

## SOME NEW SPECIES OF COPRINUS FROM THE NETHERLANDS

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Four new species of *Coprinus* are illustrated and described as *C. calosporus* and *C. ochraceolanatus* in sect. *Coprinus* subsect. *Lanatuli* (Fr.) Sing. and *C. goudensis* and *C. piepenbroekii* in sect. *Coprinus* subsect. *Alachuani* Sing. (= *Impexi* s. Kühn. & Rom., 1953).

At the base of the stem of a *Yucca*, growing in a flowerpot in a room of the Rijksherbarium at Leiden, a number of basidiocarps of a species of *Coprinus* were found by H. Kruijer, bryologist at the Rijksherbarium. Macroscopically they resembled *C. lagopus*, but microscopical examination showed that the spores were conspicuously nodulose and had a different shape. As in literature no suitable name could be found, the concerning taxon is newly described here as *C. calosporus*.

*Coprinus ochraceolanatus* is another new species in subsect. *Lanatuli*, distinguishing itself in the field by its rather deep ochraceous yellow veil. Kemp (1975a: 382 and 1975b: 62) has shown by means of oidial homing that there is another good reason to consider this fungus (then provisionally named *C. ochraceovelatus*) as a species in its own right in the *C. lagopus*-group.

A recent collection of a *Coprinus* growing on a stump of *Fraxinus* near Gouda turned out to represent an undescribed species in subsect. *Alachuani* and is named *C. goudensis*.

Among the unnamed collections of *Coprinus* in the Rijksherbarium, Leiden, a second new species in the same subsection, collected almost 20 years ago by Mr. J.H. and Mrs. G. Pie-penbroek, has been discovered. It is named after its collectors: *C. piepenbroekii*. Although the single collection available of this species consists of no more than 3 young basidiocarps, it was decided to publish it as new, because of its outstanding characters.

In the following descriptions the colour code of Munsell Soil Color Charts (abbreviated Mu.) is used to designate colours. Other abbreviations in text and drawings are:

av. – average	l – number of lamellulae between two lamellae
B – breadth of spores in frontal view	Pl. – pleurocystidia
Bas. – basidia	P. p. – pileipellis
Ch. – cheilocystidia	Q – length divided by breadth
diam. – diameter	s. – sensu
L (relating to lamellae) – number of lamellae reaching stipe	Sp. – spores
L (relating to spores) – length	St.v. – veil from stipe
	Ve. – veil from centre of pileus

The notation [60,2,1] stands for '60 spores from 2 basidiocarps from 1 collection measured'. All collections Uljé in herb. Uljé (L); other collections examined have been deposited in the Rijksherbarium, Leiden.

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

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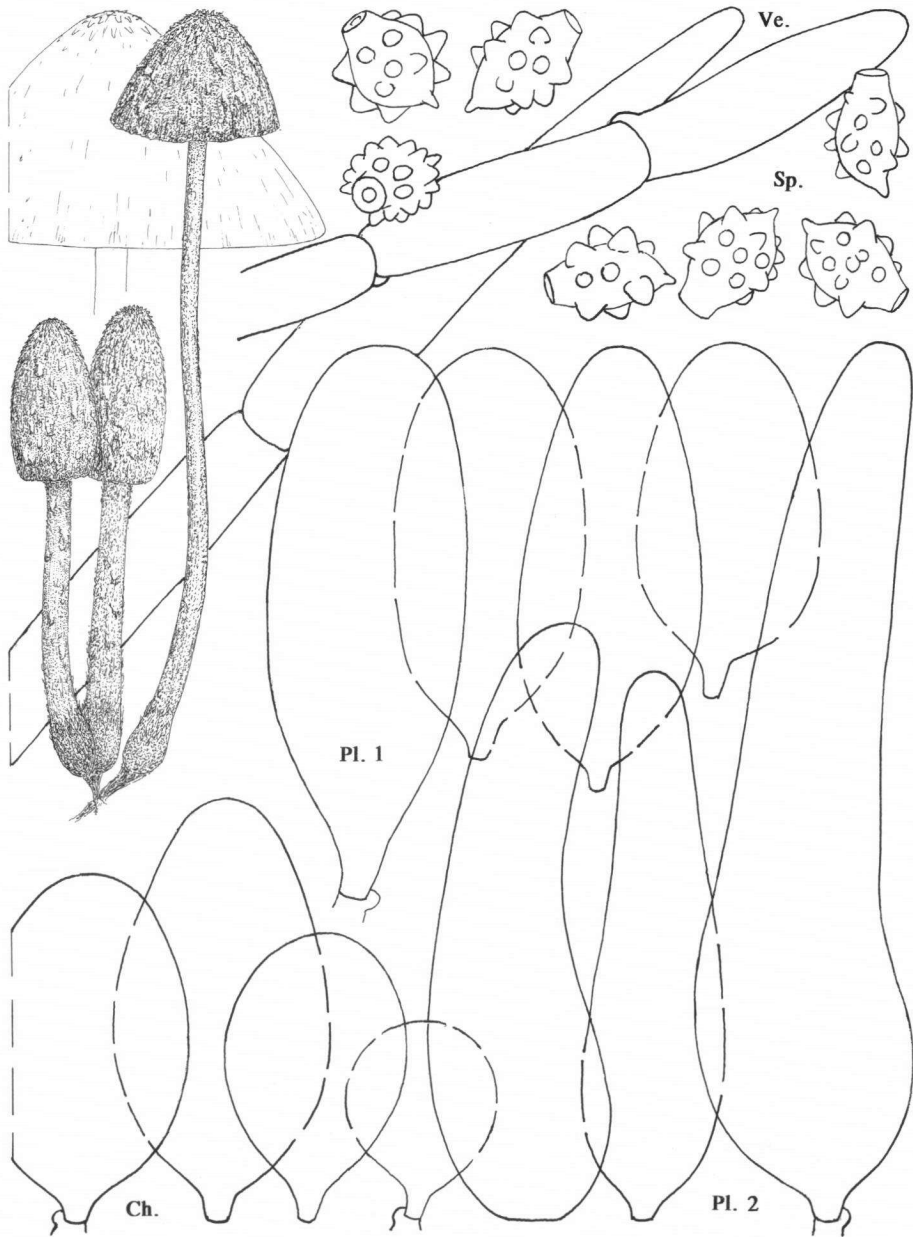


