps are all based on dried material and show the specimens (enlargement  $\times 1$ ) that were found in the collections studied. The enlargement of the spores is  $\times 2000$ , while all other microscopical features are shown at  $\times 800$ . For further explanation and abbreviations see Uljé & Noordeloos (1996).

### TYPE STUDIES

#### 1. *Coprinus alnivorus* Van De Bogart, Mycotaxon 4 (1976) 241 — Fig. 1B

Holotype: USA, Washington state, Lewis, Cispus Center, Gufford Pinchot Nat. Forest, 25 Oct. 1975, *F. Van De Bogart 3370* (WTU).

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2) Nationaal Herbarium Nederland, Universiteit Leiden branch, P.O. Box 9514, 2300 RA Leiden, The Netherlands.

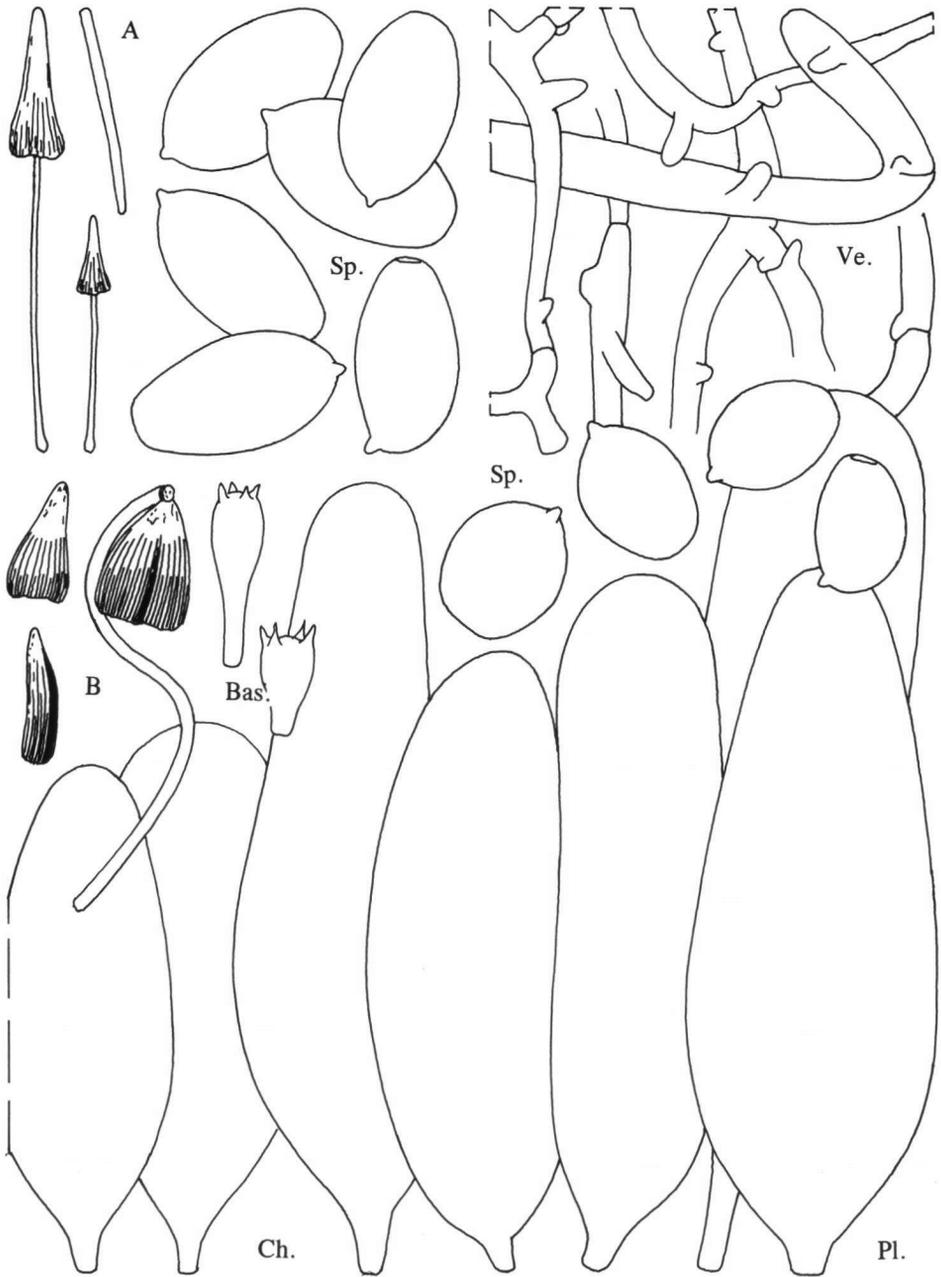


Fig. 1A. *Coprinus sylvicola* (holotype). Dried basidiocarps and spores. — B. *Coprinus alnivorus* (holotype). Dried basidiocarps, spores, pleurocystidia, cheilocystidia, basidia and veil.

*Original description.* Pileus at first short-glandiform, then campanulate, then margin becoming lacinate and somewhat revolute, when unexpanded 2.0 cm in length, expanding to 2.0 cm in width. At first white except pale brown at the apex, then becoming grey, then black, but only brownish grey at the apex. Surface at first with a thin arachnoid universal veil with some minute squamules, in maturity the arachnoid veil largely vanishing but the minute squamules persisting although scattered, surface eventually slightly plicate-striate. Pileal margin at first connected to the stipe with a prominent, scaly white annulus. Flesh thin and fragile. Stipe slender, tapering only slightly from base towards apex, 9.0 cm  $\times$  4.0–6.0 mm, hollow, lumen with some loosely interwoven hyphal webbing, surface smooth, glabrous, white. Flesh slightly fibrous, but very fragile. Loose membranous annulus present, 1.0 mm in width, white, very friable and soon disintegrating into small fragments. Lamellae lanceolate, free, very crowded, at first white, then black. Autolysis complete. Odor faint odor of mushrooms.

Spores subglobose to short ellipsoidal, 7.5–10.7  $\times$  6.2–7.5  $\mu\text{m}$ , apiculus small, often not visible, germ pore apical 1.5  $\mu\text{m}$  in diameter. Color soot black en masse and at first dark purple or brownish purple microscopically, then soon black and opaque in 3% KOH. Wall smooth. Basidia trimorphic, short clavate and 16.5–17.5  $\times$  8.0–10.5  $\mu\text{m}$ , clavate and 18.0–26.0  $\times$  8.0–9.0  $\mu\text{m}$ , long pedicellate-clavate and 27.0–29.0  $\times$  8.0–9.0  $\mu\text{m}$ , all 4-spored. Cheilocystidia clavate to ellipsoidal-fusiform, apices obtuse to subacute, 28.0–135.0  $\times$  11.0–35.0  $\mu\text{m}$ ; hyaline, thin walled, smooth. Pleurocystidia ellipsoidal to subfusiform, apices obtuse to slightly branching, 145.0–182.0  $\times$  30.0–45.0  $\mu\text{m}$ , hyaline, thin walled, smooth. No other cystidia present. Pileal surface a cutis of slender, cylindrical, radially oriented, hyaline, thin walled hyphae. Universal veil of small scales and a thin arachnoid web on pileal surface and base of stipe, scales ar web consisting of slender, non swollen, thin walled, hyaline, cylindrical, septate and clamped hyphae, very interwoven, some branching, most cells separating readily at the septations, 2.5–10.0  $\mu\text{m}$  in diameter, some scales with membranous surface. Clamp-connections present on the hyphae of stipe base, in the universal veil, and in the lamellar trama.

Habitat. Lignicolous, on hard scarcely rotted wood of *Alnus* sp. in a hardwood rain forest.

This species is similar in many features to *C. arachnoideus* and likewise appears to be transitional to section *Lanatuli* in its veil characteristics and possession of pleurocystidia. It differs from *C. arachnoideus* in most of its microscopical features.

*Observations on the holotype.* Spores [20, 1, 1] 8.0–9.6  $\times$  5.4–7.3  $\mu\text{m}$ , ovoid with slightly conical base and rounded to somewhat truncate apex, and almost central, hardly visible, 1.3–1.5  $\mu\text{m}$  wide germ pore, dark red-brown;  $Q = 1.25\text{--}1.50$ , av.  $Q = 1.35$ ; av.  $L = 8.8$ , av.  $B = 6.5$   $\mu\text{m}$ . Basidia 16–38  $\times$  8–10  $\mu\text{m}$ , 4-spored, surrounded by (5–)6–7(–8) pseudo-paraphyses. Pleurocystidia 90–125  $\times$  27–40  $\mu\text{m}$ , subutriform, narrowly ovoid or subcylindric. Cheilocystidia 80–120  $\times$  28–38  $\mu\text{m}$ , narrowly ovoid, (sub)utriform, oblong or subcylindric. Pileipellis hyphoid. Veil made up of hyphoid, cylindrical, thin-walled elements, up to 150  $\times$  3–8  $\mu\text{m}$ , rather sparse branched and diverticulate. Clamp-connections present.

*Notes.* The holotype collection of *Coprinus alnivorus* consists of fragments of a single basidiocarp in good condition. The large cystidia noted by Van De Bogart were not found in the material examined.

Although Van De Bogart (1976) suggested *Coprinus alnivorus* might have an affinity to subsection *Lanatuli*, it definitely belongs to subsect. *Alachuani* on account of the branched and diverticulate veil. It has not been recorded from Europe (Uljé & Noordeloos, 1997).

## 2. *Coprinus alutaceivelatus* Van De Bogart, Mycotaxon 8 (1979) 270 — Fig. 2

Holotype: USA, Washington state, Seattle, 20 Oct. 1973, *F. Van De Bogart 2516* (WTU).

*Original description.* Pileus at first glandiform, then conical, then campanulate. Prior to expansion 1.0–2.0 cm in length and after expansion 1.7–2.9 cm in breadth. At first tan from universal veil tissue, apex under veil medium brown, with maturity pileus yellow-brown under the tan veil and apex brown

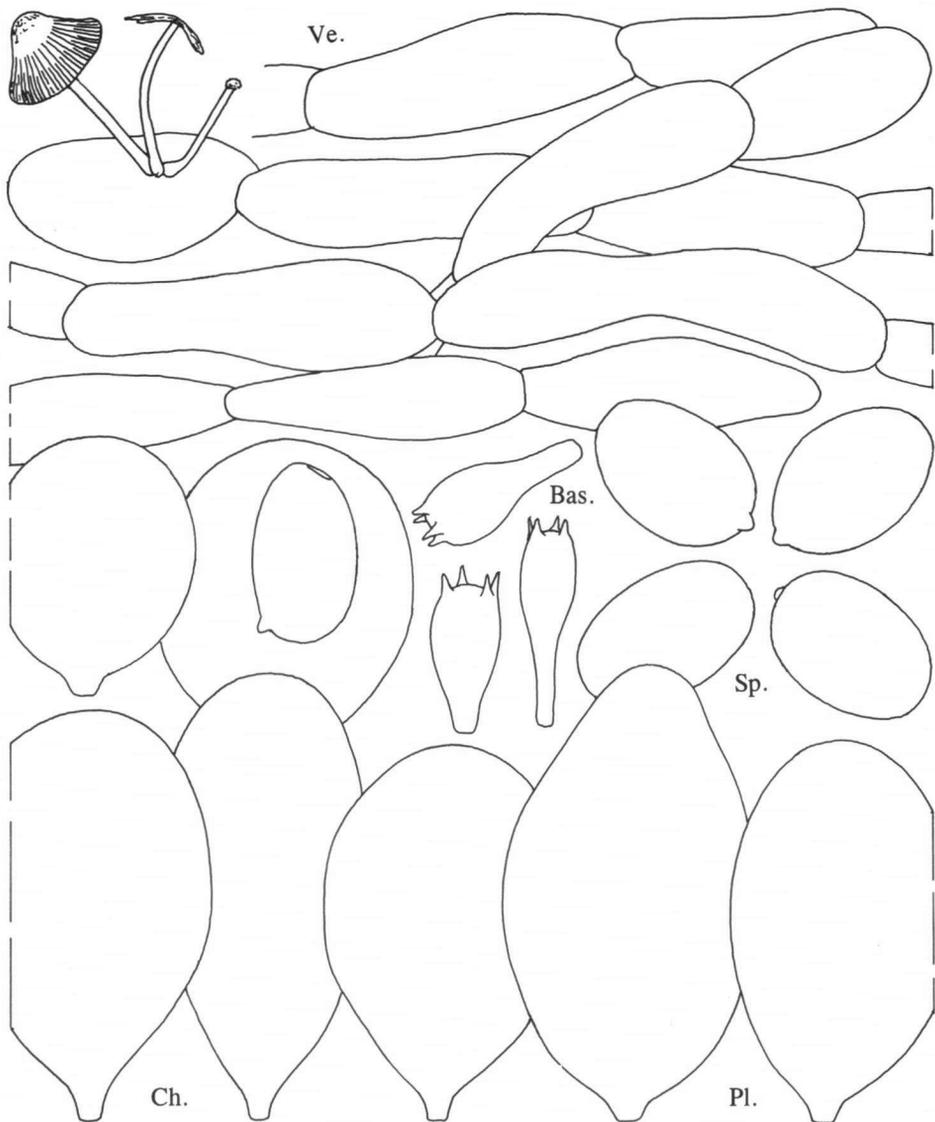


Fig. 2. *Coprinus alutaceivelatus* (holotype). Dried basidiocarps, spores, pleurocystidia, cheilocystidia, basidia and veil.

under the veil remnants. Surface covered at first then plicate-striate under small felt-like irregular veil remnants. Flesh thin and membranous. Stipe hollow, no mycelial web or thread present, very thin and slightly tapered towards the apex, 1.0–2.5 cm × 2.0–3.0 mm, white, opaque, surface glabrous and silky, faint annular or volval ring present at the base, flesh moderately thick and fibrous. Lamellae lanceolate, lamellulae very numerous, 0.8–12.5 × 1.0–3.0 mm, at first very crowded, then less so. White, then brownish black, finally soot black. Autolysis complete. Odor none. Taste not observed.

Spores ellipsoidal, mostly round in cross-section, a few slightly flattened, 8.7–11.3 × 6.2–8.8 × 6.2–7.5 μm, lacking a perispodium, apiculus of medium size and usually visible, germ pore eccentric, 1.2 μm

diameter. Color en masse soot black, microscopically purple-brown becoming greyish in 3% KOH. Wall smooth. Basidia dimorphic, short clavate and  $20.0\text{--}22.5 \times 12.5 \mu\text{m}$ , clavate and  $26.2\text{--}32.5 \times 12.5\text{--}15.0 \mu\text{m}$ , all 4-spored. Cheilocystidia globose to short ellipsoidal,  $22.5 \mu\text{m}$  in diameter to  $70.0 \times 45.0 \mu\text{m}$ , hyaline, thin walled, smooth. Pleurocystidia ellipsoidal,  $56.0\text{--}75.0 \times 35.0\text{--}44.5 \mu\text{m}$ , very numerous, mostly bridging between two opposing lamellae, hyaline, thin walled, smooth. No other cystidia present. Pileal surface somewhat cellular but all the cells elongated in a radial direction. Pileal context pale yellow-brown in 3% KOH. Universal veil felt-like and at first continuous over pileal surface, soon breaking up into small irregular patches, tan, composed of somewhat interwoven chains of cells. Cells cylindrical to greatly swollen, constricted at the septa, seldom branched, hyaline, smooth, thin walled. Cells  $2.5\text{--}23.0 \mu\text{m}$  in diameter. Annular line at stipe of similar cells. Clamp-connections rare on stipe.

Habitat. Terrestrial, on soil and conifer needle duff. Loosely clustered.

The tan color of the universal veil and yellow-brown pileal context are distinctive features of this species. The eccentric germ pore of this species and of *C. bubalinus* distinguish them from others of this section present in the western states.

*Observations on the holotype.* Spores [20, 1, 1]  $11.3\text{--}12.1 \times 7.3\text{--}7.8 \mu\text{m}$ , ellipsoid with rounded base and apex, and eccentric, c.  $2 \mu\text{m}$  wide germ pore, dark red-brown;  $Q = 1.50\text{--}1.60$ , av.  $Q = 1.55$ ; av.  $L = 11.8$ , av.  $B = 7.6 \mu\text{m}$ . Basidia  $16\text{--}36 \times 10\text{--}14 \mu\text{m}$ , 4-spored, surrounded by 3–6 pseudoparaphyses. Pleurocystidia  $55\text{--}80 \times 28\text{--}40 \mu\text{m}$ , obovoid, ellipsoid, ovoid or subcylindric. Cheilocystidia  $35\text{--}60 \times 25\text{--}40 \mu\text{m}$ , (sub)globose to ellipsoid. Veil made up of hyphoid, thin-walled elements, up to  $80 \times 4\text{--}18 \mu\text{m}$ , cylindrical, somewhat inflated or with median constriction; terminal cells ellipsoid, clavate or fusoid. Clamp-connections not found.

*Notes.* The poor type collection consists of a single basidiocarp, two stipes, and a small part of a stipe. However, all microscopical features could be found in the material. Clamp-connections were not found, but according to Van De Bogart these are present, though rare, on elements of the stipe. The length of the spores appeared to be considerably larger than in the original description.

### 3. *Coprinus ammophilae* Courtecuisse, Doc. mycol. 18 (72) (1988) 76 — Fig. 3

Holotype: France, reg. Pas de Calais, Stella-Plage, March 1950, *R. Courtecuisse* 84.1109.01 (herb. Courtecuisse).

*Original description.* Chapeau 10–15 mm de diamètre, d'abord campanulé à sommet un peu aplati puis étalé. Marge denticulée fimbriée à ciliée. Voile fibrillo-pelucheux, gris-souris, labile, reposant sur une cuticule gris-perle plus ou moins foncée, fortement fissurée radialement. Lames peu serrées, avec lamelles intermédiaires, arquées, basses, collariées à faces grises ponctuées de noir et arête soulignée de noir. Stipe fragile, 20–30  $\times$  1.5–2 mm, cylindrécé, un peu épaissi sous les lames, blanc, entièrement fibrilleux, ponctué de noir au sommet. Chair subnulle, grise dans le stipe et gris-brunâtre dans le chapeau qui est translucide sur 1/2 rayon. Carpophores assez rapidement déliquescents.

Spores (9.5–)10–12(–13)  $\times$  (6–)6.5–7.5(–8)  $\mu\text{m}$ , très sombres, elliptiques à face ventrale souvent plus plane, très légèrement lenticulaires. Pore germinatif présent, assez larges, axial. Basides 4-sporiques, clavées, parfois étranglées au sommet ou juste sous celui-ci, stipitées,  $45\text{--}50 \times 5.5\text{--}15 \mu\text{m}$  plus les stérigmates qui sont arqués vers l'intérieur. Pseudoparaphyses trapues, trapézoïdales ou presque rectangulaires,  $30\text{--}35 \times 16\text{--}20 \mu\text{m}$ . Boucles présentes. Voile du type *Lanatuli*, formé de chaînes de cellules allongées,  $20\text{--}65 \times 15\text{--}35 \mu\text{m}$ , plus fines dans les derniers articles (jusque  $\times 8 \mu\text{m}$ ) qui sont atténués-coniques. Pigment membranaire lisse ou légèrement ponctué dans le voile. Revêtement du stipe identique mais avec quelques cellules plus courtes, presque ovales.

