

STUDIES IN COPRINUS III – COPRINUS SECTION VELIFORMES
Subdivision and revision of subsection *Nivei* emend.

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Coprinus section *Veliformes* is defined and delimited to comprise four subsections: subsection *Micacei*, subsection *Domestici*, subsection *Nivei*, and subsection *Narcotici*, subsection nov. A key to the subsections is given. Subsection *Nivei* is emended, including also most taxa of subsection *Flocculosi* Citerin. A key is given to all species known from the Netherlands, or to be expected in the Netherlands on account of records from neighbouring countries. Three new species are described, viz. *Coprinus nemoralis*, *C. idae* and *C. pseudoniveus*. A neotype has been selected for *Coprinus poliomallus* Romagn. The following species are fully described: *C. bellulus*, *C. candidatus*, *C. cardiasporus*, *C. coniophorus*, *C. cordisporus*, *C. cortinatus*, *C. cothurnatus*, *C. ephemeroides*, *C. idae*, *C. iocularis*, *C. nemoralis*, *C. niveus*, *C. pachyspermus*, *C. patouillardii*, *C. pseudoniveus*, *C. pilosotomentosus*, *C. poliomallus*, *C. pseudocortinatus*, *C. ramosocystidiatus* and *C. urifer*.

After the first modern revision of the genus *Coprinus* by J. Lange (1915) the genus has received considerable attention in Europe in the past decades (Bender & Enderle, 1988; Citerin, 1992; Dissing & Lundqvist, 1992; Enderle & Bender, 1990; Enderle, Krieglsteiner & Bender, 1986; Krieglsteiner, Bender & Enderle, 1982; Kühner & Romagnesi, 1953; Moser, 1983; Orton & Watling, 1979; Petersen & Vesterholt, 1990). These publications provide keys and descriptions of numerous species, and form the base of the revision of *Coprinus* in the Netherlands by the first author. Many new data were gathered by him, a number of new species described, and nomenclatural and/or taxonomic confusions solved (Ulje, 1988, 1990; Ulje & Bas, 1991).

MATERIAL AND METHODS

The present paper is based on extensive studies by the first author on material collected in the Netherlands by himself and several members of the Netherlands' Mycological Society in the Netherlands, supplemented by numerous collections from the Herbarium at Leiden. Selected material from abroad has been studied to supplement the data gathered on the material of the Netherlands. Type-studies have been undertaken of *C. bellulus*, *C. candidatus*, *C. cardiasporus*, *C. idae*, *C. iocularis*, *C. luteocephalus*, *C. nemoralis*, *C. pachyspermus*, *C. patouillardii* var. *lipophilus* and *C. pseudoniveus*.

For methods used for the examination of macroscopical and microscopical data, see Ulje & Bas (1991: 276).

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PRESENTATION

All collections are deposited in the Rijksherbarium, Leiden (L) unless otherwise indicated. Collections indicated by the name of the collector (Uljé), but without collection number refer to material that has been observed but not conserved.

The information on the distribution in the Netherlands is based on the first author's observations and not necessarily reflected in the number of collections studied.

The enlargements of the drawings are $\times 2000$ for the spores, $\times 800$ for the other microscopical characters and $\times 1$ for the basidiocarps, unless otherwise indicated.

Synonyms are in general given only when generally accepted. For practical reasons we have refrained from studying other synonyms and their types.

In the descriptions, reference is made to the colour codes of Munsell (1975) and Kornerup & Wanscher (1978), respectively indicated as Mu. and K. & W. Other abbreviations used are:

av. = average	L (relating to spores) = length
B = breadth of the spores in front view	l = number of short lamellae (not reaching stipe)
bas. = basidia	l.c. = loco citato
c. = circa	pl. = pleurocystidia
cau. = caulocystidia	pp. = pileipellis
ch. = cheilocystidia	Q = length divided by breadth
diam. = diameter	sp. = spores
L (relating to the lamellae) = number of lamellae reaching stipe	ve. = veil
	W = width of the spores in side view

The terminology applied in this paper is in accordance with the glossary in *Flora agaricina neerlandica*, vol. 1 (Vellinga, 1988).

A notation like [80/4/2] means: 80 spores from 4 specimens from 2 collections were measured. Spore measurements are based on samples of 20 spores.

The sizes of the spores as given in the key and the descriptions relate to $L \times B$ or $L \times B \times W$. Although in literature on agarics Q generally relates to the length and the width of the spores in side view ($L : W$), in this publication Q relates to the length and the breadth of the spores in front view ($L : B$). The reason for this is that in *Coprinus* the breadth of the spores varies much more strongly than the width, because a number of species have spores that are to some degree dorsiventrally flattened. This makes a Q value relating length to breadth a taxonomically very useful character. The given width of the spores is usually based upon less numerous observations in lentiform spores than length and breadth, as this character is very difficult to observe. Only extreme values are given.

The measurements of the cystidia, when lageniform, give the length, the width of the basal part, followed by the width of the neck.

INFRAGENERIC DELIMITATION OF *COPRINUS* WITH REGARD TO
SECTION VELIFORMES

J. Lange (1915, 1939) demonstrated the importance of the pileipellis and veil for the classification and subdivision of the genus *Coprinus*. He divided the genus into groups without giving them taxonomic status: *Comati*, for those species with filamentous veil forming felt or squamules on the young pileus, subdivided into the *Annulati* for species

with a ring, and *Exannulati* for those without a ring; *Nudi*, for those without a veil, subdivided into the *Glabri*, for species with a glabrous pileus, and *Setulosi*, for those with setules in the pileipellis, and a third group, *Farinosi*, for all taxa with a veil consisting of rounded elements. The latter is subdivided into two subgroups, viz. *Annulati* (stipe with ring; only one species: *C. ephemeroïdes*), and *Exannulati* (stipe without ring). The *Exannulati* comprises the group *Micacei* with only *C. micaceus*, and the *Vestiti*, which includes all taxa with powdery/mealy veil, i.e. both the species with smooth velar elements (*C. cordisporus*, *C. cortinatus*, and *C. niveus*) and the group of *C. narcoticus/stercoreus*, characterized by velar elements densely beset with small warts. Lange also included in the *Vestiti* taxa with setules, by the present authors placed in section *Pseudocoprinus*, subsection *Setulosi* (Uljé & Bas, 1991).

Kühner & Romagnesi (1953) accepted Lange's concept of the *Vestiti*. They distinguish within the *Vestiti* the group of *Coprinus niveus*, with six species and two varieties belonging to subsection *Nivei*, viz. *C. bulbillosus*, *C. coniophorus*, *C. cortinatus*, *C. niveus*, *C. patouillardii*, *C. patouillardii* var. *isabellinus*, *C. patouillardii* var. *lipophilus* and *C. poliomallus*. *Coprinus patouillardii* var. *lipophilus* is considered by us as a synonym of *C. patouillardii* and *C. patouillardii* var. *isabellinus* as being the same as *C. cordisporus* (see descriptive part); *C. ephemeroïdes* is treated by Kühner & Romagnesi as *C. bulbillosus* Pat. The rest of the *Vestiti* s. Kühner & Romagnesi consists of *Coprinus stercorarius* and related taxa.

Orton & Watling (1979) delimited *Coprinus* to three sections: *Coprinus* (with filamentous veil), *Micaceus* (veil at least in part consisting of globose elements) and *Pseudocoprinus* (pileus without veil or with setules). Section *Micaceus* in their sense is subdivided into a number of stirpes. The species of the 'niveus'-group as presented in the present paper, are accommodated in Stirps *Flocculosus* (except for *C. flocculosus* which to our opinion belongs to subsection *Domestici* conform Kühner & Romagnesi, 1953); Stirps *Cortinatus* (except *C. filiformis*, probably a synonym of *C. cortinatus* and *C. luteocephalus* that has a filamentous veil, and therefore belongs to another section) and stirps *Niveus* (except for *C. latisporus* that is not accepted as a good species; see descriptive part with *C. niveus*). Orton & Watling (l.c.) have eight species that we accept in subsection *Nivei*, viz.: *C. cordisporus*, *C. cortinatus*, *C. cothurnatus*, *C. ephemeroïdes*, *C. niveus*, *C. pachyspermus*, *C. patouillardii* and *C. poliomallus*. The group of *Coprinus narcoticus* is accommodated by Orton & Watling (l.c.) in stirps *Narcoticus*.

Citerin (1992) proposed a new infrageneric classification of *Coprinus*. He distinguished three subgenera: *Coprinus*, *Micaceus* en *Pseudocoprinus*, in about the same concept as the sections in Orton & Watling (1979). Within subgenus *Micacei*, five sections are recognized: section *Veliformes* (type: *C. stercoreus*); section *Domestici* (type: *C. domesticus*); section *Micacei* (type: *C. micaceus*); and section *Farinosi* 'Lange' (type: not indicated). Section *Farinosi* is subdivided into subsection *Nivei* Citerin (type: *C. niveus*) and subsection *Flocculosi* (type: *C. flocculosus*).

Although Moser (1983) keys out the groups with smooth velar elements as well as those with warty elements as clearly different groups, he uses the name *Vestiti* for both. He distinguished altogether 7 taxa in the 'niveus'-group: *C. coniophorus*, *C. cortinatus*, *C. cothurnatus*, *C. ephemeroïdes*, *C. niveus*, *C. patouillardii* and *C. poliomallus*.

Patrick (1977) split *Coprinus* up into 12 sections. The taxa with globose velar elements are accommodated in section *Veliformes* Fr. ex Cooke emend. Patrick (type: *Coprinus ster-*

coreus Fr.), *Micacei* (Fr.) Penn. (type: *C. micaceus* (Bull.: Fr.) Fr.), and section *Domestici* (Singer) Patrick (type: *C. domesticus* (Bolt.: Fr.) S.F. Gray). In the concept of Patrick, the 'niveus'-group would be part of section *Veliformes*, together with the 'stercoreus/narcoticus'-group.

Singer (1975, 1986) distinguished four sections in *Coprinus*: section *Coprinus*, section *Micacei*, section *Cyclodei*, and section *Hemerobii*. Section *Cyclodei* is based on the group *Vestiti* sensu J. Lange, and comprises also here both the 'niveus'- and 'stercoreus/narcoticus'-groups.

Petersen & Vesterholt (1990) divided *Coprinus* into five groups, without taxonomic rank (A–F). Group F comprises the whole of section *Veliformes* in our sense (including the 'niveus'-group: *C. cortinatus*, *C. ephemeroides*, *C. latisporus*, *C. niveus*, *C. patouillardii* en *C. poliomallus*).

Dissing & Lundqvist (1992) have five sections: *Coprinus*, *Setulosi*, *Vestiti*, *Micacei* and *Hemerobii*. Section *Vestiti* is also in this work treated in the sense of J. Lange (1915) and Kühner & Romagnesi (1953), comprising both the 'niveus'- and 'narcoticus/stercorius'-groups.

Reijnders (1979) has given a comprehensive survey of the developmental anatomy of *Coprinus*. He studied 27 species, which represent a good sample of the variation found in the genus with respect to pileipellis structure and development of the veil. Reijnders attempted to make a phylogenetic tree. The species round *Coprinus niveus* and *C. narcoticus* are considered to be most primitive. The pileipellis in these species is not very much differentiated and has a thick layer of spherocysts over the pileus. In *Coprinus patouillardii* and *C. cortinatus* a differentiation of the pileipellis has taken place into an epithelium, covered by spherocysts. The species round *Coprinus micaceus* and *C. domesticus* are different from the 'niveus'-group, as, according to Reijnders (l.c.) the pileipellis is distinctly differentiated into a palisadodermium. The veil consists of both spherocysts and elongate, filamentous elements. This supported Singer (1986) who ranged the group of *Coprinus niveus* and *C. narcoticus* in section *Cyclodei*, and the group of *C. micaceus* in the separate section *Micacei*.

The present authors consider structure of the pileipellis and development of the veil to be important characters for the infrageneric delimitation as well, and accept the classification in sections proposed by Orton & Watling (1979). Within section *Veliformes*, the taxa in the group of *C. niveus/cortinatus* are considered significantly different from those in the 'narcoticus'-group, and therefore warranting separation on subsectional level. The differences found in structure of pileipellis and veil are even greater than those between the 'micaceus'- and 'domesticus'-groups. On account of the structure of the veil, four subsections are accepted within section *Veliformes*: subsection *Micacei* (Fr.) stat. nov. (basonym: *Coprinus* 'group' *Micacei* Fr., Epicr.: 1838, 247); subsection *Domestici* Sing., subsection *Nivei* Citerin 1992 emend. and subsection *Narcotici* Uljé & Noordel., subsection nov. (see below).

Subsection *Nivei* Citerin is emended here by including most of the species of subsection *Flocculosi* Citerin, except for *Coprinus flocculosus*, the type-species of the subsection, and *C. luteocephalus*. *Coprinus utrifer* is also included here in subsection *Nivei*, although the veil consists not only of globose elements, but also of hypha-like structures. Because of this mixed nature of the veil, many authors placed *C. utrifer* in other sections. Kühner

& Romagnesi (1953) place it in section *Impexi*, Orton & Watling (1979) in a stirps of its own, stirps *Utrifer* in section *Coprinus*; Moser (1983) in section *Coprinus*, and Citerin (1992) in subgenus *Coprinus* section *Picaceus*. But the present authors prefer to place it in subsection *Nivei* because of the great similarity with the structure of the veil of *Coprinus niveus*.

KEY TO THE SECTIONS AND SUBSECTIONS

- 1a. Pileus without veil, smooth or with setules and/or setae sect. *Pseudocoprinus*
- b. Pileus with veil, without setules 2
- 2a. Veil consisting of elongate elements only sect. *Coprinus*
- b. Veil at least partly consisting of (sub)globose elements (sect. *Veliformes*) 3
- 3a. Fruit-bodies medium-sized, somewhat fleshy; stipe 3–10 mm thick; pileus usually brown, never pure white; veil present in form of scattered, granulose floccules or small flocculose scales, often (partly) thick-walled and brown-pigmented under microscope; pileus conical or campanulate, long closed, only tardily expanding, never applanate when old, not grooved, without veil at margin when young 4
- b. Fruit-bodies small, very thin-fleshed; stipe 0.5–3 mm thick; pileus white to grey; veil mealy-powdery, entirely covering the pileus, at centre often woolly-floccose, white, sometimes pale pinkish brown, yellowish or grey, thin-walled, not pigmented or rarely thick-walled, pale yellow-brown in centre of pileus; pileus expanding to become applanate, usually radially grooved and splitting, when young covered in woolly veil at margin 5
- 4a. Veil present in scattered, granulose flocks which soon disappear, microscopically existing of a layer of globose, thin-walled cells, slightly colouring pink or lilaceous in KOH or ammonia subsect. *Micacei*
- b. Veil breaking up in small, more persistent flocculose scales, microscopically existing of chains of fusiform, ellipsoid to globose, in part usually thick-walled cells not colouring in KOH or ammonia subsect. *Domestici*
- 5a. Elements of veil with persistent, nipple-shaped warts that do not dissolve in HCl; spores usually with distinct, rarely indistinct or lacking episporium subsect. *Narcotici*
- b. Elements of veil smooth or with crystals that easily dissolve in HCl; spores without episporium subsect. *Nivei*

DESCRIPTIVE PART

Coprinus section *Veliformes* (Fr.) Penn. in Kauffm.

Basidiocarps very small to medium-sized; expanded pileus 0.1–50 mm. Pileus with veil made up of – at least in part – (sub)globose cells mixed or not with elongate, hyphal elements. Pileipellis made up of radial chains of (sub)globose or fusiform cells, often covered by a very thin layer of narrow hyphae. Stipe smooth and/or covered with very small velar flocks or – in some species – covered with lageniform or (sub)globose caulocystidia.

Subsection *Narcotici* Uljé & Noordel., *subsect. nov.*

Species ad sectionem *Veliformes* pertinentes; velum verrucis in HCl persistentibus praeditum; sporae frequenter cum episporio distincto. Species typica: *Coprinus narcoticus* (Batsch: Fr.) Fr.

Elements of veil with persistent, nipple-shaped warts that do not dissolve in HCl; spores usually with distinct, rarely indistinct or lacking episporium. Type species: *Coprinus narcoticus* (Batsch: Fr.) Fr.

Selected literature. Kits van Waveren, *Persoonia* 5 (1968) 131–176; Orton & Watling, *Br. Fung. Fl.* 2 (1979) 69–81.

Subsection *Nivei* Citerin emend. Uljé & Noordel.

Type species: *Coprinus niveus* (Pers.: Fr.) Fr.

General characteristics

Basidiocarps white, cream-coloured, pinkish cream or grey with mealy-powdery veil, usually forming a cortina at margin of the pileus in young specimens; veil smooth or covered with crystals or granules that dissolve in HCl; spores without episporium; smell indistinct.

Macroscopical characters

The species in section *Nivei* can be recognized by the mealy-powdery veil that covers the entire pileus in young specimens, and can easily be removed. Expanded pilei are always distinctly grooved up to centre, while the veil remains visible between the grooves, unless washed off by rain. This is in contrast with the species in subsections *Micacei* and *Domestici* which also have a veil consisting of globose elements, but there the veil breaks apart in small floccose squamules, showing the pileal surface beneath, which is never distinctly grooved, and usually of a brown colour. The veil in most species of subsection *Nivei* is white, often tinged cream-coloured or ochraceous at centre, or even more intensely coloured in dry conditions. The pileus is white with a few exceptions: in *Coprinus poliomallus* the pilei are pale grey to mouse-grey in primordia, then paler coloured; *C. conio-phorus* is very dark grey, often with a weak green tinge in primordia, and stays dark at centre in mature specimens, while the marginal zone becomes white. *Coprinus patouillardii*, *C. cordisporus* and *C. cardiasporus* are pale pinkish brown in young stadia, retaining this colour at centre of the pileus when mature. *Coprinus ephemeroideis* is pinkish brown, cream-coloured or yellowish in a young stage.

Size of fruit-bodies may vary strongly from one collection to another, especially in species growing on dung. *Coprinus niveus* for example, usually is a medium-sized species with closed pilei up to 25 × 15 mm, but there are collections with very minute basidiocarps, only a few mm that are in all respects completely similar, except may be in slightly smaller spores.

Lamellae are free, except in *C. conio-phorus*, which has narrowly adnate lamellae, and usually narrower than 5 mm. The colour is white in young specimens, becoming grey to (pinkish) brown or black. The number of lamellae reaching the stipe varies from 6 to 38, the lamellulae range from 0 to 5.

The stipe varies from 10–130 mm in length and 0.1–5 mm in width, is usually white and covered with floccose veil which becomes denser towards base. In the group of *Copri-*

nus patouillardii the veil often forms a small volva-like structure just above the base of the stipe.

Spore-prints are not easy to obtain, if not impossible in the very small taxa, and therefore not taken into consideration in the present revision. Probably the colour of the spore-print is more or less similar in all taxa.

Microscopical characters

Spores vary from ellipsoid, rounded-angular, limoniform, cordiform, amygdaliform or weakly hexagonal in outline; *Coprinus iocularis* has spores with two blunt knobs at each side. Size varies very much from one species to another, ranging from 6–8 µm long in some species to 13–19 µm in *C. niveus*. Also within one species the variability in size of the spores may be considerable. Especially dung-inhabiting species show great differences (see discussion following the description of *Coprinus niveus*). Within one species the size of the spores also may vary considerable per collection.

Basidia are 2-spored in *Coprinus bellulus*, *C. pachyspermus*, and sometimes also in *C. cordisporus*; all other taxa have 4-spored basidia. The number of sterile elements around the basidia (pseudoparaphyses) ranges from 3–7(–8).

Pleurocystidia, if present, are vesiculose, utriform, broadly cylindrical, ellipsoid or subglobose.

Cheilocystidia vary from vesiculose, utriform, clavate to ellipsoid or globose. Some taxa have lageniform cheilocystidia mixed with other types. Cheilocystidia are absent in *Coprinus cortinatus* and *C. bellulus*, but in these taxa elements of the veil may adhere to the lamellar edge, and cause confusion.

Pileipellis made up of ventricose, ellipsoid, subglobose or fusiform elements (Figs. 1b, 11), covered with a suprapellis of up to 7 µm wide hyphae, consisting of oblong to ventricose elements.

Veil covering the pileipellis at centre of pileus consists of (sub)globose elements which are usually about 50 µm in diam. In *Coprinus niveus*, *C. pachyspermus*, and *C. cothurnatus* the elements may reach 80(–100) µm diam. In these taxa, as well as in *C. pseudoniveus* and *C. utrifer*, these elements often have scattered, coarsely warty protuberances. The surface of the velar elements may be smooth or covered in granules or crystals that easily dissolve in HCl. The velar elements are connected with branched hyphae which are smooth in the complex of *Coprinus cortinatus* or diverticulate in the group of *C. niveus*. Towards the margin of the pileus and on the surface of the stipe the velar elements are more hypha-like.

