

STUDIES IN COPRINUS-II  
Subsection *Setulosi* of section *Pseudocoprinus*

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A key is given to the Netherlands' species of subsect. *Setulosi* J. Lange of *Coprinus* sect. *Pseudocoprinus* (Kühn.) P.D. Orton & Watling. Some additional species are also included. All species dealt with are concisely described and fully discussed. A few probably new species are described ad interim. Type-material has been examined of *C. bisporiger*, *C. eurysporus*, *C. fallax*, *C. subpurpureus*, and *C. subimpatiens*.

This paper is the result of our observations on *Coprinus* subsect. *Setulosi* J. Lange (1915) and is a continuation of an earlier paper (Uljé & Bas, 1988), in which subsections *Auricomis* Sing. and *Glabri* J. Lange have been treated. In some species, which in our opinion are typical members of *Setulosi*, cylindrical elements of a universal veil are present on the pileus. As sect. *Pseudocoprinus* (Kühn.) P.D. Orton & Watl. (1979) and subsect. *Setulosi* J. Lange per definition have no species with such veil elements, the diagnoses of this section and subsection have consequently been modified.

As subsect. *Setulosi* perhaps is the most frequently treated and therefore the best known group of the genus *Coprinus*, our study of it has not been very searching. For the sake of completeness, we give a key and a survey of the species of subsect. *Setulosi* found so far in the Netherlands and some species yet to be found. More thorough studies on other less well-known groups of *Coprinus* are in preparation.

The key to the species is given because in recent times a few new species have been described. Some probably undescribed species are included also; these are not yet validly named because the available material and data on these taxa are still insufficient.

It is hoped that others will be inspired by this paper to search for material of critical and possibly undescribed species of subsect. *Setulosi*. Material that cannot be named with the present key would be gratefully received for analysis and identification by the first author. Comments on this paper are welcome.

PRESENTATION

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

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av. – average	l. c. – loco citato
B – breadth of the spores in front view	pi. – pileocystidia
bas. – basidia	pl. – pleurocystidia
c. – circa	pp. – pileipellis
cau. – caulocystidia	Q – length divided by breadth (not width!)
ch. – cheilocystidia	scl. – sclerocystidia
diam. – diameter	sp. – spores
L (relating to the lamellae) – number of lamellae reaching stipe	sph. – spherocysts
L (relating to spores) – length	ve. – veil
l – number of short lamellae (not reaching the stipe)	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 (Bas & al., 1988).

Unless indicated otherwise, the collections examined are to be found in the Rijksherbarium Leiden. When no collection-number is given the collection is not preserved.

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 stronger than the width, because many 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 term cheilocystidium refers to all cystidioid sterile elements on the lamella edge. In this publication, however, the pileocystidia that in subsect. *Setulosi* sometimes continue to occur over a short distance on the lamella edge from the pileus margin inwards are excluded from the description of the cheilocystidia (see the discussion on microscopic characters).

As in subsect. *Setulosi* caulocystidia are always present and usually very similar to the pileocystidia, they are not separately mentioned, unless this pattern is broken.

Sclerocystidia also are not described, but simply their presence or absence is recorded. They too are very similar to the pileocystidia but (partly) thick-walled and somewhat more slender.

The enlargements of the drawings are  $\times 2000$  for the spores,  $\times 800$  for the other microscopic 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.

#### MATERIAL AND METHODS

As much as possible, fresh material was examined. When several fresh collections were available at the same time, first the macroscopical characters were described and then the material was quickly dried; the microscopical characters were studied later. When cylindrical veil elements are present on the pileus, these have to be studied in fresh condition, as in dried material this type of veil is hard to find.

Cylindrical veil elements, spherocysts and sclerocystidia were studied in scalps; pleuro-, cheilo-, and pileocystidia in sections of lamellae or, in very small specimens, on a flattened lamella (inclusive of an attached narrow sector of the pileus). Spores as well as sclerocystidia and spherocysts from fresh material were observed in water. Scalps from exsiccata, on which spherocysts and sclerocystidia were observed, were reinflated in KOH. Before microscopical examination, the other preparations were stained in Congo red. After about a quarter of an hour, the Congo red was sucked away with filter-paper from one side of the cover-glass, while at the other side a 5% solution KOH was added. This method has been used in all collections, fresh or dried.

#### ACKNOWLEDGEMENTS

We are greatly indebted to Mr. H. Bender (Mönchengladbach) and many members of the 'Nederlandse Mycologische Vereniging' for supplying the first author with important collections, notes, and illustrations. Thanks are due to the Directors of the Herbaria in Michigan and Kew for sending on loan valuable material. We are very grateful to Dr. R.F.O. Kemp (Edinburgh) for many corrections and comments.

#### **Coprinus section Pseudocoprinus (Kühn.) P.D. Orton & Watl.**

*Pseudocoprinus* Kühn. in *Botaniste*: 155. 1928. — *Coprinus* sect. *Pseudocoprinus* (Kühn.) P.D. Orton & Watl. in *Br. Fung. Fl.*: 9. 1979.

Very small to medium-sized species; expanded pileus 1 to c. 40 mm in diam., in extreme cases up to 80 mm. Flesh thin, thickness less than 2(-3) mm in centre of pileus. Pileus with setulae and/or setae or glabrous. Lamellae narrow, less than 5 mm wide, free to narrowly adnate. Stipe with setulae or glabrous, hollow, base slightly bulbous or clavate. Pileipellis made up of (sub)globose, ellipsoid or clavate cells with or without pedicels. Pileocystidia present or absent. Besides normal (thin-walled) pileocystidia sometimes sclerocystidia (thick-walled) and/or velar spherocysts or, rarely, velar hyphae present (the last two elements never at the same time). Pleuro- and cheilocystidia present or absent. Spores with central or eccentric germ pore.

#### **Coprinus subsection Setulosi J. Lange**

*Coprinus* subsect. *Setulosi* J. Lange in *Dansk bot. Ark.* 2 (3): 38. 1915.

Pileus and stem with setulae. Pileipellis consisting of (sub)globose, ellipsoid to clavate cells with or without pedicels. Pileo- and caulocystidia always present, often in combination with sclerocystidia and/or spherocysts; a few species with sparse veil remnants consisting of hyphae on the pileus.

#### **Macroscopical characters**

Species in subsect. *Setulosi* are rather small, with pilei when expanded usually less than 30 mm in diam., but in some species rarely slightly larger. The colour of the pileus is brown or yellow-, ochre-, fox-, red- to purple-brown or cinnamon and is, as normally in ink-caps, very variable. For most species the colour of the pileus is not a very useful character, but it is true that the one species is in general darker or has more red in its colour than the other. *Coprinus pyrhanthes* Romagn. and *C. dilectus* Fr. sensu Joss. are characterized by a beau-

tiful orange colour, but this bright colour can disappear quickly owing to the weather conditions. Species like *C. plagioporus* Romagn., *C. subpurpureus* A.H. Smith and *C. fallax* M. Lange & A.H. Smith are usually dark purple coloured in young, fresh specimens. Other species, in particular the smaller, membranous ones, can also show purple or pink tinges, especially in moist weather.

At first sight the pilei of species in subsect. *Setulosi* often seem to be smooth. In young, fresh condition, however, they mostly have a velvet appearance, especially at the centre, because of the presence of setulae. Under a hand-lens the setulae or setae are almost always well perceptible at the centre of the pileus. The best way to see them is looking with a hand-lens over the surface of a well-lit pileus against a dark background. When the conditions are moist, very small drops adhere to the setulae; the pilei then look hoary.

The veil deserves special attention. On fresh pilei, veil elements are visible with the naked eye, but they soon disappear. Therefore it is important to look for this character in the field using a hand-lens. Then the spherocysts are visible as small, granular flocks. Remnants of the veil consisting of cylindrical elements are revealed by the presence of small, radial fibrillose flocks. In the literature the last kind of veil is described in only two species, namely *C. heterothrix* Kühn. and *C. velatopruinatus* Bender. The first author of this paper has collected two more unnamed taxa of '*Setulosi*' with such a veil and discovered that it is also present in *C. hiascens* (Fr.: Fr.) Quéf.

The lamellae are narrow and thin, just free from the stem or narrowly adnate. The breadth of the lamellae is 0.5–3 mm, with a length/breadth ratio usually more than 5. Sometimes, especially in species with spherocysts (which species generally have more or less rounded pilei when still closed), the lamellae are somewhat broader with regard to the length. In these cases they are always adnate, sometimes up to half the width of the lamellae. The number of lamellae reaching the stipe may vary between 8 and 38. The number of short lamellae is 0–3, seldom 5. The colour of the lamellae is white in very young stages, becomes then grey with or without a slight brownish tinge and turns finally to a dark grey to blackish. In species with lageniform cheilocystidia the edge of the lamellae is weakly dentate to even and concolorous with the rest of the lamellae. In species with globose to vesiculose cheilocystidia the edge usually is white and subflocculose.

The stipe is white to greyish white, somewhat watery brown towards the base. Under a hand-lens caulocystidia are nearly always visible. In fresh specimens with the stipe densely covered with setulae (caulocystidia), the colour is pure white. Very small carpophores have a vitreous stipe and the setulae not so crowded. The stem is equally thick or, in most cases, slightly tapering towards the apex. The base of the stipe is weakly bulbous or clavate. The stipe is usually 0.5–3 mm wide and at the base up to 5 mm. The combination of setulae on the stipe and a relatively thin stipe makes it possible to recognize members of subsect. *Setulosi* in the field immediately. Other species of *Coprinus* with setulae on the stipe have a distinctly thicker stipe (5–10 mm).

Species belonging to subsect. *Setulosi* grow on pure dung, mixtures of straw and dung, decaying hay or straw, vegetable refuse, humus, wood, woody fragments mixed with soil, naked soil (preferably clay), lawns or at other grassy places. Paths covered with wood-chips form an ideal habitat for many species.

### Microscopical characters

The pileipellis consists of more or less globose, spheropedunculate or clavate, 10–25  $\mu\text{m}$  wide cells intermixed with setulae (pileocystidia), which are always present, and is sometimes covered by globose, thin- or thick-walled, hyaline to brown velar cells (spherocysts) or still more rarely by cylindrical velar hyphae. Velar hyphae, if present on the pileus, are straight or curved, thin-walled, sometimes slightly thick-walled at centre of pileus and somewhat diverticulate with—mostly—widened, clavate terminal cells; in most cases the walls of these cells are encrusted, but not or only partly coloured.

Sclerocystidia are found in many species. They look like the pileocystidia, but are thick-walled and more slenderly ventricose with thin necks, have usually rather long pedicels and brown walls. Pileocystidia may be slightly coloured and thick-walled, especially at their bases.

Pileocystidia are present on the whole surface of the pileus, but on the margin they are particularly dense. They usually occur also on the lamella edge over a short distance from the cap margin towards the stipe. Therefore, in species which have truly lageniform cheilocystidia (thus looking like the pileocystidia), these have to be searched for on the half of the lamella nearest to the stipe. *Coprinus disseminatus* for example, does not have cheilocystidia in the proper sense of the word, but a few pileocystidia continue to occur on the edge of the lamellae, sometimes even up to half-way. Most authors consider these, in our opinion 'escaped' pileocystidia, as being cheilocystidia and include them as such in their keys (M. Lange, 1952; Kühner & Romagnesi, 1953; M. Lange & A.H. Smith, 1953; Moser, 1978; Orton & Watling, 1979).

All species have caulocystidia which are similar to the pileocystidia, but in general a little larger and broader. In a few cases the shape is somewhat aberrant.

Except *C. disseminatus* all species of the '*Setulosi*' group have true cheilocystidia. Some species have lageniform cheilocystidia; others cheilocystidia which are more or less globose, ellipsoid or vesiculose. A few species have a mixture of these two types of cystidia.

Pleurocystidia are present only in some of the species. If present, they are (sub)globose, ellipsoid, ovoid, vesiculose, or broadly cylindrical. *Coprinus eurysporus* M. Lange & A.H. Smith is the only species, which, according to the original description, has lageniform pleurocystidia. We were unable to detect such pleurocystidia in the type-material; in fact we did not find any pleurocystidia at all.

Clamp-connections may be present or not and their presence is not always easy to detect. Sometimes they seem to be present, but they may be the short side-branches of hyphae near the septa. These short branches sometimes strongly suggest clamp-connections indeed and have usually been named pseudoclamps.

The spores of most species are ellipsoid or ovoid in front view. Only *C. marculentus* Britz., *C. angulatus* Peck, *C. verrucispermus* Joss. & Enderle, and *C. silvaticus* Peck have differently shaped spores. In *C. disseminatus* (Pers.: Fr.) S.F. Gray and *C. hiascens* (Fr.: Fr.) Quéf. the spores taper somewhat towards their base into the hilar appendage. The other species have spores with a more rounded base with an abrupt hilar appendage. Ellipsoid and—in particular—ovoid spores can sometimes have a slight apical papilla.

In most species, the germ pore is eccentric, but in some it is central. The degree of eccentricity differs not only between species, but also in different collections of the same species. In species that usually have spores with a slightly eccentric germ pore, it may also be almost central, thus leading to mistakes. The diameter of the germ pore varies between 1.3 and 2.5  $\mu\text{m}$ .

Most of the species have spores which are 10–13  $\mu\text{m}$  long, but some species lie outside this range. In side view the spores are usually slightly narrower than in front view ( $B-W=0-1 \mu\text{m}$ ), and in some species up to 2.5  $\mu\text{m}$  as in *C. angulatus*. A warty surface is found in the spores of *C. verrucispermus* and in *C. silvaticus* but all other species have smooth spores. Under the microscope the ripe spores are dark red-brown to almost black. The larger the spores are, the darker their colour.

Basidia may be four- or two-spored. In *C. singularis* Uljé, which has predominantly two-spored basidia, some of the basidia are one-spored in all collections studied. Except in *C. silvaticus*, where the basidia have a length of up to 60  $\mu\text{m}$ , the basidia are never longer than 40  $\mu\text{m}$ . The number of pseudoparaphyses (sterile cells around the basidia) is usually between 3 and 5 or 4 and 6 per basidium, but 7 may be found. These cells are more or less globose and 10–25  $\mu\text{m}$  wide.

#### KEY TO THE SUBSECTIONS OF COPRINUS SECT. PSEUDOCOPRINUS

1. Stipe and pileus with setulae . . . . . subsect. *Setulosi*
1. Stipe glabrous; pileus glabrous or with scattered, microscopical, long, brown hairs (see Uljé & Bas, 1988) . . . . . subsect. *Glabri* and *Auricomi*

#### KEY TO THE SPECIES OF SUBSECT. SETULOSI<sup>1</sup>

1. Spores smooth.
2. Basidia 4-spored.
3. Spores ellipsoid, ovoid or oblong.
4. Pileocystidia with distinctly tapering neck.
5. No velar spherocysts on pileipellis.
6. Germ pore eccentric (sometimes only slightly).
7. With pleurocystidia.
8. On dung.
  9. Clamps-connections absent . . . . . 24. *C. congregatus*
  9. Clamps-connections present . . . . . 25. *C. ephemerus*
8. Not on dung.
  10. Av. Q of spores c. 1.25 . . . . . 23. *C. eurysporus*
  10. Av. Q of spores c. 1.60 . . . . . 16. (*Uljé 877*)
7. Without pleurocystidia.
11. Cheilocystidia predominantly globose, subglobose, ellipsoid, broadly ellipsoid, ovoid or obovoid.
  12. On dung. Pileus < 8 mm in diameter . . . . . 28. *C. heterosetulosus*
  12. Not on dung. Pileus larger.
    13. Pileocystidia > 100  $\mu\text{m}$ . Sclerocystidia present . . . 14. *C. callinus*  
(compare also 13. *C. sclerocystidiosus*)
    13. Pileocystidia < 100  $\mu\text{m}$ . Sclerocystidia absent . . . 15. (*Uljé 1009*)
11. Cheilocystidia predominantly lageniform.
  14. Av. Q of spores c. 1.25 . . . . . 23. *C. eurysporus*
  14. Av. Q of spores c. 1.60 . . . . . 22. *C. impatiens*

- 6. Germ pore central.
  - 15. On dung and decaying straw. Base of spores rounded.
    - 16. With pleurocystidia. Breadth of spores 5–6  $\mu\text{m}$ . Pileus c. 20 mm  
26. *C. stellatus*
    - 16. Without pleurocystidia. Breadth of spores 4–5  $\mu\text{m}$ . Pileus < 8 mm  
27. *C. pellucidus*
  - 15. Not on dung. Base of spores rounded or obconical.
    - 17. With cylindrical elements of veil on pileus. Base of spores obconical  
7. *C. hiascens*
    - 17. Without cylindrical elements of veil on pileus. Base of spores rounded  
22. *C. impatiens*
- 5. With velar spherocysts on pileipellis.
  - 18. On dung. Pileus brown, < 10 mm ..... 3. *C. heptemerus*
  - 18. Not on dung. Pileus orange, somewhat larger.
    - 19. Cheilocystidia in general ellipsoid to globose ..... 5. *C. pyrphanthes*
    - 19. Cheilocystidia in general lageniform ..... 4. *C. dilectus*
- 4. Pileocystidia (sub)cylindrical, with apex more or less thickened or not, but not tapering.
  - 20. Av. length of spores 10–12  $\mu\text{m}$ .
    - 21. No velar spherocysts on pileipellis. Not on dung.
      - 22. No cylindrical veil on pileus.
        - 23. Cheilocystidia globose  
17. *C. plagioporus* (compare 18. *C. subpurpureus* and 19. *C. fallax*).
        - 23. Cheilocystidia at least partly lageniform.
          - 24. Cheilocystidia mixed, ellipsoid to globose and lageniform. Av. Q of spores < 1.80. .... 12. *C. subimpatiens*
          - 24. Cheilocystidia lageniform. Av. Q of spores > 1.80  
20. *C. subdisseminatus*
      - 22. Cylindrical veil present on pileus.
        - 25. Spores < 6  $\mu\text{m}$  broad. Cheilocystidia lageniform.
          - 26. Av. Q of spores c. 1.70 ..... 8. *C. heterothrix*
          - 26. Av. Q of spores c. 2.00 ..... 10. (*Uljé 952*)
        - 25. Spores > 6  $\mu\text{m}$  broad. Cheilocystidia ellipsoid to globose  
11. *C. velatopruinatus*
    - 21. Velar spherocysts present on pileipellis. On dung ..... 2. *C. curtus*
  - 20. Av. length of spores < 10  $\mu\text{m}$  or > 12  $\mu\text{m}$ .
    - 27. Av. length of spores more than 12  $\mu\text{m}$ .
      - 28. Cheilocystidia globose or ellipsoid.
        - 29. Pileus brown. Sclerocystidia numerous  
13. *C. sclerocystidiosus* (compare 14. *C. callinus*)
        - 29. Pileus with purple tinges. Sclerocystidia rare  
18. *C. subpurpureus* (compare 17. *C. plagioporus* and 19. *C. fallax*)
      - 28. Cheilocystidia lageniform ..... 21. (*den Held Jager 1276*)
    - 27. Av. length of spores less than 10  $\mu\text{m}$ .
      - 30. With spherocysts on pileipellis. Pileocystidia up to 200  $\mu\text{m}$  long. Base of spores obconical. Germ pore entral ..... 6. *C. disseminatus*
      - 30. Without spherocysts on pileus. Cylindrical elements of veil present. Pileocystidia < 120  $\mu\text{m}$ .
        - 31. Germ pore eccentric. Cheilocystidia lageniform ..... 8. *C. heterothrix*
        - 31. Germ pore central. Cheilocystidia ellipsoid to globose .... 9. (*Uljé 926*)
- 3. Spores mitriform or angular, not ellipsoid, ovoid or oblong.
  - 32. Spores mitriform ..... 29. *C. angulatus*
  - 32. Spores hexagonal (more or less 6-angled) in front view ..... 1. *C. marculentus*
- 2. Basidia 2-spored.
  - 33. Cheilocystidia globose, subglobose, ellipsoid, broadly ellipsoid, ovoid or obovoid.

34. No sclerocystidia. No clamps-connections. Pleurocystidia absent or present.  
 35. Pleurocystidia absent. On dung or decaying straw . . . . . 31. *C. bisporus*  
 35. Pleurocystidia usually present. On sticks, not on dung . . . . . 30. *C. bisporiger*  
 34. Sclerocystidia, pleurocystidia and clamp-connections present. On dung . . . . . 36. *C. sassii*  
 33. Cheilocystidia lageniform.  
 36. Germ pore eccentric. Spores ellipsoid. Av. Q of spores 1.75–1.80 . . . 32. *C. amphithallus*  
 36. Germ pore central. Spores broadly cylindrical to ovoid. Av. Q of spores 1.35–1.50  
 33. *C. singularis*
1. Spores warty.  
 37. Basidia 4-spored. Cheilocystidia lageniform. Pleurocystidia absent . . . . . 34. *C. silvaticus*  
 37. Basidia 2-spored. Cheilocystidia ellipsoid to globose. Pleurocystidia present . . 35. *C. verrucispermus*

### 1. *Coprinus marculentus* Britz. — Fig. 1

*Coprinus marculentus* Britz. in Bot. Zbl. 15/17: 13. 1893.—*Coprinus hexagonosporus* Joss. (invalid) in Rev. Mycol. 13: 82. 1948.

Closed pileus up to 13 × 10 mm, yellow-brown to date-brown, more frequently dark red-brown at centre (Mu. 7.5 YR 3/3 to 6/6, K. & W. 5E7 to 5D8), paler towards margin, up to 25 mm in diameter when expanded. Granular-flocculose veil present on pileus. Lamellae free to narrowly adnate, white in very young stage, blackish at mature. Stipe 40–80 × 1–2 mm, whitish, pubescent.

Spores [60, 3, 3] 9.7–14.3 × 6.3–8.7 × 6.2–7.3 μm, av. L = 10.7–12 μm, av. B = 7.4–7.7 μm, Q = 1.30–1.70, av. Q = 1.45–1.55, hexagonal in front view; germ pore eccentric, c. 1.8 μm wide. Basidia 16–38 × 9–12 μm, 4-spored. Pseudoparaphyses (3–)4–5(–6) per basidium. Cheilocystidia 20–70 × 17–40 μm, ellipsoid to globose. Pleurocystidia 60–90 × 20–35 μm, oblong, ellipsoid to subglobose. Sclerocystidia absent. Velar spherocysts on pileipellis up to c. 40 μm in diam., globose. Pileocystidia 50–100 × 12–20 μm, lageniform with cylindrical, 6–10 μm wide neck and equal to slightly broader, up to 12 μm wide apex. Clamp-connections present.

Habitat.—On dung, mixtures of straw and dung and decaying grass. Subgregarious. Rather rare.

Collections examined.—NETHERLANDS: prov. Zuid-Holland, Alphen a/d Rijn, 3 Oct. 1984, *Uljé 564b*; Hazerswoude, 15 Aug. 1987, *Uljé 864*; Ter Aar, 22 Sept. 1989, *Uljé 1036*.

This species is easy to recognize by its six-angled spores. In the literature, it is usually named *C. hexagonosporus* Jossierand, Enderle & al. (1986: 118), however, discovered that *C. marculentus* Britz. is identical with *C. hexagonosporus*. The description of Britzelmayer and in particular his drawings leave no doubt about the synonymy of these two names, of which *C. marculentus* is the oldest and has to be used for this species.

Jossierand (1948: 86) also described *C. hexagonosporus* var. *stephanosporus* and Malençon (Malençon & Bertault, 1970: 241) *C. hexagonosporus* var. *homosetulosus*. Enderle & al. (l.c.) introduced new combinations for both of these variants. According to Jossierand his variety was distinguished by the presence of small warts around the suprahilar plage, pronounced in NH<sub>4</sub>OH or HCl. Enderle & al. attached little value to this character and reduced Jossierand's variety to forma, *C. marculentus* f. *stephanosporus* (Joss.) Enderle.

*Coprinus marculentus* var. *homosetulosus* (Malençon.) Enderle would be recognizable by the probable absence of pleurocystidia and lageniform cheilocystidia.

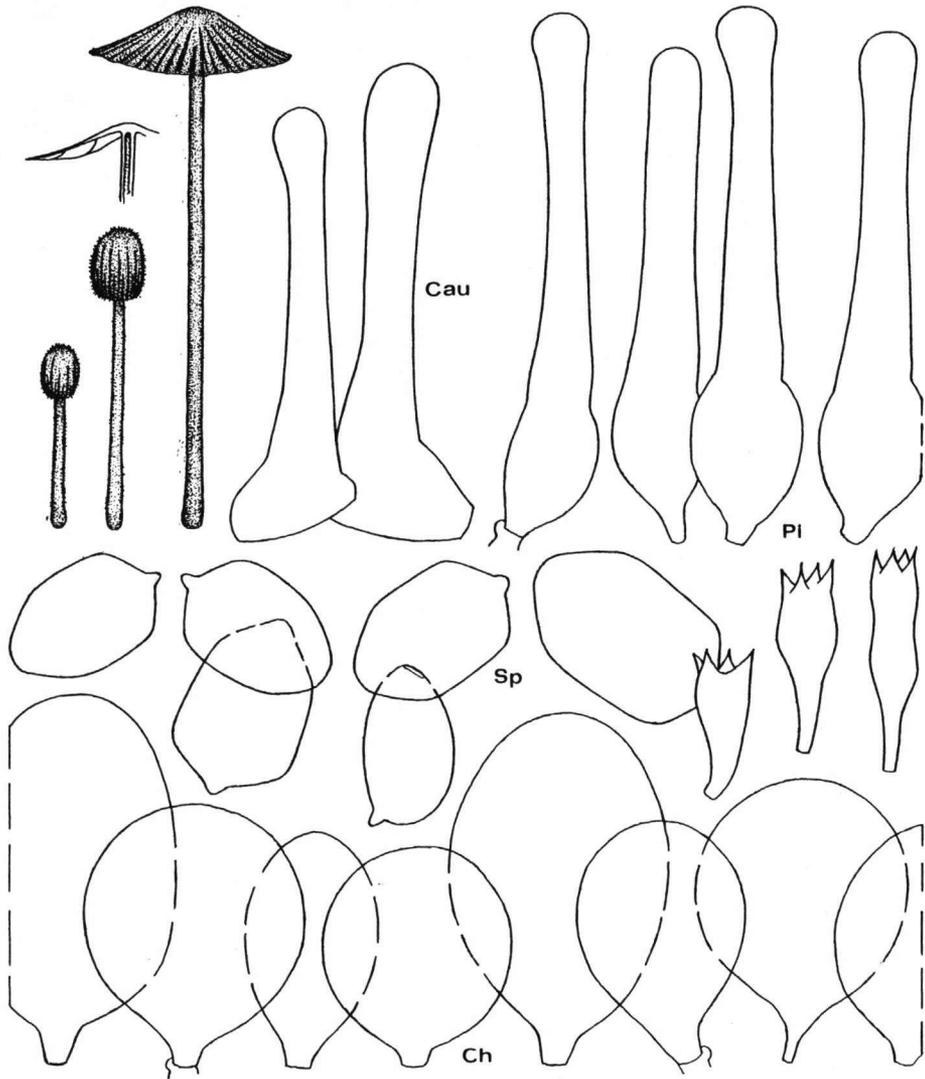


Fig. 1. *Coprinus marculentus* Britz. — All figures from *Ulje* 1036.

## 2. *Coprinus curtus* Kalchbr.—Fig. 2

*Coprinus curtus* Kalchbr. in *Grevillea* 9: 133. 1881.

Closed pileus up to 6 × 4 mm, cream coloured, at centre with yellow-brown to ochre-brown granular-flocculose veil; expanded pileus up to 10(–15) mm wide. Lamellae almost free to free, whitish, grey to blackish; L = c. 20, l = 0–1. Stipe 30–60 × 0.5–1 mm, whitish, vitreous, sparsely pubescent from setulae.