Fig. 1. *Coprinus calosporus*. Pl. 1 from young basidiocarp; Pl. 2 from older one. All figures from *Uljé 1131* (isotype).

**Coprinus calosporus** Bas & Uljé, *spec. nov.* — Fig. 1

Pileus ad c. 30 mm latus, initio albus, mox cinerascens vel cinereo-brunnescens, velo fibrilloso vel floccoso, primo albo, postea pallide griseo vel pallide griseo-brunneo obtectus. Lamellae liberae, subconfertae, initio albae, mox griseo-brunneae vel nigrae. Stipes 50–100 × 2–4 mm, sursum subattenuatus, basi clavatus vel subbulbosus, pseudorhiza brevi, attenuata praeditus, cavus, albidus, fibrilloso-floccosus.

Spores 7.3–9.8 × 4.6–5.8 μm, rubro-brunneae, apice late truncatae, poro germinativo, angusto, centrali instructae, c. 16–24 nodulis conicis, magnis ornatae. Basidia tetraspora. Pleurocystidia 30–150 × 20–40 μm, elongato-ellipsoidea vel oblonga vel sublageniformia. Cheilocystidia 30–70 × 20–35 μm, ellipsoidea vel oblonga. Pileipellis ex hyphis repentibus, 4–22 μm latus, constans. Velum cellulis cylindricis vel subinflatis, catenulatis, 30–150 × 5–25 μm metientibus. Fibulae adsunt.

Typus: 'Netherlands, prov. Zuid-Holland, Leiden, 18.IV.1991, *C. Bas 8795 (L).*'

Pileus when still closed up to 29 × 12 mm, ellipsoid, cylindrico-ellipsoid, often somewhat conical, white in very young stage, soon becoming greyish or grey-brown, underneath veil somewhat darker (Mu. 10 YR 5/4), darkest at centre, expanding to conical, then via convex to applanate, finally plano-concave with reflexed margin, up to c. 30 mm in diam. when mature. Veil in primordia smooth, mat, pure white, later pale grey to pale grey-brown (10 YR 7/3), covering entire pileus, soon radially splitting into hairy to fibrillose, often pointed and adpressed or – especially at centre – recurving flocks. Lamellae, L = 32–46, l = 1–3(–5), free, narrow, rather crowded, first white, soon greyish brown to blackish. Stipe 50–100 × 2–4 mm, whitish, somewhat tapering upwards, up to 5 mm wide at clavate to slightly bulbous base, with short and narrow pseudorhiza, hollow, hairy-flocculose over entire surface but particularly densely so at lower part, becoming glabrous with age. Spore print not available.

Spores [60,2,1] 7.3–9.8 × 4.6–5.8 μm (L × B, without ornamentation), av. L = 8.0–8.4, av. B = 5.0–5.4 μm, Q = 1.35–1.75, av. Q = 1.60, red-brown under microscope, amygdaliform, often with attenuate base and with broadly truncate, somewhat nozzle-shaped apex, covered with c. 16–24 large, short, broad, rounded-conical nodules, with central germ pore, seemingly c. 3 μm wide, but because of thick wall actual pore c. 1.3 μm wide. Basidia 13–24 × 6–8 μm, 4-spored. Pseudoparaphyses (3–)4–5(–6) around each basidium. Pleurocystidia 30–150 × 20–40 μm, elongate-ellipsoid to oblong to rather broadly sublageniform. Cheilocystidia 30–70(–90) × 20–35 μm, ellipsoid to oblong, sometimes slightly vesiculose. Pileipellis consisting of radial, repent, 4–22 μm wide hyphae. Veil made up of elongate, sausage-like elements, 30–150(–250) × (3–)5–25(–40) μm, often somewhat inflated, usually constricted at septa. Clamp-connections present.

*Habitat.* Fasciculate against stem of *Yucca* in flowerpot. Indoors.

*Collections examined.* NETHERLANDS: prov. Zuid-Holland, Leiden, Rijksherbarium, 18 April 1991, *C. Bas 8795a* (holotype), *C.B. Uljé 1131* (isotype); 30 April 1991, *C. Bas 8795b*.

