

STUDIES IN COPRINUS IV – COPRINUS SECTION COPRINUS
Subdivision and revision of subsection AlachuaniC.B. ULJÉ¹ & M.E. NOORDELOOS²

Coprinus section *Coprinus* is defined and delimited to comprise four subsections: *Atramentarii*, *Coprinus*, *Lanatulii* and *Alachuani*. A key to the subsections is given as well as a key to the species of subsection *Alachuani* known from the Netherlands or to be expected in the Netherlands on account of records from neighbouring countries. Three new species, *Coprinus epichloeus*, *Coprinus fluvialis* and *Coprinus sclerotiorum* are described as well as a new variety of *C. urticicola*: var. *salicicola*. In addition the following species are fully described: *C. argenteus*, *C. echinosporus*, *C. episcopalis*, *C. filamentifer*, *C. friesii*, *C. gonophyllus*, *C. goudensis*, *C. herinkii*, *C. kimurae*, *C. kubickae*, *C. luteocephalus*, *C. phaeosporus*, *C. phlyctidosporus*, *C. picaceus*, *C. piepenbroekii*, *C. pseudofriesii*, *C. rugosobisporus*, *C. spilosporus*, *C. stanglianus*, *C. strossmayeri*, *C. tigrinellus*, *C. urticicola*, *C. vermiculifer*, *C. xantholepis*, and *C. xenobius*.

This paper is a result of our observations on *Coprinus* subsect. *Alachuani*, and is a continuation of earlier papers (Uljé & Bas, 1988, 1991; Uljé & Noordeloos, 1993), also in connection with the preparation of a manuscript for the *Flora agaricina neerlandica*. All species currently known from the Netherlands and neighbouring countries are fully described and some new species are added. To draw attention to some still undescribed species, of which insufficient good material is available at present, some taxa are described here as *Coprinus* spec. and identified with some combination of the collector's name, a collection number, a location and a date.

PRESENTATION

All collections are deposited in the Rijksherbarium, Leiden (L), unless otherwise indicated. Collections made by the first author, but without a collection number, refer to material that has not been conserved.

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

Type studies which form the base of the present species concepts have been published in an earlier paper (Uljé & Noordeloos, 1996).

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

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

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

av. — average	L — relating to spores: length
B — breadth of the spores in front view	l — number of short lamellae (not reaching stipe)
Bas. — basidia	l.c. — loco citato
c. — circa	Pl. — pleurocystidia
Cau. — caulocystidia	P.p. — pileipellis
Ch. — cheilocystidia	Q — length divided by breadth
diam. — diameter	Sp. — spores
gh — greenhouse	St.v. — veil of stipe
L — relating to the lamellae: number of lamellae reaching stipe	Ve. — veil
	W — width of the spores in side view

The terminology in this paper follows the glossary in *Flora agaricina neerlandica*, vol. 1 (Vellinga, 1988).

A notation like [80, 4, 2] means: 80 spores from 4 specimens from 2 collections were measured. Spore measurements are generally 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 $L \times B \times W$. The quotient of the spores (Q) relates to $L : B$.

In the species descriptions the spores are described as seen in frontal view.

The expression 'diverticulate veil' is used for a veil made up of diverticulate hyphae, while 'veil thick- or thin-walled' denotes a veil made up of thick- or thin-walled elements.

ACKNOWLEDGEMENTS

Sincere thanks are due to many colleagues, in particular H. Bender (Germany) and members of the Netherlands Mycological Society (NMV) for the loan and gift of valuable material for this study. The Directors of the herbaria of E, G, K, M and PRM are thanked for the loan of type-material, Dr. R.A. Maas Geesteranus for improving the Latin descriptions, Ms. E.C. Vellinga for critical reading and correcting the manuscript and other valuable advice and J. Lennie for correcting the English text.

INFRAGENERIC DELIMITATION OF COPRINUS WITH REGARD TO SECTION COPRINUS

In an earlier paper (Uljé & Noordeloos, 1993) the authors presented their view on the infrageneric classification of the genus *Coprinus*, resulting in a key to the sections. In this concept, three sections are recognized: sect. *Coprinus*, characterized by the presence of a filamentous veil, sect. *Pseudocoprinus*, accommodating species without a veil or a very minute veil in combination with pileocystidia, and sect. *Veliformes* for those taxa that have a veil that, at least partly, is composed of globose elements. This classification differs from that of Singer (1986), who distinguished four sections: sect. *Coprinus*, which is similar to our concept of the same name, sect. *Micacei* and sect. *Cyclodei*, which together approximate our concept of sect. *Veliformes*, and sect. *Hemerobii*, for taxa without veil or with veil in combination with setulae on the pileus, which agrees with our sect. *Pseudocoprinus*. Like Singer (l.c.) we distinguish four subsections in sect. *Coprinus*, mainly based on characters of the veil: subsect. *Coprinus* (= *Annulati* Lange, 1915), subsect. *Atramentarii* (Fr.) Konr. & Maubl. (1930), subsect. *Alachuani* Sing. (1948), and subsect. *Lanattuli* Sing. (1986).

Citerin (1992, 1994) distinguishes similar groups in the genus *Coprinus*, but treats them on subgeneric instead of sectional level. As a result Citerin has four sections in 'subgenus' *Coprinus*, which he calls *Coprinus* (= *Comati* Fr.), *Atramentarii* (Fr.) Penn. in Kf., *Lanatulii* (Fr.) "Penn. in Kf.", and *Picacei* (Fr.) Penn. in Kf. (Citerin obviously was unaware that Pennington did not use the Friesian name *Lanatulii* but called the group *Lanulati* (Kauffman, 1918: 207, 220)).

Other authors usually place the taxa with diverticulate veil (our subsect. *Alachuanii*) in different sections. Pilát & Svrček (1967: 386) and Redhead & Traquair (1981) put the grass-inhabiting species around *Coprinus friesii* in section *Herbicola*. Kühner & Romagnesi (1953, 'groupe' *Impexi*) keep the species with diverticulate veil together, forming the basis of Singer's (and our) sectional concept. Moser (1983: 253) places all species with veil made up of elongate elements, including species without diverticulate veil, in one group, but without indicating a formal taxonomic rank.

Subsect. *Lanatulii* is also considered as a distinct section by several authors (Van De Bogart, 1979; Citerin, 1992). In our concept subsection *Coprinus* is reserved for those taxa that have a narrow, loose annulus that can easily be shifted along the lower part of the stipe. So far only two taxa have been accepted in this subsection, viz. *Coprinus comatus* and *C. sterquilinus*, and the subsection needs revision.

Subsection *Atramentarii* contains species with a scarce veil, which is not easily removed from the pileus. Such taxa grow in bundles (*Coprinus atramentarius*, *C. acuminatus* and *C. insignis*). These macroscopical characters are the main reasons to keep the *Atramentarii* separate from the *Alachuanii*, since there are hardly any convincing microscopical differences. Future studies will prove whether our present view must be adjusted. In connection with the nomenclatural aspect of the sectional name *Atramentarii* it is interesting to note that the authors of this name, Konrad & Maublanc (1930), erroneously indicated the presence of an annulus as character for subsect. *Atramentarii* instead of for subsect. *Volvati* in which they placed *Coprinus comatus* and *C. sterquilinus*. However this is without nomenclatural consequences.

TAXONOMIC PART

Coprinus section *Coprinus*

Basidiocarps small to rather large, always covered with veil, which presents itself in form of hairy-floccose covering of the basidiocarp or in patches scattered over the surface. Veil consisting of elongate, filamentous elements, which are smooth, thin-walled or diverticulate and then often thick-walled. In some species of subsection *Lanatulii* a few globose or ellipsoid cells may also be present in the veil. Pileipellis made up of repent, elongate, often inflated hyphae, which are smooth or branched and diverticulate.

Holotype: *Coprinus comatus* (Müll.: Fr.) Pers.

KEY TO THE SUBSECTIONS

1. Veil tightly adhering to surface of pileus and difficult to remove; basidiocarps medium to rather large with 6–15 mm wide stipe; pileus white, greyish, grey-brown to ochre brown below veil; if white then pileus oblong.

2. Pileus whitish, except for the centre, usually oblong, height-width ratio of pileus usually more than 1.5; annulus present on lower half of stipe; basidiocarps single or in groups; veil often reflexed subject. *Coprinus*
2. Pileus grey or brown, ovoid, or broadly ellipsoid, height-width ratio of pileus usually less than 1.5; without annulus; basidiocarps fasciculate; veil sparse, only at centre, adpressed subject. *Atramentarii*
1. Veil loosely attached and easily removable from pileus; basidiocarps very small to small, a few medium-sized to rather large; stipe 1–6(–10) mm wide; pileus white to dark grey below veil, rarely brown.
 3. Veil made up of chains of smooth, thin-walled, filamentous to oblong, sometimes ellipsoid or a few almost globose elements with distinct terminal elements
subject. *Lanattuli*
 3. Veil made up of branched, diverticulate hyphae; if elements in chains with distinct terminal elements, then the walls are thickened and yellow-brown
subject. *Alachuani*

Subsection *Alachuani* Sing.

Basidiocarps very small to medium-sized; expanded pileus 6–60 mm. Pileus with veil made up of weakly to strongly diverticulate, and then often thick-walled elements. Stipe smooth, but in most cases covered with very small velar flocks, especially at base.

Macroscopical characters

Most species very small to small with stipes less than 3 mm thick; sometimes medium-sized to rather large with up to 6 resp. 10 mm thick stipe. Veil present in all species, covering the whole pileus of young specimens in most cases, but breaking up in patches or in small, radially arranged, hairy flocks while pileus expands. Lamellae crowded, about 20 in the smallest specimens, up to 60 and more in larger ones, free with no space between place of attachment and stipe; white in very young stages, soon becoming grey, often with brown tinge, finally dark grey or black spotted in small species to black in medium-sized species. Stipe hollow in all species, whitish, equal or slightly tapering towards apex; with equal or somewhat thickened, clavate or – in a few species – more or less bulbous base; with minute remnants of velar flocks, particularly towards base. One species develops on sclerotia. Smell of pileus not specific but in *C. strossmayeri* the rhizomorphs have a distinct smell. Spore print black with a very slightly violaceous or purple tinge. This could be an additional character for the whole group, but since it is almost impossible to make a spore print from the small and fragile basidiocarps of many taxa in sect. *Alachuani*, information on the colour of the spore-print is lacking.

Microscopical characters

Characteristic for the species in subsection *Alachuani* is the structure of the veil, as indicated in the introduction and key to the subsections. The veil is composed of filamentous hyphae that are weakly to strongly diverticulate. This means that most hyphae have wart- or finger-like excrescences. Sometimes these excrescences are branched again, which we call multiple-branched in this paper.

Pileipellis usually consisting of repent, radially arranged hyphae, made up of rather strongly inflated, partly branched and/or diverticulate elements. However, a critical anal-

ysis of the pileipellis is very difficult on (old) exsiccates, and should preferably be done on fresh material. Since in many cases good, fresh specimens have not been available, our knowledge of the exact structure of the pileipellis is still incomplete.

The colour of the spores given in the descriptions is the colour when the spores are observed in water under the microscope. Pleuro- en cheilocystidia present in all species; clamp-connections present in most species. Basidia 4-spored in most species, sometimes 2-spored. The number of pseudoparaphyses around the basidia varying from 3-6 to 5-8.

KEY TO THE SPECIES OF SUBSECT. ALACHUANI

1. Spores smooth, without ornamentation.
2. Basidia 2-spored; spores amygdaloid and truncate 36. *C. piepenbroekii*
2. Basidia 4-spored; if spores amygdaloid then never truncate.
3. Average spore length > 10 µm; on dung or soil.
 - (If not on dung or soil: step 24)
 4. Elements of veil thick-walled, with ascending terminal elements
31. *C. vermiculifer*
 4. Elements of veil thin-walled; walls < 0.5 µm thick.
 5. Breadth of spores < 10 µm.
 6. On dung; small species.
 7. Pileus white when young; average spore length > 11 µm 1. *C. xenobius*
 7. Pileus yellow when young; average spore length < 11 µm 2. *C. luteocephalus*
 6. Not on dung; medium species.
 8. Length of spores > 12.5 µm
3. *Coprinus spec.* (Amsterdamse Bos 13 July 1958)
 8. Length of spores < 12.5 µm 4. *C. stanglianus*
 5. Breadth of spores > 10 µm.
 9. On dung, growing on sclerotia 6. *C. sclerotiorum*
 9. On soil, not on sclerotia 5. *C. picaceus*
3. Average spore length < 10 µm.
 10. On dung; spores cylindrical ovoid, rounded rectangular 17. *C. filamentifer*
 10. Not on dung; spores otherwise shaped.
 11. Average spore length < 6 µm if veil thin-walled, < 6.5 µm if veil thick-walled.
 12. Spores ovoid or ellipsoid; av. Q > 1.15.
 13. Veil thick-walled; average spore length > 5.5 µm
22. *Coprinus spec.* (Uljé 1160)
 13. Veil thin-walled; average spore length < 5.5 µm
16. *Coprinus spec.* (Uljé 1170)
 12. Spores globose or the shape of a maize-kernel; av. Q < 1.15.
 14. Veil thick-walled; spores globose 21. *C. herinkii*
 14. Veil thin-walled; spores the shape of a maize-kernel 18. *C. argenteus*
 11. Average spore length > 6 µm if veil thin-walled, > 6.5 µm if veil thick-walled.
 15. Elements of veil thin-walled; walls < 0.5 µm thick.
 16. Large species; pileus 50-100 mm when expanded 9. *C. strossmayeri*
 16. Smaller species; pileus 5-40 mm when expanded.
 17. Spores globose or rounded quadrangular, with apical papilla.

18. Spores globose with apical papilla, av. length < 8 μ m
19. *Coprinus spec.* (Bas 5002)
18. Spores rounded quadrangular with apical papilla, av. length > 8 μ m
20. *C. episcopalis*
17. Spores subglobose to ellipsoid or ovoid, without apical papilla.
19. Terrestrial, on burned or bare soil, or in lawns.
20. Average Q of spores > 1.25.
21. Pleurocystidia up to 55 μ m in length with Q c. 2 13. *C. fluvialis*
21. Pleurocystidia becoming longer with Q 2.5 and more
11. *C. urticicola* var. *urticicola*
20. Average Q of spores < 1.25.
22. Usually on burned places; expanded pileus 15–30 mm wide
14. *C. gonophyllus*
22. In lawns, often on bare soil; expanded pileus 8–15 mm wide
15. *C. epichloeus*
19. Not terrestrial, not on soil.
23. Average Q of spores < 1.2.
24. Stipe 2–6 mm wide; on straw, coconut mattings, rotting textiles and straw containing materials like ceilings in old buildings etc., in Europe usually indoors 7. *C. kimurae*
24. Stipe 0.5–2 mm wide; on *Phragmites*, *Juncus*, and the like, outdoors
8. *C. kubickae*
23. Average Q of spores > 1.2.
25. Average Q of spores > 1.55; expanded pileus 10–20 mm wide; spores dark brown 10. *C. goudensis*
25. Average Q of spores < 1.55; expanded pileus 6–15 mm wide; spores pale to medium brown.
26. Veil of young pileus white, at centre sometimes pale ochraceous; usually on grasses, but also on other vegetable refuse, sometimes on wood
11. *C. urticicola* var. *urticicola*
26. Veil of young pileus dark grey at centre; on dead branches of willow
12. *C. urticicola* var. *salicicola*
15. Elements of veil thick-walled; walls > 0.5 μ m thick in places.
27. Veil mixed with long, brown, thick-walled hairs 32. *C. spilosporus*
27. No long, brown, thick-walled hairs present.
28. Walls of velar elements up to 1.5(–2) μ m thick in places.
29. Spores (sub)globose; av. Q < 1.1 23. *Coprinus spec.* (Uljé 924)
29. Spores subglobose to ellipsoid, ovoid or slightly rhomboid; av. Q > 1.1.
30. Spores short ovoid or subglobose, lentiform 24. *C. phaeosporus*
30. Spores broadly ellipsoid, ovoid or slightly rhomboid; not distinctly lentiform.
31. Pleurocystidia 20–50 μ m wide 27. *C. xantholepis*
31. Pleurocystidia 10–30 μ m wide.
32. Veil on pileus white or ochre-brown; excrescences (micr.) often tapering with pointed apex 25. *C. pseudofriesii*

32. Veil on pileus dark brown, sepia; excrescences (micr.) often cylindrical with rounded apex 26. *C. tigrinellus*
28. Walls of velar elements over 2 µm thick in places.
33. Spores ellipsoid, ovoid or rhomboid; usually on grasses ... 28. *C. friesii*
33. Spores heart-shaped, rounded triangular or submitriform.
34. Veil grey; spores heart-shaped, rounded triangular with convex to flattened base; walls of veil very pale 29. *Coprinus spec.* (Uljé 1262)
34. Veil brown; spores submitriform, with conical base; walls of veil brown 30. *Coprinus spec.* (Uljé 947)

1. Spores warty.

35. Spores amygdaloid 35. *C. echinosporus*
35. Spores ellipsoid, ovoid.
36. Basidia 4-spored 33. *C. phlyctidosporus*
36. Basidia 2-spored 34. *C. rugosobisporus*

ALTERNATIVE KEY TO THE SPECIES OF SUBSECT. ALACHUANI

1. Spores smooth, not ornamented.

2. Growing on sclerotia in dung; spores > 10 µm broad 6. *C. sclerotiorum*
2. Not growing on sclerotia in dung; if on dung then spores < 10 µm broad.
3. Basidia 2-spored; spores amygdaloid and truncate 36. *C. piepenbroekii*
3. Basidia 4-spored; if spores amygdaloid then never truncate.
4. Medium-sized species; stipe c. 4–10 µm wide (if spores subglobose, compare *C. kimurae*).
5. Spores rounded quadrangular with apical papilla; av. Q < 1.3 . 20. *C. episcopalis*
5. Spores ellipsoid, ovoid or slightly amygdaliform; av. Q > 1.3.
6. Spore length < 10 µm 9. *C. strossmayeri*
6. Spore length > 10 µm.
7. Spore breadth > 10 µm 5. *C. picaceus*
7. Spore breadth < 10 µm.
8. Spores 12.5–15.5 × 8–10 µm
3. *Coprinus spec.* (Amsterdamse Bos 13 July 1958)
8. Spores 10–12.5 × 6.5–8.5 µm 4. *C. stanglianus*
4. Smaller species; stipe c. 1–4 mm wide.
9. Only on dung (not on soil enriched with dung).
10. Veil with ascending terminal elements; elements thick-walled
31. *C. vermiculifer*
10. No ascending terminal elements; veil thin-walled; walls < 0.5 µm thick.
11. Spores cylindrical ovoid, rounded rectangular 17. *C. filamentifer*
11. Spores ellipsoid or ovoid.
12. Pileus white when young; average spore length > 11 µm .. 1. *C. xenobius*
12. Pileus yellow when young; average spore length < 11 µm
2. *C. luteocephalus*
9. Not on dung.
13. Average spore length < 6.0 if veil thin-walled, < 6.5 µm if veil thick-walled.

14. Spores ovoid or ellipsoid; av. $Q > 1.15$.
15. Velar elements thick-walled; average spore length $> 5.5 \mu\text{m}$
22. *Coprinus spec.* (Uljé 1160)
15. Velar elements thin-walled; average spore length $< 5.5 \mu\text{m}$
16. *Coprinus spec.* (Uljé 1170)
14. Spores globose or the shape of a maize-kernel; av. $Q < 1.15$.
16. Velar elements thick-walled; spores globose 21. *C. herinkii*
16. Velar elements thin-walled; spores the shape of a maize-kernel
18. *C. argenteus*
13. Average spore length > 6.0 if veil thin-walled, $> 6.5 \mu\text{m}$ if veil thick-walled.
17. Velar elements thick-walled; walls $> 0.5 \mu\text{m}$ thick in places.
18. Spores ellipsoid or ovoid, often somewhat rhomboid; av. $Q > 1.2$.
19. Walls of velar elements only slightly coloured, over $2 \mu\text{m}$ thick in places
28. *C. friesii*
19. Walls of velar elements yellow or yellow-brown, up to $1.5(-2) \mu\text{m}$ thick.
20. Pleurocystidia $25-40 \mu\text{m}$ wide 27. *C. xantholepis*
20. Pleurocystidia $10-25 \mu\text{m}$ wide.
21. Veil on pileus white or ochre-brown; excrescences (micr.) often tapering with pointed apex 25. *C. pseudofriesii*
21. Veil on pileus dark brown, sepia; excrescences (micr.) often cylindrical with rounded apex 26. *C. tigrinellus*
18. Spores (sub)globose, short ovoid, submitriform, heart-shaped or rounded triangular; av. $Q < 1.2$.
22. Spores heart-shaped, rounded triangular; walls of veil up to $2.5 \mu\text{m}$
29. *Coprinus spec.* (Uljé 1262)
22. Spores (sub)globose, short ovoid or submitriform.
23. Veil with long, thick-walled, non diverticulate hairs . 32. *C. spilosporus*
23. Veil lacking such hairs.
24. Walls of velar elements dark brown in part; spores slightly mitriform
30. *Coprinus spec.* (Uljé 947)
24. Walls of velar elements yellowish; spores not mitriform.
25. Spores short ovoid or subglobose; spore breadth $< 7 \mu\text{m}$
24. *C. phaeosporus*
25. Spores (sub)globose; spore breadth $> 7.5 \mu\text{m}$
23. *Coprinus spec.* (Uljé 924)
17. Velar elements thin-walled; walls $< 0.5 \mu\text{m}$ thick.
26. Average Q of spores < 1.25 .
27. Young pileus ochre-brown, grey-brown or dark grey-brown.
28. Young pileus ochre-brown or grey-brown 8. *C. kubickae*
28. Young pileus dark grey-brown, sepia 15. *C. epichloeus*
27. Young pileus whitish.
29. Average spore breadth $> 7.6 \mu\text{m}$ 7. *C. kimurae*
29. Average spore breadth $< 7.6 \mu\text{m}$.
30. Pileus $15-30 \text{mm}$ when expanded; terrestrial, often on burned places
14. *C. gonophyllus*

30. Pileus 8–15 mm when expanded; not terrestrial
19. *Coprinus spec.* (Bas 5002)
26. Average Q of spores > 1.25.
31. Pleurocystidia up to 55 µm in length; on bare soil, sludge . 13. *C. fluvialis*
31. Pleurocystidia becoming > 60 µm in length; on grass or other plants or on wood.
32. Pileus small, up to 20 mm when expanded; av. Q of spores > 1.55
10. *C. goudensis*
32. Pileus very small, up to 12 (15) mm when expanded; av. Q of spores < 1.55.
33. Young pileus white, later sometimes becoming brownish
11. *C. urticicola* var. *urticicola*
33. Young pileus dark grey; later whitish with dark grey centre
12. *C. urticicola* var. *salicicola*
1. Spores warty.
34. Spores amygdaloid 35. *C. echinosporus*
34. Spores ellipsoid, ovoid.
35. Basidia 4-spored 33. *C. phlyctidosporus*
35. Basidia 2-spored 34. *C. rugosobisporus*

1. *Coprinus xenobius* P.D. Orton — Fig. 1

Coprinus xenobius P.D. Orton, Notes R. bot. Gdn Edinb. 35 (1976) 148.

Selected icon. Cacialli, Caroti & Doveri, Schede Micol. I (1995) 163. Funghi Fimicola. Trento.

Pileus 2–7(–14) × 2–4(–8) mm when still closed, subglobose, ellipsoid or ovoid, white, often with clay-coloured or grey-cream centre; expanded pileus up to 8(–20) mm, greyish; veil radial hairy-floccose, whitish. Lamellae crowded, free, first whitish, then clay-coloured or greyish, finally violaceous black. Stipe up to 40 × 0.3–2(–2.5) mm, whitish, watery white, very fine floccose, more dense at base.

Spores [100, 5, 3] 9.6–14.7 × 5.0–8.2 µm, oblong, mainly rounded at apex, dark red-brown, with central, 1.5–1.8 µm wide germ pore; Q = 1.60–2.15, av. Q = 1.80–1.95; av. L = 10.9–13.5, av. B = 5.9–7.5 µm. Basidia 18–32 × 8–10 µm, 4-spored, surrounded by (3–)4–6 pseudoparaphyses. Pleurocystidia 90–125 × 20–40 µm, cylindrical, utriform or ellipsoid. Cheilocystidia 60–100 × 22–40 µm, mainly utriform, a smaller number globose to ellipsoid or cylindrical. Elements of veil thin-walled, diverticulate, c. 30–100 × 2–10(–12) µm. Clamp-connections present.

Habitat & distribution — On old cow dung, solitary or a few together. Very rare. Not known from the Netherlands. Only a few collections are known to us from Europe. Two finds from Scotland (see original description), one from Italy and the species has been recorded by Bender (1991: 12) from Germany.

Collections examined. ITALY: Livorno, Botro delle Fontanelle, 8 Dec. 1994 (herb. Cacialli, Caroti & Doveri, no. 03794); 30 Apr. 1995 (without further annotations). — GREAT BRITAIN: Scotland, Perthshire, Camghouran, on cow dung, 11 June 1972, P.D. Orton 4504 (isotype, E).

Coprinus xenobius differs from the very closely related species *C. luteocephalus* in having slightly larger spores and smaller basidiocarps, less globose-ellipsoid but more

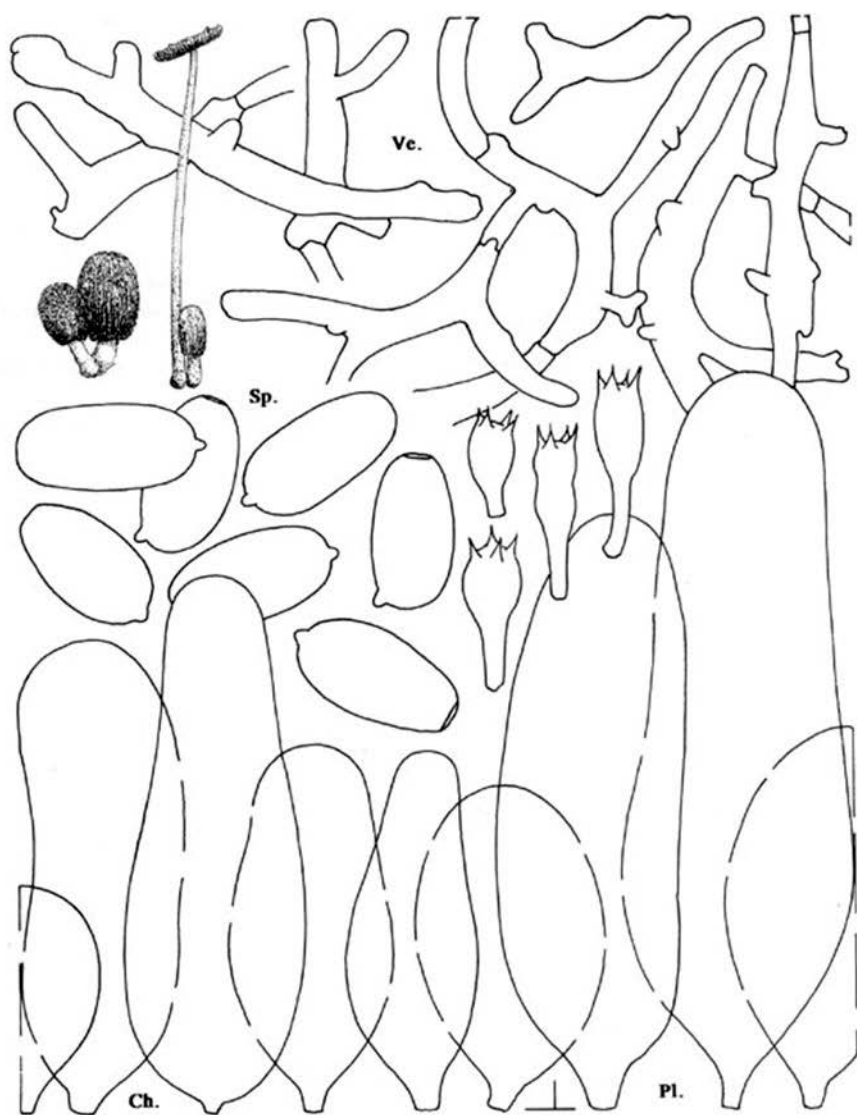


Fig. 1. *Coprinus xenobius* P.D. Orton. All figures from *P. D. Orton 4504* (isotype).

utriform cheilocystidia and lack of yellow colours. The contrast in substrate preference (horse dung in *C. luteocephalus* versus cow dung in *C. xenobius*) does not seem to represent a reliable difference between the two taxa, especially when so little material is available.

The size of the basidiocarps in the two Scottish collections mentioned in the original description ($2-7 \times 1-4$ mm) is distinctly smaller than in the Italian material ($8-14 \times 5-8$ mm). In addition the spores in the Italian collections are somewhat smaller and more closely resemble the spores of the type of *C. luteocephalus*. (The differences between the two species are discussed further following the description of *Coprinus luteocephalus*.)

2. *Coprinus luteocephalus* Watling — Fig. 2

Coprinus luteocephalus Watling, Notes R. bot. Gdn Edinb. 31 (1972) 359.

Pileus 8–18 × 6–16 mm when still closed, ellipsoid, ovoid or oblong, first sulphur to citrine yellow, darker and more yellow towards the centre, becoming more yellow at maturity then isabelline towards the margin; expanded pileus 8–22 mm, distinctly umbonate, fibrillose scurfy throughout or more velvety at the disk, striate then sulcate at margin. Lamellae crowded, free, first whitish, then grey, finally violaceous black, whitish floccose at margin when young. Stipe up to 60 × 1–1.5 mm, 2–3 mm at base, hyaline or slightly brownish, equal except for slightly bulbous base which is coated with sulphur or olivaceous hyphae.

Spores [40, 2, 2] 9.6–11.8 × 5.3–6.8 μm, oblong, mainly rounded at apex, dark brown, with central, c. 1.6 μm wide germ pore; Q = 1.60–2.00, av. Q = 1.65–1.85; av. L = 10.3–10.9, av. B = 5.9–6.5 μm. Basidia 14–28 × 8–10 μm, 4-spored, surrounded by (3–)4–6 pseudoparaphyses. Pleurocystidia 75–175 × 25–50 μm, utriform, cylindrical or ellipsoid. Cheilocystidia 35–100 × 25–50 μm, globose to ellipsoid or broadly utriform. Elements of veil thin-walled, sometimes slightly thick-walled (< 0.5 μm) and yellowish, diverticulate, up to c. 100 × 2–10(–12) μm. Clamp-connections present.

Habitat & distribution — On horse dung, solitary or a few together. Very rare. Not known from the Netherlands. Only known to us by the two collections cited by Watling (l.c.) and the statement by Bender (1991: 11) from Germany.

Collections examined. GERMANY: Coll. Bender (as *C. xenobius*, but without annotations, herb. Bender, Germany). — GREAT BRITAIN: Scotland, Midlothian, Penicuik, Glencorse, R. F. O. Kemp, Watling 7360 (from culture, Kemp 556 1781, see below).

The macroscopical description is based on Watling (l.c.). *Coprinus luteocephalus* is microscopically close to *C. xenobius* (for differences, see the discussion under *C. xenobius*). In subsect. *Alachuani* the only other species with oblong spores is *C. goudensis* and that species grows on wood, the spores are distinctly smaller and the cystidia are ellipsoid or subcylindrical, never utriform.