Spores [40, 1, 1] 9.7–13.8 × 6.7–8.8 × 5.8–8.2 μm, av. L = 11.0–12.0, av. B = 7.3–8.0 μm, Q = 1.35–1.70, av. Q = 1.50–1.55, ellipsoid to ovoid in front view; germ pore strongly eccentric, c. 2 μm wide. Basidia 11–28 × 8–12 μm, 4-spored. Pseudoparaphyses 5–7 per basidium. Cheilocystidia globose, up to 35 μm in diam. to subglobose, the latter up to 40 × 35 μm. Pleurocystidia absent. Pileocystidia 40–90(–110) × 10–20 μm, lageniform to nettle hair-shaped with cylindrical to slightly tapering, 3–7 μm wide neck and subcapitate to capitate, up to 12(–15) μm wide apex. Sclerocystidia absent. Velar spherocysts on pileipellis up to 40 μm in diam., rather strongly encrusted, often brown. Clamp-connections not seen.

H a b i t a t.—On horse-dung. Subgregarious. Rather rare.

C o l l e c t i o n e x a m i n e d.—NETHERLANDS: prov. Zuid-Holland, Hazerswoude, 23 Oct. 1988, *Uijé* 997.

*Coprinus curtus* is the only species that has both spherocysts and (sub)capitate pileocystidia. Other species with velar spherocysts on the pileus (except *C. marculentus*) have pileocystidia with tapering or cylindrical neck without enlarged apex. *Coprinus marculentus* has differently shaped (hexagonal) spores.

Romagnesi (1941: 126) described *C. curtus* Kalchbr. f. *macrosporus* which has somewhat larger spores (10.7–14.7 × 6.5–8.5 μm). M. Lange & A.H. Smith raised this taxon to the rank of species, naming it *C. heptemerus* (see under that name).

## 3. *Coprinus heptemerus* M. Lange & A.H. Smith—Fig. 3

*Coprinus curtus* f. *macrosporus* Romagn. in *Rev. Myc.* 6: 126, 1941. — *Coprinus heptemerus* M. Lange & A.H. Smith in *Mycologia* 45: 751. 1953.

Closed pileus up to 8 × 5 mm, brown, yellow-brown to dark-brown at centre (Mu. 10 YR 3/3 to 6/6, K. & W. 5E7, 5D8), paler towards margin; pileus up to 10 mm in diam. when expanded. Brownish granular-flocculose veil present on pileus. Lamellae free, narrow, rather distant, white to blackish. Stipe 25–50 × 0.5–1 mm, whitish, vitreous, sparsely pubescent from setulae.

Spores [20, 1, 1] 12.7–16.6 × 7.2–8.5 μm, av. L = 14.7, av. B = 7.8 μm, Q = 1.70–2.10, av. Q = 1.90, ellipsoid to oblong in front view; germ pore distinctly eccentric, c. 2.3 μm wide. Basidia 14–38 × 9–11 μm, 4-spored. Pseudoparaphyses not noted. Cheilocystidia 25–55 μm in diam., vesiculose. Pleurocystidia absent. Pileocystidia 50–120 × 8–21 μm, ventricose-lageniform with narrow, tapering neck and 2.5–4 μm wide apex. Sclerocystidia absent. Velar spherocysts on pileipellis 20–35 μm in diam., often with long spine-like projections. Clamp-connections absent.

H a b i t a t.—On dung of different animals. Subgregarious. Rather common.

C o l l e c t i o n e x a m i n e d.—NETHERLANDS: prov. Zuid-Holland, Alphen a/d Rijn, 19 Sept. 1985, *Uijé* 609.

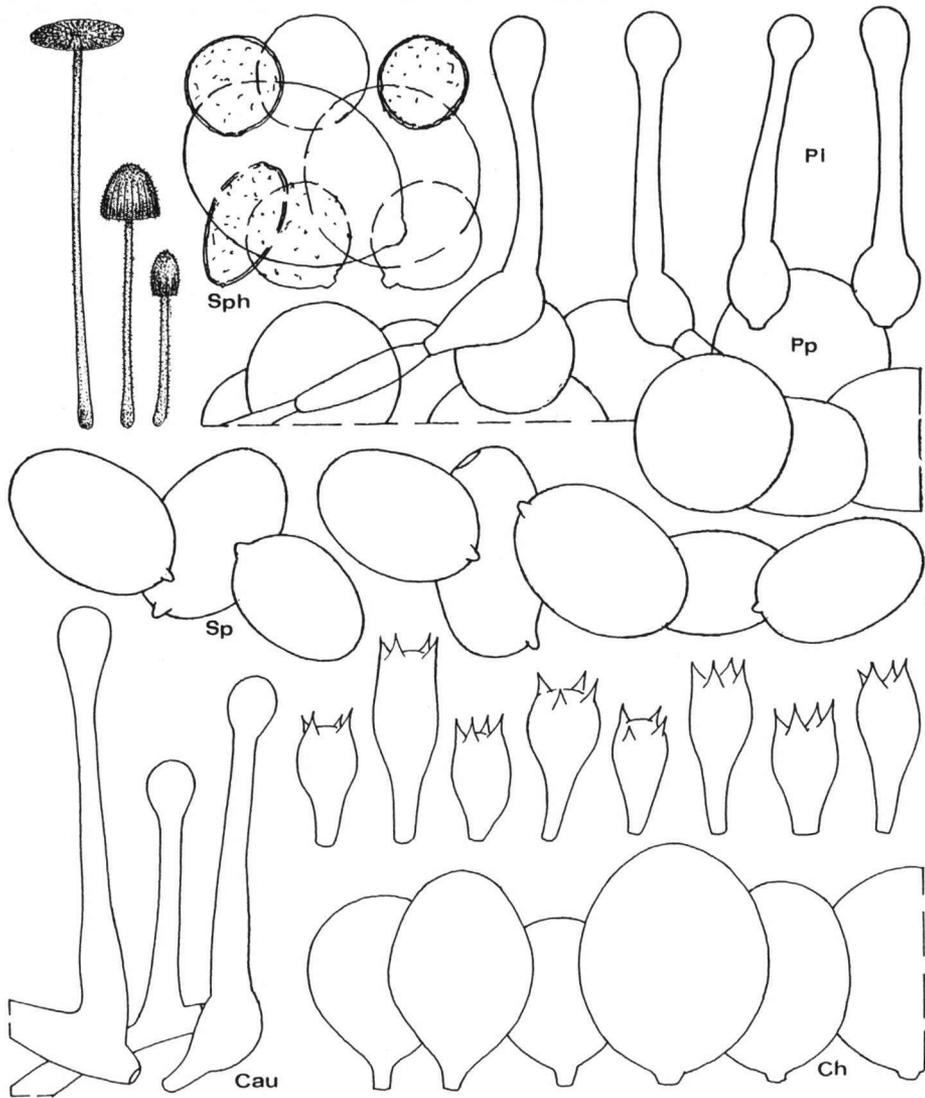


Fig. 2. *Coprinus curtus* Kalchbr. — All figures from Uljé 997.

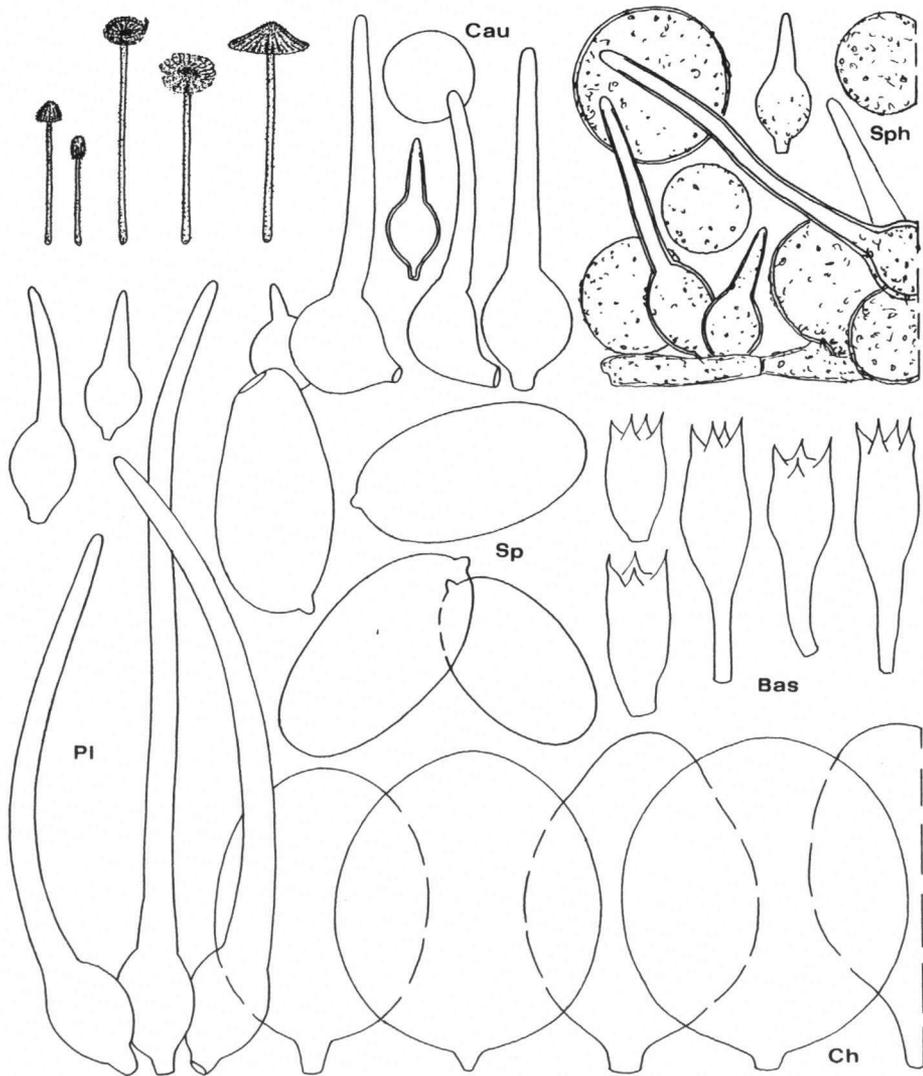


Fig. 3. *Coprinus heptemerus* M. Lange & A.H. Smith. — All figures from *Uljé 609*.

*Coprinus heptemerus* is recognizable by the combination of spherocysts, tapering pileocystidia, a brown pileus and a preference for dung. The spine-like projections of the velar spherocysts are typical for *C. heptemerus*, which species is based on *C. curtus* f. *macrosporus* Romagn. The description of Romagnesi is, however, not very clear about the important characters of this species. M. Lange & A.H. Smith (1953) checked their material with the authentic culture of *C. curtus* f. *macrosporus* in the C.B.S. at Baarn (Netherlands) and found all details identical.

#### 4. *Coprinus dilectus* Fr. sensu Joss.—Fig. 4

*Coprinus dilectus* Fr. sensu Joss. in Bull. trimest. Soc. myc. Fr. 57: 46. 1941.

E x c l u d e d.—*Coprinus dilectus* sensu J. Lange in Dansk bot. Ark. 2 (3): 40. 1915 (= *C. erythrocephalus*).

Closed pileus up to  $7 \times 4$  mm, beautifully 'vermillon fauve en naissant', orange-brown, up to 13 mm wide when expanded. Lamellae narrowly adnate, first pale, later grey; L = ?, l = 1–3. Stipe  $15\text{--}27 \times 1\text{--}1.5$  mm, whitish, pubescent, at base somewhat orange (from spherocysts).

Spores  $13.3\text{--}14.5 \times 6.8\text{--}7.2$   $\mu\text{m}$ , ellipsoid; germ pore present, very distinct, probably central. Basidia  $25\text{--}40 \times 10\text{--}11$   $\mu\text{m}$ , 4-spored. Cheilocystidia numerous, lageniform,  $50\text{--}60 \times 18\text{--}22$   $\mu\text{m}$ , neck  $7\text{--}9$   $\mu\text{m}$  wide. Pleurocystidia not mentioned. Spherocysts on pileipellis

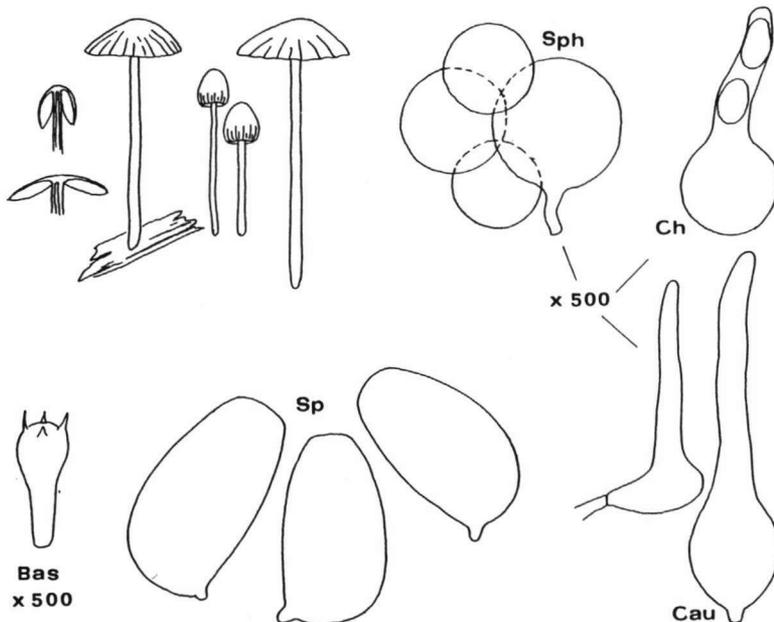


Fig. 4. *Coprinus dilectus* Fr. sensu Joss. — Figures copied from Jossierand, in Bull. trimest. Soc. mycol. Fr. 57: 47. 1941).

globose to ovoid, 12–40  $\mu\text{m}$  wide. Pileocystidia not described. Sclerocystidia not noted. Caulocystidia lageniform, 70–90  $\times$  16–20  $\mu\text{m}$  with 8–10  $\mu\text{m}$  wide neck. Velar spherocysts on pileipellis 12–40  $\mu\text{m}$  in diam., globose. Clamp-connections present.

H a b i t a t.—On muddy soil. Not known from the Netherlands. Very rare.

*Coprinus dilectus* is accepted here in the sense of Jossierand. Because of its brief diagnosis *C. dilectus* sensu Fries (1838: 250) may be almost every species of the 'Setulosi'.

By the combination of the orange colour of the pileus, the presence of spherocysts on the pileipellis and particularly the size of the spores, this species is easy to recognize. In subsect. *Setulosi* only *C. pyrghanthes* has the same pileus colour, but has much smaller spores (less than 12  $\mu\text{m}$  in length) and vesiculose cheilocystidia. *Coprinus dilectus* seems to be a very rare species. A good collection was not available; therefore Jossierand's description is reproduced here. Orton & Watling (1979: 84) described *C. dilectus* from only one location. Krieglsteiner & al. (1982: 82) described this species for the first time from West Germany.

The position of the germ pore is not clear. Jossierand (1941) describes it as very distinct but does not show it in his drawings and does not indicate its position. Orton & Watling (l.c.) say: 'germ pore central, sometimes indistinct'. Krieglsteiner & al. (l.c.) found it to be  $\pm$  eccentric.

Because Jossierand does not mention the presence of pileocystidia, it is possible the *C. dilectus* sensu Joss. does not belong to the subsection *Setulosi*, although its other characters indicate that it does.

### 5. *Coprinus pyrghanthes* Romagn.—Fig. 5

*Coprinus pyrghanthes* Romagn. in Rev. Mycol. 16: 128. 1951.

Closed pileus up to 12  $\times$  8 mm, orange-brown, granular-flocculose (from spherocysts), up to 20 mm in diam. when mature. Lamellae narrowly adnate, rather broad, white to blackish; L = c. 16, l = 1–3. Stipe 20–50  $\times$  0.5–1.5 mm, white, pubescent.

Spores [40, 1, 1] 7.1–9.3  $\times$  4.7–6.2  $\mu\text{m}$ , av. L = 8.4, av. B = 5.5, Q = 1.40–1.60, av. Q = 1.50, ovoid to ellipsoid; germ pore eccentric, c. 1.5  $\mu\text{m}$  wide. Basidia 15–32  $\times$  8–10  $\mu\text{m}$ , 4-spored. Pseudoparaphyses (3–)4–6(–7) per basidium. Cheilocystidia 20–40  $\times$  15–30  $\mu\text{m}$ , vesiculose. Pleurocystidia absent. Pileocystidia 40–150  $\times$  14–24  $\mu\text{m}$ , lageniform to nettle hair-shaped with 4–7  $\mu\text{m}$  wide neck. Sclerocystidia absent. Velar spherocysts on pileipellis up to 40  $\mu\text{m}$  in diam., the largest usually hyaline, the smaller ones more yellow-brown and thick-walled. Clamp-connections absent.

H a b i t a t.—Gregarious. The description given here is based on the collection from Germany found on old saw-dust. Very rare.

C o l l e c t i o n s e x a m i n e d. — NETHERLANDS: prov. Flevoland, Zuid-Flevoland, May 1970, G.A. de Vries. — GERMANY: Westfalen, Mönchengladbach, Volksgarten, 15 Aug. 1988, H. Bender (Ulje 1059).

Macroscopically this species is close to *C. dilectus*, but it differs in microscopical characters (see discussion under *C. dilectus*). The size of the spores is very variable. *Coprinus pyrghanthes* is a distinct species because of its numerous velar spherocysts, vesiculose cheilocystidia, ovoid spores with eccentric germ pore and its habitat not on dung. The description



above is based on the collection of H. Bender from Mönchengladbach. According his information (pers. comm.), he finds *C. pyrghanthes* almost every year near his home.

The collection from Zuid-Flevoland recorded above represents the only one known from the Netherlands. It has larger spores ( $9.3\text{--}11.8 \times 6.3\text{--}7.4 \times 5.8\text{--}6.5 \mu\text{m}$ ), which is closer to the size of the spores given in the original description ( $10.7\text{--}11.5 \times 5.2\text{--}5.7 \mu\text{m}$  (L  $\times$  W)), but we are not quite sure about the identity of this collection. Velar spherocysts are available in great profusion, but we did not find any caulocystidia at all and only a few pileocystidia. Unfortunately, this collection is in a very poor condition. Macroscopically, however, the specimens closely resemble those of the German collection.

### 6. *Coprinus disseminatus* (Pers.: Fr.) S.F. Gray—Fig. 6

*Coprinus disseminatus* (Pers.: Fr.) S.F. Gray, Nat. Arr. Brit. Pl. 1: 634. 1821.

Closed pileus up to  $8 \times 7$  mm, usually pale brown, yellow-brown, ochre (Mu. 10 YR 4–6/6, 7/4, K. & W. 5C3–4, 5C/D5, 5D8) at centre, paler towards margin (Mu. 10 YR 6/4 to 8/2), sometimes almost entirely white; expanding pileus up to 15 (–20) mm wide. Whitish to brown granular-flocculose veil present on pileus. Lamellae narrowly to rather broadly adnate, c. 3 mm wide, length divided by breadth  $< 3$ ; L = 16–32, l = 0–3, white to blackish. Stipe 20–40 (–60)  $\times$  1–1.5 mm, white to greyish-white, often somewhat vitreous, pubescent.

Spores [100, 5, 5]  $6.6\text{--}9.7 \times 4.1\text{--}5.8 \mu\text{m}$ , av. L = 7.7–9.2, av. B = 4.7–5.5  $\mu\text{m}$ , Q = 1.45–1.90, av. Q = 1.55–1.75, ovoid, obconical at base, truncate; germ pore central, c. 1.5  $\mu\text{m}$  wide. Basidia 16–40  $\times$  5–8  $\mu\text{m}$ , 4-spored. Pseudoparaphyses 4–6 per basidium. Cheilocystidia absent (pileocystidia continuing along edge of lamellae over short distance). Pleurocystidia absent. Pileocystidia 50–200  $\times$  15–24  $\mu\text{m}$ , lageniform with cylindrical, 6–15 (–17)  $\mu\text{m}$  wide neck and rounded apex. Sclerocystidia absent. Velar spherocysts on pileipellis up to 40  $\mu\text{m}$  in diam., usually numerous. Clamp-connections not found (short side-branches of hyphae near septa, resembling clamp-connections, often observed).

Habitat.—On and near wood, gregarious and fasciculate, often in large quantities. Very common.

Collections examined. — NETHERLANDS: prov. Zuid-Holland, Ter Aar, Langeraar, 30 May 1981, *Uljé* 168, 17 May 1985, 20 May 1986, 25 July 1986; Alphen a/d Rijn, 10 Aug. 1987, *Uljé* 859.

*Coprinus disseminatus* is one of the best known ink-caps. It generally grows with numerous basidiocarps on and around stumps of trees or on soil mixed with wood fragments. The velar spherocysts and typical spore-shape together with the long pileocystidia with cylindrical neck and rounded apex, make this species easily recognizable. Macroscopically, *C. disseminatus* may be mistaken for *Psathyrella pygmaea* (Quél.) Sing., which has a similar habit (fasciculate) and more or less the same appearance. *Coprinus hiascens* too resembles *C. disseminatus* somewhat in habit and in the shape of the spores (see discussion under *C. hiascens*).

Lanconelli & Lanzoni (1988: 236) report the presence of a small number of ellipsoid and fusiform cheilocystidia in one of the four collections of *C. disseminatus* analyzed by them.

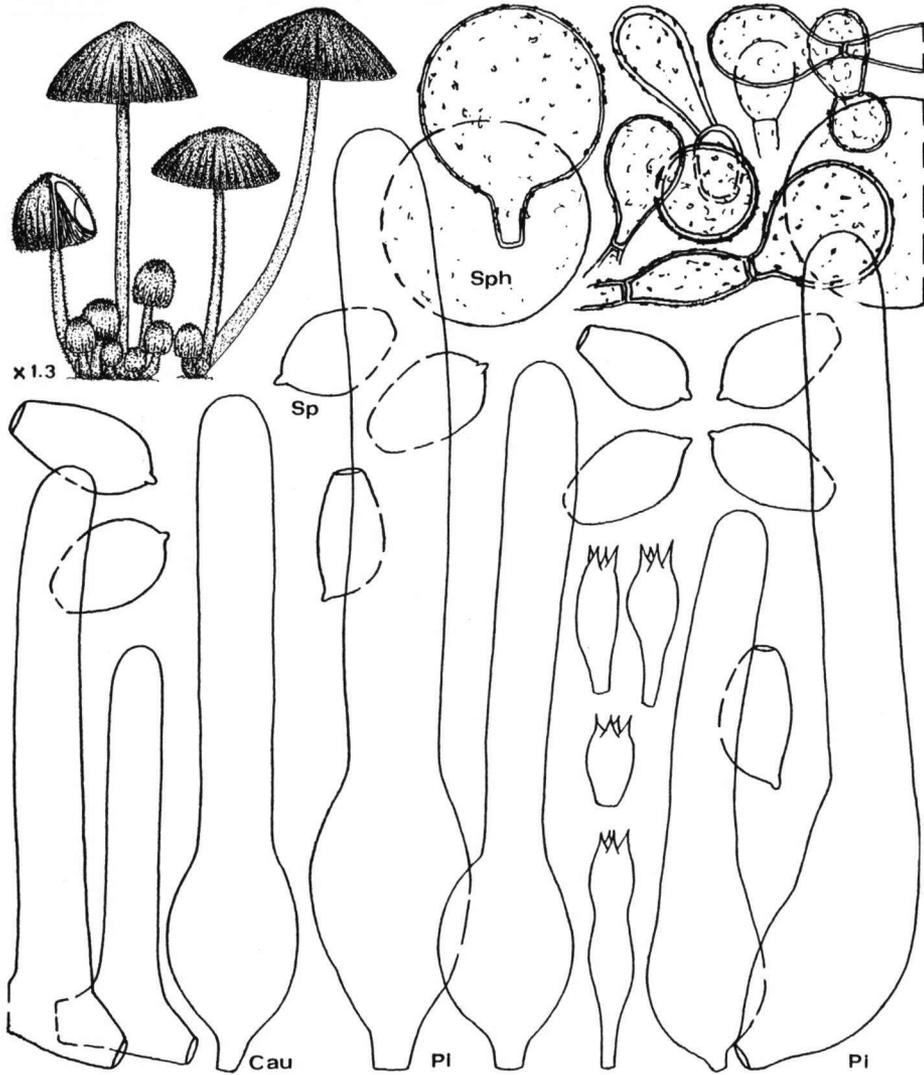


Fig. 6. *Coprinus disseminatus* (Pers.: Fr.) S.F. Gray. — All figures from Uljé, 25 July 1986.

### 7. *Coprinus hiascens* (Fr.: Fr.) Quél.—Fig. 7

*Coprinus hiascens* (Fr.: Fr.) Quél., Flore mycol. France: 42. 1888.

Closed pileus up to 15 × 12 mm, usually ochre-brown (Mu. 7.5 YR 4/6, 10 YR 3–4/3, 4/4, 4–5/6, K. & W. 6E5, 5D7) at centre, paler (Mu. 10 YR 5/3–6, 6/4, 8/5, 2.5 Y 5/2, K. & W. 5D6, 5C/D3) towards margin, up to c. 40 mm in diam. when expanded, only rarely entirely flattened. Veil present, visible as small, whitish, radially fibrillose flocks. Lamellae narrowly adnate, white to blackish; L = 24–36, l = 1–3. Stipe 40–100 × 1–3(–4) mm, white to greyish-white, pubescent, with slightly clavate, up to 5 mm wide base.

Spores [160, 8, 8] 7.5–11.5 × 4.3–5.9 μm, av. L = 8.8–9.7, av. B = 4.8–5.5 μm, Q = 1.60–2.10, av. Q = 1.70–1.90, ovoid to ellipsoid, obconical at base, truncate; germ pore central, c. 1.8 μm wide. Basidia 14–38 × 7–8 μm, 4-spored. Pseudoparaphyses 3–5 per basidium. Cheilocystidia 30–50(–75) × 10–18 μm, lageniform with 3.5–7 μm wide, tapering neck. Pleurocystidia absent. Pileocystidia slender, 50–200(–250) × 13–24 μm, lageniform, with 4–10 μm wide, tapering neck. Sclerocystidia absent. Veil on pileus consisting of cylindrical or somewhat inflated hyphae, with terminal cells 2–15 μm wide (somewhat wider than in *C. heterothrix*). Clamp-connections present.

**Habitat.**—On naked soil or grassy places. Gregarious and fasciculate, usually in bundles of more than ten specimens. Rather common.

**Collections examined.**—NETHERLANDS: prov. Utrecht, Breukelen, Over-Holland, 27 Aug. 1986, *Uljé*; Haarzuilens, 8 Aug. 1987, *Uljé* 889; Breukelen, Sterreschans, 21 June 1988, *Uljé* 914; Linschoten, 6 Aug. 1989, *Uljé* 1015, 1016, 1017; prov. Zuid-Holland, Leiden, 5 Sept. 1985, *Uljé* 618; Leiden, Leidse Hout, 19 Oct. 1985, *Uljé* 719; Ter Aar, de Put, 25 Oct. 1985, *Uljé* 681; Ridderkerk, Huys ten Donck, 9 Aug. 1986, *J. v. Luypen*.

*Coprinus hiascens* is easily recognizable by the tapering, long pileocystidia in combination with the spore-shape, which is more or less similar to that of *C. disseminatus*, but in that species the spores are slightly smaller and cylindrical veil elements are lacking from the pileus. Moreover, *C. disseminatus* has pileocystidia with a broad, cylindrical, not tapering neck and velar spherocysts on the pileus.

The obconical base of the spores distinguishes this species from other species with cylindrical veil elements on the pileus, which have spores with rounded bases. So far the presence of cylindrical veil has never been mentioned for *C. hiascens*. The basidiocarps and their habit remind of *C. disseminatus*, but those of *C. hiascens* are in general distinctly larger and smaller in number.

### 8. *Coprinus heterothrix* Kühner—Fig. 8

*Coprinus heterothrix* Kühner in Bull. Soc. Nat. Oyonnax 10–11 (Suppl.): 3. 1957.