Récoltes. Le Crotoy (Somme). Etang de pêche de la Baie de la Maye. Ammophilion. Le 11.11.82. Leg.: RC no 82111131; Stella-Plage (Pas-de-Calais). Cordon de dune secondaire. Ammophiletum. Le

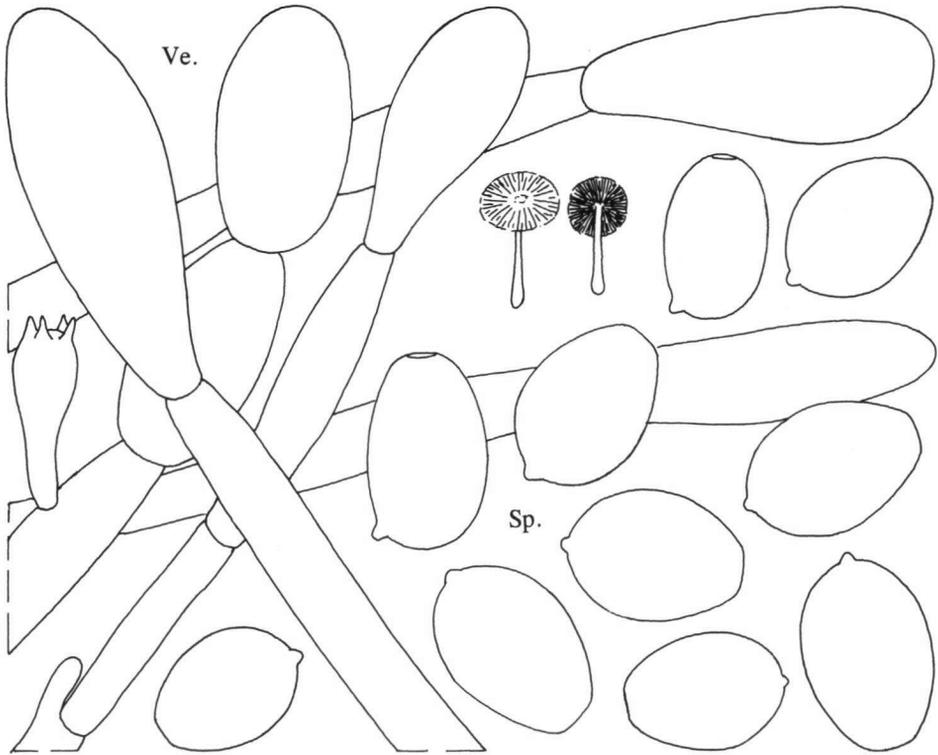


Fig. 3. *Coprinus ammophilae* (holotype). Dried basidiocarps, spores, basidia and veil.

9.11.84. Leg.: RC, M. Bon et J. Vast; no 84110901; Merlimont (Pas-de-Calais). Sable humide parmi les oyats et d'autres graminées (fétuques...) près d'un ruisseau artificiel. Le 2.11.86. Leg.: RC et M. Citerin; Pors-Morvan (Côtes du Nord). Plestin-les-Graves. Cordon dunaire et un talus sableux. Euphorbio-Ammophiletum avec quelques Agropyron. Le 20.11.86. Leg.: RC et D. Réaudin; no 86112001.

La description qui précède n'est pas très complète, mais résulte pourtant de l'observation de plusieurs récoltes effectuées en des lieux et à des moments distincts. Son caractère incomplet est dû à la déliquescence des carpophores, problème général avec les coprins, mais surtout à la croissance du champignon dans la dune blanche. La présence inévitable de grains de sable sur les fructifications, en particulier au niveau de la cuticule (souvent déjà très gênante chez les champignons charnus que l'on peut pourtant arriver à 'nettoyer' sans leur causer trop de dommages) s'est révélée ici extrêmement préoccupante. L'observation, si importante, de la structure vélaire a été très difficile et n'a pu être réalisée correctement que sur le type et sur l'exemplaire breton. Néanmoins, l'aspect macroscopique du voile rattache évidemment cette espèce aux *Lanatulii* et nous étions persuadé depuis longtemps d'avoir à faire à un nouveau taxon. Nous avons attendu de la retrouver plusieurs fois afin de compléter sa description dans la mesure du possible et de nous assurer de son caractère original. Nous nous décidons donc à la publier, même si nous sommes conscient du fait que sa diagnose pourra encore être enrichie à la faveur de récoltes ultérieures, moins 'ensablées' que les précédentes.

Les travaux sur le genre *Coprinus* que nous avons consultés (en particuliers, Orton et Watling, 1979) nous mènent à proximité de *C. lagopus*, espèce qui diffère macroscopiquement de la nôtre par son chapeau beaucoup 'plus digitiforme-cylindracé', son stipe souvent très élancé et aussi par son habitat terricole subhygrophile, généralement sylatique.

*Observations on the holotype.* Spores [20, 1, 1]  $9.7\text{--}12.2 \times 7.1\text{--}8.4 \mu\text{m}$ , ellipsoid or ovoid with rounded base and apex, and central, rather truncate, c.  $1.8 \mu\text{m}$  wide germ pore, dark red-brown;  $Q = 1.30\text{--}1.50$ , av.  $Q = 1.35\text{--}1.40$ ; av.  $L = 11.1$ , av.  $B = 8.0 \mu\text{m}$ . Basidia, pseudoparaphyses and cystidia collapsed. Veil made up of hyphoid, thin-walled elements,  $50\text{--}100 \times 20\text{--}30 \mu\text{m}$ , usually somewhat inflated and constricted at septa; terminal cells clavate. Clamp-connections present.

*Notes.* The collection consists of two very badly preserved basidiocarps. Only spores and minute veil fragments could be observed.

#### 4. *Coprinus arachnoideus* Van De Bogart, Mycotaxon 4 (1976) 238 — Fig. 4

*Holotype:* USA, Washington State, Seattle, March 1950, *F. Van De Bogart 2161* (WTU).

*Original description.* Pileus at first long glandiform, then conic, then campanulate. Prior to expansion 1.8 cm in length and after expansion 3.0 cm in breadth. Pale creamy white at first, soon becoming pale grey-tan to pale creamy grey-tan. Small shallow plicate striations developing as pileus becomes mature. Surface covered at first with a thin wispy fibrillar universal veil that soon breaks up into small scattered irregular patches. Flesh thin and membranous. Stipe hollow, slender, nearly equal but with a slight swelling at the base and slightly narrowed towards the apex,  $4.0\text{--}6.5 \text{ cm} \times 2.2\text{--}3.6 \text{ mm}$ . White, opaque, glabrous except for a few small bits of loosely interwoven fibrillose tomentum scattered around the stipe base. Flesh thin and fragile. Lamellae linear, some short lamellae present,  $0.6\text{--}1.6 \text{ cm} \times 5.0 \text{ mm}$ , broadly adnate, crowded, with no appreciable spreading by the limited amount of plicate striation, white, then soot black. Autolyses complete. Odor and taste not observed.

Spores ovate in dorsal view and ellipsoidal in lateral view, flattened,  $11.2\text{--}13.8 \times 7.5\text{--}8.8 \times 6.2\text{--}7.3 \mu\text{m}$ , suprahilar depression present on most, apiculus small, visible only in lateral view, germ pore eccentric,  $1.3\text{--}1.8 \mu\text{m}$  in diameter. Color en masse black, microscopically deep purple-brown in 3% KOH. Wall smooth. Basidia dimorphic, short clavate and  $22.0\text{--}25.0 \times 12.0 \mu\text{m}$ , long clavate and  $30.2\text{--}35.2 \times 13.0\text{--}15.0 \mu\text{m}$ , all 4-spored. Cheilocystidia globose to ellipsoidal,  $12.5 \mu\text{m}$  in diameter to  $50.0 \times 39.0 \mu\text{m}$ , mostly with a short pedicel  $3.0\text{--}6.0 \mu\text{m}$  long, hyaline, smooth. Pleurocystidia ellipsoidal,  $77.0\text{--}98.2 \times 42.5\text{--}58.0 \mu\text{m}$ , pedicellate, pedicels  $1.0\text{--}12.0 \mu\text{m}$  long, hyaline, smooth. No other cystidia present. Pileal surface a cutis of more or less radially oriented hyphae, the surface cells two or three times as long in the radial orientation as in any other direction.

Universal veil of fibrillar nature, interwoven. Individual elements occurring in long chains of more or less cylindrical cells, hyaline, thin walled, some swollen and somewhat constricted at the septations, others not swollen. Some cells irregular, the chains composed of cells of varied sizes all along its length, some of them branched or anastomosed. The same types of chains of cells found on both the pileal surface and at the stipe base. Universal veil cell size  $16.2\text{--}12.5 \times 2.5\text{--}33.8 \mu\text{m}$ . Clamp-connections absent.

*Habitat.* Terrestrial, on prepared soil mixes in a greenhouse, solitary.

This species differs from most of the other species of section *Coprinus* in its lack of any web or thread of hyphae inside the lumen of the stipe, its lack of refractive plugs in the sterigmata, its adnate lamellae and its lack of clamp-connections. *C. arachnoideus* differs from *C. alnivorus* microscopically. It resembles some of the species of section *Lanatuli* in its universal veil characters and in the possession of pleurocystidia.

*Observations on the holotype.* Spores [20, 1, 1]  $10.6\text{--}15.0 \times 6.7\text{--}9.1 \mu\text{m}$ , ellipsoid or ovoid with rounded base and apex, and strongly eccentric, c.  $1.6 \mu\text{m}$  wide germ pore, dark red-brown;  $Q = 1.45\text{--}1.65$ , av.  $Q = 1.60$ ; av.  $L = 13.3$ , av.  $B = 8.3 \mu\text{m}$ . Basidia  $20\text{--}30 \times 11\text{--}13 \mu\text{m}$ , 4-spored, surrounded by 5–7 pseudoparaphyses. Pleurocystidia  $90\text{--}125 \times 30\text{--}50$  ( $\text{--}60$ )  $\mu\text{m}$ , obovoid, ellipsoid or subcylindric. Cheilocystidia  $40\text{--}100 \times 25\text{--}40 \mu\text{m}$ , (sub-)globose to ellipsoid or subcylindric. Veil made up of hyphoid, thin-walled elements,  $40\text{--}60 \times 14\text{--}25 \mu\text{m}$ , usually somewhat inflated and constricted at septa; terminal cells ellipsoid or clavate. Clamp-connections sparse, not distinct.

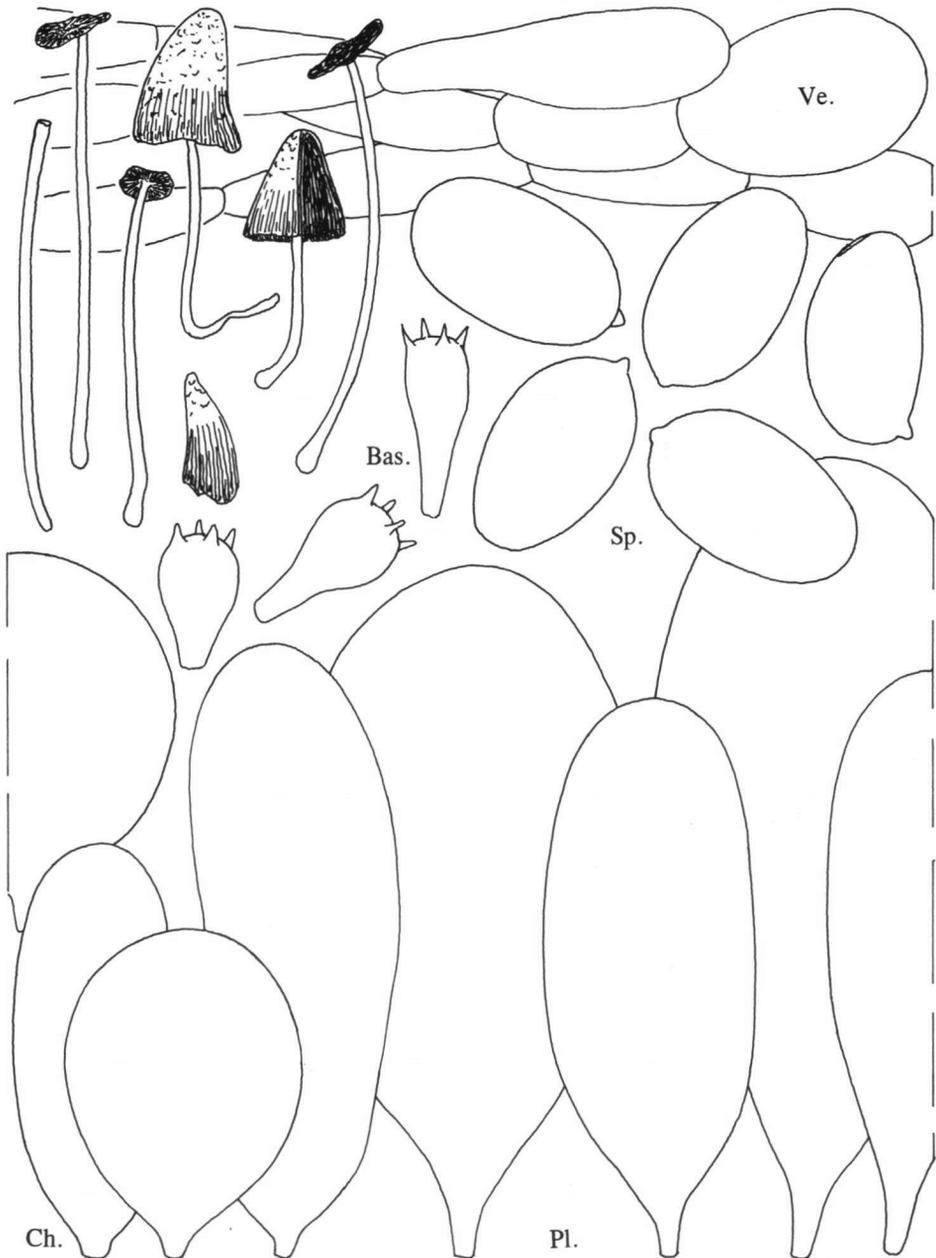


Fig. 4. *Coprinus arachnoides* (holotype). Dried basidiocarps, spores, pleurocystidia, cheilocystidia, basidia and veil.

**Notes.** The holotype is in a fairly good condition, and consists of four basidiocarps and a fragment of another one. Although said to be absent in the original description, we observed some clamp-connections in the veil.

## 5. *Coprinus asterophoroides* Van De Bogart, Mycotaxon 4 (1976) 252 — Fig. 5

Holotype: USA, Washington, Beverly, 5 Aug. 1974, *F. Van De Bogart 3333* (WTU).

*Original description.* Pileus at first rounded, then hemispherical, then campanulate, then plane, and finally mostly lysed, when unexpanded 2.0–3.0 cm long, expanding to 4.0–6.0 cm broad. Universal veil white when young, then cuticle darkening to black or blackish brown as universal veil recedes, apex remaining white with universal veil. Universal veil of a felt-like consistency, very thick, soon torn into a distinctly stellate persistent remnant as pileus expands. Pileal surface becoming deeply plicate striate. Pileal margin becoming revolute or curling under and eventually reduced to tattered shreds. Stipe hollow, slender, 7.0–11.5 cm × 3.0–6.0 mm. Stipe lumen with a distinct and persistent hyphal strand in the center. Surface mostly smooth and glabrous, some appressed fibrils near the bottom or occasionally small scales on the lower half. White at first, then slowly blackening as lysis proceeds, opaque. Flesh very thin and fragile. Lamellae lanceolate, free and remote, very crowded, soot black when mature, autolysis complete.

Spores ovate to ovate-ellipsoidal, slightly flattened, 17.5–20.0 × 11.2–12.5 μm, apiculus usually small, germ pore apical to very eccentric, 1.8 μm in diameter. Color soot black en masse and a dark brownish purple-black microscopically in 3% KOH. Wall smooth. Basidia trimorphic, short clavate and 35.0–39.0 × 20.0–22.5 μm, clavate and 50.0–54.0 × 20.0–22.5 μm, subululiform and 52.0–61.5 × 20.0–21.5 μm, sterigmata with dark somewhat refractive plugs, apex of basidia dark grey-brown, all 4-spored. Cystidia not seen. Pileal surface of slender, cylindrical, radially aligned, thin-walled hyphae. Many hyphae with irregular patches of dark brown pigment on the cell walls. Universal veil composed of long parallel, radially aligned chains of long, often somewhat swollen cells, constricted at the septae, larger cells of the chains bound together by slender, branched and anastomosed hyphae. All cells of universal veil hyaline and thin walled. Large cells 12.5–63.5 μm in diameter. Cells of the binding hyphae 3.5–11.0 μm in diameter. Clamp-connections present in universal veil and rarely on the stipe, usually very irregular.

Habitat. Terrestrial, on sandy soil in dry open sagebrush desert area.

This species is closely related to *C. asterophorus* Long & Miller and to *C. xerophilus* Van De Bogart. It shares many morphological features as well as the arid habitat with both. *C. asterophoroides* differs from *C. asterophorus* in possessing a distinct and persistent hyphal strand in the stipe lumen, the universal veil remaining white even when dried, the germ pore often very eccentric, the much larger diameter of the universal veil elements, the absence of a bulbous volvate stipe base, and the larger and much broader basidia with pigmented apices. *C. asterophoroides* differs from *C. xerophilus* in the universal veil remaining stellate, the smaller germ pore, the absence of a bulbous volvate stipe base, and the pigmented apex of the basidia.

*Observations on the holotype.* Spores [40, 2, 1] 14.8–20.6 × 10.7–14.2 × c. 11.5–12.0 μm, ovoid or ellipsoid with rounded base and apex, and eccentric, 1.8–2.1 μm wide germ pore, very dark red-brown; Q = 1.40–1.65, av. Q = 1.45–1.50; av. L = 17.4–18.6, av. B = 11.6–12.8 μm. Basidia 32–60 × 20–25 μm, 4-spored. Pseudoparaphyses and cystidia collapsed. Veil made up of hyphoid, thin-walled elements, 20–150 × 20–50 (–60) μm, usually somewhat inflated and constricted at septa; terminal cells ellipsoid or clavate. Clamp-connections not found.

*Notes.* The type material consists of two old basidiocarps. No cystidia could be located nor could pseudoparaphyses be found.

## 6. *Coprinus brunneistragulatus* Van De Bogart, Mycotaxon 8 (1979) 246 — Fig. 6

Holotype: USA, Washington state, Insula, 6 Oct. 1968, *F. Van De Bogart 194* (WTU).

*Original description.* Pileus at first ovate, then conical, then campanulate, and finally revolute. Prior to expansion 2.0–2.5 cm in length, after expansion 4.0–6.0 cm in breadth. At first dark grey with lighter colored universal veil patches and dark greyish brown at the apex, with maturity becoming darker grey and brownish black at the apex. Some plicate striations developing under the universal veil, the striations

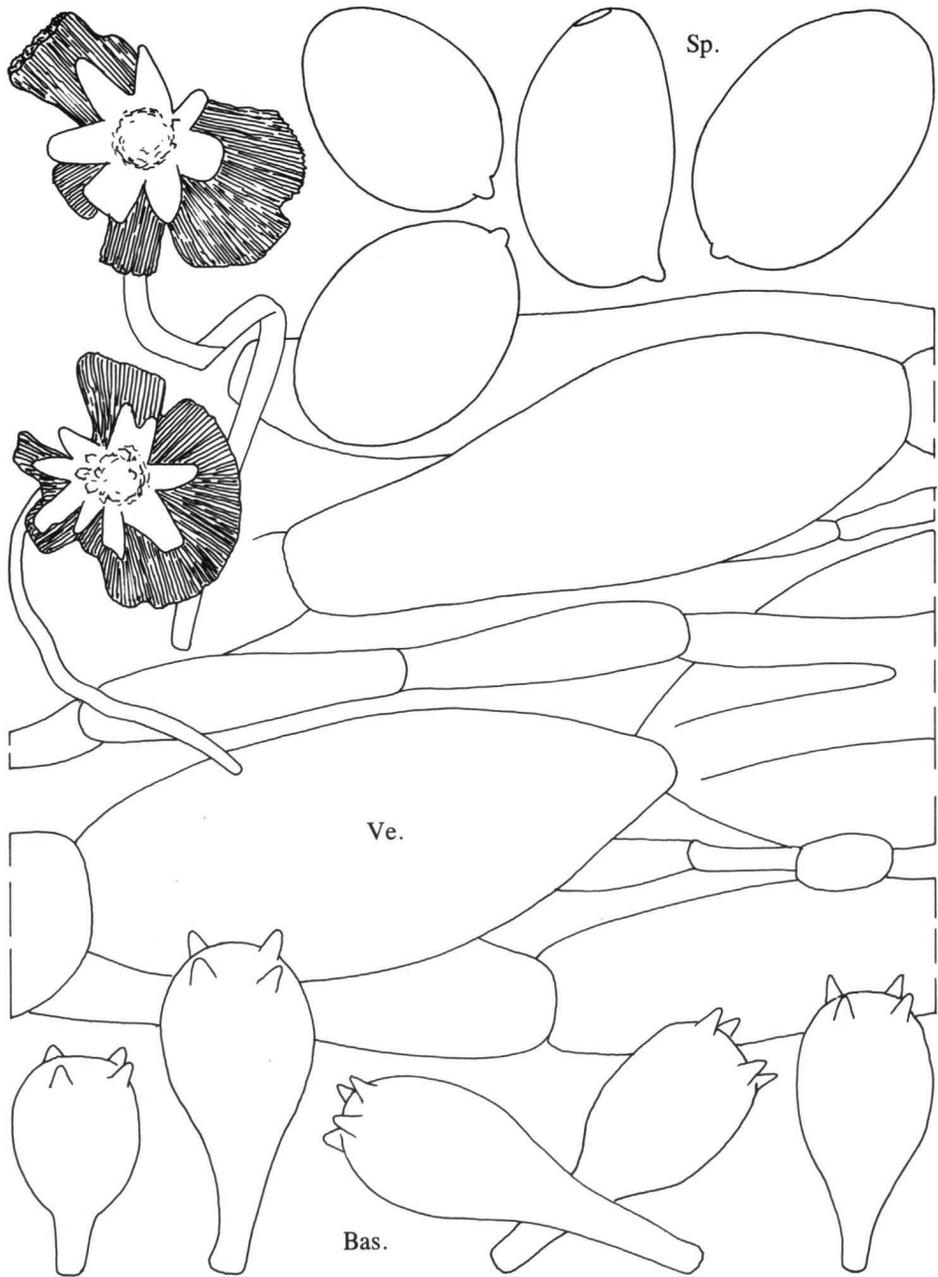


Fig. 5. *Coprinus asterophoroides* (holotype). Dried basidiocarps, spores, basidia and veil.