Clamp-connections may be present or absent. In the complex of *Coprinus niveus* clamps are not easy to find or not always present. This is reflected in the literature on the group. In his first, unofficially published revision on this group, Uljé (1990) recorded clamp-connections for *Coprinus niveus*, *C. cothurnatus*, *C. pachyspermus*, and *C. pseudoniveus*. Orton & Watling (1979) indicated the presence of clamps only for *Coprinus niveus* and stated that clamps were either not studied, or not found in all other taxa. Enderle, Krieglsteiner, and Bender (1986) do not mention clamp-connections at all in their description of *Coprinus niveus*, but in the accompanying figures a clamp is clearly indicated at the base of a cheilocystidium. Sometimes the hyphae elements slightly to distinctly overlap at the septa, giving the impression of a clamp-connection. We call this pseudo-clamps.

KEY TO THE SPECIES OF COPRINUS SUBSECTION NIVEI IN EUROPE

- 1a. Av. length of spores $> 12 \mu\text{m}$ 2
 b. Av. length of spores $< 12 \mu\text{m}$ 4
- 2a. Basidia 4-spored; pileus white at first 3
 b. Basidia 2-spored; pileus grey or cream-grey, sometimes white at first
 4. *C. pachyspermus*
- 3a. Spores $12\text{--}19 \times 11\text{--}15.5 \mu\text{m}$; spores \pm limoniform; pleurocystidia present
 1. *C. niveus*
 b. Spores $10\text{--}15 \times 6.5\text{--}8.5 \mu\text{m}$; spores \pm 6-angular (hexagonal); pleurocystidia absent
 or very sparse 3. *C. cothurnatus*
- 4a. Spores oval or ellipsoid, sometimes slightly cylindrical. 5
 b. Spores differently shaped. 15
- 5a. Basidia 4-spored. 6
 b. Basidia 2-spored 11. *C. bellulus*
- 6a. Cystidia present 7
 b. Cystidia absent. 10. *C. cortinatus*
- 7a. Both cheilo- and pleurocystidia present 8
 b. Only cheilocystidia present 13
- 8a. Pileus very small, expanded $< 6 \text{ mm}$; average length of spores $< 9 \mu\text{m}$ 9
 b. Pileus larger, $5\text{--}25 \text{ mm}$ when expanded or av. length of spores $> 9 \mu\text{m}$ 11
- 9a. In lawns, terrestrial, not on dung, young pileus white; spores $7\text{--}9.5 \times 5\text{--}6.5 \mu\text{m}$
 8. *C. idae*
 b. On dung; pileus grey or white and then breadth of spores $< 5 \mu\text{m}$ 10
- 10a. Young pileus grey; spores $7.5\text{--}9.5 \times 5\text{--}6 \mu\text{m}$ 6. *C. poliommallus*
 b. Young pileus white; spores $6\text{--}7.5\text{--}(8) \times 3.5\text{--}4.5\text{--}(5) \mu\text{m}$. 7. *C. pseudocortinatus*
- 11a. Expanded pileus up to 25 mm ; average length of spores $< 9 \mu\text{m}$; on dung
 5. *C. utrifer*
 b. Expanded pileus $5\text{--}12 \text{ mm}$; average length of spores $> 9 \mu\text{m}$ 12
- 12a. On grasses. Cheilocystidia $20\text{--}45 \times 8\text{--}13 \mu\text{m}$ 17. *C. pilosotomentosus*
 b. On wood. Cheilocystidia $50\text{--}80 \times 20\text{--}35 \mu\text{m}$ 20. *C. nemoralis*
- 13a. Cheilocystidia utriform 9. *C. candidatus*
 b. Cheilocystidia (sub)globose or ellipsoid 14
- 14a. Caulocystidia present, with finger-like diverculations at apex; cheilocystidia (sub)glo-
 bose to ellipsoid, partly also diverculate 18. *C. ramosocystidiatus*
 b. Caulocystidia absent, cheilocystidia without diverticulations in apical part: see dis-
 cussion under *C. cortinatus*.
- 15a. Spores with rounded angles (4–5-angular), $8\text{--}10.5 \times 8\text{--}10 \mu\text{m}$; pleurocystidia
 present 16
 b. Spores differently shaped; breadth of spores $< 8 \mu\text{m}$ or spores limoniform; pleuro-
 cystidia present or absent 18
- 16a. Ring present 15. *C. ephemeroideus*
 b. Ring absent 17
- 17a. Cheilocystidia in part lageniform. On dung 12. *C. cordisporus*
 b. No lageniform cheilocystidia present. On vegetable debris 13. *C. patouillardii*

- 18a. Pleurocystidia present 19
 b. Pleurocystidia absent 20
 19a. Breadth of spores 5–6 μm , heart- or pear-shaped 14. *C. cardiasporus*
 b. Breadth of spores 7.5–11.5 μm , limoniform 2. *C. pseudoniveus*
 20a. Veil white, often cream-coloured or slightly ochraceous at centre of pileus; spores \pm 6-angular in frontal view, c. 5–6 μm broad; with two bumps at each side
 16. *C. iocularis*
 b. Veil at centre of pileus dark grey, usually with greenish hue; spores narrowly ovoid or amygdaliform, c. 4–5 μm broad 19. *C. coniothorus*

1. *Coprinus niveus* (Pers.: Fr.) Fr. — Figs. 1a, 1b

Agaricus niveus Pers., Syn. meth. Fung. (1801) 400. — *Agaricus niveus* Pers: Fr., Syst., mycol. 1 (1821) 311. — *Coprinus niveus* (Pers.: Fr.) Fr., Epicr. (1838) 246.

Coprinus latissporus P.D. Orton, Notes R. bot. Gdn Edinb. 32 (1972) 140.

Selected literature. Enderle, Krieglsteiner & Bender, Z. Mykol. 52 (1986) 121.

Selected icon. R. Fillion, *Coprinus niveus*. Bull. Féd. mycol. Dauphiné-Savoie 122 (1991) 9. — M. Tabarés, Bolets de Catalunya V (1986) pl. 215.

Closed pileus ellipsoid, cylindrical-ellipsoid or subglobose, up to 25 mm high and 15 mm wide, completely covered with white, powdery veil, centre of pileus often cream-coloured to pale ochraceous; veil at margin, particularly in early stages, somewhat more hairy-floccose; expanded pileus up to 40 mm wide, conical or convex, finally applanate with slightly deflexed margin. Lamellae, L = 24–38, l = 1–3(–5), free, white at first, then grey to black. Stipe up to 100 \times 4 mm, attenuate upwards, white, towards base up to 6 mm wide, and often brownish with white velar flocks. Smell absent. Spore print very dark chocolate brown, almost black.

Spores [180,9,7] 12.2–19.0 \times 10.8–15.6 \times 7.5–9 μm , Q = 1.05–1.40, av. Q = 1.10–1.30, av. L = 14.5–17.3, av. B = 11.9–13.9 μm , lentiform, limoniform in frontal view, ellipsoid in side view, dark red-brown, with central to slightly eccentric germ pore. Basidia 25–40 \times 12–16 μm , 4-spored, surrounded by 5–7(–8) pseudoparaphyses. Pleurocystidia 50–150 \times 25–60 μm , vesiculose, ellipsoid, or subcylindric. Cheilocystidia 30–80 \times 15–50 μm , similar to pleurocystidia. Veil made up of up to 100 μm wide, (sub)globose elements. Clamp-connections sparse, probably just pseudoclamps.

Habitat & distribution. Solitary or a few together. On dung of horse and cow. Rather common.

Collections examined. NETHERLANDS: prov. Utrecht, Bunnik, 12 Oct. 1947, O.F. Uffellie; prov. Zuid-Holland, Oegstgeest, Poelgeest, 22 Aug. 1944, R.A. Maas Geesteranus 3055; 7 Sept. 1944, A.C. Perdeck; Leiden, 6 July 1959, C. Bas 1731; Grevelingen, 17 Nov. 1977, C. Bas 7291; Wassenaar, Meijendel, 28 Sept. 1991, C.B. Uljé 1183. — SWITZERLAND: canton Graubünden, Silvaplana, 25 Aug. 1976, C. Bas 7016.

Coprinus niveus can be easily recognized by the very large spores which are limoniform in frontal view and ellipsoid in side-view, borne on 4-spored basidia. Generally, *Coprinus niveus* has medium-sized basidiocarps, but in collection Uljé 1183 they are only a few mm. In this collection the spores are also somewhat smaller than in normal *C. niveus*, viz. 12.2–16.0 \times 10.8–13.0 μm , Q = 1.15–1.40, av. Q = 1.25, av. L = 14.6, av. B = 12.0 μm . In the description given above, these measurements are included.

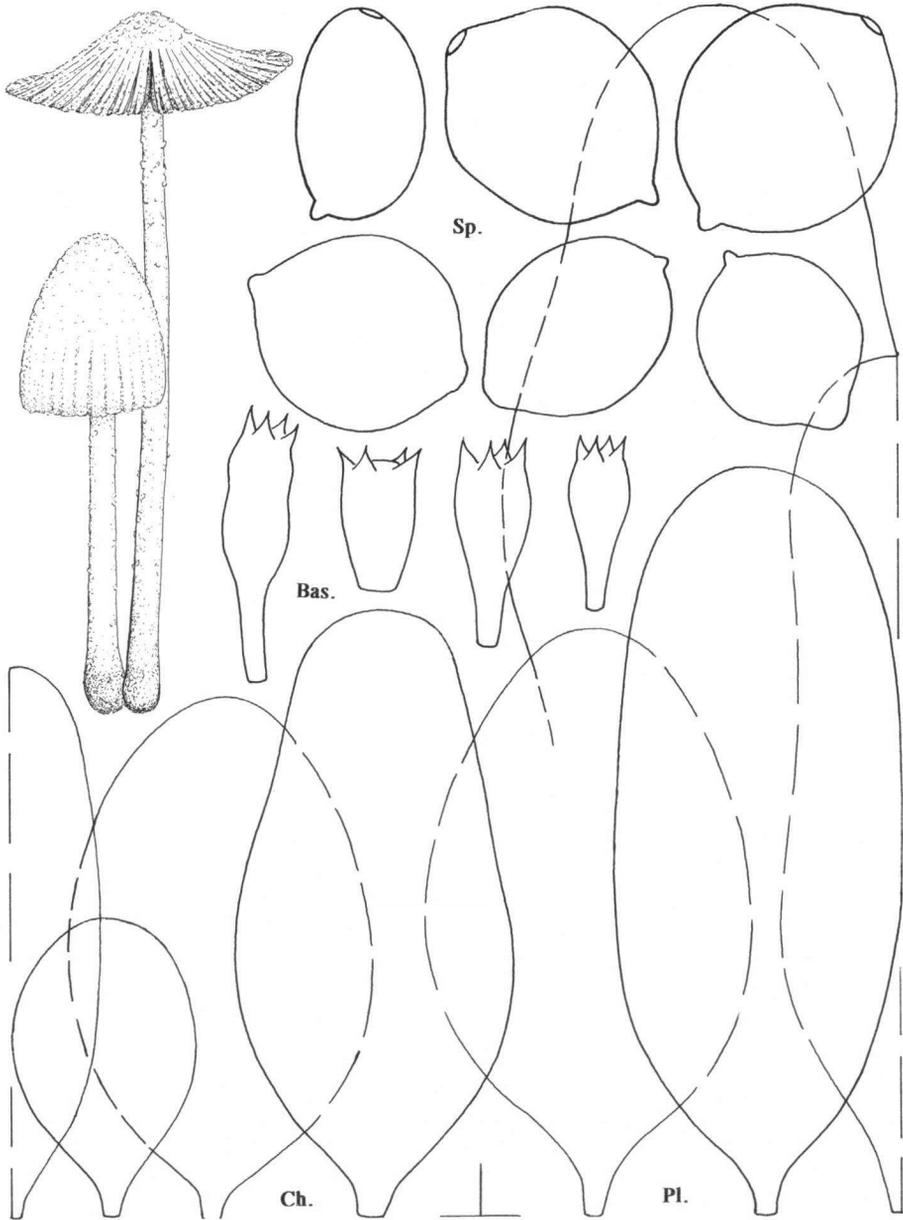


Fig. 1a. *Coprinus niveus* (Pers.: Fr.) Fr. All figures from *Maas Geesteranus* 3055.

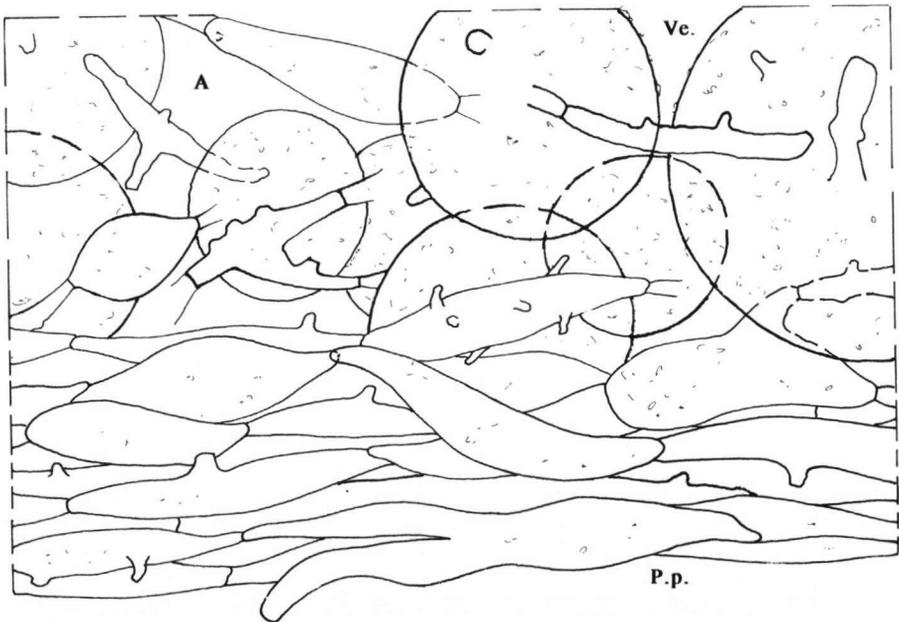
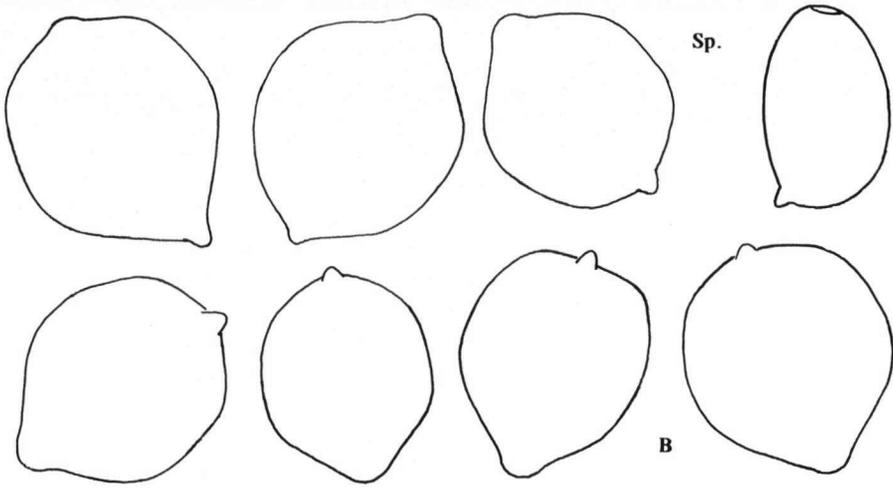


Fig. 1b. A. Pileipellis in the 'niveus'-complex' (of *Coprinus cothurnatus* Godey, from Uljé 1005); B. spores of *Coprinus laisporus* (from type).

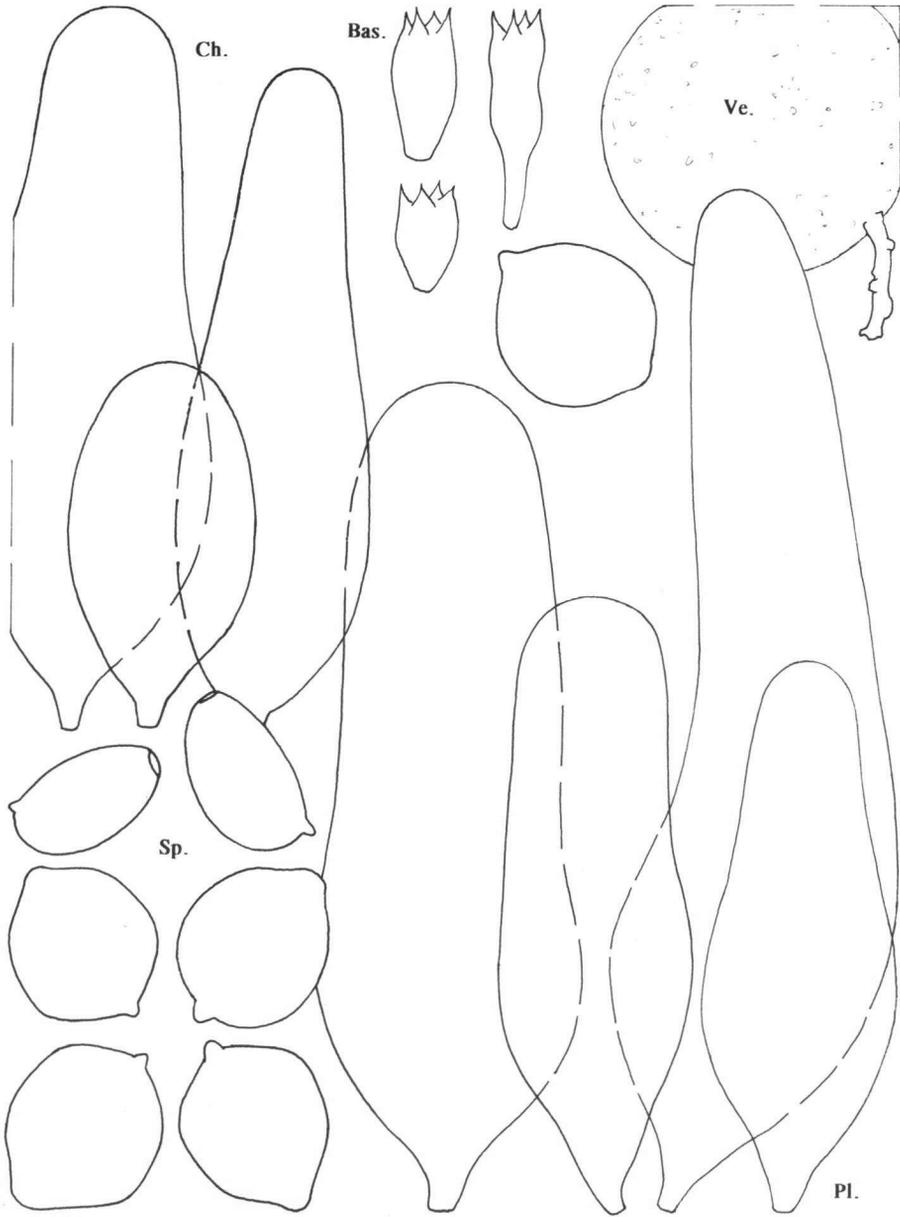


Fig. 2. *Coprinus pseudoniveus* Bender & Uljé. All figures from coll. Veldre.