Closed pileus up to 10 × 8 mm, first red-brown (Mu. 5 YR 2.5/2, 3/4, K. & W. 6E6), than somewhat more dull brown (Mu. 7.5 YR 4/6 to 5–6/4, K. & W. 6D/E6), finally more greyish brown (Mu. 10 YR 5–6/3–4) to greyish; expanded pileus up to 20 mm wide. Veil present on pileus visible as small, whitish, radial fibrillose flocks. Lamellae narrowly adnate, relative distant, first white, soon dark brown to blackish; L = 9–18, l = 0–3. Stipe 20–50 × 0.5–1.5 mm, at base up to 2 mm wide, whitish, pubescent from setulae.

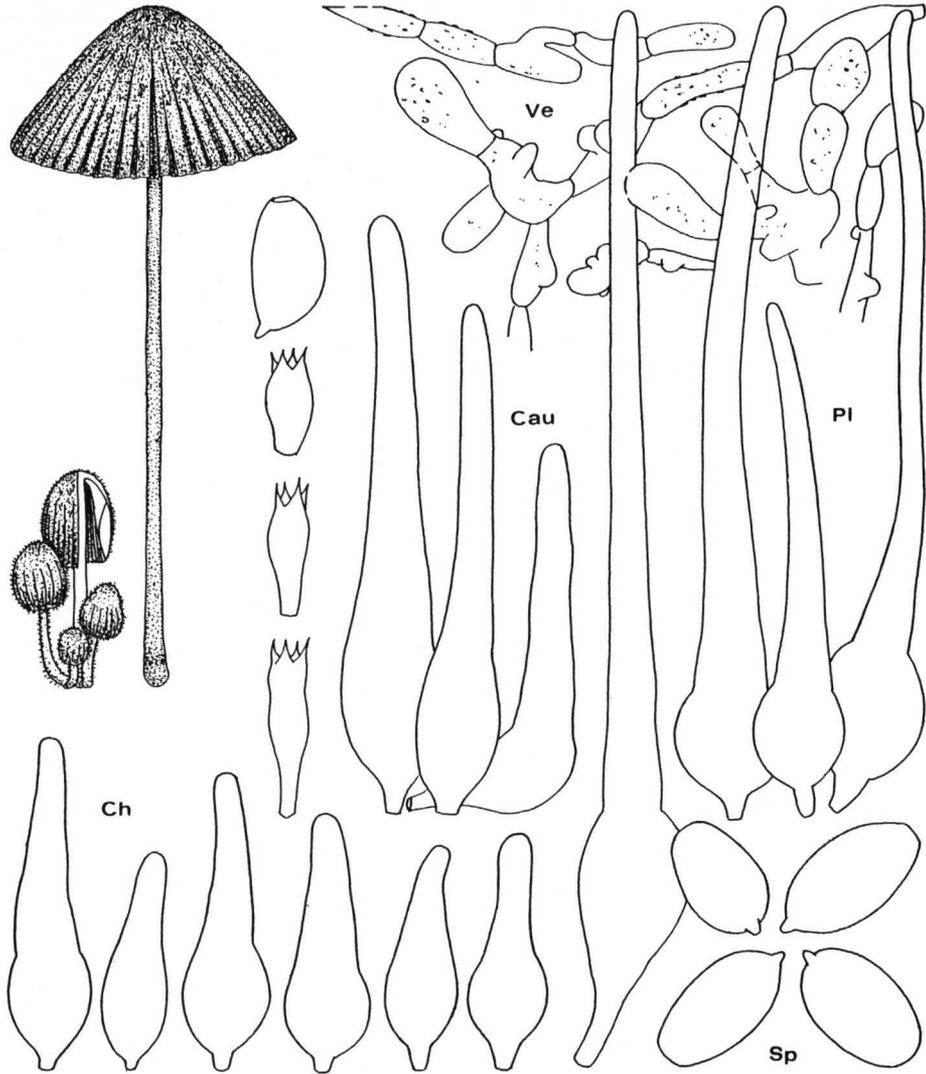


Fig. 7. *Coprinus hiascens* (Fr.: Fr.) QuéL. — All figures from *Uljé 1015*.

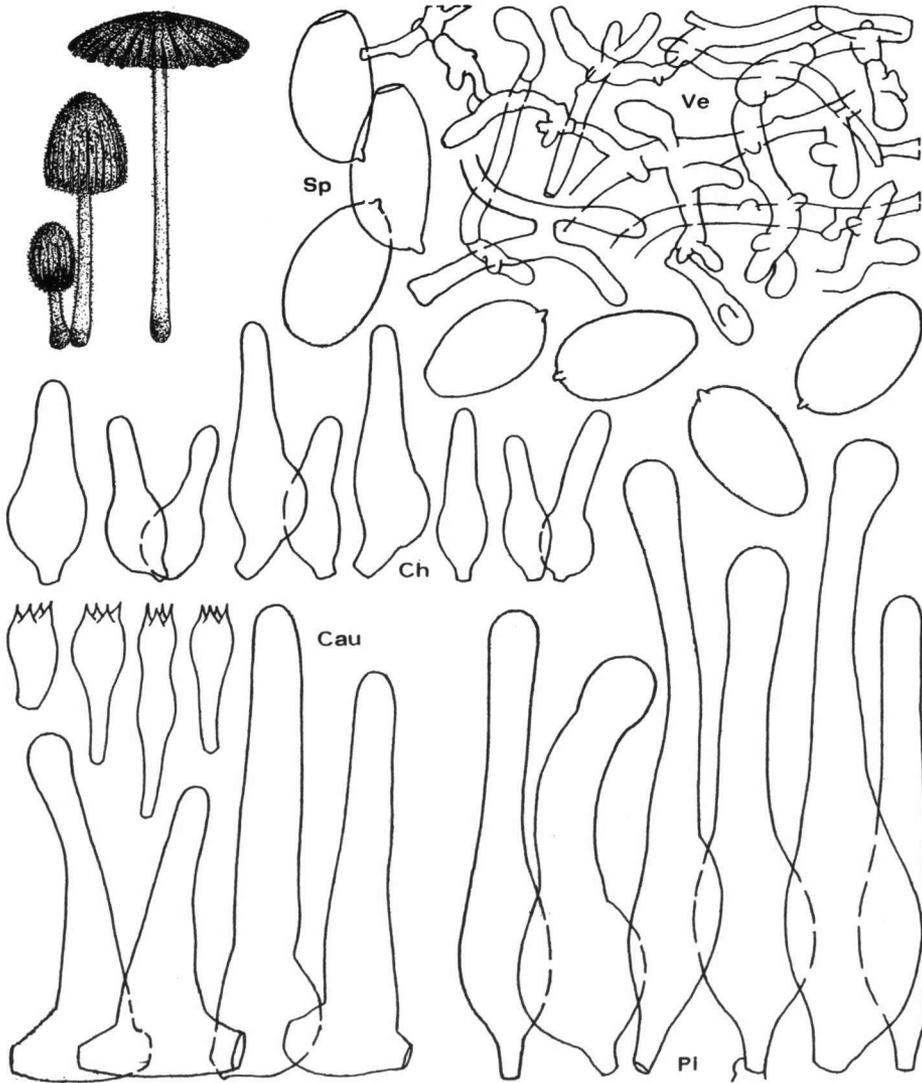


Fig. 8. *Coprinus heterothrix* Kühn. — All figures from *Uljé 1028*.

Spores [180, 9, 9]  $8.5-10(-12) \times 5-6 \mu\text{m}$ , av.  $L = 8.8-9.6$ , av.  $B = 5.3-5.6 \mu\text{m}$ ,  $Q = 1.55-1.80$ , av.  $Q = 1.65-1.70$ , ovoid; germ pore slightly eccentric to almost central, c.  $1.5 \mu\text{m}$  wide. Basidia  $16-30 \times 6-9 \mu\text{m}$ , 4-spored. Number of pseudoparaphyses 3-5 per basidium. Cheilocystidia  $20-45 \times 9-13 \mu\text{m}$ , lageniform with rather thick, tapering to cylindrical neck and in part somewhat enlarged apex,  $3-6 \mu\text{m}$  wide. Pleurocystidia absent. Pileocystidia lageniform,  $50-110 \times 11-20 \mu\text{m}$ , usually with slightly enlarged, subclavate,  $6-11 \mu\text{m}$  wide apex. Sclerocystidia absent. Veil on pileus consisting of cylindrical, somewhat diverticulate, thin-walled, in part slightly thick-walled ( $< 1 \mu\text{m}$ , seldom up to  $1.5 \mu\text{m}$  thick) hyphae with often clavate, up to  $7 \mu\text{m}$  thick terminal cells, usually with granular incrustations. Clamp-connections present.

**Habitat.**—On naked, often mossy soil and on mossy branches. Subgregarious. Rather common.

**Collections examined.**—NETHERLANDS: prov. Utrecht, Breukelen, Over-Holland, 23 Aug. 1986, *G. J. Keizer*, 3 Oct. 1986, *Uljé*; prov. Zuid-Holland, Leiden, 10 Aug. 1987, *Uljé*; Ter Aar, de Put, 6 Oct. 1986, *Uljé 911*; 15 May 1989, *Uljé 1009*; 18 May 1989, *Uljé 911*; 29 July 1989, *Uljé 1012*; Alphen a/d Rijn, 29 Aug. 1988, *Uljé 965*; 4 Sept. 1989, *Uljé 1028*.

This species can be distinguished from *C. hiascens* and *Coprinus spec. Uljé 926* by its spores with a slightly eccentric germ pore. *Coprinus hiascens* has tapering pileocystidia whereas *C. heterotrix* has not and *Uljé 926* possesses vesiculose cheilocystidia, by which character also *C. velatopruinatus* deviates from *C. heterotrix*. *Coprinus spec. Uljé 952*, another species with cylindrical velar elements differs in subcylindrical, more slender spores and differently shaped velar elements. The lamellae are rather distant in *C. heterotrix*; this is probably a useful taxonomic character.

### 9. *Coprinus* species (*Uljé 926*)—Fig. 9

Closed pileus up to  $4 \times 3 \text{ mm}$ , at centre cinnamon, towards margin paler, soon grey, up to c.  $7 \text{ mm}$  wide when expanded. Veil present on pileus, visible as small, whitish, radial fibrillose flocks. Lamellae narrowly adnate;  $L = 8-13$ ,  $l = 0-1$ . Stipe  $8-20 \times 0.1-0.5 \text{ mm}$ , whitish, vitreous, with widely dispersed setulae.

Spores [40, 2, 1]  $7.0-8.5 \times 5.1-6.2 \mu\text{m}$ , av.  $L = 7.4-8.1$ , av.  $B = 5.5-5.7 \mu\text{m}$ ,  $Q = 1.25-1.60$ , av.  $Q = 1.35-1.40$ , broadly ellipsoid, ellipsoid to ovoid; germ pore central,  $1.6 \mu\text{m}$  wide. Basidia  $16-40 \times 8-11 \mu\text{m}$ , 4-spored. Pseudoparaphyses not noted. Cheilocystidia  $20-50 \times 20-30 \mu\text{m}$ , vesiculose. Pleurocystidia absent. Pileocystidia  $50-100 \times 14-22 \mu\text{m}$ , (broadly) lageniform with  $7-12 \mu\text{m}$  wide, equal to slightly subcapitate apex. Sclerocystidia absent. Veil on pileus of somewhat diverculate  $2-8(-10) \mu\text{m}$  broad hyphae. Clamp-connections present.

**Habitat.**—On sandy-clayey soil, among or on wood-chips. Solitary or a few together.

**Collection examined.**—NETHERLANDS: prov. Zuid-Holland, Alphen a/d Rijn, 17 July 1988, *Uljé 926*.

In this species particularly the shape and the size of the spores are characteristic. None of the other species with cylindrical veil elements has spores as small as *Uljé 926*. The central germ pore is the most important difference with other species (except *C. hiascens*) which possess cylindrical veil elements. *Coprinus hiascens*, however, has spores with a conical apex, lageniform cheilocystidia and tapering pileocystidia, whereas *Uljé 926* has spores with

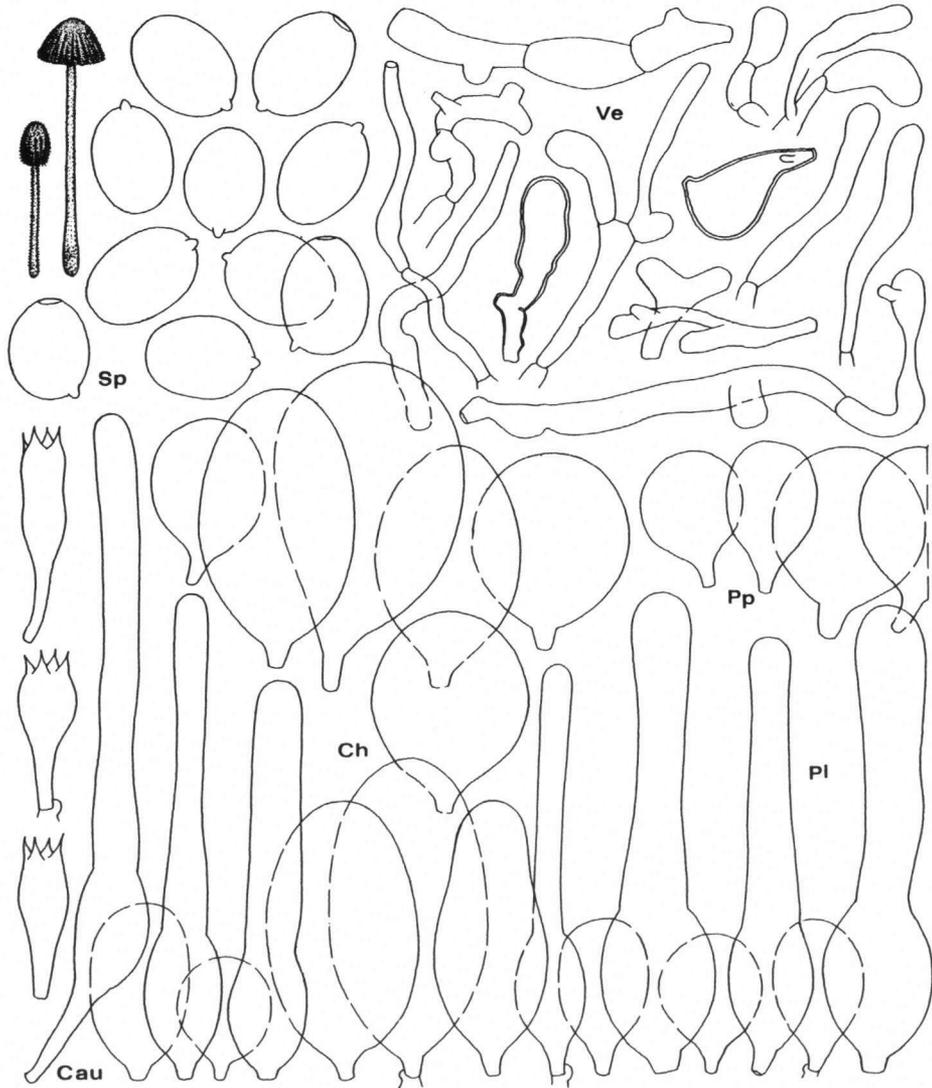


Fig. 9. *Coprinus* species (Uljé 926).

a rounded apex, vesiculose cheilocystidia and pileocystidia that are broadened at the apex. Because of the very small size of the fruit-bodies and the greyish colour of the pileus this species is very inconspicuous and difficult to find.

#### 10. *Coprinus* species (Uljé 952)—Fig. 10

Closed pileus up to 6 × 4 mm, ochre-brown at centre, somewhat paler towards margin, up to c. 12 mm in diam. when expanded. Veil present, visible as small, whitish, radially fibrillose flocks on pileus. Lamellae narrowly adnate;  $L \leq 18$ ,  $l = 0-1(-3)$ . Stipe 15–30 × 0.5–1 mm, whitish, vitreous, pubescent.

Spores [20, 1, 1] 8.8–11.6 × 5.0–5.7  $\mu\text{m}$ , av.  $L = 10.4$ , av.  $B = 5.3 \mu\text{m}$ ,  $Q = 1.70-2.15$ , av.  $Q = 1.95$ , subcylindric to narrowly ovoid; germ pore distinctly eccentric, c. 1.6  $\mu\text{m}$  wide. Basidia 17–36 × 7–9  $\mu\text{m}$ , 4-spored. Pseudoparaphyses (3–)4–5(–6) per basidium. Cheilocystidia 30–50 × 8–10  $\mu\text{m}$ , lageniform with 3–5  $\mu\text{m}$  wide neck often slightly enlarged towards (up to 6.5  $\mu\text{m}$  wide) apex. Pleurocystidia absent. Pileocystidia 70–120 × 13–18  $\mu\text{m}$ , broadly lageniform with 7–11  $\mu\text{m}$  wide neck and equal to subclavate, 9–13(–15)  $\mu\text{m}$  wide apex. Sclerocystidia absent. Veil consisting of inflated, fusiform, 6–16  $\mu\text{m}$  thick hyphae present on pileus. Clamp-connections present.

H a b i t a t.—On bare, rich river-clay; a few together.

Collection examined.—NETHERLANDS: prov. Utrecht, Linschoten, 13 Aug. 1988, *Uljé* 952.

The single collection of this taxon available consists of only a few fruit-bodies. The veil on the pileus consists of hyphae made up of elongate cells and fusiform to clavate terminal cells. The cells of this veil are larger and broader than in other species of the *Setulosi* with velar hyphae on the pileus. Moreover, this taxon can be distinguished from those species by its slender, (sub)cylindrical spores.

#### 11. *Coprinus velatopruinatus* Bender—Fig. 11

*Coprinus velatopruinatus* Bender in Beitr. Kenntn. Pilze Mitteleur. 5: 80. 1989.

Closed pileus 10 × 20 mm high, cinnamon-brown to ochre, up to 35 mm wide when expanded. Veil present on pileus, visible as small, whitish, radially fibrillose flocks. Lamellae narrowly adnate, crowded, white to blackish. Stipe 35–65 × 1.2–2 mm, whitish, pubescent, somewhat white-felted at base when young.

Spores [20, 1, 1] 11–13.4 × 6.8–7.7 × 6.2–7.1  $\mu\text{m}$  (according to the original description 10.5–12.9 × 6.5–7.5(–8) × 5.8–6.5  $\mu\text{m}$ ), av.  $L = 12.1$ , av.  $B = 7.2 \mu\text{m}$ ,  $Q = 1.55-1.85$ , av.  $Q = 1.70$ , ovoid, in part with slightly apical papilla; germ pore eccentric, c. 1.8  $\mu\text{m}$  wide. Basidia 18–36 × 8–10  $\mu\text{m}$ , 4-spored. Pseudoparaphyses 4–6 per basidium. Cheilocystidia first globose, 15–40  $\mu\text{m}$  broad, later ellipsoid to broadly (sub)cylindrical, up to 70  $\mu\text{m}$  in length. Pleurocystidia absent. Pileocystidia 65–115(–140) × 10–30  $\mu\text{m}$ , lageniform with cylindrical neck and equal to slightly broadened, 5–10  $\mu\text{m}$  wide apex. Sclerocystidia absent. Veil on pileus consisting of 2.5 to 5.5  $\mu\text{m}$  wide, somewhat diverticulate, encrusted hyphae. Clamp-connections present.

H a b i t a t.—Usually gregarious on old saw-dust and small pieces of wood mixed with soil. Not known from the Netherlands.

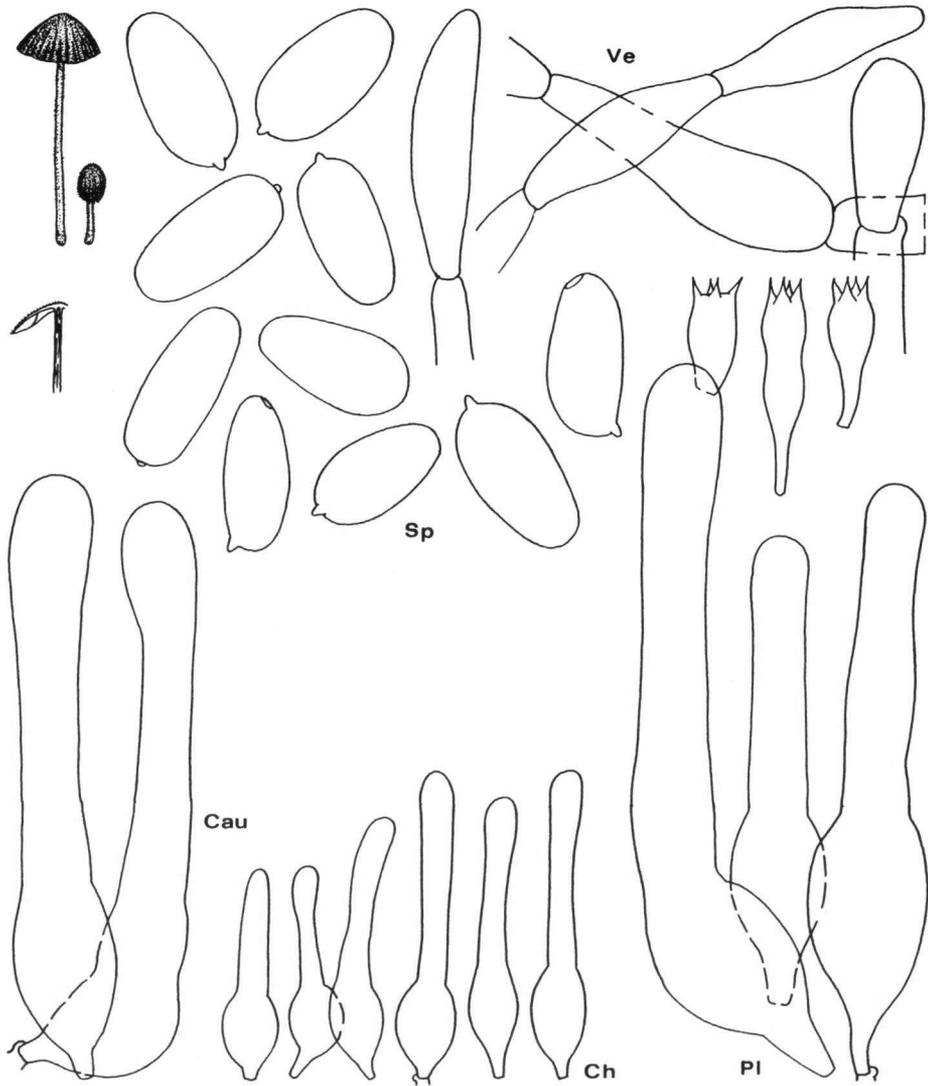


Fig. 10. *Coprinus* species (Uljé 952).

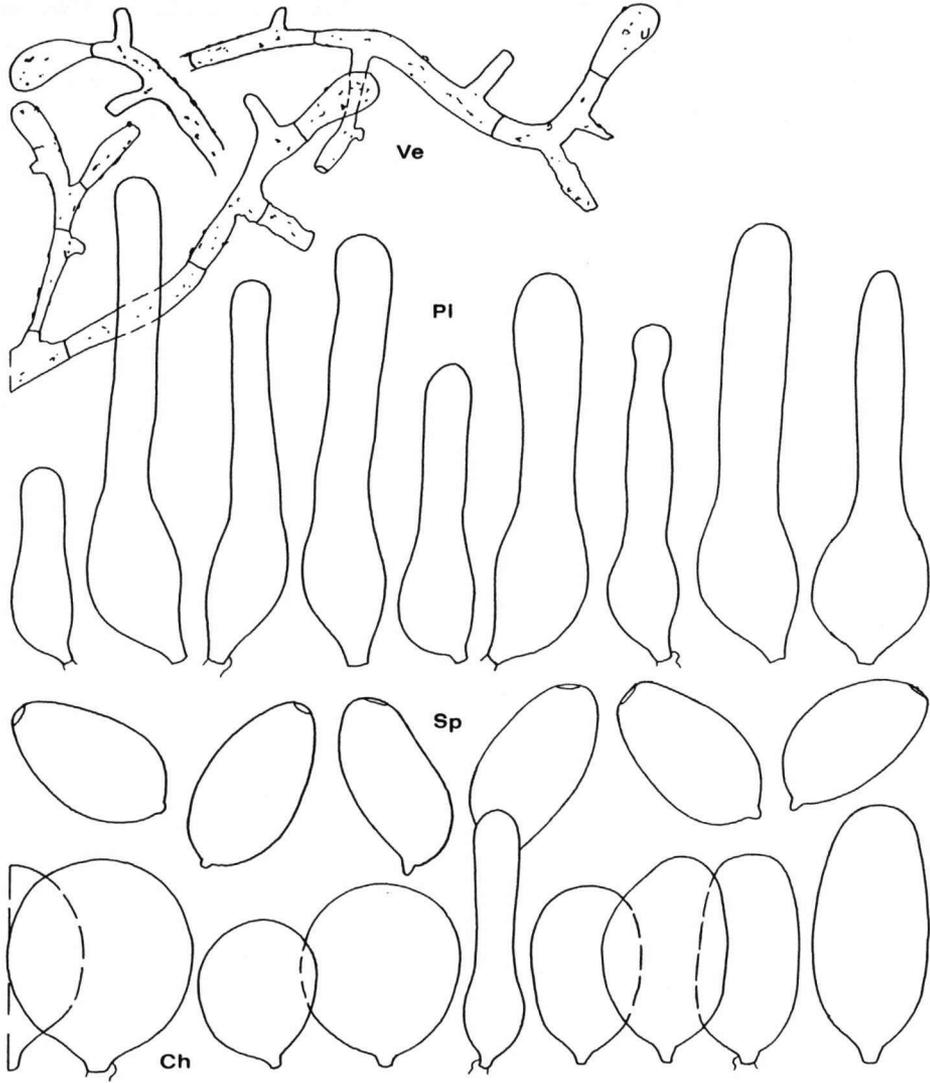


Fig. 11. *Coprinus velatopruinatus* Bender. — All figures copied from Bender (1989: 79).

**Collection examined.**—GERMANY: Westfalen, Mönchengladbach, MTB 4804, 31 Aug. 1988, H. Bender (herb. Bender, topotype).

*Coprinus velatopruinatus* is one of the species of subsect. *Setulosi* with a veil on the pileus that consists of cylindrical hyphae and seems closely related to *C. heterothrix*. The microscopical differences are the shape of the cheilocystidia which are mainly globose to ellipsoid and rarely lageniform to subcylindrical in *C. velatopruinatus*, but always lageniform in *C. heterothrix* and the smaller spores in last named species. Bender (l.c.) did not compare his new species with *C. heterothrix*, but with *C. subimpatiens*, *C. callinus*, and *C. sclerocystidiosus*.

## 12. *Coprinus subimpatiens* M. Lange & A.H. Smith—Fig. 12

*Coprinus subimpatiens* M. Lange & A.H. Smith in *Mycologia* 45: 772. 1953.

Closed pileus up to 23 × 18 mm, dark reddish brown to yellow-brown or leather- to cinnamon-coloured at centre (Mu. 2.5 YR 2.5/4, 5 YR 3/2–3, 5/8, 7.5 YR 4–5/6, 10 YR 5–6/5–6), paler towards margin (7.5 YR 4–5/6, 10 YR 6/7, 7/6, 5–7/4, 5–6/2, 5/1), up to c. 40 mm in diam. when expanded. Lamellae narrowly adnate to free, white to blackish; L = c. 26–28, l = 1–3. Stipe 40–100 × 1–3 mm, white to greyish-white, pubescent.

Spores [160, 7, 7] 9.3–14.1 × 6.2–8.2 μm, av. L = 10.3–12.3, av. B = 6.3–7.6 μm, Q = 1.40–1.85, av. Q = 1.50–1.65, ellipsoid to ovoid; germ pore eccentric, c. 1.8 μm wide. Basidia 18–43 × 9–10 μm, 4-spored. Pseudoparaphyses (4–)5–6(–7) per basidium. Cheilocystidia from globose and up to c. 50 μm in diam. to lageniform and 40–70(–100) × 13–17 μm with somewhat tapering neck and 4–8 μm wide apex. Pleurocystidia 50–75 × 20–40 μm, vesiculose to utriform, not always present. Pileocystidia 60–120 × 13–24 μm, lageniform with cylindrical to somewhat tapering neck and 5–10 μm wide, equal to slightly broader apex. Sclerocystidia in most collections present (not found in type material). Clamp-connections present.