The status of the studied material is not clear. The envelope of Watling 7360 was empty, and the available material originates from a culture by Kemp. It seems likely that the culture was made from the holotype material, but the original description mentions another collection by Kemp (England: Cumberland, Wigton, without date), which could have been the source of the culture.



Fig. 2. *Coprinus luteocephalus* Watling. All figures from R. F. O Kemp 556 1781 (culture from type?).

The collection from Germany (with spores $10-11.8 \times 5.3-6.3 \mu\text{m}$; $Q = 1.75-2.00$, av. $Q = 1.85$; av. $L = 10.9$, av. $B = 5.9 \mu\text{m}$) has been studied but is not included in the above description because of the poor macroscopical annotation. The sizes of the spores agree with those of *C. luteocephalus* but are somewhat narrower. Not noted are the colour and size of the pileus. The collection was labelled *C. xenobius* but that species has much larger spores.

The yellow colour and smaller spores should distinguish *Coprinus luteocephalus* from *C. xenobius*, but the Italian collections cited under *C. xenobius* have spores characteristic for *C. luteocephalus* while the basidiocarps lack the characteristic yellow tinges. This could mean that *Coprinus luteocephalus* may sometimes lack yellow tinges, and then only the spore-size is left to distinguish it from *C. xenobius*. It seems likely that one, variable taxon is involved but we need more material to confirm this.

3. *Coprinus spec.* (Amsterdamse Bos 13 July 1958) — Fig. 3

Pileus 20–40 \times 15–30 mm when still closed, first white, later grey; expanded pileus up to 50 mm. Veil splitting up in small patches. Lamellae very crowded, free, first white then grey to blackish. Stipe up to 200 \times 5–10 mm, white, greyish white, first covered with minute white flocks from veil, soon smooth; base bulbous, woolly-hairy.

Spores [20, 1, 1] $12.5-15.6 \times 7.9-10.0 \mu\text{m}$, ovoid or slightly amygdaliform, mainly rounded at apex, dark red-brown, with somewhat eccentric, $1.6-1.8 \mu\text{m}$ wide germ pore; $Q = 1.45-1.70$, av. $Q = 1.55$; av. $L = 14.1$, av. $B = 9.1 \mu\text{m}$. Elements of veil branched, weakly diverticulate with in part swollen cells, $40-200 \times 4-8(-10) \mu\text{m}$, inflated cells up to $15 \mu\text{m}$. Clamp-connections present.

Habitat & distribution — Habitat not noted. Very rare, only known from one locality in the Netherlands.

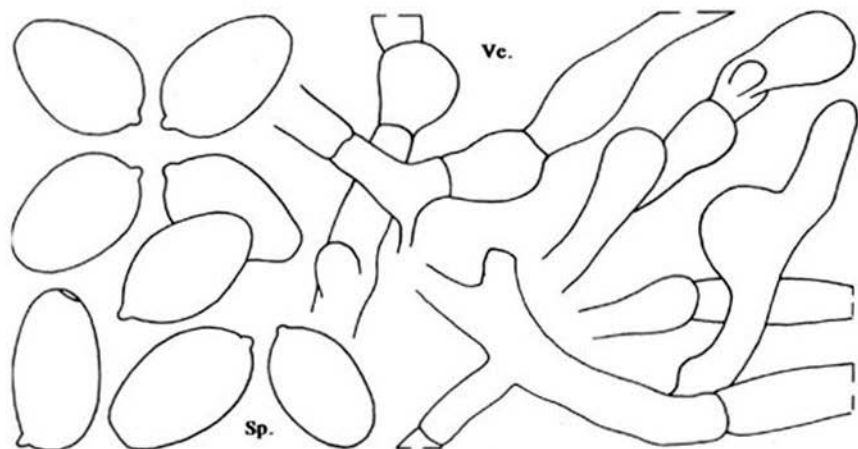


Fig. 3. *Coprinus spec.* (Amsterdamse Bos 13 July 1958). All figures from coll. E. Kits van Waveren.

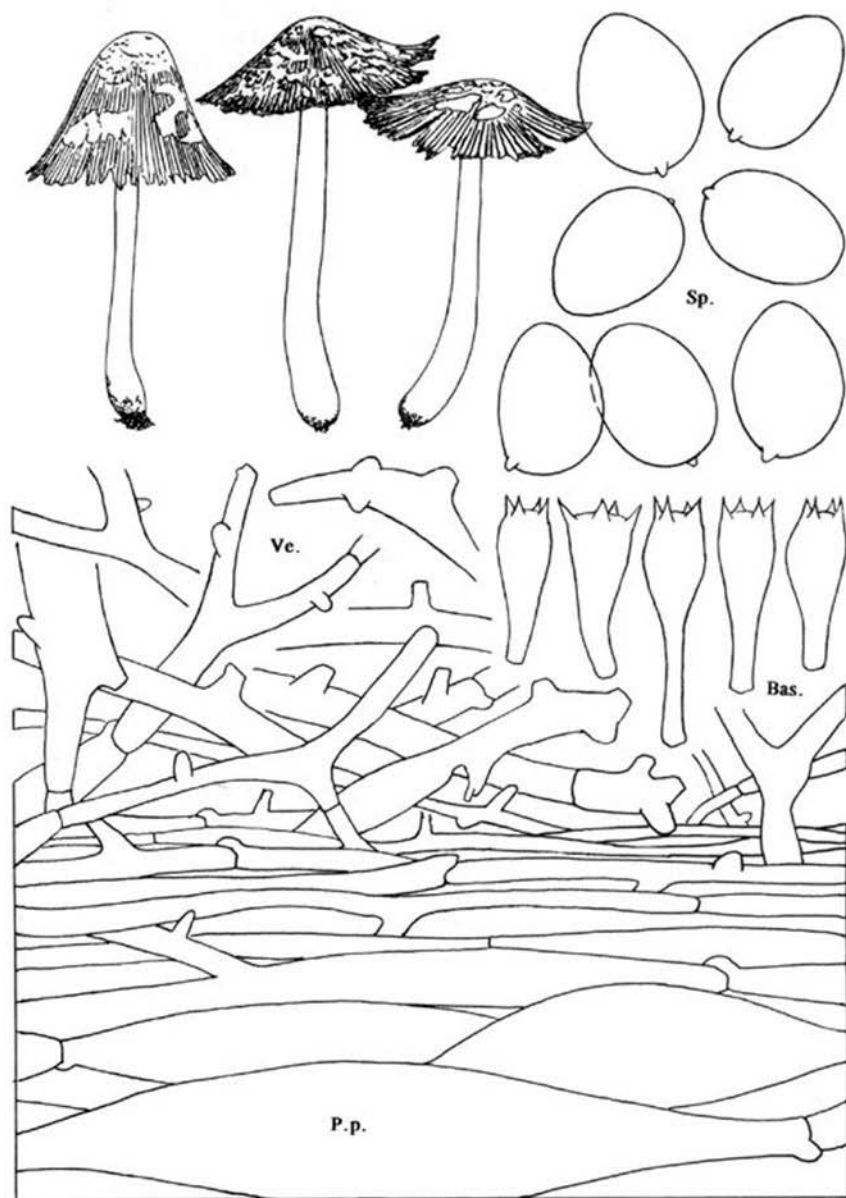


Fig. 4a. *Coprinus stanglianus* Enderle, Bender & Gröger. All figures from coll. E. Arnolds 6478.

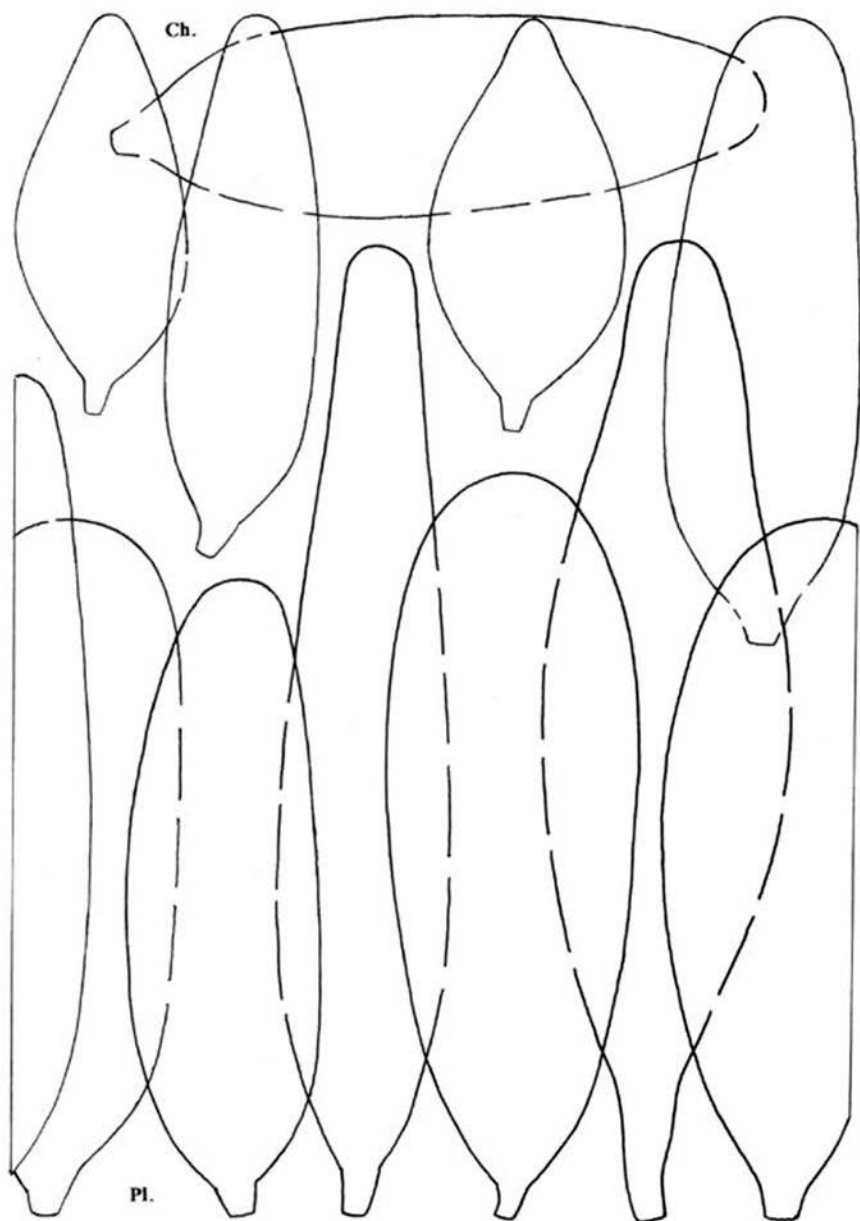


Fig. 4b. *Coprinus stanglianus* Enderle, Bender & Gröger. Pleuro- and cheilocystidia from coll. E. Arnolds 6478.

Collection examined. NETHERLANDS: prov. Noord-Holland, Amsterdam, Amsterdamse Bos, E. Kits van Waveren, 13 July 1958.

Only one specimen is present in the Rijksherbarium (L). This mature basidiocarp is in bad condition. Therefore no cystidia nor other important characters could be found in the material. Spore size of this basidiocarp, however, is clearly different from the closely related *Coprinus stanglianus* and *C. picaceus*. Therefore the description is included in this paper to draw attention to this taxon, in the hope that it will be collected again.

4. *Coprinus stanglianus* Enderle, Bender & Gröger — Fig. 4a, 4b

Coprinus stanglianus Enderle, Bender & Gröger, Z. Mykol. 54 (1988) 57–64.

Selected icons. Henrici & Lessøe, Mycologist 7 (1993) 87; Arnolds, Kuyper & Noordeloos, Overzicht Paddenst. Ned. (1995) Pl. 4A; Enderle, Bender & Gröger, l.c., opposite p. 64.

Pileus 15–40 × 10–25 mm when still closed, ellipsoid or ovoid, first whitish, soon pale greyish or beige, cream-beige (Mu. 2.5 YR 7/2 to 10 YR 5/3; K. & W. 4B3 to 5D3), later with beige, greyish ochre or ochre-brown tinges. Veil at first whitish then splitting up in greyish beige to ochre-brown patches, the last particularly on disk. Lamellae very crowded, free, first whitish, then brownish, later grey-brown to dark grey, finally black. Stipe up to 120 × 3–10 mm, slightly attenuate upwards, white or grey-white, minute woolly fibrous, in particular at base.

Spores [60, 3, 3] 8.6–12.6 × 6.1–8.9 µm, ovoid or ellipsoid, rounded to somewhat acute at apex, very dark brown, with central, c. 1.5 µm wide germ pore; Q = 1.25–1.65, av. Q = 1.40–1.50; av. L = 10.1–11.4, av. B = 6.9–8.0 µm. Basidia 18–47 × 8–13 µm, 4-spored, surrounded by (4–)5–7(–8) pseudoparaphyses. Pleurocystidia 75–165 × 21–50 µm, ellipsoid, oblong, utriform, narrowly utriform or cylindrical. Cheilocystidia 50–135 × 18–45 µm, utriform, ellipsoid, oblong or broadly conical. Elements of veil thin-walled, diverticulate, up to c. 100 × 4–8(–11) µm thick. Clamp-connections present.

Habitat & distribution — Solitary or a few together, in dry limestone grasslands. Very rare in the Netherlands and Belgium, rare in Germany. Usually found on calcareous soil. In the Netherlands mainly found in the South of prov. Limburg on chalky loam.

Collections examined. BELGIUM: Ave et Auffe, 6 Sept. 1975, P. B. Jansen 75-344; Rochefort, 10 Sept. 1975, P. B. Jansen 75-343. — NETHERLANDS: prov. Overijssel, Oldenzaal, Delden, 26 Sept. 1980, collector not noted; prov. Limburg, Maastricht, Pietersberg, 9 Oct. 1993, E. Arnolds 6478.

Coprinus stanglianus is rather similar to *C. picaceus*, but that species has distinctly larger spores and somewhat larger basidiocarps. Macroscopically also *C. kimurae* is close but that species has smaller spores of different shape.

5. *Coprinus picaceus* (Bull.: Fr.) S.F. Gray — Fig. 5

Coprinus picaceus (Bull.: Fr.) S.F. Gray, Nat. Arr. Br. Pl. 1 (1821) 634.

Agaricus picaceus Bull.: Fr., Syst. mycol. I (1821) 308.

Selected icons. Phillips, Mushr. other Fungi (1981) 178; Jamoni, Funghi Ambiente 47 (1988) between 16 and 17, pl. 118; Anonymous, Mycologist 6 (1992) 15; Breitenb. & KränzL., Pilze Schweiz 4 (1995) 246, pl. 297.

Pileus 20–70 × 15–40 mm when still closed, ellipsoid or ovoid, first covered with whitish, soon pale greyish or beige, cream-beige, later beige, greyish ochre or ochre-brown

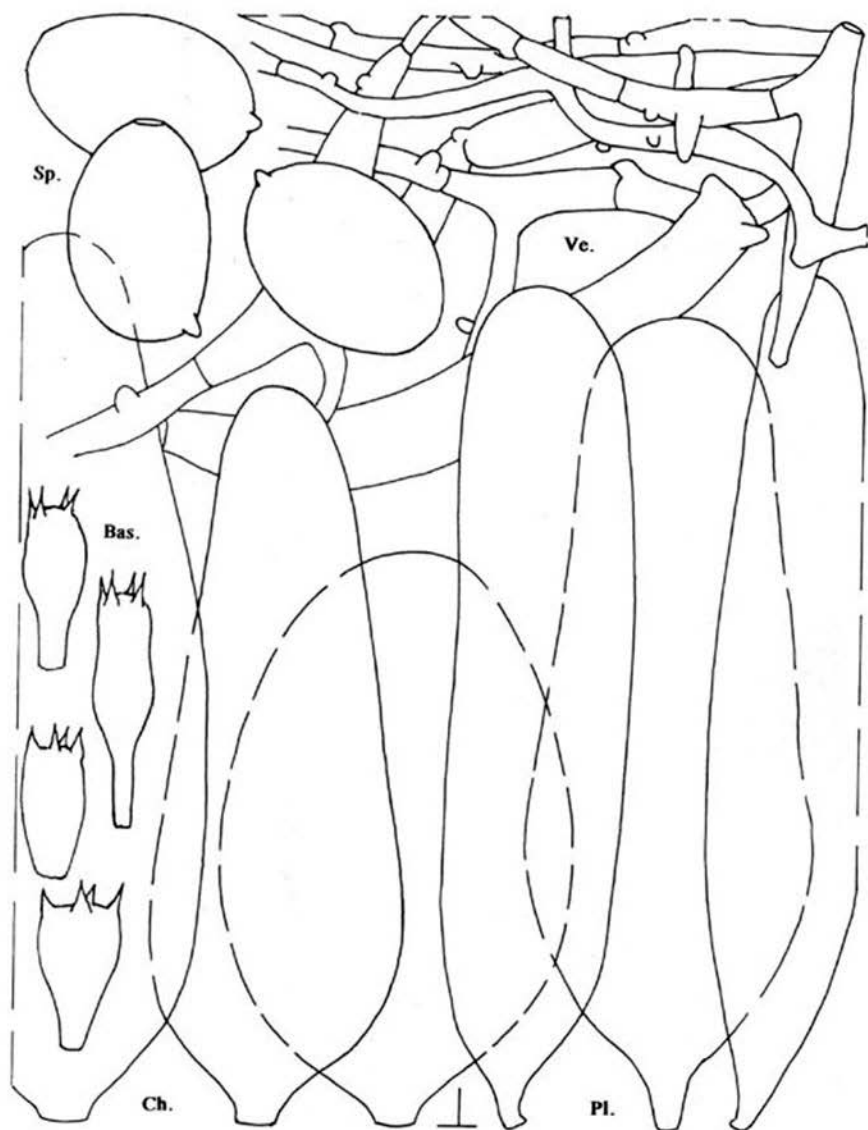


Fig. 5. *Coprinus picaceus* (Bull.: Fr.) S.F. Gray. All figures from coll P.B. Jansen 88-152.

veil, breaking up in patches. Lamellae very crowded, free, first whitish, then brownish, later grey-brown to dark grey, finally black. Stipe up to $300 \times 6-15$ mm, slightly attenuate upwards, white or grey-white, minute woolly fibrous, in particular at base.

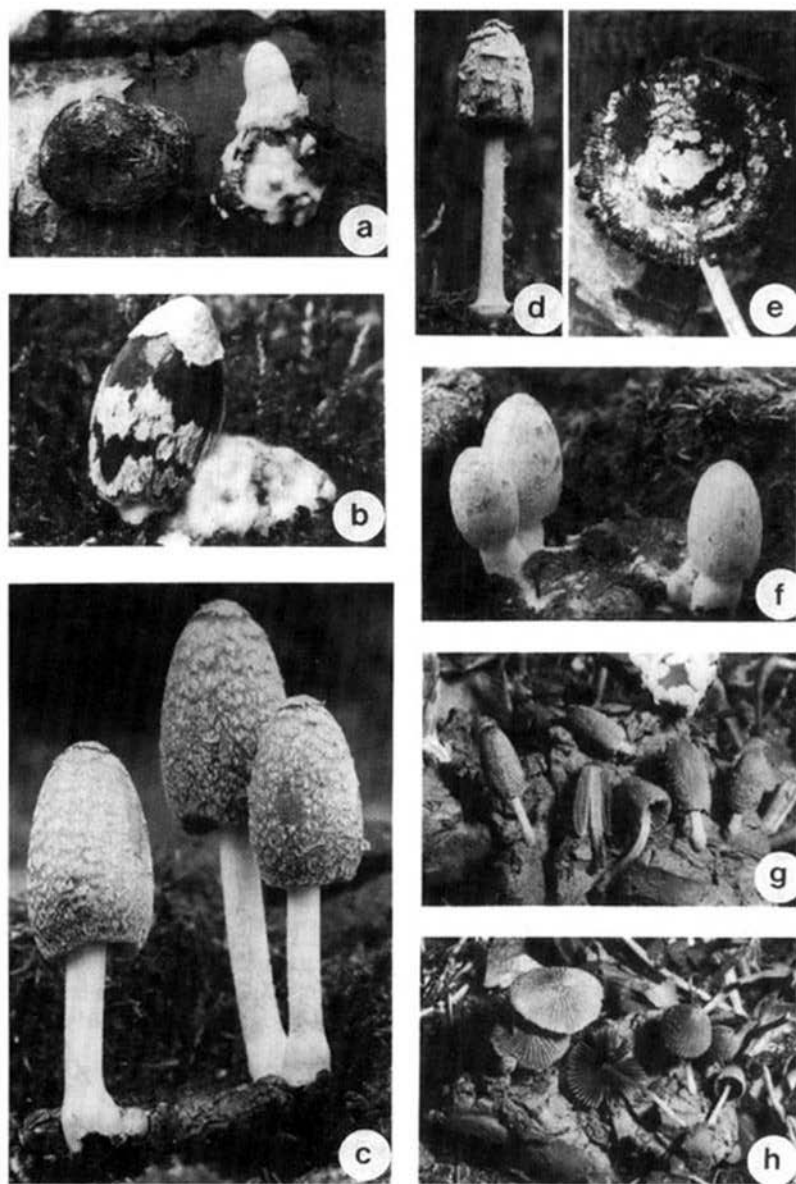


Plate 1. *Coprinus sclerotiorum*. a. Sclerotium with primordium; b, d. veil breaking up in patches; c. veil breaking up in fine scales; e. old pileus; f. young basidiocarps on sclerotium (a, b, f, $\times 1.6$; d, e, $\times 1.4$; c, $\times 4$). — *Coprinus fluviatilis*. g, h. basidiocarps ($\times 1.6$).

Spores [120, 6, 4] 14.0–18.8 × 9.6–13.0 µm, ellipsoid or ovoid, rounded at apex, very dark brown, almost black, with central, c. 2.5 µm wide germ pore; Q = 1.25–1.60, av. Q = 1.35–1.50; av. L = 14.7–16.9, av. B = 10.7–11.6 µm. Basidia 16–46 × 12–15 µm, 4-spored, surrounded by 5–8 pseudoparaphyses. Pleurocystidia 100–165 × 28–50(–60) µm, utriform, cylindrical, conical or ellipsoid. Cheilocystidia 80–150 × 24–50 µm, utriform, broadly utriform, ellipsoid or conical. Elements of veil thin-walled, diverticulate, up to c. 100(–175) × (3–)5–14(–18) µm. Clamp-connections present.

Habitat & distribution — Solitary or a few together, on calcareous soil or chalky loam, mainly in *Fagus* forests. Rare but widespread in Europe. In the Netherlands only known from the valley of the river IJssel.

Collections examined. LUXEMBOURG: Hundsdorf, 29 Sept. 1988, L. Laarman, P. B. Jansen 88-152. — NETHERLANDS: prov. Gelderland, Zutphen, Wichmond, estate 'Zuideras', 26 Oct. 1991, C. Bas 8806.

The very large spores with a breadth of 10–13 µm in addition to the habitat not on dung are the salient features of *Coprinus picaceus*. All species in subsect. *Alachuanii*, except for *Coprinus picaceus* and *C. sclerotiorum* (growing on sclerotia in dung), have spores whose breadth is always less than 10 µm. The macroscopically similar *Coprinus stanglianus* and *C. kimurae* can readily be distinguished on spore size.

6. *Coprinus sclerotiorum* Horvers & de Cock, *spec. nov.* — Fig. 6a, 6b and Plate 1

Pileus primo usque ad 18 mm altus, 13 mm latus subglobosus, ellipsoideus, ovoideus vel conicus, demum campanulatus vel applanatus, usque ad 25 mm latus, albus demum brunneo-griseus vel violaceo-griseus vel ater, primo totus tomentosus demum flocculosus cum velo albo. Lamellae liberae, valde confertae, ex albo nigricantes. Stipes usque ad 120 × 5-6 mm, versus basim incrassatus, albus. Sporae [40, 2, 1] 13.3-17.5 × 10.3-12.3 × c. 9-10.5 µm, in antice angulato-ovoideae, in facie ellipsoideae vel cylindrico-ellipsoideae, obscure rufo-brunneae vel atrae poro germinativo centrico obscuro lato 2.5 µm instructae. Basidia 22–40 × 12–17 µm, 4-sporigera. Pseudoparaphyses 5–8(–9). Pleurocystidia 80–125(–160) × 30–40 µm, cylindracea, subutriformia, oblonga vel ellipsoidea. Cheilocystidia 60-100 × 30–40 µm, ellipsoidea vel ovoidea, late ellipsoidea, ellipsoidea, oblonga vel utriformia. Velum e elementis diverticulatis, 2–7 µm latis, tenuitunicatis, valde incrustatis. Pileipellis cutis hyphis cylindraceis vel inflatis, tenuitunicatis. Fibulae absentes, pseudofibulae praesentes. Ad sclerotia crescens in fimo bovino.

Holotypus: The Netherlands, prov. Noord-Brabant, Tilburg, 'de Sijsten', 6–26 May 1996, B. Horvers (L).

Pileus up to 18 mm high and 13 mm wide when still closed, first globose (primordia), soon ellipsoid, ovoid or conical, then campanulate, flattened when fully expanded and up to 25 mm wide. Veil a thick, felty layer, white, covering the whole pileus when young, splitting up in patches during expanding; pileus first white under veil, then pale to dark grey-brown (Mu. 10 YR 5/4, 4/4, 3/3, 3/1; K. & W. 5D4, 5E6, 5E5, 5F4), finally fuscous violaceous grey to black. Surface of pileus (below veil) often covered with a very thin gelatinous layer. Lamellae very crowded, up to 3.5 mm broad, white when very young, soon grey to dark grey with white edge, later black. Stipe up to 120 × 5–6 mm, white, somewhat fibrous, with yellow-brown drops when fresh, slightly widened downwards; after margin of pileus gets loose from bulbous base, a small, volva-like margin remains, with a finely striate imprint from the lamellae. Sclerotia subglobose, somewhat irregular, c. 10 mm in diam. or finger-shaped and then up to 35 × 10 mm, very dark brown.

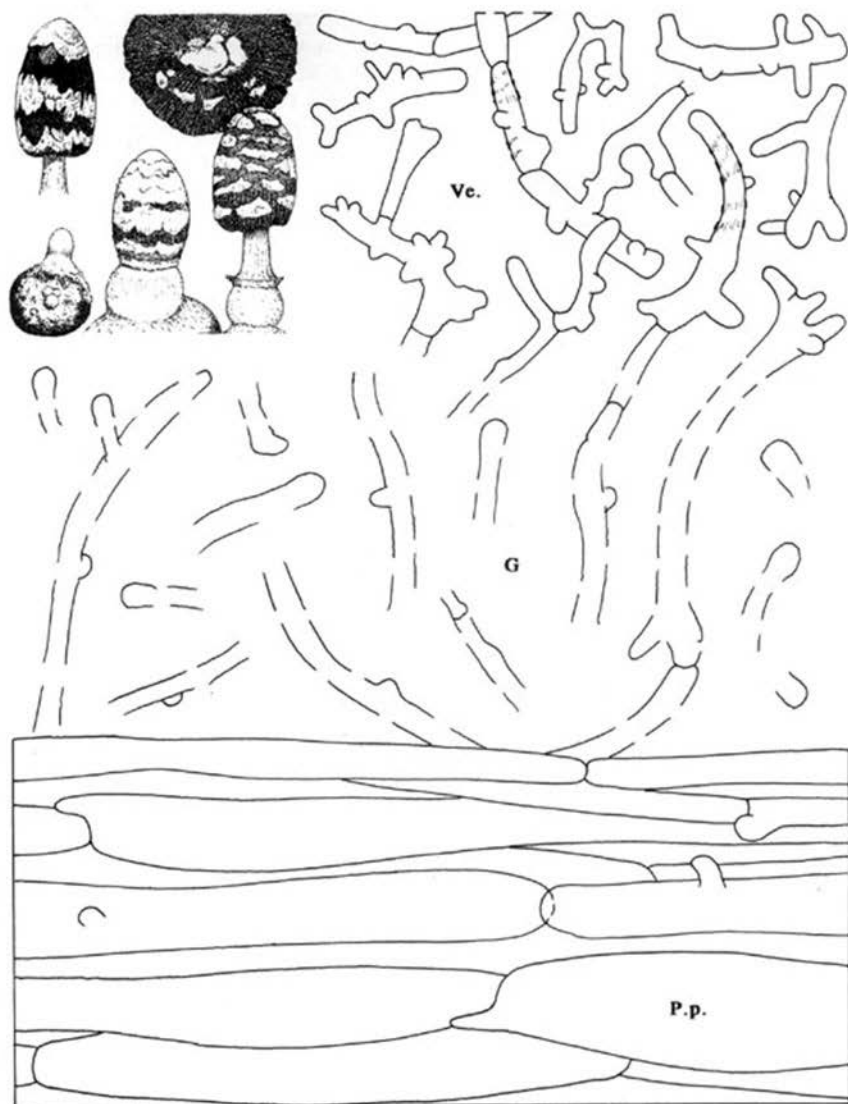


Fig. 6a. *Coprinus sclerotiorum* Horvers & de Cock. G = gelatinous layer on pileus. All figures from holotype.

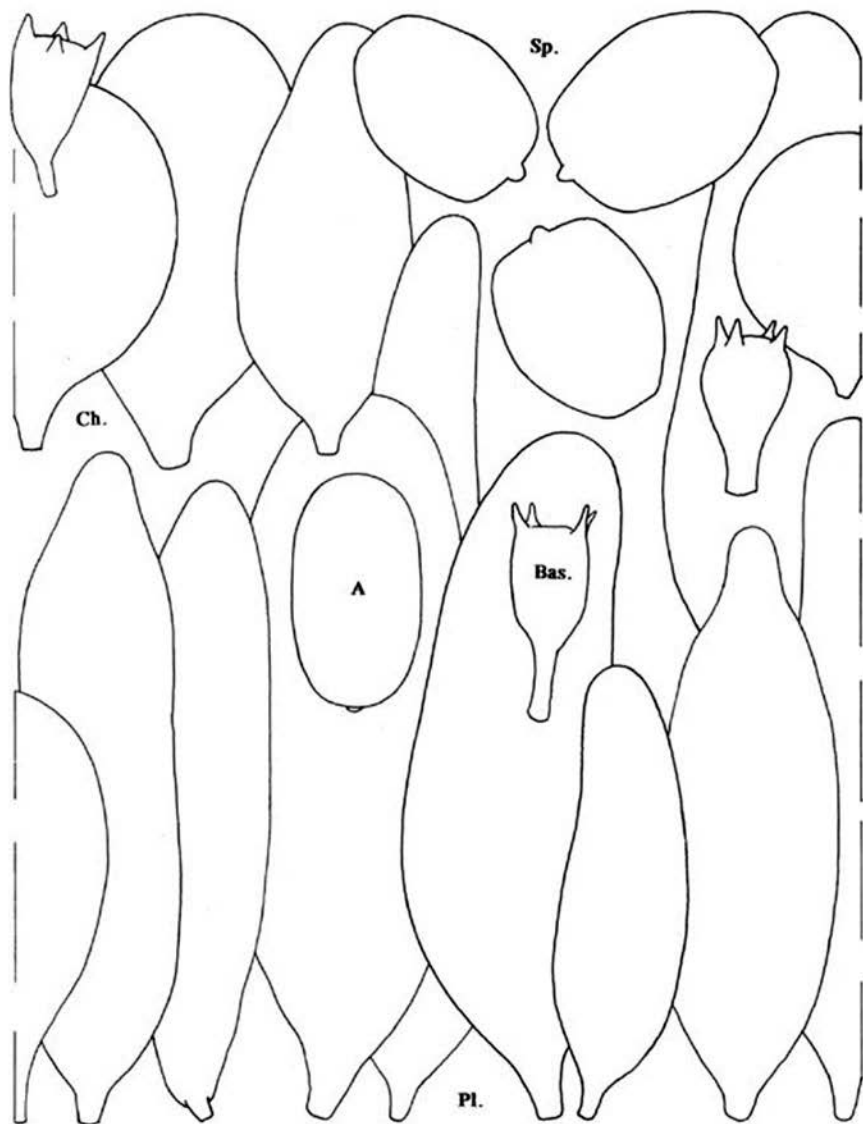


Fig. 6b. *Coprinus sclerotiorum* Horvers & de Cock. A = Spore in side view. All figures from holotype.