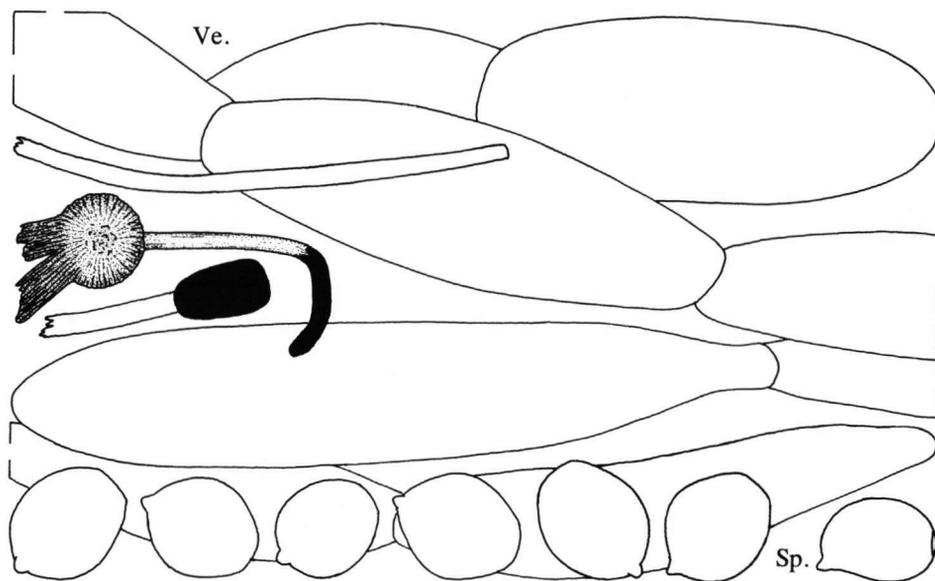


Fig. 6. *Coprinus brunneistragulatus* (holotype). Dried basidiocarps, spores and veil.

often masked at least in part by the veil. Surface completely covered at first, and partly covered at maturity by a feltlike universal veil that breaks up into irregular patches as the pileus expands. Flesh thin and membranous even at the apex. Stipe hollow, thin, slender, tapered from base to apex, 10–12 cm  $\times$  2–5 mm. Base nearly abrupt. White or faintly greyish, opaque. Surface somewhat fibrillose. Flesh thin, fragile and easily broken. Lamellae narrowly lanceolate, some lamellulae present, 0.5–2.8 cm  $\times$  3–4 mm, free or slightly adnexed when young, crowded at first, then less so as pileus expands and plicate striation develops. Pale then blackish brown. Autodigestion incomplete, most of the lamellae lysing but usually most of the pileal surface remaining. Odor and taste not observed.

Spores subglobose to broadly limoniform, round in cross-section, 6.9–8.8  $\times$  6.2–7.5  $\mu$ m, apiculus tiny but often visible, germ pore apical, 1.0–1.4  $\mu$ m in diameter. Color en masse brownish black, microscopically deep purple-brown in 3% KOH. Contents guttulate or not. Wall with a prominent pale brown perisporium that shows best on spores of young specimens but is also found on those of older specimens. Cheilocystidia globose 12.5–38.0  $\mu$ m in diam., or ellipsoidal with rounded ends, 44.0–50.0  $\times$  17.0–22.0  $\mu$ m, hyaline, thin walled, smooth. Pleurocystidia long ellipsoidal, ends usually rounded, 110.0–142.0  $\times$  45.0–52.0  $\mu$ m, hyaline, smooth, thin walled, numerous, often bridging between two opposing lamellae. No other cystidia present. Pileal surface of radially oriented hyphae. Universal veil of large patches adhering to the pileus, composed of chains of smooth, thin walled, hyaline, cylindrical to greatly swollen hyphae, 40.0–150.0  $\times$  11.2–44.0  $\mu$ m, constricted at the septae in most cases. The chains of cells seem to be adherent to each other but are seldom anastomosed. Clamp-connections present on stipe and universal veil.

Habitat. Terrestrial on moist, shaded lawns, solitary.

This species resembles *Coprinus lagopides* P. Karst. in most ways but differs markedly in the presence of a pigmented perisporium.

*Observations on the holotype.* Spores [20, 1, 1] 6.7–8.4  $\times$  6.0–7.0  $\mu$ m, ovoid or ellipsoid, tending to quadrangular, with rounded base and rather truncate apex, and central, c. 1  $\mu$ m wide germ pore, very dark red-brown;  $Q = 1.10$ – $1.20$ , av.  $Q = 1.15$ ; av.  $L = 7.8$ , av.  $B = 6.6$   $\mu$ m. Basidia, pseudoparaphyses and cystidia collapsed. Veil made up of hyphoid, thin-walled elements, 20–100  $\times$  15–36  $\mu$ m, usually somewhat inflated and constricted at septa; terminal cells cylindrical with obtuse apex or ellipsoid. Clamp-connections not found.

*Notes.* The holotype is in a very bad condition. Only a stipe, a part of stipe with collapsed pileus as a black mass at apex and a small part of a pileus remain.

### 7. *Coprinus bubalinus* Van De Bogart, Mycotaxon 8 (1979) 266 — Fig. 7A, 7B

Holotype: USA, California, Lafayette, April 1972, *F. Van De Bogart 3821* (WTU).

*Original description.* Pileus at first rounded oblong, then ellipsoidal, then conical, then campanulate, finally somewhat revolute. Prior to expansion 1.0–3.5 cm in length and after expansion 3.0–6.0 cm in breadth. Surface at first covered a white universal veil. Veil fragile, soon breaking up into irregular patches revealing a honey colored, yellow-tan to light ochre pileal surface. Color of pileal apex similar. Entire pileus blackens with lysis. Moderately plicate-striate. Surface under the veil somewhat lubricous. Margin of young pileus curved in to stipe. Flesh buff colored, thin fragile. Stipe hollow and somewhat pithy. The pithy material drying into gelatinous lumps. Slender, slightly tapered, at first 1.5–4.0 × 1.0–1.4 cm, when mature 6.0–8.0 × 0.4–0.8 cm, whitish buff, bruising tan, opaque, surface faintly pruinose, small evanescent remnants of the universal veil present on young specimens about 4.0 mm above the base. Base merges into a fine white mycelium. Flesh fragile. Lamellae lanceolate, some lamellulae also present, 1.0–2.7 cm × 1.0–3.0 mm, crowded, free or slightly adnexed, at first whitish tan, then mottled grey-black, immature lamellar margins whitish cinereous. Autolysis complete unless halted by drying. Odor fungoid or earthy. Taste fungal.

Spores ellipsoidal, slightly flattened, 10.0–14.1 × 6.7–8.5 × 6.2–6.8 μm, lacking a perispodium, apiculus small, germ pore eccentric, 1.7–2.1 μm in diameter. Color en masse black, microscopically purplish black and soon deep brownish black in 3% KOH. Wall smooth. Basidia trimorphic but not completely separate and distinct in sizes and shapes, short clavate and 22.0–28.0 × 11.0–12.0 μm, clavate and 34.0–39.0 × 11.5–12.0 μm, long clavate and 40.0–49.0 × 14.5 μm, all 4-spored. Cheilocystidia globose 10.0–50.0 μm in diameter or ellipsoidal 50.0–65.0 × 22.0–28.0 μm, some with pedicel, 0.1–5.0 μm in length, hyaline, thin walled, smooth. Pleurocystidia ellipsoidal, 70.0–93.0 × 28.0–43.0 μm, some with pedicel, 0.1–3.0 μm in length, hyaline, thin walled, smooth. Some bridging between two opposing lamellae. No other cystidia present. Pileal surface of mature sporocarps composed of swollen cells, mostly elongate in a radial direction, some isodiametric cells also present. Universal veil felt-like or arachnoid or pruinose, at first continuous over pileal surface, soon breaking up into small irregular patches, composed of hyphae with cylindrical to very swollen cells, 12.0–116.0 × 12.0–36.0 μm, the swollen cells with constricted septa, some cells branched, all hyaline, thin walled, smooth. Cells at tip of hyphal chains mostly clavate-swollen. Same cell types present in veil remnants on pileus and stipe base. Clamp-connections rarely present on stipe only.

Habitat. Lignicolous, on walnut and mulberry slash, solitary or small clusters.

This species seems to be closely related to *C. sylvicola*, *C. marcidus* and *C. alutaceivelatus*. The pithy material in the stipe of young sporocarps which upon drying becomes gelatin-like lumps is somewhat distinctive. *Coprinus bubalinus* resembles *C. alutaceivelatus* in its overall appearance and the presence of eccentric germ pores on spores of both. It differs in its lack of pigmented pileal context and in having trimorphic basidia as opposed to dimorphic. The color of the pileal surface below the universal veil is much more yellow in *C. bubalinus* than the more nearly brown surface of *C. alutaceivelatus*.

*Observations on the holotype.* Spores [20, 1, 1] 11.7–14.4 × 8.1–9.6 × c. 7–8.5 μm, ellipsoid or ovoid, with rounded base and apex, and strongly eccentric, 1.8–2.2 μm wide germ pore, very dark red-brown; Q = 1.35–1.55, av. Q = 1.45–1.50; av. L = 13.1, av. B = 8.9 μm. Basidia 24–46 × 12–15 μm, 4-spored, surrounded by 5–7(–8) pseudoparaphyses. Pleurocystidia 70–120 × 40–70 μm, subglobose, ellipsoid, oblong, utriform or subcylindrical. Cheilocystidia 40–120 × 30–70 μm, (sub)globose, ellipsoid, oblong or subutriform. Pileipellis a layer of spheropedunculate cells. Veil made up of hyphoid, thin-walled elements, 30–100 × 10–40(–50) μm, usually not inflated, constricted at septa and branched in part, mixed with clavate, ellipsoid or (sub)globose cells; terminal cells clavate, ellipsoid or subglobose. Clamp-connections not found.

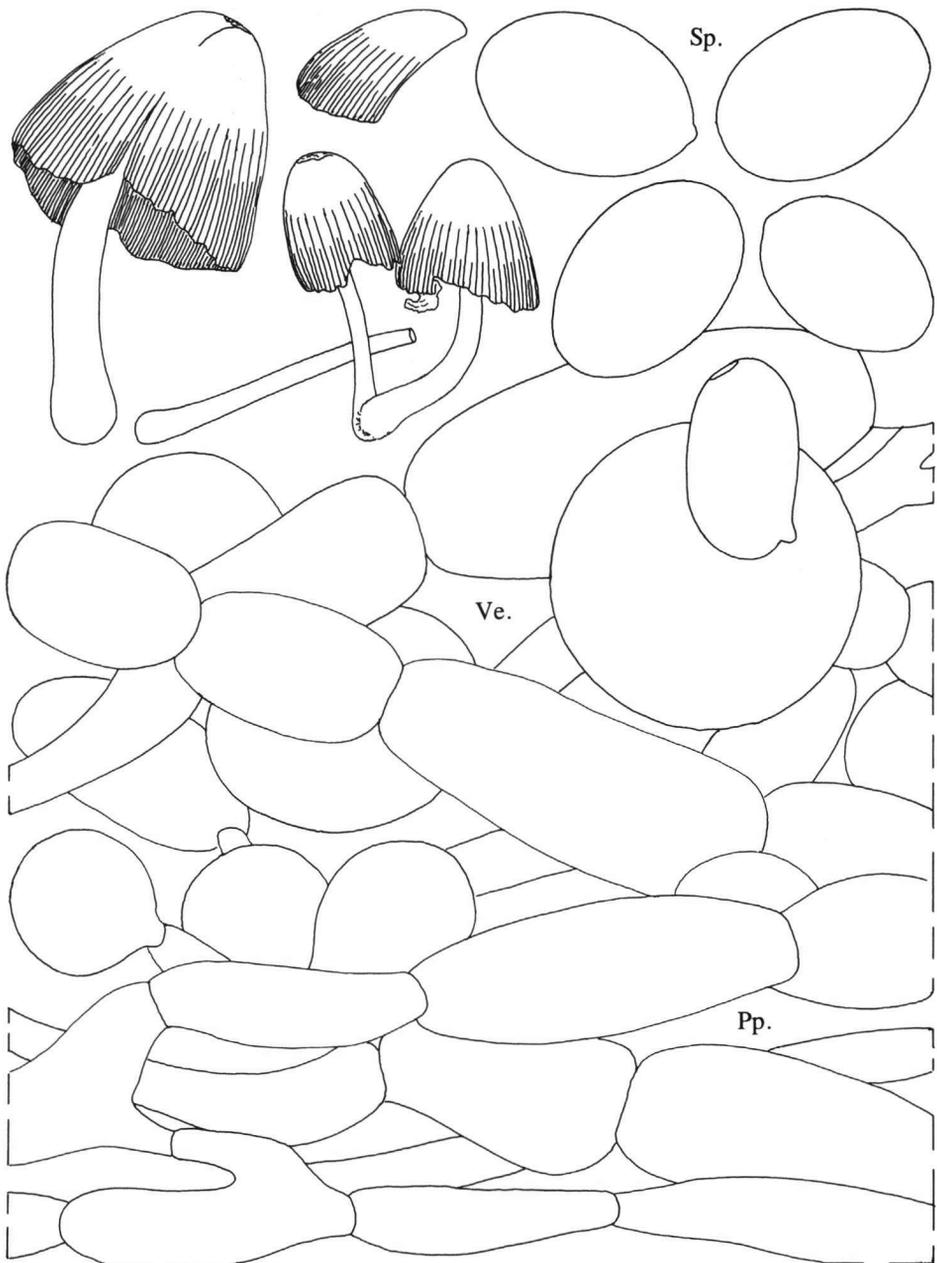


Fig. 7A. *Coprinus bubalinus* (holotype). Dried basidiocarps, spores, pileipellis and veil.

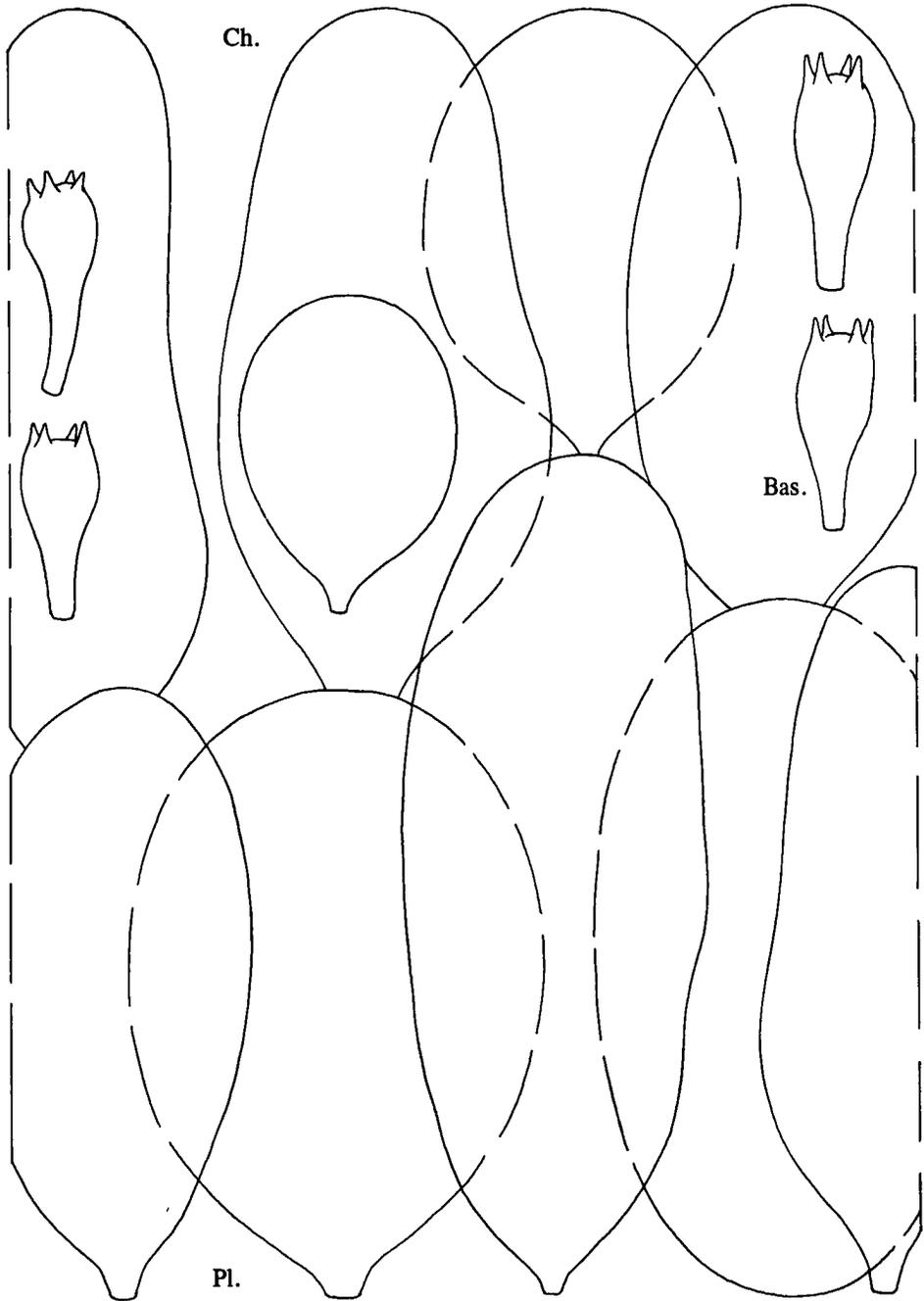


Fig. 7B. *Coprinus bubalinus* (holotype). Pleurocystidia, cheilocystidia and basidia.

*Notes.* The holotype consists of three whole basidiocarps and a fragment, all in a rather good state. All microscopical features could be found in the material. Our measurements show somewhat broader spores both in side and in frontal view. The pileipellis was described as composed of elongate, swollen cells in radial direction. We found that the pileipellis was a hymeniderm.

### 8. *Coprinus citrinovelatus* E. Ludw. & P. Roux, Z. Mykol. 61 (1995) 35 — Fig. 8

Holotype: Germany, Berlin-Düppel, on wood-chips, 30 May 1982. Gregarious (G, B).