**Habitat.**—Gregarious on often clayey soil. Rather common.

**Collections examined.**—U.S.A.: Michigan, Gratiot Co., Ithaca, Schovence's Woods, 22 Aug. 1948, v. Potter (holotype MICH). — NETHERLANDS: prov. Utrecht, Breukelen, Over-Holland, 27 Aug. 1986, *Uljé* 747; 19 Sept. 1986, *Uljé* 640; prov. Zuid-Holland, Alphen a/d Rijn, 27 Nov. 1984, *Uljé* 503; Leiden, 16 Oct. 1985, *Uljé* 697; 24 Aug. 1986, *Uljé*; Ter Aar, de Put, 15 Aug. 1986, *Uljé* 746.

*Coprinus subimpatiens* is close to *C. callinus*. The most important difference between these two species is the shape of the cheilocystidia: in *C. callinus* exclusively globose, in *C. subimpatiens* intermixed lageniform and globose.

In species with predominantly globose cheilocystidia, like *C. callinus*, a few lageniform ones are sometimes present. In some species with mixed globose and lageniform cheilocystidia, the latter are not always abundant. Therefore identification is not easy. Fortunately there are other characters that may help.

In the case of *C. subimpatiens* and *C. callinus* such characters are: (1) the spores of *C. subimpatiens* are somewhat broader (6.2–8.2 μm versus 5.7–7.4 μm); (2) the neck of the pileocystidia is more (sub)cylindrical in *C. subimpatiens* and tapering towards the apex in *C. callinus*; (3) in *C. subimpatiens* sclerocystidia usually are rare or even absent, in *C. callinus* almost always present, sometimes abundant.

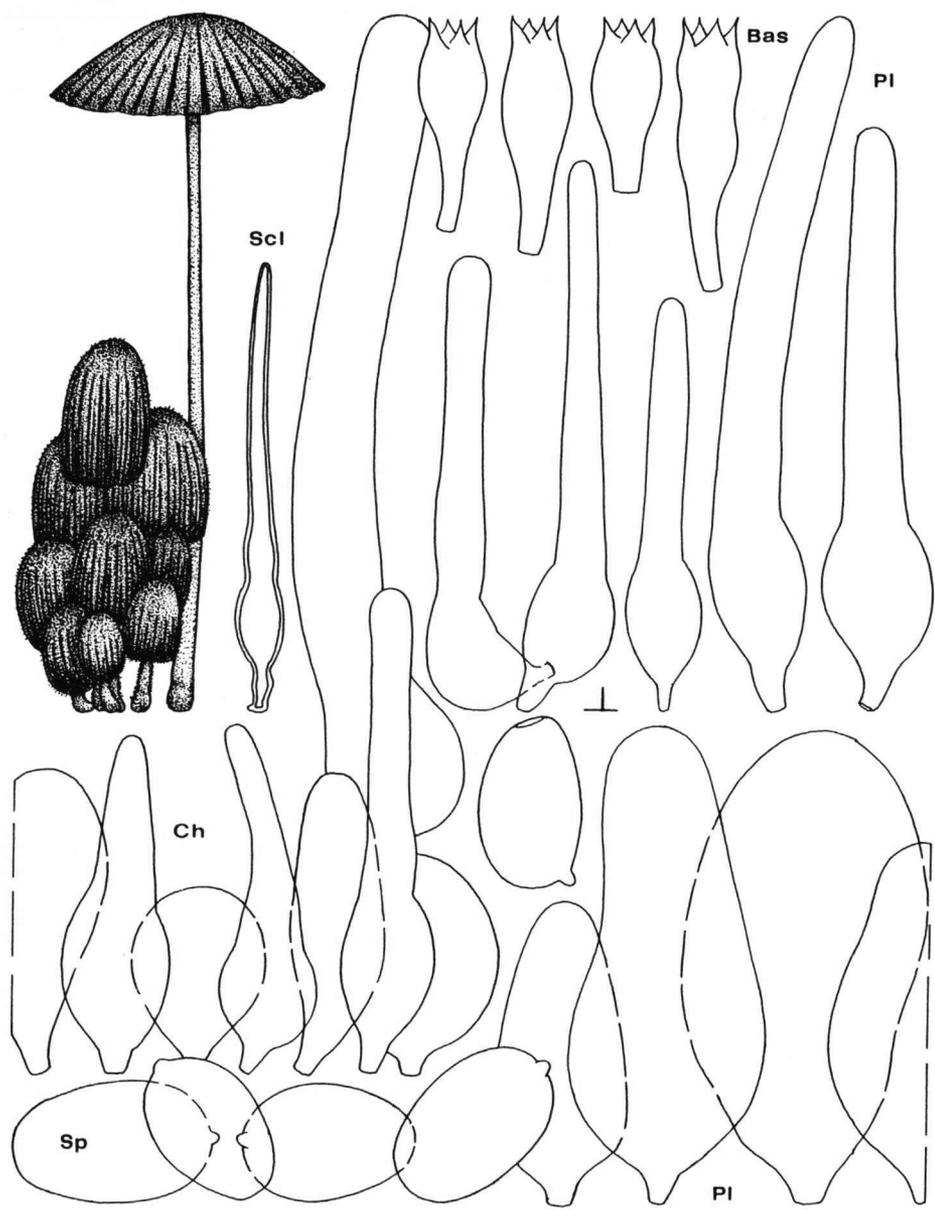


Fig. 12. *Coprinus subimpatiens* M. Lange & A.H. Smith. — All figures from type.

In the original description of *C. subimpatiens* pleurocystidia are mentioned, but according to its authors they are absent in some specimens. The first author (Uljé) found pleurocystidia to be present in the type collection, but not in other collections. Judging from the literature on this species pleurocystidia may not be always present.

### 13. *Coprinus sclerocystidiosus* M. Lange & A.H. Smith—Fig. 13

*Coprinus sclerocystidiosus* M. Lange & A.H. Smith in *Mycologia* 45: 769. 1953.

Closed pileus up to 22 × 16 mm, yellow-brown to ochre-brown at centre (Mu. 10 YR 4/6, 2.5 Y 6/8, K. & W. 5D5 to 4A/B7), paler towards margin, up to c. 35 mm in diam. when expanded. Lamellae free, narrow, white to blackish; L = c. 36, l = 1–3 (–5). Stipe 40–100 × 1–3 (–4) mm, white to greyish-white, pubescent.

Spores [60, 2, 2] 10.6–14.2 × 6.7–8.4 μm, av. L = 12.1–12.6, av. B = 7.4–7.9 μm, Q = 1.35–1.80, av. Q = 1.55–1.70, ellipsoid to ovoid; germ pore eccentric, c. 2 μm wide. Basidia 18–38 × 8–10 μm, 4-spored. Pseudoparaphyses 4–6 (–7) per basidium. Cheilocystidia 20–60 × 20–50 μm, globose, ellipsoid, ovoid to obovoid. Pleurocystidia absent. Pileocystidia 40–120 × 8–16, lageniform with cylindrical to sometimes slightly tapering neck and equal, 3–8 μm wide apex. Sclerocystidia present, usually numerous. Clamp-connections present.

H a b i t a t.—Terrestrial on lawns, but also on wood-chips, usually fasciculate. Rather rare.

C o l l e c t i o n s e x a m i n e d.—NETHERLANDS: prov. Zuid-Holland, Leiden, Wandelpark Noord, 9 June 1984, *Uljé* 543; Alphen a/d Rijn, 11 Sept. 1984, *Uljé* 555.

The species most closely related to *C. sclerocystidiosus* are *C. callinus* and *C. subpurpureus*.

*Coprinus callinus* can be distinguished by its tapering pileocystidia and its somewhat smaller spores (9.3–13.1 × 5.7–7.4 μm versus 10.6–14.2 × 6.7–8.4 μm).

The density of the sclerocystidia is not always the same in each species which has them. In *C. sclerocystidiosus* they are usually abundant, but in *C. callinus* they can sometimes be abundant.

The main differences between *C. sclerocystidiosus* and *C. subpurpureus* are the colour of the pileus (yellow-brown to ochre-brown versus red-brown to purple-brown) and the abundant versus scarce sclerocystidia. In addition the pileocystidia of *C. sclerocystidiosus* are not or very rarely enlarged at the apex as they often are in *C. subpurpureus*.

### 14. *Coprinus callinus* M. Lange & A.H. Smith—Fig. 14

*Coprinus callinus* M. Lange & A.H. Smith in *Mycologia* 45: 770. 1953.

Closed pileus up to 18 × 12 mm, dirty red-brown, cinnamon, ochre to rather pale (yellow-) brown (Mu. 7.5 YR 3/2, 4/6, 10 YR 5/3, 5/6, 6–8/6 to 2.5 Y 5/4, K. & W. 6D6, 5D5, 4A4) at centre, paler towards margin (Mu. 7.5 YR 6/5, 10 YR 5/5, 6/2–3, 7/3, 5/2, 2.5 Y 7–8/4, 6/2, K. & W. 6C4–5, 5D6–7 to 3–4, 5B3, 4B4, 4A3); up to 35 mm wide when expanded. Lamellae free, white to blackish; L = 18–36, l = 0–3. Stipe 50–120 × 1–3, white to greyish-white, with base up to c. 4 mm wide, pubescent.

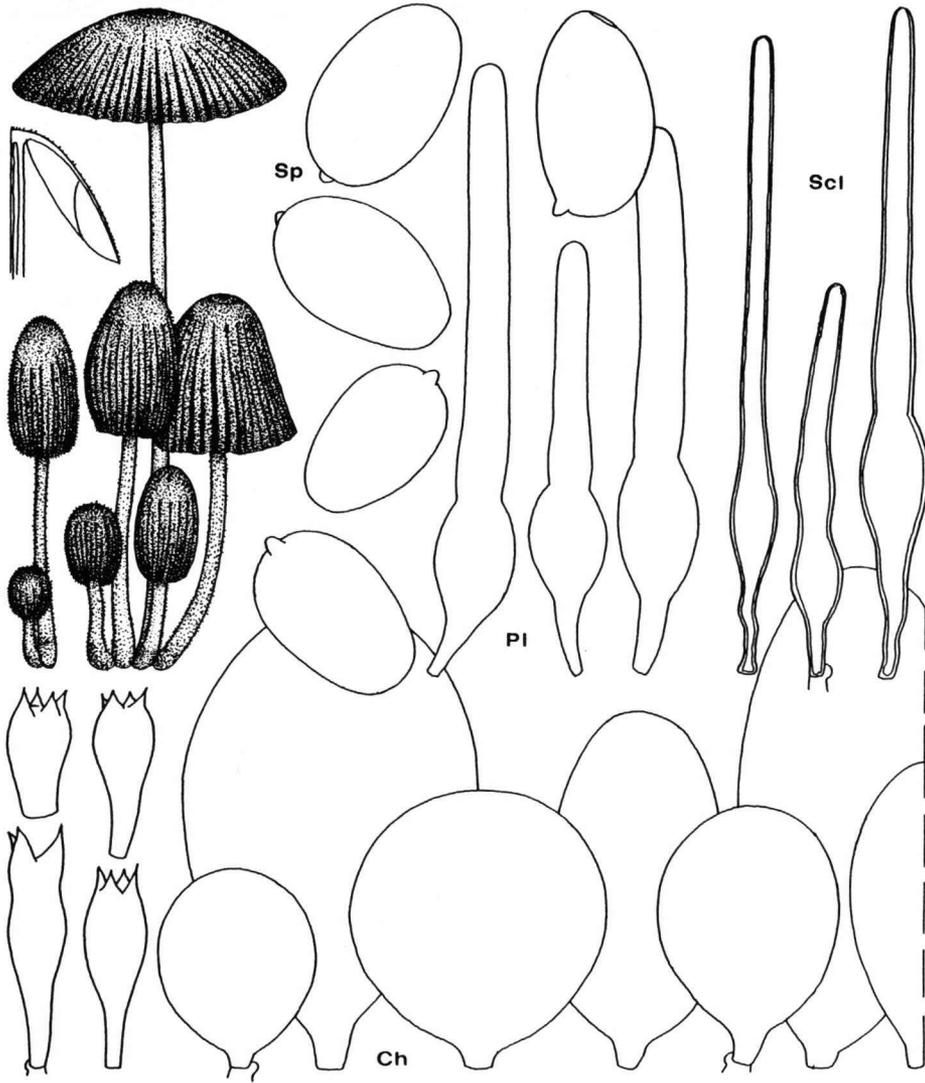


Fig. 13. *Coprinus sclerocystidiosus* M. Lange & A.H. Smith. — All figures from *Ulje* 543.

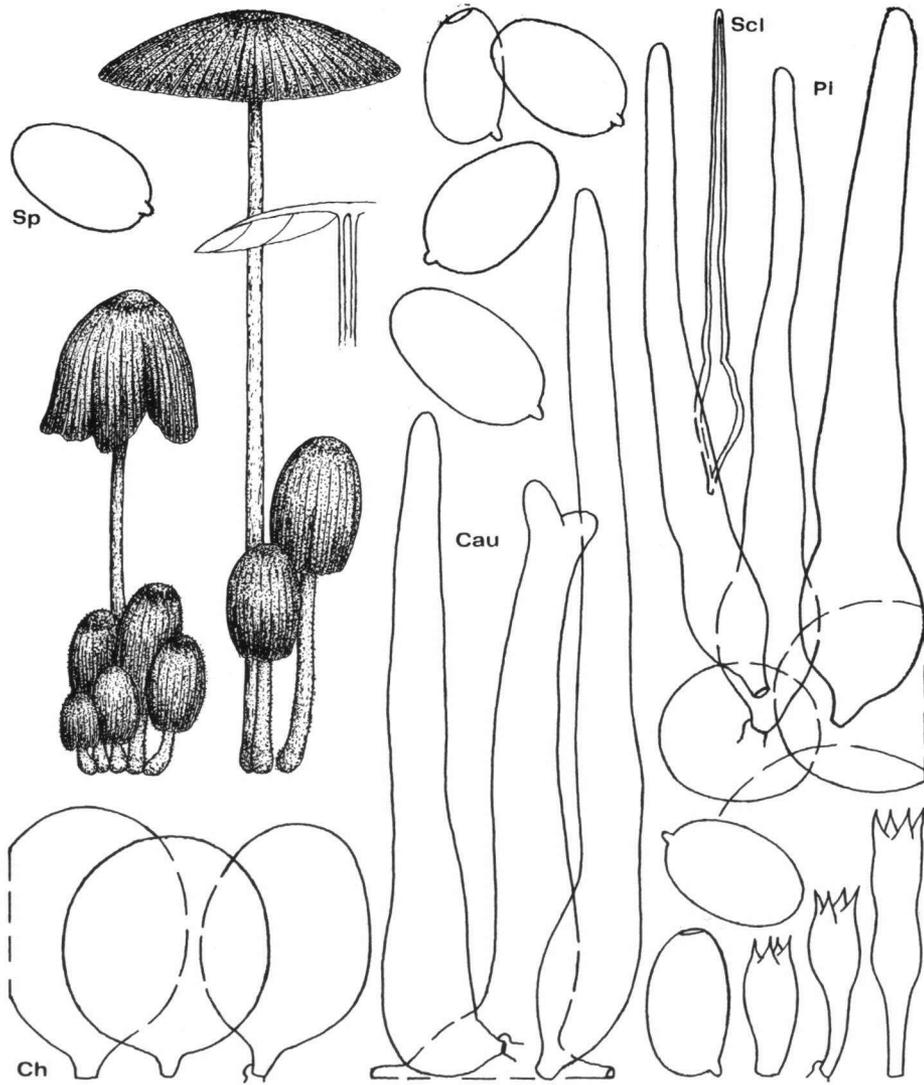


Fig. 14. *Coprinus callinus* M. Lange & A.H. Smith. — All figures from *Uijé 1011*.

Spores [220, 11, 11]  $9.3\text{--}13.1 \times 5.7\text{--}7.4 \mu\text{m}$ , av.  $L = 10.3\text{--}12.1$ , av.  $B = 6.1\text{--}6.9 \mu\text{m}$ ,  $Q = 1.50\text{--}1.95$ , av.  $Q = 1.65\text{--}1.90$ , ellipsoid to ovoid; germ pore weakly to rather strongly eccentric, c.  $1.8 \mu\text{m}$  wide. Basidia  $14\text{--}38 \times 8\text{--}10 \mu\text{m}$ , 4-spored. Pseudoparaphyses 4–6 per basidium. Cheilocystidia globose and  $20\text{--}50 \mu\text{m}$  in diam., to ellipsoid and  $20\text{--}60 \times 15\text{--}40 \mu\text{m}$ . Pleurocystidia absent. Pileocystidia  $60\text{--}150\text{--}(200) \times 6\text{--}25 \mu\text{m}$ , lageniform with  $4\text{--}8\text{--}(10) \mu\text{m}$  wide, tapering neck. Sclerocystidia usually present. Clamp-connections present.

**Habitat.**—Terrestrial, usually at or near wood fragments, particularly on paths covered with wood chips. (Sub) fasciculate. Common.

**Collections examined.**—NETHERLANDS: prov. Noord-Holland, Amsterdam, Amsterdams Bos, 23 July 1985, *Uljé 705*; prov. Zuid-Holland: Alphen a/d Rijn, 21 July 1984, *Uljé 526b*; 23 July 1984, *Uljé 564*; 11 Sept. 1984, *Uljé 511*; 12 Oct. 1984, *Uljé 539b*; 10 Aug. 1987, *Uljé 885*; 12 July 1988, *Uljé*; 8 Sept. 1988, *Uljé 970*; Ter Aar, 11 Sept. 1984, *Uljé 520*; 21 Apr. 1989, *Uljé 1011*; Leiden, 6 June 1987, *Uljé 875*.

In the Netherlands *C. callinus* is a common species, especially on paths covered with wood-chips. In this habitat the species is often abundant and grows in distinct fascicles.

The colour of the pileus is in general not very dark and does not have much red in it. Usually the colour is yellow-brown to ochre-brown or cinnamon. The tapering pileocystidia together with the sclerocystidia, which are usually present, sometimes even numerous, and the spores with a length between 10 and  $13 \mu\text{m}$ , are the most important characters of this species.

#### 15. *Coprinus* species (*Uljé 1009*)—Fig. 15

Closed pileus up to  $10 \times 9 \text{ mm}$ , dark red-brown to ochre-brown at centre (Mu. 7.5 YR 3–4/4, 4/6, 10 YR 4/4, 5/3–4, 6/5, K. & W. 6E/F8, 6E7, 5C4), paler towards margin (7.5 YR 4/4, 10 YR 4–5/3, 6/4–6, 7/2–4, 2.5 Y 7.5/4 to 5 Y 6/1, K. & W. 5C/D4, 4A3); up to c. 22 mm wide when expanded. Lamellae free, up to 2 mm broad, white to blackish;  $L = 16\text{--}21$ ,  $l = 1\text{--}3$ . Stipe  $20\text{--}50 \times 1.5\text{--}2.5 \text{ mm}$ , whitish, pubescent.

Spores [60, 3, 1]  $9.4\text{--}12.8 \times 6.0\text{--}7.6 \mu\text{m}$ , av.  $L = 11.1$ , av.  $B = 6.7 \mu\text{m}$ ,  $Q = 1.55\text{--}1.80$ , av.  $Q = 1.65$ , ellipsoid to ovoid; germ pore eccentric, c.  $1.8 \mu\text{m}$  wide. Basidia  $18\text{--}40 \times 8.5\text{--}10.5 \mu\text{m}$ , 4-spored. Pseudoparaphyses 3–6 per basidium. Cheilocystidia mostly globose, up to  $40 \mu\text{m}$  in diam., but also broadly ellipsoid, up to  $40 \times 25 \mu\text{m}$ . Pleurocystidia absent. Pileocystidia  $50\text{--}90 \times 13\text{--}20 \mu\text{m}$ , lageniform with tapering neck,  $5\text{--}7 \mu\text{m}$  wide at apex. Sclerocystidia absent. Caulocystidia somewhat shorter and broader,  $40\text{--}80 \times 16\text{--}25 \mu\text{m}$ , lageniform with tapering to cylindrical neck and equal, sometimes slightly enlarged,  $5\text{--}8.5 \mu\text{m}$  wide apex. Clamp-connections present.

**Habitat.**—Solitary or gregarious in dry ditch, on humus and fallen branches.

**Collection examined.**—NETHERLANDS: prov. Zuid-Holland, Ter Aar, de Put, 20 Aug. 1986, *Uljé 1009*.

Macroscopically this taxon resembles *C. callinus*, but the fruit-bodies are smaller than in *C. callinus* and they grow (sub)solitary. Microscopically this species deviates in the absence of sclerocystidia, which are almost always present in *C. callinus*. The other microscopical characters are practically the same, with exception of the length of the pileo- and caulocystidia, which is greater in *C. callinus*.

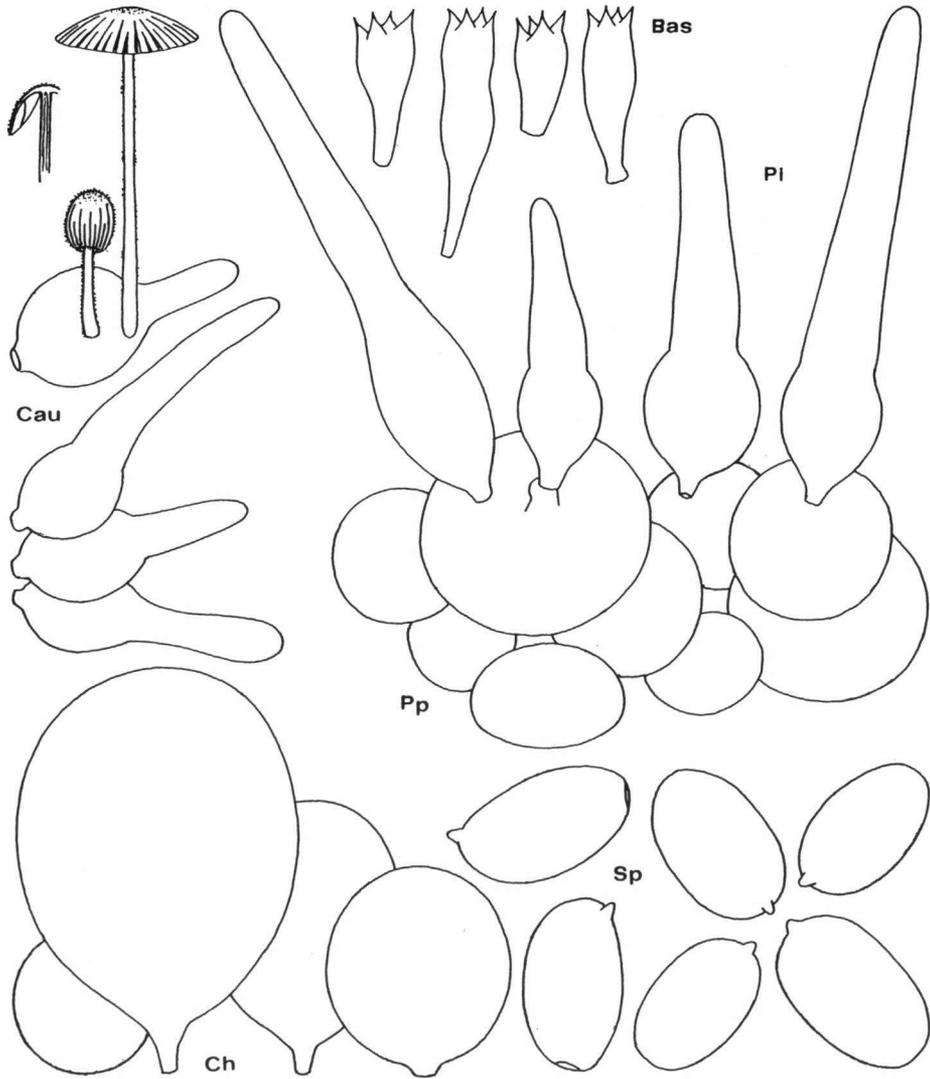


Fig. 15. *Coprinus* species (Uljé 1009).

16. *Coprinus* species (*Uljé 877*)—Fig. 16

Closed pileus up to 6 × 5 mm, ochre-brown at centre (Mu. 7.5 YR 4/6, 10 YR 4–5/4, 6/5), paler towards margin (10 YR 4–5/3, 6/6, 7/2), up to 16 mm in diam. when expanded. Lamellae narrowly adnate, white to blackish; L = 16–24, l = 1–3. Stipe 20–30 × 1–1.5 mm, whitish, pubescent from setulae.

Spores [40, 2, 1] 10.3–13.1 × 5.8–7.1 μm, av. L = 11.8, av. B = 6.5 μm, Q = 1.60–1.75, av. Q = 1.65, ellipsoid to ovoid; germ pore eccentric, c. 1.8 μm wide. Basidia 16–34 × 9–10 μm, 4-spored. Pseudoparaphyses 4–6(–7) per basidium. Cheilocystidia vesiculose, 30–55 × 17–35 μm. Pleurocystidia 50–110 × 27–45 μm, ellipsoid, oblong to slightly utri-form. Pileocystidia 60–100 × 11–17 μm, lageniform with tapering neck, 4–6 μm wide at apex. Sclerocystidia absent. Clamp-connections present.

*Habitat*.—Under shrubs, on branches embedded in mud taken from ditch. Fasciculate.

*Collection examined*.—NETHERLANDS: prov. Zuid-Holland, Oegstgeest, Laan van Poelgeest, 26 July 1987, *Uljé 877*.

Although this species does not grow on dung, it agrees rather well with *C. ephemerus* in its microscopical characters. The spores, however, are somewhat smaller. Not only this character, but also the smaller fruit-bodies and the different habitat make it probable that this collection represents another species. *Coprinus congregatus* is rather similar also, but is firmicolous, has no clamps and has somewhat larger pleuro-, cheilo- and pileocystidia.

17. *Coprinus plagioporus* Romagn.—Fig. 17

*Coprinus plagioporus* Romagn. in *Rev. Mycol.* 6: 127. 1941.

Closed pileus up to c. 16 × 12 mm, red-brown to purple-brown, in young specimens often very dark (Mu. 5 YR 2.5/2, K. & W. 9F4) at centre, paler towards margin (Mu. 7.5 YR 4/2, K. & W. 7D/E4), up to c. 30 mm in diam. when expanded. Lamellae narrowly adnate. Stipe 40–80 × 1–3 mm, white to greyish white, pubescent from setulae.

Spores [140, 7, 7] 10.4–13.8 × 5.8–7.4 μm, av. L = 11.7–12.6, av. B = 6.3–7.0 μm, Q = 1.70–1.90, av. Q = 1.75–1.85, ellipsoid to ovoid; germ pore eccentric, c. 1.8 μm wide. Basidia 18–38 × 8–9 μm, 4-spored. Pseudoparaphyses (3–)4–6 per basidium. Cheilocystidia globose, up to c. 40 μm wide. Pleurocystidia absent. Pileocystidia 60–150 × 10–18 μm, lageniform with cylindrical neck and clavate to (sub)capitate 7–12 μm wide apex. Sclerocystidia absent. Clamp-connections present.

*Habitat*.—Terrestrial, often on clayey soil, also on paths covered with wood-chips, fasciculate. Common.

*Collections examined*.—NETHERLANDS: prov. Zuid-Holland: Ter Aar, Langeraar, 29 May 1984, *Uljé 478*; 17 Sept. 1984, *Uljé 540b*; Alphen a/d Rijn, 28 July 1984, *Uljé 529*; 17 Sept. 1984, *Uljé 546a*; 11 Aug. 1985, *Uljé 621*; 7 Aug. 1987, *Uljé 870*; 1 Dec. 1987, *Uljé 873*.