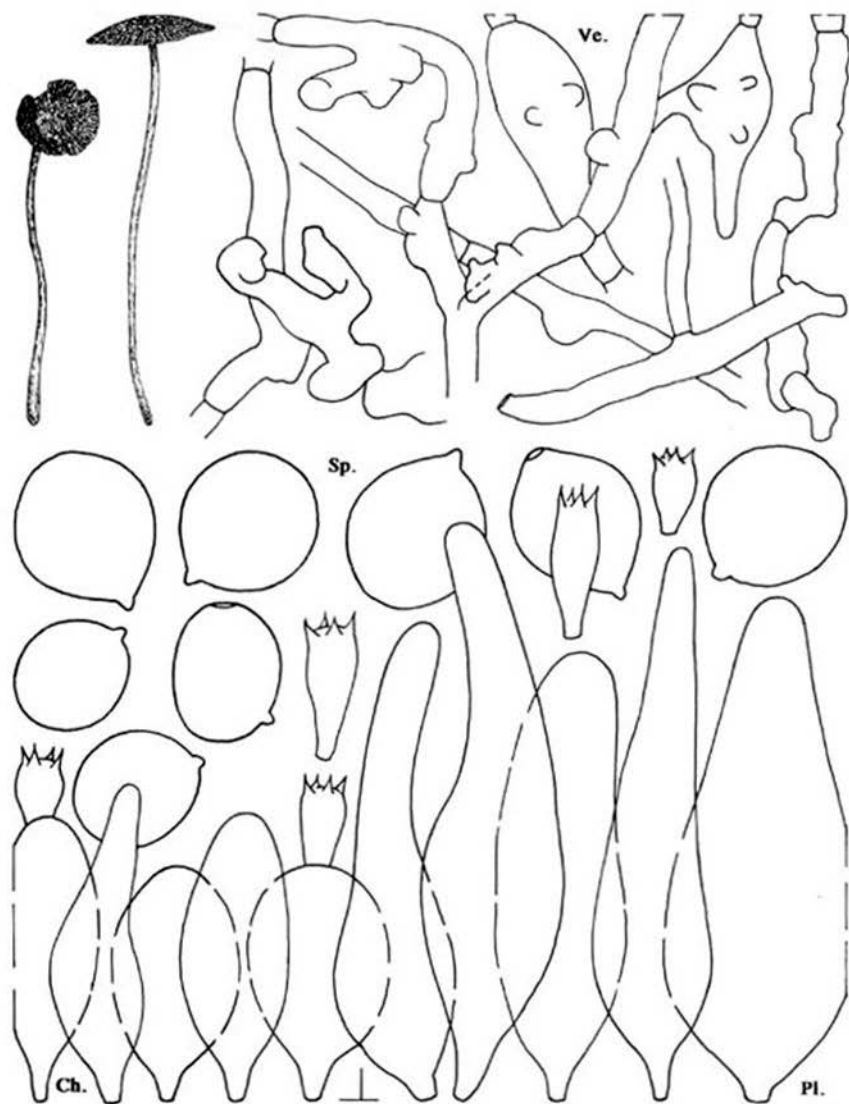


Fig. 7. *Coprinus kimurae* Hongo & Aoki. All figures from coll. C. B. Uljé 1215. Basidiocarps from dried material.

Spores [40, 2, 1] 13.3–17.5 × 10.3–12.3 × c. 9–10.5 µm, rounded angular ovoid in frontal view, ellipsoid to cylindrical ellipsoid in side view, lentiform, rather truncate, very dark red-brown, almost black, with central, hardly visible, c. 2.5 µm wide germ pore; $Q = 1.25-1.45$, av. $Q = 1.35$; av. $L = 14.7-15.7$, av. $B = 11.1-11.3$ µm. Basidia 22–40 × 12–17 µm, 4-spored, surrounded by 5–8(–9) pseudoparaphyses. Pleurocystidia 80–125(–160) × 25–45 µm, cylindrical, subutriform, oblong or ellipsoid. Cheilocystidia 60–100 × 30–40 µm, ellipsoid or ovoid, broadly ellipsoid, ellipsoid, oblong or utriform. Elements of veil diverticulate, thin-walled, 2–7 µm wide. Between surface of pileus and veil a slimy layer is present, 70–100 µm thick and mixed with velar elements. Pileipellis made up of filamentous, in part inflated elements. Clamp-connections not found, only pseudo-clamps (Uljé & Noordeloos, 1993: 263).

Habitat & distribution — On sclerotia (see notes) in dung of cow (Limousines). Solitary. Very rare, only known from type-locality.

Collection examined. NETHERLANDS: prov. Noord-Brabant, Tilburg, 'de Sijsten', 6–26 May 1996, B. Horvers (holotype, L).

The specimens studied did develop in culture on the collected sclerotia which were put in a transparent synthetic box, on wet moss. The sclerotia were collected in April 1996, and basidiocarps developed on 6, 22, 24 and 26 May 1996.

On account of the diverticulate veil the species belongs to the subsect. *Alachuanii*. Related species with large spores are *C. picaceus* and *C. stanglianus*, but those species never grow on dung and have ellipsoid spores.

The gelatinous layer between surface of pileus and veil is not always present, only in wet conditions. If present, it can also be found in dried specimens.

7. *Coprinus kimurae* Hongo & Aoki — Fig. 7

Coprinus kimurae Hongo & Aoki, Trans. mycol. Soc. Japan 7 (1966) 16.

Selected icons. Imazeki, Otani & Hongo, Fungi Japan (1988) 204; Breitenb. & Kränz. Pilze Schweiz 4 (1995) 238 (pl. 284).

Pileus 15–30 × 6–18 mm when still closed, 45 mm when expanded, oblong, often somewhat conical, first covered with a layer of white, woolly-felty veil, breaking up in patches, later often cream or ochre-brown coloured. Lamellae, $L = 60-80$, $l = 1-5$, free, first white to beige, then grey-brown to dark grey, finally black. Stipe up to 120 × 2–6 mm, white, greyish white, minutely fibrillose-floccose, later glabrous; base slightly bulbous and white felty.

Spores [80, 3, 4] 9.0–12.7 × 8.2–11.7 µm, subglobose or broadly ellipsoid, sometimes with slightly apical papilla, slightly narrower in side view (c. 0.5 µm), rounded at apex, dark red-brown, with central to slightly eccentric, c. 1.6 µm wide germ pore, which is often difficult to observe; $Q = 1.00-1.25$, av. $Q = 1.05-1.15$; av. $L = 10.9-11.3$, av. $B = 9.5-10.7$ µm. Basidia 16–32 × 9–13 µm, 4-spored, surrounded by 5–7(–8) pseudoparaphyses. Pleurocystidia 60–200 × 20–26(–40) µm, (narrowly) utriform, (sub)cylindrical, lageniform or conical. Cheilocystidia 50–120 × 20–32 µm, (narrowly) utriform, (sub)cylindrical, (narrowly) conical or sublageniform. Elements of veil thin-walled, diverticulate, 3–10(–18) µm wide. Clamp-connections absent.

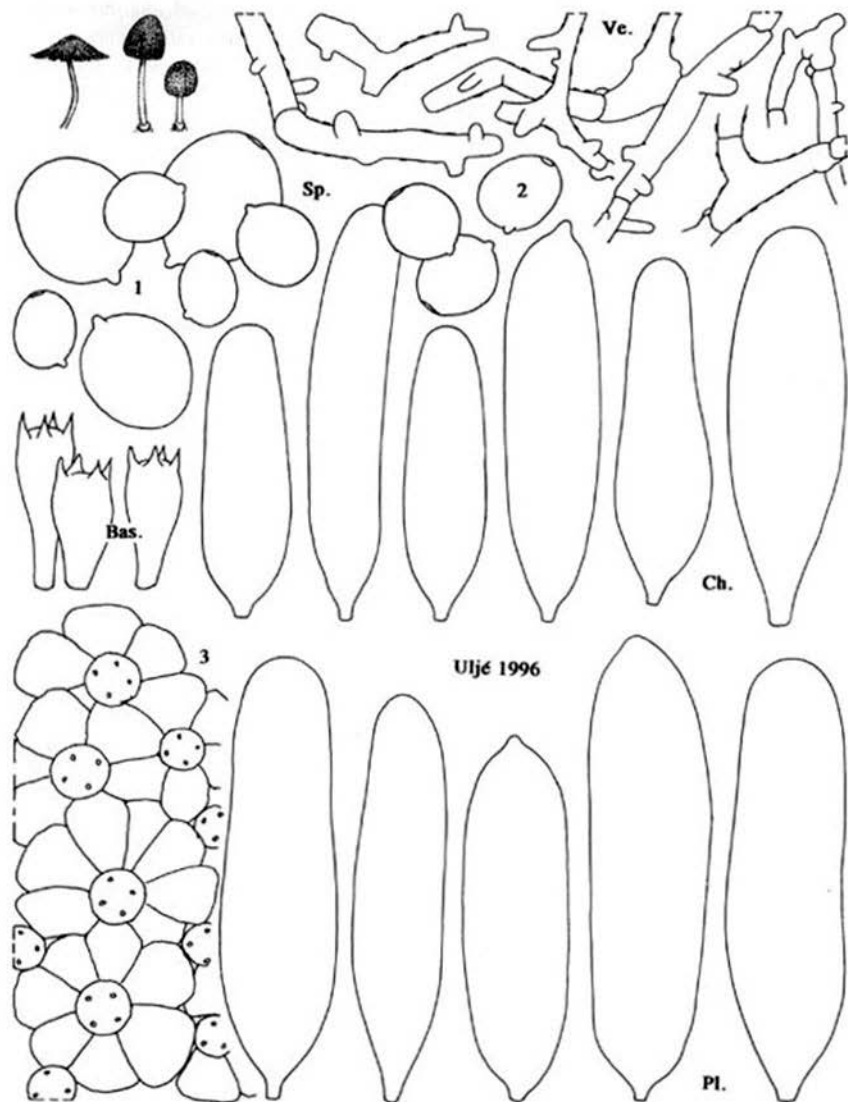


Fig. 8. *Coprinus kubickae* Pilát & Svrček. — Spores 1: $\times 2000$, 2: $\times 1200$. — 3. Fragment of lamella: basidia surrounded by pseudoparaphyses. All figures from coll. *Chripijn*, 10 July 1996.

Habitat & distribution — In small groups, a few together on straw (gh), rice-straw (Japan) and on rotting material made up of natural materials like coconut mattings, lime ceilings mixed with straw, cotton textiles, etc. Rare. Europe, Canada, Japan. In Western Europe in most cases indoors and in greenhouses.

Collections examined. NETHERLANDS: prov. Utrecht, Baarn, 6 Febr. 1973, H. v.d. Aa, herb. *Daams* 73-26 (gh); Maarsseveen, 15 Febr. 1973, J. Daams 73-34 (gh); prov. Zuid-Holland, Leiden, 28 Oct. 1991, E. Proux Kluit (indoors).

Coprinus kimurae can be recognised by the subglobose to broadly ellipsoid spores, the absence of clamp-connections, the rather large basidiocarps, the veil breaking up in patches (similar to *C. picaceus*) and the habitat.

Considering the occurrence indoors in (heated) greenhouses, and outdoors in places like compost heaps and on rotten coconut-fibre fabric, it is likely that *Coprinus kimurae* is a thermophilic fungus. In the Netherlands it is found in greenhouses, although the species has been found outdoors on a coconut matting (in a sheltered garden) and there is one recording from a compost heap, which probably was in a greenhouse.

In earlier publications (Uljé, 1995a: 11 and Uljé, 1995b: 119) the first author considered that *C. kubickae* was synonymous with *C. kimurae*, but further study has indicated that this opinion was wrong. *Coprinus kubickae* is a very small species with veil breaking up in very small flocks and not in patches, with on average somewhat smaller spores, narrower elements of veil, presence of clamp-connections and a habitat which is clearly different.

8. *Coprinus kubickae* Pilát & Svrček — Fig. 8

Coprinus kubickae Pilát & Svrček, Česká Mykol. 21 (1967) 142.

Coprinus amphibius Anastasiou, Can. J. Bot. 45 (1967) 2213.

Pileus 3–6(–10) × 2.5–5(–8) mm when still closed, up to 10(–18) mm when expanded, first subglobose, ellipsoid or ovoid and ochre-brown (K. & W. 6E5) or mocha brown, soon becoming pale grey to grey, covered with minute flocculose veil. Lamellae, L = c. 34, l = 1–3, free, first white to beige, then grey-brown to dark grey, finally black. Stipe up to 30 × 0.5–1.5 mm, white, minutely fibrillose-floccose, later glabrous; base bulbous, with tomentose, basal disk.

Spores [440, 22, 19] 6.8–11.7 × 6.2–10.4 µm, subglobose or broadly ellipsoid, rounded at apex or slightly acute, medium to dark red-brown, with central to slightly eccentric, 1.3–1.6 µm wide germ pore, which is often difficult to observe; Q = 1.00–1.35, av. Q = 1.05–1.25; av. L = 8.1–10.7, av. B = 7.5–9.2 µm. Basidia 14–36 × 8–11.5 µm, 4-spored, surrounded by 5–8 pseudoparaphyses. Pleurocystidia 55–110(–200) × 12–20(–28) µm, utriform or (sub)cylindrical. Cheilocystidia 35–80(–120) × 11–20(–28) µm, (narrowly) utriform, (sub)cylindrical or conical. Elements of veil thin-walled, diverticulate, 2–6 µm wide. Clamp-connections present.

Habitat & distribution — Solitary or a few together on dead *Phragmites*, *Juncus* and *Carex*, in greenhouses on rich soil and rotten straw. Rare, but probably overlooked. Europe, but probably also in other regions.

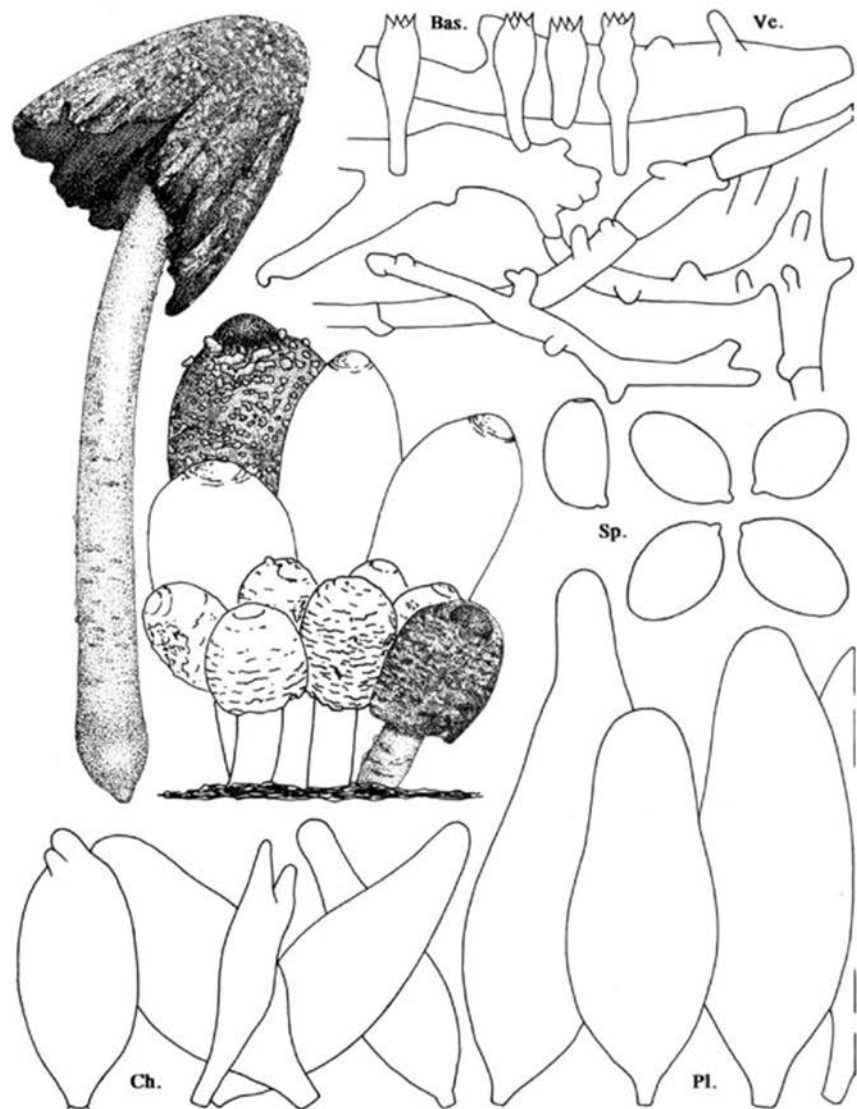


Fig. 9. *Coprinus strossmayeri* (Kawam.) Hongo & K. Yokoyama. All figures from coll. V. Coccia.

Collections examined. NETHERLANDS: prov. Groningen, Ulrum, Lauwersmeer, 10 July 1996, R. Chrispijn (herb. Chrispijn); prov. Noord-Holland, 's-Graveland, 13 March 1971, E. Kits v. Waveren (gh); Kortenhof, 26 Febr. 1971, J. Daams 71-11 (gh); idem, 27 Febr. 1971, J. Daams 71-16 (gh); idem, 1 March 1971, J. Daams 72-21 (gh); idem, 5 March 1971, J. Daams (gh); idem, 8 March 1971, J. Daams 71-24 (gh); idem, 13 March 1971, J. Daams 71-36 (gh); idem, 8 May 1971, J. Daams 71-124 (gh); idem, 7 March 1972, J. Daams 72-39 (gh); idem, 9 March 1972, J. Daams 72-25 (gh); idem, 8 Febr. 1973, J. Daams 73-32 (gh); idem, 16 Febr. 1973, J. Daams 73-37 (gh); idem, 6 March 1973, J. Daams 73-51 (gh); prov. Utrecht, Maarsseveen, 31 Jan. 1973, J. Daams 73-23 (gh); Vleuten, 25 Febr. 1972, J. Daams 71-44 (gh); prov. Zuid-Holland, Dubbeldam, 29 Jan. 1971, P.B. Jansen 792 (gh); Gouderak, Veerstalblok, 25 June 1981, P.B. Jansen 81/142. — CZECHIA: Třeboň, on *Juncus*, 8 July 1953, J. Kubička, coll. no. PR 626344 (holotype, PRM).

The colour, size of the basidiocarps, habitat and the subglobose spores are characters to identify *Coprinus kubickae* (for discussion see under *C. kimurae*).

In greenhouses the basidiocarps become larger (see sizes between parentheses), as do the pleuro- and cheilocystidia.

9. *Coprinus strossmayeri* S. Schulz. — Fig. 9

Coprinus strossmayeri S. Schulz., Verh. zool. bot. Ges. Wien 28 (1879) 430.

Coprinus rhizophorus Kawam., Icons Jap. Fungi 5 (1954) 559 (no Latin description); Kawam. ex Hongo & K. Yokoyama, Trans. mycol. Soc. Japan 17 (1976) 140.

Selected icon. Enderle & Bender, Z. Mykol. 56 (1990) opposite 40.

Pileus up to 40 × 25 mm when still closed, up to 45(–60) mm wide when mature, but never fully expanded; young pileus at first ellipsoid, ovoid, broadly cylindrical, then paraboloid, obtusely conical or campanulate with rounded umbo, finally subumbonate, completely covered with white veil when young, later splitting up in small, white or cream (Mu. 10 YR 8/2; K. & W. 4A2) felty patches, dirty yellow at centre (Mu. 10 YR 7/4, 7/6; K. & W. 5B3, 5B4); pileus below veil greyish to ochraceous, in particular at centre ochre-brown, paler towards margin (from centre to margin: Mu. 10 YR 6/3, 5/2, 6/2, 7/2, 8/2; K. & W. 5C3, 5D3, 5C2, 5B2, 5A2); primordia often cream coloured (Mu. 10 YR 7/6; K. & W. 5B4). Lamellae, L = more than 60, l = 3–5(–7), very crowded, free, first white, then grey-brown to dark brown, finally black. Stipe up to 120 × 4–10 mm, cylindrical, hollow, whitish, slightly yellowish (Mu. 10 YR 7/4, 8/4; K. & W. 5B3, 5D/E5) in the middle, somewhat fibrous with scattered velar remnants; base equal or slightly enlarged with mycelium remnants, finally and fleetingly hairy; stipe develops from orange-brown to dark brown rhizomorphs, 20–30 cm in length and up to 3 mm thick, densely available in upper 10 cm of bottom between and adherent to wooden remnants. Yellow-brown drops often are present on fresh specimens. Smell fungoid but rhizomorphs with strong smell of truffle or mould.

Spores [140, 7, 4] 6.9–8.9 × 4.7–6.0 × c. 4.5–5.2 μm, ovoid or ellipsoid with rounded apex, dark red-brown, with central, 1–1.3 μm wide germ pore; Q = 1.35–1.70, av. Q = 1.50–1.55; av. L = 7.7–8.2, av. B = 5.1–5.6 μm. Basidia 13–32 × 6–9 μm, 4-spored, surrounded by 3–5 pseudoparaphyses. Pleurocystidia 70–180 × 24–50 μm, ellipsoid, oblong, sublageniform or utriform. Cheilocystidia 40–170 × 15–40 μm, to a large extent utriform and then often with rather long neck (sublageniform), ellipsoid, oblong or fusiform. Elements of veil thin-walled, branched, weakly diverticulate, 50–100 × (2–)4–9

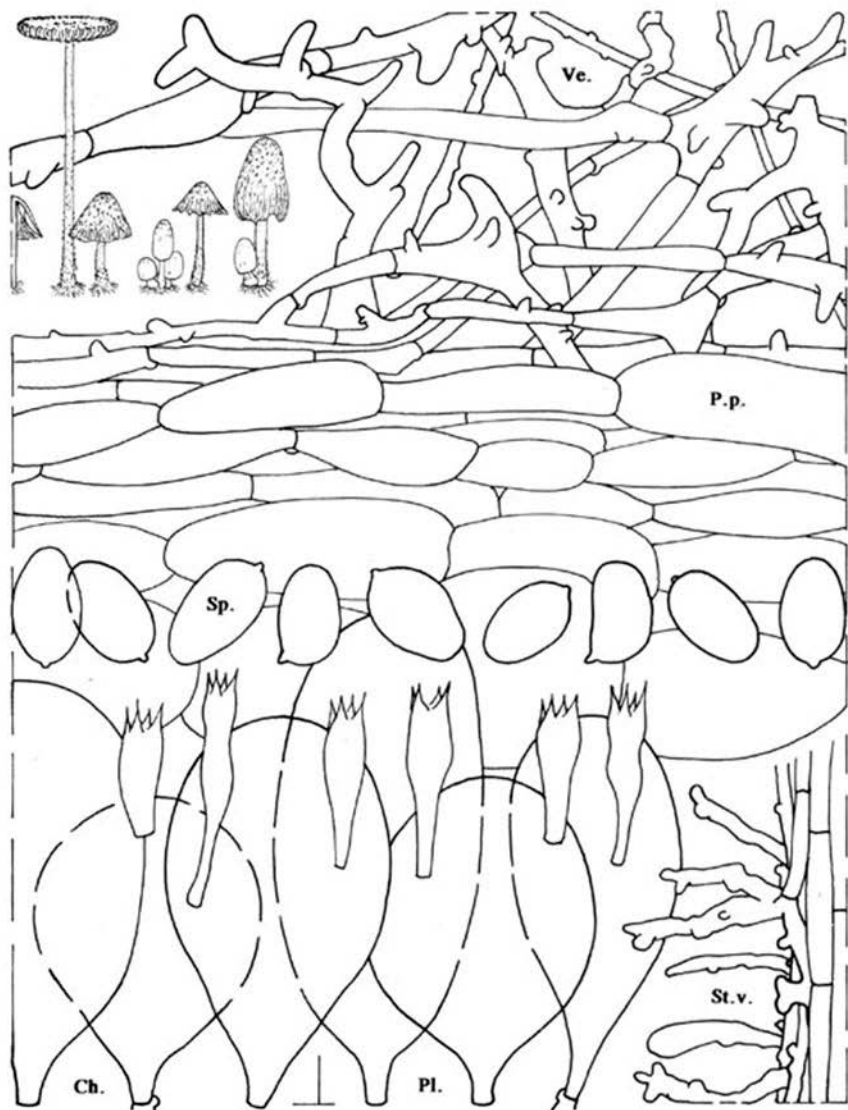


Fig. 10. *Coprinus goudensis* Uljé & Bas. All figures from coll. C.B. Uljé 1213 (holotype).

(-14) μm wide, in part slightly thick-walled (less than 0.5 μm) and pale yellowish incrust-ed. Clamp-connections present.

Habitat & distribution — Fasciculate on wood or woody remnants of broad-leaved trees, often dozens of basidiocarps together. Very rare. Europe, Japan. Occurs from May to July.

Collection examined. GERMANY: Lebau, 27 May 1984, A. Hausknecht (herb. Bender, Germany); Heizenheim, 3 June 1984, Mr. Matske (herb. Bender, Germany). — ITALY: Marlia, Lucca-Toscana, 21 May 1994, V. Coccia (two collections received, the second without annotations, probably representing a part of first collection). — NETHERLANDS: prov. Utrecht, Breukelen, estate 'Nijenrode', 10 June 1996, G.J. Immerzeel (coll. C.B. Uljé 1290).

Coprinus strossmayeri is recognizable in the field by the rather large basidiocarps growing in clumps like *C. atramentarius* but in contrast to that almost smooth species the young specimens of *C. strossmayeri* are covered with thick, white veil breaking up in small, felt scales when pileus expands. These scales are somewhat larger than the flocculose scales of species in subsect. *Domestici* (sect. *Micacei*) and more persistent. The basidiocarps of *C. strossmayeri* are more slender and more conical when mature. The base of the stipe in *C. strossmayeri* is connected to dense, dark orange-brown rhizomorphs with strong smell of mould. Microscopically *C. strossmayeri* is distinguished from species in subsect. *Domestici* in having diverticulate velar hyphae and distinct ovoid spores (in subsect. *Domestici* the elements of veil are in chains, globose in great part, never diverticulate and the spores are cylindrical-ellipsoid or ellipsoid).

10. *Coprinus goudensis* Uljé & Bas — Fig. 10

Coprinus goudensis Uljé & Bas, Persoonia 15 (1993) 363.

Pileus 5–12 \times 4–9 mm when still closed, up to 20 mm when expanded, first ellipsoid, ovoid or conical, white, soon greyish. Veil white, breaking up in small, radial, hairy-fibrillose scales. Lamellae, L = 23–26, l = 0–3, rather crowded, free, first white, then grey-brown to blackish. Stipe up to 40 \times 1–1.5 mm, white, greyish white, minutely white floccose, in particular at clavate base.

Spores [140, 6, 4] 7.0–9.8(-10.7) \times 4.6–6.2(-6.9) μm , oblong, sometimes ellipsoid or ovoid with rounded apex, rather pale (dirty) red-brown and central, c. 1.3 μm wide germ pore; Q = 1.45–1.90, av. Q = 1.55–1.70; av. L = 8.4–9.1, av. B = 5.0–5.6 μm . Basidia 18–40 \times 7–9 μm , 4-spored, surrounded by (3–)4–5(-6) pseudoparaphyses. Pleurocystidia 60–100 \times 35–50 μm , broadly cylindrical or oblong to ellipsoid. Cheilocystidia 30–80 \times 20–50 μm , (sub)globose to ellipsoid, oblong or obovoid, sometimes sub-triangular or subcylindrical. Elements of veil thin-walled, diverticulate, 3–10(-15) μm wide; excrescences up to c. 15 μm in length. Clamp-connections present.

Habitat & distribution — In small groups, a few together on dead wood (*Acer* and *Populus*), very rare. Only known from a few localities in the Netherlands and Germany.

Collections examined. GERMANY: Neersbroich, 7 Aug. 1987, H. Bender (herb. Bender, Germany); Thüringen, Remstädt, 25 May 1996, F. Gröger (herb. Gröger, Germany). — NETHERLANDS: prov. Zuid-Holland, Reeuwijk, Reeuwijker Hout, 20 Oct. 1991, C.B. Uljé 1213 (holotype, L); idem, 14 Nov. 1991, C.B. Uljé 1217; prov. Zeeland, Hontenisse, Vogelwaarde, 21 Sept. 1981, A. de Meijer 397.

Coprinus goudensis can easily be recognized by the ellipsoid spores which in average are less than 10 μm long, having an average quotient of 1.6 or more, and the lignicolous habitat.

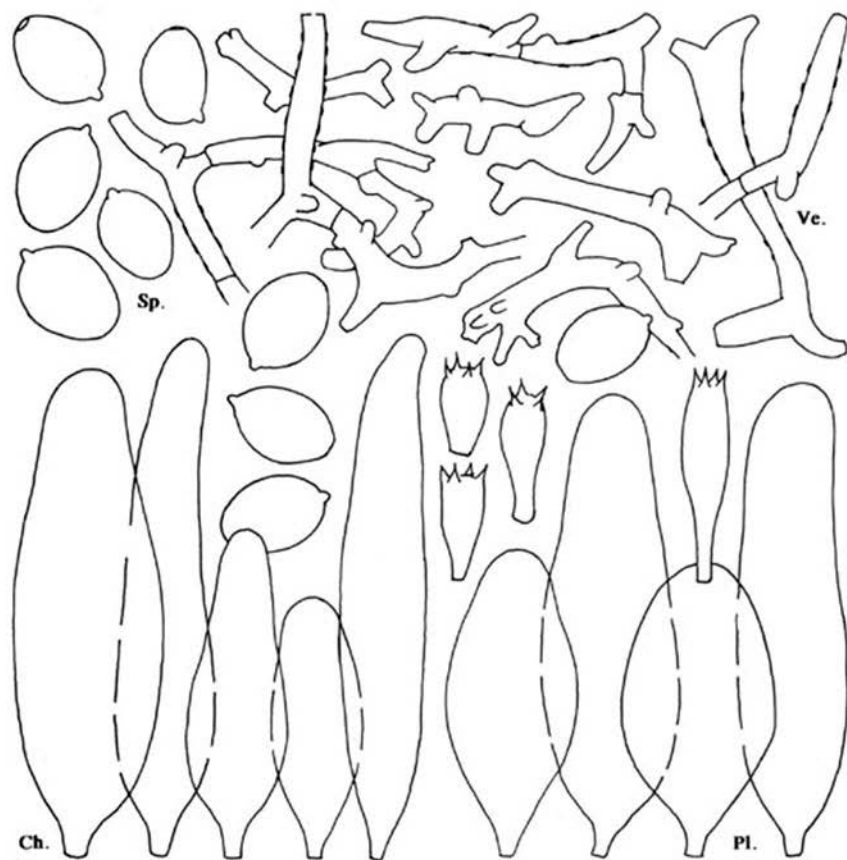


Fig. 11. *Coprinus urticicola* (B. & Br.) Buller var. *urticicola*. All figures from coll. C. B. Uljé 1168.