Macroscopically it is not possible to distinguish *C. calosporus* from other members of subsect. *Lanatuli*. One look at the spores under the microscope, however, is sufficient to establish its identity. Their ornamentation of large, rounded-conical nodules and their very broadly truncate, somewhat elongate apex make them highly characteristic.

We know only one other species of *Coprinus* with nodulose spores, viz. *C. iocularis* Uljé (Uljé, 1988: 485), but that belongs to subsect. *Nivei* and consequently looks very much different. Moreover, the spores of that species have only four, much weaker developed nodules which render the spores in frontal view more or less hexagonal.

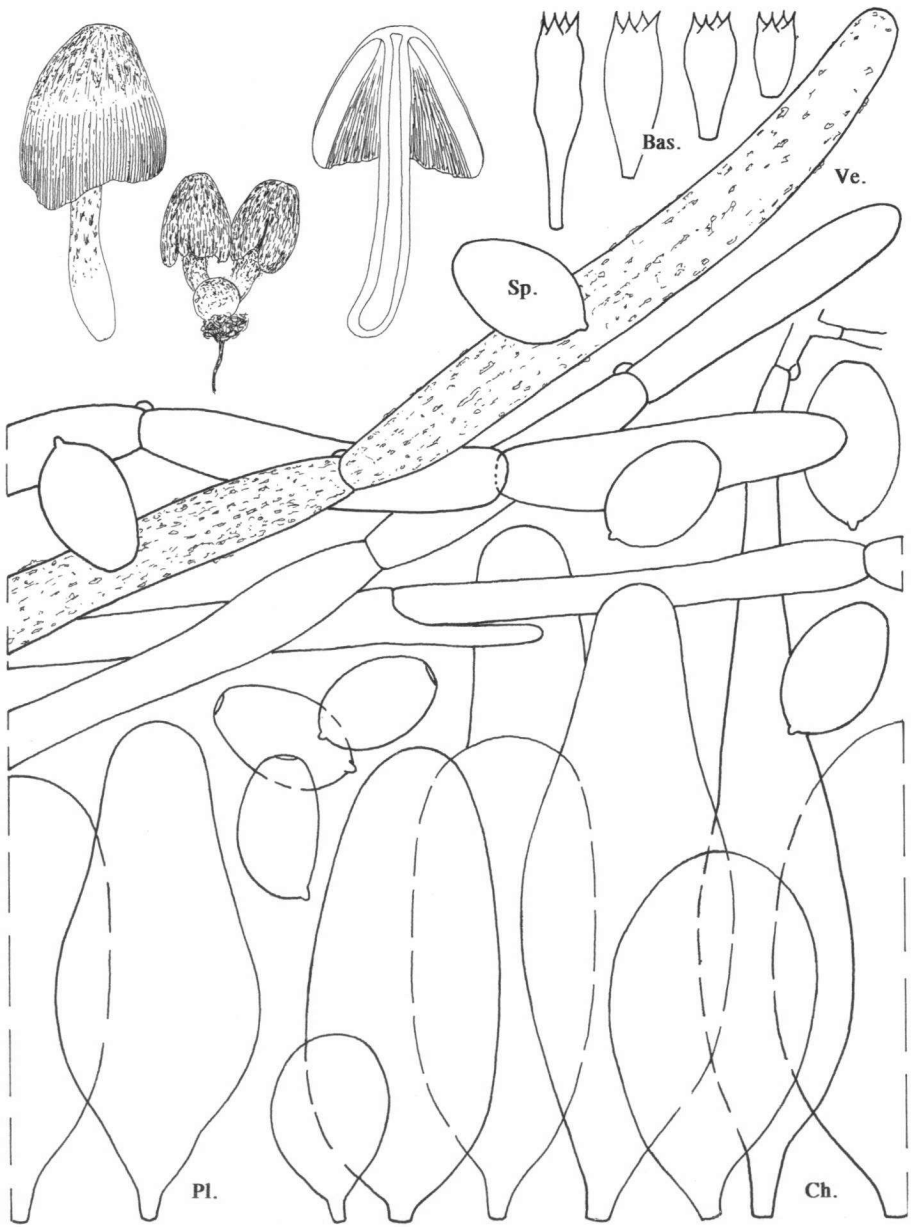


Fig. 2a. *Coprinus ochraceolanatus*. All figures from Bas 5813 (type).