In young and fresh stages *C. plagioporus* has a dark purple pileus. Microscopically the combination of subcapitate to capitate pileo- and caulocystidia and globose cheilocystidia is usually characteristic for this species. But unfortunately the tips of the pileocystidia and caulo-

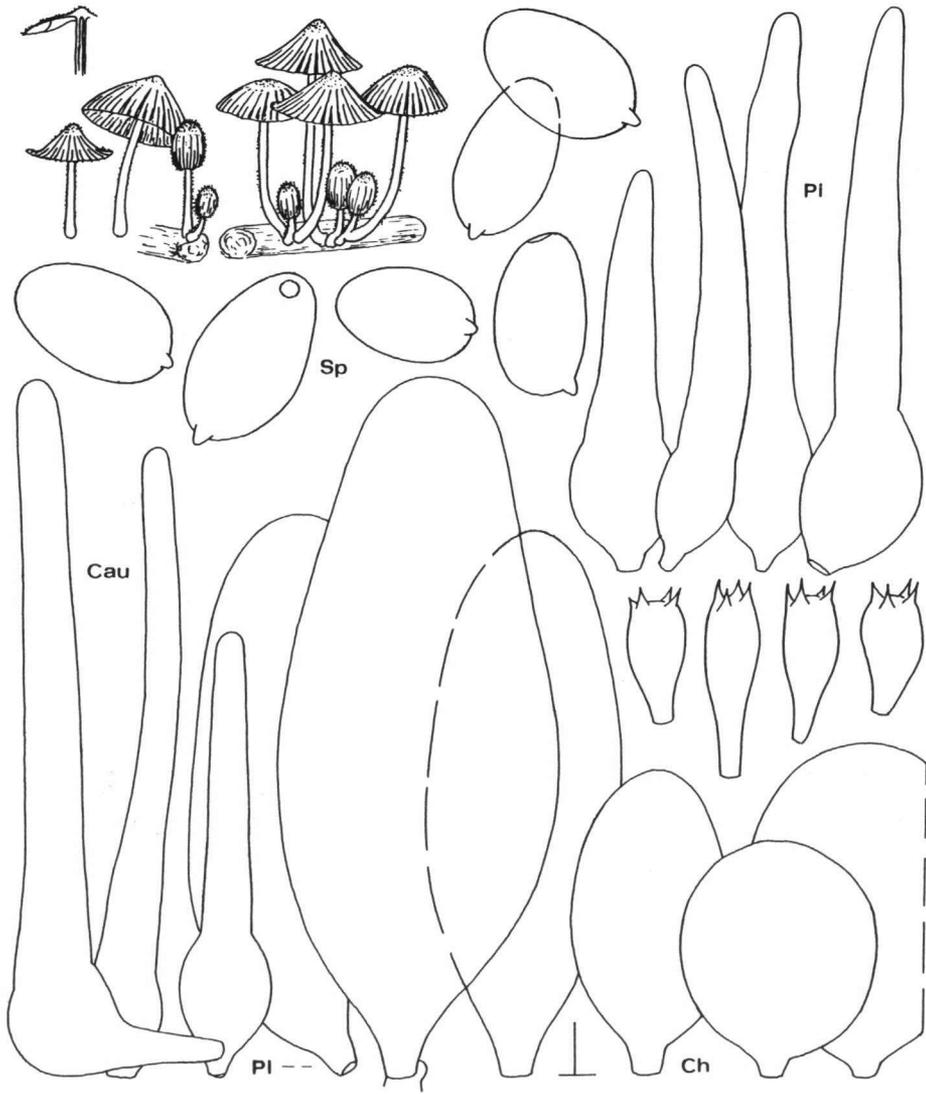


Fig. 16. *Coprinus* species (Uljé 877).

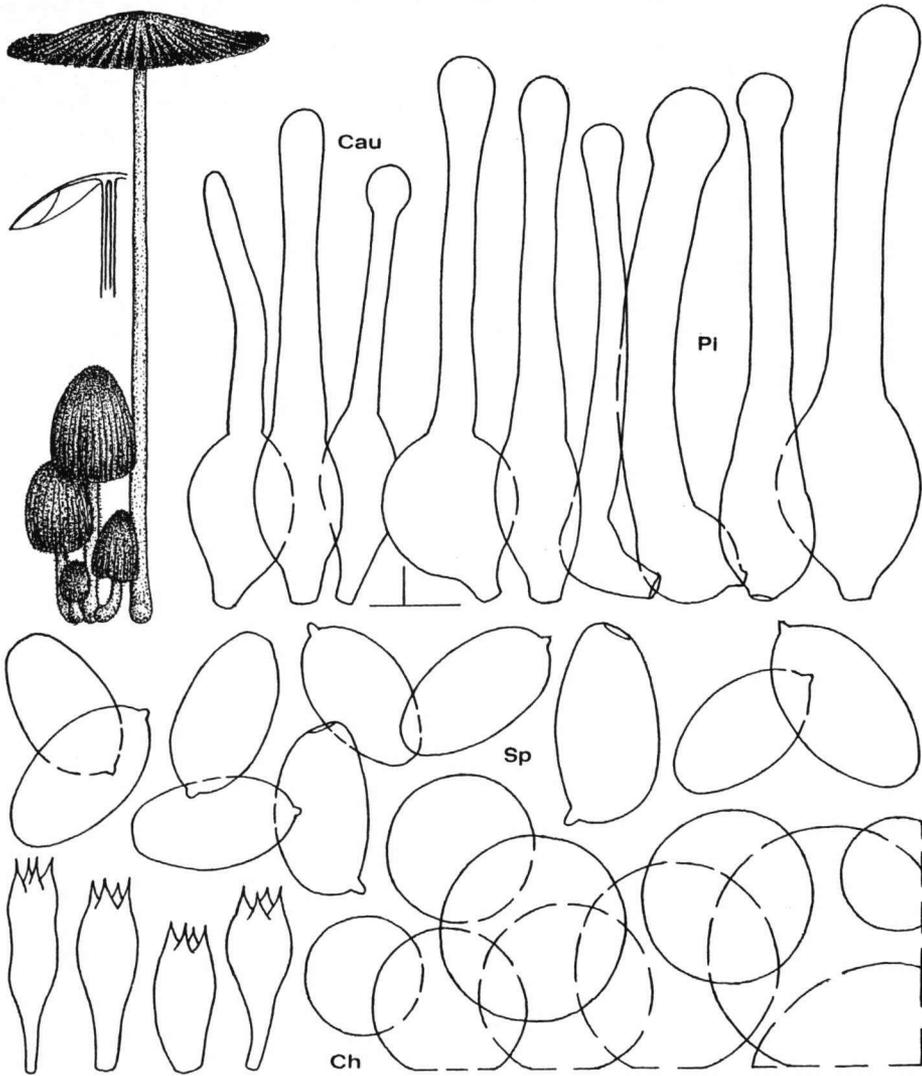


Fig. 17. *Coprinus plagioporus* Rom. — All figures from Uljé 870.

cystidia are sometimes only slightly enlarged and in these cases confusion with *C. subpurpureus* and *C. fallax* is possible (see also the discussions under these two species).

From a morphological point of view it is tempting to consider *C. plagioporus*, *C. subpurpureus*, and *C. fallax* as variants of one and the same species. M. Lange (1952: 44), however, found *C. plagioporus* and *C. subpurpureus* completely intersterile. One year later M. Lange & A.H. Smith (1953: 765) described the probably closely related *C. fallax* as a new species, mainly on account of its aberrant spore print colour ('reddish'), but without testing it against *C. plagioporus* and *C. subpurpureus*.

M. Lange & A.H. Smith (l.c.: 766–768) stated that because of the moderately eccentric germ pore and the dark spores measuring  $11.75 \times 6.05 \mu\text{m}$  on the av., *C. ephemerus* f. *saturatus* J. Lange (1939: 117) is identical with *C. plagioporus*. But many species of section *Setulosi* have such spores and J. Lange's forma may belong to any of them. J. Lange's coloured illustration (1939: pl. 160 D) does not help either, as macroscopically many species of subsect. *Setulosi* look very similar and this illustration could refer to several of them.

### 18. *Coprinus subpurpureus* A.H. Smith—Fig. 18

*Coprinus subpurpureus* A.H. Smith in *Mycologia* 40: 684. 1948.

Closed pileus up to 15 mm high, up to 35 mm in diam. when expanded, dark vinaceous brown at centre, paler towards margin. In age 'dark purple drab' over disk and dark grey to blackish over margin. Lamellae narrowly adnate, whitish to black. Stipe 40–100  $\times$  1–3 mm, dull lilac umber when young, rarely pallid, becoming paler in age, densely pubescent to pubescent but soon glabrescent; base white-strigose (macroscopic description after A.H. Smith, l.c.).

Spores (from type) [20, 1, 1]  $9.0\text{--}11.5 \times 5.6\text{--}7.0 \mu\text{m}$ , av. L = 10.2, av. B = 6.5  $\mu\text{m}$ , Q = 1.45–1.65, av. Q = 1.60, ellipsoid to ovoid; germ pore eccentric, c. 1.8  $\mu\text{m}$  wide. Basidia 16–40  $\times$  8–10  $\mu\text{m}$ , 4-spored. Pseudoparaphyses 3–6 per basidium. Cheilocystidia vesiculose, 40–85  $\times$  25–45  $\mu\text{m}$ . Pleurocystidia absent. Pileocystidia 45–100  $\times$  7–14  $\mu\text{m}$ , lageniform with (sub)cylindrical neck and even to clavate, 4.5–9  $\mu\text{m}$  wide apex. Sclerocystidia absent. Clamp-connections present.

H a b i t a t.— In moist leaves or on wet black muck. Gregarious or solitary.

C o l l e c t i o n e x a m i n e d.— U.S.A.: Michigan, Cheboygan Co., Burt Lake, Colonial point, 31 July 1947, M. Feigly (A.H. Smith 26158, holotype MICH).

*Coprinus subpurpureus* should be distinguishable from *C. plagioporus* by its pileocystidia with a cylindrical neck and not or weakly enlarged but not capitate apex and its more purple colour. Collections that have pileocystidia with a subcapitate apex have to be named *C. plagioporus* because the apex of the pileocystidia in *C. plagioporus* is not always distinctly capitate.

It should be mentioned that there is a great difference between the size of the spores given in the original description and that in our own measurements on the type material ( $12\text{--}14 \times 7\text{--}8 \mu\text{m}$  versus  $9.0\text{--}11.5 \times 5.6\text{--}7.0 \mu\text{m}$ ).

*Coprinus fallax* is another probably closely related species, but should have a more reddish spore print (see also the discussion under *C. plagioporus* and *C. fallax*).

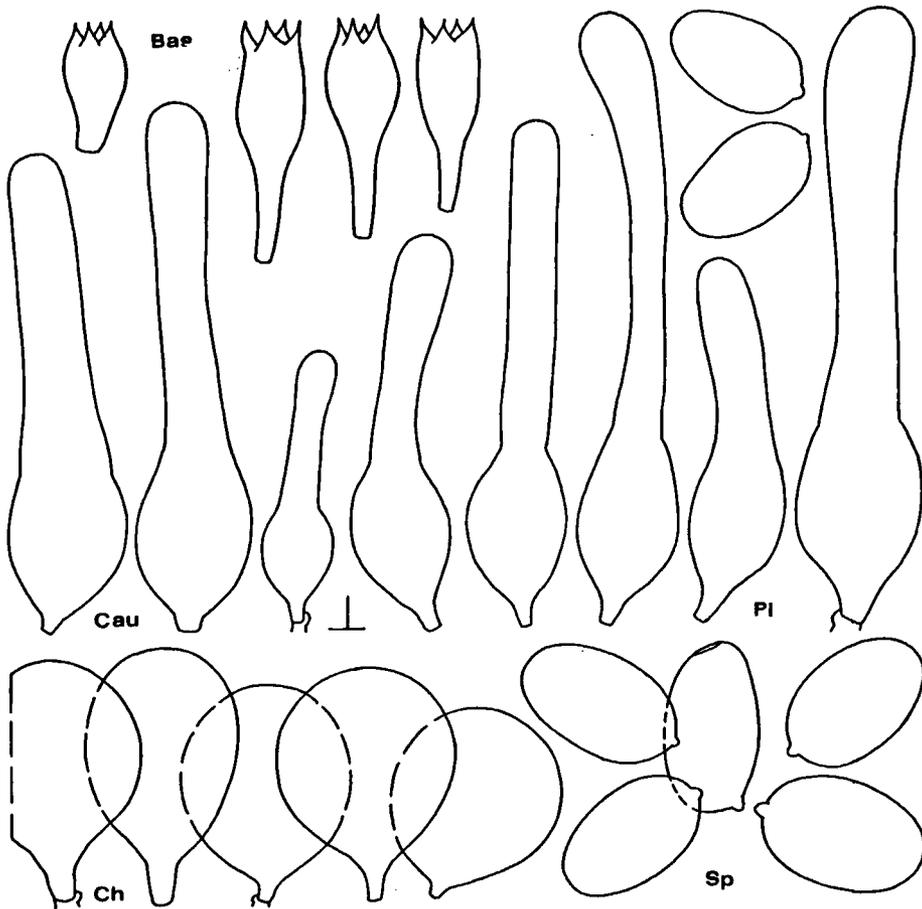


Fig. 18. *Coprinus subpurpureus* A.H. Smith. — All figures from type.

19. *Coprinus fallax* M. Lange & A.H. Smith—Fig. 19

*Coprinus fallax* M. Lange & A.H. Smith in *Mycologia* 45: 765. 1953.

Closed pileus up to 10 × 7 mm, walnut-brown to 'Rood's brown' on disk, margin about dark to pale vinaceous brown; expanded pileus up to 20 mm wide. Lamellae narrowly adnate, (sub)distant, the faces about concolorous with pileus. Stipe 20–35 × c. 1 mm, white or at base slightly discoloured (macroscopical description after M. Lange & A.H. Smith, l.c.).

Spores (from type) [40, 1, 1] 9.4–12.0 × 6.3–7.5 μm, av. L = 11.1, av. B = 7.2 μm, Q = 1.50–1.65, av. Q 1.60, ellipsoid to ovoid; germ pore eccentric, c. 1.8 μm wide. Basidia 16–32 × 8–11 μm, 4-spored. Pseudoparaphyses (3–)4–5(–6) per basidium. Cheilocystidia vesiculose, 40–70 × 25–35 μm. Pleurocystidia absent. Pileocystidia 60–110 × 16–27 μm, lage-

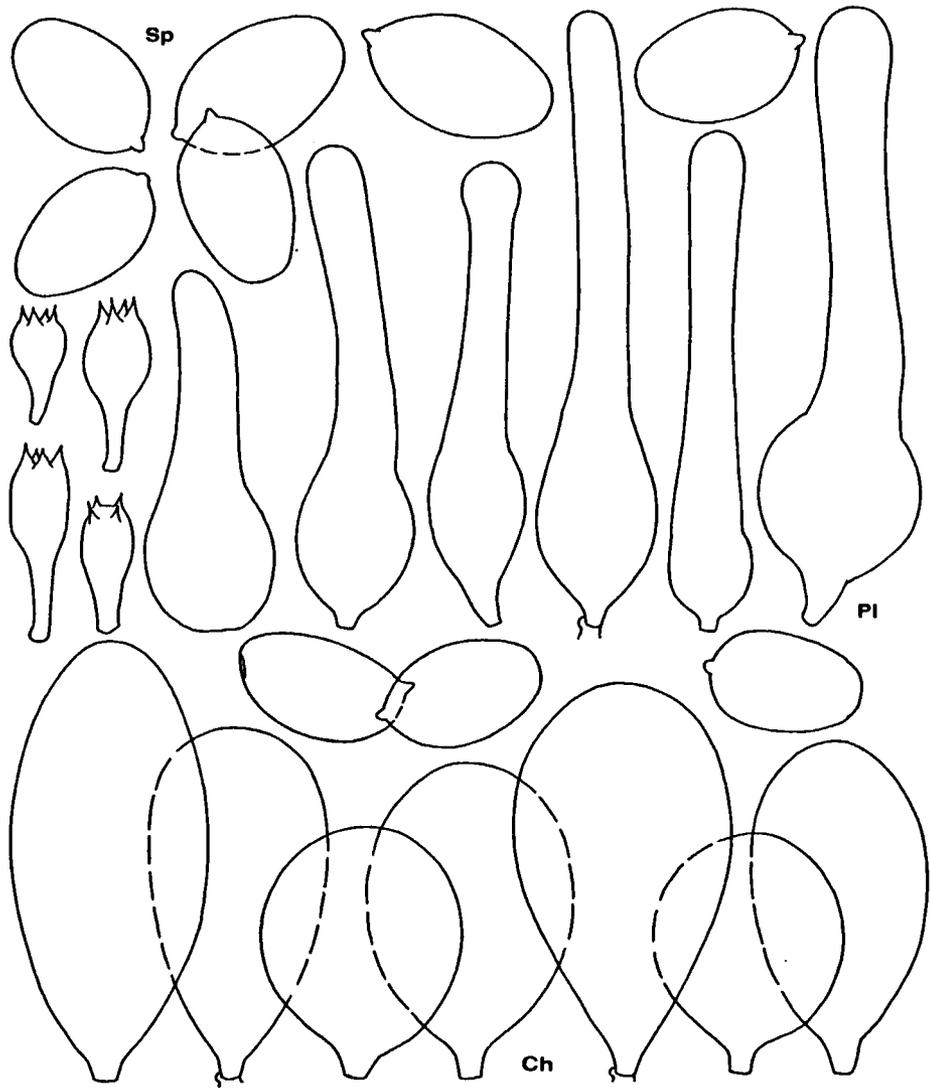


Fig. 19. *Coprinus fallax* M. Lange & A.H. Smith. — All figures from type.

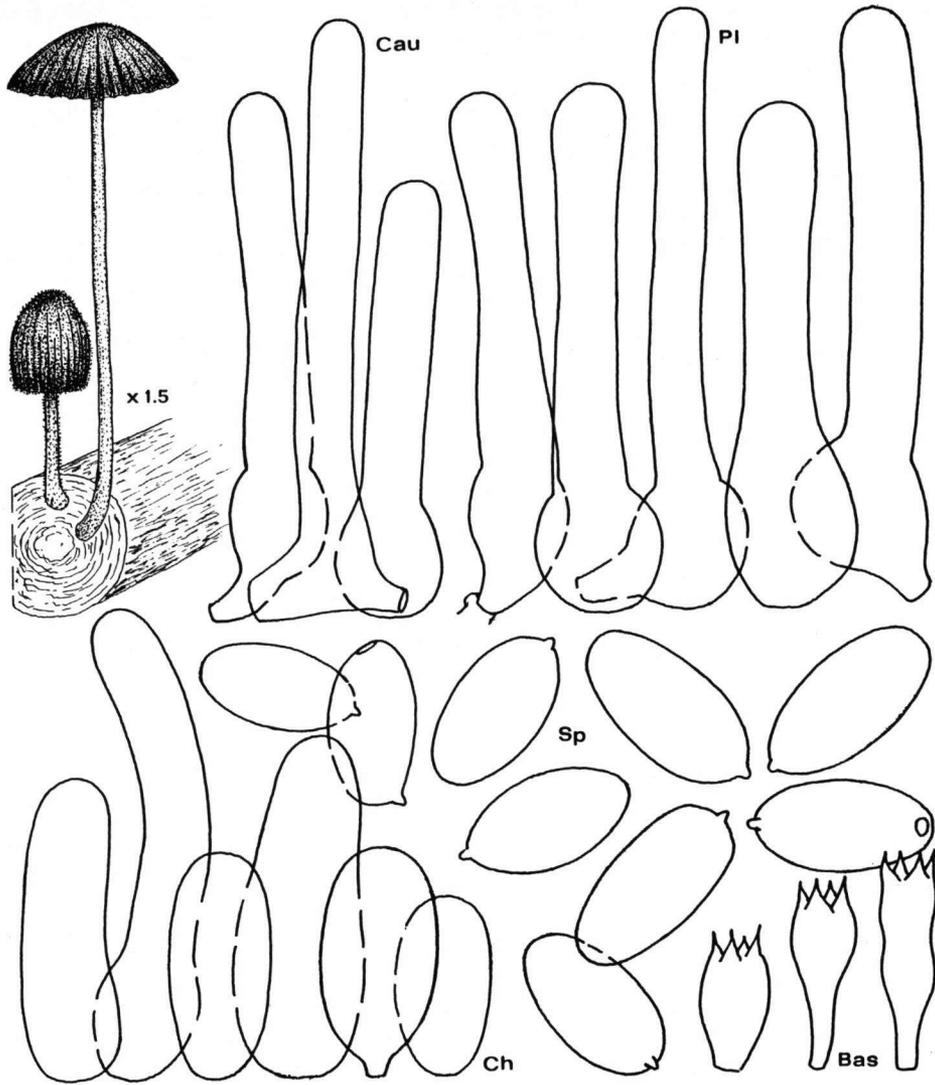


Fig. 20. *Coprinus subdisseminatus* M. Lange. — All figures from Uljé, 23 Sept. 1989.

niform with (sub)cylindrical neck and equal to somewhat enlarged, 8–12  $\mu\text{m}$  wide apex. Sclerocystidia very rare or absent. Clamp-connections present.

*H a b i t a t.*—Caespitose on soil in a lumber yard. Known only from the type location.

*C o l l e c t i o n e x a m i n e d.*—U.S.A.: Michigan, Washtenaw Co., Dexter, 24 May 1949, A.H. Smith 32096 (holotype MICH).

According to the original description *C. fallax* should have a reddish spore-print. In KOH the spores should become first pale and then purplish grey-brown.

Under the microscope we did not observe anything unusual in the colour of the spores of the type in comparison to other species of subsect. *Setulosi*. The spores became paler in KOH but not darker afterwards. The sizes of the spores of the type material in our own measurements differ from those in the original description (9.4–12  $\times$  6.3–7.5  $\mu\text{m}$  versus 11–14  $\times$  6.0–7.5  $\mu\text{m}$ ). The breadth of the spores in the original description relates to the breadth in side view (W)! (See also the discussion under *C. plagioporus*).

## 20. *Coprinus subdisseminatus* M. Lange—Fig. 20

*Coprinus subdisseminatus* M. Lange in *Mycologia* 45: 777. 1953.

Closed pileus up to 8  $\times$  6 mm, pale brown, at centre somewhat darker, up to 15 mm in diam. when expanded. Lamellae narrowly adnate, white to blackish; L = 16–24, l = 0–1. Stipe 20–40  $\times$  0.5–1 mm, whitish, vitreous, sparsely pubescent.

Spores [60, 2, 2] 9.2–13.3  $\times$  5.3–6.7  $\mu\text{m}$ , av. L = 10.8–11.7, av. B = 5.8–6.3  $\mu\text{m}$ , Q = 1.70–2.05, av. Q = 1.85–1.95, oblong to elongate ellipsoid or ovoid; germ pore eccentric, c. 1.5  $\mu\text{m}$  wide. Basidia 18–36  $\times$  8.5–11  $\mu\text{m}$ , 4-spored. Pseudoparaphyses not noted. Cheilocystidia ellipsoid to oblong, some of them (sub)cylindrical or slightly utriform, 30–55  $\times$  15–23  $\mu\text{m}$ , but also pileocystidia-like cheilocystidia sparsely present on the edge of the lamellae. Pleurocystidia absent. Pileocystidia 60–90(–120)  $\times$  10–22  $\mu\text{m}$ , lageniform with (sub)cylindrical neck and equal, sometimes somewhat broadened, 8–14  $\mu\text{m}$  wide apex. Sclerocystidia absent. Clamp-connections probably present.

*H a b i t a t.*—On or near branches, in very wet places. Rare.

*C o l l e c t i o n s e x a m i n e d.*—NETHERLANDS: prov. Zuid-Holland: Leiden, 16 Oct. 1985, Uijé; Alphen a/d Rijn, 23 Sept. 1989, Uijé.

The main character of this species is the rather broad, cylindrical neck of the pileocystidia. They resemble the pileocystidia of *C. disseminatus* very much, but are distinctly shorter.

*Coprinus subdisseminatus* has been found only twice in the Netherlands, both times on sticks. According to the original description the species also grows on wet, black mull and other vegetable matter in wet places.

## 21. *Coprinus* species (*C.M. den Held-Jager* 1276)—Fig. 21

Closed pileus up to 4  $\times$  3 mm, at centre brown (K. & W. 7E2, 7D3). Lamellae narrowly adnate, thin, brownish grey (K. & W. 7F2); L = rather few. Stipe 16–18  $\times$  0.5 mm, whitish, somewhat tomentose at base (descr. den Held-Jager).

Spores [20, 1, 1] 12.6–16.0  $\times$  8.2–9.4  $\mu\text{m}$ , av. L = 13.8, av. B = 8.8  $\mu\text{m}$ , Q = 1.50–

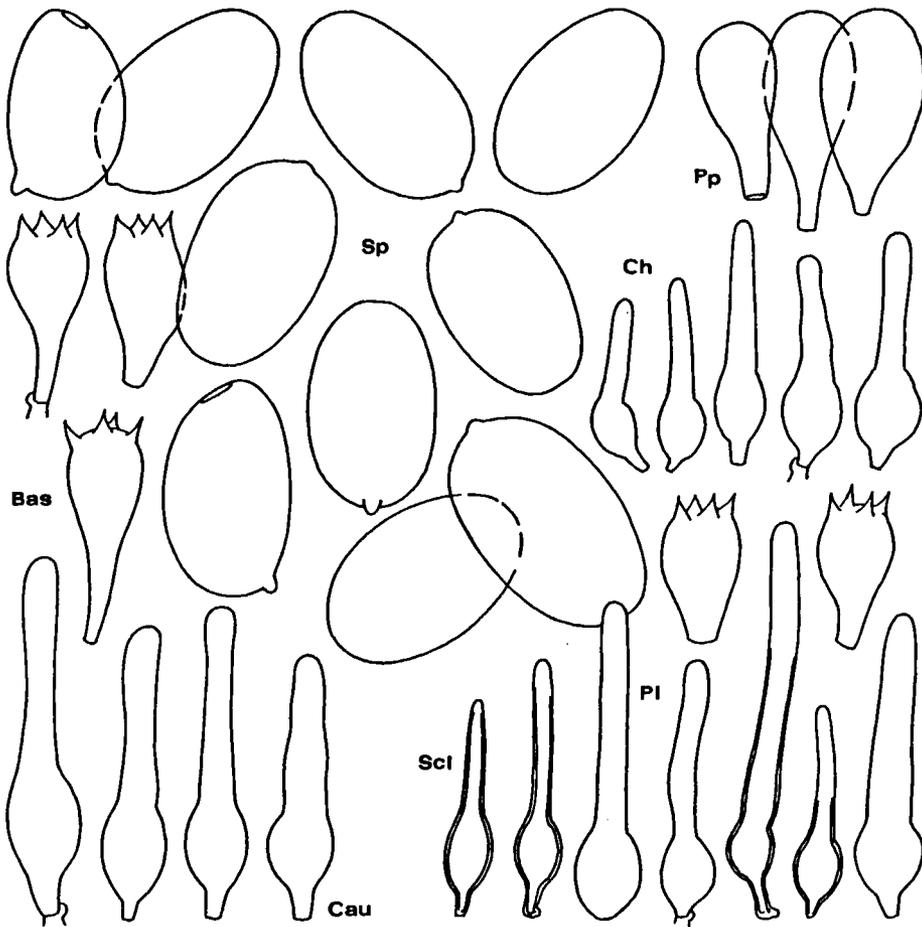


Fig. 21. *Coprinus* species (den Held-Jager 1276).

1.70, av.  $Q = 1.60$ , ellipsoid to ovoid; germ pore distinctly eccentric, c.  $2\ \mu\text{m}$  wide. Basidia 4-spored. Pseudoparaphyses not noted. Cheilocystidia  $25\text{--}40\text{--}(50) \times 7\text{--}11\ \mu\text{m}$ , lageniform with (sub)cylindrical to slightly tapering neck and  $2\text{--}4\ \mu\text{m}$  wide apex. Pileocystidia  $30\text{--}70 \times 7\text{--}12\ \mu\text{m}$ , lageniform with cylindrical to slightly tapering neck and  $2\text{--}5\ \mu\text{m}$  wide apex. Sclerocystidia sparse. Clamp-connections present.