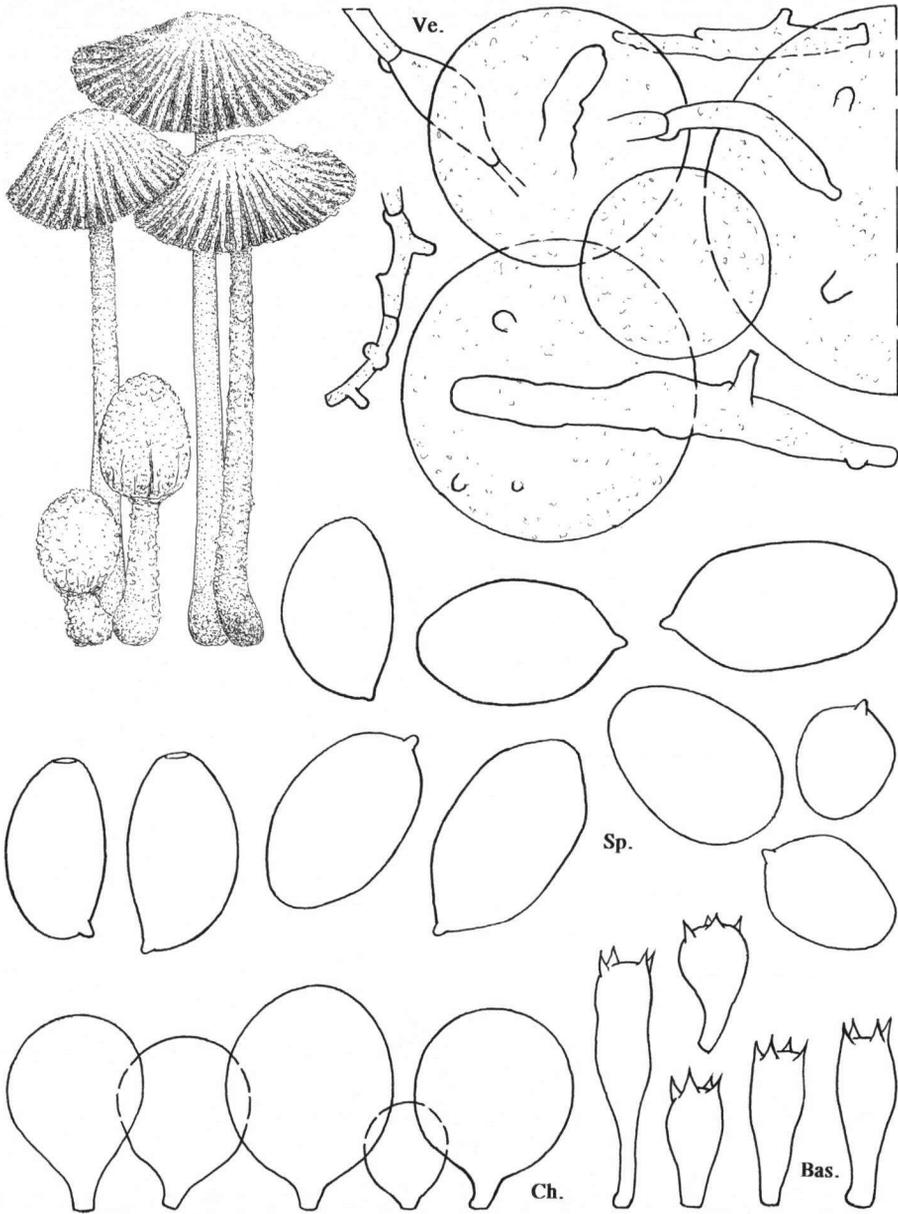


Fig. 3. *Coprinus cothurnatus* Godey apud Gillet. All figures from *Uljé 1005*.

Coprinus latisporus was characterized by Orton (1972: 160) in the original description as follows: "It could be mistaken for a small *C. niveus*, but differs from that species in its differently shaped spores, which are less elongate in side-view and more rounded and less regular in face-view, and the smaller fruit-body with less copious veil." He also depicted a small specimen. The type material consists of one, small, probably still very young basidiocarp with spores $13.0\text{--}15.4 \times 11.2\text{--}14.5 \mu\text{m}$, which appear for the greater part immature and very pale to dark brown; truly ripe, i.e. black, spores have not been found. The difference in shape, as noted by Orton, was not found (Fig. 1b) but only a slight difference in length, which can be explained by the still immature state. Furthermore, small specimens of *Coprinus niveus* may occur, as pointed out above, and the difference in veil covering does not appear to be a significant difference to us. It is likely that Orton described a small, still immature specimen of *C. niveus*, and we therefore prefer to consider *C. latisporus* a synonym.

2. *Coprinus pseudoniveus* Bender & Uljé, *spec. nov.* — Fig. 2

Pileus primo ellipsoideus, demum cylindrico-ellipsoideus, 12–20 mm altus, 6–12 mm latus, dein explanatus, 20–40 mm latus, primo pruinosis ad marginem flocculosus cum velo albedo-cinerascente. Lamellae liberae, L = 22–36, l = 1–3(–5), ex albo cinerascens vel nigricans. Stipes usque ad 50–120 × 3–5 mm, versus basim incrassatus, albidus vel cinereus, albedo floccosus. Sporae [60,3,3] $9.2\text{--}12.3 \times 7.5\text{--}11.3 \times 6.2\text{--}7.8 \mu\text{m}$, Q = 1.05–1.35, in antice limoniformes, facie ellipsoideae, rufo-brunneae, poro germinativo centrico vel excentrico instructae. Basidia 15–40 × 9–13 μm , tetrasporigera. Pseudoparaphyses 4–6(–7). Pleurocystidia 75–180 × 25–50 μm , utriformia, vesiculosa vel subcylindracea. Cheilocystidia 40–65 × 20–27 μm , utriformia, vesiculosa, ellipsoidea vel subcylindracea. Velum e elementis (sub)globosis, glabris, usque ad 75 μm diam. constans. Fibulae absentes vel inconstantes vel pseudofibulae. In stercore vaccino vel sarmenta.

Holotypus: Netherlands, prov. Utrecht: Baarn, 6 Febr. 1973, *J. Daams* 73-26 (L).

Closed pileus ellipsoid, then cylindrical ellipsoid, 12–20 mm high and 6–12 mm wide, completely covered with white, later greyish, powdery veil; veil at margin, particularly in early stages somewhat more hairy-floccose; expanded pileus 20–40 mm wide, at first conical, later expanded, undulated with split, reflexed margin. Lamellae, L = 22–36, l = 1–3(–5), free, white at first then grey to black with pale edge. Stipe up to 50–120 × 3–5 mm, attenuate upwards, white to greyish, with white velar flocks, at base somewhat swollen, densely white flocculose. Smell somewhat yeast-like (coll. *Bender*); of coconut, cinnamon, fruit-drop, holy grass, *Anthoxanthum odoratum* (coll. *Veldre*). Spore print black with violet hue.

Spores [60,3,3] $9.2\text{--}12.3 \times 7.5\text{--}11.3 \times 6.2\text{--}7.8 \mu\text{m}$, Q = 1.05–1.35, av. Q = 1.15–1.20; av. L = 10.6–11.5, av. B = 8.8–9.9 μm , limoniform in frontal view, ellipsoid in side view, dark red-brown, with central to slightly eccentric germ pore. Basidia 15–40 × 9–13 μm , 4-spored, surrounded by 4–6(–7) pseudoparaphyses. Pleurocystidia 75–180 × 25–50 μm , utriform, vesiculose or subcylindric. Cheilocystidia 40–65 × 20–27 μm , utriform, vesiculose, ellipsoid or subcylindric. Veil made up of up to 75 μm wide, (sub)globose elements. Clamp-connections sparse, difficult to find. Probably just pseudo-clamps.

Habitat & distribution. Solitary or a few together. On cow-dung and compost heaps. Rare in the Netherlands.

Collections examined. NETHERLANDS: prov. Utrecht, Baarn, 6 Febr. 1973, *J. Daams* 73-26 (holotype; *L.*) — AUSTRIA: Klopeiner See, 2 Sept. 1985, *H. Bender* (Herb. Bender). — ESTONIA: Valgamaa, Piiri, 5 Sept. 1985, *S. Veldre*.

The macroscopical description of *Coprinus pseudoniveus* is based upon the collection of Bender. Both this collection and that of Veldre, had a striking smell according to their collectors, although their descriptions of this smell are rather different. *Coprinus* species with a striking smell are rare, except for the taxa in subsection *Narcotici*. *Coprinus pseudoniveus*, however, belongs to the *C. niveus* complex, because of the limoniform spores and structure of the veil. It has distinctly smaller spores and narrower cystidia than *C. niveus*. *Coprinus cothurnatus* has narrower, more hexagonal spores, and is usually devoid of pleurocystidia; *C. pachyspermus* has 2-spored basidia.

3. *Coprinus cothurnatus* Godey apud Gillet — Fig. 3

Coprinus cothurnatus Godey apud Gillet, *Hyménomycètes* Fr. (1874) 605.

Selected literature. G.J. Krieglsteiner, H. Bender & M. Enderle, *Studies zur Gattung Coprinus* I, *Z. Mykol.* 48 (1982) 77.

Selected icon. B. Cetto, *I funghi dal vero*, Part 5 (ed. 2) (1989) no. 1719.

Closed pileus ellipsoid, cylindrical ellipsoid or subglobose, up to 20 mm high and 13 mm wide, completely covered with white, powdery veil; veil at margin, particularly in early stages somewhat more hairy-floccose; expanded pileus up to 35 mm wide, conical or convex, finally applanate with reflexed margin. Lamellae, $L = 22-30$, $l = 0-3$, free to narrowly adnate, white at first, then grey to black. Stipe up to $100 \times 3-5$ mm, slightly attenuate upwards, white, flocculose from veil; at base up to 6 mm wide, often brownish, with white velar flocks. Smell absent. Spore print black with violet hue.

Spores $[40,2,2]$ $9.6-15.4 \times 6.5-8.7 \times 7-7.5$ μm , $Q = 1.45-1.80$, av. $Q = 1.50-1.55$, av. $L = 11.9-12.3$, av. $B = 7.8$ μm , more or less 6-angular in frontal view, ellipsoid in side view, dark red-brown, with central to slightly eccentric germ pore. Basidia $18-50 \times 9-13$ μm , 4-spored, surrounded by 3-5 pseudoparaphyses. Pleurocystidia sparse or absent, $50-150 \times 25-60$ μm , vesiculose, ellipsoid or subcylindric. Cheilocystidia $30-80 \times 15-50$ μm , similar to pleurocystidia. Veil made up of up to 100 μm wide, (sub)globose elements. Clamp-connections sparse, probably just pseudoclamps.

Habitat & distribution. Solitary or a few together. On dung of horse and cow. Rather common.

Collections examined. NETHERLANDS: prov. Zuid-Holland, Hazerswoude, 31 Oct. 1988, *C.B. Uljé* 1005; prov. Zeeland, Goes, 25 Sept. 1987, *W.D.J. Kuijs*.

Coprinus cothurnatus occupies an isolated position in subsection *Nivei*, because of the hexagonal spores which are also distinctly narrower than in the other species of this complex.

In collection *C.B. Uljé* 1005 a few 1-, 2- and 3-spored basidia have been found.

4. *Coprinus pachyspermus* P.D. Orton — Fig. 4

Coprinus pachyspermus P.D. Orton, *Notes R. bot. Gdn Edinb.* 32 (1972) 144.

Selected literature. Orton & Watling, *Coprinaceae*, part. 1, *Coprinus*. *Brit. Fung. Fl.* 2 (1979) 65.

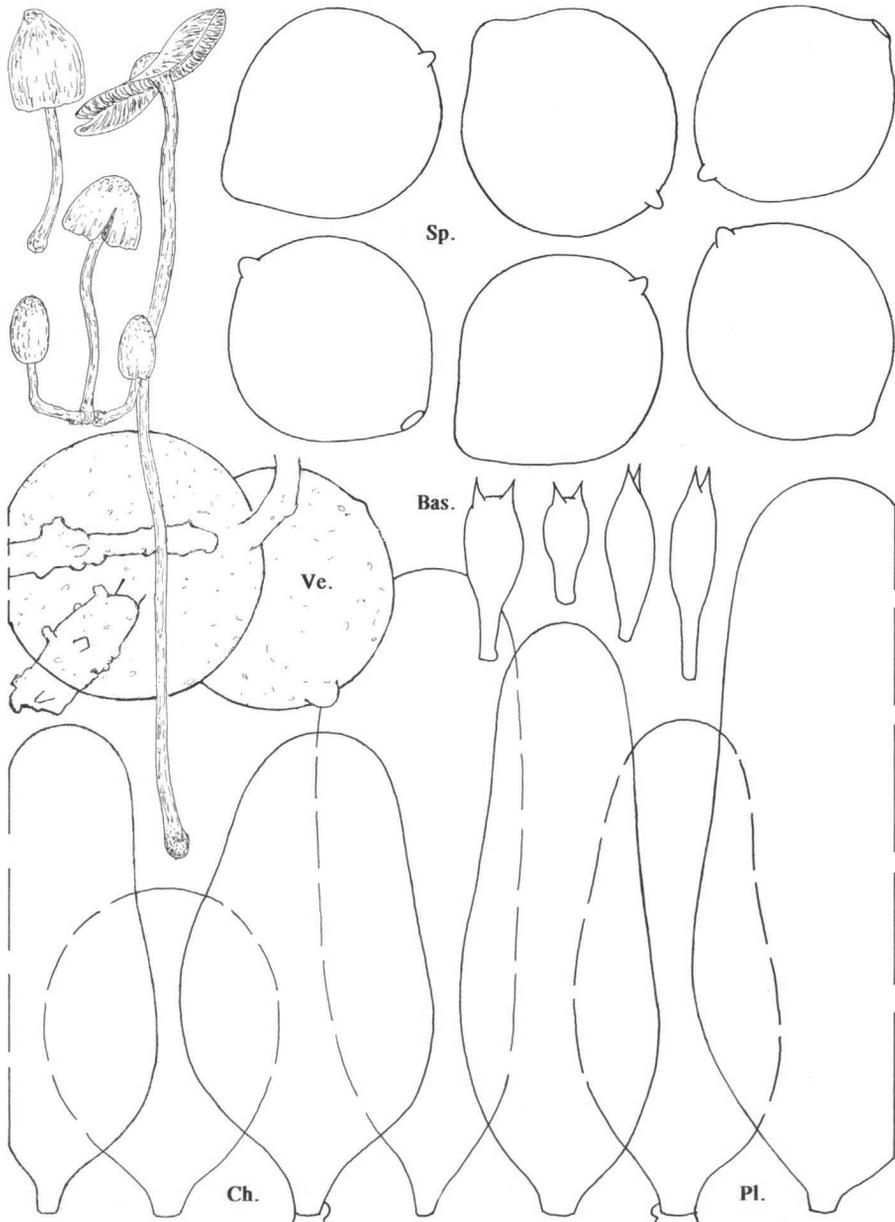


Fig. 4. *Coprinus pachyspermus* P.D. Orton. All figures from Orton 3555 (type).

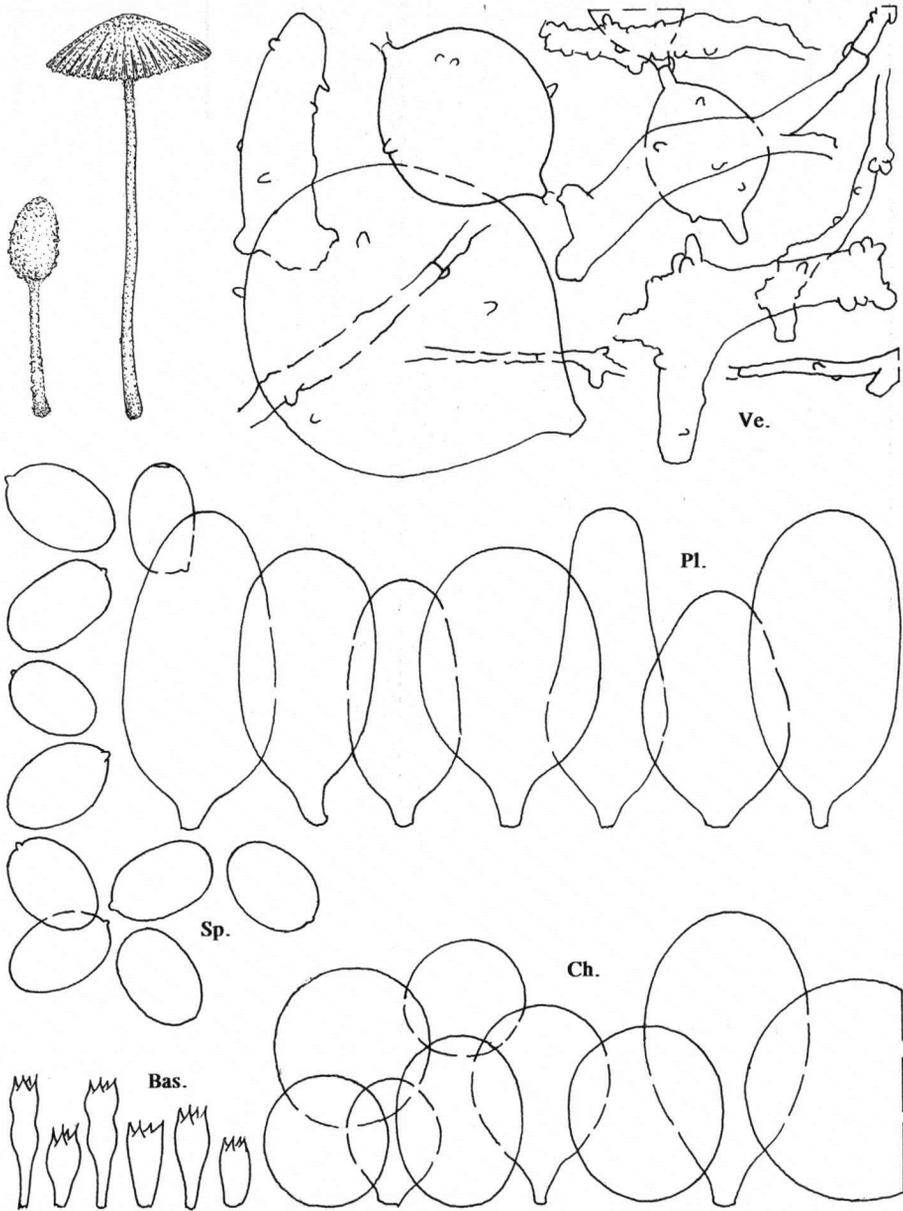


Fig. 5. *Coprinus utrifer* [Joss. ex] Watl. All figures from coll. Veldre.

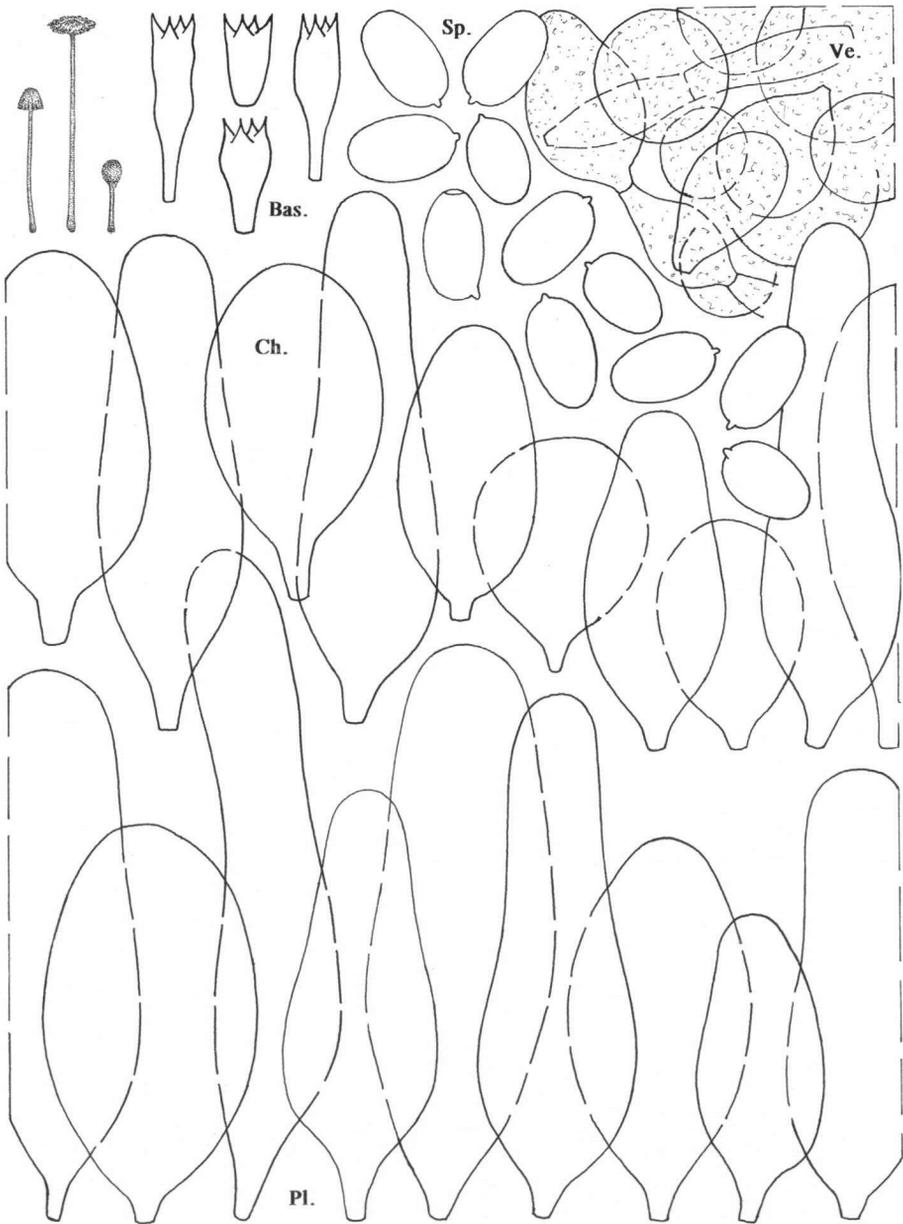


Fig. 6. *Coprinus poliomallus* Romagn. All figures from neotype (Uljé 1181).