11. *Coprinus urticicola* (B. & Br.) Buller var. *urticicola* — Fig. 11

Coprinus urticicola (B. & Br.) Buller, Trans. Br. mycol. Soc. 5 (1917) 485; *Agaricus urticicola* B. & Br. (as *urticaecola*), Ann. Mag. Nat. Hist., ser. 3 (7) (1861) 376.

Coprinus brassicae Peck, Rep. N.Y. St. Mus. nat. Hist. 43 (1890) 64.

Coprinus melo J. Favre, Ass. fong. Hauts-Marais (1948) 215.

Coprinus suburticicola Pilát & Svrček, Česká Mykol. 21 (1967) 140.

Selected icons: Breitenb. & Kränzl., Pilze Schweiz 4 (1995) 252, pl. 306; Cetto, *Funghi Vero* 5 (1987) pl. 1724.

Pileus 3–6(–8) × 2–4 mm when still closed, up to 13 mm when expanded, at first (sub-)globose, ellipsoid, ovoid or conical, pure white. Veil white, breaking up in small, woolly-

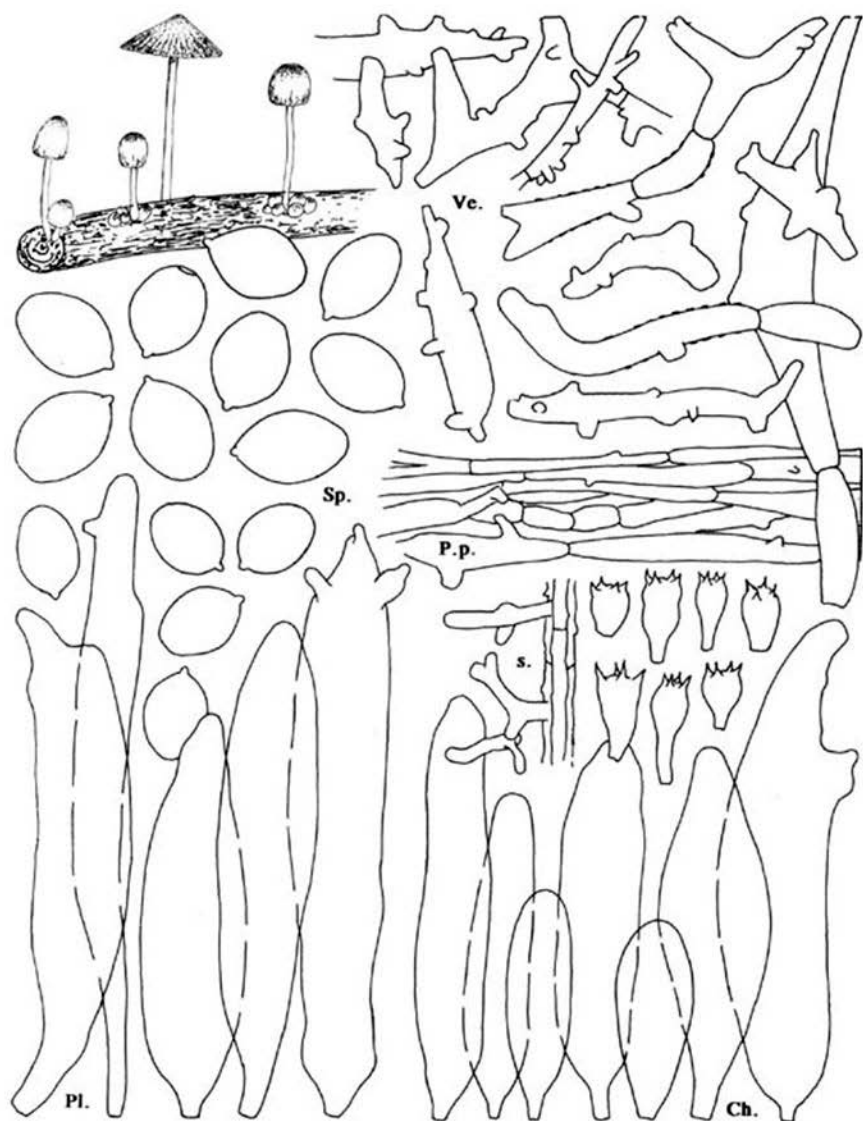


Fig. 12. *Coprinus urticicola* var. *salicicola* Uljé & Noordeloos. All figures from coll. C.B. Uljé 1143.

hairy scales. Lamellae, $L = c. 35$, $l = 0-3$, crowded, free, first white, then grey to blackish. Stipe up to $30 \times 0.5-1$ mm, white, greyish white, somewhat floccose above the slightly clavate base.

Spores [480, 24, 22] $5.3-8.9 \times 4.3-6.7$ μm , subglobose to ellipsoid and then often somewhat conical to base and apex, rounded at apex, rather pale red-brown, with central, $1.0-1.5$ μm wide germ pore; $Q = 1.10-1.65$, av. $Q = 1.25-1.45$; av. $L = 6.0-8.1$, av. $B = 4.8-6.0$ μm . Basidia $10-23 \times 6-8.5$ μm , 4-spored, surrounded by (3-4)-6 pseudoparaphyses. Pleurocystidia $40-70 \times 10-15$ μm , (sub)cylindrical, (narrowly) utriform, oblong, ellipsoid or narrowly conical. Cheilocystidia $30-65 \times 10-14$ μm , similar to pleurocystidia. Elements of veil thin-walled, diverticulate, $2-8$ μm wide; walls slightly to strongly incrustated. Clamp-connections absent.

Habitat & distribution — Solitary or a few together, on grasses and herbs, sometimes on wood. Common in Europe. Recorded from Canada, USA.

Collections examined. GREAT BRITAIN: England, King's Cliffe, on nettle roots, 8 Aug. 1858, Berkeley 1304 (holotype of *Agaricus (Psathyra) urticicola* B. & Br., K). — CZECHIA: Horní Sloveniče pr. Lomnice nad Lužnicí, Bohemia merid., on stems of dead *Glyceria* species, 14 July 1962, M. Svrček & J. Kubička 346/62, coll. no. PR 567917 (holotype of *C. suburticicola*, PRM). — NETHERLANDS: prov. Drenthe, Holthe, 3 July 1993, E. Arnolds 6362 (WBS); prov. Gelderland, Veenendaal, 'de Hel', 14 July 1982, P. B. Jansen 82-114; prov. Noord-Holland, Kortenhoef, 3 Apr. 1971, J. Daams 71-74 (gh); idem, 8 Apr. 1971, J. Daams 71-90 (gh); idem, 17 Apr. 1971, J. Daams 71-99 (gh); idem, 15 May 1971, J. Daams 71-119 (gh); 's-Graveland, 20 Apr. 1975, J. Daams 75-14 (gh); prov. Utrecht, Maarsseveen, 6 March 1972, J. Daams 72-36 (gh); Vleuten, 31 March 1972, J. Daams 72-81 (gh); prov. Zuid-Holland, Boskoop, Gouwebos, 19 July 1991, C. B. Uljé 1168; Zegveld, 3 July 1990, C. B. Uljé; Alphen aan den Rijn, 15 July 1988, C. B. Uljé 919; idem, on stem of *Phragmites*, 22 July 1991, C. B. Uljé 1169; Leiden, Boerhaveaan, 27 July 1958, C. Bas 1470; idem, Groenord, 20 July 1960, A. C. v. d. Laan; Noorden, 27 June 1957, C. Bas 1207; prov. Noord-Brabant, Breda, Liesbos, 13 Aug. 1971, P. B. Jansen; idem, on *Juncus*, 30 July 1979, P. B. Jansen 79-155; prov. Limburg, Tegelen, 24 Sept. 1961, J. v. Brummelen 1348. — SWITZERLAND: Bière, la Côte, Vallée du Joux, 28 Aug. 1939, J. Favre GK 7762 (holotype of *C. melo*, G).

Coprinus urticicola is a common species in hay-fields with abundant dead grasses; also rather common in *Phragmites* lands. The species can be recognized by the small, pure white basidiocarps with woolly scales of veil. Microscopically the often conical, ellipsoid or ovoid, pale coloured spores and thin-walled elements of veil are good characters to identify *Coprinus urticicola*. The microscopical characters of the types of *Coprinus melo* and *C. suburticicola* are similar to those of *C. urticicola*, and these species are therefore considered synonyms. Since the description of *Coprinus brassicae* Peck (1890: 64) also agrees very well with *C. urticicola*, this species is also listed among the synonyms.

12. *Coprinus urticicola* (Berk. & Br.) Buller var. *salicicola* Uljé & Noordel., var. nov. — Fig. 12

A varietate typica differt pilei centro velo atro brunneo atque in ramulos *Salicis* provento. — Holotypus: 'C. B. Uljé 1143, 21-VI-1991, Alphen aan den Rijn, prov. Zuid-Holland, Netherlands (L)'.

Pileus up to $3-6 \times 2-4$ mm when still closed, up to 15 mm when expanded, subglobose, ellipsoid or ovoid-conical, very dark brown (sepia coloured) at centre, around centre white. Veil dark grey-brown (Mu. 7.5 YR 3/3; K. & W. 6F7), splitting up in minute, hairy-floccose scales. Lamellae, $L = c. 32$, $l = 0-3$, rather crowded, free, first white, then grey-brown, finally blackish. Stipe up to $40 \times 1-2$ mm, whitish, at base somewhat clavate and tomentose.

Spores [120, 6, 5] 5.4–8.3 × 4.2–5.7 µm, ellipsoid or ovoid, often somewhat conical base and rounded apex, rather pale grey-brown (Mu. 10 YR 5/3), with central, c. 1.5 µm wide germ pore; Q = 1.20–1.75, av. Q = 1.30–1.55; av. L = 6.0–7.8, av. B = 4.5–5.3 µm. Basidia 12–30 × 7–9 µm, 4-spored, surrounded by (3–)4–6(–7) pseudoparaphyses. Pleurocystidia 60–110 × 10–30 µm, cylindrical, oblong or fusiform. Cheilocystidia 30–100 × 10–23 µm, ellipsoid, oblong, (sub)cylindrical, subutriform, fusiform or narrowly conical. Elements of veil thin- to slightly thick-walled (walls greyish brown in microscope), diverticulate, 2–7(–10) µm wide, slightly incrustated. Clamp-connections not found.

Habitat & distribution — Solitary or a few together on dead branches of *Salix*. Very rare, so far only collected from one locality.

Collections examined. NETHERLANDS: prov. Zuid-Holland, Alphen aan den Rijn, 28 Aug. 1988, C.B. Uljé 962; idem, 21 June 1991, C.B. Uljé 1143 (holotype); idem, 2 July 1991, C.B. Uljé 1152; idem, 12 July 1991, C.B. Uljé 1164; idem, 27 July 1991, C.B. Uljé 1172.

Coprinus urticicola var. *salicicola* differs from the typical variety mainly by the dark colour of the veil that also becomes slightly thick-walled, the grey-brown colour of the spores and the habitat on branches of *Salix*.

13. *Coprinus fluvialis* Lanconelli & Uljé, *spec. nov.* — Fig. 13

Pileus primo 5–9 × 3–5 mm, subglobosus, ellipsoideus vel ovoideus, dein conicus, convexus vel explanatus, 10–15 mm latus, griseo-brunneus vel obscure griseus, totus flocculosus cum velo albo vel brunneo. Lamellae liberae, L = 26–30, l = 0–3, ex albo nigricantes. Stipes 20–30 × 1 mm, versus basim incrassatus, albus, flocculosus. Sporae [60, 3, 2] 6.9–10.6 × 5.3–7.8 µm, ovoideae vel obovoideae, interdum submitriformes moderate rufo-brunneae poro germinativo centrico lato 1.3 µm instructae. Basidia 14–40 × 7–9 µm, 4-sporigera. Pseudoparaphyses 3–6. Pleurocystidia 40–55 × 19–28 µm, subglobosa, ellipsoidea vel late cylindracea. Cheilocystidia 30–55 × 17–32 µm, (sub)globosa, ellipsoidea, ovoidea, obovoidea vel late cylindracea. Velum e elementis diverticulatis, 20–50 × 2–7 µm, tenuitunicatis, valde incrustatis constituis. Pileipellis cutis hyphis cylindraceis, tenuitunicatis. Fibulae praesentes. Ad terram.

Holotypus: Italy, RA: Alfonsine, 5 July 1996, L. Lanconelli 78-96 (L).

Pileus 5–9 × 3–5 mm when still closed, subglobose, ellipsoid or ovoid, then obtusely conical to convex, finally flattened and 10–15 mm wide, densely covered with white to brownish (at centre) veil when young; centre of pileus grey-brown to dark grey below veil. Lamellae L = 26–30, l = 0–3, free, white to blackish. Stipe 20–30 × 1 mm, white, flocculose; base somewhat clavate.

Spores [60, 3, 2] 6.9–10.6 × 5.3–7.8 µm, ovoid or obovoid, often conical to base (submitriform) with rounded apex, medium red-brown and central, 1.3 µm wide germ pore; Q = 1.25–1.45, av. Q = 1.30–1.35; av. L = 7.5–9.5, av. B = 5.8–7.1 µm. Basidia 14–40 × 7–9 µm, 4-spored (a few 2-spored basidia also are found) surrounded by 3–6 pseudoparaphyses. Pleurocystidia 40–55 × 19–28 µm, subglobose, ellipsoid or short broadly cylindrical. Cheilocystidia 30–55 × 17–32 µm, (sub)globose, ellipsoid, ovoid, obovoid or short broadly cylindrical. Elements of veil 20–50 × 2–7 µm, diverticulate, thin-walled, strongly incrustated. Pileipellis hyphoid, made up of cylindrical to inflate elements. Clamp-connections present, but difficult to see because of the very thin and not coloured walls.

Habitat & distribution — Solitary, in small groups, close together but not fasciculate, on bare soil, sludge. Only known from one locality.

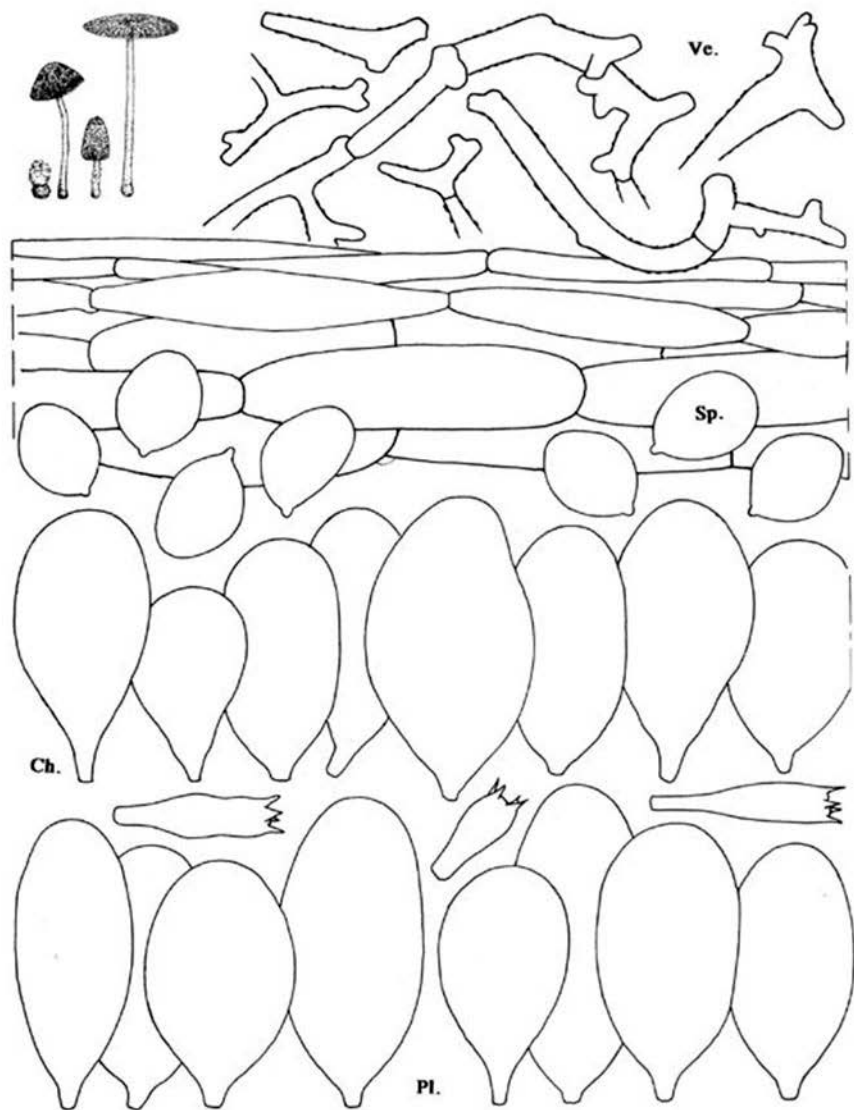


Fig. 13. *Coprinus fluvialis*. All figures from coll. Lanconelli 78-96.

Collections examined. ITALY: Alfonsine (RA), on the bank of a river, 2 May 1987, *L. Lanconelli* 8-87 (L) and 5 July 1996, *Lanconelli* 78-96 (holotype, L).

The size of the spores is very variable in these collections. The collection 8-87 consists of old basidiocarps in which the spores are smaller than in the other collection.

The material is close to *C. epichloeus* but differs in shape and quotient of the spores and sizes and shape of the cystidia.

14. *Coprinus gonophyllus* Quél. — Fig. 14

Coprinus gonophyllus Quél., Ann. Sci. Nat. Bordeaux 14, Suppl. 5 (1884) Pl. 1.

Selected icons. Jamoni, *Funghi Ambiente* 47 (1988) between 16 and 17, pl. 117; Migliozi & Cocchia, *Boll. Assoc. m. e. Romana* 16 (1989) 14; Monti, *Funghi Cenosi Aree bruciate* (1992) 83; Breitenb. & Kränzl., *Pilze Schweiz* 4 (1995) 234, pl. 278; Cacialli, Caroti & Doveri, *Funghi Fimicola, Schede Micol.* 1 (1995) 133.

Pileus up to 4–15(–20) × 3–12 mm when still closed, up to 30 mm when expanded, first globose or sometimes ellipsoid, ovoid or conical, then hemispherical or obtusely conical, finally convex, white. Veil first white and covering whole pileus, then breaking up around centre in felty patches, later becoming brownish in part. Lamellae, L = 32–38, l = 0–3(–5), free, first white, then grey-brown, finally blackish. Stipe up to 60 × 1–3(–4) mm, whitish; base somewhat clavate, up to 5 mm.

Spores [220, 11, 9] 6.2–8.7 × 5.3–8.2 × 4.8–6.5 μm, short ovoid or subglobose and truncate, lentiform, generally very dark red-brown, with central, 1.3–1.5 μm wide germ

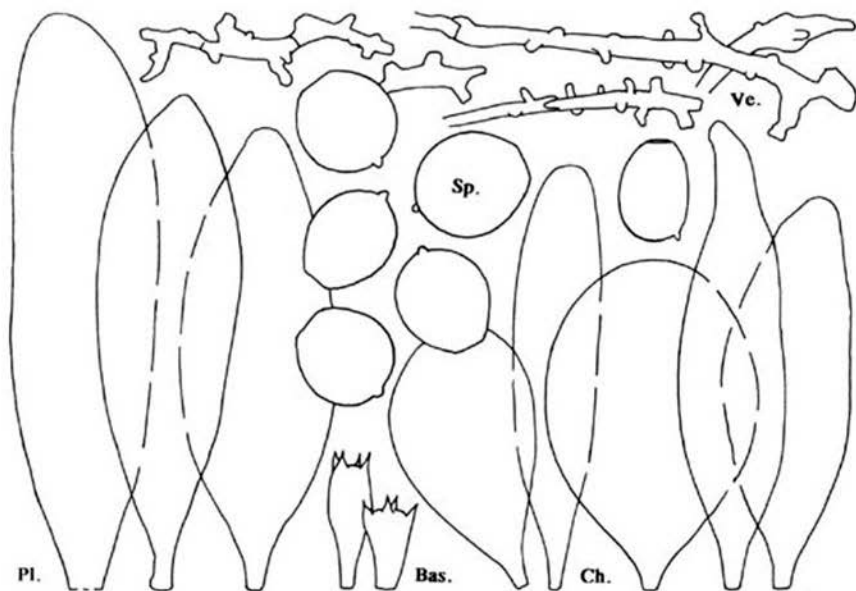


Fig. 14. *Coprinus gonophyllus* Quél. All figures from coll. P. B. Jansen 89-243.

pore; $Q = 1.00-1.35$, av. $Q = 1.05-1.25$; av. $L = 7.0-8.0$, av. $B = 6.1-7.6 \mu\text{m}$. Basidia $12-34 \times 7-9 \mu\text{m}$, 4-spored, surrounded by 4-7 pseudoparaphyses. Pleurocystidia $50-120 \times 20-40 \mu\text{m}$, subcylindrical, oblong and then often conical towards apex or fusiform. Cheilocystidia $40-85 \times 25-45 \mu\text{m}$, subcylindrical, oblong, (broadly) ellipsoid, fusiform or subtriform. Elements of veil thin-walled, diverticulate, 2-5(-7) μm wide, slightly incrustated. Clamp-connections present.

Habitat & distribution — Solitary or a few together; often on burned places but also on bare, often clayey soil. Widespread but not common in Europe.

Collections examined. GERMANY: Stetten, 18 July 1972, P. B. Jansen 72-280. — NETHERLANDS: prov. Flevoland, Lelystad, Visvijverbos, 20 June 1987, P. B. Jansen 87-156a; prov. Overijssel, Deventer, 'Het Joppe', 8 Oct. 1966, E. Kits v. Waveren; Delden, 24 Sept. 1969, E. Kits v. Waveren; prov. Gelderland, Panterden, 'Lobberdensch Waard', 22 Oct. 1992, E. Arnolds 6306 (WBS); prov. Noord-Holland, Kortenhoef, 27 June 1972, J. Daams 72-223 (gh); Nederhorst ten Berg, 6 May 1973, J. Daams 73-74; Amsterdam, Oeverlanden, 11 Oct. 1989, P. B. Jansen 89-243; prov. Zeeland, Zuid-Beveland, den Inkel, 17 Apr. 1985, W. D. J. Kuijs.

Coprinus gonophyllus can be recognized by the rather firm, usually hemispherical basidiocarps which often grow on burnt places and the thin-walled, narrowly velar hyphae and the short, subglobose spores with truncate germ pore. The size of the spores is somewhat similar to that of *Coprinus spilosporus*, but that species has long, thick-walled hairs between the velar elements. Another taxon, named *Coprinus spec. Bas 5002* in the present paper, is close to *C. gonophyllus* but differs in smaller, (sub)globose spores with an apical papilla (limoniform). *Coprinus epichloeus* is a much smaller and fragile species with spores which are not distinctly truncate at apex.

15. *Coprinus epichloeus* Uijé & Noordel., *spec. nov.* — Fig. 15

Pileus primo 3-6 \times 2-5 mm latus, subglobose vel ovatus, demum expansus, usque ad 15 mm latus; velum hirsuto-floccosum; lamellae liberae, albae demum griseo-brunneae vel atrae; stipes usque ad 30 \times 0.5-1 mm, albidus vel griseo-albidus, glaber, basin versus leviter tomentosus-hirsutus.

Sporae 7.0-10.2 \times 6.7-9.0 \times 6.4-7.8 μm , medio rubro-brunneae, subgloboae apice conicae, interdum leviter quadrangulatae cum poro germinativo 1.3-1.5 μm lato; basidia 16-32 \times 9-11 μm , 4-sporigera, 5-7(-8) pseudoparaphysibus circumcincta; pleurocystidia 60-105 \times 12-24 μm , elongato-ellipsoidea, utriformia vel subcylindracea; cheilocystidia 45-100 \times 15-30 μm , elongato-ellipsoidea, ellipsoidea, utriformia vel subcylindracea; velum e hyphis tenuitunicatis, hyalinis vel pallide griseo-flavidis sparse diverticulatis; fibulae praesentes. In graminis.

Holotypus: 'C.B. Uijé 908, 5-VI-1988, Alphen aan den Rijn, Netherlands (L)'.

Pileus 3-6 \times 2-5 mm when still closed, subglobose or ovoid, veil at primordia sepia, soon paler grey to almost white when expanded; then pileus up to 15 mm wide. Veil breaking up in small, hairy flocks. Lamellae, $L = c. 20$, $l = 1-3$, free, first whitish, soon grey-brown to dark grey, finally blackish. Stipe up to 30 \times 0.5-1 mm, white, greyish white, almost glabrous; base somewhat woolly hairy.

Spores [60, 3, 2] 7.0-10.2 \times 6.7-9.0 \times 6.4-7.8 μm , subglobose, often more or less conical to the apex, sometimes somewhat quadrangular, medium red-brown (about Mu. 2.5 YR 3/6; K. & W. 8E8) with central, c. 1.3-1.5 μm wide germ pore; $Q = 1.00-1.20$, av. $Q = 1.10$; av. $L = 8.1$, av. $B = 7.5 \mu\text{m}$. Basidia 16-32 \times 9-11 μm , 4-spored, surrounded by 5-7(-8) pseudoparaphyses. Pleurocystidia 60-105 \times 12-24 μm , oblong, (sub)cylin-

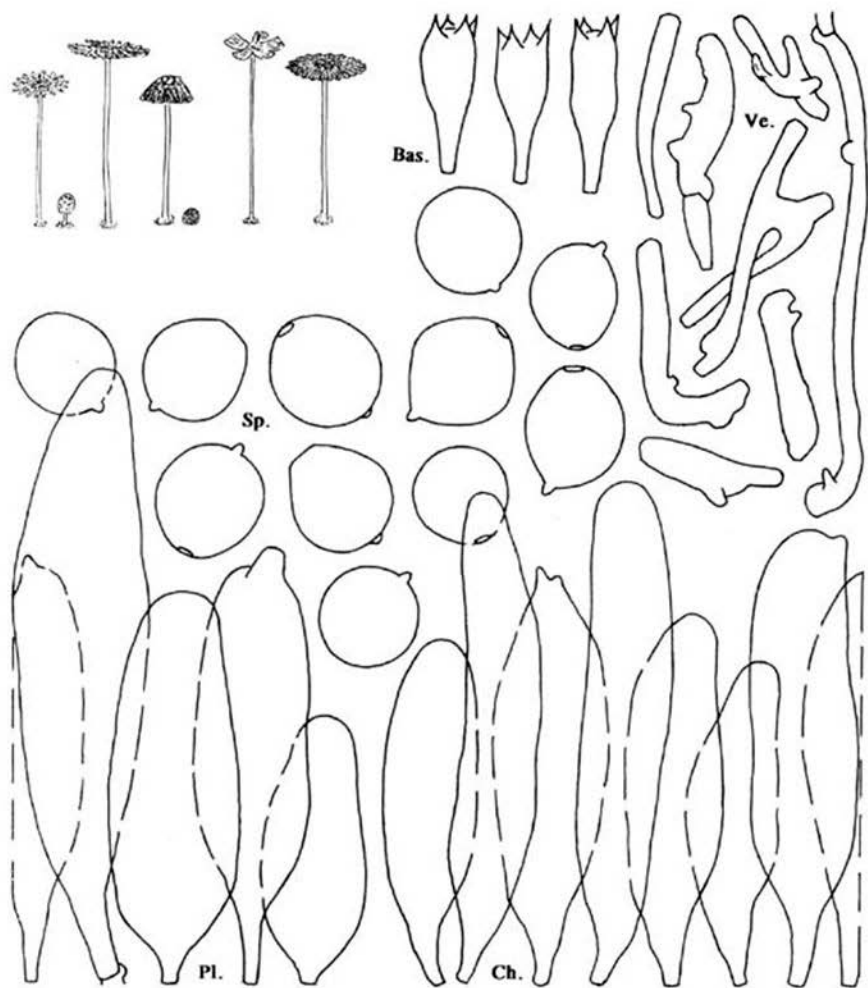


Fig. 15. *Coprinus epichloeus*. All figures from coll. C. B. Uljé 909 (holotype).

drical or utriform. Cheilocystidia $45\text{--}100 \times 15\text{--}30 \mu\text{m}$, oblong, ellipsoid, (sub)cylindrical or (narrowly) utriform. Elements of veil thin-walled, sparsely diverticulate, $2\text{--}10 \mu\text{m}$ wide; walls hyaline or slightly greyish yellow, less than $0.3 \mu\text{m}$ thick. Clamp-connections present.

Habitat & distribution — Solitary or a few together in small groups; in lawns, often on bare places. Probably not rare; found in one locality only, but there in several places.

Collections examined. NETHERLANDS: Alphen aan den Rijn, 5 June 1988, C. B. Uljé 908, idem, C. B. Uljé 909 (holotype, L).

Microscopically this species is close to *Coprinus gonophyllus* but differs in distinctly smaller, much more fragile basidiocarps and the more globose, slightly larger spores with rarely truncate apex. The habitat also is different, as it does not grow in burnt places, but in lawns among grass (though often also on bare places in the lawns). The spores of *Coprinus epichloetus* resemble somewhat those of *Coprinus phaeosporus*, but that species, like all other species in subsect. *Alachuani* with subglobose spores, has thick-walled velar elements.

16. *Coprinus spec.* (Uljé 1170) — Fig. 16

Pileus 2–4 × 2–3 mm when still closed, up to 8 mm when expanded, first globose, subglobose, ovoid or conical, beige. Veil beige, breaking up in small, woolly-hairy scales, becoming whitish when expanding; the beige colour staying at centre of pileus for a rather long time. Lamellae rather crowded, free, first white, then grey to blackish. Stipe up to 20 × 0.5–1 mm, white, greyish white, somewhat floccose above clavate base.

Spores [20, 1, 1] 4.0–5.6 × 3.3–4.1 μm, ellipsoid or ovoid with rounded apex, rather pale (grey-)brown and central, c. 1 μm wide germ pore; Q = 1.20–1.40, av. Q = 1.30; av. L = 4.9, av. B = 3.7 μm. Basidia 10–24 × 6–8 μm, 4-spored, surrounded by 3–6 pseudo-paraphyses. Pleurocystidia 30–70 × 10–14 μm, (sub)cylindrical or slightly utriform. Cheilocystidia 30–60 × 10–15 μm, similar to pleurocystidia. Elements of veil thin-walled, diverticulate, 2–8 μm wide; walls slightly incrustated. Clamp-connections absent.

Habitat & distribution — On grasses. Probably not rare but overlooked.

Collection examined. NETHERLANDS: prov. Zuid-Holland, Alphen aan den Rijn, Sportlaan, at base of *Carex*, 20 July 1993, C.B. Uljé 1170.