**Habitat.**—On wood-chip at stony road-side with many pieces of wood and stems of flowering plants. Among *Campanula*, *Rhinanthus*, *Gentiana lutea*, and *Rhododendron*. Till now only known from Andorra.

**Collection examined.**—ANDORRA: Val d'Incles, 21 July 1981, C.M. den Held-Jager 1276 (herb. den Held-Jager).

This species is characterized by large, broad spores in combination with lageniform cheilocystidia and four-spored basidia. Other species that have large spores in combination with lageniform cheilocystidia are *C. amphithallus* and *C. singularis*.

Both species have 2-spored basidia and in *C. amphithallus* the spores are distinctly smaller and the pileo- and cheilocystidia are more tapering towards the apex. In *C. singularis* the germ pore is central and the shape of the spores is different.

The closest species is probably *C. subimpatiens*, which also has pileocystidia with a more or less cylindrical neck, but in that species the lageniform cheilocystidia are intermixed with globose ones and the smaller spores have a germ pore that is not so strongly eccentric.

## 22. *Coprinus impatiens* (Fr.) Quél.—Fig. 22

*Coprinus impatiens* (Fr.) Quél. in Fl. mycol. France: 42. 1888.

Closed pileus up to 16 × 12 mm, dark red-brown to ochre-brown at centre, paler towards margin, up to c. 30 mm wide when expanded. Lamellae narrowly adnate, rather distant; L = 14–21, l = 0–3. Stipe 30–80 × 0.5–2 mm, whitish, pubescent.

Spores [100, 5, 5] 10.6–11.3 × 6.2–7.6 μm, av. L = 10.7–10.9, av. B = 6.7–6.9 μm, Q = 1.45–1.75, av. Q = 1.55–1.65, ellipsoid to ovoid; germ pore weakly eccentric to almost central, c. 1.5 μm wide. Basidia 20–40 × 9–10 μm, 4-spored. Pseudoparaphyses 4–6(–7) per basidium. Cheilocystidia 25–50 × 8–15 μm, lageniform with distinctly tapering neck and 2–6 μm wide apex. Pleurocystidia absent. Pileocystidia 50–100(–125) × 12–22 μm, lageniform with tapering neck, 3–6 μm wide at apex. Sclerocystidia absent. Clamp-connections present.

Habitat.—Terrestrial, often at grassy places. Solitary to gregarious. Rather common.

Collections examined.—NETHERLANDS: prov. Utrecht, Breukelen, 27 Aug. 1986, *Uljé* 622; 21 June 1988, *Uljé* 912; prov. Noord-Holland, Vogelenzang, 3 May 1981, *Uljé* 160; prov. Zuid-Holland: Leiden, 21 Sept. 1984, *Uljé* 566; Alphen a/d Rijn, 21 Aug. 1988, *Uljé* 958.

Microscopically *C. impatiens* closely resembles *C. heterothrix*. The differences are the presence of veil remnants consisting of hyphae at the centre of the pileus in *C. heterothrix* and the more ovoid spores of that species. Moreover, the germ pore is often somewhat projecting in *C. heterothrix* and not at all in *C. impatiens*. Macroscopically *C. impatiens* has more crowded lamellae.

## 23. *Coprinus eurysporus* M. Lange & A.H. Smith—Fig. 23

*Coprinus eurysporus* M. Lange & A.H. Smith in Mycologia 45: 773. 1953.

Pileus 10–25(–30) mm broad, subcylindric when young, becoming obtusely conic to convex, deer-brown, cinnamon, paler towards margin. Lamellae narrowly adnate, whitish to blackish. Stipe 50–90 × 0.25–1 mm, white, somewhat thickened towards base (macroscopical description after M. Lange & A.H. Smith, l.c.).

Spores (from type) [60, 1, 1] 8.3–10.3 × 6.7–8.4 μm, av. L = 9.1–9.8, av. B = 7.3–7.9 μm, Q = 1.10–1.40, av. Q = 1.25, broadly ovoid; germ pore weakly eccentric, c. 2 μm wide. Basidia 18–40 × 8–11 μm, 4-spored. Pseudoparaphyses (3–)4–6(–7) per basidium. Cheilocystidia 20–40 × 8–14 μm, lageniform with tapering neck and 2.5–3.5 μm wide apex. Pleurocystidia not found (present and lageniform according to original description).

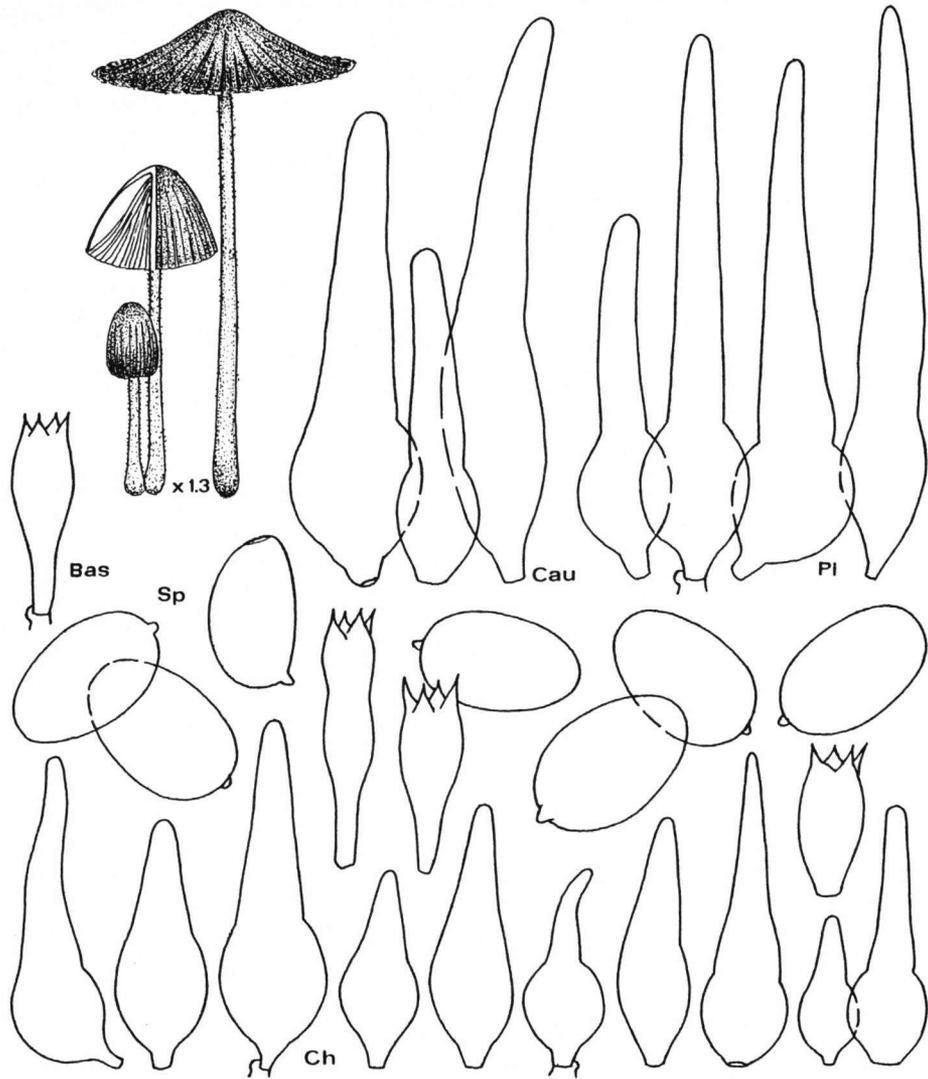


Fig. 22. *Coprinus impatiens* (Fr.) Quél. — All figures from *Ulje* 912.

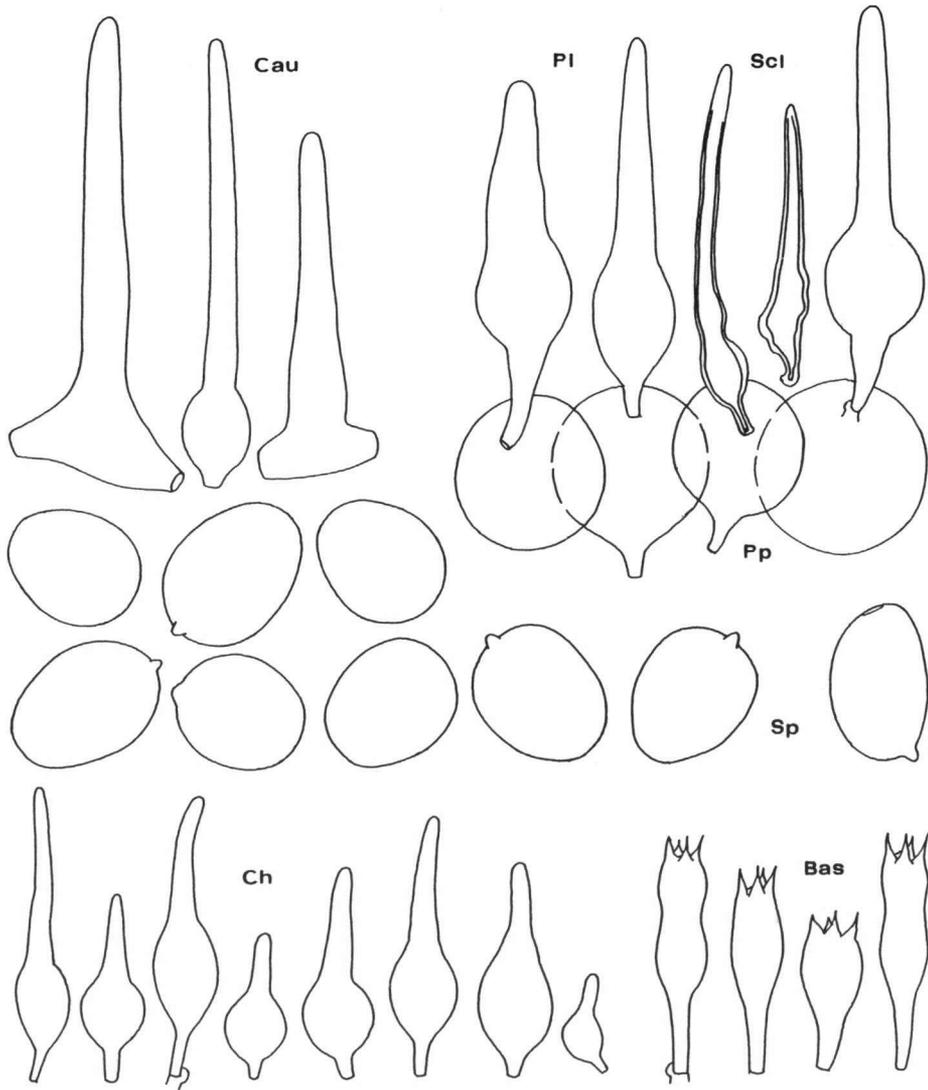


Fig. 23. *Coprinus eurysporus* M. Lange & A.H. Smith. — All figures from type.

Pileocystidia 40–70(–90) × 9–16 μm, lageniform with tapering neck, 2.5–5(–7) μm wide at apex. Sclerocystidia up to 100 μm long, rather scanty. Clamp-connections present.

*Habitat*.—Gregarious on fallen branches. Not known from the Netherlands.

*Collection examined*.—U.S.A.: Oregon, Hood River Co., Mt. Hood National Forest, Beaver Creek, 21 Oct. 1947, A.H. Smith 28033 (holotype MICH).

*Coprinus eurysporus* is close to *C. impatiens* but has spores that are broader than in the latter species. The spores are not ellipsoid as normally in subsect. *Setulosi* but are broadly rounded subtruncate-ovoid. According to its authors *C. eurysporus* should have lageniform pleurocystidia. The first author of this paper was unable to find pleurocystidia in the type-material. *Coprinus eurysporus* would be the only species with lageniform pleurocystidia in subsect. *Setulosi*. In the other species with pleurocystidia in this subsection, they are inflated, globose to broadly subutriform.

#### 24. *Coprinus congregatus* Bull.: Fr.—Fig. 24

*Coprinus congregatus* Bull.: Fr., *Epicr.*: 249. 1838.

Closed pileus up to 18 × 14 mm, cream-coloured with ochre-brown to cinnamon-coloured centre (Mu. 7.5 YR 4/6, K. & W. 6E6) when young, at mature greyish-yellow (Mu. 10 YR 7/6, K. & W. 4A/B4), c. 25 mm in diam. when expanded. Lamellae narrowly adnate to almost free, narrow, white to blackish; L = 18–34, l = 0–3. Stipe 30–80 × 0.5–2.5 mm, whitish, pubescent.

Spores [40, 2, 2] 9.8–14.2 × 5.6–7.5 μm, av. L = 11.1–12.4, av. B = 6.1–7.0 μm, Q = 1.55–1.95, av. Q = 1.75–1.85, ellipsoid to ovoid; germ pore strongly eccentric, c. 1.8 μm wide. Basidia 16–36 × 9–12 μm, 4-spored. Pseudoparaphyses (3–)4–5(–6) per basidium. Cheilocystidia 30–90 × 20–45 μm, ellipsoid to broadly utriform. Pleurocystidia 30–140 × 20–50 μm, ellipsoid, oblong to slightly utriform. Pileocystidia 30–120 × 8–18 μm, lageniform with tapering neck and 3–8 μm wide apex. Sclerocystidia absent. Clamp-connections absent.

*Habitat*.—Gregarious on dung, especially dung mixed with straw. Common.

*Collection examined*.—NETHERLANDS: prov. Zuid-Holland, Alphen a/d Rijn, 10 Aug. 1987, Uljé 862.

*Coprinus congregatus* is very similar to *C. ephemerus*. It seems to differ from that species practically only in the absence of clamps and the somewhat smaller spores (9.8–14.2 × 5.6–7.5 μm versus 11.6–15.8 × 6.1–7.9 μm).

#### 25. *Coprinus ephemerus* (Bull.: Fr.) Fr.—Fig. 25

*Coprinus ephemerus* (Bull.: Fr.) Fr., *Epicr.*: 252. 1838.

Closed pileus up to 16 × 12 mm, ochre-brown to cinnamon-brown at centre (Mu. 10 YR 6–7/6, K. & W. 5B5) paler towards margin, up to c. 20(–25) mm wide when expanded. Lamellae narrowly adnate, almost free, white to blackish; L. 26–38, l = 0–3. Stipe 30–80 × 1–3 mm, whitish, pubescent.

Spores [20, 1, 1] 11.6–15.8 × 6.1–7.9 μm, av. L = 13.8, av. B = 6.9 μm, Q = 1.80–2.00, av. Q = 1.90, ellipsoid to ovoid; germ pore eccentric, c. 1.8 μm wide. Basidia 18–40 ×

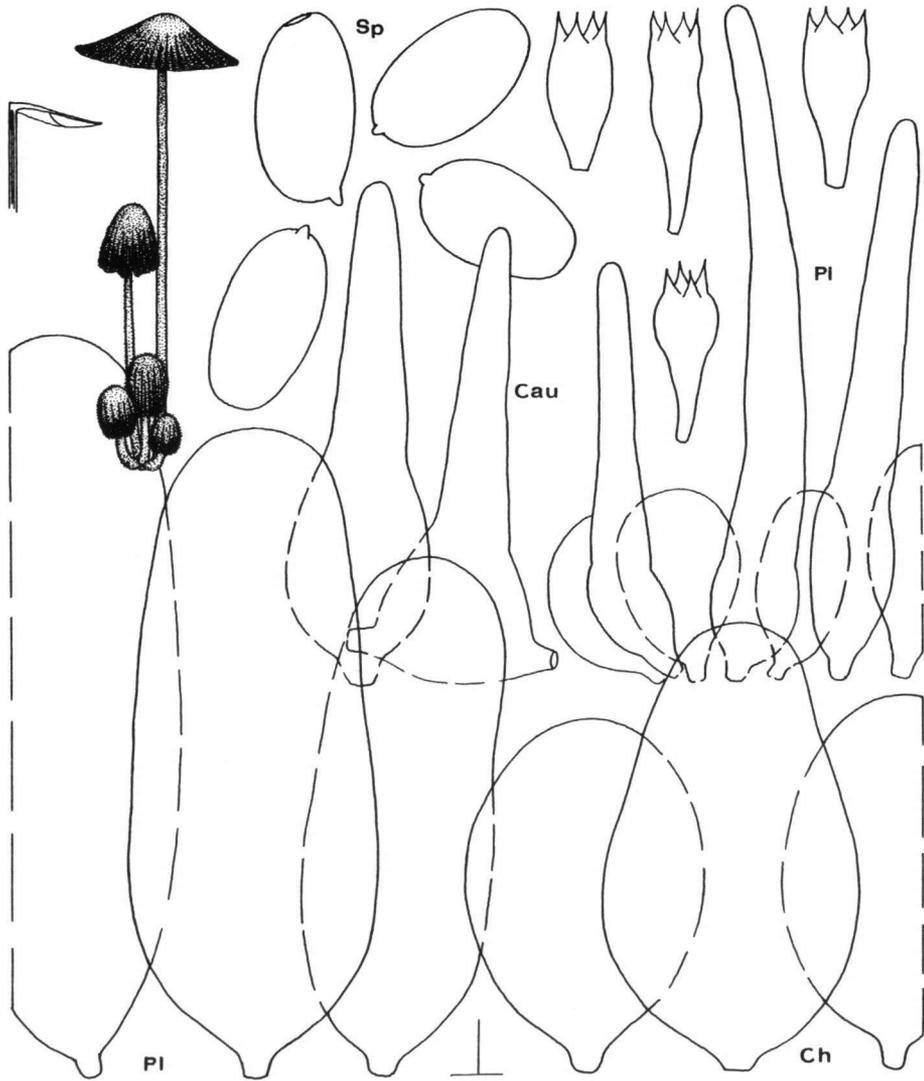


Fig. 24. *Coprinus congregatus* Bull.: Fr. — All figures from *Uljé 862*.

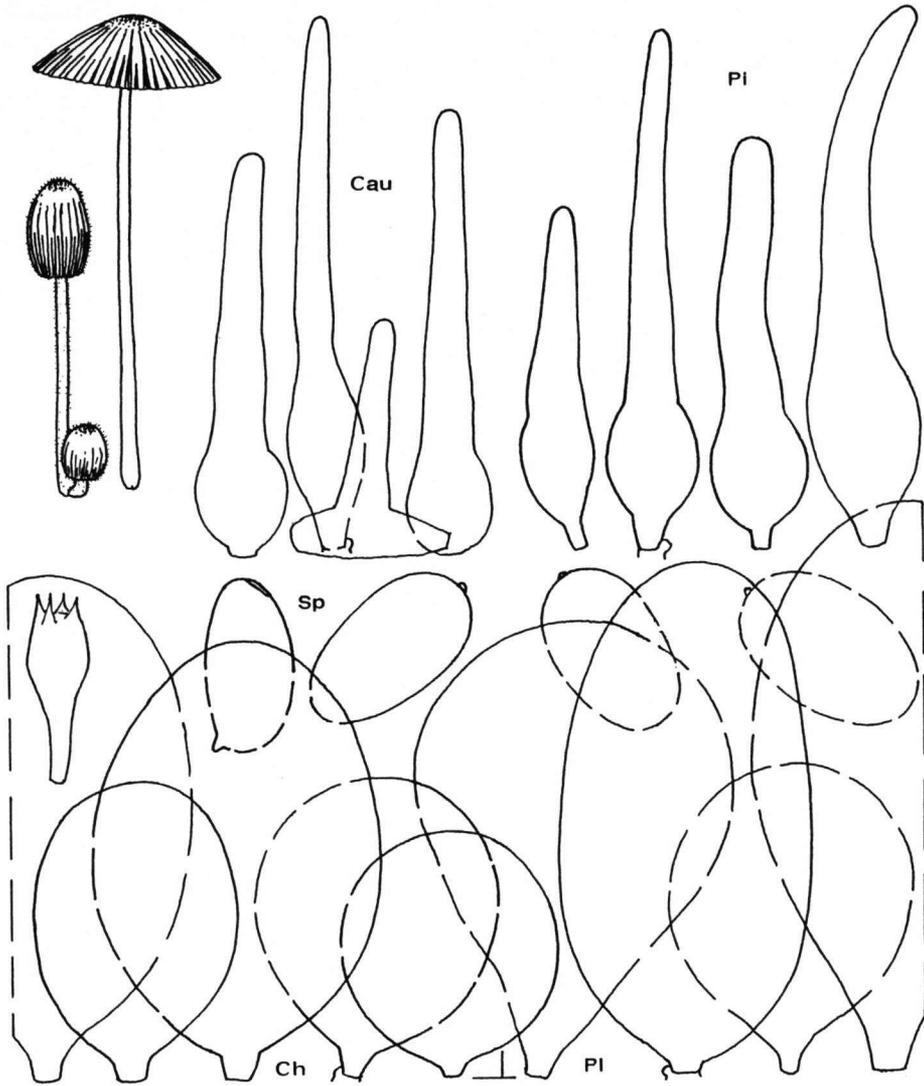


Fig. 25. *Coprinus ephemerus* (Fr.: Bull.) Fr. — All figures from Daams 72-200.

9–13  $\mu\text{m}$ , 4-spored. Pseudoparaphyses 4–6 per basidium. Cheilocystidia 20–60  $\times$  20–30  $\mu\text{m}$ , (sub)globose, (broadly) ellipsoid, obovoid, but some lageniform cheilocystidia are present as well. Pleurocystidia 60–120  $\times$  20–45  $\mu\text{m}$ , subglobose, broadly ellipsoid, obovoid to broadly cylindrical. Pileocystidia 30–110  $\times$  10–21  $\mu\text{m}$ , lageniform with tapering neck and 4–8  $\mu\text{m}$  wide apex. Sclerocystidia absent. Clamp-connections present.

**Habitat.**—On cow-dung, but also on decaying straw. Gregarious or more or less fasciculate. Rare.

**Collection examined.**—NETHERLANDS: prov. Noord-Holland, 's-Graveland, 19 June 1972, *J. Daams* 72-200.

This species is characterized by the combination of pleurocystidia, four-spored basidia, spores with an eccentric germ pore, clamp-connections and its preference for dung. *Coprinus congregatus* is probably the closest relative. It differs from *C. ephemerus* in the absence of clamps and the slightly smaller spores.

## 26. *Coprinus stellatus* Buller—Fig. 26

*Coprinus stellatus* Buller, *Fungi Manitoba*: 119. 1929.

*Coprinus brevisetulosus* Arnolds, *Ecol. Coenol. Macrofungi Grassl. Heathl. Drenthe Netherl.*: 309. 1982.

Closed pileus up to 10  $\times$  7 mm, ochre-coloured at centre, paler towards margin, up to c. 18 mm in diam. when expanded. Lamellae free, narrowly, white to blackish; L = c. 12–20, l = 0–1 (–3). Stipe 30–70  $\times$  0.5–2 mm, whitish, pubescent.

Spores [40, 2, 2] 7.9–11.4  $\times$  5.2–6.7  $\mu\text{m}$ , av. L = 8.7–9.2, av. B = 5.3–5.4  $\mu\text{m}$ , Q = 1.50–1.90, av. Q = 1.65–1.70, ovoid, somewhat truncate; germ pore central, c. 1.4  $\mu\text{m}$  wide. Basidia 16–30  $\times$  8–11  $\mu\text{m}$ , 4-spored. Pseudoparaphyses (3–)4–5 (–6) per basidium. Cheilocystidia 40–60  $\times$  20–30  $\mu\text{m}$ , globose to ellipsoid, ovoid or oblong. Pleurocystidia 60–120  $\times$  15–35  $\mu\text{m}$ , ellipsoid, ovoid, obovoid, oblong, (sub)cylindrical or slightly utriform. Pileocystidia 20–65  $\times$  7–14  $\mu\text{m}$ , lageniform with tapering neck, 2.5–5  $\mu\text{m}$  wide at apex. Sclerocystidia absent. Clamp-connections absent.

**Habitat.**—Gregarious, on dung.

**Collections examined.**—NETHERLANDS: prov. Drenthe, de Wijk, Reestdal, 15 Oct. 1976, *E. Arnolds* 3666 (as *C. brevisetulosus*, holotype WBS); Westerbork: Mantinge, 14 Jan. 1975, *Arnolds* 3381 (WBS); Elp, 9 Oct. 1975, *Arnolds* 3440 (WBS); prov. Overijssel, Staphorst, Reestdal, 7 Oct. 1975, *Arnolds* 3437 (WBS); 10 Sept. 1976, *Arnolds* 3579 (WBS); prov. Zuid-Holland, Alphen a/d Rijn, 23 Sept. 1986, *Uljé*.

The main characters, separating this species from others in the '*Setulosi*', are the roundish apex of the spores and the central germ pore. The other species with this character is *C. pellucidus*, but that has no pleurocystidia and its cheilocystidia are more globose and smaller. Moreover, *C. pellucidus* has very small fruit-bodies.

M. Lange (1952: 115) described *C. stellatus* with spores measuring 8.8–12.1  $\times$  4.9–5.9  $\mu\text{m}$  (averages per sample); Buller (original description) found them to measure 8–10  $\times$  4–5  $\mu\text{m}$ . In view of the narrow species concept in the *Setulosi*, Arnolds preferred to describe *C. stellatus* sensu M. Lange as a new species on account of the different spore sizes and the somewhat deviating colour of the pileus (slightly more reddish) with the name *C. brevisetulosus*.

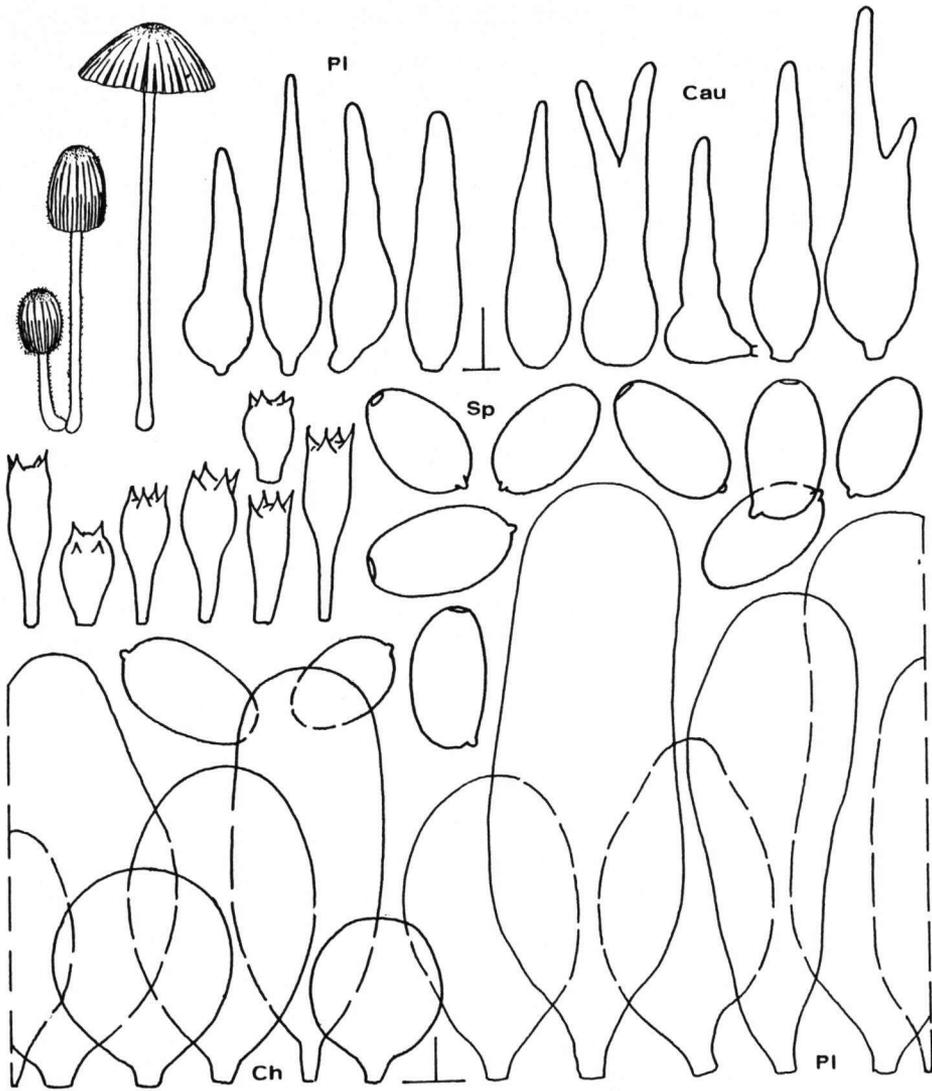


Fig. 26. *Coprinus stellatus* Buller — All figures from *Ulje*, 23 Sept. 1986.