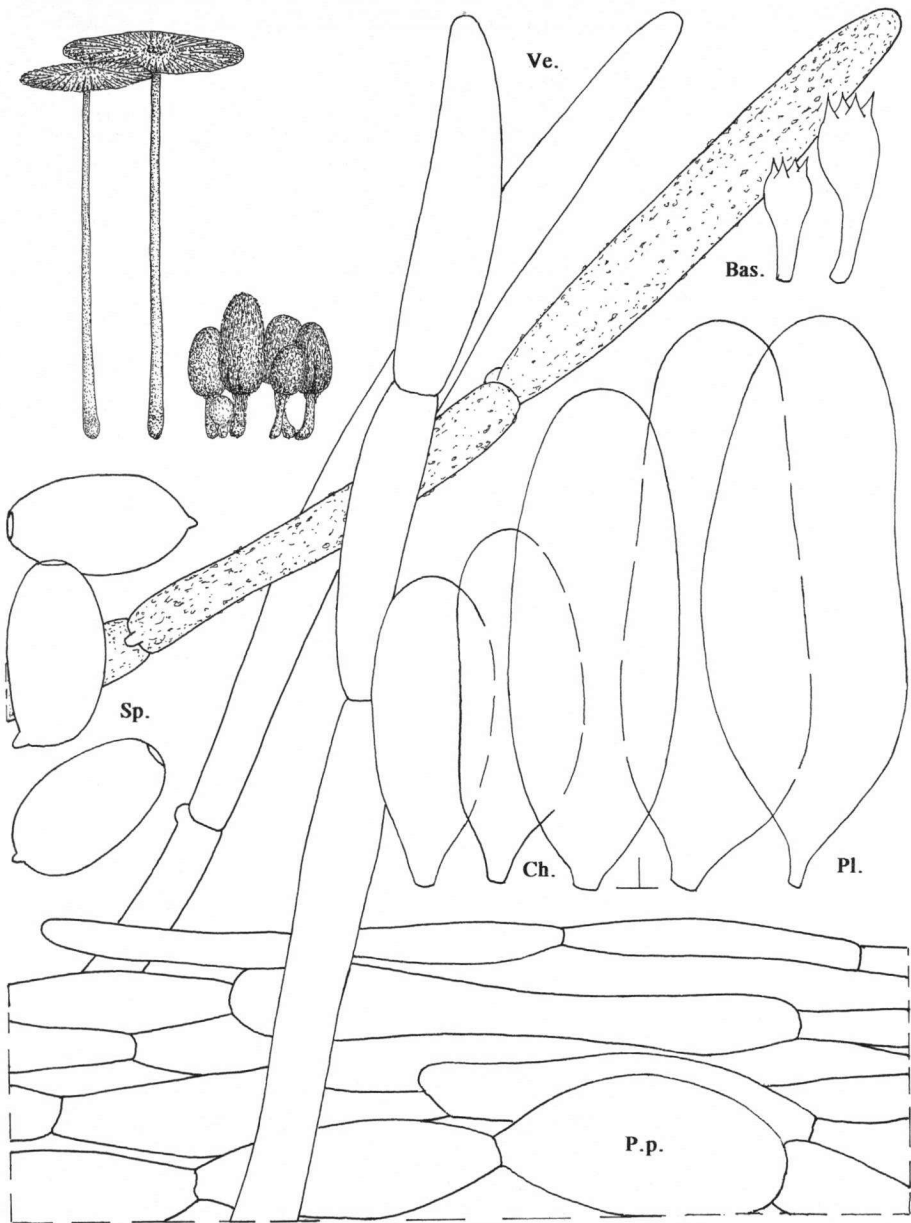


Fig 2b. *Coprinus ochraceolanatus*. All figures from Uljé 1062.

**Coprinus ochraceolanatus** Bas, *spec. nov.* — Figs. 2a, 2b

Pileus ad c. 50 mm latus, pallide griseus vel griseo-brunneus, velo adpresso, fibrilloso-squamoso, ochraceo ornatus. Lamellae liberae, confertae, purpureo-brunneae vel obscure griseo-purpureo-brunneae. Stipes ad 80 × 5.5 mm, sursum attenuatus, interdum pseudorhiza brevi praeditus, (sub)fasciculatus, griseo-albidus, dense ochraceo-fibrillosus, interdum basi ochraceo-squamulosus.

Sporae 8.3–13.4 × 5.7–7.3 μm, rubro-brunneae, ellipsoideae vel ovoideae, poro germinativo centrali instructae. Basidia tetraspora. Pleurocystidia 50–140 × 20–50 μm, elongato-ellipsoidea, vesiculosa, cylindrica vel late fusiformia. Cheilocystidia 30–120 × 15–50 μm, primo subglobosa, postea ellipsoidea, oblonga, clavata vel cylindrica. Pileipellis ex hyphis repentibus 8–26 μm latis constans. Velum cellulis cylindricis vel subfusiformibus, flavo-incrustatis, 45–200 × 7–20 μm metientibus. Fibulae adsunt.

Typus: 'Netherlands, prov. Zuid-Holland, Voorschoten, 31.V.1972, *C. Bas 5813* (L).'

Pileus just before expanding up to 30 × 20 mm, ovoid, sometimes with truncate apex and irregular somewhat lobed margin, rather pale grey (Mu. 5 Y 6/1) at margin to somewhat darker (5 Y 5/1) near apex, but slightly more brownish although not as brown as 2.5 Y 6/2 to 5/2 in *Bas 5813*, rather more brown (7.5 YR 3/2 to 10 YR 4/3) in *Uljé 1062*, deeply and densely sulcate at margin, sulcate-striate near centre, with appressed (but in young buds suberect), long, thin, fibrillose, ochraceous to salmon-ochraceous (10 YR 7/4 to 7/6) velar scales condensed to a thin, felted, salmon-ochraceous patch at centre; margin of cap in early stages loosing contact with stem; pileus up to c. 50 mm when expanded. Lamellae, L = 36–41, l = 1–3(–5), crowded, free, rather narrow (up to 4 mm wide), already in young buds fairly dark chocolate-brown (7.5 YR 3/2), finally dark greyish purple-brown (5 YR 2/2) with thin, pale ochraceous, subflocculose edge; pleurocystidia visible with handlens. Stipe up to 80 × 5.5 mm, tapering upwards, hollow, subfasciculate to fasciculate, in some specimens with thin, up to 12 mm long pseudorhiza, slightly greyed whitish, densely fibrillose, with ochraceous tinge because of rather deeply ochraceous-yellow superficial fibrils (under lens), especially near base sometimes with a few incomplete, pale ochraceous, floccose girdles or many small, similarly coloured scales. Context ± chocolate-brown in centre of cap, slightly more greyish purple-brown in base of stipe and paler along cavity of stipe; rest pale. Smell indistinct, weakly fungoid. Taste subraphanoid with somewhat bitterish, unpleased aftertaste. Spore print not available.