Closed pileus subglobose to ellipsoid, up to 30 mm high and 18 mm wide, completely covered with grey or creamy-grey, powdery, mealy-floccose, often somewhat pointed veil, at centre of pileus sometimes rather dark sepia-brown at the tips of the scales; expanded pileus up to 40 mm wide, conical or convex, finally appanate with slightly deflexed margin. Lamellae, L = 24–38, l = 1–3(–5), free, white at first then grey to black. Stipe up to 110 × 4 mm, attenuate upwards, whitish; at base up to 6 mm wide, often brownish, with white velar flocks. Smell absent. Spore print fuscous black.

Spores [20,1,1] 13.4–16.7 × 12.7–15.4 × c. 8.5–10 μm, Q = 1.05–1.20, av. Q = 1.10, av. L = 15.1, av. B = 13.7 μm, lentiform, limoniform in frontal view, ellipsoid in side view, dark red-brown, with slightly to strongly eccentric germ pore. Basidia 18–38 × 9–13 μm, 2-spored, surrounded by 4–6 pseudoparaphyses. Pleurocystidia 80–160 × 30–60 μm, vesiculose, utriform, ellipsoid or subcylindric. Cheilocystidia 30–90 × 20–50 μm, similar to pleurocystidia. Veil made up of up to 90 μm wide, (sub)globose elements. Clamp-connections sparse, probably just pseudoclamps.

Habitat & distribution. Solitary or a few together. On old cow dung. Known only from the type locality.

Collection examined. UNITED KINGDOM: Inverness-shire, Nettle Bridge, 28 Aug. 1969, Orton 3555 (holotype, E).

The macroscopical description is based on the original diagnosis by Orton (l.c.); the microscopical data are based on our study of the holotype.

According to the description by Orton (1972), *Coprinus pachyspermus* can be readily recognised by the 2-spored basidia and the large lentiform spores. Although the pileus is described as grey or cream grey (Orton, l.c.; Orton & Watling, 1979), Orton & Watling in their key (1979: 16) characterized the species as 'white or grey to clay-buff scaly.' If the species exists also truly white, the only difference between *C. pachyspermus* and *C. niveus* is in the 2-spored basidia.

Orton (l.c.) did not mention the clamp-connections. We found some in the type material, but like in the other species in the '*C. niveus*'-complex, they are difficult to find and not abundant.

5. *Coprinus utrifer* [Joss. ex] Watl. — Fig. 5

Coprinus utrifer Joss., Bull. Soc. mycol. Fr. 64 (1948) 26 (invalid, no Latin description). — *Coprinus utrifer* Joss. ex Watl., Notes R. bot. Gdn Edinb. 31 (1972) 362.

Closed pileus ellipsoid or cylindrical ellipsoid, up to 13 mm high and 3–8 mm wide, completely covered with creamy-white, later pale greyish-ochre, powdery veil (according to the description of Watling (l.c.) the pileus is covered throughout with pale grey scurfy sheath-like veil with a faint flush of ochraceous; finally the pileus is evenly sepia with remnants of the veil in irregular patches flushed with ochraceous); veil at margin, particularly in early stages somewhat more hairy-floccose; expanded pileus 10–25 mm wide, first conical or campanulate, later appanate with reflexed margin. Lamellae free, white at first then grey (violaceous grey according to Watling) then black with pale edge. Stipe up to 50 × 1–2 mm, attenuate upwards, white to greyish, with small velar flocks, at base somewhat swollen, white hairy-flocculose. Smell absent. Spore print violaceous black.

Spores [20,1,1] $6.0-7.7 \times 4.2-5.0 \times 4.1-4.5 \mu\text{m}$, $Q = 1.35-1.70$, av. $Q = 1.50$; av. $L = 7.0$, av. $B = 4.7 \mu\text{m}$, cylindrical-ellipsoid in frontal view, ellipsoid in side-view, red-brown, with central, truncate germ pore, difficult to see. Basidia $10-22 \times 6-8 \mu\text{m}$, 4-spored, surrounded by 3-5 pseudoparaphyses. Pleurocystidia $30-55 \times 15-35 \mu\text{m}$, ellipsoid, utriform, vesiculose or subcylindric. Cheilocystidia $20-50 \times 15-35 \mu\text{m}$, ellipsoid or (sub)globose. Veil made up of (sub)globose elements, $25-60 \mu\text{m}$ in diam., mixed with fusiform or elongate, $2-15 \mu\text{m}$ wide elements. Clamp-connections present.

Habitat & distribution. Solitary or a few together. On dung of sheep, cow and horse. Not known from the Netherlands.

Collection examined. ESTONIA: 19 July 1988, on horse dung, *S. Veldre*.

Coprinus utrifer is microscopically easy to identify by its small subcylindrical spores. Some measurements in literature appear to be slightly different: spores (Watling: $7.5-8.5 [-9.0] \times 4.5-5.5 \mu\text{m}$; Josserand: $7.8-8.8 \times 4.6-5.3 [-5.5] \mu\text{m}$); pleurocystidia (Watling: $40-100 \times 17-23 \mu\text{m}$; Josserand: $60-100 \times 20-30 \mu\text{m}$), cheilocystidia (Watling: $25-40 \times 25-35 \mu\text{m}$; Josserand ($15-$) $25-40 \times 10-20 \mu\text{m}$), but we think the Estonian collection studied fits well in the concept of *Coprinus utrifer*.

The species is included here in section *Nivei* because of the very similar veil, that is made up of (sub)globose and elongate elements. The relatively strongly diverculate elements also resembles the veil found in other groups of *Coprinus* which is the reason that *C. utrifer* is placed in different sections by various authors. Kühner & Romagnesi (1953) place it in section *Impexi*, Moser (1983) in section *Coprinus* and Citerin (1992) in section *Picaceus* (see also the paragraph on infrageneric classification).

6. *Coprinus poliomallus* Romagn. — Fig. 6

Coprinus poliomallus Romagn., Rev. mycol. 10 (1945) 89.

Selected literature. M. Enderle & H. Bender, Studien zur Gattung *Coprinus* V, Z. Mykol. 56 (1990) 32.

Closed pileus ellipsoid to cylindrical-ellipsoid, up to $5 \times 3 \text{ mm}$, expanding up to 7 mm broad, in buds dark grey or mouse-grey, becoming paler with age, entirely powdery but at margin somewhat hairy-floccose. Lamellae, $L = 8-16$, $l = 0-1$, free, rather distant, first white but soon grey to spotted blackish. Stipe up to $20 \times 0.5 \text{ mm}$, vitreous, subbulbous at base. Smell absent.

Spores [140,7,6] $6.3-10.3 \times 3.8-6.2 \mu\text{m}$, $Q = 1.34-1.95$, av. $Q = 1.55-1.80$, av. $L = 7.4-9.3$, av. $B = 4.5-5.7 \mu\text{m}$, cylindrico-ellipsoid, ellipsoid or ovoid, red-brown under microscope, with central, $1.3 \mu\text{m}$ wide germ pore. Basidia $12-28 \times 7-9 \mu\text{m}$, 4-spored, surrounded by (3-)4-5(-6) pseudoparaphyses. Pleurocystidia $50-120 \times 21-38 \mu\text{m}$, ellipsoid, utriform or subcylindrical. Cheilocystidia $40-90 \times 18-32 \mu\text{m}$, similar to pleurocystidia. Pileipellis consisting of roundish elements covered by narrow hyphae, passing upwards into velar tissue. Velar elements (sub)globose to ellipsoid, up to $50 \mu\text{m}$ wide, connected by $10-75 \mu\text{m}$ long and $3-7 \mu\text{m}$ wide, cylindrical, sometimes fusiform hyphae, hyaline, greyish in part, thin-walled, granular. Velum at margin of pileus and on stipe made up of cylindrical to fusiform or clavate elements for the most part. Clamp-connections absent.

Habitat & distribution. Solitary or in groups; on pure dung, especially of cow.

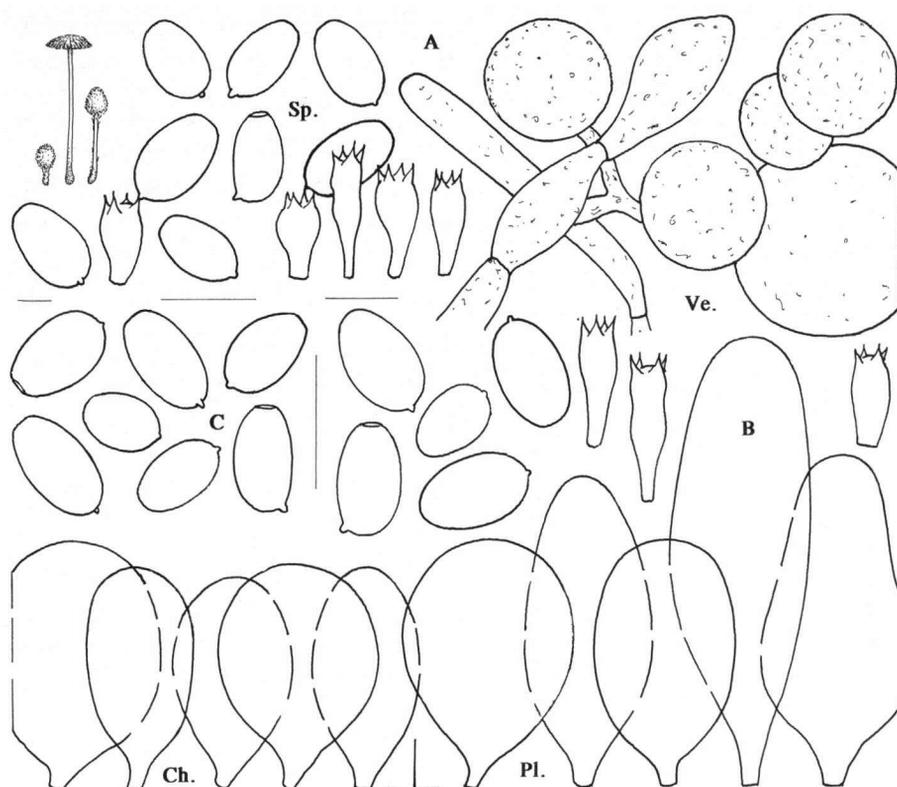


Fig. 7. *Coprinus pseudocortinatus* Locq. A. Veil, spores and basidia from *Vellinga*, 1 June 1986; B. spores, basidia and cystidia from *Uljé*, 22 Jan. 1990; C. spores from *Uljé 1051*.

Collections examined. NETHERLANDS: prov. Utrecht, Huizen, 29 Nov. 1986, *C.B. Uljé 823*; prov. Noord-Holland, Landsmeer, 26 Sept. 1992, *C.B. Uljé 1229*; prov. Zuid-Holland, Hazerswoude, Spookverlaat, 1 Nov. 1989, *C.B. Uljé 1055*; *ibid.* 12 Sept. 1990, *C.B. Uljé 1129*; Wassenaar, 28 Sept. 1991, *C.B. Uljé 1181* (neotype). — GERMANY: St. Märgen, 6 Sept. 1987, *H. Bender*.

The type of *C. poliommallus* is lost (*H. Romagnesi pers. comm.*) Therefore, collection *Uljé 1181* is selected here as neotype.

Coprinus coniophorus, the only other species in subsection *Nivei* with greyish veil, differs from *C. poliommallus* by the larger basidiocarps, amygdaliform spores, gregarious growth, and the habitat, being on and round rotten wood.

7. *Coprinus pseudocortinatus* Locq. — Fig. 7

Coprinus pseudocortinatus Locq., *Bull. Soc. myc. Fr.* 63 (1947) 81 (invalid, no Latin description).

Closed pileus globose, subglobose to ellipsoid, 0.3–4 mm high, 0.2–2.5 mm wide, completely covered with white, powdery veil; veil at margin, particularly in early stages, somewhat more hairy-floccose; expanded pileus 1–7 mm wide, convex, later applanate,

finally with slightly deflexed margin, veil on pileus becoming grey with age. Lamellae, $L = 6-12$, $l = 0-1$, free, white at first then greyish to grey with blackish spots. Stipe up to $20 \times 0.1-0.7$ mm, whitish, vitreous, at base up to 1 mm wide, often brownish, with white velar flocks. Smell absent.

Spores [$120,6,5$] $5.6-7.7 \times 3.5-4.7$ μm ; $Q = 1.50-2.00$, av. $Q = 1.65-1.70$; av. $L = 6.5-6.6$, av. $B = 3.9-4.0$ μm , ellipsoid or ovoid, with central germ pore, red-brown. Basidia $9-30 \times 6-8.5$ μm , 4-spored, surrounded by (3-)4-6 pseudoparaphyses. Pleurocystidia $50-90 \times 20-40$ μm , utriform, a few subcylindric or ellipsoid. Cheilocystidia $30-50 \times 15-30$ μm , subglobose, ellipsoid, utriform or subcylindric. Velar elements up to 55 μm wide, globose. Clamp-connections absent.

Habitat & distribution. Solitary, in small groups on dung. Rather rare.

Collections examined. NETHERLANDS: prov. Utrecht, Huizen, 29 Nov. 1986, *C.B. Uljé*; prov. Noord-Holland, Vogelenzang, 1 June 1986, *E.C. Vellinga*; prov. Zuid-Holland, Leiden, 12 Sept. 1985, *C.B. Uljé*; Hazerswoude, Spookverlaat, 1 Nov. 1989, 5 Nov. 1989, *C.B. Uljé 1051*; 22 Jan. 1990, *C.B. Uljé*.

Because of the small size of the basidiocarps, a number of collections of *C. pseudocortinatus* could not be preserved after examination, but the observations on these finds are taken into consideration while preparing the description given above.

We have not been able to locate original material of *Coprinus pseudocortinatus*. It would have been a good opportunity here to validate Locquin's species by publishing a Latin diagnosis and designing a holotype. Unfortunately we have no good, rich collection for such a purpose.

Other small and rather similar species are *C. poliommallus* and *C. idae*. The former has dark mouse-grey basidiocarps when young, and the latter is terrestrial and has broader, differently shaped spores.

8. *Coprinus idae* Uljé, *spec. nov.* — Fig. 8

Pileus primo conicus demum plano-convexus vel applanatus, usque ad 8 mm latus, albo-pruinosis, demum cinerascens. Lamellae liberae, distantes ($L = 11-18$, $l = 0-1$), ex albo cinerascens vel nigricantes. Stipes usque ad $35 \times 0.2-1$ mm, basi subbulbosus, albidus, hyalinus, flocci albi velii. Sporae $6.7-9.7 \times 4.7-6.8$ μm , $Q = 1.5-1.6$, late ellipsoideae vel ovaliformes, pallide rubro-brunneae, cum poro germinativo centrico. Basidia $16-28 \times 6.5-8$ μm , tetrasporigera. Pseudoparaphyses 4-5. Pleurocystidia $25-55 \times 14-28$ μm , (sub)globose, ellipsoidea, utriformia vel vesiculosa. Cheilocystidia similia, $25-50 \times 16-28$ μm . Velum mixtum, e elementis globosis, glabris, ad 50×38 μm vel elementis diverticulatis constans. Fibulae absentes. Ad terram inter gramina.

Typus: Netherlands, Alphen a/d Rijn, near Zegersplas, 5.V.1988, *C.B. Uljé 908* (L).

Etymology: named after the author's wife.

Closed pileus up to 3.5×2.5 mm, in most cases somewhat smaller, first conical then plano-convex, finally applanate and then up to 8 mm wide, completely white-powdery, soon becoming greyish. Lamellae, $L = 11-18$, $l = 0-1$, free, white at first then grey to blackish spotted. Stipe up to $35 \times 0.2-1$ mm, with subbulbous base, whitish-hyaline, covered with white velar flocculi. Smell absent.

Spores [$120,6,3$] $6.7-9.7 \times 4.7-6.8$ μm , $Q = 1.30-1.75$, av. $Q = 1.50-1.55$, av. $L = 8.0-8.8$ μm , av. $B = 5.1-5.9$ μm , broadly ellipsoid to oval, rather pale red-brown, with central germ pore. Basidia $16-28 \times 6.5-8$ μm , 4-spored, surrounded by 4-5 pseudoparaphyses. Pleurocystidia $25-55 \times 14-28$ μm , (sub)globose, ellipsoid, utriform or

vesiculose. Cheilocystidia 25–50 × 16–28 µm, similar to pleurocystidia. Veil on pileus consisting of smooth or somewhat granular globose and 12–42 µm wide elements and ellipsoid to oval elements, up to 50 × 38 µm, mixed with frequently branching, colourless, thin-walled hyphae with processes. Clamp-connections absent.

Habitat & distribution. Terrestrial in lawn, solitary or a few together. Very rare, known only from type-locality.

Collections examined. NETHERLANDS: prov. Zuid-Holland, Alphen a/d Rijn, near Zegeerplas, 5 June 1988, *C.B. Uljé 908*, 11 July 1988, *C.B. Uljé*; same locality, 11 June 1990, *C.B. Uljé 1070* (holotype; L).

Coprinus idae is a very small, white species like *C. pseudocortinatus*. The latter has narrower, differently shaped spores, larger pleurocystidia, and grows on pure dung.

9. *Coprinus candidatus* Uljé — Fig. 9

Coprinus candidatus Uljé, Persoonia 13 (1988) 483.

Pileus ovoid to subglobose and up to 8 × 6 mm when still closed, expanding up to 16(–20) mm, white to cream, becoming sordid with age, entirely powdery but at margin somewhat hairy-floccose. Lamellae, L = 21–28, l = 0–3, free, first white but soon grey to spotted blackish, with white edge. Stipe c. 50 × 1.5 mm, attenuate upwards subbulbous at base, white-flocculose. Smell absent.

Spores [140,7,4] 7.3–11.5 × 4.6–6.0 µm, Q = 1.60–2.05, av. Q = 1.70–1.90, av. L = 8.6–10.9, av. B = 5.0–5.8 µm, cylindrico-ellipsoid, but somewhat conical towards apiculus, red-brown under microscope, with central, up to 2 µm wide germ pore. Basidia 15–35 × 7–10 µm, 4-spored, surrounded by 3–5 pseudoparaphyses. Cheilocystidia up to 40(–50) µm long, with 7–15(–25) µm wide ventricose part and 4–10(–15) µm wide neck, utriform to more rarely lageniform or vesiculose, with more or less cylindrical neck and rounded apex. Pleurocystidia absent. Veil made up of colourless to slightly yellowish, smooth to granular, up to 50 µm wide, globose elements. Clamp-connections present.

Habitat & distribution. Terrestrial on bare soil, sometimes on or against fallen branchlets. Not common.

Collections examined. NETHERLANDS: prov. Utrecht, Breukelen, estate 'Over-Holland', 19 Sept. 1986, *C.B. Uljé 807*; prov. Noord-Holland, Amsterdam, Amsterdamse Bos, 2 Sept. 1986, *C.B. Uljé 812* (holotype; L); ditto, 20 Sept. 1987, *C.B. Uljé 852*; prov. Zuid-Holland, Leiden, 26 March 1985, *C.B. Uljé 486*.

Among the species of the *C. cortinatus*-group, *C. candidatus* is easily recognized by its utriform cheilocystidia and by its usually cylindrico-ellipsoid spores.

10. *Coprinus cortinatus* J. Lange — Fig. 10

Coprinus cortinatus J. Lange, Dansk bot. Ark. 2 (3) (1915) 45.

Misapplied name. *Coprinus filiformis* s. H. Bender & M. Enderle, Z. Mykol. 54 (1988) 49.

Selected literature. H. Bender & M. Enderle, Studien zur Gattung *Coprinus* IV, Z. Mykol. 54 (1988) 49 (as *C. filiformis*); C. B. Uljé & C. Bas, Four new species from the Netherlands, Persoonia 13 (1988) 479.