The first author (Uljé) studied the type of *C. brevisetulosus* and found the difference in size of the spores in comparison to those of *C. stellatus* sensu Buller somewhat smaller. Two times a sample of 20 spores was measured and the sizes found are:  $7.9\text{--}9.9 \times 4.9\text{--}5.8 \mu\text{m}$  and  $8.0\text{--}10.2 \times 5.0\text{--}6.0 \mu\text{m}$ . Arnolds found them to be  $9.0\text{--}10.6 \times 5.2\text{--}5.6 \mu\text{m}$ .

The diagnosis of *C. brevisetulosus* Arnolds gave the following spore sizes:  $(7.7\text{--})8.9\text{--}11.4(-12.0) \times 4.6\text{--}6.7(-7.0) \mu\text{m}$ , probably compiled from those of the type and the four paratypes (Arnolds 3381, 3437, 3440 en 3579). In Arnold's notes with these collections the measurements are:

(3381)  $8.6\text{--}10.8 \times 4.8\text{--}5.7 \mu\text{m}$

(3440)  $9.5\text{--}11.4 \times 6.0\text{--}6.7 \mu\text{m}$

(3437)  $8.7\text{--}9.8 \times 5.2\text{--}6.0 \mu\text{m}$

(3579)  $8.6\text{--}10.2 \times 4.6\text{--}5.4 \mu\text{m}$

From these data it appears that the length of the spores of the type of *C. brevisetulosus* and the collections Arnolds 3437, 3579, and to a lesser degree also of 3381 agrees fairly well with the length of the spores of *C. stellatus* given by Buller. The breadth of the spores of these collections, however, agrees better with that given by M. Lange; the same applies to the length of the spores of Arnolds 3440.

The differences in spore size between *C. stellatus* and *C. brevisetulosus* is then mainly restricted to the breadth of the spores: values of about  $0.5\text{--}1 \mu\text{m}$ .

We think that these differences are too insignificant to justify the maintenance of *C. brevisetulosus* as a separate species. Moreover, it is possible that Buller measured the spores in side view, whereas we and perhaps also other authors did that in front view. Because of the great variation in the colours of the pileus in subsection *Setulosi* the possible slight difference in pileus colour mentioned by Arnolds is even less convincing.

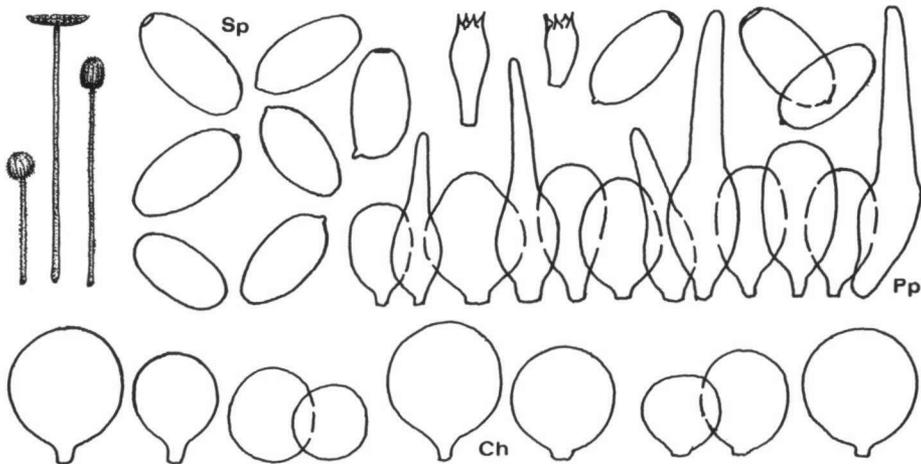


Fig. 27. *Coprinus pellucidus* Karst. — All figures from Uljé 1006.

27. *Coprinus pellucidus* P. Karst.—Fig. 27

*Coprinus pellucidus* P. Karst. in Meddn Soc. Fauna Fl. fenn. 9: 61. 1882.

Closed pileus up to 5 × 3 mm, but usually much smaller, whitish with pale yellow-brown, ochre-brown to grey-brown centre (Mu. 10 YR 6/4, K. & W. 5D5), up to c. 7 mm in diam. when expanded. Lamellae free, whitish to blackish; L = 12–20, l = 0–1. Stipe 15–70 × 0.1–0.5 mm, whitish, vitreous, sparsely pubescent.

Spores [60, 3, 3] 6.3–9.4 × 3.2–4.2 μm, av. L = 7.3–7.9, av. B = 3.6–3.9 μm, Q = 1.80–2.20, av. Q = 1.95–2.10, oblong to ovoid, often somewhat cylindrical, slightly truncate; germ pore central, c. 1.3 μm wide. Basidia 10–26 × 5–7 μm, 4-spored. Pseudoparaphyses not noted. Cheilocystidia c. 20–30 × 15–23 μm, (sub)globose. Pleurocystidia absent. Pileocystidia 25–50 × 7–12 μm, lageniform with tapering neck, 3–4 μm wide at apex. Sclerocystidia absent. Clamp-connections absent.

Habitat.—On cow dung. Common.

Collections examined.—NETHERLANDS: prov. Noord-Holland, 1 June 1986, E. C. Vellinga; prov. Zuid-Holland, Leiden, 20 Sept. 1985, Uljé 660; Alphen a/d Rijn, Hazerswoude, 31 Oct. 1988, Uljé 1006.

The spores of *C. pellucidus* are slightly smaller and somewhat more (sub)cylindrical than in *C. stellatus* and that species has pleurocystidia, which *C. pellucidus* has not. In addition the fruit-bodies of *C. pellucidus* are very small and usually cream-coloured whereas those of *C. stellatus* are larger and more ochraceous brown.

28. *Coprinus heterosetulosus* Locq. ex Watl.—Fig. 28

*Coprinus heterosetulosus* Locq. in Bull. trimest. Soc. mycol. Fr. 63: 78. 1947 (invalid) — *Coprinus heterosetulosus* Locq. ex Watl. in Notes R. bot. Gdn Edinb. 35: 153. 1976.

Closed pileus up to 5 × 4 mm, sometimes up to 7 mm high, date-brown, umbra-brown (Mu. 7.5 YR 3/6, K. & W. 5E5), paler towards margin, up to c. 7(–10) mm in diam. when expanded. Lamellae free, narrow, white to blackish; L = 8–13, l = 0–1. Stipe 15–50 × 0.25–0.75 mm, whitish, vitreous, sparsely pubescent.

Spores [60, 3, 3] 8.0–11.0 × 5.0–6.4 μm, av. L = 9.1–9.7, av. B = 5.5–5.8 μm, Q = 1.50–1.80, av. Q = 1.65–1.70, ellipsoid to ovoid; germ pore eccentric, c. 1.6 μm wide. Basidia 16–32 × 8.5–10 μm, 4-spored. Pseudoparaphyses 4–6 per basidium. Cheilocystidia 13–25 × 12–18 μm, (sub)globose to ovoid. Pleurocystidia absent. Pileocystidia 30–95 × 8–21, lageniform with tapering neck, 2–5 μm wide at apex. Sclerocystidia present. Clamp-connections present.

Habitat.—Solitary or subgregarious on horse dung. Common.

Collections examined.—NETHERLANDS: prov. Zuid-Holland, Hazerswoude, 30 Nov. 1987, Uljé; 12 Dec. 1987, Uljé 884; 7 March 1988, Uljé; Alphen a/d Rijn, 1 March 1988, Uljé 986; 25 Oct. 1988, Uljé 1002.

*Coprinus heterosetulosus* is easily recognizable because of its usually numerous sclerocystidia, its habitat on dung and its spores with an eccentric germ pore. It has very small fruit-bodies, like *C. pellucidus*, but that species has no sclerocystidia and has spores with a central germ pore. The colour of *C. heterosetulosus* is a rather dark brown in fresh, young specimens.

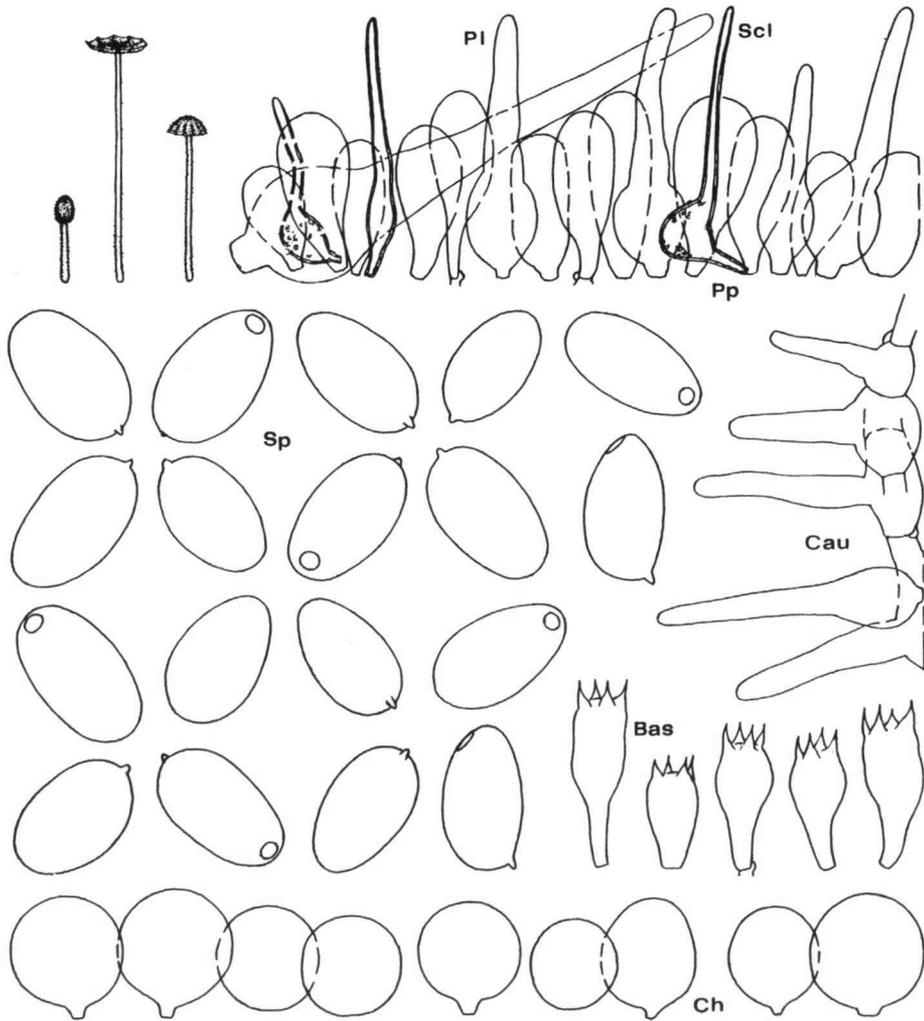


Fig. 28. *Coprinus heterosetulosus* (Locq.) Watl. — All figures from *Uljé 986*.

### 29. *Coprinus angulatus* Peck—Fig. 29

*Coprinus angulatus* Peck in Rep. N. Y. St. Mus. nat. Hist. 26: 60. 1874.

*Coprinus boudieri* Quéf. in Bull. Soc. bot. France 24: 321. 1877.

Closed pileus up to 20 × 15 mm, dark rust-brown to ochre-brown (Mu. 7.5 YR 3/6 to 6/6, K. & W. 6E7 to 5C/D7), remaining campanulate rather long, up to 30 mm in diam. when expanded. Lamellae narrowly adnate, rather broad and distant, white to blackish. Stipe 30–60 × 1–3 mm, usually relatively short, whitish, pubescent.

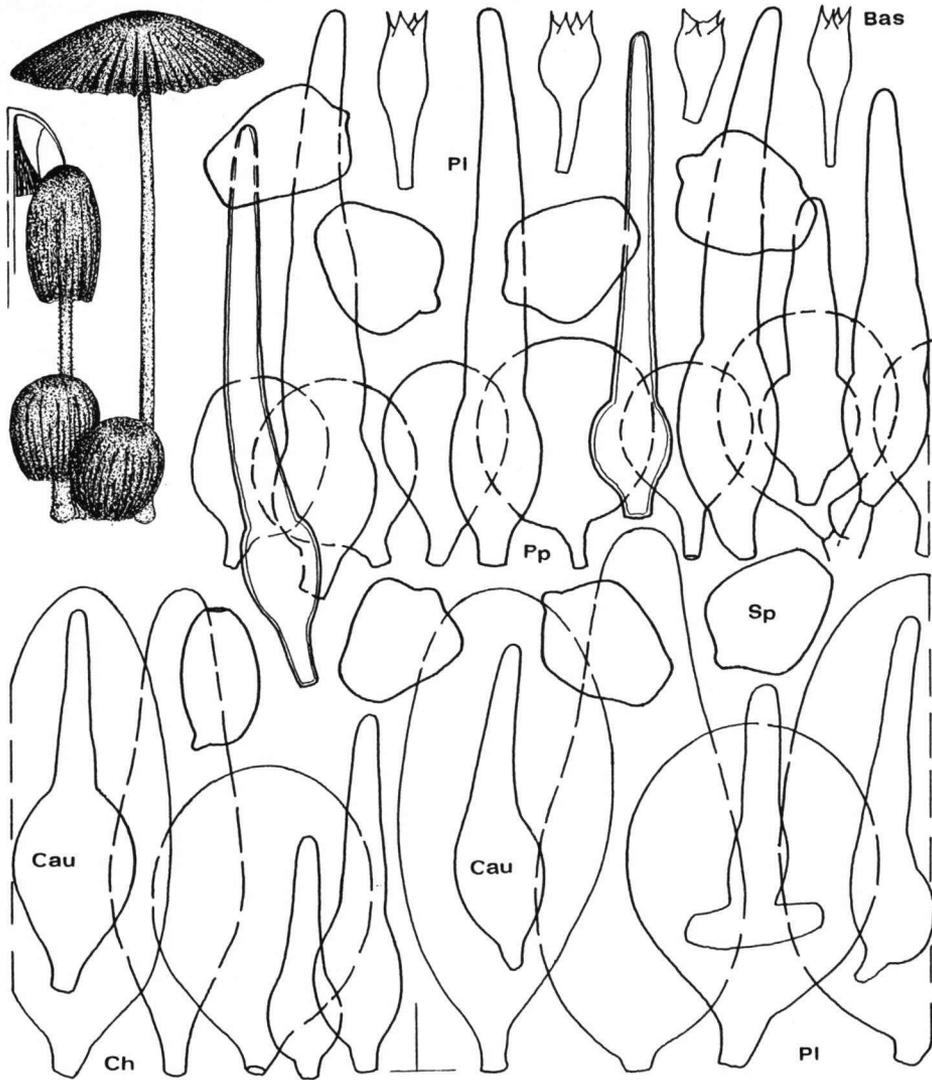


Fig. 29. *Coprinus angulatus* Peck. — All figures from *Daams*, 27 July 1974.

Spores [40, 2, 2]  $7.7\text{--}10.5 \times 6.0\text{--}7.8 \times c. 5.5 \mu\text{m}$ , av.  $L = 8.7\text{--}9.6$ , av.  $B = 6.8\text{--}7.2 \mu\text{m}$ ,  $Q = 1.15\text{--}1.60$ , av.  $Q = 1.25\text{--}1.35$ , mitriform in front view, truncate; germ pore central, c.  $1.8 \mu\text{m}$  wide. Basidia  $15\text{--}36 \times 8\text{--}10 \mu\text{m}$ , 4-spored. Pseudoparaphyses 4–6 per basidium. Cheilocystidia  $30\text{--}80 \times 25\text{--}40$ , (sub)globose to narrowly ellipsoid, sometimes slightly utri-form intermixed with lageniform ones,  $30\text{--}60 \times 8\text{--}20 \mu\text{m}$ , with tapering neck and  $2\text{--}5 \mu\text{m}$  wide at apex. Pleurocystidia  $60\text{--}100\text{--}(120) \times 25\text{--}60 \mu\text{m}$ , (sub)globose to ellipsoid or utri-form. Pileocystidia  $50\text{--}100 \times 12\text{--}15 \mu\text{m}$ , lageniform with tapering neck,  $3.5\text{--}6 \mu\text{m}$  wide at apex. Sclerocystidia present. Clamp-connections present.

H a b i t a t.—Gregarious, on burnt ground. Rather common.

C o l l e c t i o n s e x a m i n e d.—NETHERLANDS: prov. Noord-Holland, 's-Graveland, Boekesteyn, 27 July 1974, *J. Daams*; prov. Gelderland, Winterswijk, Buskusbos, 29 Sept. 1973, *W. Gams*.

The peculiar shape of the spores makes this species easy to recognize. Macroscopically, the roundish shape of the young fruit-bodies, usually rather dark brown, and the habitat on burned places, are indications that one is dealing with this species.

A.H. Smith (1948: 670) studied the type material and recorded the size of the spores as being  $8.5\text{--}10\text{--}(11) \times 7\text{--}8.8 \times 5.7\text{--}6.3 \mu\text{m}$ . The breadth of the spores is somewhat larger than we found in the two collections analyzed.

### 30. *Coprinus bisporiger* Buller ex P.D. Orton—Fig. 30

*Coprinus bisporiger* Buller ('*bisporigera*') in Trans. Brit. mycol. Soc. 3: 350. 1911 (invalid) — *Coprinus bisporiger* Buller ex P.D. Orton in Notes R. bot. Gdn Edinb. 35: 147. 1976.

M i s a p p l i e d.—*Coprinus bisporus* sensu Buller non *J. Lange* in Trans. Brit. mycol. Soc. 6: 363. 1920.

Closed pileus up to  $12 \times 9 \text{ mm}$ , ochre-brown to cinnamon-brown (Mu. 10 YR 5/6 to 6/8, K. & W. 5C5 to 5A6, 5B5), up to 25 mm in diam. when expanded. Lamellae narrowly adnate, up to 2 mm broad;  $L = c. 32$ ,  $l = 1\text{--}3$ , white to blackish. Stipe  $40\text{--}80 \times 1\text{--}3 \text{ mm}$ , whitish, pubescent.

Spores [80, 4, 3]  $10.3\text{--}13.7 \times 6.3\text{--}8.3 \mu\text{m}$ , av.  $L = 11.4\text{--}12.2$ , av.  $B = 7.0\text{--}7.9 \mu\text{m}$ ,  $Q = 1.45\text{--}1.70$ , av.  $Q = 1.55\text{--}1.60$ , ellipsoid to ovoid; germ pore eccentric, c.  $1.8 \mu\text{m}$  wide. Basidia  $16\text{--}32 \times 7\text{--}9 \mu\text{m}$ , 2-spored. Pseudoparaphyses 4–6 per basidium. Cheilocystidia  $25\text{--}55 \times 20\text{--}35 \mu\text{m}$ , globose to ellipsoid. Pleurocystidia  $40\text{--}65 \times 28\text{--}37 \mu\text{m}$ , subglobose to ellipsoid. Pileocystidia  $50\text{--}110 \times 12\text{--}25 \mu\text{m}$ , lageniform with tapering neck,  $5\text{--}8 \mu\text{m}$  wide at apex. Sclerocystidia absent. Clamp-connections absent.

H a b i t a t.—Growing in woods, among leaves and on fallen branches. Rare.

C o l l e c t i o n s e x a m i n e d.—NETHERLANDS: prov. Noord-Holland, Kudelstaart, 21 July 1988, *K.J. Eigenhuis (Uljé 921)*. — GERMANY: Westfalen, Mönchengladbach, 1 June 1982, *H. Bender* (herb. Bender). — GREAT BRITAIN: England, Surrey, Richmond, Kew, Oct. 1911, *R. Buller* (holotype, K).

*Coprinus bisporiger* is very similar to *C. bisporus* but grows on fallen branches and among leaves, whereas *C. bisporus* is fimicolous. Orton & Watling (1979: 88) suggest that *C. bisporiger* also differs in the presence of thick-walled setulae. Bender (1987: 219) stated that *C. bisporiger* has pleurocystidia. The first author of this paper indeed found these in Bender's collection cited above, but only in the half of the lamellae closest to the edge. In the Netherlands' collection pleurocystidia were lacking.

The first author was unable to find more than spores and pileocystidia in Buller's type collection of *C. bisporiger*.

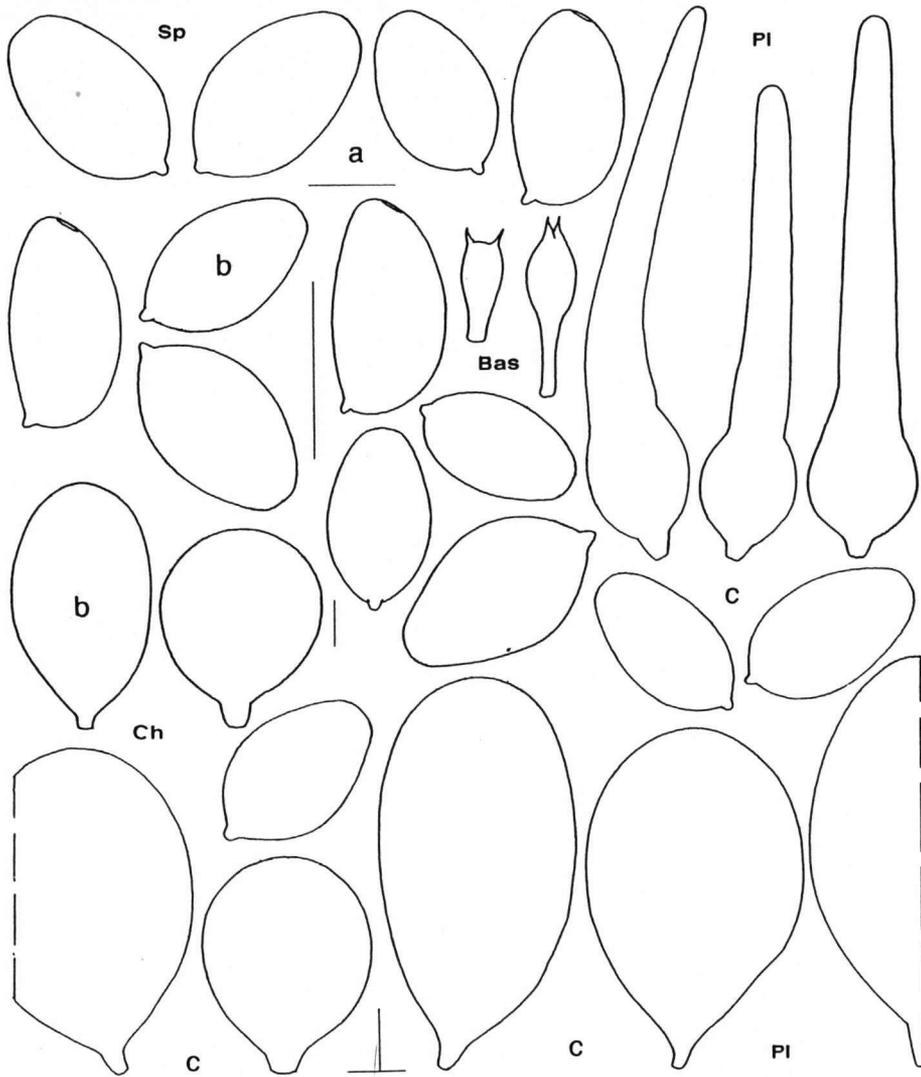


Fig. 30. *Coprinus bisporiger* Buller ex P.D. Orton. — a. From type. — b. From *Uljé 921*. — c. From *Bender*, 1 June 1982.

31. *Coprinus bisporus* J.E. Lange—Fig. 31

*Coprinus bisporus* J.E. Lange in Dansk bot. Ark. 2 (3): 50. 1915.

Closed pileus up to 16 × 12 mm, ochre to cinnamon at centre (Mu. 10 YR 6–7/6, 2.5 Y 5.5/4, K. & W. 5D5, 4A5), paler towards margin (Mu. 2.5 Y 5/5–7/3), up to 20 mm wide when expanded. Lamellae narrowly adnate to free, white to blackish. Stipe 40–80 × 1–2 mm, whitish, pubescent.

Spores [80, 4, 4] 9.7–13.7 × 6.1–8.4 μm, av. L = 10.9–12.2, av. B = 6.5–7.4 μm, Q = 1.40–2.10, av. Q = 1.55–1.80, ellipsoid to ovoid; germ pore eccentric, c. 1.8 μm wide. Basidia 15–28 × 6–8 μm, 2-spored. Pseudoparaphyses (3–)4–5(–6) per basidium. Cheilocystidia 20–55 × 15–32 μm, vesiculose. Pleurocystidia absent. Pileocystidia 60–120 × 10–22 μm, lageniform with tapering neck, 5–10 μm wide at apex. Sclerocystidia absent. Clamp-connections absent.

Habitat.—Fasciculate on dung, mixtures of straw and dung and also on decaying straw. Common.

Collections examined.—NETHERLANDS: prov. Zuid-Holland, Alphen a/d Rijn, 3 Oct. 1984, *Ulje* 551; 19 Apr. 1985, *Ulje* 632; 29 Aug. 1987, *Ulje* 894; Hazerswoude, 15 Oct. 1988, *Ulje* 995.

*Coprinus bisporus* is easily recognizable by its two-spored basidia, and its globose to ellipsoid cheilocystidia, by the absence of sclerocystidia and clamp-connections and by its preference for dung or straw dung-mixtures. Only *C. bisporiger* is close, but that species grows on sticks and among leaves and perhaps has also some morphological differences (see the discussion under that species).

Kemp (pers. comm.) received *C. bisporiger* from Hohmeyer in Germany (Westfalen) and found it to mate with *C. bisporus*.

32. *Coprinus amphithallus* M. Lange & A.H. Smith—Fig. 32

*Coprinus amphithallus* M. Lange & A.H. Smith in Mycologia 45: 774. 1953.

Closed pileus up to 8 × 5 mm, expanding to 18 mm in diam., cream with dark brown to cinnamon-coloured centre (Mu. 7.5 YR 3–4/4 to 4–5/6, K. & W. c. 6D6), later more grey (Mu. 10 YR 5–6/1, K. & W. 5C/D2), disk and radial stripes staying brown for a rather long time. Lamellae narrowly adnate, up to 1.5 mm broad, whitish, then grey to blackish; L = c. 20, l = 0–1. Stipe 30–80 × 1–1.5 mm, whitish, somewhat vitreous, sparsely pubescent.

Spores [60, 3, 3] 12.3–15.6(–19) × 6.7–8.7(–9.5) μm, av. L = 13.2–14.2, av. B = 7.4–7.9 μm, Q = 1.65–1.90, av. Q = 1.75–1.80, ellipsoid to ovoid; germ pore eccentric, c. 1.8 μm wide. Basidia 21–34 × 8–11 μm, 2-spored. Pseudoparaphyses not noted. Cheilocystidia 25–40(–50) × 10–16 μm, lageniform with tapering neck, 2–3(–5) μm wide at apex. Pleurocystidia absent. Pileocystidia 40–85 × 10–16 μm, lageniform with tapering neck, 4–7 μm wide at apex. Clamp-connections present.

Habitat.—At clayey-sandy roadsides, often among grasses. Solitary or subgregarious. Rather rare.

Collections examined.—NETHERLANDS: prov. Noord-Holland, 19 June 1984, *Ulje* 562; prov. Zuid-Holland, Alphen a/d Rijn, 19 July 1984, *Ulje* 525. — GERMANY: Eifel, Berlinger Bach, 21 Sept. 1980, F. & G. *Tjallingii* (herb. *Tjallingii*).