Spores [100,5,3] 8.3–13.4 × 5.7–7.3 μm (L × B), av. L = 9.4–12.3, av. B = 6.1–6.8 μm, Q = 1.45–2.10, av. Q = 1.55–1.85, red-brown under microscope (not as blackish brown as in *C. lagopus*), ellipsoid to ovoid; germ pore central, 1.5–1.8 μm wide. Basidia 15–38 × 8–11 μm, 4-spored. Pseudoparaphyses 3–5(–6) around each basidium. Pleurocystidia 50–140 × 20–50 μm, elongate-ellipsoid, subglobose, cylindrical or broadly fusiform. Cheilocystidia 30–120 × 15–50 μm, in very young pileus subglobose or vesiculose, later rather more elongate or ellipsoid, clavate, oblong, vesiculose or cylindrical. Pileipellis consisting of repent, radial chains of ± cylindrical to inflated, 8–26 μm wide cells. Veil made up of parallel, yellowish, granular-incrustated hyphae of 45–200 × 7–20 μm large, often somewhat fusiform elements, not or only slightly constricted at septa. Incrustations on velar hyphae persistent in HCl 10% and alcohol, loosening in KOH and NH<sub>4</sub>OH and dissolving in Melzer's reagent. Clamp-connections present.

*Habitat.* Fasciculate on old mud taken out of ditch one year earlier, in old deciduous forest on sandy clay with much humus and forest litter; gregarious on wood-chips; near old stump of tree.

*Collections examined.* NETHERLANDS: prov. Utrecht, Maarseeven, Zuidplas, 15 May 1982, *C.B. Uljé 313*; prov. Zuid-Holland, Voorschoten, 'Ter Wadding', 31 May 1972, *C. Bas 5813* (holotype, L); Ter Aar, 'de Put', 9 May 1990, *C.B. Uljé 1062*.

*Coprinus ochraceolanatus* is rather close to *C. lagopus*, but differs in having more slender and densely incrustated velar cells (up to 20 µm wide), whereas *C. lagopus* has smooth velar cells which are much more inflated (up to 40 µm wide). Macroscopically the colour of the veil of *C. ochraceolanatus* is yellowish ochre, in *C. lagopus* whitish or greyish, more rarely pale yellow but then the hyphal walls are not incrustated.

The length of the spores of *C. ochraceolanatus* shows a great deal of variation. In *Bas 5813* the spores measure 8.3–11.8 × 5.8–6.8 µm, with a quotient of 1.45–1.90. The other collections examined have spores with a length up to c. 13 µm, whereas the breadth of the spores is very constant in all collections. Consequently the L/B-quotient is 1.50–2.10. Such a difference in size of the spores is not unusual in *Coprinus* and therefore we accept the collections with spores up to 13 µm long as to belong to *C. ochraceolanatus* also, because they share with the type-collection the yellow, granular-incrustated, 7–20 µm wide hyphae of the universal veil.

Kemp (1975a: 382; 1975b: 62) introduced the reactions of monokaryotic hyphae to oidia in cultures as a way of testing the degree of relationship among species of *Coprinus* sect. *Lanatuli*.

Three interspecific reactions are possible: 1. hyphal tips of one species do not curve to grow towards oidia of another species ('no homing'); 2. hyphal tips of one species curve to grow towards oidia of another species ('homing'); 3. hyphal tips of one species grow towards oidia of another species and fuse with these, but the fusion is lethal ('homing and lethal'). Kemp considers case 3 as indicating the highest degree of relationship and case 1 as the lowest.

*Coprinus ochraceolanatus* (in Kemp's papers provisionally called *C. ochraceovelatus*, 1975a: 380) was tested in this respect against nine other species of sect. *Lanatuli*. In none of the tests with *C. ochraceolanatus* homing plus a lethal reaction occurred. In fact in most tests there was no homing at all. In three cases there was homing of hyphae towards conidia of *C. ochraceolanatus*, viz. with *C. cinereus*, *C. macrocephalus*, and *C. radiatus*, but in the reciprocal tests hyphae of *C. ochraceolanatus* showed no homing to conidia of any of the species involved.

Thus Kemp's tests strongly support the taxonomic value of *C. ochraceolanatus* as a species.

### *Coprinus goudensis* Uljé, *spec. nov.* — Fig. 3

Pileus 10–20 mm latus, albus vel griseolus, centro griseo-brunneus, velo albo, fibrilloso-flocculoso vel fibrilloso-squamuloso obtectus. Lamellae liberae, subdistantes, primo albae vel griseo-brunneae, postea nigrae. Stipes 20–40 × 1–1.5 mm, deorsum subincrassatus, basi interdum subbulbosus, albo-fibrilloso-flocculosus.