*Original description.* Hut jung kegelig, bis 2 cm hoch, später flach aufschwimmend und 3–4 cm breit, zuletzt schalenförmig vertieft. Häutig dünn. Jung glatt, mit zunehmender Reife bis zur Mitte faltig gefürcht. Grundfarbe hellgrau. Im Primordialstadium vollständig übersponnen von einem anfangs kräftig ocker-gelben, später hell zitronengelbem faserig-haarigen Velum, das bis zuletzt auf dem Scheitel erhalten bleibt. Lamellen jung hell umbrabraun, dann umbraschwärzlich, an den Schneiden gelblich (!). Stiel 3–6 × 0.15–0.3 cm. Basis lange etwas knollig abgesetzt. Abwärts verdickt. Ebenfalls von gelbem Velum übersponnen, im unteren Teil lange regelrecht gestieft. Zuletzt – zumindest im oberen Bereich – weizig; ringlos, in frühen Stadien bisweilen mit leichter knotiger Verdickung. Fleisch nicht zerfließend, sondern welkend. Unangenehm nach Mist riechend.

Basidien 4-sporig. Sporen (10–)11–14 × 6.5–7.5 µm; in Frontansicht ellipsoid bis ovoid, dabei überwiegend schlank, manchmal fast zylindrisch-ellipsoid; in Seitenansicht leicht abgeflacht; am Apikalus meist etwas spitz ausgezogen; glatt, in KOH dattelfarbig. Keimporus zentral, deutlich, bis 2 µm breit. Cheilozystiden überwiegend keulig, selten auch subutriform bis breithalsig-flaschenförmig, blaßgelb; 40–110 × 15–35 µm. Pleurozystiden vorhanden; ähnlich geformt. HDS zellig, aus zu bis 30 µm breiten Elementen. Velum überwiegend aus zylindrischen, bisweilen etwas unregelmäßigen Elementen; kein Kugelzellen. Schnallen vorhanden.

R. Watling, dem Abbildung und Material des Fundes vorgelegt wurden, verneinte definitiv eine Identität mit seinem *C. luteocephalus*, stufte die Art aber sicher zurecht als "very close" (sehr nahestehend) ein. Die Hauptunterschiede ergeben sich aus der Tabelle 1.

	<i>Coprinus luteocephalus</i>	<i>Coprinus citrinovelatus</i>
Vorkommen	Auf Pferdemitzen, Affinit	auf Erdboden, teilweise Holzrestchen ansitzen
Sporenform	Ellipsoid-mandelförmig, in Frontansicht ellipsoid	überwiegend schlank ellipsoid bis fast zylindrisch-ellipsoid
Sporegröße	10.5–12.5 × 5–7.5 µm	11–14 × 6.5–7.5 µm
Cheilozystiden	Ballonförmig, bis ellipsoid, diam. –18 µm, hyalin	neben ballonförmig, und ellipsoiden auch subutriforme bis breithalsig-lageniforme, diam. –35 µm, gelbwandig

*Observations on the holotype.* Spores [50, 5, 2] 11.1–13.8 × 6.3–7.5 µm; Q = 1.60–1.95, av. Q = 1.70–1.80; av. L = 11.7–12.3, av. B = 6.7–7.1 µm, dark red-brown with central, c. 1.8 µm wide germ pore. Basidia 18–34 × 8–9 µm, 4-spored, surrounded by (3–)4–6 (–7) pseudoparaphyses. Pleurocystidia 70–100 × 25–32 µm, oblong to subutriform. Cheilocystidia 50–90 × 20–32 µm, ellipsoid, oblong or subutriform. Elements of veil 25–100 × 8–14 µm, of type 'Lanatuli', very sparse, yellowish incrustated.

*Notes.* *Coprinus citrinovelatus* appeared to be a later synonym of *C. ochraceovelatus* Bas (Uljé & Noordeloos, 1999).

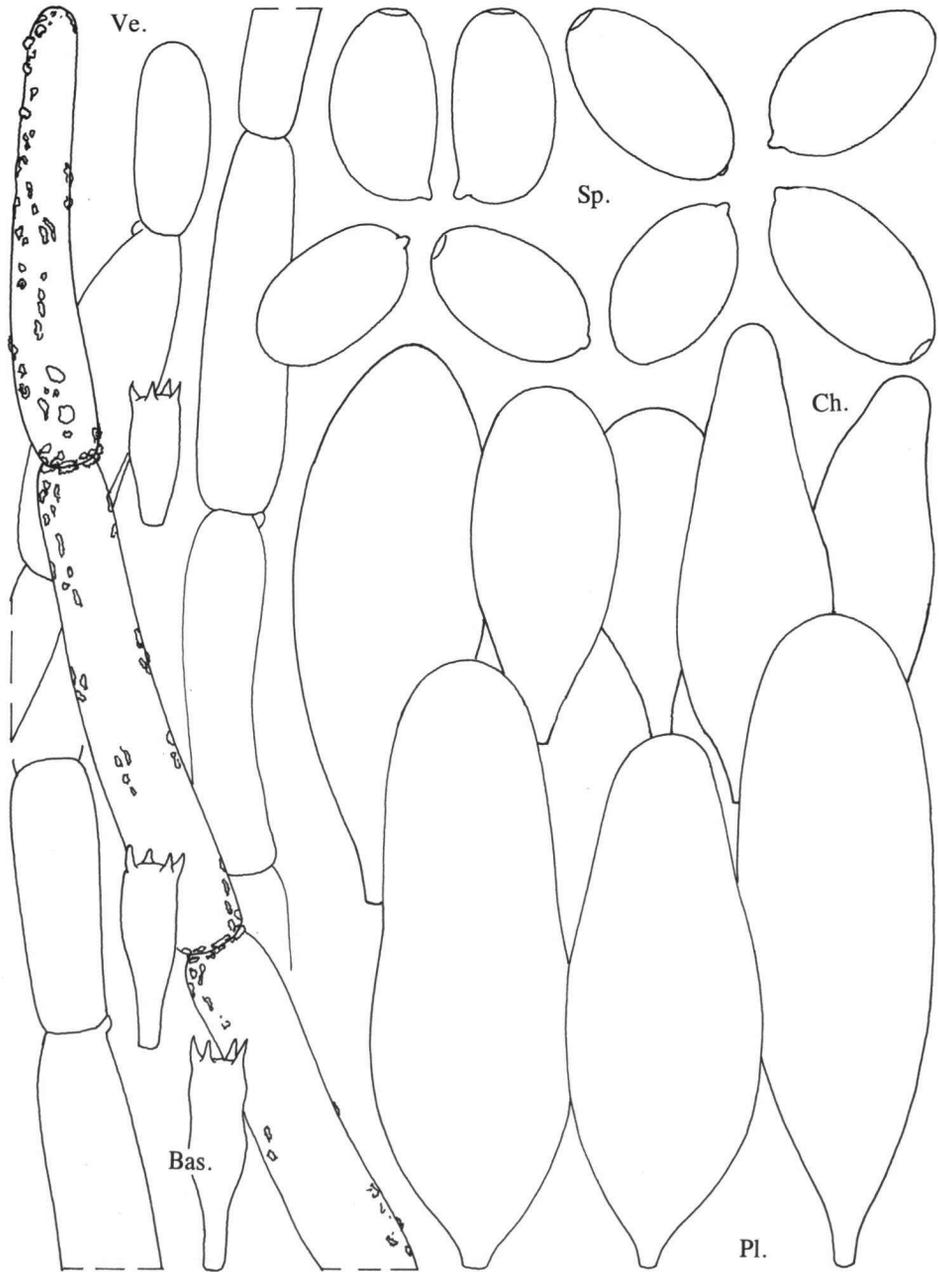


Fig. 8. *Coprinus citrinovelatus* (holotype). Spores, pleurocystidia, cheilocystidia, basidia and veil.

## 9. *Coprinus colosseus* Van De Bogart, Mycotaxon 4 (1976) 265 — Fig. 9A, 9B

Holotype: USA, Washington State, Redmond, 2 May 1966, *F. Van De Bogart 143* (WTU).

*Original description.* Pileus oblong-oval at first, then narrow conical, then narrow campanulate, then broadly shallow campanulate, and eventually lacinate-revolute. Prior to expansion 13.0–25.4 cm in length and after expansion 8.0–14.0 cm broad, the smaller size due to autodigestion during expansion. White with brownish-tipped scales and pale brown pileal apex at first and then gradually darkening with maturity and autolysis. Plicate striation limited in development, involving little or none of the lamellar trama. Surface covered with a universal veil of rather small scales that are white to white with brownish tips. Scales firmly attached when pileus is immature but becoming loose and easily removable as pileus matures. Flesh mostly thin and membranous but up to 3.0 mm in thickness at apex. Stipe hollow, the lumen containing a loose yarnlike thread of loosely interwoven filaments. Almost equal but with a slight tapering from base to apex, 35.0–50.5 × 1.5–2.5 cm, the base abrupt and embedded up to 8 additional centimeters into the soil. A small loose annulus present on some specimens. Surface seeming smooth and glabrous. White at first, then as spores are produced and autolysis proceeds the apical flesh slowly blackening internally as well as externally. Flesh opaque, coarse and fibrous. Rhizomorphs of compact white hyphae penetrating about 15.0 cm into the substrate from some specimens. Lamellae linear, almost all long, 8.0–25.0 × 1.5–2.3 cm, free but attached to a small collarium. Extremely crowded at first and remaining crowded throughout sporulation and lysis, pale but becoming soot black. Autolysis almost complete, nearly the entire pileus affected. Odor and taste none.

Spores ovate in dorsal view and ovate-ellipsoidal in lateral view, somewhat flattened, 16.8–20.0 × 9.8–13.7 × 8.4–11.3 µm, apiculus large and conspicuous, germ pore somewhat eccentric to very eccentric 1.8–3.1 µm in diameter. Color en masse soot black, microscopically an extremely dark smoky black color in 3% KOH. Contents seeming minutely guttulate or granular in 3% KOH. Wall smooth. Basidia trimorphic, short clavate and 31.5–35.5 × 16.0–18.0 µm, long clavate and 42.5–48.5 × 17.0–18.0 µm, very long clavate-pedicellate and 54.0–65.0 × 19.0–20.0 µm, all 4-spored, all sterigmata with a large refractive or pigmented plug. Cheilocystidia globose or ellipsoidal-ovate, globose 20.0–37.5 µm in diameter, ellipsoidal-ovate 35.0–50.0 × 20.0–25.0 µm, hyaline, smooth. No other cystidia present. Pileal surface of radially oriented hyphae. Universal veil scales composed of cylindrical septate hyphae, mostly swollen and somewhat constricted at the septations, smooth, hyaline, thin-walled cells 17.5–165.0 × 5.0–38.0 µm. A thin tomentum present at base of stipe, composed of slender, nonswollen, hyalin, smooth, thin-walled, branched and interwoven septate hyphae, the cells tending to be long and straight. Clamp-connections rare on stipe cuticle.

Habitat. Terrestrial, on loose, crumbly soil in a dense brushy scrub frondose forest, in large loose clumps, rare.

This species is well marked by its huge overall size, large spore size, and by the darkening of the stipe apex. The last two features it shares with *C. sterquilinus*, a coprophilous species which is much smaller.

*Observations on the holotype.* Spores [20, 1, 1] 16.9–21.1 × 10.9–13.6 × c. 9–11.5 µm, ellipsoid or ovoid, with rounded base and apex, and eccentric, c. 2.5 µm wide germ pore, very dark red-brown; Q = 1.45–1.60, av. Q = 1.55; av. L = 18.8, av. B = 12.2 µm. Basidia 40–65 × (14–)16–20 µm, 4-spored, surrounded by 7–13 pseudoparaphyses. Pleurocystidia absent. Cheilocystidia 20–50 × 20–35 µm, (sub)globose. Pileipellis hyphoid. Veil made up of hyphoid, thin-walled elements, 30–150 × 8–30 µm, in part somewhat inflated, constricted at septa; terminal cells clavate, ellipsoid or subcylindric. Clamp-connections not found.

*Notes.* The holotype consists of just two basidiocarps in a rather bad state. The basal ring described by Van De Bogart was not found in either of the specimens.

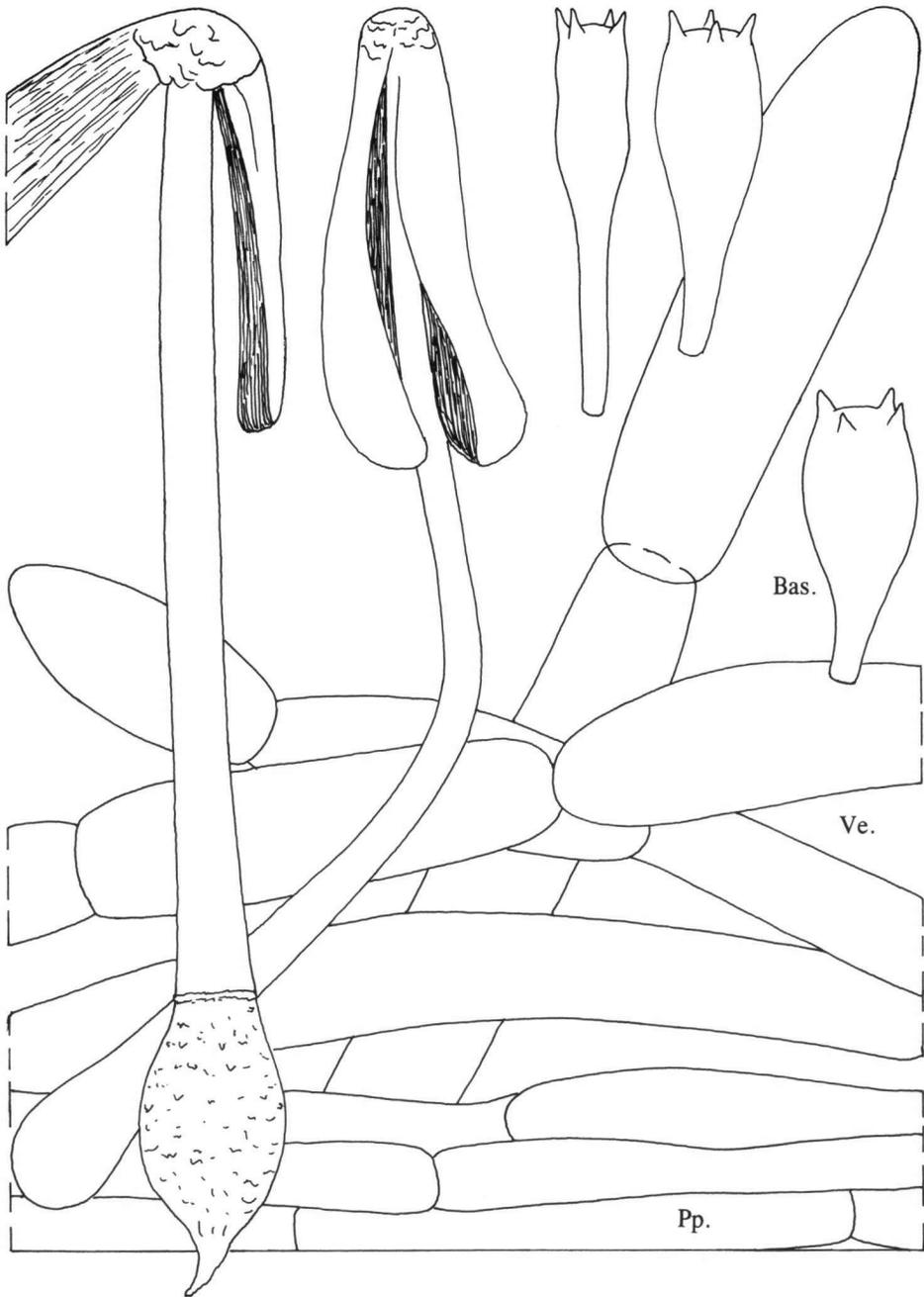


Fig. 9A. *Coprinus colosseus* (holotype). Dried basidiocarps, basidia, pileipellis and veil.

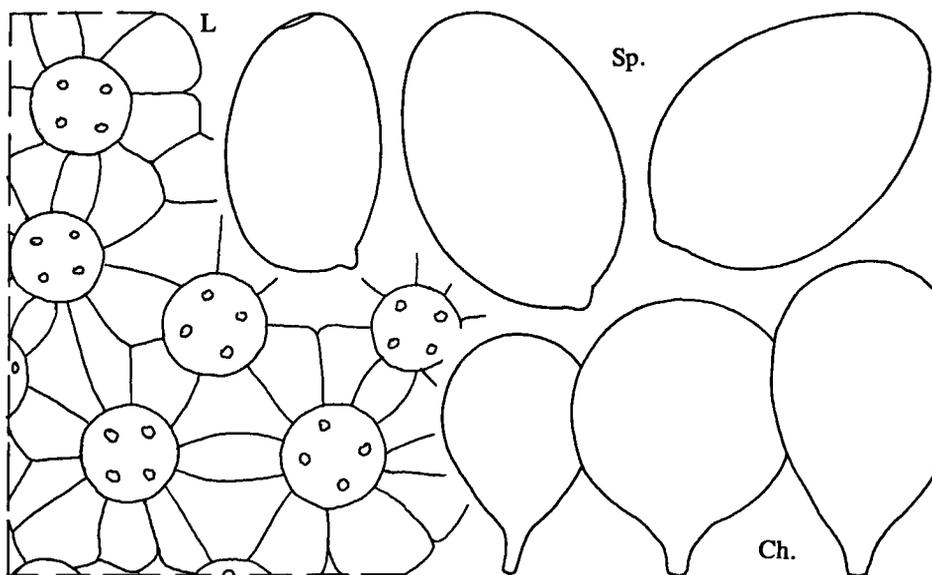


Fig. 9B. *Coprinus colosseus* (holotype). Basidia surrounded by pseudoparaphyses and cheilocystidia.

#### 10. *Coprinus jonesii* Peck, Bull. Torrey bot. Club 22, 1 (1895) 206 — Fig. 10

Holotype: USA, Vermont, Burlington, April 1891, *Prof. L.R. Jones* (NYS).

*Original description.* Plant fragile; pileus 1–2 in. broad, submembranous, campanulate becoming broadly convex or expanded and split or revolute on the margin, very blunt or truncate at the apex when young, everywhere covered with tawny-gray or pale-cervine floccose scales which wholly and partly disappear with age revealing the striate surface beneath; lamellae crowded, linear, free, at first white or whitish, becoming black; stem equal or slightly tapering upward, minutely floccose, hollow, white; stem 2–3 in. long, 2–3 lines thick.

Spores black, broadly elliptical, .0003 to .00035 in. long, .00025 in. broad, with an apiculus at one end.

Habitat. In a cellar.

*Observations on the holotype.* Spores [40, 2, 1]  $6.6\text{--}8.3 \times 5.8\text{--}7.1 \mu\text{m}$ ;  $Q = 1.12\text{--}1.23$ , av.  $Q = 1.18$ ; av.  $L = 7.6$ , av.  $B = 6.4 \mu\text{m}$ , medium red-brown with central, c.  $1.3 \mu\text{m}$  wide germ pore. Basidia  $16\text{--}30 \times 6.5\text{--}8 \mu\text{m}$ , 4-spored, surrounded by 3–5 pseudoparaphyses. Pleurocystidia  $75\text{--}135 \times 35\text{--}50 \mu\text{m}$ , utriform or subcylindric. Cheilocystidia  $40\text{--}100 \times 17\text{--}40 \mu\text{m}$ , subglobose, ellipsoid, ovoid, oblong, utriform or subcylindric. Veil  $15\text{--}45 \mu\text{m}$  wide, hyphoid, elements constricted at septa, and with clavate to fusoid, sometimes ellipsoid terminal elements. Clamp-connections present, small.

*Notes.* The type-material is in good condition and consists of a sufficient number of basidiocarps.