This species differs from *Coprinus urticicola* to which it is closely related, by having distinctly smaller spores and beige coloured basidiocarps.

17. *Coprinus filamentifer* Kühn. — Fig. 17

Coprinus filamentifer Kühn., Bull. Soc. Nat. Oyonnax 10–11 (1957) 3.

Pileus 7–10 × 4–5.5 mm when still closed, up to 18 mm when expanded, subglobose, ellipsoid, ovoid, first white with somewhat greyish centre, soon more grey. Veil white to grey, radially splitting up in small, hairy floccose scales. Lamellae, L = 26–28, l = 0–3, rather crowded, free, first white, then greyish, finally blackish; Stipe up to 100 × 1–1.5 mm, whitish, at base somewhat clavate.

Spores [40, 2, 1] 6.7–8.7 × 4.8–6.3 μm, cylindrical-ovoid, rounded rectangular in most cases, rather truncate, very dark red-brown, with central, c. 1.8 μm wide germ pore; Q = 1.30–1.60, av. Q = c. 1.45; av. L = 7.9–8.3, av. B = 5.5–5.6 μm. Size of basidia not noted, 4-spored. Pleurocystidia 80–135 × 20–30 μm, subcylindrical or oblong, often conical. Cheilocystidia 50–100 × 15–25 μm, similar to pleurocystidia. Elements of veil thin-walled, diverticulate, 2–7(–10) μm wide, slightly incrustated. Clamp-connections probably present.

Habitat & distribution — In small groups on dung of herbivores. Very rare. Not known from the Netherlands. Recorded from England, Ireland and Scotland according to Orton & Watling (1979: 51).

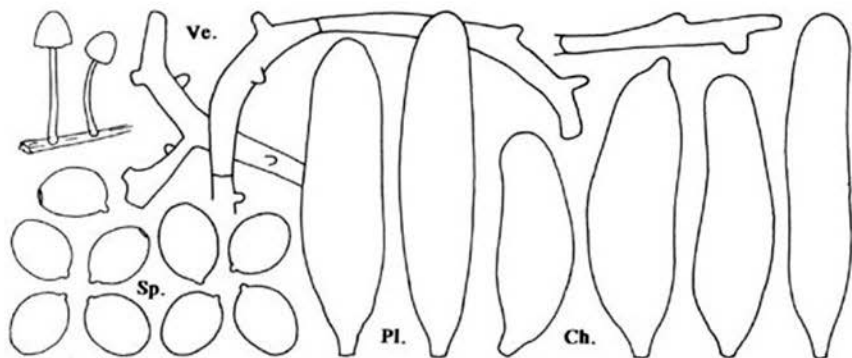


Fig. 16. *Coprinus spec.* (Uljé 1170). All figures from coll. C.B. Uljé 1170.

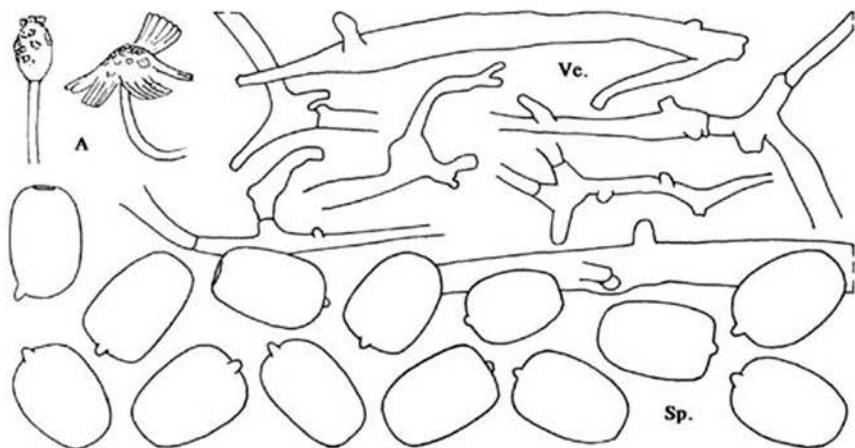


Fig. 17. *Coprinus filamentifer* Kühn. All figures from coll. G 388191 (holotype).

Collection examined. ALGERIA: cultivated on cow dung collected in Chréa, 20 June 1932. Coll. no. 388191 (holotype, G).

The presence of clamp-connections could not be verified with certainty because of the bad condition of the type material. *Coprinus filamentifer* can readily be recognized by the subcylindrical spores and coprophilous habitat.

18. *Coprinus argenteus* P.D. Orton — Fig. 18

Coprinus argenteus P.D. Orton, Notes R. bot. Gdn Edinb. 32 (1972) 139.

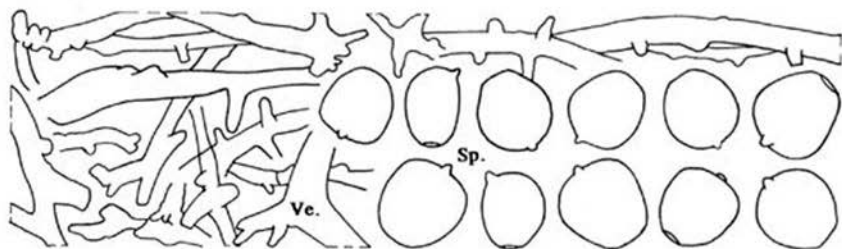


Fig. 18. *Coprinus argenteus* P.D. Orton. All figures from coll. P.D. Orton 955 (holotype).

Pileus 10 × 4 mm when still closed, up to 15 mm when expanded, ellipsoid conical oblong or ovoid, first white, soon more greyish. Veil white, often somewhat yellow-brown at centre, breaking up in patches. Lamellae free, rather crowded, first white, then greyish, finally blackish. Stipe up to 20 × 1–2 mm, whitish, base clavate, with small, tomentose disk.

Spores [40, 2, 1] 4.5–6.7 × 4.5–6.1 × 4.3–5.8 μm, the shape of a maize-kernel, truncate, medium red-brown, with central, c. 1 μm wide germ pore; Q = 0.95–1.25, av. Q = c. 1.10; av. L = 5.6–5.9, av. B = 5.2–5.4 μm. Basidia 14–26 × 8–9 μm, 4-spored, surrounded by 4–6 pseudoparaphyses. Pleuro- and cheilocystidia not found in type-material (see note). Elements of veil thin-walled, diverticulate, 2–7(–10) μm wide, slightly incrustated. Clamp-connections present.

Habitat & distribution — Solitary or a few together. In grassland on calcareous soil. Very rare, only known from England.

Collections examined. GREAT BRITAIN: Surrey, Mickleham, Juniper Hill, 22 June 1956, *Carol Kemball, Orton 955* (holotype, K).

Coprinus argenteus can be recognized by the typical shape of the spores in combination with the thin-walled velar elements. The type-material consisted of a fragment of a pileus only, and therefore no cystidia could be studied. In the original description no cystidia were mentioned and Orton stated: 'Cystidia not noted'.

19. *Coprinus spec.* (*Bas 5002*) — Fig. 19

Pileus 3–8 × 2–5 mm when still closed, up to 15 mm when expanded, ellipsoid or ovoid, first white, soon greyish. Veil white, often somewhat yellow-brown in centre, breaking up in patches. Lamellae rather crowded, free, first white, then greyish, finally blackish. Stipe up to 30 × 1–1.5 mm, white, at base slightly bulbous.

Spores [40, 3, 3] 6.3–8.5 × 5.8–7.8 × 4.6–5.7 μm, (sub)globose with apical, rather truncate papilla, dark red-brown, and central, 1.5–1.8 μm wide germ pore; Q = 1.00–1.20, av. Q = 1.05–1.10; av. L = 6.8–7.5, av. B = 6.3–7.2 μm. Basidia 14–28 × 6–8 μm, 4-spored, surrounded by (3–)4–5(–6) pseudoparaphyses. Pleurocystidia 50–90 × 16–28 μm, utriform, cylindrical, oblong or utriform. Cheilocystidia 30–80 × 10–26 μm, (sub)globose, ellipsoid, oblong or utriform. Elements of veil thin-walled, slightly diverticulate and incrustated, 2–6 μm wide, sometimes somewhat thick-walled (walls < 0.5 μm thick). Clamp-connections present.

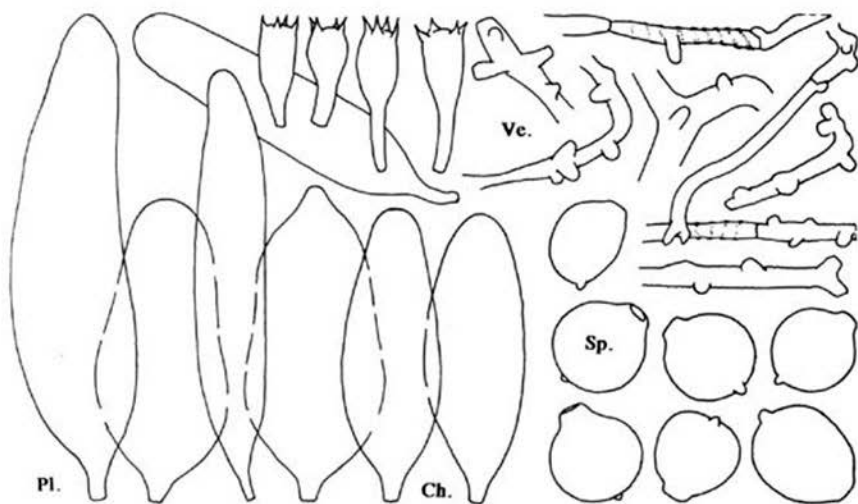


Fig. 19. *Coprinus spec.* (Bas 5002). All figures from coll. C. Bas 5002.

Habitat & distribution — Solitary or a few together. Very rare. Only known from the Netherlands (two finds) and Germany (one find). The Dutch collections were made on moist filter-paper on which seeds of *Petasites* were germinating and in a greenhouse (substrate not noted). The German collection was found on a beam in the ceiling of a cellar.

Collections examined. GERMANY: no date, no location, *Meusers* (herb. Bender, Germany). — NETHERLANDS: prov. Zuid-Holland, Leiden, 10 Nov. 1968, C. Bas 5002; prov. Noord-Holland, Kortenhoef, 2 Apr. 1984, *J. Daams* 84-18 (gh).

This taxon differs from *Coprinus episcopalis* in the distinctly smaller and more globose spores, smaller basidiocarps and smaller cystidia, and from *C. gonophyllus* in having slightly smaller spores with an apical papilla. Another difference is the habitat within buildings.

20. *Coprinus episcopalis* P.D. Orton — Fig. 20

Coprinus episcopalis P.D. Orton, Trans. Brit. mycol. Soc. 40 (1957) 270.

Pileus 20–30 × 10–18 mm when still closed, first oblong or obtusely conical, then conical to convex, up to 55 mm when fully expanded, first white, soon more greyish. Veil white, often somewhat yellow-brown in centre, breaking up in patches. Lamellae crowded, free, first white, then greyish, finally blackish. Stipe up to 95 × 5–9 mm, white, base (8–15 mm) more or less marginate bulbous, white silky striate.

Spores [80, 4, 2] (6.7–)7.9–10.7(–11.3) × 5.8–9.0(–11.0) × 4.8–6.7 μm, rounded quadrangular with apical, rather truncate papilla, dark red-brown, with central, c. 1.5–1.8 μm wide germ pore; Q = 1.00–1.45, av. Q = 1.10–1.30; av. L = 8.1–9.8, av. B = 6.5–8.5(–8.7) μm. Basidia 17–35 × 10–11 μm, 4-spored, surrounded by 4–7(–8) pseudoparaphyses. Pleurocystidia 50–140 × 15–40 μm, (sub)cylindrical, oblong, ellipsoid or

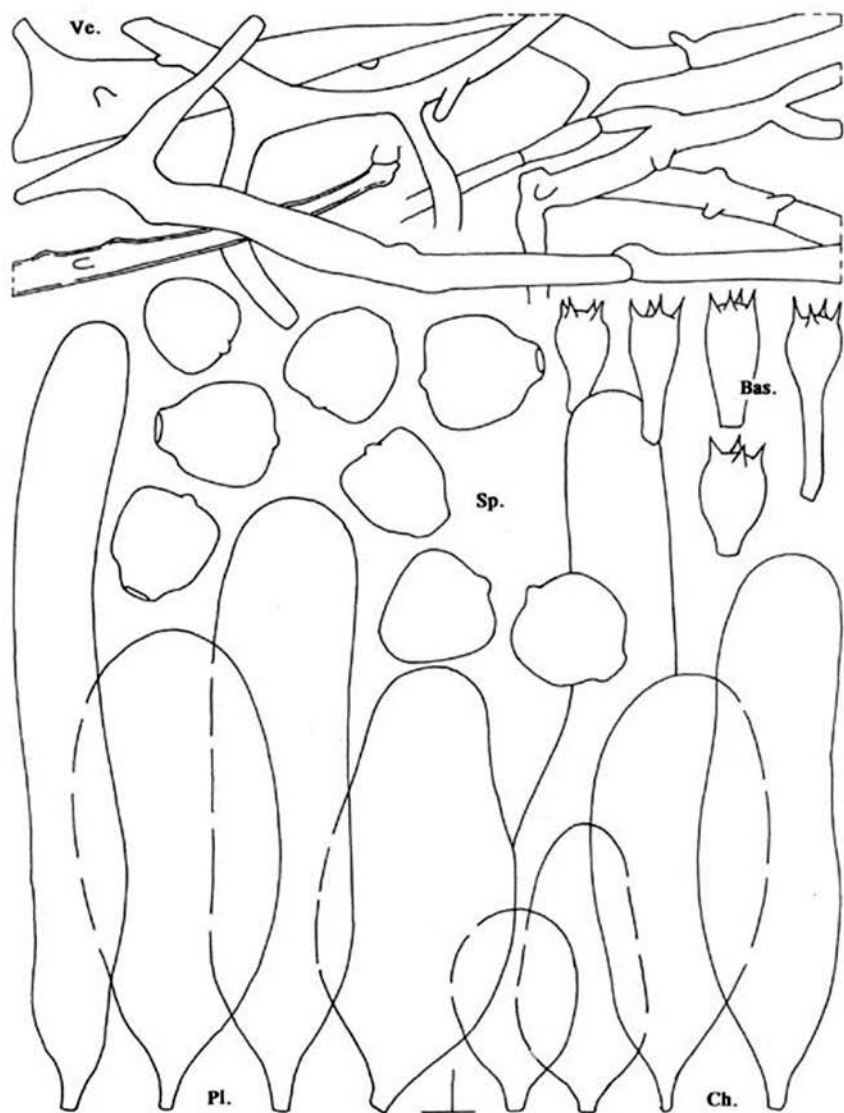


Fig. 20. *Coprinus episcopalis* P.D. Orton. All figures from coll. P.D. Orton 20 Nov. 1953 (holotype).

utriform. Cheilocystidia 30–120 × 10–40 µm, (sub)globose, ellipsoid, oblong, (sub)cylindrical or utriform. Elements of veil thin-walled, slightly diverticulate, 2–10(–15) µm wide, slightly incrusted; sometimes some elements are slightly thick-walled and then somewhat yellowish, less than 0.5 µm; excrescences up to c. 5 µm in length. Clamp-connections present.

Habitat & distribution — Solitary or a few together among leaves of deciduous trees (*Fagus*) on calcareous soil. Very rare in England and Germany. Not yet known from the Netherlands.

Collections examined. GREAT BRITAIN: Surrey, Mickleham downs, among leaves of *Fagus* on calcareous soil, 20 Nov. 1953, P. D. Orton (holotype, E). — GERMANY: Eifel, Lothar, 8 Aug. 1982, G. J. Kriegelsteiner (Herb. Bender, Germany).

Coprinus episcopalis is a rather large species in the section *Alachuanii* and easy to recognize by the characteristic shape of the spores. The American species *Coprinus maysoidisporus* (Redhead & Traquair, 1981: 381) is rather close but the spores in that species never have an apical papilla (l.c.: 380) and are somewhat smaller. Furthermore, the basidiocarps of *C. maysoidisporus* are much smaller (4.5–7 mm when still closed). *Coprinus* spec. Bas 5002 also comes rather close, but its spores are not angled and are smaller, globose with apical papilla.

21. *Coprinus herinkii* Pilát & Svrček — Fig. 21

Coprinus herinkii Pilát & Svrček, Česká Mykol. 21 (1967) 137.

Pileus 5–8 × 3–5 mm when still closed, ovoid or obtuse conical, whitish; expanded pileus up to 12 mm wide. Veil white, splitting up in small patches. Lamellae free, first whitish, then dark grey to blackish. Stipe up to 30 × 0.5–1 mm, white, grey-white, almost glabrous; base slightly clavate.

Spores [80, 2, 2] 4.7–6.7 × 4.8–6.6 × c. 4.7 µm, globose, a few subglobose, medium greyish red-brown, with central, c. 1.3 µm wide germ pore; Q = 0.95–1.10, av. Q = 1.00–1.05; av. L = 5.3–6.4, av. B = 5.2–6.2 µm. Basidia 16–36 × 8.5–9 µm, 4-spored, surrounded by 4–7 pseudoparaphyses. Pleurocystidia 60–100(–165) × 14–26 µm, oblong or (sub)cylindrical. Cheilocystidia 45–100 × 14–23 µm, similar to pleurocystidia. Elements of veil thick-walled, multiple-branched and diverticulate, 2–7 µm wide; walls up to 1.5 µm thick in German collection, but in type up to 3 µm in places, pale grey yellowish. Clamp-connections present.

Habitat & Distribution — Solitary on dead grasses. Very rare. Not known from the Netherlands. In addition to the type collection only one recent collection from Germany is known to us.

Collections examined. CZECHIA: Bohemia, Vodňany, 12 Aug. 1938, J. Herink, coll. no. PR 499700 (holotype, PRM). — GERMANY: Göttingen, Billinghamen, 6 Sept. 1995, M. A. E. Pilot 1006 (herb. Pilot, Germany).

This species is characterized by the small, globose spores. The warty-like lumpy surface of the spores which was mentioned in the original description of the species, could not be observed in the holotype. The original description is based on only one specimen. The spores in the type specimen measure 4.7–5.7 × 4.8–5.7 µm; Q = 0.95–1.05, av. Q = 1.00; av. L = 5.3, av. B = 5.2 µm. On account of the presence of similar, small, globose spores the

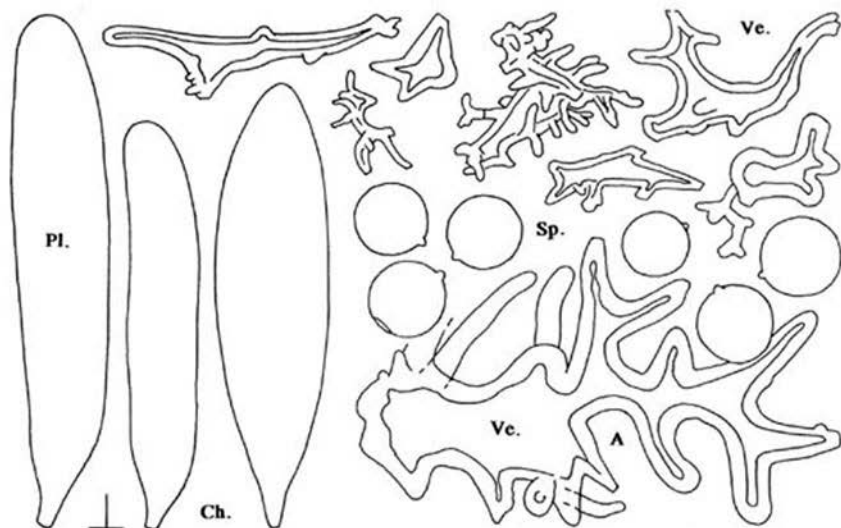


Fig. 21. *Coprinus herinkii* Pilát & Svrček. All figures from coll. J. Herink, coll. PR 499700 (holotype) (A, $\times 2000$).

German collection has been included in *C. herinkii*, although there are some differences. The German collection has somewhat larger spores and the walls of the veil are less thick.

22. *Coprinus spec.* (Uljé 1160) — Fig. 22

Pileus 3–7 \times 2–5 mm when still closed, up to 12 mm when expanded, first conical, ovoid or ellipsoid, whitish with beige or ochre centre. Veil breaking up in white or cream to ochre patches. Lamellae, L = 32–38, l = 0–3, rather crowded, free, first white, then greyish to black. Stipe up to 30 \times 0.5–1 mm, white, greyish white, somewhat floccose at clavate base.

Spores [80, 4, 2] 5.3–6.9(–7.5) \times 4.4–6.3 μm , short ovoid, truncate, medium red-brown, with central, 1.0–1.3 μm wide germ pore; Q = 1.05–1.35, av. Q = 1.15–1.25; av. L = 6.1–6.5, av. B = 5.1–5.6 μm . Basidia 12–26 \times 8–10 μm , 4-spored, surrounded by (4–)5–6(–7) pseudoparaphyses. Pleurocystidia 50–85 \times 12–23 μm , (sub)cylindrical, oblong, narrowly conical, sublageniform or narrowly utriform. Cheilocystidia 30–75 \times 10–18 μm , (sub)cylindrical, subutriform or ellipsoid. Elements of veil thick-walled, strongly multiple-branched and diverticulate, 2–8(–12) μm wide; walls more than 1.5 μm thick in places (up to 2.5 μm), pale yellow-brown. Clamp-connections present.

Habitat & distribution — Solitary or a few together in small groups on dead stems and leaves of herbs, very rare. So far only known from two collections.

Collections examined. NETHERLANDS: prov. Zuid-Holland, Alphen aan den Rijn, Zegersloot, 7 July 1991, on stem of herb (*Urtica*), C.B. Uljé 1160; prov. Noord-Brabant, Bergen op Zoom, 6 July 1974, on leaves and stems of herbs, P.B. Jansen 74-346.

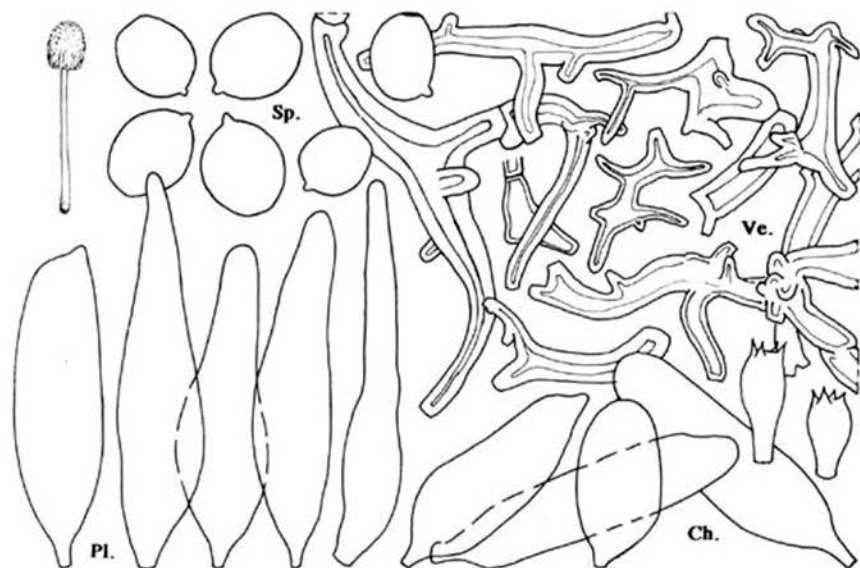


Fig. 22. *Coprinus spec.* (Uljé 1160). All figures from coll. C. B. Uljé 1160.

Coprinus spec. Uljé 1160 differs from *C. friesii* by much smaller spores and the habitat: growing on herbaceous stems. Both species have very thick-walled veilar elements, which are more than 1.5 μm thick in places.

23. *Coprinus spec.* (Uljé 924) — Fig. 23

Pileus 3–6 \times 2–5 mm when still closed, ovoid or ellipsoid, up to 10 mm when expanded, first covered with greyish pink to pink veil, brownish pink in centre, breaking up in minute hairy flocks. Lamellae free, first white to beige, then dark grey to blackish. Stipe up to 25 \times 0.5–1 mm, white, grey-white, almost glabrous; base slightly clavate.

Spores [40, 2, 1] 8.2–9.8 \times 7.7–9.0 μm , subglobose to globose, dark dirty red-brown, with central to somewhat eccentric, c. 1.6 μm wide germ pore; $Q = 1.00$ –1.10, av. $Q = 1.05$; av. $L = 8.9$, av. $B = 8.5$ μm . Basidia 16–32 \times 11–14 μm , 4-spored. Pleurocystidia 90–150 \times 24–35 μm , (sub)cylindrical, often with conical apex, narrowly conical or subutriform. Cheilocystidia 80–120 \times 16–35 μm , similar to pleurocystidia. Elements of veil thick-walled, diverticulate, 2–5 μm wide, walls up to 1.5 μm thick. Clamp-connections present.

Habitat & distribution — On dead herbaceous stems. Very rare. Only known from one locality.

Collection examined. NETHERLANDS: prov. Zuid-Holland, Boskoop, Dammekade, 24 July 1988, C. B. Uljé 924.

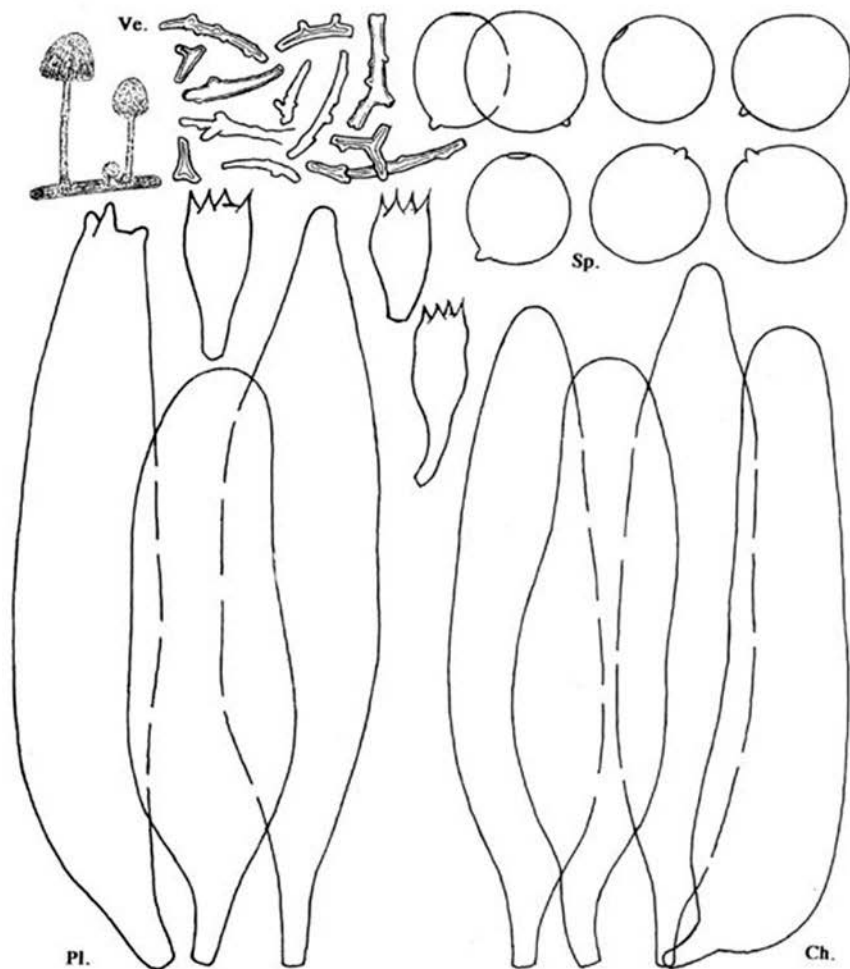


Fig. 23. *Coprinus spec.* (Uljé 924). All figures from coll. C. B. Uljé 924.

The beautiful pink colour of the basidiocarps in combination with the globose spores are distinctive for this taxon. *Coprinus herinkii* has similarly shaped spores, but smaller, and a thin-walled veil. In *Coprinus spilosporus*, another species with (sub)globose, and similarly sized spores, the veil is completely different.

24. *Coprinus phaeosporus* P. Karst. — Fig. 24

Coprinus phaeosporus P. Karst, Meddn Soc. Fauna Fl. fenn. 6 (1881) 9.

Coprinus saichiae Reid, Trans. Br. mycol. Soc. 41 (1958) 430.

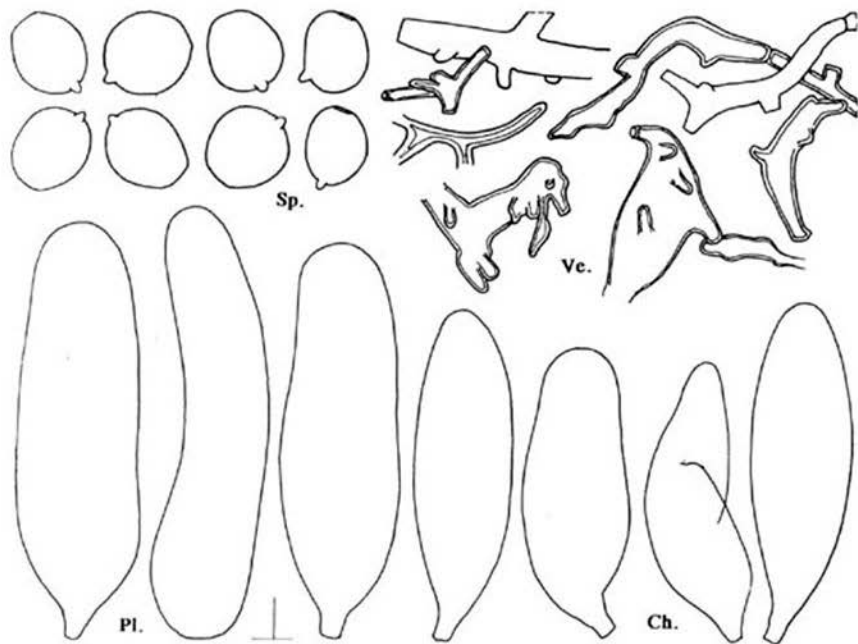


Fig. 24. *Coprinus phaeosporus* P. Karst. All figures from coll. P.A. Karsten 1602 (type).

Pileus 5–15(–20) × 3–12 mm when still closed, subglobose, ellipsoid, oval or conical, up to 30 mm when expanded, white with ochre-brown, velvety scales, especially around disk. Lamellae, L = 32–38, l = 0–3, crowded, free, first white, then dark grey to blackish. Stipe up to 120 × 0.5–2 mm, white, greyish white, almost glabrous.

Spores [140, 7, 6] 5.5–8.0 × 4.7–7.0 × 4.4–6.1 μm, subglobose or ovoid, sometimes slightly the shape of a maize-kernel, often truncate, dark red-brown, not strongly but distinctly lentiform with slightly to rather strongly eccentric, sometimes central, c. 1.0–1.3 μm wide germ pore; Q = 1.03–1.30, av. Q = 1.08–1.19; av. L = 6.1–7.1, av. B = 5.3–6.3 μm. Basidia 14–28 × 7–9 μm, 4-spored, surrounded by 4–7 pseudoparaphyses. Pleurocystidia 50–100(–150) × 10–30 μm, oblong, (sub)cylindrical or subutriform. Cheilocystidia 30–100(–120) × 10–30 μm, oblong, utriform or subcylindrical. Elements of veil thick-walled, strongly multiple-branched and diverticulate, 2–10 μm wide; walls less than 1.5 μm thick, pale yellow-brown. Clamp-connections present.