Sporae 7.0–9.8 × 4.6–6.0 µm, ovoideae, ellipsoideae vel subamygdaliformes, pallide griseo-rubro-brunneae, poro germinativo centrali instructae. Basidia tetraspora. Pleurocystidia 60–100 × 35–50 µm, ellipsoidea vel late cylindrica, raro subglobosa vel obovoidea. Cheilocystidia 30–80 × 20–50 µm, (sub)globosa, ellipsoidea vel obovoidea, raro late utriformia vel cylindrica. Pileipellis ex hyphis repentibus, 3–18 µm latis constans. Hyphae veli ramosae, tenui-tunicatae, 3–10 µm latae, raro ad 15 µm latae et disperse diverticulatae; diverticula 8–15 × 1–4 µm, cylindrica, apice rotundata. Fibulae adsunt.

Typus: 'Netherlands, prov. Zuid-Holland, Reeuwijk near Gouda, 14.XI.1991, *C.B. Uljé 1217* (L).'

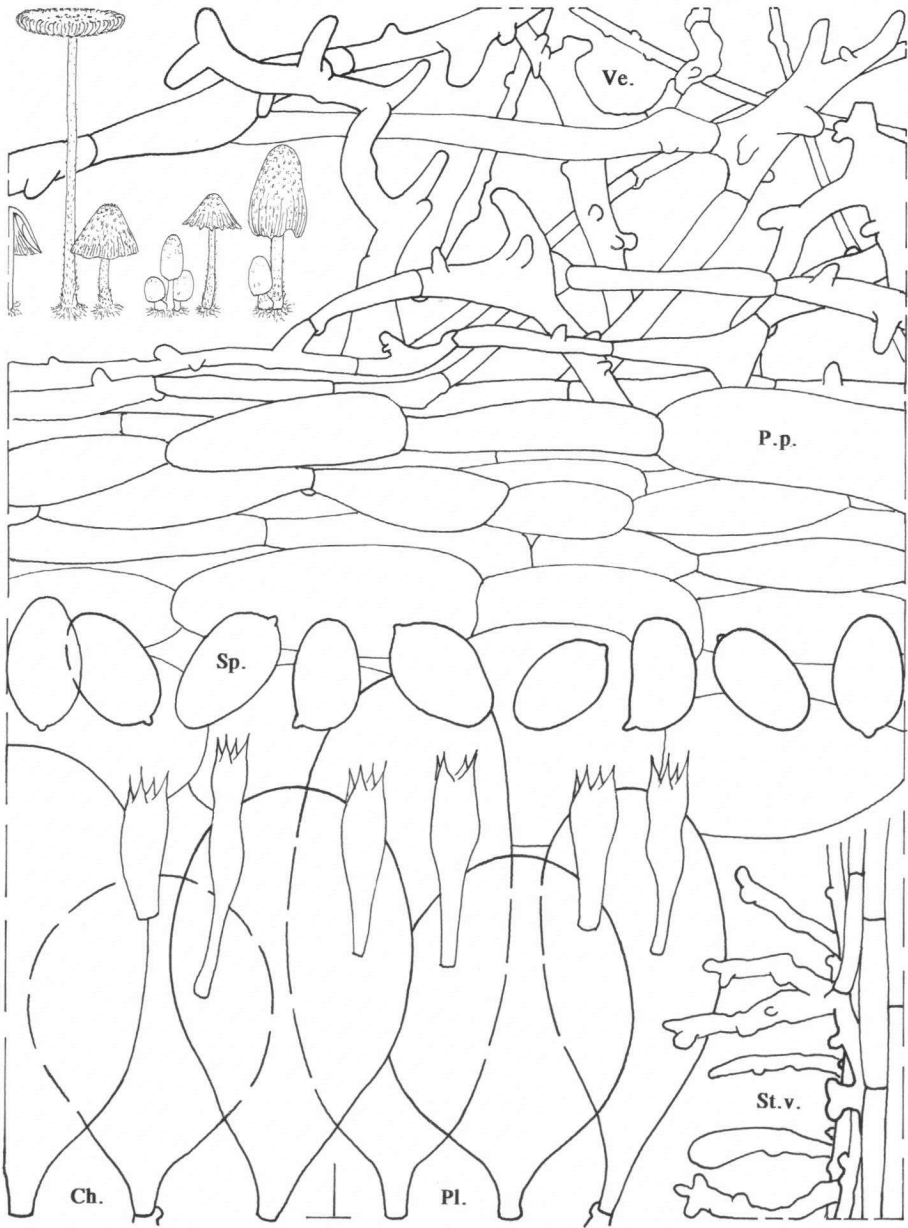


Fig. 3. *Coprinus goudensis*. All figures from type.



Pileus up to 12 × 9 mm when still closed, first ellipsoid to ovoid, then conical, finally flattened with reflexed margin, 10–20 mm wide when expanded, covered with white veil and this unbroken when young but soon radially splitting up in hairy-flocculose scales, with surface white to greyish under veil, dark grey-brown at centre when fresh, paler when drying. Lamellae, L = 23–26, l = 0–3, free, subventricose, moderately distant, white to greyish brown, finally black. Stipe 20–40 × 1–1.5 mm, hollow, whitish, slightly thickening towards equal to subbulbous base, white hairy-flocculose all over but more densely so at base than at apex.