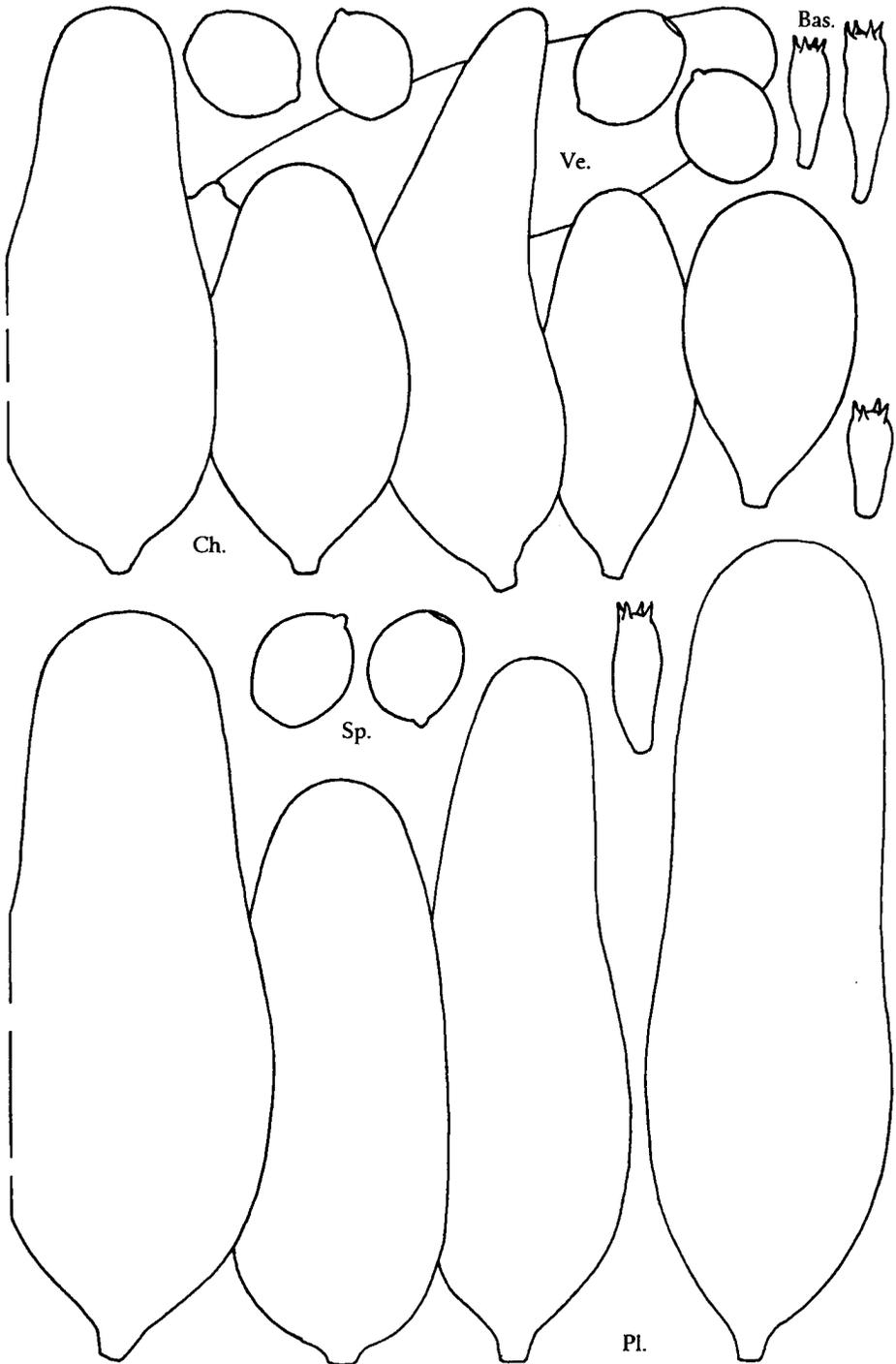


Fig. 10. *Coprinus jonesii* (holotype). Spores, pleurocystidia, cheilocystidia, basidia and veil.

11. **Coprinus lagopides** P. Karst., Meddn Soc. Fl. Fauna fenn. 5 (1879) 23. (Symb. Mycol. fenn. VI) — Fig. 11A

Lectotype: Finland, Tammala, Mustiala, 28 Oct. 1878, *P.A. Karsten 3757* (H).

*Original description.* Pileus 2–3 cm. latus. Stipes 3–4 cm. longus.

Sporae subsphaeroideae, irregulares, atrae (s. micr.), longit. 6–8 mmm, crassit. 5–6 mmm.

Mustalia, supra terram, m. Octobri semel.

*Observations on the lectotype.* Spores [10, 1, 1]  $9.0\text{--}10.7 \times 6.9\text{--}7.8 \mu\text{m}$ ;  $Q = 1.27\text{--}1.39$ , av.  $Q = 1.30$ ; av.  $L = 9.6$ , av.  $B = 7.5 \mu\text{m}$ , ovoid or (broadly) ellipsoid, warty, also on truncate apex, with central, c.  $1.6 \mu\text{m}$  wide germ pore.

*Notes.* The material is in bad condition. Only the spores could be observed. On account of the warty spores and characters of the veil, *C. lagopides* is an older synonym of *C. phlyctidosporus* Romagn. in sect. *Alachuani* (Uljé & Noordeloos, 1999).

An additional collection at H, also labelled *Coprinus lagopides* (Finland, Travastia australis, Tammela, Mustala, 4 Aug. 1884, *P.A. Karsten 3758*), appeared to be identical with the current concept of *C. lagopides*, which must be considered a misapplication. The correct name for *C. lagopides* sensu auct. is *C. jonesii* Peck (Uljé & Noordeloos, 1999).

*Observations on collection P.A. Karsten 3758.* (Fig. 11B). Spores [40, 1, 1]  $7.8\text{--}9.2 \times 7.0\text{--}7.9 \mu\text{m}$ ;  $Q = 1.05\text{--}1.21$ , av.  $Q = 1.16$ ; av.  $L = 8.7$ , av.  $B = 7.5 \mu\text{m}$ , ovoid, tending to conical at base, truncate at apex, with central, c.  $1.3 \mu\text{m}$  wide germ pore. Veil 10–40  $\mu\text{m}$  wide, made up of chains of cylindrical, somewhat inflate elements, constricted at septa. Clamp-connections present, small.

12. **Coprinus marcidus** Van De Bogart, Mycotaxon 8 (1979) 262 — Fig. 12

Holotype: USA, Montana, Flathead, 8 Sept. 1972, *F. Van De Bogart 2185* (WTU).

*Original description.* Pileus at first glandiform, then conic, then plano-convex and finally revolute. Prior to expansion 4.0–5.0 mm in length and after expansion 10.0 mm in breadth. Pale grey or white at first under a dark grey to greyish black universal veil layer, then becoming pale grey with white striae where the surface overlies each lamellar trama, and dark grey at the apex. Surface becoming deeply plicate-striate. Universal veil at first obscuring the pileal surface with a continuous fibrillose dark grey to almost black layer that eventually splits into shredlike remnants and becomes widely scattered with a few larger fragments at the pileal apex. Flesh thin at the apex. Stipe slender or filiform, 3.5 cm  $\times$  0.6–1.1 mm, tapering slightly from base to apex, hollow but with the lumen containing a column of water. Pale grey to glassy straw color, opaque at base to semitranslucent at apex. Surface covered with coarse and strigose grey fibrils at base and part way up the stipe, apical half glabrous. Flesh extremely thin, watery, and fragile. Lamellae narrowly lanceolate or ellipsoidal, with some lamellulae, 2.0–4.3  $\times$  1.0 mm, free from stipe apex but with all lamellae attached to a rudimentary collarium. Crowded at first then subdistant as plicate striation develops with pileal expansion, pale then soot black. Autodigestion incomplete, only the margins affected by lysis. Odor and taste none.

Spores ellipsoidal, 8.7–13.8  $\times$  6.2–8.3  $\times$  6.2–7.5  $\mu\text{m}$ , mostly round in cross-section but with some larger spores slightly flattened, apiculus large and prominent, germ pore apical, 1.2–1.5  $\mu\text{m}$  in diameter. Color en masse soot black microscopically deep purplish black 3% KOH., walls smooth. Basidia trimorphic, short clavate and 20.0–22.0  $\times$  10.0  $\mu\text{m}$ , long clavate and 30.0–32.0  $\times$  10.0  $\mu\text{m}$ , ululiform and 35.0–36.5  $\times$  8.6–10.0  $\mu\text{m}$ , all 4-spored. Cheilocystidia probably present but not observed due to partially lysed condition of lamellar margins. Pleurocystidia few in number, located near the lamellar margins only, ellipsoidal, 60.0–80.0  $\times$  23.0–26.0  $\mu\text{m}$ , apices rounded, hyaline, thin walled, smooth. No other cystidia present. Pileal surface of radially elongated cells, two to three times as long as broad, cell walls

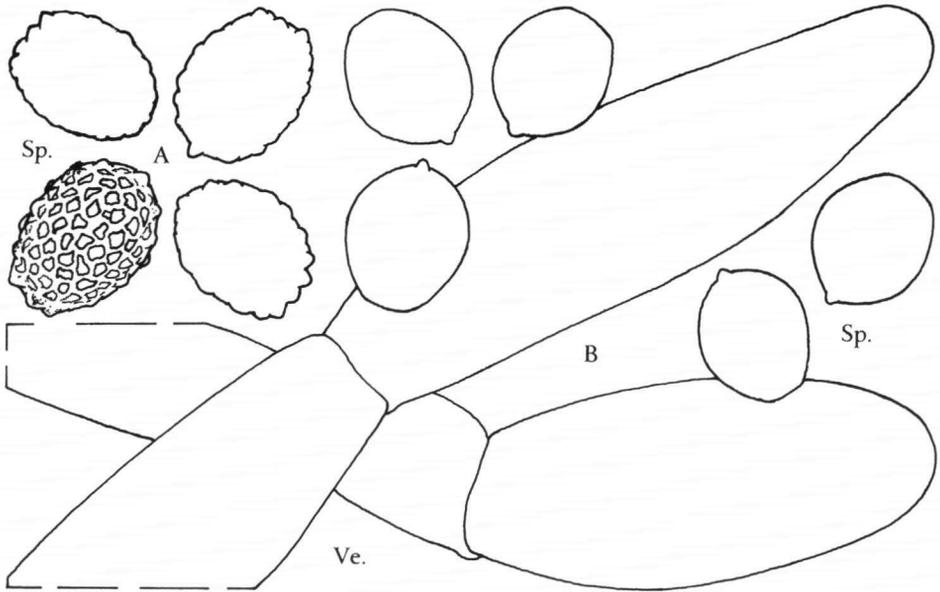


Fig. 11. *Coprinus lagoides* (holotype). A. Spores; B. coll. P.A. Karsten 3758. Spores and veil.

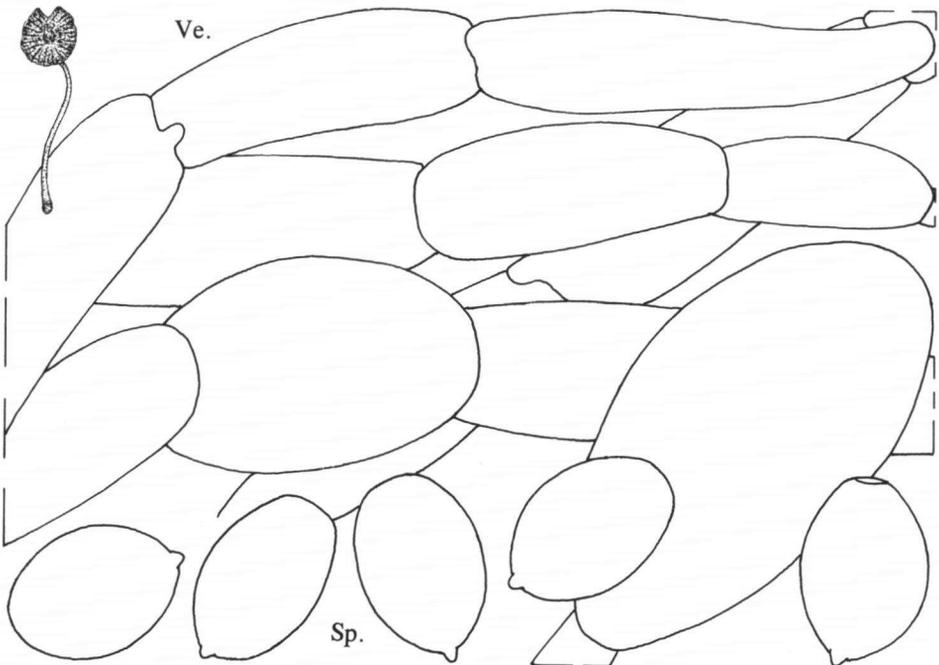


Fig. 12. *Coprinus marcidus* (holotype). Dried basidiocarp, spores and veil.

pale brown in 3% KOH. Universal veil present on pileus and at stipe base as a dark fibrillose layer that splits into small irregular patches but not into small upturned scales. Fibrils and patches composed of chains of elongate cells  $50.0\text{--}100.0 \times 10.0\text{--}27.5 \mu\text{m}$ , hyaline to pale brownish, thin walled, swollen, constricted at the septa, usually with clamp-connections, unbranched. Some of the chains of cells present at stipe bases are little or not swollen and resemble normal cylindrical hyphae. Clamp-connections present on universal veil on stipe, in pileal trama, and in the lamellar trama.

Habitat. Lignicolous, on a piece of wood buried in a thick moss carpet on the floor of a conifer forest. Solitary.

This species possesses several distinctive features, of which the dark color of the veil and the pronounced absence of autodigestion except the lamellar margins are the most outstanding ones. More subtle but still distinctive characters are the pleurocystidia that are rather small and few in number, and the slightly colored cells of the pileal surface which are elongated radially but do bear some resemblance to the appearance of a cellular type of surface.

*Observations on the holotype.* Spores [20, 1, 1]  $11.2\text{--}12.3 \times 7.7\text{--}8.5 \mu\text{m}$ , ellipsoid or ovoid, with slightly conical base and truncate apex, and central to slightly eccentric, c.  $1.6 \mu\text{m}$  wide germ pore, dark red-brown;  $Q = 1.35\text{--}1.55$ , av.  $Q = 1.45$ ; av.  $L = 11.7$ , av.  $B = 8.1 \mu\text{m}$ . Basidia c.  $26 \times 10 \mu\text{m}$ , 4-spored, surrounded by 3–5 pseudoparaphyses. Cystidia collapsed. Pileipellis hyphoid. Veil made up of hyphoid, thin-walled elements,  $40\text{--}180 \times 7\text{--}32\text{--}(40) \mu\text{m}$ , in part somewhat inflated, constricted at septa; terminal cells clavate, ellipsoid or subfusiform. Clamp-connections present, small.

*Notes.* The type collection consists of just one small basidiocarp with a very dark veil.

### 13. *Coprinus pachydermus* Van De Bogart, Mycotaxon 8 (1979) 274 — Fig. 13

Holotype: USA, Washington State, Univ. Washington, 5 Oct. 1971, *F. Van De Bogart 237* (WTU).

*Original description.* Pileus glandiform at first, then conic, then campanulate, and finally revolute and somewhat laciniate. Prior to expansion  $0.8\text{--}1.1$  cm in length and after expansion  $1.8\text{--}2.2$  cm in breadth. Pale grey-white to medium brown at apex at first, then generally darkening as spores mature. Surface faintly striate, but very little plicate striation develops. Entire surface covered at first by a hyaline to pale brown fibrous-scaly universal veil, and when fresh small glistening drops are present. The universal veil is loosely attached and easily dislodged and lost. The true surface is smooth and glabrous. Flesh thin and membranous. Stipe hollow, slender and thin, tapered slightly from base to apex,  $6.0\text{--}8.5$  cm  $\times$   $2.0\text{--}3.0$  mm. White, slightly translucent. Surface slightly woolly to silky at apex, becoming increasingly woolly towards the base. Flesh thin and fragile. Lamellae narrowly lanceolate, some short lamellae present,  $4.0\text{--}10.0 \times 2.0\text{--}3.0$  mm, free and remote, crowded and remaining so until destroyed by lysis, pale then black. Autodigestion destroys the entire pileus. Odor and taste none.

Spores ellipsoidal, nearly round in cross-section,  $10.0\text{--}11.5 \times 6.0\text{--}6.4 \mu\text{m}$ , lacking a perispodium, apiculus large and conspicuous, germ pore apical,  $1.2\text{--}1.4 \mu\text{m}$  in diameter. Color en masse soot black, microscopically deep brown in 3% KOH. Spores mostly with one guttule. Walls smooth. Basidia dimorphic, short clavate and  $16.5\text{--}19.0 \times 7.0\text{--}8.0 \mu\text{m}$ , long clavate and  $25.0\text{--}27.5 \times 7.5 \mu\text{m}$ , all 4-spored. Cheilocystidia probably present but destroyed by lysis of lamellar margin. Pleurocystidia scattered widely over entire lamellar face, not plentiful, not bridging the interlamellar spaces, subglobose and  $45.0\text{--}50.0 \mu\text{m}$  in diameter or short ellipsoidal and  $68.0 \times 40.0\text{--}48.0 \mu\text{m}$ , apices rounded, hyaline, thin walled, smooth. No other cystidia present. Pileal surface of radially oriented hyphae. Universal veil present on pileus as small white upturned loose scales composed of bundles of chains of ellipsoidal to subcylindrical elements, the chains of elements often exceeding  $1200 \mu\text{m}$  in length. Individual cells  $50.0\text{--}210.0 \times 10.0\text{--}45.0 \mu\text{m}$  in size, hyaline, mostly somewhat swollen and constricted at the septa, some of them thin walled but most with walls up to about  $1.5 \mu\text{m}$  thick, smooth, usually with clamp-connections, unbranched. Clamp-connections present on the universal veil, in the pileal trama, and also (a few) on the stipe surface.

Habitat. Lignicolous or sublignicolous, on an open compost pile of rotting wood chips and sawdust. In loose groups.

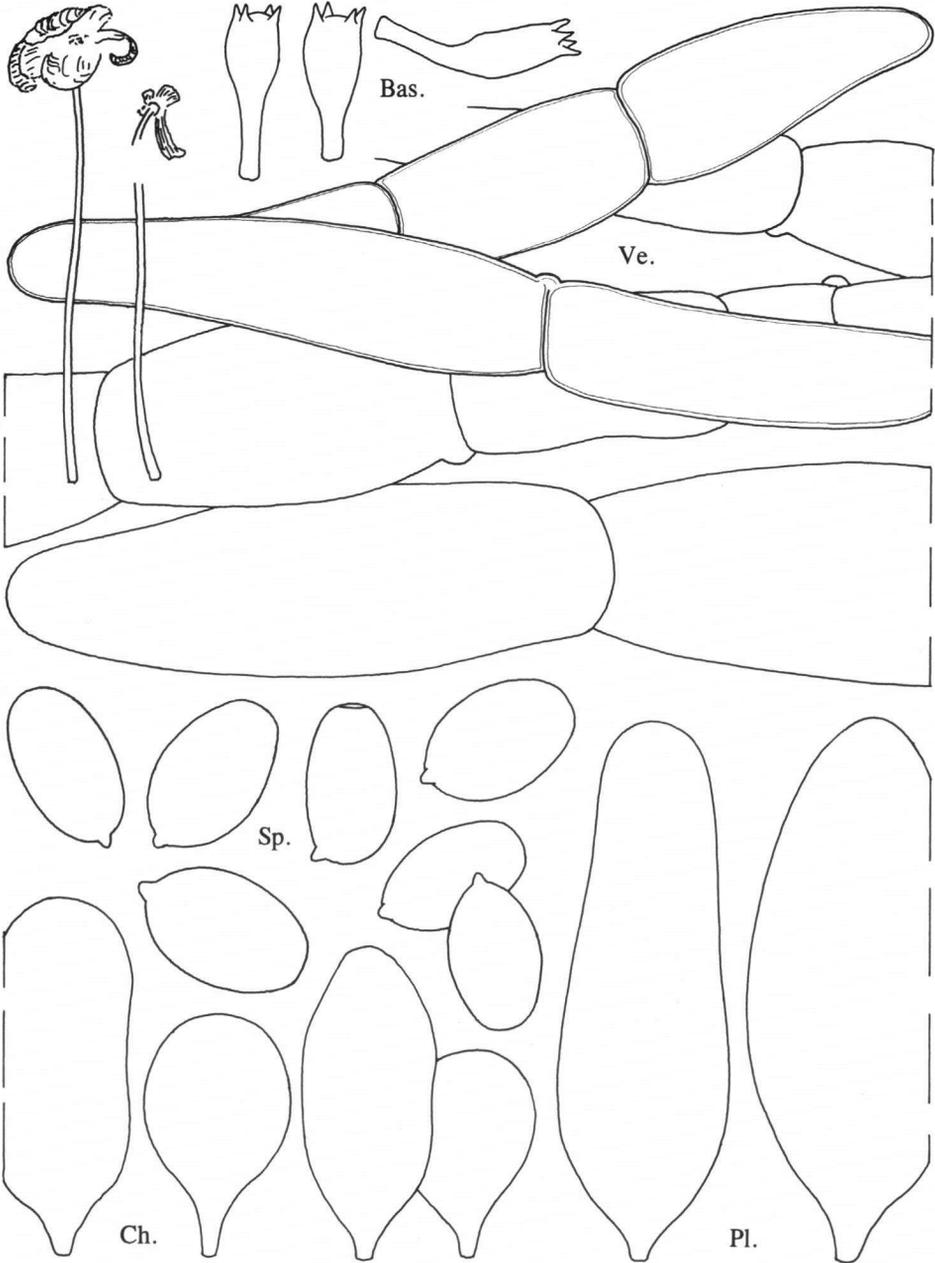


Fig. 13. *Coprinus pachydermus* (holotype). Dried basidiocarps, spores, pleurocystidia, cheilocystidia, basidia and veil.