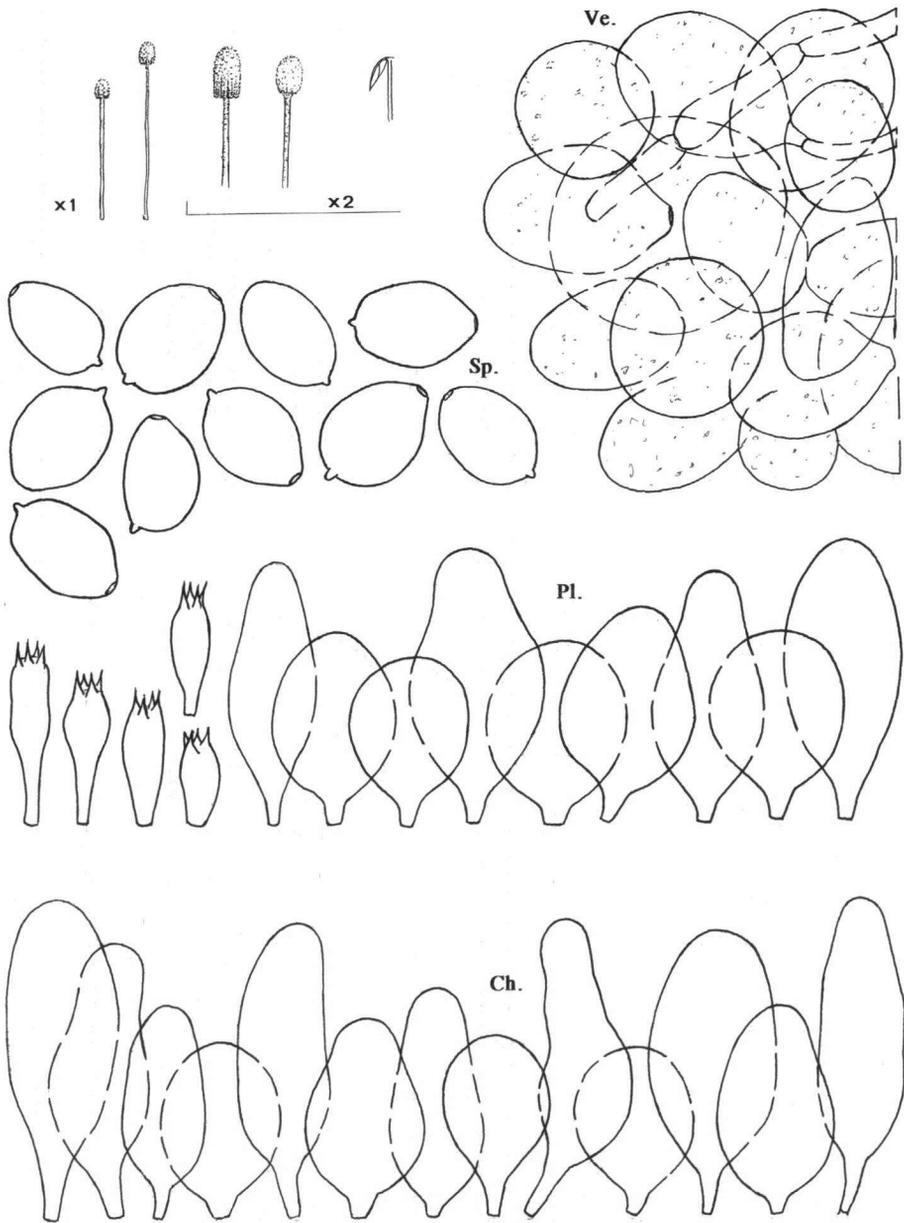


Fig. 8. *Coprinus idae* Uljé. All figures from *Uljé 908* (type).

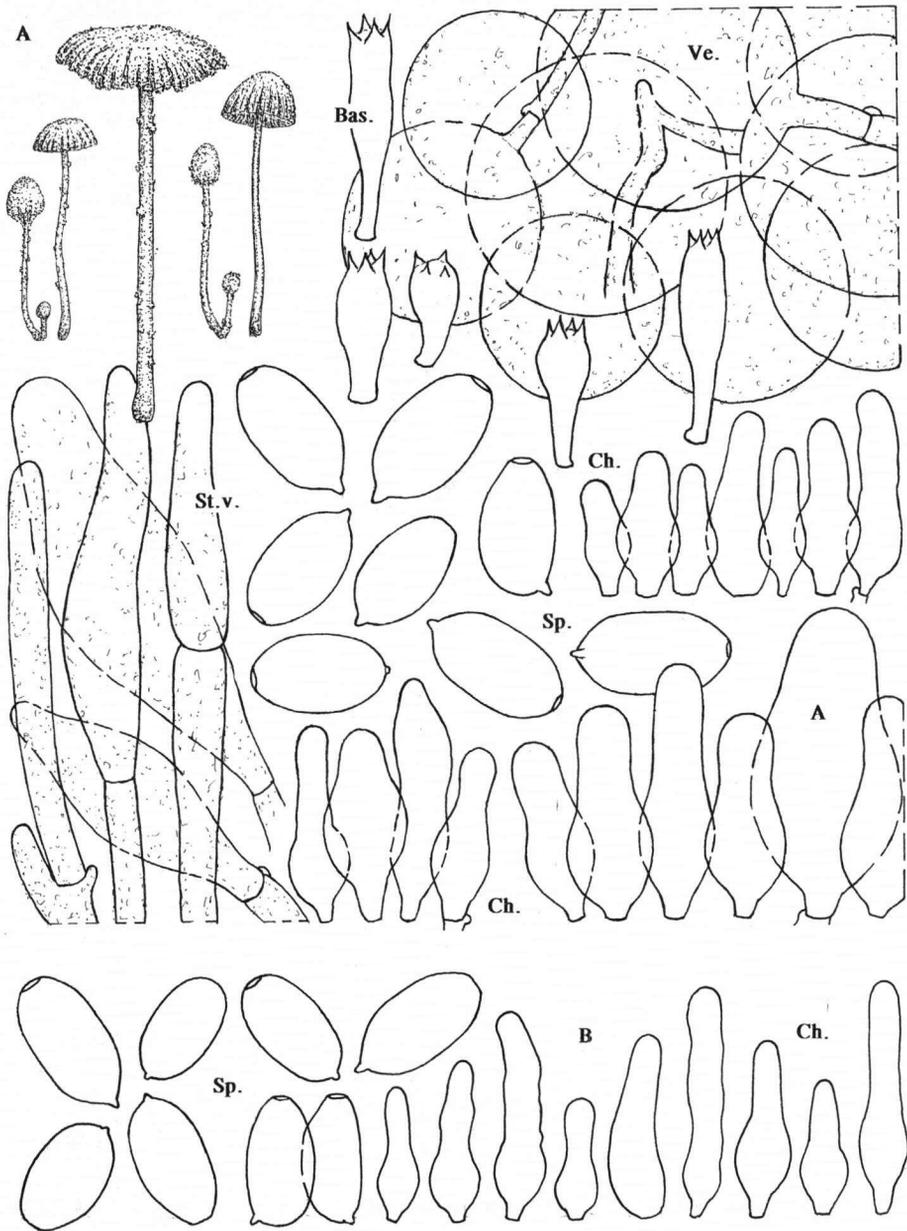


Fig. 9. *Coprinus candidatus* Uljé. All figures from Uljé 812 (type).

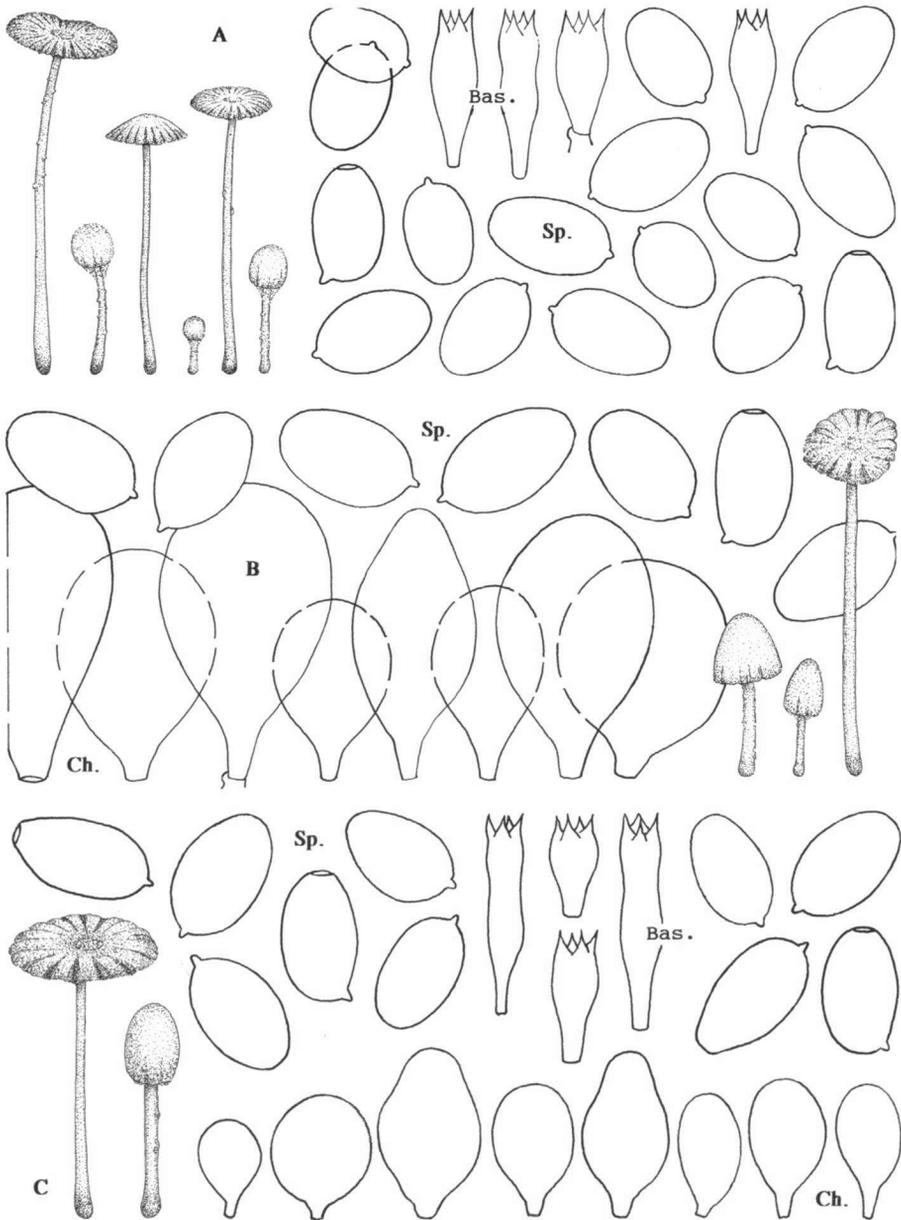


Fig. 10. *Coprinus cortinatus* J. Lange. A. from Uljé 41/86; B. from Uljé 1177; C. from Uljé 65.

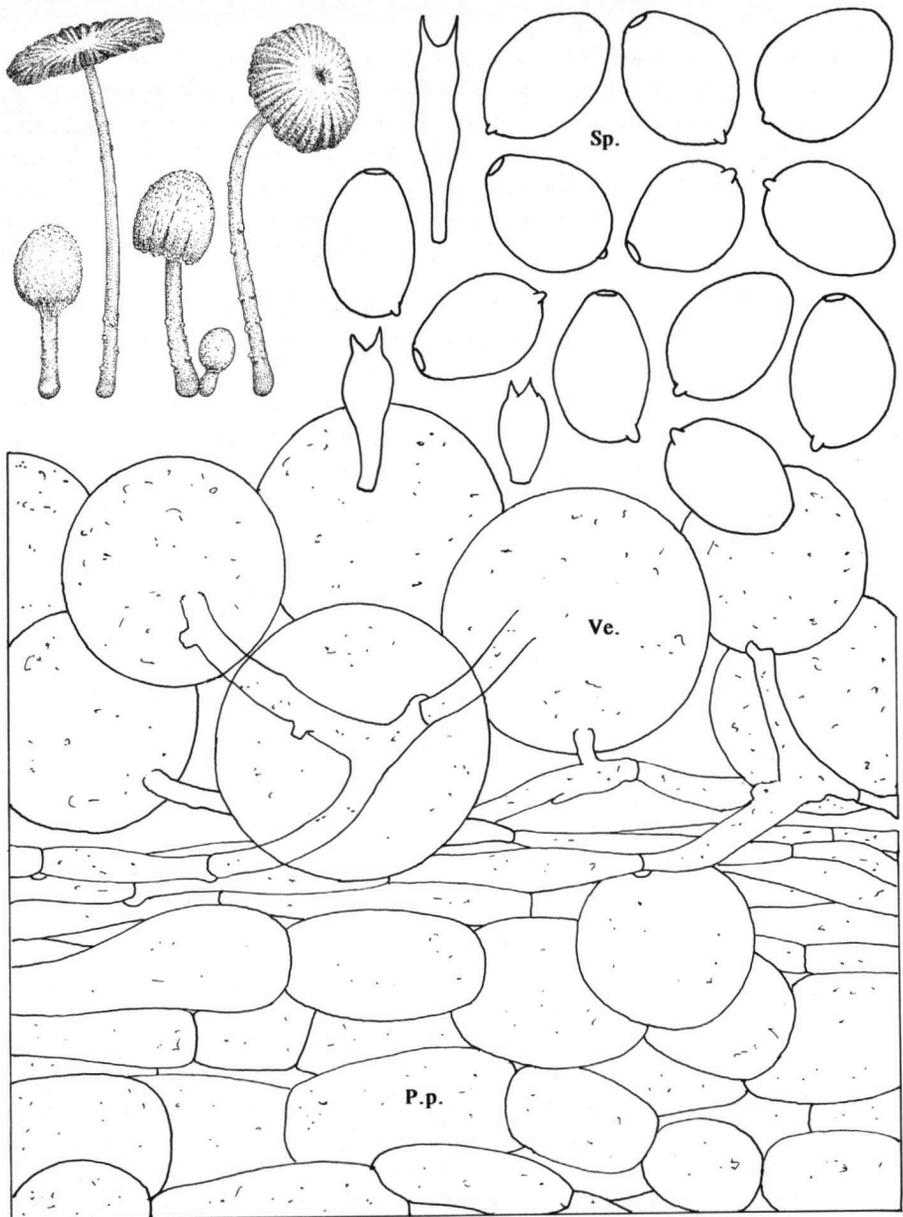


Fig. 11. *Coprinus bellulus* Uljé. All figures from Uljé 777 (type).

Closed pileus globose, subglobose to ellipsoid, up to 6 mm high and 5 mm wide, completely covered with powdery white veil, often cream to pale ochraceous at centre; veil at margin, particularly in early stages, somewhat more hairy-floccose; expanded pileus up to 15 mm wide, convex or flat, finally lamellae with slightly deflexed margin; veil greying with age. Lamellae, L = 18–24, l = 1–3, free, up to 2 mm wide, white at first, then greyish to grey with blackish spots. Stipe up to 40 × 0.5–1 mm, attenuate upwards, at base up to 1.5 mm wide, white, somewhat hyaline; at base up to 3.5 mm wide, often brownish, with white velar flocks. Smell absent. Spore print dark chocolate brown (Munsell 5 YR 2/1).

Spores [180,9,9] 6.2–9.7 × 4.3–6.0, Q = 1.30–1.70, av. Q = 1.45–1.55, av. L = 7.9–8.4, av. B = 5.1–5.4 μm, ellipsoid, sometimes slightly amygdaliform, dark reddish-brown, with central germ pore. Basidia 15–26 × 7–8 μm, 4-spored, surrounded by 3–5 pseudoparaphyses. Cheilo- and pleurocystidia absent but here and there sterile elements (probably somewhat enlarged basidioles) projecting from lamellae and sometimes velar remnants sticking to lamellar edge. Veil made up of colourless to slightly yellowish, smooth to granular, up to 50 μm wide, globose elements, mixed with some hypha-like elements. Clamp-connections present.

Habitat & distribution. Solitary or in small groups; on bare soil or in grassy-mossy places, in most cases under shrubs or trees. Not rare in the Netherlands.

Collections examined. DENMARK: (exact locality unknown), 20 Jan. 1939, *J.E. Lange 1903* (C). — NETHERLANDS: prov. Gelderland, Bergh, 2 Aug. 1952, *H.S.C. Huijsman*; prov. Utrecht, Breukelen, estate 'OverHolland', 27 Aug. 1986, *C.B. Uljé 22/86*; Haarzuilens, 8 Aug. 1987, *C.B. Uljé*; prov. Noord-Holland, Amsterdam, 10 Dec. 1958, *E. Kits van Waveren*; prov. Zuid-Holland, Leiden, Leidse Hout, 29 Sept. 1986, *C.B. Uljé 41/86*, 10 Sept. 1986, *C.B. Uljé 30/86*; Leiden, Nov. 1983, *C.B. Uljé*, 19 Oct. 1985, *C.B. Uljé 65/85*.

The present concept agrees well with that of J. Lange (1915), who does not mention hymenial cystidia. However, we collected several taxa very close to *Coprinus cortinatus* in the present sense, but with distinct, broadly clavate to ellipsoid cheilocystidia. For example we have a number of terrestrial collections with cheilocystidia up to 30 × 18 μm (*C.B. Uljé 65*, *C.B. Uljé*, 4 Sept. 1986, *C.B. Uljé 982* en *C.B. Uljé 1177*; with cheilocystidia resp. 15–30 × 11–16, 21–30 × 10–14, 11–27 × 7–12 en 20–32 × 13–18 μm) and collections from dung with larger cheilocystidia, up to 50 × 25(–35) μm (*Bender*, 3 Aug. 1983, *Bender*, 23 June 1985, *C.B. Uljé 1001*; with cheilocystidia resp. 20–52 × 15–38 μm, 20–33 × 12–25 μm and 20–40 × 15–35 μm). Intermediates, however, seem to exist, as two collections not growing on dung (*C.B. Uljé 991* on wood and *C.B. Uljé 48/86* on soil) have large cheilocystidia similar to the collections mentioned above from dung (cheilocystidia 26–37 × 22–30 μm and 30–50 × 19–29 μm). Finally there is one collection (*C.B. Uljé*, 17 Aug. 1985, Huys ten Donk) with large, utriform cheilocystidia and differently shaped spores, that is undoubtedly related to *Coprinus cortinatus*. An observation on two collections from dung with very small basidiocarps (< 2 mm) revealed smaller spores (5–7 × 4–5 μm and 5–6 × 3.7–4.5 μm), but the material has not been preserved. It will be clear that more studies need to be undertaken in the complex of *Coprinus cortinatus*. We therefore refrain from describing the taxa with cheilocystidia in detail and await more information.

Bender & Enderle (1988: 49) described what they considered to be *Coprinus filiformis* B. & Br., which should differ from *C. cortinatus* in the structure of the veil, consisting of two types of elements. Besides the normal globose elements, also hypha-like elements are said to be present, whereas *C. cortinatus* in their conception is said to have only globose velar elements. Our observations revealed that in all species of section *Nivei* both types of elements can be found, especially near the margin of the pileus. This is also the case in our conception of *Coprinus cortinatus*. *Coprinus filiformis* in its original concept of Berkeley & Broome is a very small mushroom with a pileus only 1 mm high when still closed. As no original material seems to exist, nor collections that fit with *C. filiformis*, we consider it a nomen dubium. Compare also Uljé (1988).

11. *Coprinus bellulus* Uljé — Fig. 11

Coprinus bellulus Uljé, Persoonia 13 (1988) 481.

Selected icon. M. Enderle & H. Bender, Studien zur Gattung Coprinus V, Z. Mykol. 56 (1990) 24.

Closed pileus globose, subglobose to ellipsoid, up to 12 mm high and 9 mm wide, completely covered with powdery white veil, but very young buds and centre of pileus of more advanced stages often cream to pale ochraceous (Mu. 10 YR 8/3); veil at margin, particularly in early stages, somewhat more hairy-floccose; expanded pileus up to 25(–5) mm wide, convex or flat with slightly deflexed margin, rarely completely expanded; veil with age greying. Lamellae, L = 20–36, l = 1–3, free, up to 2 mm wide, white at first, then greyish to grey with blackish spots. Stipe up to 80 × 2.5 mm, attenuate upwards, at apex up to 1.5 mm wide, white but at apex often somewhat hyaline and brownish towards subbulbous, up to 3.5 mm wide base, with white velar flocks. Smell absent. Spore print dark chocolate brown (Mu. 5 YR 2/1).