Spores [60,2,2] 7.0–9.8 × 4.6–6.0 µm, av. L = 8.4–8.8, av. B = 5.0–5.1, Q = 1.50–1.90, av. Q = 1.65–1.70, ovoid, ellipsoid or slightly amygdaliform, rather pale greyish red-brown; germ pore central, c. 1.3 µm wide. Basidia 18–40 × 7–9 µm, 4-spored. Pseudoparaphyses (3–)4–5(–6) around each basidium. Pleurocystidia 60–100 × 35–50 µm, ellipsoid to broadly cylindrical, more rarely subglobose or obovoid. Cheilocystidia 30–80 × 20–50 µm, globose, subglobose, ellipsoid or obovoid, seldom broadly utriform or subcylindrical. Pileipellis consisting of repent, 3–18 µm wide hyphae consisting of cylindrical or somewhat inflated elements, constricted at septa. Elements of suprapellis in part diverticulate. Veil on pileus consisting of branched, hyaline, thin-walled, 3–10 µm wide, sometimes up to 15 µm wide hyphae locally with cylindrical or upwards tapering diverticulations with rounded apex, up to 8(–15) µm in length and 1–4 µm wide. Clamp-connections present.

*Habitat.* On the side of a stump of *Acer pseudoplanatus* in a maple plantation.

*Collections examined.* NETHERLANDS: prov. Zuid-Holland, Reeuwijk near Gouda, Reeuwijker Hout, 20 Oct. 1991, C.B. Uljé 1213; 14 Nov. 1991, C.B. Uljé 1217 (holotype, L).

Because of the branched, diverticulate veil *C. goudensis* belongs to the subsect. *Alachuani* Sing. (= *Impexi* s. Kühn. & Rom., 1953). In this section, six species have been compared with the present species, viz. *C. suburticicola* Pilát & Svrček (1967: 140), *C. urticicola* (Berk. & Br.) Buller s. Redhead & Traquair (1981: 388), the tropical species *C. neotropicus* Redhead & Traquair (1981: 394), *C. luteocephalus* Watling (1972: 359), *C. xenobius* P.D. Orton (1976: 148), and *C. stanglianus* Enderle et al. (1988: 62). *Coprinus urticicola* differs in much smaller basidiocarps, smaller spores (5.5–8 × 4–5.5 µm according to Pilát & Svrček, 5.5–8 × 3.9–5.1 µm acc. to Redhead & Traquair) and its habitat on grasses. *Coprinus suburticicola* deviates in the same features except the size of the spores (7–9 × 5–6 µm). After an examination of the type Redhead & Traquair (1981: 390) stated that although many of its spores are larger than in typical *C. urticicola*, the spore size ranges overlap too much to maintain *C. suburticicola* as a separate species. *Coprinus neotropicus* is a tropical species with much smaller and much broader spores. *Coprinus luteocephalus* has yellow veil, larger spores and grows on dung; the last two characters also apply to *C. xenobius*. *Coprinus stanglianus* has much larger spores and basidiocarps and grows on the soil, among grasses.

### *Coprinus piepenbroekii* Uljé & Bas, *spec. nov.* — Fig. 4

Pileus 10–20 mm latus, centro mox obscure brunneus, velo ochraceo vel viridi-ochraceo, fibrilloso vel fibrilloso-squamuloso obtectus. Lamellae liberae, subdistantes, primo albidae vel griseo-brunneae, postea nigrae. Stipes 20–40 × 1–2 mm, deorsum subincrassatus, basi subbulbosus, albidus.