The exceptionally thick walls of most of the cells of the universal veil and the short subglobose pleurocystidia are distinctive.

*Observations on the holotype.* Spores [20, 1, 1]  $9.3\text{--}11.0 \times 5.7\text{--}7.2 \mu\text{m}$ , ellipsoid or ovoid, with rounded base and apex (base in part tending to conical), and central to slightly eccentric, c.  $1.3 \mu\text{m}$  wide germ pore, medium to dark red-brown;  $Q = 1.40\text{--}1.75$ , av.  $Q = 1.55$ ; av.  $L = 10.1$ , av.  $B = 6.5 \mu\text{m}$ . Basidia  $22\text{--}34 \times 6\text{--}9 \mu\text{m}$ , 4-spored, surrounded by 3–5 pseudoparaphyses. Pleurocystidia  $60\text{--}90 \times 24\text{--}35 \mu\text{m}$ , utriform or subcylindric. Cheilocystidia  $30\text{--}50 \times 18\text{--}25 \mu\text{m}$ , (sub)globose, ellipsoid or subutriform. Pileipellis hyphoid, made up of mainly inflate hyphae; elements  $20\text{--}100 \times 10\text{--}30 \mu\text{m}$ . Veil made up of hyphoid, thin- or slightly thick-walled elements ( $0.2\text{--}0.7 \mu\text{m}$  thick),  $40\text{--}180 \times 12\text{--}40 \mu\text{m}$ , in part somewhat inflated and constricted at septa; terminal cells subfusiform. Clamp-connections present.

*Notes.* The type material consists of a single basidiocarp and a fragment in bad condition, but most microscopical features could be found.

#### 14. *Coprinus palmeranus* Van De Bogart, Mycotaxon 4 (1976) 248 — Fig. 14

Holotype: USA, Washington state, Mason, Olympic National Park, Oct. 1974, *F. Van De Bogart 3340* (WTU).

*Original description.* Pileus at first glandiform, then conic, then campanulate and becoming revolute, when unexpanded 3.2 cm in length, expanding to 3.0 cm in width. White and light brown at the apex when young, becoming grey-white and brown at the apex with maturity, covered at first with small scales of the universal veil with maturity the universal veil scales becoming scattered and evanescent, slightly plicate striate where not covered with veil, margin at first attached to stipe by partial veil, flesh very thin and membranous. Stipe hollow, the lumen stuffed with a loose webbing of hyphae, slender, base bulbous with a slender subtending rhizomorph, shaft tapering slightly towards apex,  $8.5 \text{ cm} \times 3.0\text{--}7.0 \text{ mm}$ , surface smooth and mostly glabrous with an occasional loose fibril, white and opaque, base with a scurfy area and a small free white membranous annulus, flesh somewhat fibrous although fragile. Lamellae lanceolate, free, very crowded, few short lamellulae present, at first white, then pink, then brown, then dark brown, then black. Autolysis complete.

Spores moderately flattened, laterally broadly ellipsoidal, dorsally narrowly ovate,  $8.7\text{--}10.0 \times 5.6\text{--}6.3 \times 4.3\text{--}5.7 \mu\text{m}$ , apiculus present, small, germ pore slightly eccentric,  $1.8 \mu\text{m}$  in diameter. Color soot black en masse and a dark purplish grey microscopically in 3% KOH. Wall smooth. Basidia trimorphic, short clavate and  $20.0\text{--}22.5 \times 12.5 \mu\text{m}$ , clavate and  $31.2\text{--}37.5 \times 10.0\text{--}11.3 \mu\text{m}$ , ululiform and  $45.0\text{--}49.0 \times 10.0\text{--}12.5 \mu\text{m}$ , sterigmata with refractive plugs, all 4-spored. Cheilocystidia globose, obovate, lageniform, and ellipsoidal,  $10.0 \mu\text{m}$  in diameter to  $46.5 \times 19.0 \mu\text{m}$ . No other cystidia present. Pileal surface a cutis of slender, radially oriented thin-walled hyaline hyphae. Universal veil scales composed of parallel chains of cells, cells cylindrical, some swollen and constricted at the septa, all hyaline, thin-walled  $5.0\text{--}19.0$  in diameter. Annulus membranous, composed of mostly slender cylindrical cells, sparsely septate, somewhat interwoven and anastomosed, hyaline, thin-walled,  $2.5\text{--}11.5 \mu\text{m}$  in diameter. Clamp-connections present in stipe context, not common.

Habitat. Terrestrial, on clay soil in open grassy maple woods.

This species bears a striking resemblance to *C. comatus* in its overall appearance. It differs mainly in its much smaller stature and much smaller size of the spores and basidia.

*Observations on the holotype.* Spores [20, 1, 1]  $9.3\text{--}11.0 \times 6.5\text{--}7.8 \mu\text{m}$ , ovoid with rounded base and apex (base tending to conical), and slightly eccentric, c.  $1.5 \mu\text{m}$  wide germ pore, dark red-brown;  $Q = 1.35\text{--}1.55$ , av.  $Q = 1.40$ ; av.  $L = 10.1$ , av.  $B = 7.2 \mu\text{m}$ . Basidia  $20\text{--}50 \times 10\text{--}13 \mu\text{m}$ , 4-spored, surrounded by 6–9 pseudoparaphyses. Pleurocystidia absent. Cheilocystidia  $25\text{--}50 \times 14\text{--}26 \mu\text{m}$ , (sub)globose, ellipsoid, ovoid, oblong or utri-

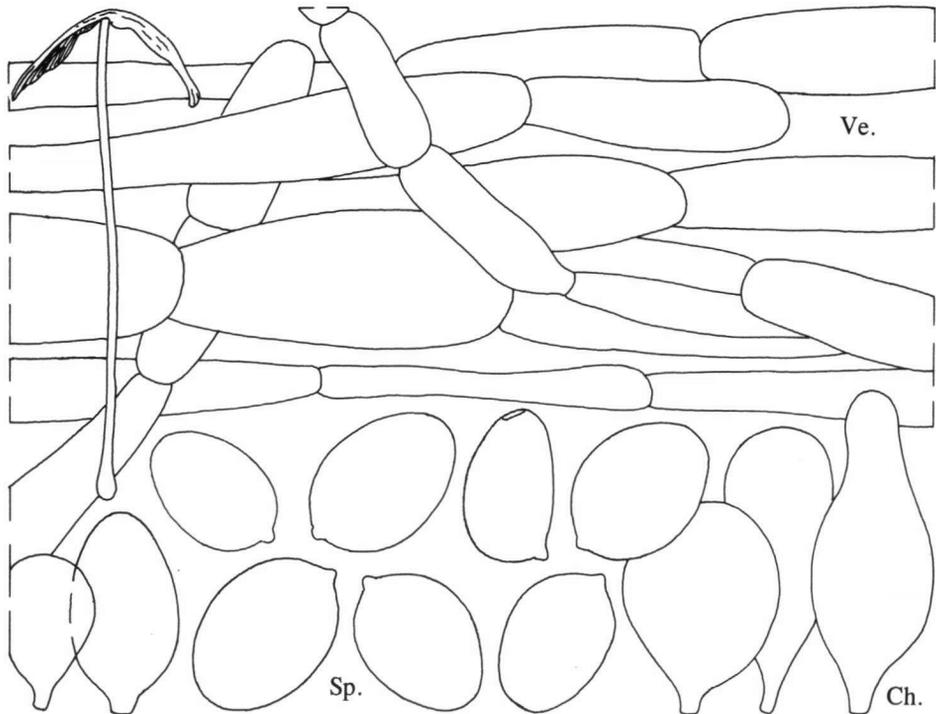


Fig. 14. *Coprinus palmeranus* (holotype). Dried basidiocarp, spores, cheilocystidia and veil.

form. Pileipellis hyphoid, made up of mainly cylindrical hyphae; elements  $30\text{--}140 \times 6\text{--}22 \mu\text{m}$ . Veil made up of cylindrical, thin-walled elements,  $40\text{--}150 \times 4\text{--}20\text{--}(28) \mu\text{m}$ , somewhat constricted at septa; terminal cells cylindrical with rounded or tapering apex, sometimes slightly fusoid. Clamp-connections absent.

*Notes.* The annulus, noted by Van De Bogart, has not been found in the type material.

#### 15. *Coprinus roseistipitatus* Van de Bogart, Mycotaxon 4 (1976) 262 — Fig. 15

Holotype: USA, Washington state, Lewis, Cispus Center, Gufford Pinchot Nat. Forest, 25 Oct. 1975, F. Van De Bogart 3369 (WTU).

*Original description.* Pileus at first glandiform, then conic, then campanulate with margins somewhat revolute and lacinate, when unexpanded 2.5 cm in length, expanding to 3.5 cm in width. Pale brown at first and remaining so at the apex, the remainder soon whitish, then black with whitish striae marking the interlamellar spaces. Pileal surface at first covered with smooth universal veil which then become scaly, then scales scattered and evanescent exposing plicate-striate surface. Margin attached to stipe by an annulus at first. Flesh thin and fragile. Stipe slender, tapering gradually toward the apex,  $11.5 \text{ cm} \times 4.0\text{--}6.5 \text{ mm}$ , hollow, lumen with a thinly dispersed webbing of hyphae, surface silky, wrinkled, white at base, in maturity the upper half of the stipe becoming pale pinkish grey, fading to grey when dried, annulus prominent, loose, becoming black on under surface when mature; stipe flesh thin and fragile although fibrous. Lamellae lanceolate, very crowded, free and remote, at first white, then pale pinkish brown, then black. Autolysis complete.

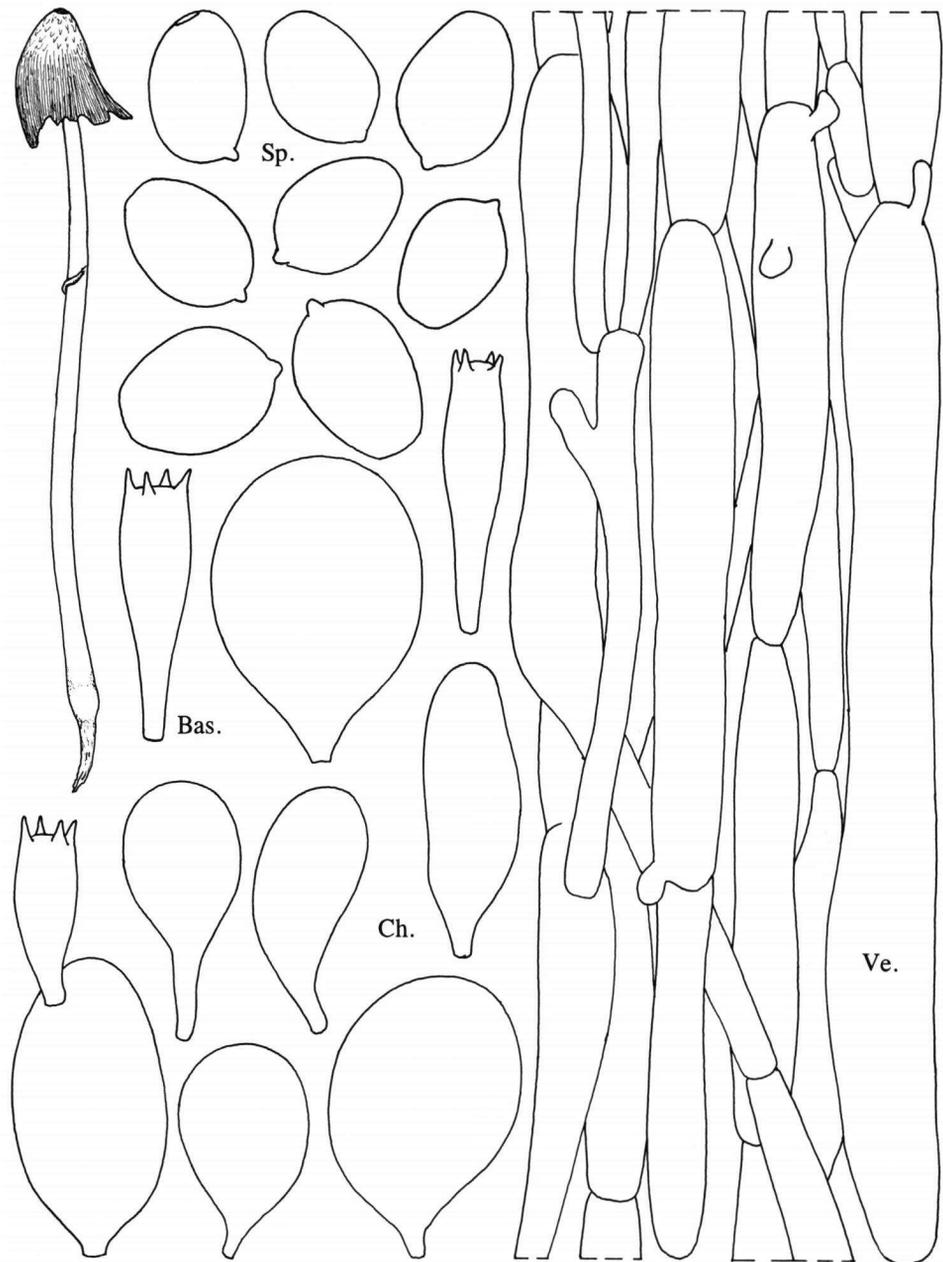


Fig. 15. *Coprinus roseistipitatus* (holotype). Dried basidiocarp, spores, cheilocystidia, basidia and veil.

Spores nearly ovate, the apex slightly narrowed in dorsal view,  $9.0\text{--}11.0 \times 5.5\text{--}6.5 \times 7.0\text{--}7.8 \mu\text{m}$ , apiculus large and distinct, germ pore somewhat eccentric,  $1.5\text{--}2.5 \mu\text{m}$  in diameter. Color soot black en masse and nearly black microscopically in 3% KOH. Wall smooth. Basidia trimorphic, clavate and  $25.0\text{--}28.0 \times 8.0\text{--}11.5 \mu\text{m}$ , long clavate and  $40.0\text{--}43.5 \times 8.0\text{--}10.0 \mu\text{m}$ , ululiform and  $48.0\text{--}50.0 \times 9.0\text{--}10.0 \mu\text{m}$ , all 4-spored, all sterigmata with refringent plugs, all basidia with a median grey pigment band. Cheilocystidia obovate, oblong, clavate, subglobose, occasionally interconnected, mostly pedicellate,  $30.0\text{--}70.0 \times 17.0\text{--}33.0 \mu\text{m}$ , pedicels up to  $20 \mu\text{m}$  in length, cells distinctly pink en masse until destroyed by lysis. No other cystidia present. Pileal surface a compact layer of cylindrical, septate, thin-walled, radially oriented hyphae, in maturity mostly pigmented dark grey-brown, some cells dark, some light, some pigment in the walls, some pigment the intercellular spaces. Universal veil of scales on pileus and tomentum at stipe base. Scales of long parallel chains of slightly swollen cells, cells cylindrical,  $5.0\text{--}22.0 \mu\text{m}$  in diameter, thin-walled, hyaline, rarely branching, showing some tendency to separate at the septa, smooth. Tomentum at stipe base very thin, composed of slender, cylindrical, hyaline, thin-walled hyphae, seldom branched, very interwoven,  $3.0\text{--}6.0 \mu\text{m}$  in diameter, septation sparse. Annulus  $1.0 \mu\text{m}$  wide. Clamp-connections absent.

Habitat. Coprophilous, on rabbit or deer dung in a very moist hardwood rain forest. Substrate covered a thin but persistent white felt-like mycelium.

This species somewhat resembles *C. sterquilinus* but differs in the brown color of the universal veil when young, the much smaller spores, the pink color of the stipe apex, the pink cheilocystidia, the blackening of the undersurface of the annulus, and the median grey band on each basidium.

*Observations on the holotype.* Spores [20, 1, 1]  $8.7\text{--}10.7 \times 6.3\text{--}7.9 \mu\text{m}$ , ovoid with rounded base and apex (base tending to conical), and slightly eccentric, c.  $1.6 \mu\text{m}$  wide germ pore, dark red-brown;  $Q = 1.30\text{--}1.45$ , av.  $Q = 1.40$ ; av.  $L = 9.7$ , av.  $B = 6.9 \mu\text{m}$ . Basidia  $20\text{--}50 \times 10\text{--}13 \mu\text{m}$ , 4-spored, surrounded by 5–8 pseudoparaphyses. Pleurocystidia absent. Cheilocystidia  $30\text{--}48 \times 14\text{--}38 \mu\text{m}$ , subglobose, ellipsoid, oblong or utriform. Pileipellis hyphoid, made up of mainly cylindrical hyphae; elements  $30\text{--}150 \times 4\text{--}18 \mu\text{m}$ . Veil made up of cylindrical, thin-walled elements,  $30\text{--}150 \times 4\text{--}18 \mu\text{m}$ , somewhat constricted at septa; terminal cells cylindrical with rounded or tapering apex. Only pseudoclamps found.

*Notes.* The collection consists of a single good basidiocarp. A part of the ring is still present on this specimen. The apex of the sterigmen is dark. This character is also found in *C. spadiceisporus*.

## 16. *Coprinus scobicola* P.D. Orton, Notes R. bot. Gdn Edinb. 32 (1972) 147 (Notes on British Agarics IV) — Fig. 16

Holotype: England, Devon, Plym Bridge, on sawdust, 29 Aug. 1956, Orton 964 (E).

*Original description.* Cap ovoid or cylindric-ovoid  $16\text{--}22 \times 9\text{--}11 \text{ mm}$ , then expanded-convex up to  $30 \text{ mm}$  broad, sometimes split at the margin, grey then tinged clay-buff at centre, at first covered with white "recurved fibrillose scales, those at centre often dirty brownish and thick and shaggy, then becoming" smooth as cap expands and plicate-striate to disc. Gills narrowly adnate to free, soon grey then black, crowded, edge white flocculose when fresh. Stem  $35\text{--}50 \times 2.5\text{--}4 \text{ mm}$ , attenuated upwards, white, at first minutely flocculose with 'tomentose base, becoming' smooth as cap expands, hollow. Flesh very thin, grey at disc. Smell none. Spore-print blackish.

Spores ellipsoid or slightly ellipsoid-amygdaliform with central germ-pore,  $11.5\text{--}14 \times 7\text{--}8.5 \mu\text{m}$ , very dark sub micr. Basidia 2-spored. Marginal cystidia pyriform or shortly vesiculose,  $30\text{--}54 \times 24\text{--}44 \mu\text{m}$ . Facial cystidia cylindric-vesiculose,  $80\text{--}110 \times 30\text{--}40 \mu\text{m}$ . Hyphae of veil on cap cylindric or narrowed at septa, ca.  $50\text{--}100 \times 8\text{--}20 \mu\text{m}$ .

Habitat. On sawdust.