Habitat & distribution — In small groups on herbs and grasses. Rather common and widespread in Europe.

Collections examined. GREAT BRITAIN: Hertfordshire, Kings Langley, on dead grass in a lawn, 23 Sept. 1955, R.A. Saich (*Coprinus saichiae* Reid, holotype, K). — FINLAND: Tavastia, Tammela, Mustiala, 5 Aug. 1880, P.A. Karsten 1602 (holotype, H). — NETHERLANDS: prov. Groningen, Robbenoord, de Marne, 1 Sept. 1992, P.B. Jansen 92-147; prov. Gelderland, Beuningen, 3 Aug. 1987, N.J. Dam 87088 (herb. Dam); prov. Noord-Holland, Amsterdam, Amsterdamse Bos, 8 Aug. 1971, E. Kits v. Waveren; prov. Zuid-Holland: Alphen aan den Rijn, 15 Sept. 1990, C.B. Uljé 1099.

Type-studies have shown that *Coprinus saichiae* is very similar in all macro- and microscopical characters to *C. phaeosporus*, so they are considered synonymous.

The subglobose, rather strongly lentiform spores which have in most cases a slightly to rather strongly eccentric germ pore, distinguish *C. phaeosporus* from *C. pseudofriesii* and *C. xantholepis*, both of which have more broadly ellipsoid and somewhat larger, not distinctly lentiform spores. Only in *C. xantholepis* is the germ pore sometimes slightly lentiform.

25. *Coprinus pseudofriesii* Pilát & Svrček — Fig. 25

Coprinus pseudofriesii Pilát & Svrček, Česká Mykol. 21 (1967) 140.

Pileus 5–10 × 3–8 mm when still closed, up to 20 mm when expanded, first conical-ellipsoid or conical, rounded at apex and whitish with pale brown, ochre centre. Veil breaking up in ochre-brown patches, becoming paler with age. Lamellae, L = 32–40(–50), l = 0–3, crowded, free, first white, then grey to blackish. Stipe up to 60 × 1–2 mm, white, greyish white, somewhat floccose at base.

Spores [620, 31, 31] 6.1–10.2 × 5.0–7.9 µm, medium dirty red-brown, broadly ellipsoid, ellipsoid, ovoid or slightly rhomboid, rounded at apex with central, c. 1.5 µm wide germ pore; Q = (1.05–)1.15–1.55, av. Q = 1.25–1.40; av. L = 7.0–8.9, av. B = 5.4–6.8 µm. Basidia 18–32 × 9–11 µm, 4-spored, surrounded by 4–7 pseudoparaphyses. Pleurocystidia 60–120 × 10–27 µm, (sub)cylindrical or narrowly utriform. Cheilocystidia 30–80 × 7–22 µm, similar to pleurocystidia. Elements of veil thick-walled, multiple-branched and divaricate, 3–8 µm wide; thickness walls up to 1.5 µm, distinctly yellow, very clear in microscope; excrescences up to c. 20 µm in length. Clamp-connections present.

Habitat & distribution — Solitary or a few together; on wood, especially dead branches, also found on herbs and grasses. Rather common. Widespread in Europe.

Collections examined. CZECHIA: Bohemia centralis, Praha-Divoká Šárka, on fragments of *Juglans regia*, 22 July 1941, J. Herink 332/41, coll. no. PR 626346 (holotype, PRM). — GERMANY: Gotha, Luisenthal, 9 July, 1983, F. Gröger (herb. Bender, Germany); Glauchau, Wernsdorf, 23 June 1992, M. Graf (herb. Bender, Germany). — NETHERLANDS: prov. Flevoland, Lelystad, 20 July 1988, E. C. Vellinga 1308; Muiderzand, 19 July 1988, C. B. Uljé 920; prov. Drenthe, Beilen, 'Schepping', 1 Aug. 1993, E. Arnolds 6364, 2 Aug. 1993, E. Arnolds 6371 (herb. WBS); prov. Gelderland, Rhenen, 'Blauwe Kamer', 28 July 1995, P. B. Jansen; prov. Utrecht, Maarsseveen, 15 Febr. 1973, J. Daams 783 (gh); Vleuten, 15 March 1972, J. Daams 72-48 (gh); Breukelen, estate 'Sterreschans', 23 Aug. 1986, C. B. Uljé; idem, estate 'Over-Holland', 27 Aug. 1986, C. B. Uljé; idem, estate 'Nijenrode', 12 Sept. 1991, C. B. Uljé; prov. Noord-Holland, Texel, Oudeschild, 4/5 July 1984, M. Groenendaal (herb. Groenendaal); Amsterdam, Amsterdamse Bos, 16 July 1966, E. Kits v. Waveren; Kortenhoef, 23 March 1970, J. Daams 70-5 (gh); idem, 13 March 1971, J. Daams 71-25 (gh); idem 20 March 1971, J. Daams 71-18 (gh); idem 26 March 1971, J. Daams 71-63 (gh); idem, 19 Febr. 1972, J. Daams 72-15 (gh); idem, 11 March 1972, J. Daams 72-53 (gh); idem, 17 March 1972, J. Daams 72-42 (gh); idem, 27 March 1972, J. Daams 642 (gh); idem, 16 Apr. 1973, J. Daams 72-64 (gh); idem, 28 Jan. 1974, J. Daams 74-5 (gh); prov. Zuid-Holland, Alphen aan den Rijn, 5 June 1988, C. B. Uljé; idem, 10 June 1988, C. B. Uljé; idem, 4 July 1988, C. B. Uljé; Ter Aar, 'de Put', 18 Sept. 1986, C. B. Uljé; Oegstegeest, estate 'Poelgeest', 21 July 1957, C. Bas 1220; Warmond, near Seminarium, 28 July 1973, C. Bas 6033; Delft, Den Hoorn, 30 Jan. 1973, J. Daams 73-18 (gh); Ridderkerk, estate 'Huis ten Donck', 27 Aug. 1988, C. B. Uljé 960; prov. Noord-Brabant, Moerdijk, 10 Oct. 1989, E. Arnolds 6029 (WBS).

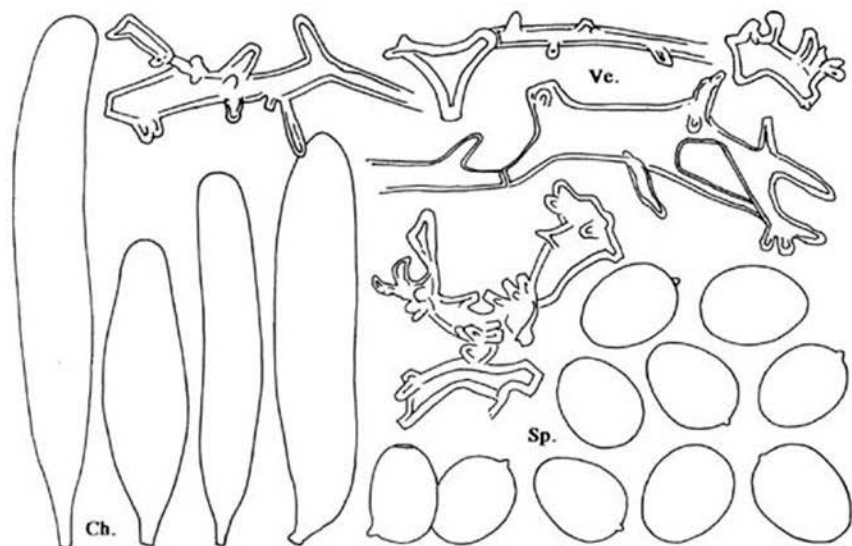


Fig. 25. *Coprinus pseudofriesii* Pilát & Svrček. All figures from coll. J. Herink 332/41 (holotype).

Coprinus pseudofriesii is characterised by the slightly thick-walled veil (up to 1.5 μm wide), the ellipsoid, ovoid or rhomboid spores up to c. 9 or 10 μm in length and the rather large basidiocarps. *Coprinus pseudofriesii* differs from *C. friesii* by the larger basidiocarps, the generally lignicolous habitat and less thick walls of velar elements, and from *C. phaeosporus* by the not distinctly lentiform, more ellipsoid spores with central germ pore. *Coprinus xantholepis* has much larger cystidia.

26. *Coprinus tigrinellus* Boud. — Fig. 26

Coprinus tigrinellus Boud., Bull. trimest. Soc. bot. Fr. 32 (1885) 283.

Coprinus subtigrinellus Dennis, Kew Bull. 15 (1961) 122–123.

Selected icon. Breitenb. & Kränzl., Pilze Schweiz 4 (1995) 252, pl. 304.

Pileus 5–10 \times 3–6 mm when still closed, up to 14 mm when expanded, ovoid, conical or ellipsoid, whitish with dark brown, sepia centre. Veil breaking up in dark brown, woolly scales and becoming paler with drying. Lamellae, L = 32–40(–50), l = 0–3, rather crowded, free, first white, then grey to blackish. Stipe up to 60 \times 1–2 mm, white, greyish white, somewhat floccose at base.

Spores [180, 9, 7] 5.3–10.6 \times 4.1–8.3 μm , ovoid or ellipsoid, mainly rounded at apex, medium red-brown, with central to slightly eccentric, 1.3–1.5 μm wide germ pore; Q = 1.05–1.45, av. Q = 1.20–1.30; av. L = 6.1–10.1, av. B = 4.6–8.0 μm . Basidia 12–28 \times 8–10 μm , 4-spored, surrounded by (4–)5–7(–8) pseudoparaphyses. Pleurocystidia 50–100(–120) \times 16–25(–28) μm , subcylindrical, oblong and then often with tapering

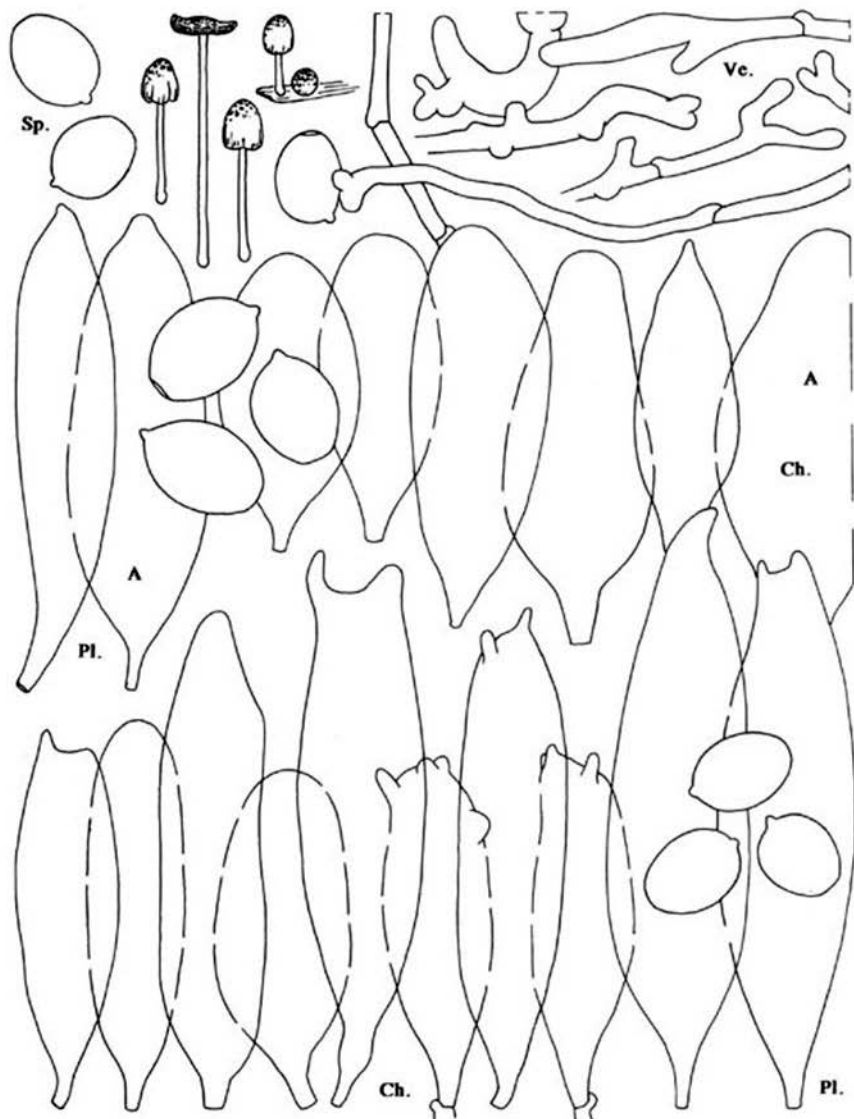


Fig. 26. *Coprinus tigrinellus* Boud. Most figures from coll. P. B. Jansen 79-154. — A = Pleuro- and cheilocystidia from C. B. Ulfé, 8 Aug. 1992.

apex. Cheilocystidia 40–80(–100) × 18–28(–32) µm, (sub)cylindrical, oblong, ellipsoid, conical or utriform. Elements of veil thick-walled, multiple-branched and diverticulate, 3–7(–10) µm wide; excrescences rounded; walls up to 1.5 µm thick. Clamp-connections present.

Habitat & distribution — In small groups, solitary or a few together, on *Phragmites* and other grasses. Widespread in Europe but not common. Holotype of *C. subtigrinellus* from Venezuela, South America.

Collections examined. NETHERLANDS: prov. Flevoland, 'de Abbert', 16 June 1981, *C. Bas* 7778; prov. Noord-Holland, Naarden, Naardermeer, 22 June 1960, *C. Bas* 1920; prov. Zuid-Holland, Streefkerk, 8 Aug. 1992, *C. B. Uljé*; Reeuwijk, 29 July 1995, *C. B. Uljé*; prov. Noord-Brabant, Breda, Liesbos, 12 Aug. 1967, *C. Bas* 4900; idem, 30 July 1979, *P. B. Jansen* 79-154. — VENEZUELA: Caracas, Botanic Garden, on dead *Arundo donax*, 30 June 1958, *R. W. G. Dennis* 1124 (holotype of *C. subtigrinellus*, K).

Although macroscopically *Coprinus tigrinellus* usually is fairly well characterized by the dark brown (sepia) veil on the pileus, this may be less distinctly developed. The distinctive character, however, of this species is to be found in the rounded excrescences of the elements of the veil.

Coprinus subtigrinellus is considered here a synonym of *C. tigrinellus*. A study of the holotype of *Coprinus subtigrinellus* showed that the spores are rather small for typical *C. tigrinellus* (5.3–7.2 × 4.2–5.5 µm), but the structure of the veil is similar to that of *C. tigrinellus* and, in our opinion, provides adequate reason for not maintaining *C. subtigrinellus* as a separate species.

27. *Coprinus xantholepis* P.D. Orton — Fig. 27

Coprinus xantholepis P.D. Orton, Notes R. bot. Gdn Edinb. 32 (1972) 150.

Pileus 8–10 × 4–5 mm when still closed, up to 20 mm when expanded, first cylindrical, ellipsoid, ovoid or somewhat conical, whitish with ochre centre. Veil breaking up in felty, ochre scales and becoming paler. Lamellae, L = 34–46, l = 0–3, rather crowded, free, first white, then grey to blackish. Stipe up to 60 × 1–1.5 mm, white, greyish white, somewhat floccose at clavate base.

Spores [60, 3, 3] 5.0–7.2 × 4.5–6.2 µm, short ovoid or ovoid, truncate, medium red-brown, with central, rarely slightly eccentric, 1.3–1.5 µm wide germ pore; Q = 1.00–1.30, av. Q = 1.10–1.20; av. L = 5.9–6.3, av. B = 5.4 µm. Basidia 18–44 × 8–11 µm, 4-spored, surrounded by (3–)4–6(–7) pseudoparaphyses. Pleurocystidia 80–180 × 25–40(–60) µm, (sub)cylindrical, oblong or utriform. Cheilocystidia 40–120 × 18–32(–40) µm, similar to pleurocystidia. Elements of veil thick-walled, strongly multiple-branched and diverticulate, in general with rounded protuberances, 3–7(–10) µm wide; walls up to 1 µm thick, pale brown. Clamp-connections present.

Habitat & distribution — In small groups, on grasses and herbs. Rare, recorded from Scotland and the Netherlands.

Collections examined. NETHERLANDS: prov. Noord-Holland, Kortenhoef, 26 Febr. 1971, *J. Daams* 71-12 (gh); prov. Zuid-Holland, Leiden, Leidse Hout, 22 July 1953, *M. Lange*. — GREAT BRITAIN: Scotland, Aberdeenshire, Loch Skene, 19 Aug. 1964, *P. D. Orton* 2567 (holotype, E).

Coprinus xantholepis differs from *C. phaeosporus*, *C. pseudofriesii* and *C. tigrinellus* particularly by the larger and broader cystidia.

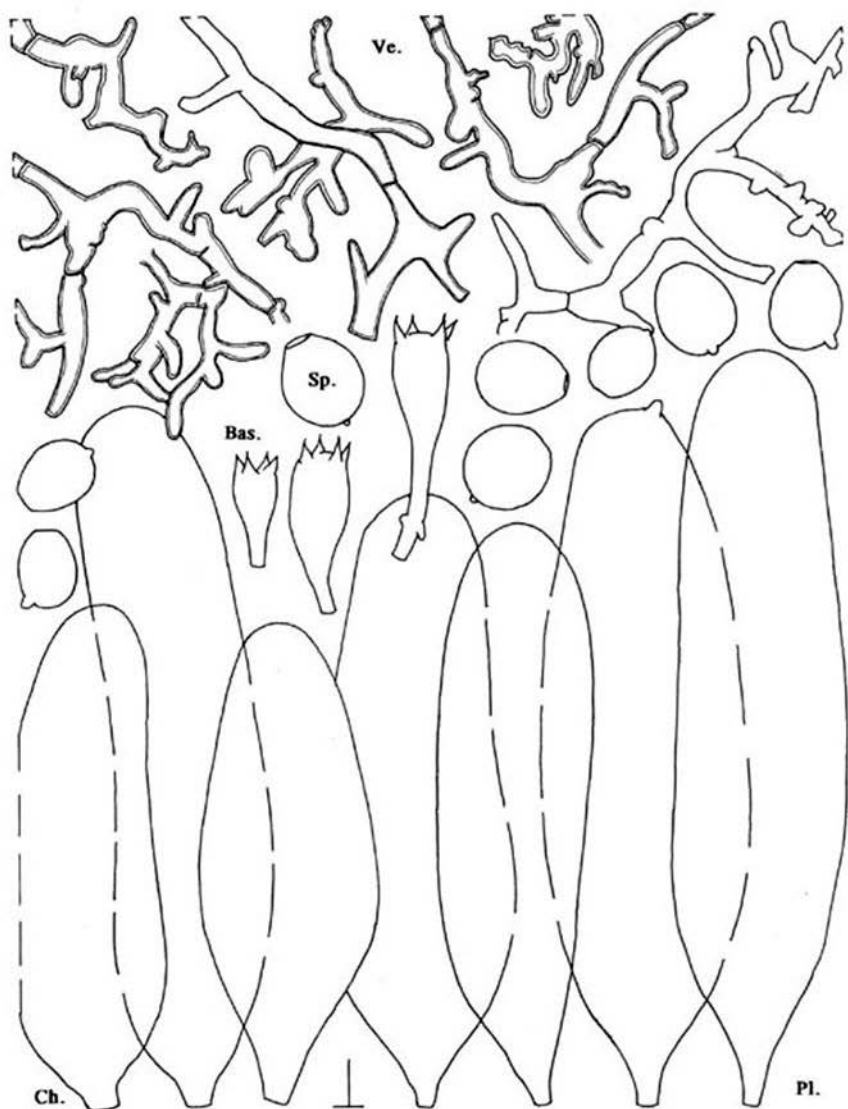


Fig. 27. *Coprinus xantholepis* P.D. Orton. All figures from coll. P.D. Orton 2567 (holotype).

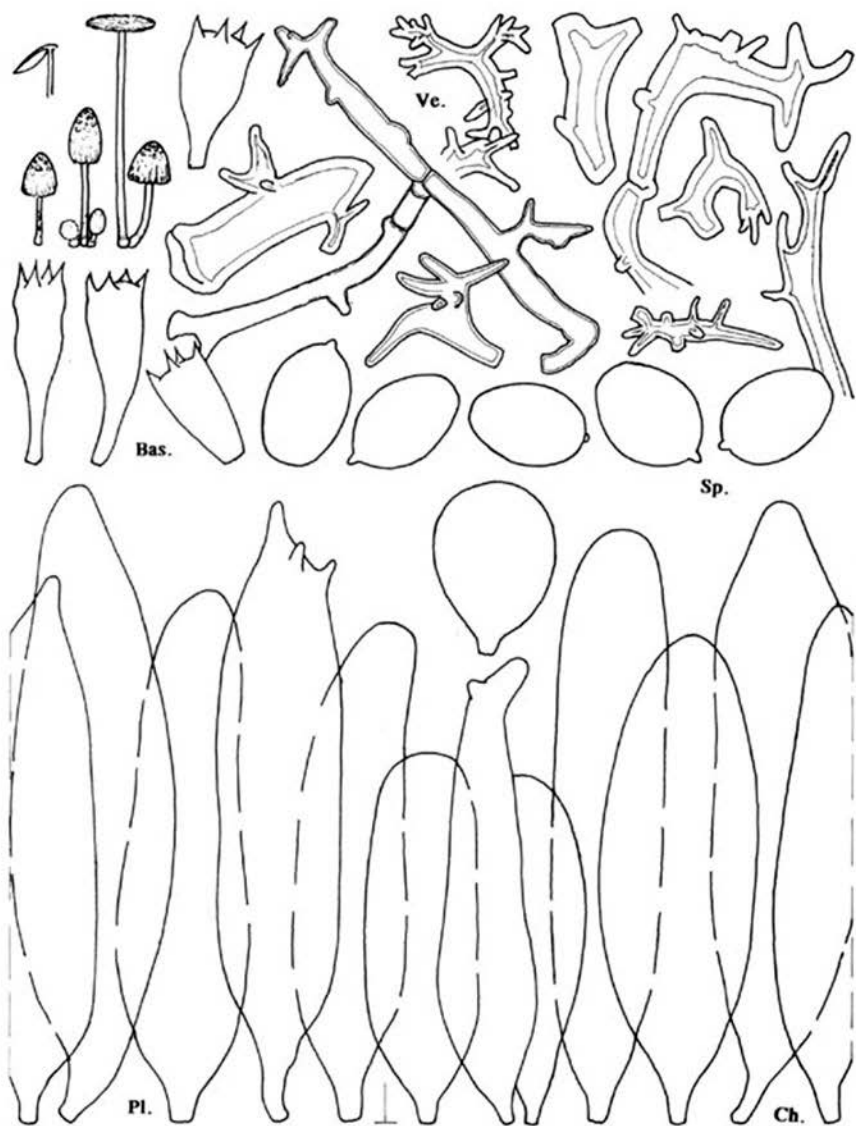


Fig. 28. *Coprinus friesii* Quél. All figures from coll. C. B. Uljé 1165.

28. *Coprinus friesii* Quéf. — Fig. 28

Coprinus friesii Quéf., Mém. Soc. Émul. Montbéliard, ser. II (5) (1872) 129.
Coprinus rhombisporus P.D. Orton, Notes R. bot. Gdn Edinb. 32 (1972) 145.

Pileus 3–8 × 2–6 mm when still closed, up to 15 mm when expanded, conical, ovoid or ellipsoid, whitish with ochre centre. Veil breaking up in cream coloured to ochre patches. Lamellae, L = c. 40, l = 0–3, rather crowded, free, first white, then grey to blackish. Stipe up to 35 × 1–1.5 mm, white, greyish white, somewhat floccose at the slightly clavate base.

Spores [180, 9, 9] 6.2–9.5(–10.8) × 5.5–7.2(–8.3) µm, ovoid to slightly rhomboid, mainly rounded at apex, medium red-brown, with central, 1.3–1.6 µm wide germ pore; Q = 1.10–1.40(–1.50), av. Q = 1.20–1.30; av. L = 7.6–8.3(–9.7), av. B = 6.0–6.8(–7.9) µm. Basidia 14–32 × 8–9 µm, 4-spored, surrounded by 5–7 pseudoparaphyses. Pleurocystidia 80–125 × 16–22 µm, (sub)cylindrical, oblong or narrowly conical. Cheilocystidia 30–100 × 14–32 µm, (sub)cylindrical, oblong, narrowly conical or ellipsoid. Elements of veil thick-walled, strongly multiple-branched and diverticulate, 2–8 µm thick; walls more than 1.5 µm thick, up to (2–)2.5–3(–4) µm in places and not or only slightly coloured. Clamp-connections present.

Habitat & distribution — In small groups, a few together, generally on grasses. Common in Europe. Recorded from Canada, South America, North Africa.

Collections examined. GREAT BRITAIN: Norfolk, Surlingham, Wheatfen Broad, 3 Aug. 1968, on grass and *Carex* debris, P.D. Orton 3249 (holotype of *C. rhombisporus*, E). — NETHERLANDS: prov. Gelderland, Doetinchem, 20 June 1952, H.S.C. Huijsman; Lochem, 29 June 1967, on grass, M. v. Vuure; prov. Utrecht, Breukelen, estate 'Over-Holland', 20 July 1963, on grass, E. Kits v. Waveren; prov. Noord-Holland, 's-Graveland, 6 March 1970, E. Kits v. Waveren (gh); Kortenhoef, 28 June 1978, in lawn on grass, J. Daams; prov. Zuid-Holland, Ter Aar, 1 Aug. 1989, on dead grass, C.B. Uljé 1013; Alphen aan den Rijn, Sportlaan, 12 July 1991, on dead grass, C.B. Uljé 1165; idem, Spookverlaat, 12 Aug. 1993, on grass, C.B. Uljé.

Coprinus friesii can be recognized by the ovoid or rhomboid spores with average length of c. 8 µm in combination with the strongly thick-walled, not or slightly coloured veil. The type of *Coprinus rhombisporus* agrees in all characters with *C. friesii* and is therefore considered synonymous. *Coprinus friesii* differs from the closest related *C. pseudofriesii* by smaller basidiocarps, not or only slightly coloured walls of veil which are more than 2 µm thick in places and the habitat: *Coprinus friesii* grows on grasses whereas *C. pseudofriesii* is mainly lignicolous.

29. *Coprinus spec.* (Uljé 1262) — Fig. 29

Pileus 2–6 × 2–4 mm when still closed, up to 15 mm when expanded, ellipsoid, ovoid or conical, greyish, beige (Mu. 7.5 YR 7/2; K. & W. 6B2). Veil greyish with pinkish tinge when young, soon greyish, breaking up in small, felty patches. Lamellae free, first white, then grey-brown to dark grey or blackish. Stipe up to 50 × 1–1.5 mm, white, greyish white, somewhat floccose at clavate base.

Spores [60, 2, 1] 6.7–8.7 × 5.5–7.7 × 4.5–5.2 µm, heart-shaped, rounded triangular with rounded apex, distinctly lentiform, medium to dark red-brown and central or slightly eccentric, c. 1.5 µm wide germ pore; Q = 0.95–1.45, av. Q = 1.00–1.20; av. L = 7.0–

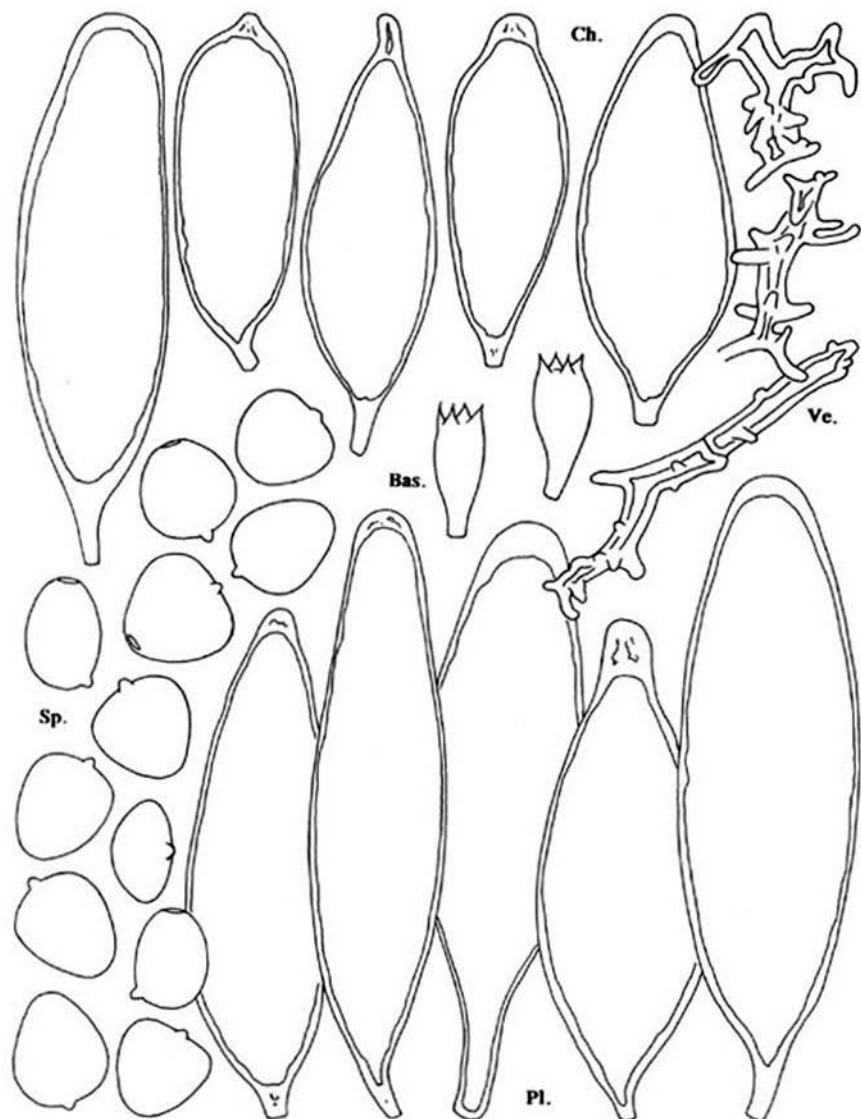


Fig. 29. *Coprinus spec.* (Uljé 1262). All figures from coll. C. B. Uljé 1262.

7.9, av. B = 6.5–7.2, av. W = 4.8–5.0 μm . Basidia 16–24 \times 9–11 μm , 4-spored, surrounded by 4–7 pseudoparaphyses. Pleurocystidia 80–120 \times 24–32 μm , utriform, oblong, (sub)cylindrical or conical with yellowish contents forming a layer inside the walls. Cheilocystidia 60–100 \times 22–28 μm , similar to pleurocystidia. Elements of veil thick-walled, multiple-branched and diverticulate, 2–6 μm wide; walls up to 2.5 μm thick, almost colourless. Clamp-connections present.

Habitat & distribution — Solitary or a few together, on dead grasses on clay. Very rare, only known from one collection.

Collection examined. NETHERLANDS: prov. Zuid-Holland, Alphen aan den Rijn, 4 Sept. 1995, C.B. Ulljé 1262.