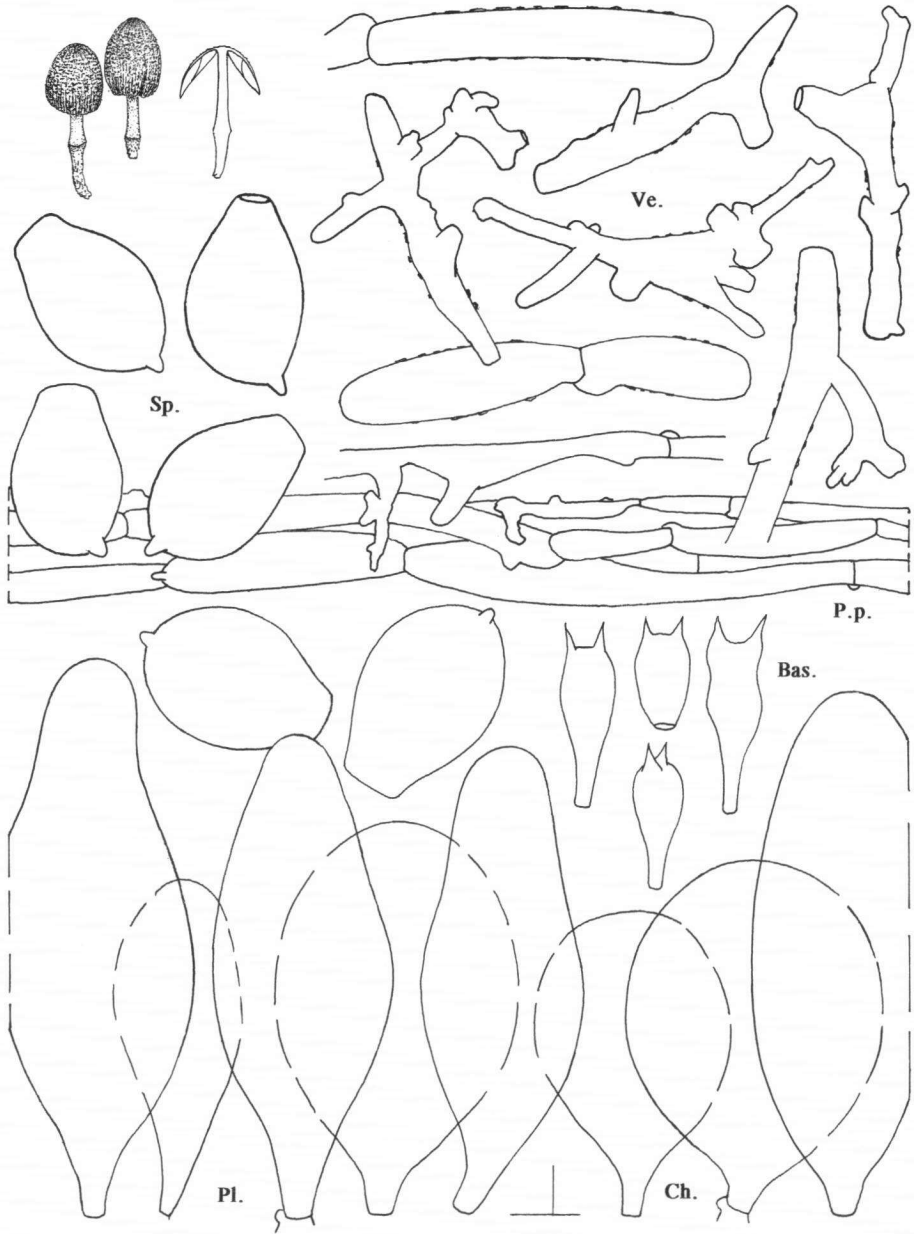


Fig. 4. *Coprinus piepenbroekii*. All figures from type.

Sporae 11.9–15.3 × 7.7–10.5 µm, amygdaliformes, apice truncatae, obscure rubro-brunneae, poro generativo centrali instructae. Basidia bispora. Pleurocystidia 55–90 × 22–40 µm, subglobosa, vesiculosa, ellipsoidea vel utriformia. Cheilocystidia 40–85 × 25–45 µm, (sub)globosa vel ellipsoidea, interdum oblonga. Pileipellis ex hyphis repentibus, 2–15 µm latus, cylindricis vel inflatis constans. Hyphae veli ramosae, tenui-tunicatae, 3–9 µm, interdum ad 12 µm latae, disperse diverticulatae; diverticula ad 15 µm longa, 1–4 µm lata, apice rotundata. Fibulae adsunt.

Typus: 'Netherlands, prov. Gelderland, Wilp, 22.VII.1974, J.H. & G. Piepenbroek 787 (L).'

Pileus up to 10 × 7 mm when still closed, first ellipsoid to ovoid, then conical, finally flattened with reflexed margin, 10–20 mm wide when expanded, soon dark brown at centre, covered with ochraceous veil often with greenish hue and outside centre splitting up into small flocculose scales. Lamellae free, white to greyish brown, finally black. Stipe 20–40 × 1–2 mm, whitish, hollow, slightly thickening towards subbulbose base.

Spores [60,3,1] 11.9–15.3 × 7.7–10.5 µm, av. L = 12.7–13.8, av. B = 8.4–9.4 µm; Q = 1.30–1.60, av. Q = 1.45–1.50, amygdaliform, dark red-brown, with central, c. 2.5 µm wide germ pore. Basidia 15–32 × 9–12 µm, 2-spored. Pseudoparaphyses 4–6 around each basidium. Pleurocystidia 55–90 × 22–40 µm, subglobose, ellipsoid, vesiculose or utriform. Cheilocystidia 40–85 × 25–45 µm, (sub)globose or ellipsoid, sometimes elongate. Pileipellis consisting of repent hyphae made up of cylindrical to somewhat inflated, 2–15 µm wide elements. Elements of suprapellis in part diverticulate. Veil on pileus consisting of branched, hyaline, non-incrusted, thin-walled hyphae, 3–9 µm wide, but sometimes up to 12 µm wide in places with cylindrical diverticulations with rounded apex, up to 15 µm in length and 1–4 µm wide. Clamp-connections present.

*Habitat.* Gregarious on burnt ground.

*Collection examined.* NETHERLANDS: prov. Gelderland, Wilp, Wilpse Dijk, 22 July 1974, J.H. & G. Piepenbroek 787 (holotype, L).

The macroscopical description is derived from the dried material and a colour slide; no descriptive notes are available. There only was a note that the veil had a distinct greenish tinge. Microscopically the green pigmentation could not be found in the elements of the veil.

*Coprinus piepenbroekii* is easily recognized by its microscopical features: large, amygdaliform spores in combination with diverticulate elements of the veil and two-spored basidia.

#### ACKNOWLEDGEMENTS

We are very grateful to Mr. H. Kruijer for bringing to our attention the growth of *C. calosporus* in one of his flowerpots.

Many thanks are due to Mr. J.H. & Mrs. G. Piepenbroek for the hundreds of excellent collections sent to the Rijksherbarium over a long period of years, among which again a new species has been discovered which we gladly name after them.

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