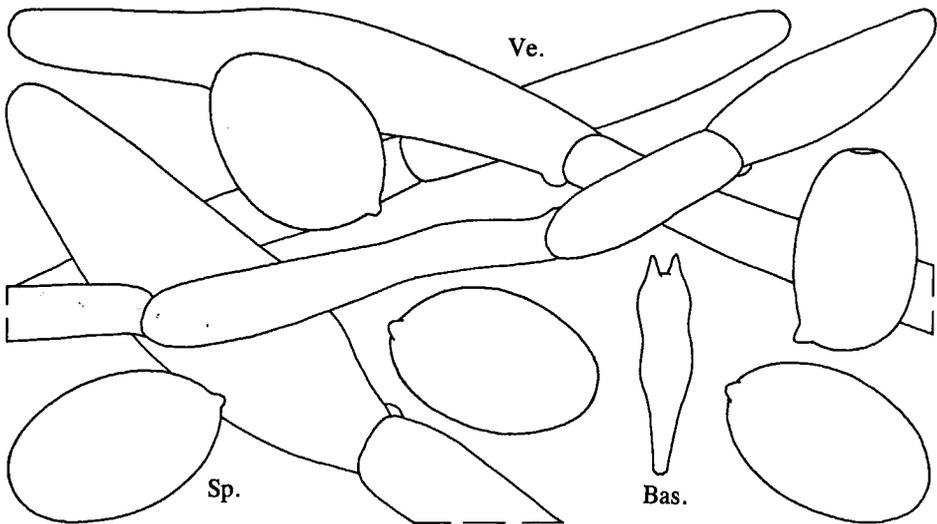


Fig. 16. *Coprinus scobicola* (holotype). Spores, basidium and veil.

Superficially resembling *C. episcopalis* but well characterised by different habitat and 2-spored basidia. It belongs to section *Picacei* with narrow to fairly broad hyphae (1–20  $\mu\text{m}$  broad) in the veil.

*Observations on the holotype.* Spores [20, 1, 1] (11.5–)12.6–14.0(–16.3)  $\times$  (7.8–)8.3–9.3(–10.4)  $\mu\text{m}$ , ovoid or ellipsoidal with rounded base and apex, and central to slightly eccentric, c. 1.8  $\mu\text{m}$  wide germ pore, very dark red-brown;  $Q = 1.40\text{--}1.60$ , av.  $Q = 1.50$ ; av.  $L = 13.3$ , av.  $B = 8.8 \mu\text{m}$ . Basidia 23–32  $\times$  7–8  $\mu\text{m}$ , 2-spored, surrounded by 4–5 pseudo-paraphyses. Cystidia collapsed. Pileipellis hyphoid. Veil made up of cylindrical, thin-walled elements, 70–150  $\times$  4–17  $\mu\text{m}$ , somewhat constricted at septa or not; terminal cells fusoid, (sub)cylindrical with rounded apex or tapering towards obtuse apex. Clamp-connections present, small.

*Notes.* The holotype consists of two basidiocarps in a bad state. The spores were found to be broader and slightly larger than in the original description.

### 17. *Coprinus spadiceisporus* Van De Bogart, Mycotaxon 4 (1976) 245 — Fig. 17

Holotype: USA, Washington State, exact locality and date unknown, *F. Van De Bogart 217* (WTU).

*Original description.* Pileus at first ovate-ellipsoidal, then conical, then campanulate, and eventually somewhat revolute, when unexpanded from 3.0–3.8 cm long, expanding to 5.0 to 6.0 cm wide. Whitish when young but soon grey from ripening spores, the apex pale brownish, soon entirely dark greyish brown, except the apex which remains paler brown. Radial pileal striations apparent even at young stage and soon developing into plicate striations. Surface covered with a universal veil of small somewhat appressed scales of dingy or dirty white color, becoming much looser in age and more scattered but even then more or less persistent. Flesh rather thin and membranous. Leaves and debris stuck to pileal surface. Stipe hollow, rather stout for *Coprinus*, 10.0–12.0 cm  $\times$  5.0–8.0 mm. Prominent, loose, white, felty annulus present, about 1 mm in width. Hollow center filled with a weblike mass of loose hyphae. Outer surface smooth and glabrous except for a loose tomentum of woolly hairs at the base. White in color at first but

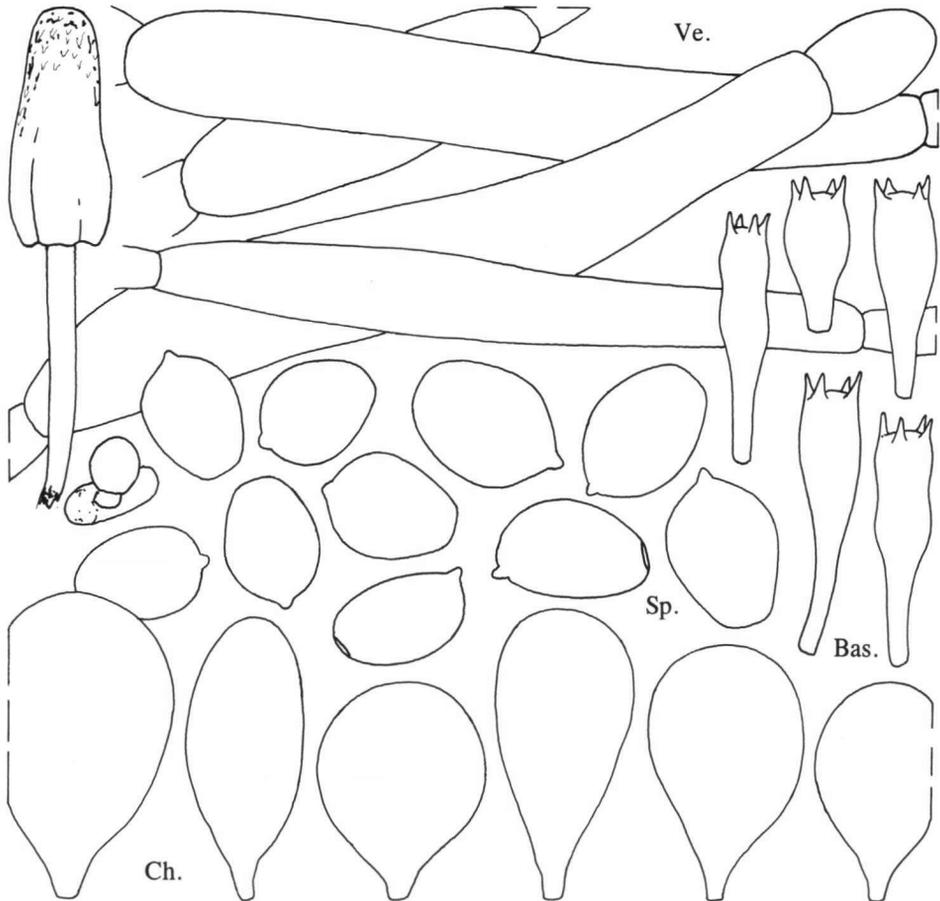


Fig. 17. *Coprinus spadiceisporus* (holotype). Dried basidiocarps, spores, cheilocystidia, basidia and veil.

soon darkening to light brownish over most of its length and becoming dark, almost black near the apex, opaque. Flesh rather thick and fibrous for a *Coprinus*. Lamellae lanceolate, 2.5–4.0 mm broad, free and remote, crowded, dark brownish black when mature. Autolysis complete.

Spores ovate-ellipsoidal, slightly flattened, basal end broader than apical end,  $8.1\text{--}10.0 \times 6.2\text{--}6.9 \times 5.0\text{--}5.6 \mu\text{m}$ , apiculus and germ pore both prominent, germ pore eccentric,  $1.5\text{--}2.0 \mu\text{m}$  in diameter. Color dark blackish brown en masse and a clear translucent chestnut brown microscopically in 3% KOH. Wall smooth. Basidia trimorphic, short clavate and  $12.5\text{--}17.5 \times 10.0\text{--}11.2 \mu\text{m}$ , long clavate and  $20.0\text{--}25.0 \times 10.0\text{--}11.2 \mu\text{m}$ , ululiform and  $28.7\text{--}35.0 \times 10.0\text{--}11.2 \mu\text{m}$ , all 4-spored. Cheilocystidia globose to more or less ovate,  $15.0 \mu\text{m}$  in diameter to  $42.5 \times 30.0 \mu\text{m}$  intermixed with thin filamentous hyphae on gill edge. No other cystidia present. Pileal surface a cutis of radially oriented hyphae. Universal veil scales composed of fibrils aligned parallel to each other and composed of chains of unbranched, often swollen cells  $6.2\text{--}20.0 \mu\text{m}$  in diameter, often constricted at the septations and then catenulate, also tending to break up into single loose cells. All cells of the universal veil with smooth, thin, hyaline walls, and all adjacent cells of the universal veil tending to be of similar size and shape. Clamp-connections present on the hyphae of the stipe surface and occasionally on the universal veil.

Habitat. Coprophilous, on rabbit or deer dung.

This species shares a peculiar feature with two other species of section *Coprinus*, *C. sterquilinus* and *C. colosseus*, namely, the discoloring and eventual blackening of the apical portion of the stipe flesh. The ovate, flattened spores with their clear light brown color seem distinctive.

*Observations on the holotype.* Spores [20, 1, 1]  $8.2\text{--}10.3 \times 5.8\text{--}7.3 \mu\text{m}$ , ovoid or slightly mitriform with rounded or conical base and rather truncate apex, and slightly eccentric,  $1.6\text{--}1.8 \mu\text{m}$  wide germ pore, dark red-brown;  $Q = 1.25\text{--}1.45$ , av.  $Q = 1.35$ ; av.  $L = 9.1$ , av.  $B = 6.7 \mu\text{m}$ . Basidia  $22\text{--}42 \times 10\text{--}12 \mu\text{m}$ , 4-spored, surrounded by 5–8 pseudoparaphyses. Pleurocystidia absent. Cheilocystidia  $30\text{--}50 \times 17\text{--}30 \mu\text{m}$ , (sub)globose, ellipsoid or oblong. Pileipellis hyphoid, made up of mainly cylindrical hyphae; elements  $50\text{--}130 \times 10\text{--}20 \mu\text{m}$ . Veil made up of cylindrical, thin-walled elements,  $30\text{--}180 \times 6\text{--}25 \mu\text{m}$ , somewhat constricted at septa; terminal cells cylindrical with rounded or tapering apex. Only pseudoclamps found.

*Notes.* The holotype consists of a single young specimen and a primordium on a small twig. White mycelium is still visible at the base of the stipe. The apex of the sterigmen is dark, as in *C. roseistipitatus*.

### 18. *Coprinus sylvicola* Van De Bogart, Mycotaxon 8 (1979) 257 — Fig. 1A

Holotype: USA, Oregon, Camp Kilowan, 27 April 1972, *F. Van De Bogart 297* (WTU).

*Original description.* Pileus at first long, slightly tapered from base to apex but almost cylindrical, with the apex obtusely rounded, becoming conic, then campanulate with a flaring margin, and finally revolute, prior to expansion 1.5–2.0 cm in length and after expansion 1.8–2.3 cm in breadth, medium grey and apex medium grey-brown at first, but soon becoming generally dark grey and dark grey-brown at the apex. Some plicate striations present early under the universal veil and often prominent in partially expanded pilei. Surface almost smooth but close examination reveals minute reddish brown scales or filaments. Flesh thin. Stipe hollow, slender, slightly tapered from base to apex,  $7.0\text{--}9.0 \text{ cm} \times 1.5\text{--}2.5 \text{ mm}$ , greyish to dirty white, opaque. Surface mostly smooth and glabrous but with a few appressed scalelike patches on lower one-third of stipe. Flesh thin, fragile, and brittle. Lamellae narrowly linear-lanceolate, few, if any, lamellulae,  $1.8 \text{ cm} \times 1.5\text{--}2.0 \text{ mm}$ , free and remote, extremely crowded at first then subdistant due to development of plicate striations as pileus expands, white, then pale reddish brown, then dark blackish brown, and finally soot black. Autodigestion destroying most of each lamella and most of the rest of the pileus. Odor and taste none.

Spores ellipsoidal with tapering ends nearly round in cross-section,  $13.7\text{--}15.0 \times 7.2\text{--}7.8 \mu\text{m}$ , lacking a perisporium, apiculus large and prominent, germ pore apical,  $1.0\text{--}1.2 \mu\text{m}$  in diameter, Color soot black en masse, microscopically deep purple-black in 3% KOH. Walls smooth. Basidia variable in shape and size. The shapes intergrade from clavate to long clavate to subululiform ululiform, and sizes range from  $25.0\text{--}51.0 \times 10.0\text{--}12.0 \mu\text{m}$ . All 4-spored. Cheilocystidia ovate to ellipsoidal,  $48.0\text{--}77.5 \times 22.5\text{--}40.0 \mu\text{m}$ , hyaline, thin walled, smooth. Some hyaline, smooth, thin walled, branched and anastomosed cylindrical hyphae  $1.5\text{--}6.3 \mu\text{m}$  in diameter present, also along lamellar margin. Pleurocystidia ovate to ellipsoidal,  $63.0\text{--}75.5 \times 30.0\text{--}40.0 \mu\text{m}$ , hyaline, smooth, thin-walled, few in number and present mostly near the lamellar margin. No other cystidia present. Pileal surface of radially oriented hyphae. Universal veil on pileus and at base of stipe of loose scales composed of long chains of swollen cells,  $38.0\text{--}102.0 \times 3.0\text{--}25.0 \mu\text{m}$ , constricted at the septa, hyaline, thin walled, smooth, seldom branched. Pileal context pallid yellow-brown in 3% KOH. The subhymenium of each side of each Lamella is also yellow-brown in 3% KOH while the thin layer of median lamellar trama is hyaline. Clamp-connections present on stipe, universal veil, pileal trama, and lamellar trama.

*Habitat.* Terrestrial or sublignicolous, on leaves and debris among chunks of rotten conifer wood lying on the soil in an old second-growth mixed forest. Small loose groups.

This species is notable for the variation and intergradation in sizes and shapes of the basidia, the very long, almost cylindrical shape of the unexpanded pileus, and the yellow-brown color of the pileus context and the subhymenium.

*Observations on the holotype.* Spores [20, 1, 1]  $11.8\text{--}13.8 \times 7.1\text{--}7.9 \mu\text{m}$ , ellipsoid or ovoid with somewhat conical base and rather truncate apex, and central, c.  $1.6 \mu\text{m}$  wide germ pore, very dark red-brown;  $Q = 1.60\text{--}1.90$ , av.  $Q = 1.75$ ; av.  $L = 13.2$ , av.  $B = 7.5 \mu\text{m}$ . Basidia, pseudoparaphyses, cystidia and veil collapsed. Clamp-connections present.

*Notes.* The type material is in a very bad state and consists of two old specimens.

### 19. *Coprinus tectisporus* Van De Bogart, Mycotaxon 8 (1979) 276 — Fig. 18

Holotype: USA, Washington State, Seattle, Mar. 1950, *F. Van De Bogart 2171* (WTU).

*Original description.* Pileus at first long glandiform, then becoming conic, then campanulate and finally revolute. Prior to expansion  $1.0\text{--}1.4 \text{ cm}$  in length after expansion  $1.0 \text{ cm}$  in breadth. Pale whitish at first then becoming grey with whitish scales, apex becoming dark grey. Fine plicate striations develop as pileus expands. Surface at first covered with a white fibrillose universal veil composed of parallel fibrils which soon breaks up into small, loose, white, recurved scales, exposing the smooth, glabrous surface. Flesh thin and fragile even at the apex. Stipe hollow, slender,  $4.0\text{--}5.0 \text{ cm} \times 1.5\text{--}3.0 \text{ mm}$ , enlarged at the base somewhat and inserted into substrate about  $1.0 \text{ cm}$ , tapering from base to apex, base ornamented with a ring of fibrils marking the site of attachment of the margin of the unexpanded pileus. Surface minutely fibrillose almost to apex, white and opaque. Flesh thin and fragile. Lamellae narrowly lanceolate, some lamellulae present,  $0.4\text{--}1.3 \text{ cm} \times 3.0 \text{ mm}$ , free and close to adnexed, extremely crowded at first, then less crowded as plicate striation develops when pileus expands, pale then deep purplish black. Autodigestion complete. Odor and taste not observed.

Spores ellipsoidal, round in cross-section,  $10.9\text{--}15.0 \times 7.5\text{--}8.8 \mu\text{m}$ , apiculus medium sized and generally visible, germ pore apical,  $2.4\text{--}2.6 \mu\text{m}$  in diameter. Color en masse deep purplish black, microscopically deep purple to almost opaque black in 3% KOH. Walls thick  $1.8\text{--}1.9 \mu\text{m}$ , smooth when first mounted in 3% KOH, then, after some minutes soaking and gentle pressure on the coverglass, a loose brownish perisporium may be dislodged. Basidia dimorphic, clavate and  $18.0\text{--}23.0 \times 10.0 \mu\text{m}$ , uliform  $28.0\text{--}31.5 \times 10.0 \mu\text{m}$ , all 4-spored. Cheilocystidia mostly globose but some ellipsoidal cells also present, globose and  $18.5\text{--}39.0 \mu\text{m}$  in diameter, ellipsoidal and  $40.0 \times 20.0 \mu\text{m}$ , smooth, thin walled, hyaline. Pleurocystidia broadly ovate to ellipsoidal, very numerous,  $77.5\text{--}137.5 \times 42.5\text{--}55.0 \mu\text{m}$  hyaline, thin walled, smooth. No other cystidia present. Pileal surface of radially oriented cylindrical hyphae. Universal veil present on pileus as scales composed of loosely aggregated chains of cells, and at the base of the stipe as a fringe of similar chains of cells. Most cells in each chain are swollen and constricted at the septa, some cells cylindrical and not swollen, all thin walled, smooth, hyaline,  $37.5\text{--}313.0 \times 5.0\text{--}52.5 \mu\text{m}$ . Clamp-connections present on universal veil, in lamellar trama, and a few in the stipe.

Habitat. Terrestrial, on soil mix in a greenhouse, solitary or in loose clusters.

The perisporium and thickness of the spore wall are distinctive features of this species.

*Observations on the holotype.* Spores [20, 1, 1]  $12.1\text{--}15.1 \times 7.9\text{--}9.0 \mu\text{m}$ , cylindrical ellipsoid or ellipsoid with rounded base and apex, and central, c.  $1.8 \mu\text{m}$  wide germ pore, dark to very dark red-brown; episprium present;  $Q = 1.45\text{--}1.85$ , av.  $Q = 1.60$ ; av.  $L = 13.3$ , av.  $B = 8.4 \mu\text{m}$ . Basidia  $15\text{--}40 \times 8\text{--}10.5 \mu\text{m}$ , 4-spored, surrounded by (3–)4–5(–6) pseudoparaphyses. Pleurocystidia  $70\text{--}100 \times 30\text{--}50 \mu\text{m}$ , ellipsoid, oblong, utriform or sub-cylindric. Cheilocystidia  $60\text{--}90 \times 32\text{--}45 \mu\text{m}$ , (sub)globose, ellipsoid or oblong. Pileipellis hyphoid, made up of mainly cylindrical hyphae. Veil made up of cylindrical, thin-walled elements,  $40\text{--}150 \times 10\text{--}50 \mu\text{m}$ , somewhat constricted at septa; terminal cells cylindrical with rounded or tapering apex. Clamp-connections not distinct.

*Notes.* The holotype of *C. tectisporus* is in rather a good condition and consists of three young and two very young basidiocarps, together with some fragments of old basidiocarps.