Spores [160,8,8] 7.3–10.6 × 5.8–8.0 × 5.0–7.1 μm, Q = 1.20–1.65, av. Q = 1.40–1.50, L = 9.6–9.9, B = 6.6–7.1 μm, in face view broadly ellipsoid, sometimes with slightly flattened side, but often somewhat irregularly shaped, dark red-brown, with central germ pore and somewhat attenuate apex. Basidia 15–32 × 7–9 μm, 2-spored, surrounded by 3–5 pseudoparaphyses. Cheilo- and pleurocystidia absent but here and there sterile elements (probably somewhat enlarged basidioles) projecting from lamellae and sometimes velar remnants sticking to lamellar edge. Velar elements up to 50 μm in diam., (sub)globose. Clamp-connections present.

Habitat & distribution. Mostly in small groups, more rarely in bundles of up to 40 specimens, but sometimes also solitary. On bare soil or at grassy-mossy places, usually under shrubs or trees, but also in lawns. Not rare in the Netherlands.

Collections examined. NETHERLANDS: prov. Flevoland, Oostelijk Flevoland, Bremerbergbos, 4 Oct. 1986, G. Tjallingii-Beukers (herb. Tjallingii); prov. Zuid-Holland, Alphen a/d Rijn, 26 June 1984, C.B. Uljé 320, 1 Aug. 1985, C.B. Uljé 530 & 11 Sept. 1987, C.B. Uljé 827; Leiden, 28 Aug 1986, C.B. Uljé 648 & 31 May 1987, C.B. Uljé 849; Ter Aar, Langeraar, 10 Nov, 1983, C.B. Uljé 308 & 16 Oct. 1986, C.B. Uljé 777 (holotype; L)

Coprinus bellulus is easily distinguished from the other members of the *C. cortinatus*-group by the 2-spored basidia, lacking pleuro- and cheilocystidia, and the somewhat irregular, broadly ellipsoid spores.

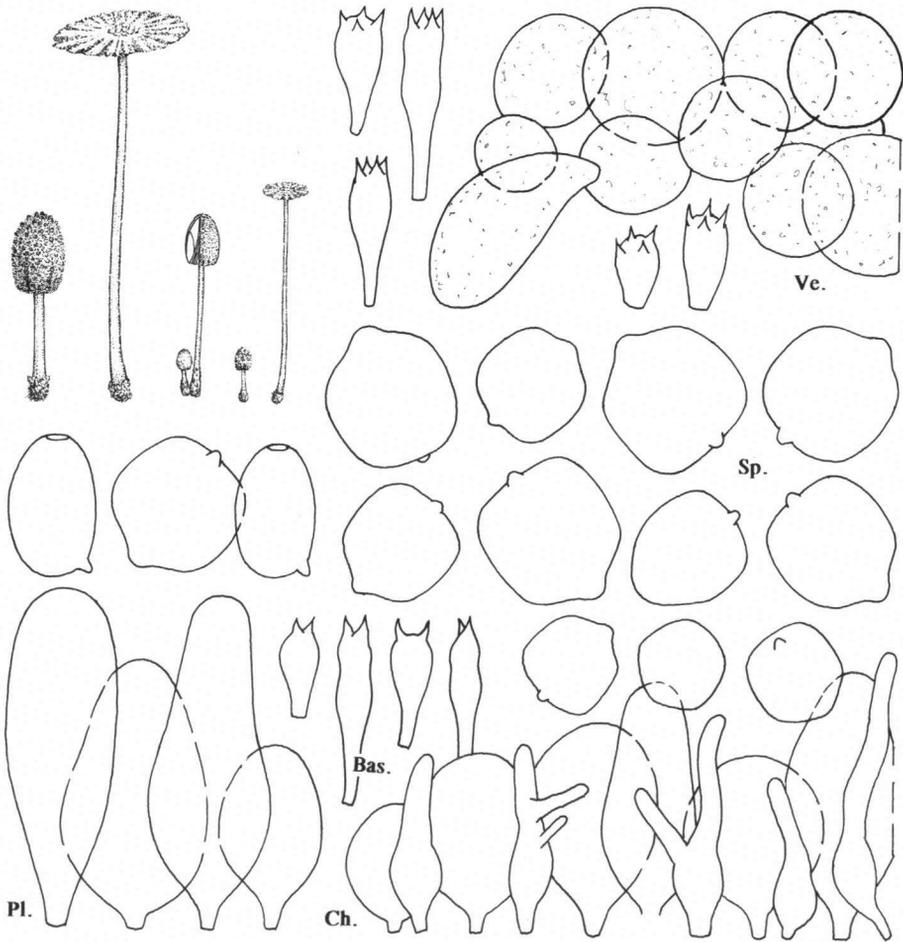


Fig. 12. *Coprinus cordisporus* Gibbs. All figures from *Uljé 915*.

12. *Coprinus cordisporus* Gibbs — Fig. 12

Coprinus cordisporus Gibbs, *The Naturalist* (1908) 100.

Coprinus patouillardii ssp. *isabellinus* Locq., *Bull. Soc. mycol. Fr.* 63 (1947) 83 (invalid, no Latin description).

Selected literature. M. Enderle, G.J. Krieglstainer & H. Bender, *Studien zur Gattung Coprinus*, *Z. Mykol.* 52 (1986) 124 (as *C. patouillardii*).

Closed pileus globose, subglobose, ellipsoid or cylindrical ellipsoid, up to 12 mm high and 8 mm wide, completely covered with powdery, pale pinkish brown veil (Mu. 7.5 YR 5/4, K. & W. 6C4 at centre) which forms small conical flocks at centre of pileus; at margin, particularly in early stages, with somewhat more hairy-floccose veil; expanded pileus up to 25 mm wide, conical or convex, later appanate. Lamellae, L = 18–24, l = 0–3,

free, up to 1.5 mm wide, white at first, then greyish to black. Stipe up to 60×0.5 –1.5 mm, white, somewhat hyaline, at base clavate, up to 2.5 mm wide, often brownish, with white velar flocks, often building a small, volva-like, erect collar. Smell absent.

Spores [240,12,12] 7.3 – 11.6×6.5 – $10.1 \mu\text{m}$; $Q = 0.95$ – 1.25 , av. $Q = 1.05$ – 1.20 ; av. $L = 7.9$ – 10.2 , av. $B = 7.1$ – $9.4 \mu\text{m}$, rectangular lemon-shaped, lentiform, dark red-brown, with central germ pore. Basidia 12 – 32×7 – $10 \mu\text{m}$, 4-spored (sometimes 2-spored and than spore-size about equal to that of the 4-spored collections), surrounded by (3–) 4–6 pseudoparaphyses. Pleurocystidia 40 – 80×16 – $28 \mu\text{m}$, utriform, subglobose to ellipsoid or subcylindric. Cheilocystidia 20 – 50×17 – $32 \mu\text{m}$, utriform, subglobose to ellipsoid or subcylindric, mixed with lageniform ones (20 – 50×8 – 12×3 – $5 \mu\text{m}$). Veil made up of (sub)globose to ellipsoid elements, smooth to granular, up to $50 \mu\text{m}$ wide. Clamp-connections absent.

Habitat & distribution. Solitary or in small groups; on dung of several kinds of animals. Rather common in the Netherlands.

Collections examined. NETHERLANDS: prov. Utrecht, 's-Graveland, 14 June 1971, *J. Daams* 71-140; Hilversum, 24 Oct. 1970, *J. Daams* 70-84; Kortenhoef, 10 Oct. 1968, *J. Daams* 48-5; Naarden, 24 April 1956, *C. Bas* 1002; prov. Limburg, Roermond, 23 July 1948, *C. Ph. Verschueren*; prov. Noord-Holland, Vogelenzang, 12 May 1986, *E. C. Vellinga* (coll. *C. B. Uljé* 915); prov. Zuid-Holland, Hazerswoude, Spookverlaat, 31 Oct. 1988, *C. B. Uljé* 1004; prov. Zeeland, Terneuzen, 9 Apr. 1981, *A. de Meijer* 242; Walcheren, Oranjezon, 15 Nov. 1936, *H. S. C. Huijsman* 1299; Oostburg, 24 July 1983, *A. de Meijer* 685. — AUSTRIA: Kastelruht, 7 Oct. 1988, *H. Bender* (herb. Bender). — NORWAY: Svalbard, 13 Aug. 1985, *Jalink* 1299 (herb. Jalink).

The most distinctive character of *Coprinus cordisporus* is the presence of lageniform cheilocystidia.

Coprinus cordisporus is very similar to *C. patouillardii*. Many authors consider them to be synonyms (Kühner & Romagnesi, 1953; Enderle, Kriegelsteiner & Bender, 1986). Orton & Watling (1979) differentiate *Coprinus cordisporus* from *C. patouillardii* on habitat (pure, relatively fresh dung), smaller sized fruit-bodies (pileus 5–10 mm), smaller spores, and presence of pleurocystidia. *C. patouillardii* has a larger pileus (10–20 mm), and grows on kitchen refuse, silage, straw and soil mixed with old dung. Arnolds (1982) accepted the taxa on account of presence or absence of pleurocystidia, but expressed his doubt as to the validity of these concepts. Citerin (1992) also accepted two taxa, based on presence or absence of pleurocystidia and a difference in width of the spores. To the present authors the differences indicated above are not strong enough to warrant a distinction on specific level between *Coprinus cordisporus* and *C. patouillardii*. Size of the fruit-bodies and spores is rather variable in this complex. In material from both taxa pleurocystidia have been found. The only difference found in microscopy, is the presence of lageniform cheilocystidia in *Coprinus cordisporus*. Following Kuyper (1988) the difference between the two taxa would best be recognized on varietal level. However, considering also the genetic studies by Kemp (1980), who showed that within this complex several incompatible taxa exist, we decided for the time being to maintain the two taxa awaiting more information.

Coprinus patouillardii ssp. *isabellinus* Locq. differs only by the smaller basidiocarps and smaller spores. In all other microscopical characters it is similar to *C. cordisporus*, especially by the presence of lageniform cheilocystidia. Therefore, we consider it a synonym of *Coprinus cordisporus* rather than a subspecies of *C. patouillardii*.

Coprinus cordisporus is also very similar to *C. cardiasporus*, and somewhat less to *C. ephemeroides*. It differs from both by the lageniform cheilocystidia. *Coprinus ephemeroides* has a small annulus, its size is somewhat smaller, and the pileus is more yellowish. *C. cardiasporus* has heart-shaped spores.

The lageniform cheilocystidia of *Coprinus cordisporus* are sometimes branched at apex, which was clearly visible in coll. *Jalink 1299* and *Bender, 7 Oct. 1988*. Also on the stipe similar caulocystidia have been found, mixed with globose velar elements.

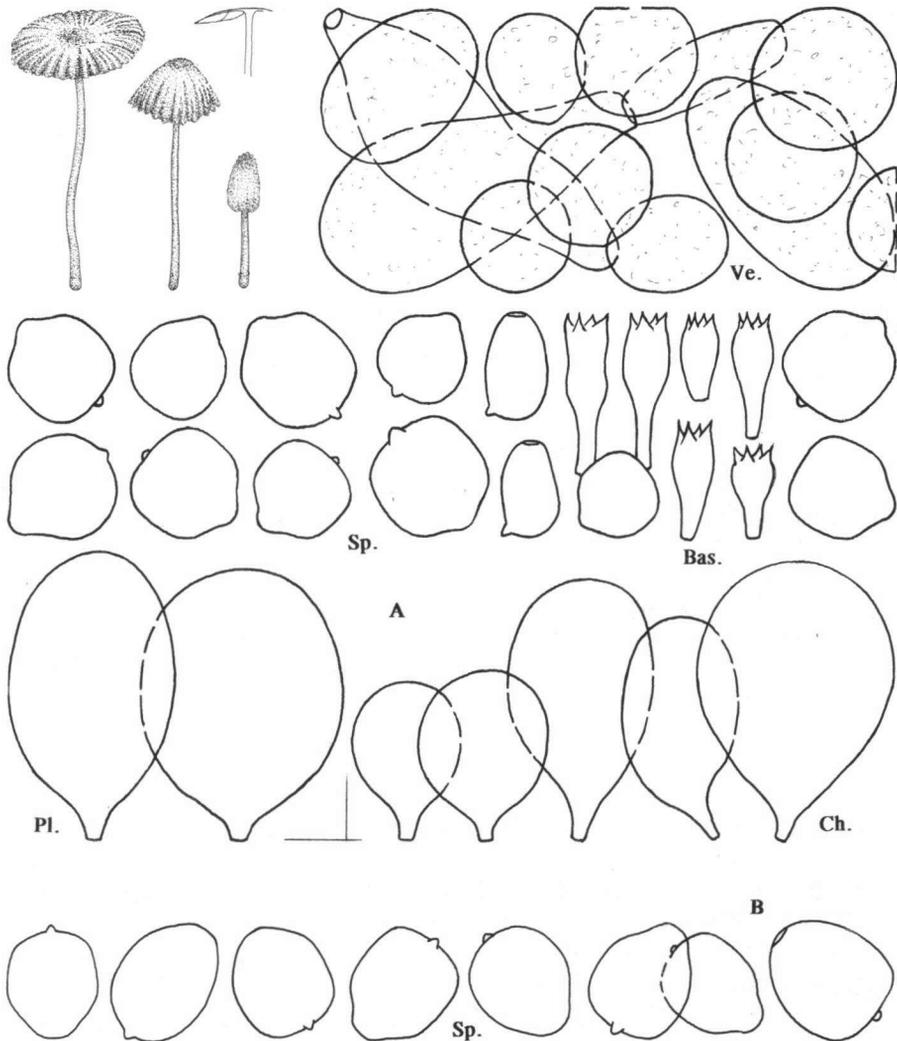


Fig. 13. A. *Coprinus patouillardii* Quél. All figures from *Uljé 1098*. — B. *Coprinus patouillardii* var *lipophilus* Romagn., spores from type.

13. *Coprinus patouillardii* Quél. — Fig. 13

Coprinus patouillardii Quél., Tab. Anal. Fung. 1 (1884) 107. — *Coprinus patouillardii* var. *lipophilus* Heim & Romagn., Bull. Soc. mycol. Fr. 50 (1934) 187.

Closed pileus globose, subglobose, ellipsoid or cylindrical ellipsoid, up to 5(–8) mm high and 4 mm wide, completely covered with powdery, pale pinkish brown veil (Mu. 7.5 YR 5/4, K. & W. 6C4 at centre), producing small conical flocks at centre of pileus; veil at margin, particularly in early stages, somewhat more hairy-floccose; expanded pileus up to 15(–22) mm wide, conical or convex, later flat. Lamellae, L = 16–22, l = 0–3, free, up to 1.5 mm wide, white at first, then greyish to black. Stipe up to 50 × 0.5–1 mm, white, somewhat hyaline. Base of stipe clavate, up to 1.5 mm wide, often brownish, with white velar flocks, often forming a small erect collar. Smell absent.

Spores [80,3,3] 6.0–8.9 × 5.8–7.8 μm, Q = 1.00–1.35, av. Q = 1.05–1.20, av. L = 7.4–8.0, av. B = 6.6–7.0 μm, rectangular lemon-shaped, lentiform, dark red-brown, with central germ pore. Basidia 15–30 × 7–8 μm, 4-spored, surrounded by 3–6 pseudo-paraphyses. Pleurocystidia 30–50 × 35–40 μm, subglobose to ellipsoid. Cheilocystidia 20–45 × 15–35 μm, globose, subglobose to ellipsoid. Pileipellis made up of (sub)globose to ellipsoid elements, smooth to granular, up to 50 μm wide. Clamp-connections absent.

Habitat & distribution. Solitary or in small groups on compost heaps. Rather rare in the Netherlands.

Collections examined. NETHERLANDS: prov. Zuid-Holland, Alphen a/d Rijn, 15 Sept. 1990, C.B. Uljé 1098, 19 Oct. 1990, C.B. Uljé 1106. FRANCE: Yerres (S.-et-O.), Aug. 1932, H. Romagnesi (type *C. patouillardii* var. *lipophilus*).

The collections studied fit the original description very well. The original *Coprinus patouillardii* also grew on vegetable refuse (on dregs from decaying grapes). A macroscopically and microscopically very similar taxon from dung is described as *C. cordisporus* Gibbs in this paper. See the discussion under that species.

The type material of *C. patouillardii* var. *lipophilus* Heim & Romagn. (1934: 187) proved to be very poor. It is nothing but a black mass, in which it was impossible to tell the lamellae apart. The shape and size of the spores of that material (Fig. 13B) fit very well with that of *C. patouillardii*, however. The differences indicated by Heim & Romagnesi, viz. the larger, convex pileus, the floccose volva-like veil at base of the stipe, also fits well into the variability of *C. patouillardii*. The habitat, greasy soil, does not seem to be of great importance. Therefore, we think it is not different from the type-variety of the species.

14. *Coprinus cardiasporus* Bender — Fig. 14

Coprinus cardiasporus Bender in Enderle, Krieglsteiner & Bender, Z. Mykol. 52 (1986) 102.

Closed pileus ellipsoid or cylindrical ellipsoid, up to 7 mm high and 4 mm wide, completely covered with powdery, white, cream-coloured or pale pinkish ochre veil, at centre of pileus somewhat granular flocculose; expanded pileus up to 10 mm wide, conical or convex, later applanate. Lamellae, L = 18–25, l = 0–3, free or narrowly adnate, c. 1 mm wide, white at first then greyish to black. Stipe up to 35 × 0.5–1 mm, white, somewhat hyaline, minutely floccose, at base clavate, up to 1.5 mm wide, often pale brownish, felty. Smell absent.

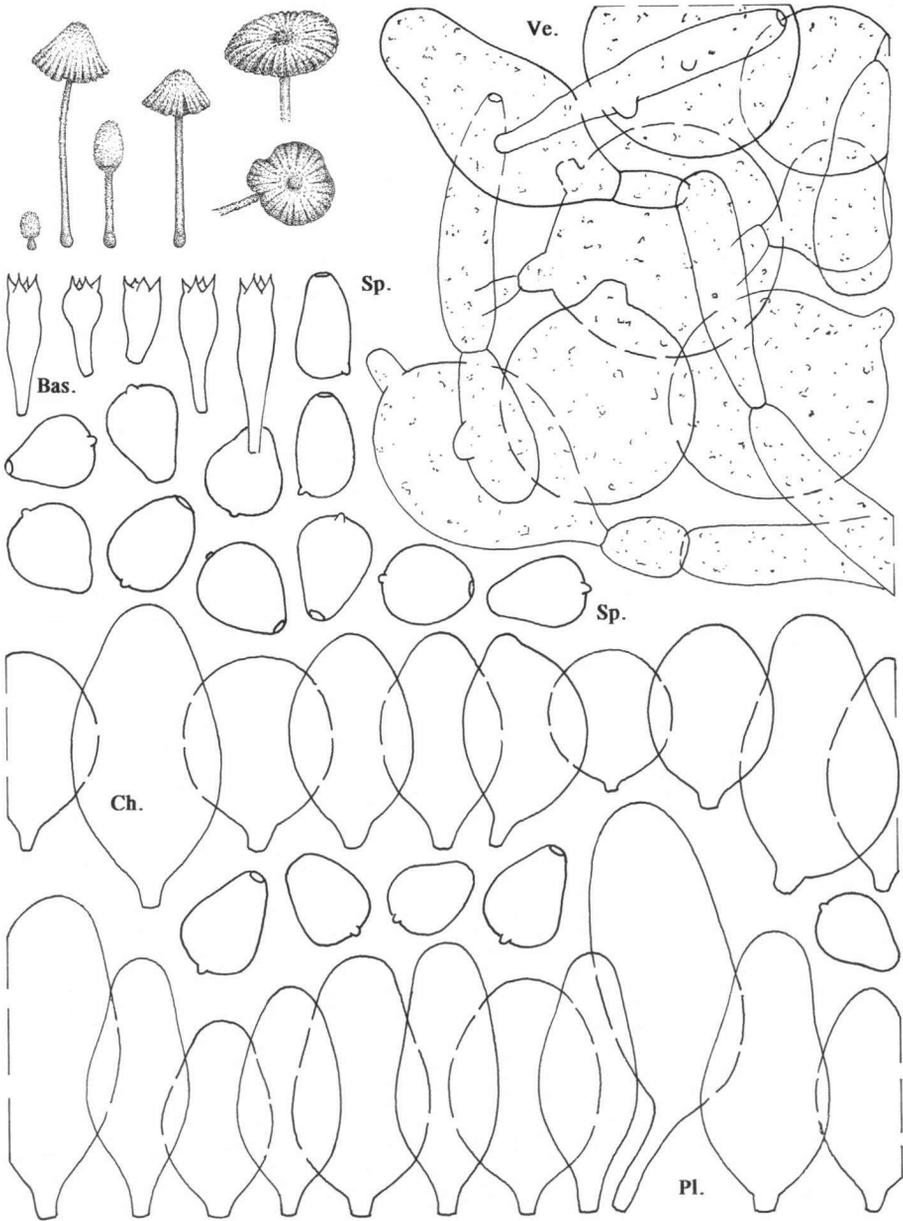


Fig. 14. *Coprinus cardiasporus* Bender. All figures from type.