Among the spores in *Coprinus spec.* Ulljé 1262 we found some ellipsoid and ovoid ones which resemble the spores of *C. friesii*. Also the structure of the veil agrees very well with that of *C. friesii* with slightly coloured and very thick-walled elements. While it is possible that this collection represents a deviating form of *C. friesii*, the spores are in greatest part distinctly triangular or heart-shaped, and for that reason a separate description is given.

30. *Coprinus spec.* (Ulljé 947) — Fig. 30

Pileus 3 \times 2 mm when still closed, up to 6 mm when expanded, ovoid, ellipsoid or conical, whitish with dark grey-brown centre. Veil breaking up in small, grey-brown, radial fibrillose, hairy scales. Colour of centre of pileus beige-brown (Mu. 7.5 YR 6/2;

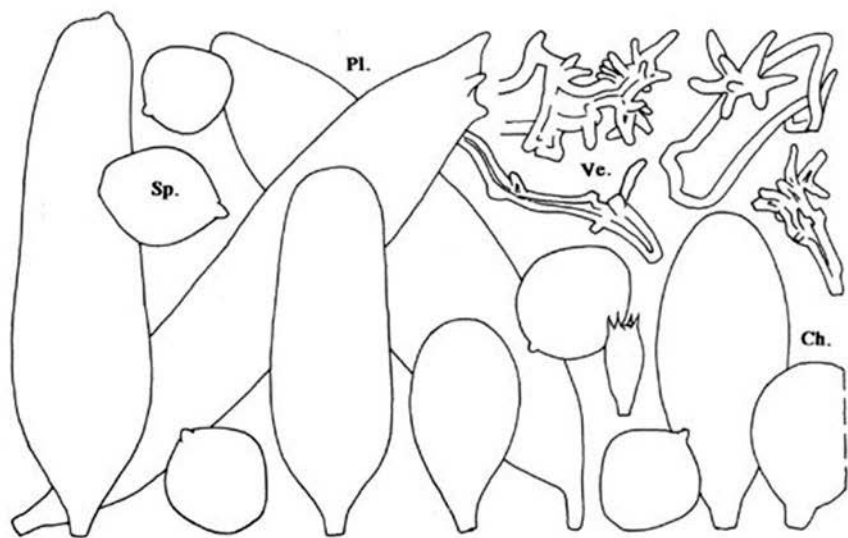


Fig. 30. *Coprinus spec.* (Ulljé 947). All figures from coll. C.B. Ulljé 947.

K. & W. 7C2), scales when young pale reddish-brown (Mu. 5 YR 5/3; K. & W. 8D3), later darker brown (Mu. 7.5 YR 4/2; Me 8E3). Lamellae, L = c. 24, l = 0-3, rather crowded, free, first white, then grey to blackish. Stipe up to 20 × 0.5-1 mm, white, greyish white, somewhat floccose at clavate base.

Spores [40, 2, 1] 6.7-10.3 × 6.7-8.4 µm, medium red-brown, short ovoid or mitriform, truncate, with central, 1.0-1.3 µm wide germ pore; Q = 1.00-1.35, av. Q = 1.10-1.15; av. L = 8.4-8.8, av. B = 7.6 µm. Basidia 16-25 × 7-10 µm, 4-spored, surrounded by 4-6(-7) pseudoparaphyses. Pleurocystidia 90-165 × 18-32 µm, (sub)cylindrical or oblong. Cheilocystidia 30-120 × 10-34 µm, (sub)cylindrical, oblong or (broadly) ellipsoid. Elements of veil thick-walled, strongly multiple-branched and diverticulate, 2-10 µm wide; walls more than 1.5 µm thick (up to 3 µm) in places and then dark brown. Clamp-connections present.

Habitat & distribution — Solitary or a few together on dead grass; very rare. Only found once.

Collection examined. NETHERLANDS: prov. Zuid-Holland, Alphen aan den Rijn, 9 Aug. 1988, on grasses, C.B. Uljé 947.

Coprinus spec. Uljé 947 differs from *C. friesii* in dark brown walls of elements of veil and short mitriform spores.

31. *Coprinus vermiculifer* Joss. ex Dennis — Fig. 31a, 31b

Coprinus vermiculifer Joss., Bull. trimest. Soc. mycol. Fr. 60 (1944) 5-9 (nomen nudum); *Coprinus vermiculifer* Joss. ex Dennis, Kew Bull. 19 (1964) 112.

Pileus 6 × 4 mm when still closed, expanded 8-16 mm, rounded conical, first entirely covered with white, felty veil, at centre often sepia-coloured and persistent there, breaking up in small, hairy-floccose scales. Lamellae crowded, free, first white, later blackish brown. Stipe up to 30 × 0.5-1 mm, whitish, minutely fibrillose-floccose, later glabrous; base slightly bulbous.

Spores [100, 4, 2] 8.5-13.7 × 6.0-9.1 µm, ellipsoid or ovoid, rounded at apex, dark red-brown, with central, c. 1.5 µm wide germ pore; Q = 1.30-1.75, gem. Q = 1.50-1.60; av. L = 10.3-12.4, av. B = 6.8-7.9 µm. Basidia 14-28 × 9-10 µm, 4-spored, surrounded by 4-6 pseudoparaphyses. Pleurocystidia 60-90 × 25-28 µm, ellipsoid, (sub)cylindrical. Cheilocystidia 35-55 × 20-32 µm, ellipsoid or (sub)globose. Elements of veil thick-walled, 3-9 µm wide, diverticulate and strongly, multiple-branched with long, thick-walled terminal elements, ascending from the pileipellis; walls up to 1.5(-2.5) µm thick. Clamp-connections present.

Habitat & distribution — In small groups on dung of deer and elephant. Very rare. Europe, Africa. Not known from the Netherlands.

Collections examined. NAMIBIA: Etoschappanne, on elephant droppings, 11 Oct. 1988, Ch. Claas (herb. Bender, Germany). — GREAT BRITAIN: Scotland, Isle of Rhum, Sgor Mhor, on deer droppings, 1 Sept. 1962, R. W. G. Dennis 236 (holotype, K).

Microscopically *C. vermiculifer* can easily be recognized by the brown, thick-walled terminal elements of the veil in combination with the large spores and the habitat on dung.

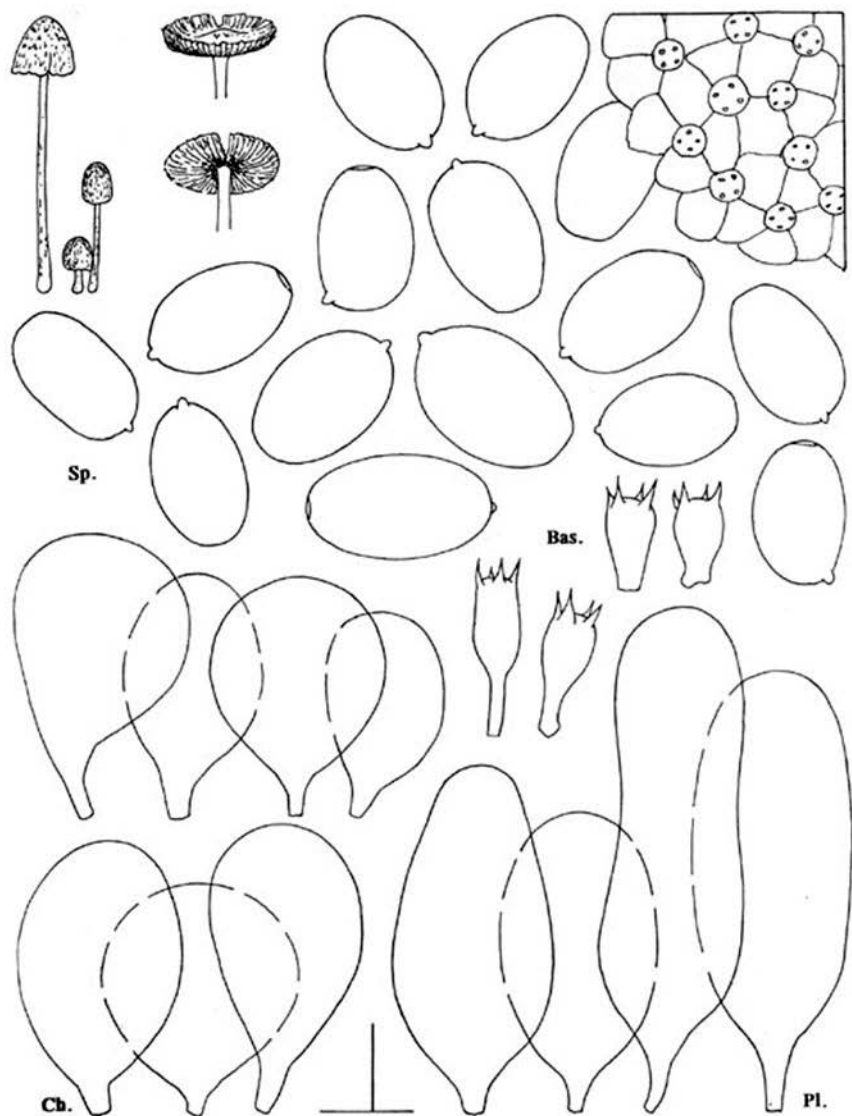


Fig. 31a. *Coprinus vermiculifer* Joss. ex Dennis. All figures from coll. R.W.G. Dennis 236 (holotype).

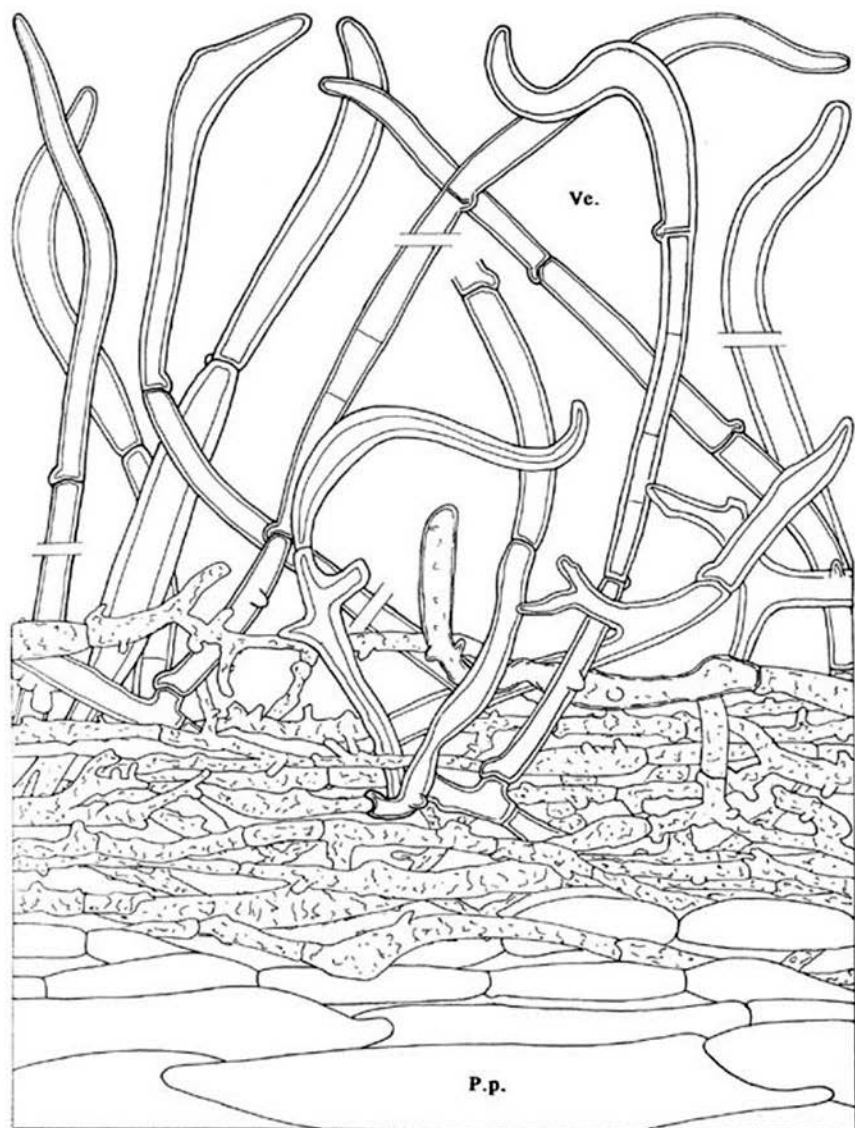


Fig. 31b. *Coprinus vermiculifer* Joss. ex Dennis. Pileipellis and veil from coll. R.W.G. Dennis 236 (holotype).

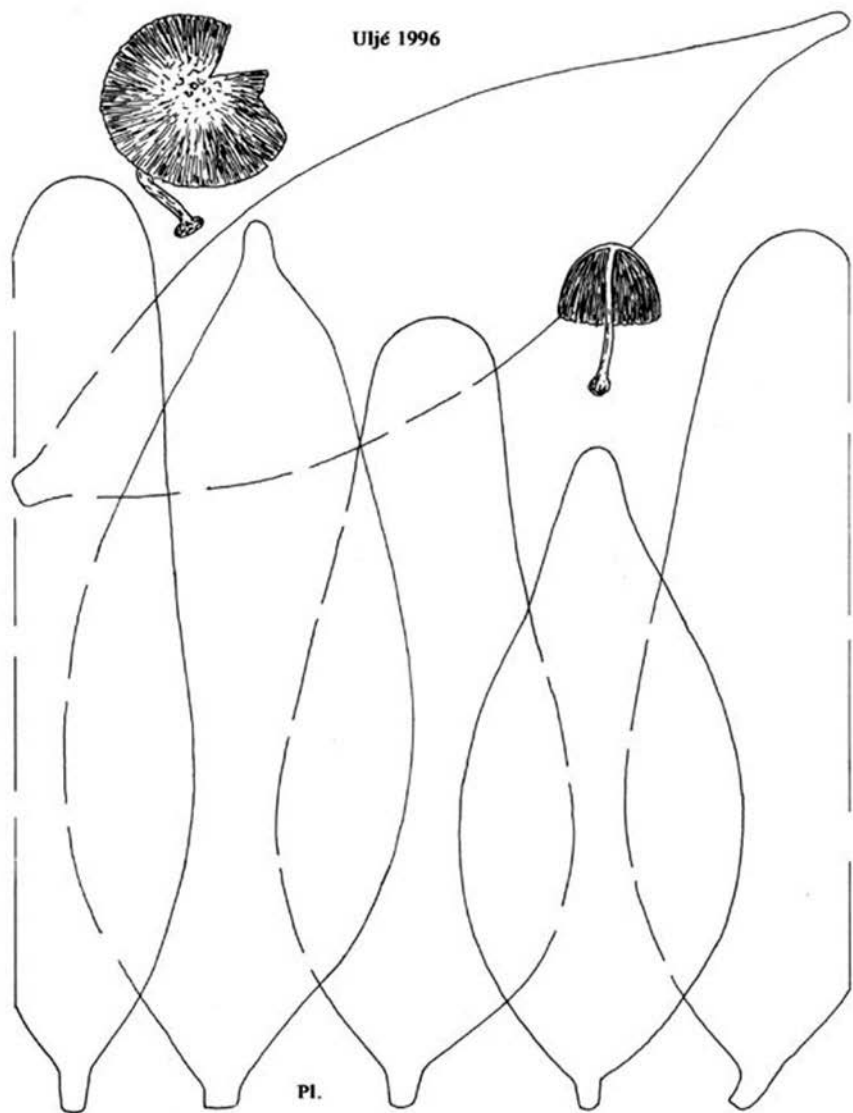


Fig. 32a. *Coprinus spilosporus* Romagn. Basidiocarps (from dried material) and pleurocystidia from coll. H. Bender (Dummerdorfer).



Fig. 32b. *Coprinus spilosporus* Romagn. Spores, basidia, pileipellis and veil from coll. H. Bender (Dummerdorfer).

32. *Coprinus spilosporus* Romagn. — Fig. 32a, 32b

Coprinus spilosporus Romagn., Rev. Mycol. 16 (1951) 127.

Selected icons. Jamoni, *Funghi Ambiente* 47 (1988) between 16 and 17, pl. 110; Cacialli, Caroti & Doveri, *Funghi Fimicola, Schede Micol.* 1 (1995) 139.

Pileus 10–20 × 8–15 mm, first subglobose, broadly ellipsoid or ovoid, then hemispherical or obtusely conical to convex when expanding and then 25–40 mm wide, very deliquescent. In young stage white, soon greying from the margin, at centre becoming pale brown to ochre. Veil at first covering the whole pileus, felty, silky fibrillose, then splitting up in small, woolly-felty, white flocks (like in *Amanita* species), at the tips and in centre becoming brownish, ochre-brown. Lamellae, L = c. 50–60, very crowded, first white, then grey-brown, finally black. Stipe 40–80 × 2.5–3.5 mm, equal or slightly tapering to the apex, snow-white at submarginate bulbous base, upwards and at maturity more watery white or slightly brownish, minutely fibrous-floccose when fresh.

Spores [160, 6, 3] 7.3–9.7 × (5.6–)6.9–9.3 μm, subglobose, globose, the shape of a maize-kernel or rounded quadrangular (some spores are elongate cylindrical-ovoid; the breadth, av. B, Q and av. Q in parentheses), truncate, red-brown (Mu. 2.5 YR 3/6–5 YR 4/6; K. & W. 8E8–8E6), with distinctly paler spot on the suprahilar plage, or with entirely pale plage, and with large, slightly eccentric to almost central, c. 3 μm wide germ pore; Q = 1.00–1.20(–1.40), av. Q = 1.05–1.10(–1.25); av. L = 7.6–8.7, av. B = (6.7–)7.2–8.2 μm. In some spores two very small apiculus-like knobs occur on the sides. When the spores germinate, the spore wall tears open with jagged edges. Basidia 22–36 × 8.5–10 μm, 4-spored, surrounded by (4–)5–6 pseudoparaphyses. Pleurocystidia 80–200 × 25–60 μm, utriform, conical or fusiform and then rather acute at apex in most cases or utriform. Cheilocystidia similar to pleurocystidia but somewhat smaller in part. Elements of veil 2–8 μm wide, strongly diverticulate, excrescences up to 20 μm in length with very thick walls, up to 3 μm thick and pale yellowish; long, up to 350 μm and 2–4 μm wide, thick-walled, hair-like terminal elements grow out of thick-walled, veil-like hyphae. Clamp-connections present.

Habitat & distribution — Solitary or a few together, on bare, gravelly-calcareous soil or in deciduous forests in mossy places; also found on burned places. Very rare. In Europe known from a few localities only. Not yet known from the Netherlands.

Collections examined. FRANCE: Corsica, 10 Oct. 1983, H. Bender (herb. Bender, Germany). — GERMANY: Wissen, Haldensand, 10 June 1982, J. Häffner, Dummerdorfer, H. Bender (herb. Bender, Germany). no annotations.

The paler spot on the plage or the entirely pale plage is a good character to distinguish *C. spilosporus* from *C. gonophyllus*. In addition the very thick-walled veil with elongate, hair-like terminal elements (up to 350 μm in length) and the (in great part) conical or fusiform cystidia are salient characters for this species.

33. *Coprinus phlyctidosporus* Romagn. — Fig. 33

Coprinus phlyctidosporus Romagn., Rev. Mycol. 10 (1945) 88.

Selected icons: Cetto, *Funghi Vero* 5: pl. 1721. 1987; Imazeki & Hongo, *Coll. III. mushr. Japan* 2 (1) (1987) 166.

Pileus 5–20 × 3–15 mm when still closed, 8–30(–40) mm when expanded, ellipsoid, ovoid, at first white, soon becoming grey, centre dark (Mu. 5 YR 2.5/2, 7.5 YR 5/2,

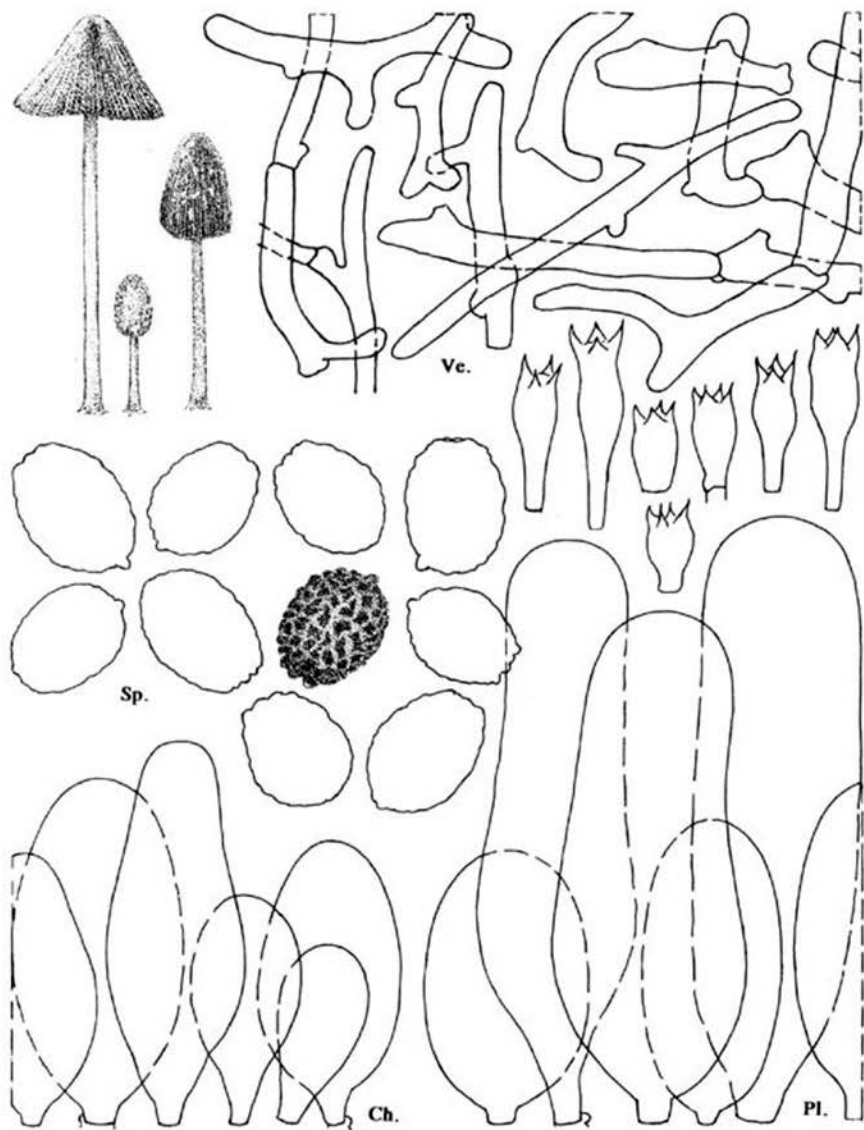


Fig. 33. *Coprinus phlyctidosporus* Romagn. All figures from coll. C. B. Uljé 1020.

10 YR 4/3 below veil). Veil white to grey, breaking up in small, radial hairy-fibrillose scales, not in patches. Lamellae, L = 18–42, l = 0–3, free, first white, then greyish, finally blackish. Stipe up to 80 × 1–3 mm, whitish, base slightly clavate.

Spores [80, 4, 3] 7.3–11.2 × 5.4–8.2 µm, ovoid, rather truncate, very dark red-brown, with warty ornamentation and central, 1.5–2 µm wide germ pore; Q = 1.20–1.50, av. Q = 1.30–1.40; av. L = 8.4–10.6, av. B = 6.0–7.6 µm. Basidia 20–35 × 7–9 µm, 4-spored, surrounded by 3–6 pseudoparaphyses. Pleurocystidia 50–110 × 20–35 µm, ellipsoid, oblong, utriform or cylindrical. Cheilocystidia 30–70 × 15–30 µm, ellipsoid, ovoid, vesiculose or utriform. Elements of veil thin-walled, diverticulate, 2–8 µm wide. Clamp-connections present.

Habitat & distribution — Subfasciculate, in small groups, a few together on wood, generally on dead branches on the ground. Also on burned places. Not common but widespread in Europe; also recorded from Japan.

Collections examined. NETHERLANDS: prov. Zuid-Holland, Ter Aar, Langeraar, 3 Sept. 1989, C.B. Uljé 1026; idem, 'de Put', 4 nov. 1986, C.B. Uljé 792; idem, 7 Sept. 1994, C.B. Uljé.

Coprinus phlyctidosporus resembles a small specimen of *C. lagopus*. It is microscopically clearly distinguished by the warty, ovoid spores and 4-spored basidia.

34. *Coprinus rugosobisporus* Geesink & Imler — Fig. 34

Coprinus rugosobisporus Geesink & Imler, Sterbeekia 12 (1979) 9.

Pileus c. 15 × 10 mm when still closed, up to 30 mm when expanded, ellipsoid or ovoid when young, first white, soon greyish. Veil white to grey, breaking up in radial hairy/fibrillose flocks, not in patches. Lamellae, L = 18–42, l = 0–3, rather crowded, free, first white, then grey, finally blackish. Stipe up to 80 × 1–3 mm, whitish, base slightly clavate.

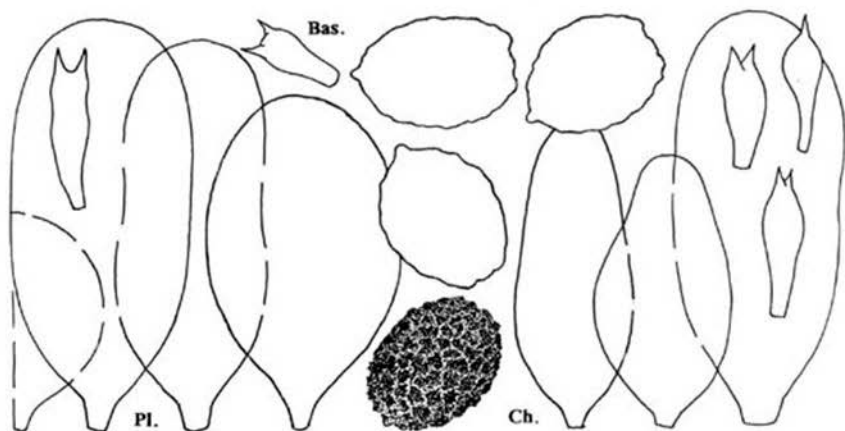


Fig. 34. *Coprinus rugosobisporus* Geesink & Imler. All figures from coll. J. Geesink (holotype).

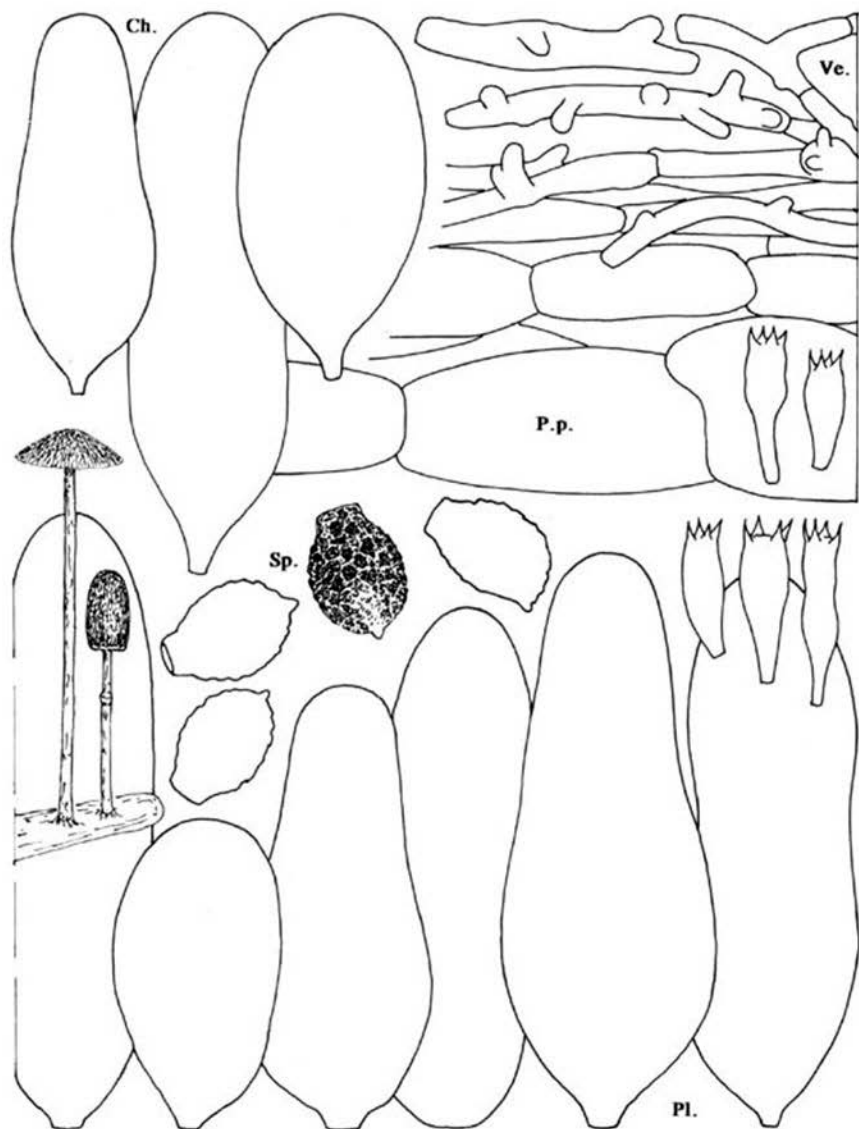


Fig. 35. *Coprinus echinosporus* Buller. All figures from coll. H. Jonker, Oct. 1983.

Spores [40, 2, 1] 9.0–11.8 × 7.0–9.1 µm, ovoid, rather truncate, very dark red-brown, with warty ornamentation and central, 1.5–2 µm wide germ pore; Q = 1.15–1.40, av. Q = c. 1.30; av. L = 10.3–10.6, av. B = 7.9–8.1 µm. Basidia 16–34 × 6–8 µm, 2-spored, surrounded by 3–6 pseudoparaphyses. Pleurocystidia 50–80 × 30–40 µm, ellipsoid, utriform or broadly cylindrical. Cheilocystidia 30–70 × 20–35 µm, (sub)globose, ellipsoid, narrowly ovoid, utriform or broadly cylindrical. Elements of veil thin-walled, diverticulate, 2–8 µm wide. Clamp-connections present.

Habitat & distribution — Solitary or a few together on wood, also found on charcoal. Very rare. Only known from Belgium and the Netherlands, one find each.

Collection examined. NETHERLANDS: prov. Noord-Holland, Wieringermeer, Dijkgatbos, on dead branch of *Acer*, 18 Oct. 1970, J. Geesink (holotype, L).

Like *Coprinus phlyctidosporus*, this species is characterized by warty, ovoid spores, which are born on 2-spored basidia. Therefore one could think it is only a 2-spored form of that species, but then one would expect the spores to be distinctly larger than in the 4-spored *C. phlyctidosporus*. For the time being we keep *Coprinus rugosobisporus* separate.

35. *Coprinus echinosporus* Buller — Fig. 35

Coprinus echinosporus A.H. Buller, Trans. Brit. mycol. Soc. 6 (1920) 363.

Coprinus giganteoporus Huijsman, Fungus 25 (1955) 19.

Selected icons. Læssøe, Svampe 20 (1989) 64; Breitenb. & Kränzli, Pilze Schweiz 4 (1995) 232, pl. 274.