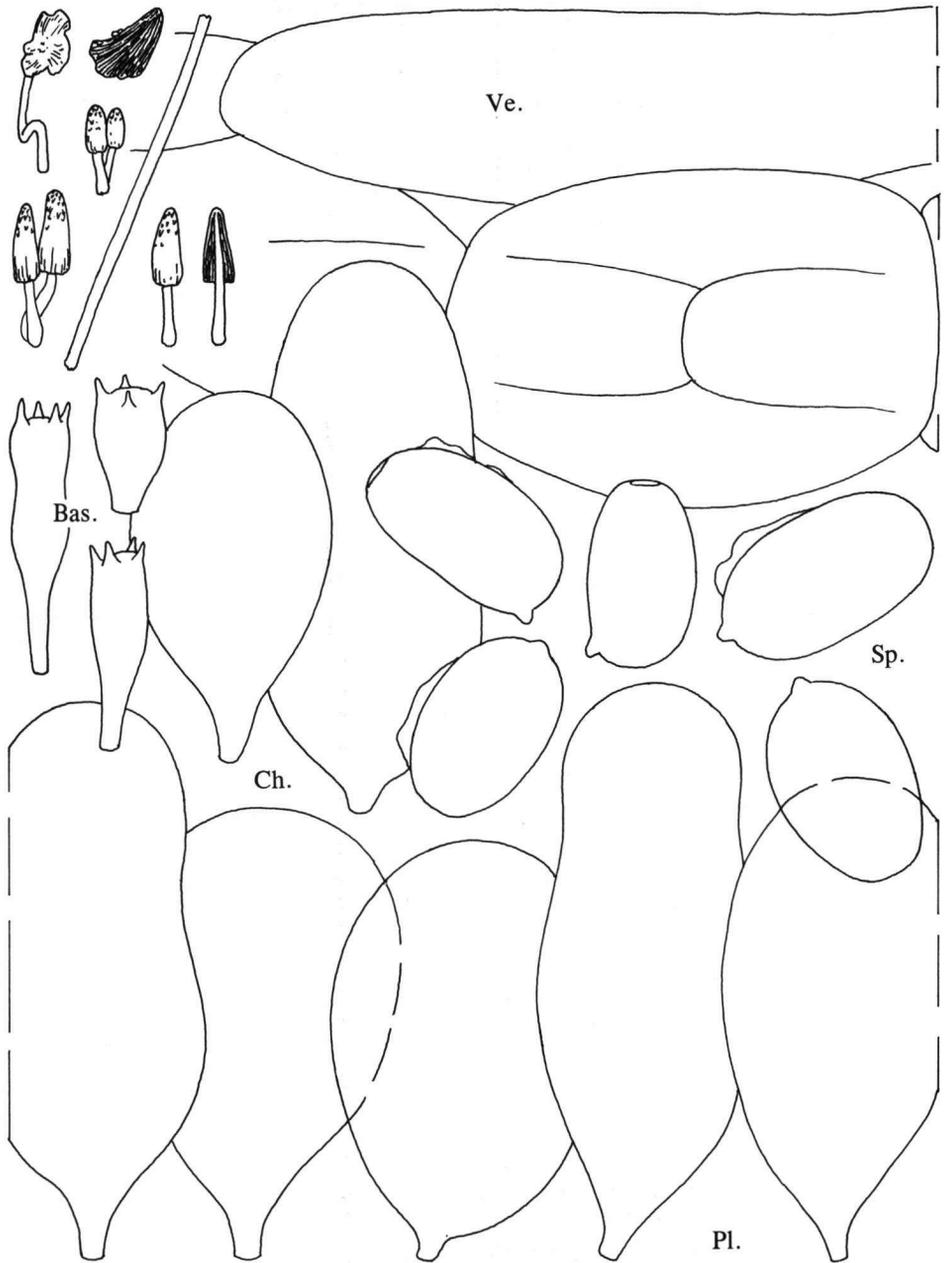


Fig. 18. *Coprinus tectisporus* (holotype). Dried basidiocarps, spores, pleurocystidia, cheilocystidia, basidia and veil.

## 20. *Coprinus undulatus* Van De Bogart, Mycotaxon 8 (1979) 250 — Fig. 19

Holotype: USA, Washington State, Thurston, 20 Nov. 1973, *F. Van De Bogart 2182* (WTU).

*Original description.* Pileus at first long-glandiform or truncate-ellipsoidal, then narrowly conic then narrowly conic, then narrowly campanulate, and finally becoming lacinate and somewhat revolute. Prior to expansion 1.0–3.1 cm in length and after expansion 1.0–3.4 cm in breadth, covered at first by white to pale tan universal veil, the surface beneath pale brown to hygrophanous brown at the apex, at maturity becoming dark hygrophanous grey with a hint of brown and dark brownish grey at the apex, faintly striate at first, eventually becoming slightly plicate-striate. The plicate striations do not seem to involve the trama of any of the lamellae. Universal veil thin, interwoven, adherent, by maturity mostly disappearing. Flesh thin and membranous but up to 1.0 mm thick at the apex. Stipe hollow, slender, tapered from base to apex, 2.0–6.0 cm × 1.5–6.0 mm. White and opaque. When young, loose hyphae often present in upper half of lumen. Most of surface smooth and glabrous silky in appearance. In button stages, some small patches of universal veil at the base. Base somewhat fleshy, fragile by the end of spore production. Lamellae narrowly lanceolate, mostly full length, only a few lamellulae present, 0.9–3.0 cm × 2.0–5.0 mm, free, extremely crowded and remaining so until lysis. White, then pale bronze, then bronze, then grey, and finally sooty black. Autodigestion complete, with the entire pileus lysed. Odor and taste none.

Spores globose, 7.9–11.3 µm in diameter, round in any section, lacking a perisporium, apiculus large, 1.2 × 1.2 µm, germ pore apical, 2.2–2.5 µm in diameter. Color en masse sooty black, microscopically dark purple-brown in 3% KOH. Contents seem finely granular. Wall smooth. Basidia dimorphic, short clavate and 20.2–27.0 × 9.0–10.7 µm, long clavate and 31.5–37.0 × 10.3–11.3 µm all 4-spored. Cheilocystidia variable in shape, sphaerocysts 11.2–36.0 µm in diameter, ovate to ellipsoidal, 22.5–92.4 × 17.0–29.3 µm, hyaline, smooth, thin walled, forming a broad band on the lamellar margin. Pleurocystidia long-oblong to long-ellipsoidal 112.0–168.0 × 27.0–58.3 µm, apices rounded, pedicels usually present, about 6 µm long, hyaline, thin walled, smooth. No other cystidia present. Pileal surface of thin-walled, radially oriented hyphae that revive poorly. Universal veil of cylindrical filaments, not swollen or constricted at the septa although of large diameter, 23.6–110.0 × 5.1–10.0 µm, thin walled, with abundant cytoplasm in fresh material, hyaline, most cells curved. Cells tending to form hypha-like chains although many loose cells are present, and very often there are collapsed empty cells. A few cells branch once, and some show slightly thickened spots on the cell wall. Veil present mostly on pileal surface and in small amounts at the base of the stipe of young specimens. The chains of veil elements are more or less radially oriented but sinuous due to the curvature in the wall of most cells. Clamp-connections present only (?) on stipe.

Habitat. Terrestrial or subcoprophilous on prepared compost intended for commercial production of *Agaricus brunnescens* in closed controlled-environment buildings. In large clusters.

The universal veil elements and spores of this species are distinctive, and the habitat seems to be unique. Personal communications with the staff mycologist of the Ostrom Mushroom Company of Lacey, Washington, indicate that this species is considered a pest, detrimental to obtaining maximum yields of *Agaricus brunnescens* Peck, Bull. Torrey Bot. Club 27: 16, 1900 (= *A. bisporus*). The spores or mycelium of *Coprinus undulatus* appear to be capable of surviving the company's present sterilization techniques for the compost.

*Observations on the holotype.* Spores [20, 1, 1] 9.3–11.3 × 9.3–10.2 × 7.7–8.3 µm, (sub-)globose, with eccentric, c. 1.3 µm wide germ pore, dark red-brown; Q = 1.00–1.15, av. Q = 1.05–1.10; av. L = 10.5, av. B = 9.8 µm. Basidia 16–28 × 9–10.5 µm, 4-spored, surrounded by 5–7 pseudoparaphyses. Pleurocystidia absent. Cheilocystidia 40–60 × 10–18 µm, clavate or oblong. Pileipellis hyphoid, made up of mainly cylindrical hyphae. Veil made up of cylindrical, thin-walled elements, 30–100 × 3–18 µm, somewhat constricted at septa or not; terminal cells cylindrical, not distinct. Clamp-connections not found.

*Notes.* The type collection consists of one old and six young basidiocarps. The veil on the pilei is collapsed, and was therefore examined from the base of the stipes.

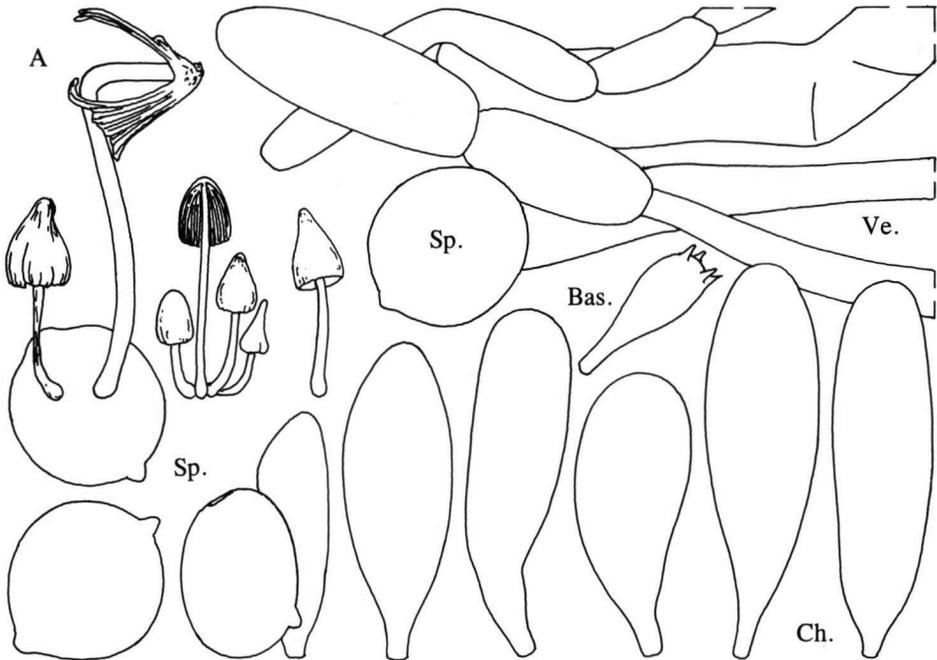


Fig. 19. *Coprinus undulatus* (holotype). Dried basidiocarps, spores, cheilocystidia, basidium and veil.

## 21. *Coprinus xerophilus* Van De Bogart, Mycotaxon 4 (1976) 255 — Fig. 20

Holotype: USA, Utah, Nephi, Juab, 15 June 1957, *F. Van De Bogart 2159* (WTU).

*Original description.* Pileus short glandiform to subglobose, then rounded conic, then broadly campanulate and eventually revolute, apex remaining somewhat broadly domelike, upon expansion becoming 1.6 to 4.0 cm broad, white at first and remaining white where covered by the universal veil. Margins eventually becoming black due to spore production and lysis. Surface showing only a small amount of plicate striation where not covered by the universal veil along the margin, mostly covered by a thick, densely interwoven universal veil which may remain in one caplike piece or break up into irregular patches and areolae, the surface under the universal veil usually becoming evident only upon complete pileal expansion and then mostly along the pileal margin. Flesh under the thick universal veil thin and membranous, only becoming about 1.0 mm thick at the apex. Stipe hollow, stuffed with widely spaced and more or less loose hyphae that sometimes form a fine webbing or a slender yarnlike thread in the center of the lumen, somewhat slender, nearly equal above the distinctly bulbous base, 4.0–7.5 cm × 2.5–6.0 mm, and the base itself 6.0–12.0 mm in diameter, white and opaque. Bulb of stipe base with a distinct volvate ridge on its upper surface, well separated from the stipe shaft. Flesh fairly thick and fibrous, up to 1.5 mm thick, the base tending to be solid. Surface of base outside of the volva covered with sand grains and debris. Lamellae narrowly ovate to lanceolate, some short lamellulae present, but sometimes few in number 0.8–2.8 × 1.0–1.2 cm, free and remote to free and close, crowded at first, then somewhat less crowded with the limited development of plicate striation as the pileus expands, pale then black. Autolysis fairly complete, the lamellae all lysing and only the universal veil and part of the pileal surface remaining. Odor and taste unknown.

Spores broadly ovate to somewhat mitriform in dorsal view, ovate-ellipsoidal in lateral view, somewhat flattened 17.5–22.6 × 11.2–16.3 × 10.6–12.5 μm, apiculus sometimes large and conspicuous, and some-

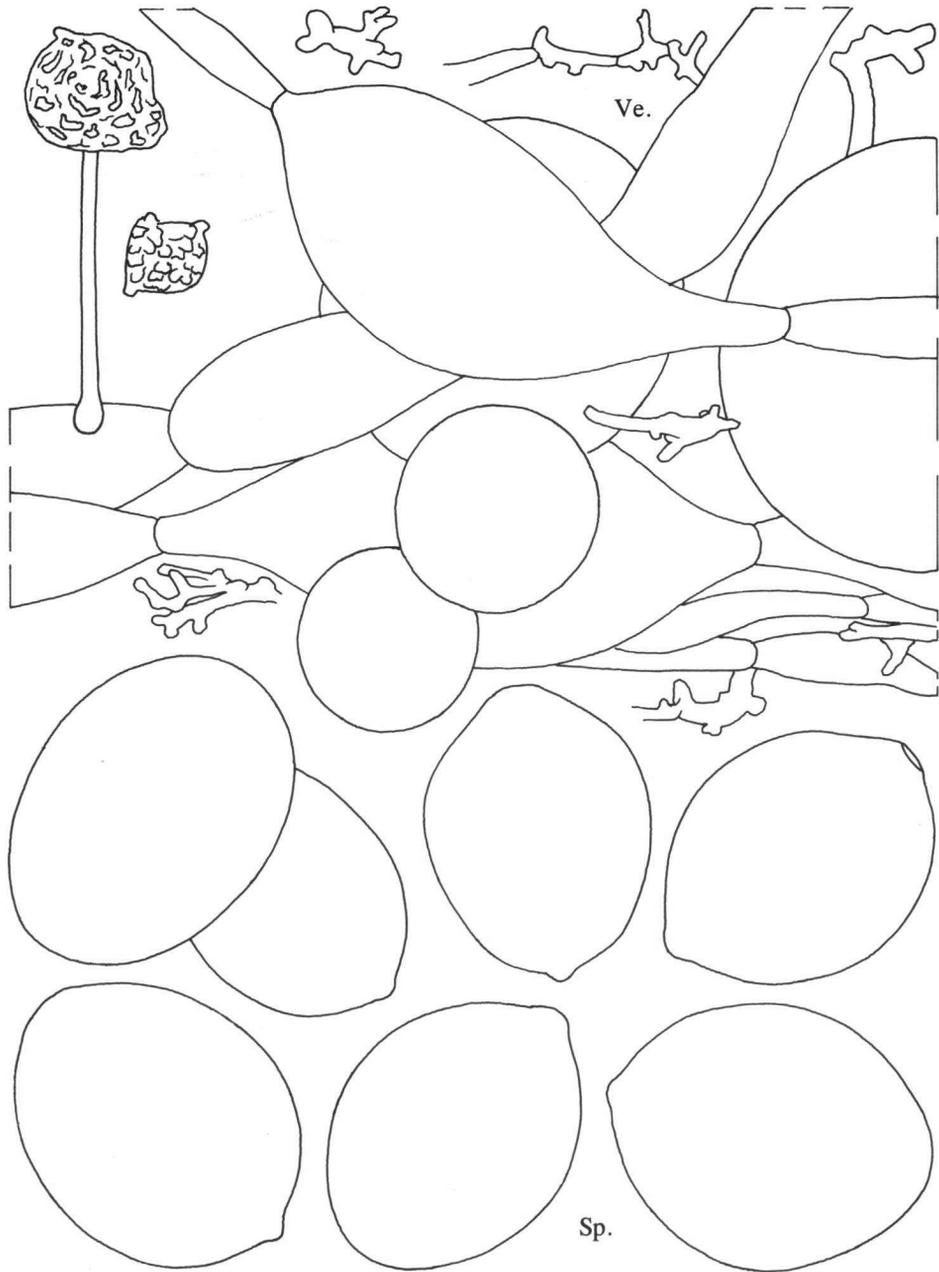


Fig. 20. *Coprinus xerophilus* (holotype). Dried basidiocarps, spores and veil.

times small and not conspicuous, germ pore eccentric and broad, 2.5–3.2  $\mu\text{m}$  in diameter. Color en masse soot black, microscopically deep clear brown to deep purplish brown in 3% KOH. Wall smooth. Basidia trimorphic, short clavate and 38.8–47.5  $\times$  18.8  $\mu\text{m}$ , long clavate and 50.0–62.5  $\times$  17.5–18.8  $\mu\text{m}$ , sub-

ululiform and  $53.8\text{--}60.5 \times 17.5\text{--}25.0 \mu\text{m}$ , all 4-spored, sterigmata pigmented or plugged. Cheilocystidia probably present but destroyed by lysis of lamellar margin. No other cystidia present. Pileal surface a cutis of radially oriented hyphae. Universal veil consisting of a thick feltlike portion on the pileus and a distinct volvate rim on the upper part of the bulbous base of the stipe, the pileal universal veil composed of long chains of cylindrical to sausagelike swollen cells that are constricted at the septations. All cells smooth, hyaline, and thin walled,  $25.0\text{--}195.0 \times 3.7\text{--}50.5 \mu\text{m}$ . Some narrow hyphae interwoven among the swollen cells and sometimes anastomosed with them, appearing to bind the larger filaments together. The volval universal veil composed of the same kind of elements but having a larger proportion of the slender nonswollen filaments. Clamp-connections present on stipe and sometimes on universal veil elements.

Habitat. Terrestrial, on sandy or gravelly soil in dry to semi-arid areas, solitary or in groups of scattered individuals.

This species is closely related to two other species, *C. asterophorus* and *C. asterophoroides*. It differs from *C. asterophorus* in its larger flattened spores, much larger basidia, persistent stipe thread, nonasteriform universal veil remnant on the pileus, and white universal veil as opposed to honey yellow to chamois. *C. xerophilus* differs from *C. asterophoroides* in its pileal universal veil of scattered patches, larger germ pore, presence of a bulbous volvate stipe base, and lack of a pigmented apex of the basidia. These species bear a striking superficial resemblance to the gasteroid genus *Montagnea*.

*Observations on the holotype.* Spores [20, 1, 1]  $16.0\text{--}21.3 \times 11.7\text{--}16.4 \mu\text{m}$ , (broadly) ellipsoid or tending obovoid with rounded base and apex, with slightly eccentric to almost central, c.  $1.8 \mu\text{m}$  wide germ pore, very dark red-brown, almost black;  $Q = 1.25\text{--}1.40$ , av.  $Q = 1.30$ ; av.  $L = 19.2$ , av.  $B = 14.8 \mu\text{m}$ . Basidia, pseudoparaphyses and cystidia collapsed. Veil a mixture of hyphoid, ellipsoid or fusoid elements,  $10\text{--}125 \times 2\text{--}50 \mu\text{m}$ , and (sub)globose cells, up to  $80 \mu\text{m}$  in diam.; connective hyphae numerous, collaroid, diverticulate and  $1.5\text{--}4 \mu\text{m}$  wide. Clamp-connections not found.

*Notes.* The type material is in bad condition and consist of only a single entire basidiocarp plus a fragment. Only the characteristics of the veil and spores could be determined.

#### ACKNOWLEDGEMENTS

The directors of the herbaria B, E, G, H, NYS, WTU and Dr. R. Courtecuisse, Lille are thanked for loan of the collections.

#### REFERENCES

- Bender, H. 1987. *Coprinus krieglsteineri* nov. spec. und *Coprinus bisporiger* in der BR Deutschland. Beitr. Kenntn. Pilze Mitteleur. III: 215–221.
- Uljé, C.B. 1992. A new species of *Coprinus* from the Netherlands. *Persoonia* 14: 565–569.
- Uljé, C.B. & C. Bas. 1993. Some new species of *Coprinus* from the Netherlands. *Persoonia* 15: 357–368.
- Uljé, C.B., F. Doveri, & M.E. Noordeloos. 2000. Additions to *Coprinus* subsection *Lanatuli*. *Persoonia* 17: 465–471.
- Uljé, C.B. & M.E. Noordeloos. 1996. Type studies in *Coprinus* subsect. *Alachuani*. *Proc. Kon. Ned. Akad. v. Wetensch.* 99: 105–124.
- Uljé, C.B. & M.E. Noordeloos. 1997. Studies in *Coprinus* IV – *Coprinus* sect. *Coprinus*. Subdivision and revision of subsection *Alachuani*. *Persoonia* 16: 265–333.
- Uljé, C.B. & M.E. Noordeloos. 1999. Studies in *Coprinus* V – *Coprinus* sect. *Coprinus*. Revision of subsection *Lanatuli* Sing. *Persoonia* 17: 165–199.
- Van De Bogart, F. 1976. The genus *Coprinus* in Western North America, part. 1. Sect. *Coprinus*. *Mycotaxon* 4: 233–275.