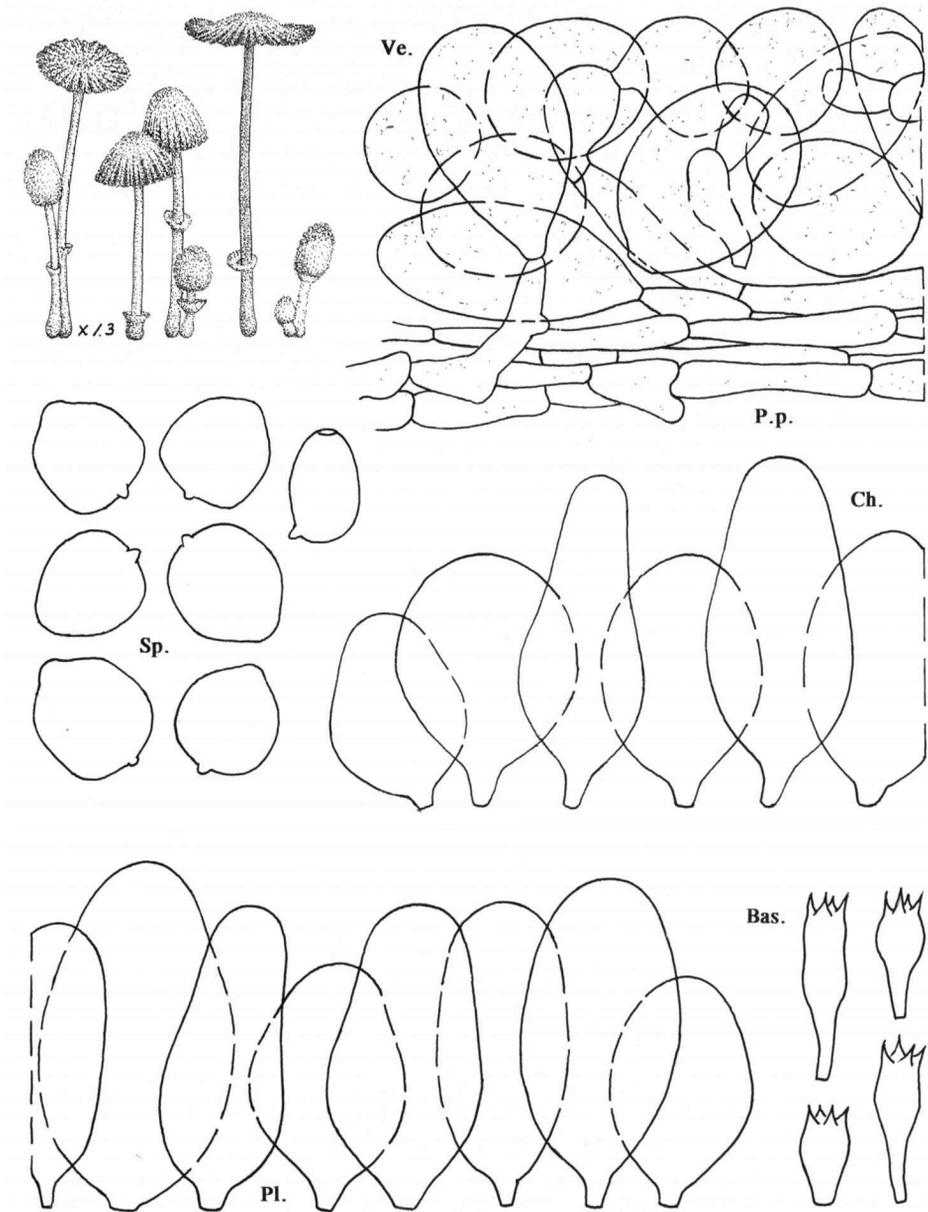


Fig. 15. *Coprinus ephemeroides* (DC.: Fr.) Fr. All figures from Uljé 1007.

Spores [80,4,3] $5.5-8.5 \times 4.8-6.5 \times 3.7-4.5 \mu\text{m}$, $Q = 1.00-1.40$, av. $Q = 1.10-1.20$, av. $L = 6.1-7.3$, av. $B = 5.3-5.5 \mu\text{m}$, cordiform, lentiform, red-brown, with central germ pore. Basidia $12-28 \times 7-8 \mu\text{m}$, 4-spored, surrounded by 3-6 pseudoparaphyses. Pleurocystidia $30-55 \times 15-26 \mu\text{m}$, vesiculose, utriform or ellipsoid. Cheilocystidia $25-50 \times 15-30 \mu\text{m}$, subglobose, ellipsoid or utriform. Veil made up of (sub)globose to ellipsoid elements, smooth to granular, up to $50 \mu\text{m}$ wide. Clamp-connections absent.

Habitat & distribution. Solitary or in small groups; on compost heaps and horse-dung mixed with soil and wood-chips. Very rare in the Netherlands.

Collections examined. NETHERLANDS: prov. Zuid-Holland, Alphen a/d Rijn, 16 Sept. 1990, *C.B. Uljé 1100*; ditto 27 Nov. 1990, *C.B. Uljé 1112*. — GERMANY: Mönchengladbach, 27 June 1985, *H. Bender* (part of holotype; herb. Bender).

The collection from Germany studied is part of the holotype. *Coprinus cardiasporus* is very close to *C. patouillardii* Qué. It differs by having spores that are narrowing towards the germ pore, whereas the spores are rounded angular in *C. patouillardii*.

According to Bender (1986), *Coprinus cardiasporus* has clamped hyphae in the mycelium; we failed to demonstrate them in our study of part of the holotype.

15. *Coprinus ephemeroide* (DC.: Fr.) Fr. — Fig. 15

Agaricus ephemeroide DC. in DC. & Lam., Fl. franç. 2 (1805) 145. — *Agaricus ephemeroide* DC.: Fr., Syst. mycol. 1 (1821) 313. — *Coprinus ephemeroide* (DC.: Fr.) Fr., Epicr. (1838) 250.

Agaricus hendersonii Berk. apud Hooker, Engl. Fl. 5 (1836) 122. — *Coprinus hendersonii* (Berk.) Fr., Epicr. (1838) 250.

Coprinus bulbillosus Pat., Tab. anal. Fung. 2 (1889) 60.

Closed pileus subglobose, ellipsoid, cylindrical ellipsoid or ovoid, up to 5(-7) mm high and 3 mm wide, completely covered with powdery, pale pinkish brown or yellowish veil, forming small conical flocks at centre of pileus; expanded pileus up to 10(-13) mm wide, conical or convex, later applanate. Lamellae, $L = 14-23$, $l = 0-3$, free, white at first, then greyish to black. Stipe up to $50 \times 0.5-1 \text{ mm}$, white, somewhat hyaline; at base clavate, up to 1.5 mm wide, with yellowish or pale brown velar flocks, forming a small erect collar when very young, later forming the ring about halfway the stipe or lower. Smell absent.

Spores [60,3,3] $5.8-9.2 \times 5.4-8.0 \times 4.4-4.9 \mu\text{m}$, $Q = 0.95-1.20$, av. $Q = 1.05-1.15$, av. $L = 6.7-8.6$, av. $B = 6.3-7.6 \mu\text{m}$, rectangular lemon-shaped, lentiform, dark red-brown, with central germ pore. Basidia $13-28 \times 7-9 \mu\text{m}$, 4-spored, surrounded by (3-)4-7(-8) pseudoparaphyses. Pleurocystidia $30-60 \times 20-35 \mu\text{m}$, vesiculose, utriform, ellipsoid, cylindrical ellipsoid. Cheilocystidia $20-60 \times 15-35 \mu\text{m}$, utriform, vesiculose, (sub)globose or ellipsoid. Veil made up of (sub)globose to ellipsoid elements, smooth to granular, up to $50 \mu\text{m}$ wide. Clamp-connections absent.

Habitat & distribution. Solitary or in small groups; on dung, especially from horse. Rather common in the Netherlands.

Collections examined. NETHERLANDS: prov. Noord-Holland, Vogelenzang, 1 June 1986, *E.C. Veltinga*; prov. Zuid-Holland, Hazerswoude, 1 Nov. 1988, *C.B. Uljé 1007*; Wassenaar, Meijendel, 28 Sept. 1991, *C.B. Uljé 1182*.

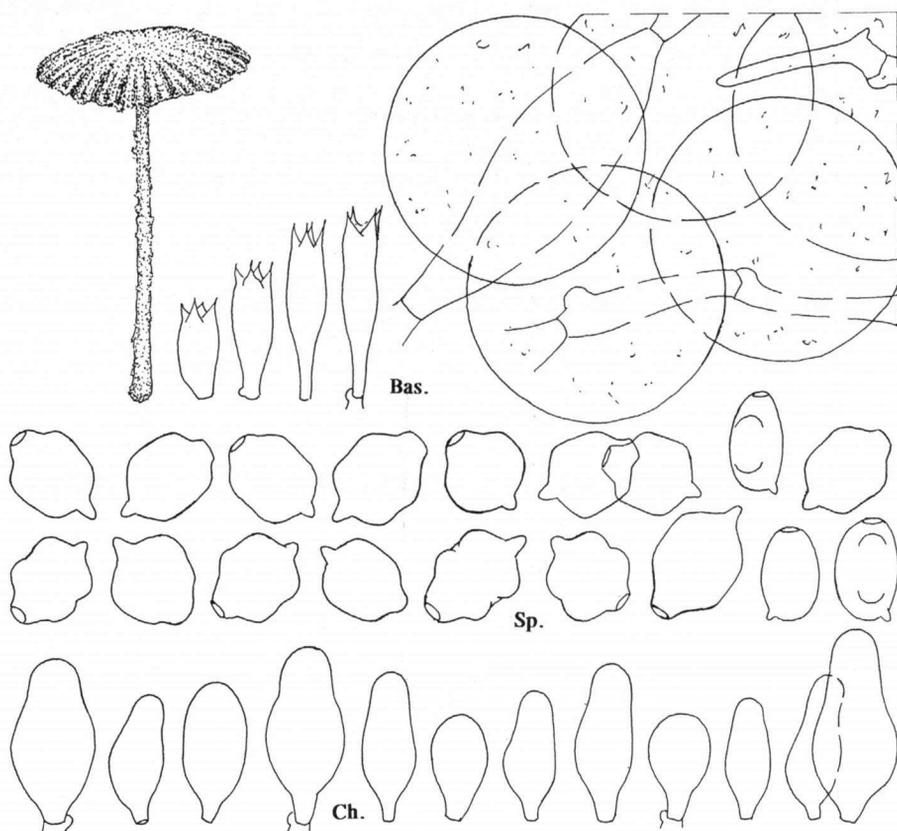


Fig. 16. *Coprinus iocularis* Uljé. All figures from Uljé 851 (type).

Coprinus ephemeroides is a species close to *C. patouillardii* and *C. cordisporus*. It differs by having a small annulus and by the colour of the pileus which usually is more yellowish.

The sparse lageniform cheilocystidia, similar to those found in *Coprinus cordisporus* were also noted in *C. ephemeroides* (coll. C.B. Uljé 1182).

Orton & Watling (1979: 68) mentioned a somewhat similar 2-spored taxon. On account of the larger spores and the larger and greyer fruit-bodies they think the difference warrants separation as a distinct species.

16. *Coprinus iocularis* Uljé — Fig. 16

Coprinus iocularis Uljé, Persoonia 13 (1988) 485.

Pileus 27 mm wide, plano-convex, completely white-powdery. Lamellae L = c. 26, l = 1–3, free, first white, then grey to blackish spotted. Stipe 45 × 1.5 mm, with subbulbous base, whitish-hyaline, covered with white velar flocculi. Smell absent.

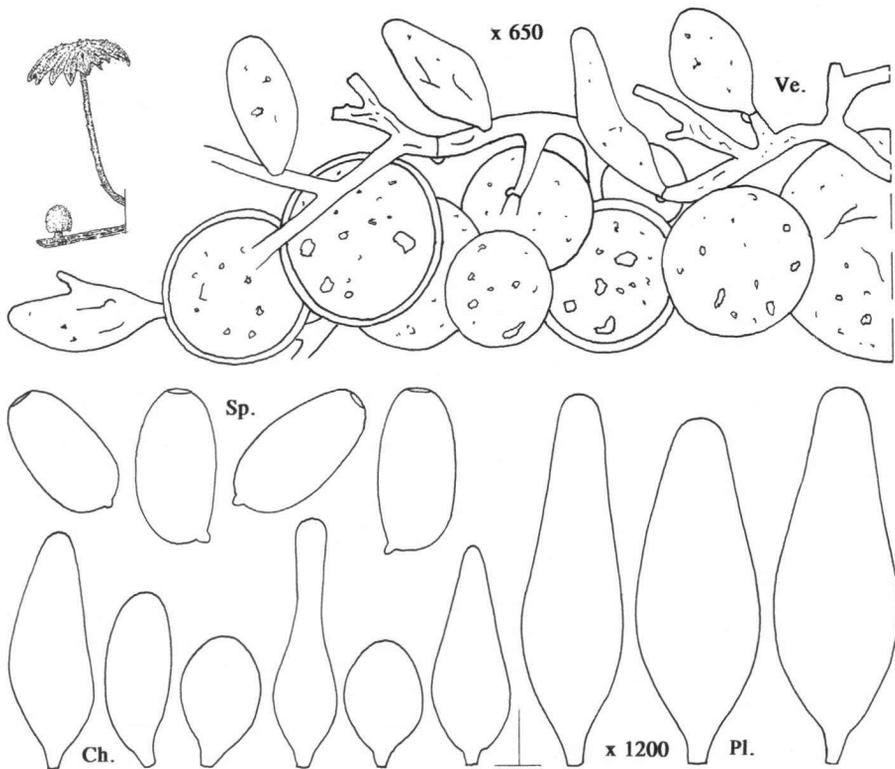


Fig. 17. *Coprinus pilosotomentosus* Bender. Figures based on original description.

Spores [60,2,2] $5.9\text{--}8.3 \times 4.8\text{--}5.9 \times 4.0\text{--}4.3 \mu\text{m}$, $Q = 1.05\text{--}1.45$, av. $Q = 1.25$, av. $L = 6.7\text{--}6.8 \mu\text{m}$, av. $B = 5.3\text{--}5.4 \mu\text{m}$, in face view more or less hexagonal but frequently with two rounded lateral nodules at each side because of slightly depressed lateral faces, red-brown, with central germ pore. Basidia $13\text{--}32 \times 6\text{--}8 \mu\text{m}$, 4-spored, surrounded by 3–5 pseudoparaphyses. Cheilocystidia $20\text{--}35 \times 8.5\text{--}15.5 \mu\text{m}$, mostly utriform; neck $6\text{--}9.5 \mu\text{m}$ wide. Pleurocystidia absent. Veil on pileus consisting of up to $50 \mu\text{m}$ wide, smooth or somewhat granular globose elements mixed with frequently branching, colourless, thin-walled hyphae with processes. Clamp-connections present.

Habitat & distribution. Terrestrial on lawn. Very rare.

Collections examined. NETHERLANDS: prov. Zuid-Holland, Alphen a/d Rijn, near Zegerplas, 23 Aug. 1987, C.B. Uijé 851 (holotype; L); Boskoop, Voshol, 15 Sept. 1989, C.B. Uijé 1029.

Coprinus iocularis can be recognized immediately by the characteristic shape of its spores. In face view the spores are more or less hexagonal (because of the two rounded lateral nodules at each side), in side view elliptical.

17. *Coprinus pilosotomentosus* Bender — Fig. 17

Coprinus pilosotomentosus Bender in Enderle & Bender, Z. Mykol. 56 (1990) 31.

Characteristics

Closed pileus globose, subglobose to ellipsoid or oval, up to 8 mm high and 4 mm wide, at first white to grey or pale brownish with powdery white veil beneath a cortina-like covering; expanded pileus 5–12 mm, then margin conspicuously split in the shape of a star and centre of pileus pale grey-brown; lamellae free, somewhat distant, white to blackish; stipe 20–50 × 0.5–1.2 mm, hollow, equal or attenuate upwards, when young covered with white velar flocks, at base more dense and forming a volva-like ring zone; smell absent.

Spores (8–)9–11.5 × 6–7(–7.5) μm, in side view somewhat cylindrical, oval or ellipsoid in frontal view, with central germ pore, dark red-brown; basidia 4-spored; cheilocystidia 18–45 × 8–13 μm, variable in shape: (sub)globose, ellipsoid, elongate-ellipsoid, utriform or (mostly) lageniform; pleurocystidia up to 60 μm in length, ellipsoid or utriform; pileipellis made up of ventricose, ellipsoid and subglobose elements covered by about 7 μm wide hyphae consisting of oblong-ventricose elements and these passing upwards into thin-walled colourless to slightly yellowish, smooth to granular, up to 45(–55) μm wide, globose velar elements, mixed with elongate elements; clamp-connections present.

Habitat & distribution. Gregarious. On dying grass (stems of *Festuca*). Known only from the type locality.

The description and illustration given here are based on the original description by Enderle & Bender (l.c.).

The most important differentiating characters of *Coprinus pilosotomentosus* are the dominantly lageniform cheilocystidia, presence of pleurocystidia and occurrence on grasses. Apart from some dung-inhabiting species, the only species in this subsection with pleurocystidia is *Coprinus idae*. This species differs in the shape of its cheilocystidia which are globose to utriform, the smaller, differently shaped spores, and smaller fruit-bodies.

Enderle & Bender (l.c.) do not indicate in which (sub)section their species should be placed. On account of the structure of the veil, we place it in subsection *Nivei*.

18. *Coprinus ramosocystidiatus* Bender — Fig. 18

Coprinus ramosocystidiatus Bender in Enderle & Bender, Z. Mykol. 56 (1990) 35.

Characteristics

Closed pileus 4 mm high and 3 mm broad, oval to ellipsoid then conical to convex, finally flat with upturned split margin, pale grey-brown with yellow-orange centre of pileus; with granular-powdery veil; expanded pileus 4–8 mm, slowly wilting; lamellae narrowly adnate, whitish to blackish; stipe 12–18 × 0.4–0.8 mm, hollow, equal, when young pruinose, base with white velar flocks; smell absent.

Spores 7.5–11.5 × 6–7.5 × (5–)5.5–6.5 μm, very variable in size (see discussion below), oval or ellipsoid in frontal view, the broader ones sometimes a little angular, ellipsoid to slightly amygdaliform in side view, with small central germ pore, c. 1.2 μm in diam.; basidia 4-spored; cheilocystidia (sub)globose, ellipsoid to ovoid, 10–21 in length

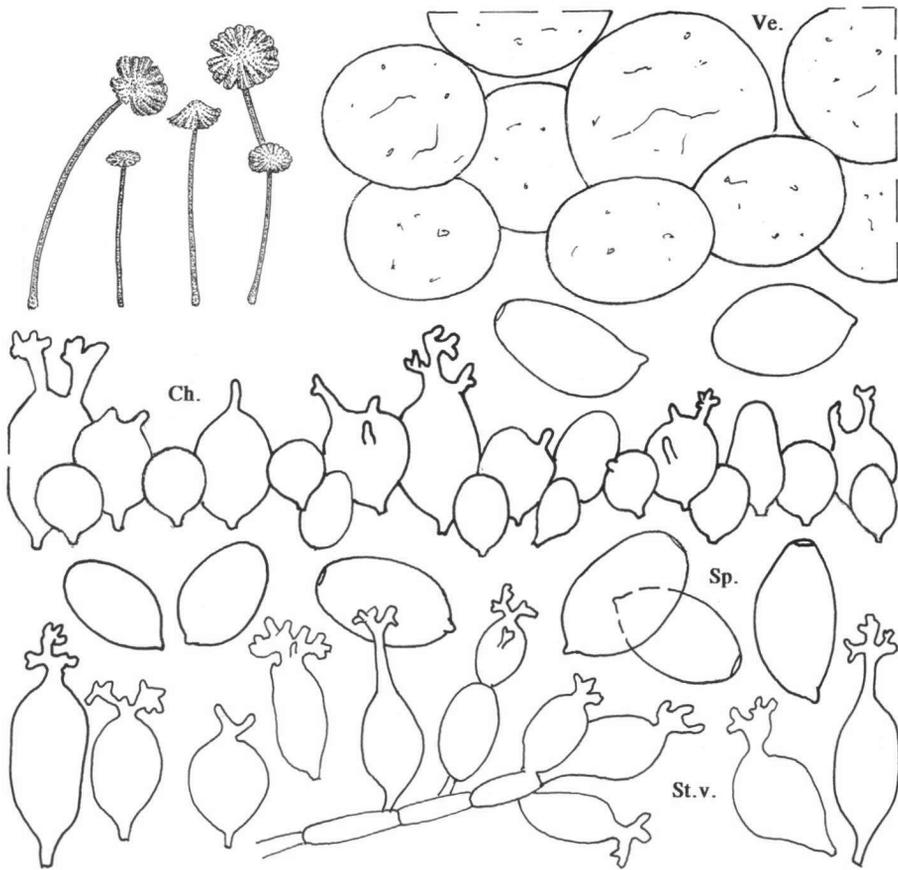


Fig. 18. *Coprinus ramosocystidiatus* Bender. Figures based on original description.

or with diverticulations and then up to 30 μm in length; pleurocystidia absent; pileipellis made up of slightly thick-walled, ventricose, ellipsoid and subglobose elements, 10–21 (–29) μm wide. Clamp-connections not found.