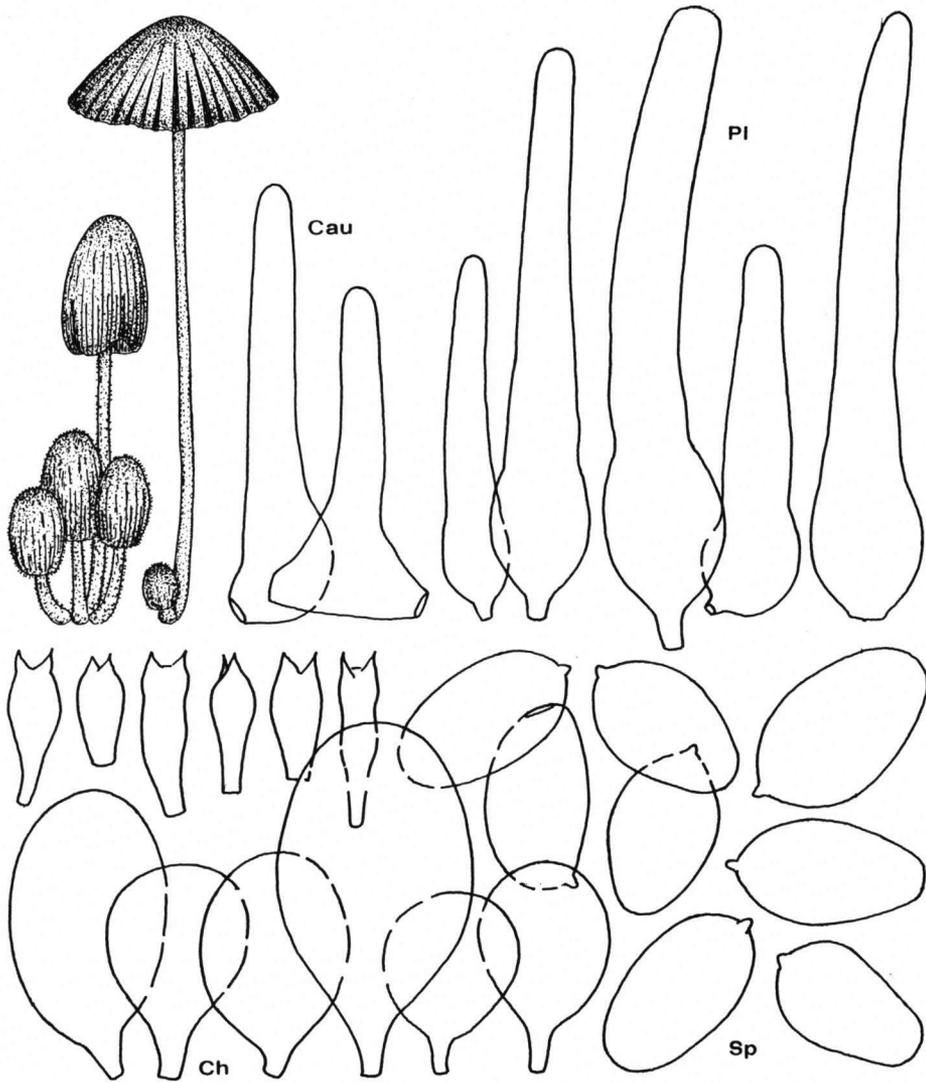


Fig. 31. *Coprinus bisporus* J.E. Lange. — All figures from *Ulje* 995.

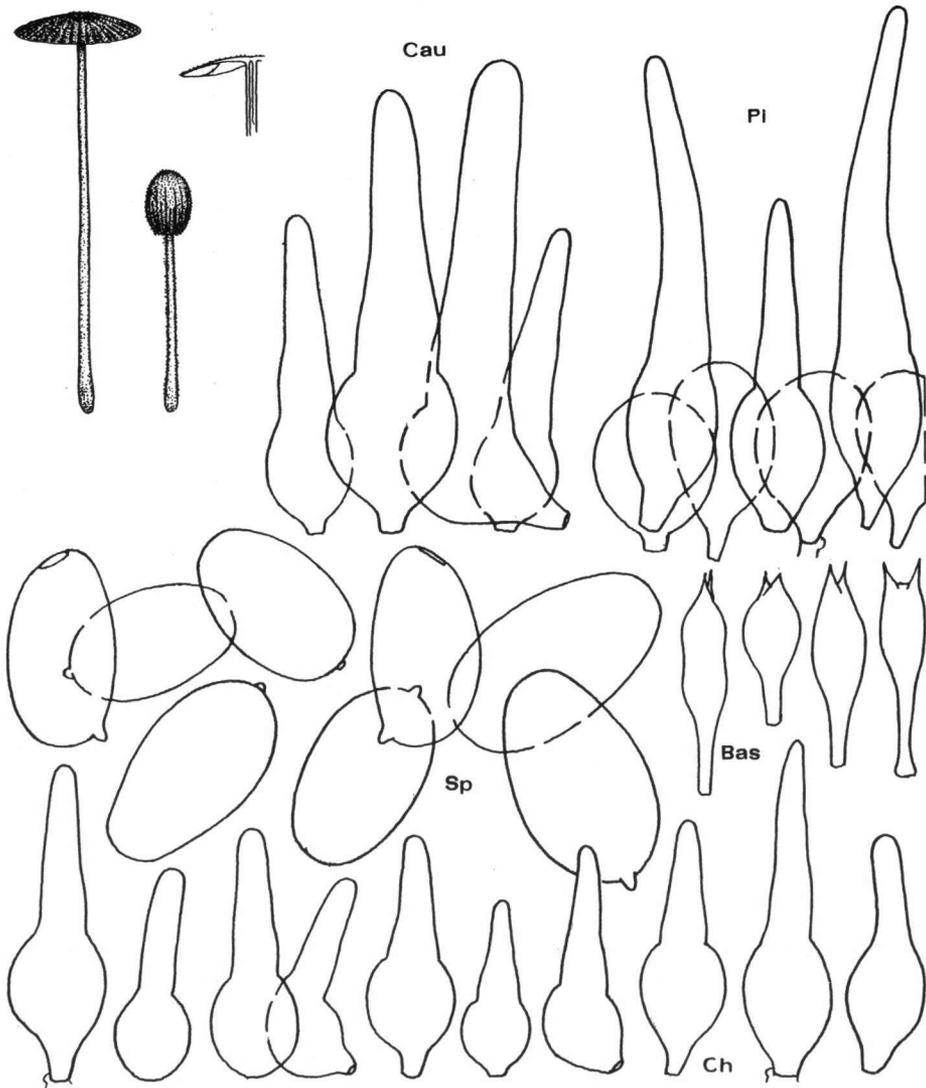


Fig. 32. *Coprinus amphithallus* M. Lange & A.H. Smith. — All figures from Uljé 562.

*Coprinus amphithallus* is a terrestrial, two-spored species with lageniform cheilocystidia. Microscopically the closest species is *C. singularis*, which has smaller fruit-bodies and broader spores with a central germ pore. The shape of the spores is different also in these two species. The other two-spored species in subsect. *Setulosi* grow on dung (except *C. verrucispermus*) and have globose cheilocystidia. *Coprinus verrucispermus* has warty, differently shaped spores.

More or less at the same time that Lange & Smith described *C. amphithallus*, Kühner & Romagnesi (1953: 391) gave a description of a species provisionally named *C. disseminatoides*. That species seems to be identical with *C. amphithallus*, a fact recognized by Kühner (1957: 61) when he gave a description of *C. amphithallus* and placed *C. disseminatoides* in its synonymy (see also Bender & Enderle, 1988: 45–48).

### 33. *Coprinus singularis* Uljé—Fig. 33

*Coprinus singularis* Uljé in *Persoonia* 13: 486. 1988.

Closed pileus up to 3 × 2 mm, pale brown to ochre-brown (Mu. 10 YR 7/3 to 7.5 YR 5/6, K. & W. 4A3), with somewhat darker radial striation; expanded pileus greyish and up to 8(–11) mm wide. Lamellae narrowly adnate, white, grey to blackish; L = 8–16, l = 0–3. Stipe 20–35 × 0.5–1 mm, whitish, vitreous, sparsely pubescent.

Spores [120, 6, 3] 9.7–17 × 6.8–10.9 μm, av. L = 11.4–14.4, av. B = 8.5–9.1 μm, Q = 1.20–1.70, av. Q = 1.35–1.50, broadly cylindrical, rounded truncate; germ pore central, difficult to see, because of very dark colour of spores, c. 2 μm wide. Basidia 15–34 × 8–10 μm, 2-spored, but often also 1-spored. Pseudoparaphyses 4–6 per basidium. Cheilocystidia 30–50 × 12–17 μm, lageniform with tapering to (sub)cylindrical neck and 3–5 μm wide apex. Pleurocystidia absent. Pileocystidia 50–85 × 11–18 μm, lageniform with tapering, sometimes (sub)cylindrical neck, 3.5–8 μm wide at apex. Clamp-connections present.

**Habitat.**—Solitary or subgregarious. On lawns and grassy roadsides. Rather common.

**Collections examined.**—NETHERLANDS: prov. Zuid-Holland, Alphen a/d Rijn, 21 Aug. 1987, *Uljé* 850 (holotype, L); 22 Sept. 1987, *Uljé* 853; 4 Sept. 1987, *Uljé*.

This species differs from *C. amphithallus* in broader, rounded truncate, subcylindrical spores with a central germ pore. The fruit-bodies are distinctly smaller. In all of the several collections found at different localities one-spored as well as two-spored basidia were present.

### 34. *Coprinus silvaticus* Peck—Fig. 34

*Coprinus silvaticus* Peck in *Rep. N.Y. St. Mus. nat. Hist.* 24: 71. 1870.

*Coprinus tardus* (Karst.) Karst. in *Meddn Soc. Fauna Fl. fenn.* 5: 34. 1880.

**Misapplied.**—*Coprinus tergiversans* Fr. sensu Rick. *Blätterpilze*: 63. 1915.

Closed pileus up to 35 × 25 mm, ochre-brown (Mu. 7.5 YR 4.5/4 to 10 YR 6/4, K. & W. 6D4.5 to 5D4) with dark reddish brown centre (Mu. 5 YR 3/4, K. & W. 7E5), usually campanulate to convex, up to 40 mm in diam. when mature, seldom entirely flat, with ochre-brown, granular-flocculose veil. Lamellae narrowly adnate, whitish, dark brown to blackish; L and l not noted. Stipe 40–80 × 2–5 mm, whitish, pubescent.

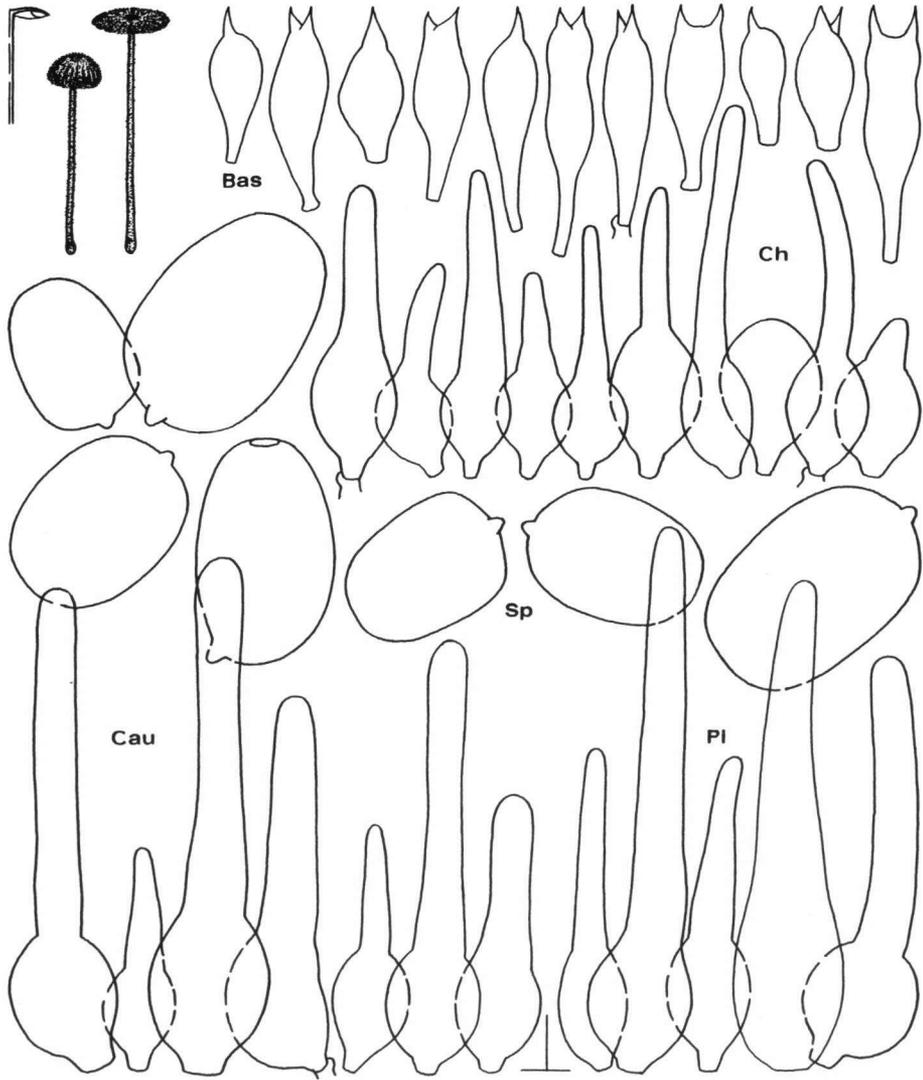


Fig. 33. *Coprinus singularis* Uljé. — All figures from type.

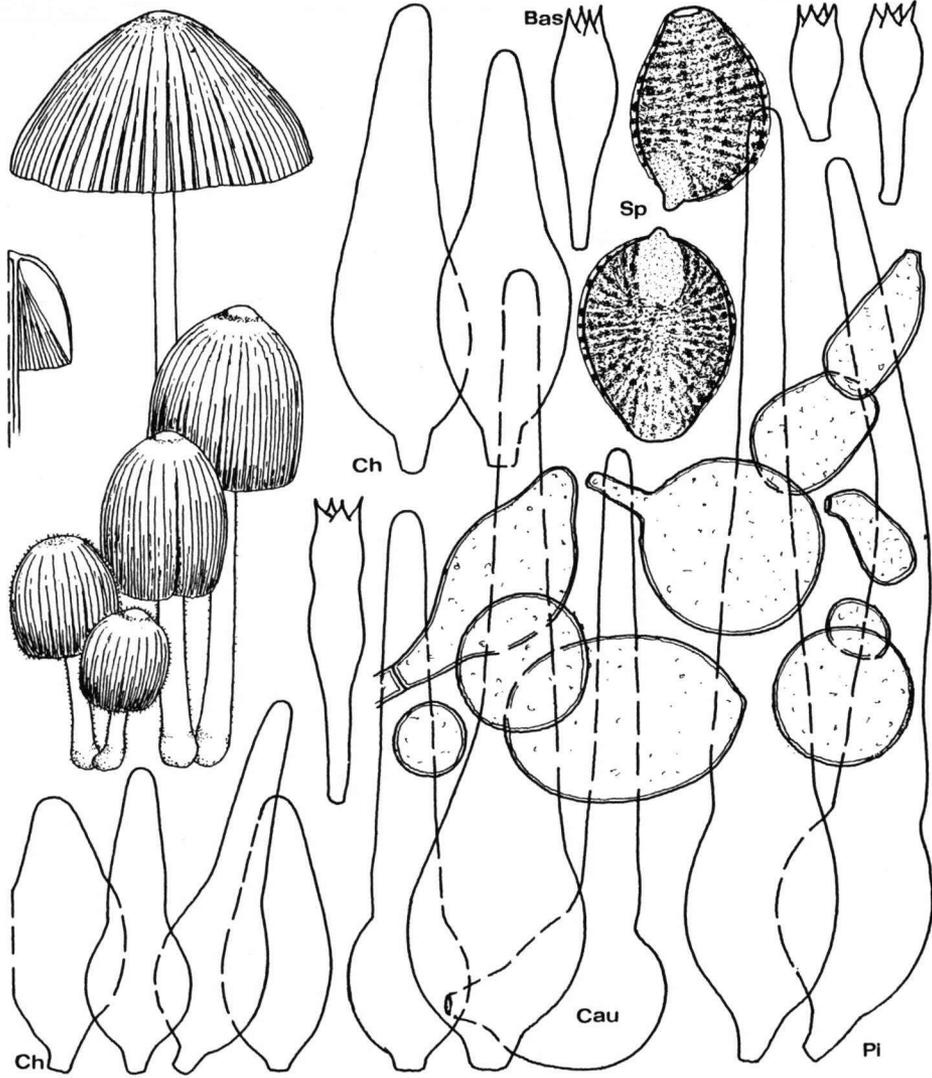


Fig. 34. *Coprinus silvaticus* Peck. — All figures from *Maas Geesteranus 3230*.

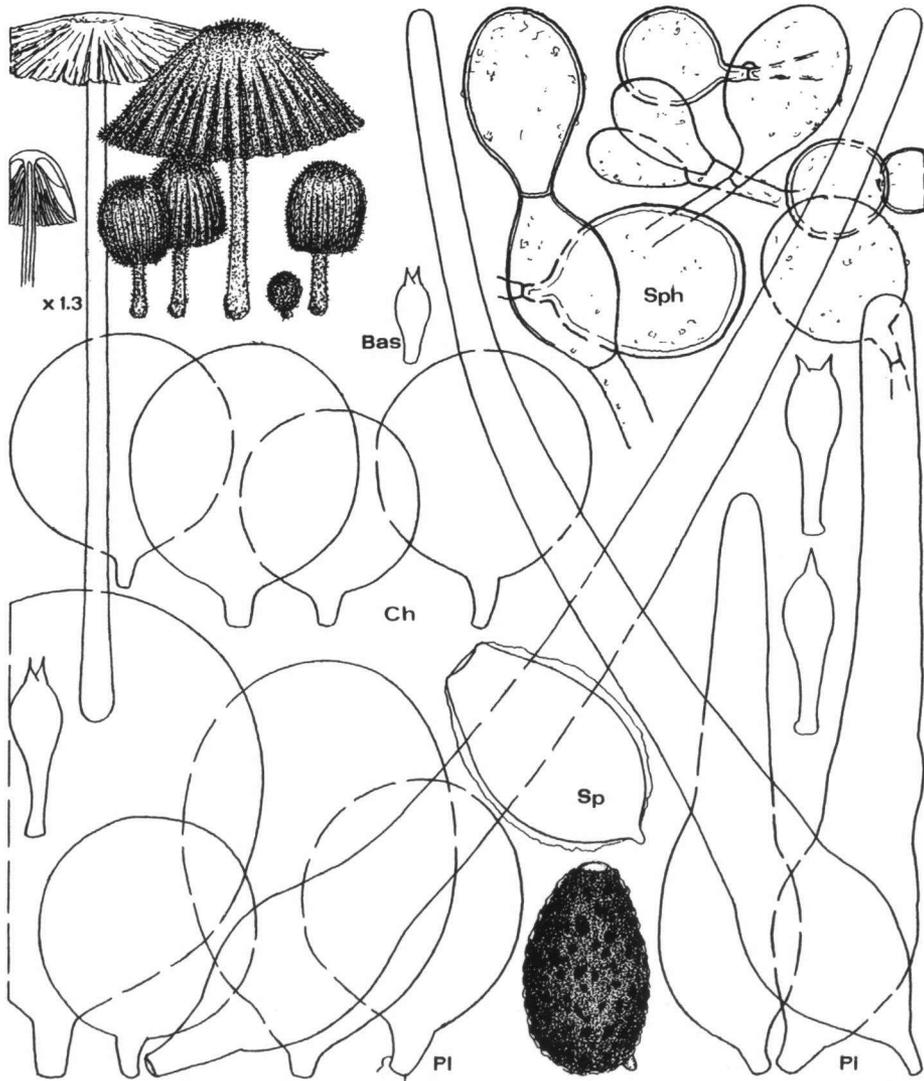


Fig. 35. *Coprinus verrucispermus* Joss. & Enderle. — All figures from *Uljé 1014*.

Spores [80, 4, 4]  $10.2-15.0 \times 7.2-10.0 \mu\text{m}$ , av. L = 12.1-12.9, av B = 7.3-8.4  $\mu\text{m}$ , Q = 1.40-1.70(-1.90), av. Q = 1.50-1.65, ovoid in front view, amygdaliform in side view, ornamented with rows of small warts or with larger, more isolate warts, truncate; germ pore central, c. 2.2  $\mu\text{m}$  wide. Basidia 20-60  $\times$  8-11, 4-spored. Pseudoparaphyses (4-)5-6 per basidium. Cheilocystidia 45-90  $\times$  16-30  $\mu\text{m}$ , lageniform or conical to fusiform with tapering neck and 5-8  $\mu\text{m}$  wide apex. Pleurocystidia absent. Pileocystidia 60-150  $\times$  20-35  $\mu\text{m}$ , lageniform with tapering neck, 6-8.5  $\mu\text{m}$  wide at apex. Velar spherocysts on pileipellis globose to ovoid, up to 45  $\mu\text{m}$  long. Clamp-connections not found. (M. Lange (1952: 127) does mention clamps).

**Habitat.**—On rich, clayey soil, usually fasciculate. Rather rare.

**Collections examined.**—NETHERLANDS: prov. Utrecht, Breukelen, Sterreschans, 23 Aug. 1986, *Ulje* 632; prov. Zuid-Holland, Wassenaar, 6 Oct. 1945, *R.A. Maas Geesteranus* 3230; prov. Noord-Holland, Vogelenzang, 28 Nov. 1967, *J. Klarenberg*; prov. Friesland, Tjalleberd, 22 Oct. 1982, *J. Wisman*.

*Coprinus silvaticus* is easily recognized by the verrucose, amygdaliform spores in combination with the four-spored basidia. It has comparatively large fruit-bodies. *Coprinus verrucispermus*, the other species in the *Setulosi* with verrucose spores, has distinctly smaller fruit-bodies and two-spored basidia. Moreover, the spores in that species are more ellipsoid to only slightly amygdaliform. The warty appearance of the spores of *C. verrucispermus* disappears in KOH, that of *C. silvaticus* not.

### 35. *Coprinus verrucispermus* Joss. & Enderle—Fig. 35

*Coprinus verrucispermus* Joss. & Enderle in *Z. Mykol.* 54: 67. 1988.

Closed pileus up to 15  $\times$  12 mm, first dark (red-)brown (Mu. 7.5 YR 4/4-5/6, K. & W. 6C4-6D6), soon paler, especially outside centre (Mu. 7.5 YR 5/6-5/8 to 10 YR 7/4, K. & W. 5C4-5, 5D4, 6C6), entirely covered with brown, flocculose-granular remnants of veil, up to 30(-47) mm in diam. when expanded. Lamellae narrowly adnate, white, dark sepia to blackish; L = 22-38, l = 0-3. Stipe 30-70  $\times$  1-3 mm, usually short in proportion to pileus, whitish, pubescent.

Spores [80, 4, 2]  $11.2-16.8 \times 7.1-9.4 \mu\text{m}$ , av. L = 13.4-14.5, av. B = 7.9-8.9  $\mu\text{m}$ , Q = 1.40-1.80, av. Q = 1.50-1.70, ovoid in front view, ellipsoid to slightly amygdaliform in side view, ornamented, with wrinkled-folded perisporium giving spores a warty appearance, but after some hours in KOH becoming smooth because of swelling of perisporium, truncate; germ pore central, c. 2  $\mu\text{m}$  wide. Basidia 18-35  $\times$  8-10  $\mu\text{m}$ , 2-spored. Pseudoparaphyses 4-6 per basidium. Cheilocystidia 20-50  $\mu\text{m}$  in diam., (sub)globose to ellipsoid. Pleurocystidia 30-65  $\mu\text{m}$  broad, vesiculose. Velar spherocysts on pileipellis globose, 10-25  $\mu\text{m}$  in diam. to ellipsoid, up to 15-35  $\times$  8-25  $\mu\text{m}$ . Pileocystidia 80-210  $\times$  18-25  $\mu\text{m}$ , lageniform with tapering neck, 5-8  $\mu\text{m}$  wide at apex. Clamp-connections small and difficult to find.

**Habitat.**—Gregarious on naked, clayey soil. Rare.

**Collections examined.**—NETHERLANDS: prov. Utrecht, Linschoten, 13 Aug. 1988, *Ulje* 951; 6 Aug. 1989, *Ulje* 1014.

This species is characterized by its warty spores in combination with two-spored basidia. The closest related species is *C. silvaticus*, which has four-spored basidia, no pleurocystidia, lageniform cheilocystidia and usually much larger fruit-bodies.

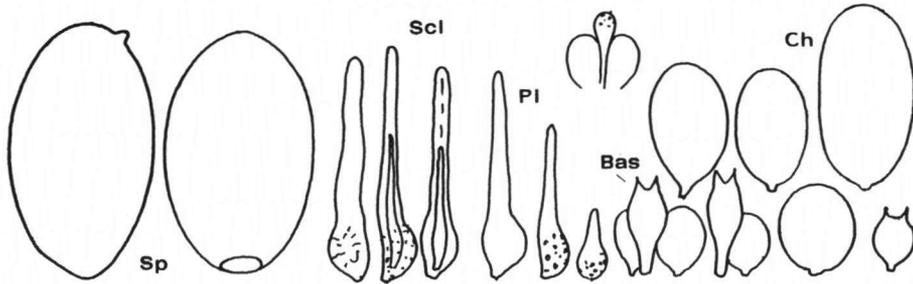


Fig. 36. *Coprinus sassii* M. Lange & A.H. Smith. — Figures copied from M. Lange 1952: 76 (sp.) and 91 (other figs.).

### 36. *Coprinus sassii* M. Lange & A. H. Smith — Fig. 36

*Coprinus ephemerus* f. *bisporus* Sass in Amer. J. Bot. 16: 669. 1929. — *Coprinus sassii* M. Lange & A.H. Smith in Mycologia 45: 755. 1953 (name change).

Closed pileus up to 20 mm high, narrowly conical, up to 35 mm in diam. when expanded, cinnamon-brown, red-brown, young specimens with somewhat purple tinge at centre. Lamellae free or almost free, whitish, finally black; L = c. 28, l = 0–1. Stipe up to 80 × 2–3 mm, white or weakly tinged with colour of pileus at base, pubescent.

Spores 12.8–20.0 × 7.9–11.0 μm, av. L = 15.2–17.3, av. B = 8.7–9.8 μm, av. Q = 1.70–1.75, ellipsoid; germ pore eccentric, c. 2.5 μm wide. Basidia 18–38 × 9–12.5 μm, 2-spored. Pseudoparaphyses not mentioned. Cheilocystidia 20–60 × 20–30 μm, globose to ovoid. Pleurocystidia 50–90 × 25–55 μm, mostly vesiculose. Pileocystidia 30–100 × 5–16 μm, with tapering neck, 2–5 μm wide at apex. Sclerocystidia present. Clamp-connections present (single-spore mycelia with and without clamps, according to Lange & Smith, l.c.).

H a b i t a t. — Gregarious on horse-dung and decaying straw. Not known from the Netherlands (the record mentioned by Arnolds & al., 1984: 67, concerns another species).

This species is unknown to us and we did not study the type. Therefore, the description above is based on that given by Lange & Smith, l.c. On account of the very large spores formed on two-spored basidia, the presence of pleurocystidia and clamp-connections and its habitat on dung *C. sassii* seems to be a well-defined species. *Coprinus bisporus* has no pleurocystidia, no clamps and much smaller spores. *Coprinus bisporiger* has pleurocystidia, but no clamp-connections, smaller spores too and its habitat is not on dung. The other two-spored species in subject. *Setulosi* have lageniform cheilocystidia. Comparing *C. sassii* with four-spored species, *C. ephemerus* seems to be close to it, but in that species the absence of sclerocystidia and the smaller spores are differentiating characters.

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