Habitat & distribution. Solitary or in small groups; on soil, among grasses and herbs. Known only from the type locality.

The description and illustration given here is based on the original publication of Bender (l.c.).

Coprinus ramosocystidiatus can be easily identified by the diverticulate cheilocystidia. The only other species known in subsection *Nivei* with such cystidia, is *C. cordisporus* which has completely differently shaped spores. From the type-locality several collections were gathered. Spore-size appears to be very variable: collection 7 Aug. 1987: (8.5–)10–11.5 \times 6–7 \times (5–)5.5–6 μm ; collection 15 Aug. 1987 (holotype): 7.5–8.5 \times 6–7 \times 5.5–6 μm ; collection 20 Aug. 1987: 9–10.5 \times 6.5–7.5 \times 5.5–6.5 μm .

Although Enderle & Bender (l.c.) placed *C. ramosocystidiatus* in the 'micaceus'-group, we place it in subsection *Nivei*, on account of the mealy-powdery aspect of the veil, which can be easily seen in the coloured photograph that was published in the original publication. It is possible that the caulocystidia described by Bender actually represent remnants of the veil, adhering to the stipe surface. In the illustration (Bender, l.c.), these 'caulocystidia' were erroneously named 'pleurocystidia.'

19. *Coprinus coniothorus* Romagn. — Fig. 19

Coprinus coniothorus Romagn., Rev. Mycol. 6 (1941) 126.

Closed pileus globose, subglobose or ellipsoid, up to 7 mm high and 5 mm wide, completely covered with powdery, dark grey-brown veil (Mu. 10 YR 3-5/2, 7.5 YR 6-7/4), often with olive-green hue (Mu. 5 Y 3/1-2, 2.5 Y 5/4, 5 Y 5/3), forming small granular flocks at centre of pileus; veil at margin quickly disappearing, showing the white pileal surface; expanded pileus up to 12(-15) mm wide, conical or convex, later applanate. Lamellae, L = 14-24, l = 0-3, narrowly adnate, white at first then greyish to black. Stipe up to 30 × 0.5-1 mm, white, somewhat hyaline, at base clavate, up to 1.5 mm wide, often with brownish velar flocks. Smell absent.

Spores [140,7,6] 6.3-8.9 × 3.8-5.2 μm, Q = 1.45-2.10, av. Q = 1.70-1.85, av. L = 7.3-7.9, av. B = 4.0-4.6 μm, amygdaliform or ovoid, with central germ pore, red-brown. Basidia 13-30 × 6-8 μm, 4-spored, surrounded by 4-5 pseudoparaphyses. Pleurocystidia absent. Cheilocystidia 10-28 × 8-15 μm, variably shaped, narrowly clavate, clavate, ellipsoid, broadly utriform or subglobose, sometimes with median constriction. Veil made up of (sub)globose to ellipsoid or fusiform elements, smooth to (usually) strongly granular, up to 50 μm wide. Clamp-connections present.

Habitat & distribution. Gregarious, on and around stumps of deciduous trees. Rare in the Netherlands.

Collections examined. NETHERLANDS: prov. Noord-Holland, Amsterdam, Amsterdamse Bos, 17 Sept. 1986, C.B. Uljé 32/86; Amsterdam, Vliegenbos, 17 Sept. 1991, R. Chrispijn (C.B. Uljé 1179); prov. Utrecht, Breukelen, Sterreschans, 16 June 1992, C.B. Uljé 1221, 1222, 1223, 1224.

Coprinus coniothorus is very easy to identify, but the caespitose growth and shape of the basidiocarps (similar to *Coprinus disseminatus*) cause it to be easily overlooked. When in the field a group of '*Coprinus disseminatus*' is encountered with rather whitish basidiocarps, it is worthwhile to have a closer look, as it may well turn out to be *Coprinus coniothorus*. Contrary to *Coprinus disseminatus*, the primordia are not cream-coloured but dark grey. Later, when the pileus is expanding, the white colour of the pileus becomes visible as the veil disappears. As pointed out in the description, young specimens of *Coprinus coniothorus* may have a weak olivaceous tint, which is visible only under certain circumstances. Microscopically the shape of the cheilocystidia and size and shape of the spores are important diagnostic features. Sometimes the spores are ovoid for the most part, but usually they are distinctly amygdaliform, protruding to the germ-pore. Cheilocystidia are not always easy to find, sometimes sparse, but anyway characteristically shaped.

Coprinus poliomallus, another small mouse-grey species grows on dung, solitary or in small groups. It has always elliptical or ovate spores and distinct pleurocystidia.

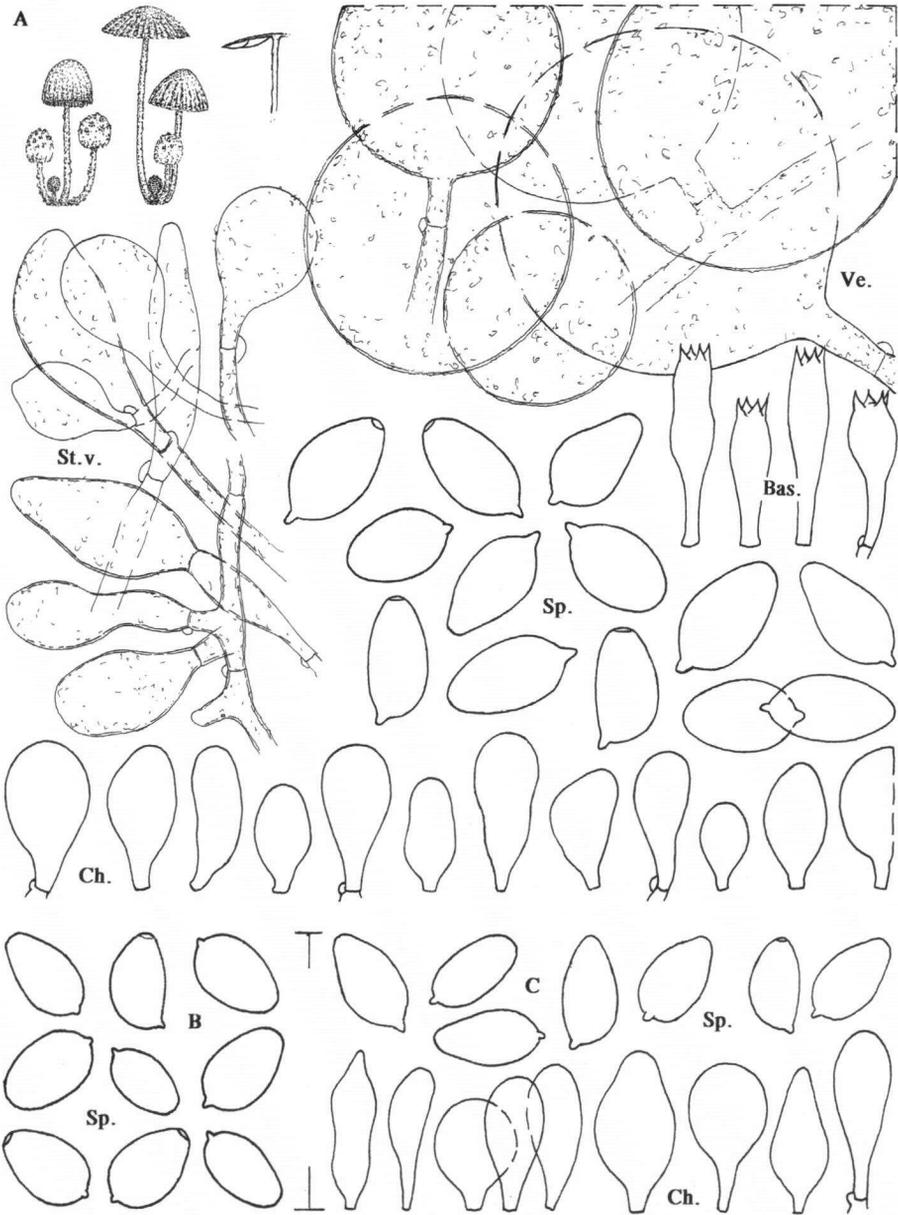


Fig. 19. *Coprinus coniothorus* Romagn. All figures from *Uljé 32/86*.

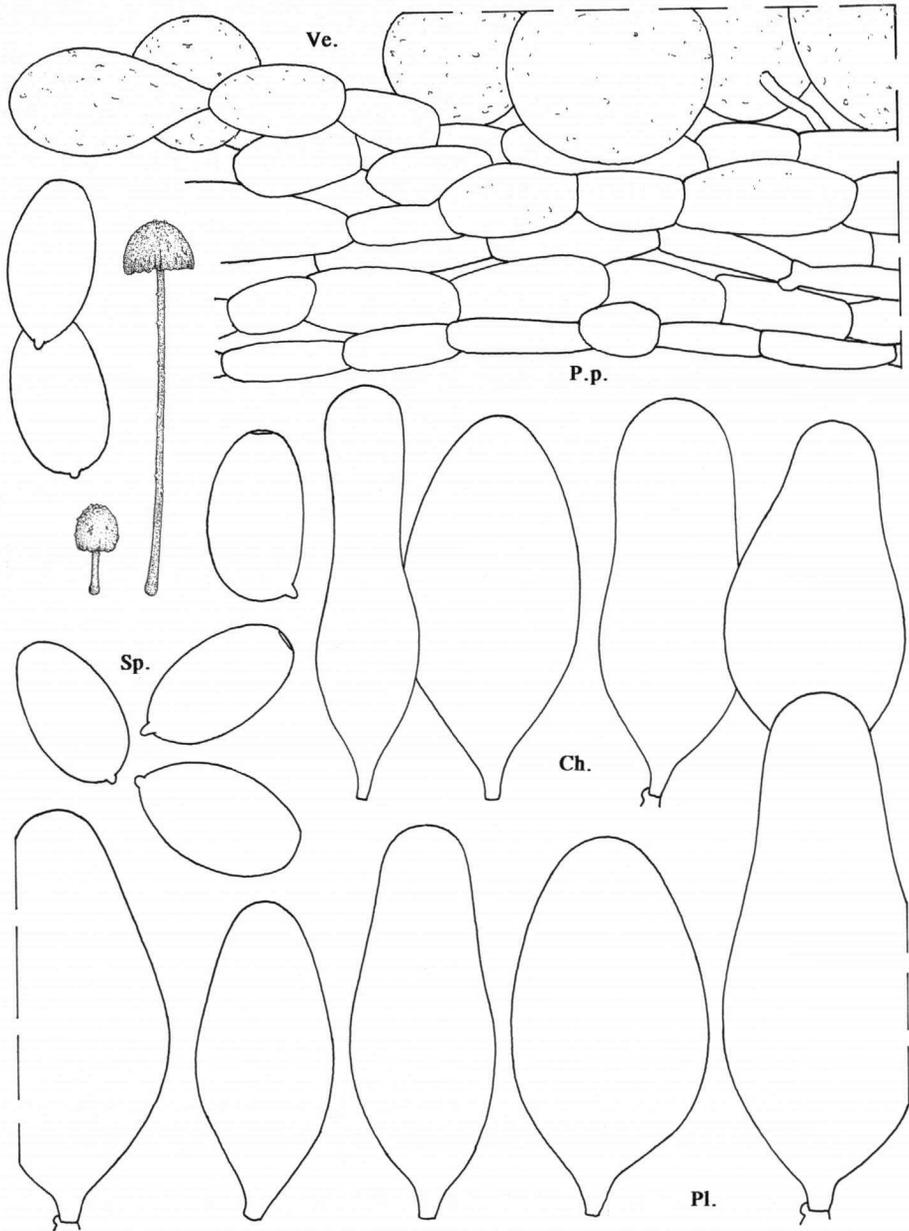


Fig. 20. *Coprinus nemoralis* Bender. All figures from holotype (coll. Bender, 16 June 1984).

20. *Coprinus nemoralis* Bender, *spec. nov.* — Fig. 20

Pileus primo ovatus, subglobosus vel ellipsoideus, usque ad 6 mm altus, usque ad 4 mm latus, toto pruinosus velo albo, centro cremeo vel ochraceo, dein explanatus ad 10 mm latus, convexus vel applanatus margine deflexus. Lamellae, L = c. 18, l = 1–3, liberae, ex albo-cinerascentes vel nigricantes. Stipes usque ad 50 × 0.5–1 mm, aequalis, albidus, juventute flocculosus, demum vitreus, versus basim incrassatus usque ad 1.5 mm, frequenter albo-flocculosus. Odore nullo.

Sporae 10–11.5 × 6.5–7.0 × 5.8–6.5 μm, Q = 1.45–1.90, in antice ovatae, ellipsoideae vel cylindraceo-ellipsoideae, in facie ellipsoideae vel amygdaliformes rubro-brunneae, cum poro germinativo centrico instructae. Basidia 15–36 × 7–9 μm, tetrasporigera. Pseudoparaphyses 3–5. Pleurocystidia vesiculosa, utriformia, ellipsoidea vel subcylindracea, interdum medio constricta. Cheilocystidia nulla. Velum e elementis globosis, usque ad 50 μm in diam., glabris vel granulosis constans. Fibulae presentes. Ad lignum putridum.

Holotypus: Germany, Mönchengladbach, Volksgarten (MTB 4804), 16 June 1984, *H. Bender* (L).

Closed pileus oval, subglobose to ellipsoid, up to 6 mm high and 4 mm wide, completely covered with powdery white veil, often cream to pale ochraceous at centre; expanded pileus up to 10 mm wide, convex or flat, finally with slightly deflexed margin; veil greying with age. Lamellae, L = c. 18, l = 1–3, free, white at first, then greyish to grey, finally black. Stipe up to 50 × 0.5–1 mm, equal, white, when young somewhat floccose, slightly hyaline; at base up to 1.5 mm wide, often with white velar flocks. Smell indistinctive.

Spores 10–11.5 × 6.5–7.0 × 5.8–6.5 μm (according to Uljé: sp. 9.7–12.3 × 5.7–6.8 μm, Q = 1.45–1.90, av. Q = 1.70, av. L = 10.9, av. B = 6.4 μm), oval, ellipsoid or cylindrico-ellipsoid in frontal view, ellipsoid, sometimes slightly amygdaliform in face view, red-brown in water, with central germ pore. Basidia 15–36 × 7–9 μm, 4-spored, surrounded by 3–5 pseudoparaphyses. Pleurocystidia vesiculose, utriform, ellipsoid or subcylindric, some with median constriction. Veil made up of colourless to slightly yellowish, smooth to granular, up to 50 μm wide, globose elements. Clamp-connections present.

Habitat & distribution. Solitary or in small groups; on branches and other pieces of wood. Known only from type locality.

Collection examined. GERMANY: Mönchengladbach, Volksgarten (MTB 4804), 16 June 1984, *H. Bender* (holotype; L).

Coprinus nemoralis differs from other species having ellipsoid spores and pleurocystidia in its larger spores and cystidia and its growth on woody debris. *C. pilosotomentosus* has spores similar to those of *C. nemoralis*, but that species grows on grasses and the cystidia are much smaller.

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REFERENCES

- Arnolds, E. 1982. Ecol. Coenol. Macrofungi Grassl. Heathl. Drenthe, Netherlands. *Bibliotheca mycol.* 90.
- Bender, H. & M. Enderle. 1988. Studien zur Gattung *Coprinus* (Pers.: Fr.) S.F. Gray in der Bundesrepublik Deutschland. IV. *Z. Mykol.* 54: 45–68.
- Bender, H., M. Enderle & G.J. Krieglsteiner. 1984. Studien zur Gattung *Coprinus* (Pers.: Fr.) S.F. Gray in der Bundesrepublik Deutschland. II. *Z. Mykol.* 50: 17–40.
- Citerin, M. 1992. Clé analytique du Genre *Coprinus*. *Docums. mycol.* 86: 1–28.
- Dissing, H. & N. Lundqvist. 1992. *Nordic Macromycetes Vol. 2:* 228–234.
- Enderle, M. & H. Bender. 1990. Studien zur Gattung *Coprinus* (Pers.: Fr.) S.F. Gray in der Bundesrepublik Deutschland. V. *Z. Mykol.* 56: 19–46.
- Enderle, M., G.J. Krieglsteiner & H. Bender. 1986. Studien zur Gattung *Coprinus* (Pers.: Fr.) S.F. Gray in der Bundesrepublik Deutschland. III. *Z. Mykol.* 52: 101–132.
- Hansen, L. & H. Knudsen. 1992. *Nordic Macromycetes Vol. 2:* 228–234.
- Heim, R. & H. Romagnesi. 1934. Sur quelques Agarics de la Flore Française. *Bull. Soc. mycol. Fr.* 50: 187–189.
- Josserand, M. 1948. Champignons de la région Lyonnaise. *Bull. Soc. mycol. Fr.* 64: 26.
- Kemp, R.F.O. 1980. Bifactorial incompatibility without clamp connections in the *Coprinus patouillardii* group. *Trans. Br. mycol. Soc.* 74: 355–360.
- Kornerup, A. & J.H. Wanscher. 1978. *Methuen handbook of colour.* Ed. 3. London.
- Krieglsteiner, G.J., H. Bender & M. Enderle. 1982. Studien zur Gattung *Coprinus* (Pers.: Fr.) S.F. Gray in der Bundesrepublik Deutschland. I. *Z. Mykol.* 48: 65–88.
- Kühner, R. & H. Romagnesi. 1953. *Flore analytique des champignons supérieurs (Agarics, Bolets, Chanterelles).* Paris.
- Lange, J.E. 1915. Studies in the Agarics of Denmark. II. *Dansk bot. Ark.* 2 (3): 32–51.
- Lange, J.E. 1939. *Flora agaricini danica 4.* Copenhagen.
- Moser, M. 1983. Die Röhrlinge und Blätterpilze (Agaricales). In Gams, K.I. *kryptog. Fl.* 2b/2, 4. Aufl. Stuttgart.
- Munsell. 1975. *Munsell soil color charts.* Baltimore.
- Orton, P.D. 1972. Notes on British agarics IV. *Notes R. bot. Gdn Edinb.* 32: 144.
- Orton, P.D. & R. Watling. 1979. Agarics and Boleti. *Br. Fung. Fl.* 2/Coprinaceae. Part 1: *Coprinus.* Edinburgh.
- Patrick, W.W., Jr. 1977. Sectional nomenclature in the Genus *Coprinus*. *Mycotaxon* 6: 341–355.
- Petersen, J.H. & J. Vesterholt. 1990. *Danske storvampe:* 341–354.
- Reijnders, A.F.M. 1979. Developmental anatomy of *Coprinus*. *Persoonia* 10: 383–424.
- Singer, R. 1975. *The Agaricales in Modern Taxonomy*, 3rd. ed. J. Cramer, Vaduz.
- Singer, R. 1986. *The Agaricales in Modern Taxonomy*, 4rd. ed. Koelz, Koenigstein.
- Uljé, C.B. 1988. Four new species of *Coprinus* from the Netherlands. *Persoonia* 13: 479–488.
- Uljé, C.B. 1990. *Coprinus* Deel 3, Sect. Micacei Subsect. Vestiti (1). (Private publication.)
- Uljé, C.B. & C. Bas. 1991. Studies in *Coprinus* 2. *Persoonia* 14: 275–339.
- Vellinga, E.C. 1988. Glossary. In: C. Bas, Th.W. Kuyper, M.E. Noordeloos & E.C. Vellinga, *Flora agaricina neerlandica 1.* Rotterdam.