Pileus 10–20 × 5–10 mm when still closed, ellipsoid or ovoid, 10–30 mm when expanded, first white, soon becoming greyish; centre very dark under veil. Veil white to grey, radially splitting up in minute, hairy-fibrillose scales. Lamellae, L = 18–42, l = 0–3, rather crowded, free, first white, then greyish, finally blackish. Stipe up to 100 × 1–3 mm, whitish; base slightly clavate, up to 4 mm wide.

Spores [140, 7, 6] 8.5–12(–13) × 6.1–8.2 µm, amygdaliform with warty ornamentation, truncate, very dark red-brown in most cases, with central, 1.5–1.8 µm wide germ pore; Q = 1.25–1.80, av. Q = 1.35–1.60; av. L = 9.2–11.1, av. B = 6.8–7.4 µm. Basidia 16–38 × 8–9.5 µm, 4-spored, surrounded by 3–6(–7) pseudoparaphyses. Pleurocystidia 60–120(–150) × 20–50(–80) µm, ellipsoid, oblong, utriform or (sub)cylindrical. Cheilocystidia 25–100 × 20–55 µm, subglobose, ellipsoid, utriform or (sub)cylindrical. Elements of veil thin-walled, diverticulate, 2–8 µm thick. Clamp-connections present.

Habitat & distribution — In small groups on wood. Widespread but not common in Europe.

Collections examined. NETHERLANDS: prov. Overijssel, Boekelo, Aug.–Oct. 1983, H. Jonker; prov. Gelderland, Doetinchem, estate 'Slangenburch', 29 June 1954, Mrs v. Vuure (*C. giganteoporus*, holotype); prov. Noord-Holland, Castricum, 31 Oct. 1964, E. Kits v. Waveren; Aerdenhout, Naaldenveld, 11 Nov. 1976, E. Kits v. Waveren; prov. Zuid-Holland, Ter Aar, Langeraar, 19 Sept. 1984, C.B. Uljé 569; Leiden, Leidse Hout, 31 May 1984, C.B. Uljé 537.

Coprinus echinosporus is easily recognized by the warty, amygdaliform spores and the 4-spored basidia. The spores of *C. phlyctidosporus* and *C. rugosobisporus*, two species close to *C. echinosporus*, are ovoid.

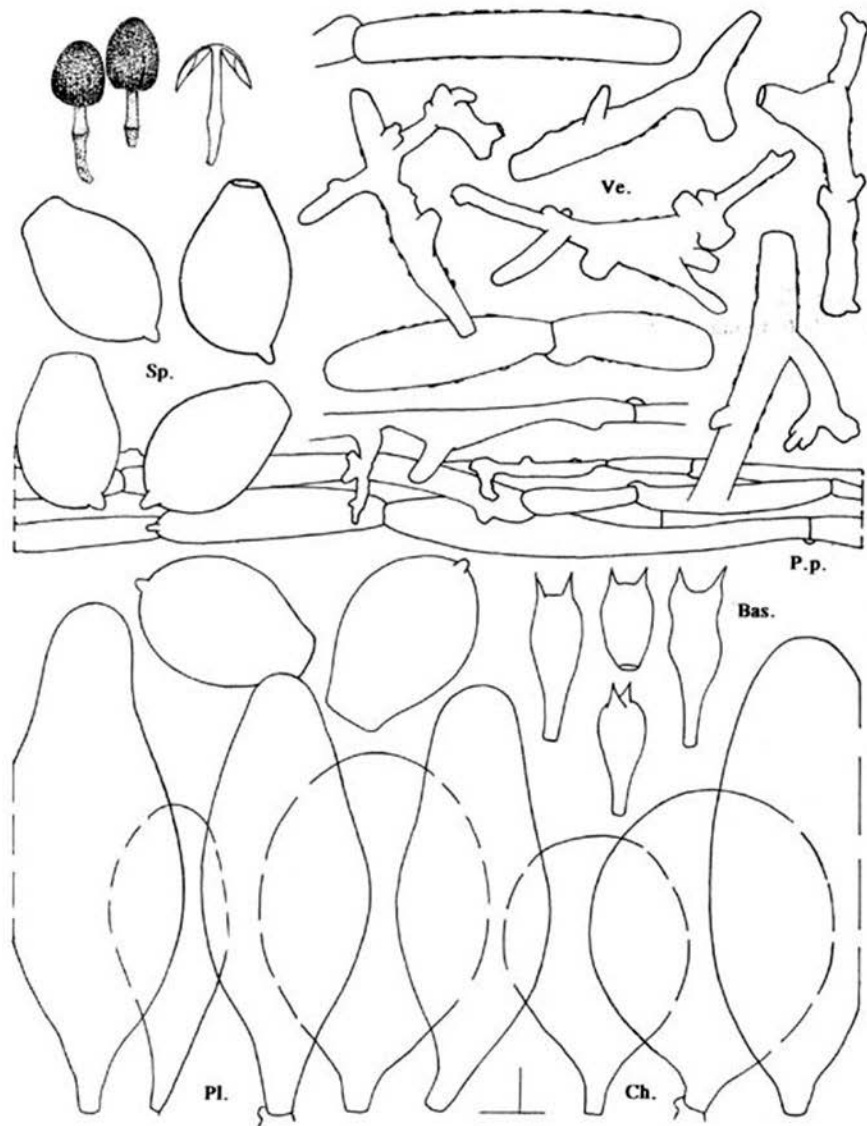


Fig. 36. *Coprinus piepenbroekii* Uljé & Bas. All figures from coll. J.H. & G. Piepenbroek 787 (holotype).

36. *Coprinus piepenbroekii* Uljé & Bas — Fig. 36

Coprinus piepenbroekii Uljé & Bas, Persoonia 15 (1993) 365.

Pileus 10 × 7 mm when still closed, up to 20 mm when expanded, first ellipsoid or ovoid, then obtusely conical to convex, pale brown, darker in centre. Veil ochre with distinct green tinge, around centre breaking up in small, floccose scales. Lamellae rather crowded, free, first white, then grey-brown, finally black. Stipe up to 40 × 1–2 mm, whitish; base slightly clavate.

Spores [60, 3, 1] 11.9–15.3 × 7.7–10.5 µm, amygdaliform, smooth, truncate, dark red-brown, with central, c. 2.5 µm wide germ pore; Q = 1.30–1.60, av. Q = 1.45–1.50; av. L = 12.7–13.8, av. B = 8.4–9.4 µm. Basidia 15–32 × 9–12 µm, 2-spored, surrounded by 4–6 pseudoparaphyses. Pleurocystidia 55–90 × 22–40 µm, subglobose, ellipsoid or utriform. Cheilocystidia 40–85 × 25–45 µm, (sub)globose, ellipsoid, sometimes oblong. Elements of veil thin-walled, diverticulate, 3–9(–12) µm thick, rather strongly in-crust. Clamp-connections present.

Habitat & distribution — In small groups on burned places, a few together. Very rare, only known from type-locality.

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

Microscopically *Coprinus piepenbroekii* is easily recognized by the smooth, large, amygdaloid spores and the 2-spored basidia. The greenish tinge of the fresh basidiocarps is characteristic for this species.

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CONTRIBUTIONS TOWARDS A MONOGRAPH OF
PHOMA (COELOMYCETES) - IVSection *Heterospora*: Taxa with large sized conidial dimorphs,
in vivo sometimes as *Stagonosporopsis* synanamorphsG. H. BOEREMA¹, J. DE GRUYTER² & M. E. NOORDELOOS³

The new section *Heterospora* is proposed for *Phoma* species producing not only relatively small, mainly aseptate conidia, but also distinctly larger conidia, which may become 1- or more septate: 'ascochytoïd-stagonosporoid'. The majority of the conidia are always phomoid in vitro, but in vivo they may be predominantly large and septate, synanamorphs being therefore referred to *Stagonosporopsis* Died. The heterosporous species are described in vitro, with additional data on the conidial morphology in vivo. An addendum deals with eight species from other sections which display a similar conidial dimorphism. Five new species and four new combinations have been proposed: *Phoma actaeae* spec. nov., *Phoma alectorolophi* spec. nov., *Phoma nigripyncnidia* spec. nov., *Phoma subboltshauseri* spec. nov. and *Stagonosporopsis dennisii* spec. nov.; *Phoma dennisii* var. *oculo-hominis* (Punith.) comb. nov., *Stagonosporopsis aquilegiae* (Rabenh.) comb. nov., *Stagonosporopsis bohemica* (Kabát & Bubák) comb. nov. and *Stagonosporopsis nigripyncnidicola* (Ondřej) comb. nov. Indices on host-fungus and fungus-host relations and a key to cultural characteristics are included as well as short comments on their ecology and distribution.

In the previous Contributions of this series - I. Section *Phoma* (de Gruyter & Noorde-loos, 1992; de Gruyter et al., 1993), II. Section *Peyronellaea* (Boerema, 1993) and III. Section *Plenodomus* (Boerema et al., 1994a, 1996) - the essentials for differentiating taxa in the genus *Phoma* Sacc. in vitro were clearly described. In addition to major morphological characteristics, these may provide important secondary identification criteria, such as the presence of chlamydospores, mycelial synanamorphs and the production of specific metabolites. In vitro studies may also help with differentiation of species where characteristics are either confusingly similar or widely variable.

The differentiation of the heterosporous species treated in this paper fully depends on comparative studies in vitro where they are stable and unquestionably phomoid. Here most pycnidia contain aseptate, hyaline conidia, generally measuring $3-11 \times (1-)1.5-4 (-5) \mu\text{m}$. However, the mature pycnidia often also contain some distinctly larger conidia, usually $(15-20-25(-28) \times 3.5-6(-7) \mu\text{m}$. Similar large conidia are common in vivo but their dimensions are more variable, $(8-11-30$ (occ. $45-62) \times (2.5-3-8$ (occ. $12-15) \mu\text{m}$. They may remain continuous, but often become two- or more-celled by secondary septation ('ascochytoïd-stagonosporoid').

The conidial dimorphism of these species has caused much taxonomic and nomenclatural confusion. Some species always produce a mixture of small and large conidia in

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variable proportions in vivo, apparently influenced by growing conditions. These species have been formerly referred to *Phoma* ('*Phyllosticta*' on leaves), '*Ascochyta*' or '*Stagonospora*'. Depending on the conditions in vivo, other species produce either only relatively small aseptate conidia or mainly large, usually septate conidia. The latter phenotypes have always been placed in '*Ascochyta*' ('*Diplodina*' on stems) or '*Stagonospora*', but in vitro they show their phomoid identity. True species of *Ascochyta* Lib. and *Stagonospora* (Sacc.) Sacc. always produce relatively large septate conidia in vitro similar to those in vivo; this is connected with the wall-thickening septation of their conidia; see Boerema & Bollen (1975: fig. 3 'distoseptation') and Boerema (1984: fig. 7). [The present generic concepts of *Phyllosticta* Pers. and *Diplodina* Westend. differ from those previously accepted (based on 'leaf and stem specificity' e.g. see Sutton, 1980) and now encompass species which used to be known in *Phyllostictina* H. Sydow and *Discella* Berk. & Br.]

The dominant 'ascochytoïd-stagonosporoid' phenotypes shown by various heterosporous *Phomas* in vivo, may be described as separate synanamorphs and then referred to the genus *Stagonosporopsis* Diedicke (1912a: 141–142). The latter was originally separated from *Ascochyta* on the basis of occasional multiseptate conidia (comp. Buchanan, 1987: 8). Diedicke (l.c.: 141) indicated that seven species belonged to this genus. The first species combination described, *Stagonosporopsis actaeae* (Allescher) Died. (l.c.: 144), interpreted by many authors as the type species, represents the 'ascochytoïd-stagonosporoid' phenotype of *Phoma actaeae*, no. 3 in this paper. *Stagonosporopsis boltshauseri* (Sacc.) Died. (1912b: 397) chosen as lectotype by Clements & Shear (1931), represents the 'ascochytoïd-stagonosporoid' phenotype of *Phoma subboltshauseri*, no. 9 in this paper.

The connection of these heterosporous species with Diedicke's *Stagonosporopsis* was first noticed in the seventies (Boerema & Verhoeven, 1979: 150; Boerema & Dorenbosch, 1981). Their classification in a separate section of *Phoma* was introduced only recently (Boerema, Pieters & Hamers, 1993: 17 and Boerema, de Gruyter & Noordeloos, 1994b). The section still needs to be formally proposed:

Phoma section Heterospora Boerema, de Gruyter & Noordel., *sect. nov.*

Species generis *Phoma* quae praeter conidia parva continua etiam conidia multi maiora, saepe 20–25 × 3.5–6 µm vel ultra, formant. Conidia maiora constanter continua vel deinde septis secundariis divisa, *Ascochytae* vel *Stagonosporae* similia. In nonnullis speciebus conidia maiora praedominantia in vivo quae synanamorphosis ad *Stagonosporopsis* Died. pertinet.

Typus sectionis: *Phoma heteromorphospora* van der Aa & van Kesteren (1980).

The description is as follows: Species which produce not only relatively small continuous phomoid conidia but also distinctly large conidia, often 20–25 × 3.5–6 µm or larger. The latter may remain continuous, or become more-celled by secondary septation ('ascochytoïd or stagonosporoid'). With some species the latter phenotypes are dominant in vivo, these synanamorphs being referred to *Stagonosporopsis* Died. Type of the section: *Phoma heteromorphospora* v.d. Aa & v. Kest. 1980.

The large conidial phenotype of the type species (no. 1 in this paper) illustrates well the various possibilities of the large sized conidial dimorph in *Phoma* sect. *Heterospora*. In vivo, *P. heteromorphospora* always produces the small and large conidia in the same pyc-

nidium. This also occurs with some other species of the section, but, as already noted above, in most species in vivo the pycnidia contain either only small or mainly large conidia (often differentiated as a *Stagonosporopsis* synanamorph).

Most species of the section are pathogens specific to particular hosts. The two types of conidia may play different roles in the life cycle. Some species produce small conidia especially on dead host material, whereas pycnidia with large conidia only develop in association with disease symptoms. The large conidia generally develop with fluctuating humidity and with desiccation, whereas only small conidia are often formed in humid conditions. This may occur in the same pycnidium and appears to be reversible. Temperature may also be important. Large conidia sometimes break (split) easily at the septa, and usually germinate more quickly than the smaller ones.

Only one species of this section is known as a plurivorous necrophyte. None has been experimentally connected with a teleomorph, but in one case a single identity with a species of *Didymella* Sacc. ex Sacc. is suggested.

The Addendum includes *Phoma* species which actually show the *Heterospora* conidial dimorphism, but which are placed in other sections due to other characteristics. This refers to three species of section *Phyllostictoides* (van der Aa et al., 1990), ordinarily producing only relatively small septate conidia, but which sometimes also form large 'ascochyroid' conidia; two species with dictyochlamydospores, already discussed under section *Peyronellaea* (Boerema, 1993) and three species distinguished by thick-walled poroid pycnidia, characteristic of the section *Sclerophomella* (compare de Gruyter & Noordeloos, 1992).

Finally it should be noted that a comparable *Phoma/Stagonospora*-like conidial dimorphism is recorded in anamorphs of some species of the Ascomycete genera *Leptosphaeria* Ces. & de Not. and *Phaeosphaeria* Miyake (Sivanesan, 1984; Leuchtman, 1984). However, in those anamorphs the relatively large septate conidial phenotype commonly dominates, not only in vivo but also in vitro. Therefore they are usually only referred to *Stagonospora* (Sacc.) Sacc. char. emend. Leuchtman (l.c.). Most of the 'associated microconidial forms', '*Aposphaeria* or *Phoma*-like' (Leuchtman l.c.), do not have a specific name, but one exception (*Phoma meliloti* Allescher) is discussed in the Addendum of Contribution III-1 on *Phoma* taxa with a *Leptosphaeria* teleomorph (Boerema et al., 1994a).

MATERIAL AND METHODS

The isolates and original samples studied were present in the collections of the Plant Protection Service as freeze-dried cultures or herbarium specimens. The methodology applied conforms with that described in Contributions I-1 & I-2 of this series (de Gruyter & Noordeloos, 1992 and de Gruyter et al., 1993). The single identity of pycnidia with only small aseptate conidia and pycnidia with large sized, mainly septate conidia was confirmed in vitro.

KEY TO THE SPECIES TREATED IN THIS PAPER

Differentiation based on characteristics in vitro

The distinguishing character of the heterosporous species treated in this paper, the large sized conidial dimorph, is most conspicuous in vivo conditions. In vitro the conidia

are always mostly small and aseptate; large and septate conidia may be wanting, especially in old isolates. Direct identification of these species *in vitro* is therefore often difficult. Most heterosporous species are pathogens with a restricted host range and/or distribution. Thus the host-fungus index on p. 341 including a code indicating conidial variability *in vivo*, may be very helpful in identification of species.

- 1a. Pycnidia with predetermined ostiole (initiated in primordium) 2
- b. Pycnidia relatively thick-walled, at first closed, then opened by a secondary pore [species with *Heterospora*-like conidial dimorphism *in vitro* and/or *in vivo*, but belonging to sect. *Sclerophomella*] 18
- 2a. Colonies producing multicellular chlamydo-spores, commonly known as dictyochlamydo-spores, unicellular chlamydo-spores may also be present [species with *Heterospora*-like conidial dimorphism *in vivo*, but classified in sect. *Peyronellaea*] 20
- b. Dictyochlamydo-spores absent, but unicellular chlamydo-spores or unicellular chlamydo-spore-like structures may be present 3
- 3a. Pycnidia containing usually aseptate as well as some 1-septate phomoid conidia of normal size, but sometimes a few distinctly large, septate ascochytoid conidia are also present [species with occasional *Heterospora*-like conidial dimorphism, but belonging to sect. *Phyllostictoides*] 16
- b. Pycnidia producing either only normal sized aseptate phomoid conidia or a mixture of these with large, often 1-septate ascochytoid conidia; intermediate aseptate or septate conidial forms may also occur 4
- 4a. Conidia hyaline, associated with disease symptoms 5
- b. Conidia with a typical yellow tinge, they are usually somewhat curved and attenuated at one end, aseptate, $4-8.5 \times 1.5-3 \mu\text{m}$, or 1(-2)-septate, $7-16 \times 2-3 \mu\text{m}$; a common saprophyte in Eurasia and North America [in *vivo*, conidia much more variable, small-aseptate or large and 1-3-septate, sometimes up to $25 \times 3.5 \mu\text{m}$, synanam. *S. fraxini*] 11. *P. samarorum*
- 5a. Growth-rate slow, < 35 mm in one week, on *Chenopodium* spp. 6
- b. Growth-rate moderate to fast, > 35 mm in one week 7
- 6a. Conidia usually of two different types; mainly small, aseptate, usually $4-7 \times 1.5-2 \mu\text{m}$, but some much larger, mostly 1-2-septate, $12.5-26.5 \times 3-5 \mu\text{m}$; common pathogen of *Chenopodium* spp. in Europe [in *vivo*, also heterosporous; the large sized conidia mostly aseptate, but sometimes 1(-3)-septate, up to $27 \times 7 \mu\text{m}$]
 1. *P. heteromorphospora*
- b. Conidia always aseptate phomoid, $3-5.5 \times 1.5-2 \mu\text{m}$; common pathogen of *Chenopodium* spp. in North and South America [in *vivo*, conidia always dimorphic, partly small-aseptate, partly large-aseptate or 1(-2)-septate, up to $25 \times 7 \mu\text{m}$]
 2. *P. dimorphospora*
- 7a. Colonies producing a diffusible pigment, staining the agar yellowish to ochre 8
- b. Colonies greenish olivaceous to olivaceous, not producing a diffusible pigment 11
- 8a. Yellow-green crystals are formed on MA, NaOH reaction reddish (not an E+ reaction), phomoid conidia (sub)cylindrical to ellipsoidal 9
- b. No crystals are formed, NaOH reaction yellow-green, gradually changing to red (E+ reaction), phomoid conidia ellipsoidal to more or less obclavate-fusiform 10

- 9a. On OA diffusible pigment staining the agar pale luteous to amber-ochraceous, often with a distinct yellow pigmentation around the pycnidia, conidia of two types, phomoid aseptate, $4.5-9.5 \times 2-3 \mu\text{m}$, or ascochytooid 1-septate, $14-28.5 \times 4-7 \mu\text{m}$, guttulate; pathogen of *Actaea* and *Cimicifuga* spp. [in vivo, conidia sometimes small-aseptate, but usually large and 1(-2)-septate, up to $28.5 \times 7 \mu\text{m}$, synanam. *S. actaeae*] 3. *P. actaeae*
- b. On OA diffusible pigment staining the agar primrose to olivaceous buff, no distinct yellow pigmentation around the pycnidia, conidia usually aseptate phomoid, $4-6.5 \times 1.5-2 \mu\text{m}$, without or with a few, small guttules, occasionally large and 1-septate, ascochytooid, $14.5-24 \times 4-7 \mu\text{m}$; on *Solidago* spp. [in vivo, conidia small-aseptate or mainly large and 1-2-septate, up to $28 \times 6 \mu\text{m}$, synanam. *S. dennisii*]
 4a. *P. dennisii* var. *dennisii*
- Note: A similar fungus, but lacking the diffusible pigment and with somewhat smaller 1-septate conidia, has once been isolated from a human cornea, United States
 4b. *P. dennisii* var. *oculo-hominis*
- 10a. On OA growth-rate 78-82 mm, diffusible pigment staining the agar saffron to fulvous, conidia usually aseptate, $6-10.5 \times 2-4 \mu\text{m}$, occasionally 1-septate up to $13 \times 5 \mu\text{m}$; on various Papaveraceae [in vivo, conidia similar or larger, occasionally aseptate, mostly 1(-2)-septate, sometimes distinctly large, up to $23 \times 6 \mu\text{m}$, synanam. *S. chelidonii*] 5. *P. glaucii*
- b. On OA growth-rate 56-75 mm, diffusible pigment staining the agar rosy buff to honey, conidia usually aseptate, $5-8 \times 2-2.5 \mu\text{m}$, occasionally 1-septate, up to $15 \times 5 \mu\text{m}$; pathogen of *Aquilegia* and perennial *Aconitum* spp., occasionally also on other Ranunculaceae [in vivo, conidia similar or mostly larger and mainly 1(-2)-septate, often $13-20 \times 4-5 \mu\text{m}$, synanam. *S. aquilegiae*] 6. *P. aquilegiicola*
- 11a. Conidia of two types, phomoid aseptate or 1-septate conidia, up to $15 \times 5 \mu\text{m}$, and distinctly large septate ascochytooid-stagonosporoid conidia up to $22-45 \mu\text{m}$ in length. 12
- b. Conidia of one type, phomoid, usually aseptate, but occasionally also 1-septate, up to $16 \times 6 \mu\text{m}$ 13
- 12a. L/b ratio phomoid aseptate conidia > 3.5 , usually $5.5-9 \times 1.5-2 \mu\text{m}$, occasionally 1-septate, mostly $9-15 \times 2-4 \mu\text{m}$ (in fresh cultures distinctly larger and often more-celled, stagonosporoid); pathogen of *Vicia cracca* and other *Vicia* spp. in south-eastern Europe [in vivo, conidia sometimes small-aseptate, but usually very large and 1-2(-4)-septate, up to $45 \times 12 \mu\text{m}$, synanam. *S. nigripycnidiicola*] 7. *P. nigripycnidia*
- b. L/b ratio phomoid aseptate conidia < 3.5 , usually $4-15 \times 1.5-5 \mu\text{m}$, 1-septate ascochytooid conidia $15.5-22 \times 4-5 \mu\text{m}$, usually guttulate, ellipsoidal to fusiform-allantoid; pathogen of *Delphinium* spp., but also recorded on *Aconitum* sp. [in vivo, conidia may be small-aseptate, but also large and 1(-2)-septate, often $15-22 \times 4-5 \mu\text{m}$, synanam. *S. delphinii*] 8. *P. delphinii*
- 13a. NaOH test positive, yellow-green, later red (E+ reaction), conidia ellipsoidal to more or less obclavate-fusiform, on Ranunculaceae 10b
- b. NaOH test negative or not specific (E-) 14
- 14a. Pycnidia initially honey coloured, later black. Conspicuous ostioles. 15
- b. Pycnidia already initially black, ostiole inconspicuous. 12a

- 15a. Colony with coarsely floccose aerial mycelium on OA, pycnidia globose to subglobose, conidia usually aseptate, $3.5-9 \times 1.5-2.5 \mu\text{m}$, occasionally 1-septate, up to $11 \times 3.5 \mu\text{m}$; pathogen of *Phaseolus vulgaris* and *Vigna unguiculata* [in vivo conidia always predominantly large, 1-3(-5)-septate, up to $34 \times 9 \mu\text{m}$, synanam. *S. hortensis*] 9. *P. subboltschauseri*
- b. Colony with floccose aerial mycelium on OA, usually sparse after 14 days, pycnidia globose to papillate, sometimes with an elongated neck, conidia usually aseptate, $4-8.5 \times 1.5-3 \mu\text{m}$, occasionally 1-septate, $7-16 \times 2-3.5 \mu\text{m}$; pathogen of *Campanula* and *Trachelium* spp. [in vivo, conidia sometimes all small and aseptate, or larger and mainly 1(-2)-septate, up to $23 \times 6 \mu\text{m}$, synanam. *S. bohemiae*] 10. *P. trachelii*
- 16a. NaOH test positive, yellow-green later red (E+ reaction), conidia mostly aseptate, usually $3.5-7.5 \times 2-3 \mu\text{m}$, 1-septate conidia mostly between $9-15 \times 3-5 \mu\text{m}$, but sometimes distinctly larger, ascochytoïd, up to $23 \times 8 \mu\text{m}$; pathogen of *Chrysanthemum morifolium* Addendum 12. *P. ligulicola* var. *ligulicola*, teleom. *Didymella ligulicola* var. *ligulicola*
- b. NaOH test negative (E-) 17
- 17a. Both aseptate and 1-septate conidia with about the same dimensions, $4-10.5 \times 2-5 \mu\text{m}$, but occasionally with some larger 1-septate ascochytoïd conidia, $12-20.5 \times 3.5-5 \mu\text{m}$; pathogen of *Lycium halimifolium* Addendum 13. *P. protuberans*
- b. Conidia mostly aseptate, $4-8 \times 2-3 \mu\text{m}$, when 1-septate, up to $10 \times 4.5 \mu\text{m}$; occasionally producing a *Didymella* teleomorph; pathogen of Cucurbitaceae, especially *Cucumis* spp. and *Citrullus vulgaris* [in vivo, some strains produce distinctly large 1-septate ascochytoïd conidia, up to $20-24 \mu\text{m}$ long] Addendum 14. *P. cucurbitacearum*, teleom. *Didymella bryoniae*
- 18a. Conidia phomoid, aseptate, variable in size, mostly $4-7.5 \times 2-3.5 \mu\text{m}$, occasionally larger, ascochytoïd, up to $18 \times 8 \mu\text{m}$, NaOH reaction yellow-green, then red (E+ reaction); on semi-parasitic *Melampyrum*, *Rhinanthus* and *Pedicularis* spp. Addendum 15. *P. alectorolophi*, teleom. *Didymella alectorolophi*
- b. Conidia phomoid, aseptate or also septate, up to $10 \times 4 \mu\text{m}$, crystals absent, NaOH reaction negative 19
- 19a. Growth-rate moderate on OA, 47-48 mm, conidia always aseptate, small, uniform, up to $5.5 \times 2.5 \mu\text{m}$, chains of globose, greenish olivaceous chlamydo-spores present; pathogen of *Dictamnus albus* [on leaf spots, distinctly large, mainly 1-septate ascochytoïd conidia are produced, up to $16 \times 4.5 \mu\text{m}$] . . Addendum 16. *P. dictamnica*
- b. Growth-rate fast on OA, 60-82 mm, conidia variable in shape and dimensions, always mainly aseptate, usually $4-10 \times 2-3 \mu\text{m}$, in some strains also 1-septate and distinctly larger, ascochytoïd, up to $34 \times 10 \mu\text{m}$, chlamydo-spores absent; on Umbelliferae Addendum 17. *P. complanata*
- 20a. Growth-rate moderate, 45-55 mm on OA, colony colourless to olivaceous grey, needle-like crystals may be formed, dictyochlamydo-spores usually intercalary, conidia usually $4-8.5 \times 2-3 \mu\text{m}$, frequently also 1-septate, up to $13 \times 4 \mu\text{m}$; pathogen of *Clematis* spp. [in vivo, also distinctly large 1-septate ascochytoïd conidia may be produced, up to $28 \times 6.5 \mu\text{m}$] Addendum 18. *P. clematidina*

Compositae

Chrysanthemum morifolium

(Disease: Chrysanthemum Ray
(flower) Blight, Black Leaf
Blotches and Stem Lesions)

- no. 12 *P. ligulicola* var. *ligulicola*: $\alpha(O) + \theta(\Theta)$
(+ Θ) [add.; sect. *Phyllostictoides*]
teleom. *Didymella ligulicola* var. *ligulicola*
[world-wide pathogen]

Solidago spp.

[no data on pathogenicity]

- no. 4a *P. dennisii* var. *dennisii*: $\alpha, (O+)\Theta(+\Theta)$
(synanam. *S. dennisii*)
[recorded in Europe and North America; *Solidago*
spp. are possibly also the natural source of the var.
oculo-hominis (4b)]

Cucurbitaceae

wild plants and cultivars of *Cucumis*,
Cucurbita and *Citrullus* spp.

(Disease: Gummy Stem Blight,
Leaf Spot, Stem Canker, Vine Wilt
and Black Fruit Rot)

- no. 14 *P. cucurbitacearum*: $\alpha, +\theta, +\Theta$
[add.; sect. *Phyllostictoides*]
(teleom. *Didymella bryoniae*)
[world-wide seed-borne pathogen]

Leguminosae

esp. *Vicia cracca*, but also on other
Vicia spp.

(Disease: Leaf Spot, Stem Lesions)

Phaseolus vulgaris

Vigna unguiculata

(Disease: Leaf Spot Disease)

- no. 7 *P. nigripycnidia*: $\alpha, \Theta + \Theta$
(synanam. *S. nigripycnidiicola*)
[frequently recorded in South-East Europe]
- no. 9 *P. subboltshauseri*: $\alpha + (O+)\Theta + \Theta$
(synanam. *S. hortensis*)
[world-wide pathogen of beans]

Papaveraceae

e.g. wild species of *Chelidonium*,
Corydalis, *Dicentra* and *Glaucium*

- no. 5 *P. glaucii*: $\alpha(+\theta), (O+)\Theta(+\Theta)$
(synanam. *S. chelidonii*)
[frequently recorded in Europe]

Ranunculaceae

esp. *Aconitum* and *Aquilegia* spp.,
but also on perennial *Delphinium* spp.
(Disease: Leaf Spot, Collar Rot)

- no. 6 *P. aquilegiicola*: $\alpha(+\theta), (O+)\Theta(+\Theta)$
(synanam. *S. aquilegiae*)
[recorded in Australasia, Europe and North
America]

Actaea and *Cimicifuga* spp.

(Disease: Leaf Blackening)

- no. 3 *P. actaeae*: $\alpha, (O+)\Theta(+\Theta)$
(synanam. *S. actaeae*)
[recorded in Europe and North America]

Clematis spp.

(Disease: Wilt, Leaf Spot and
Stem Lesions)

- no. 18 *P. clematidina*: $\alpha(+\theta), + (O+)\Theta(+\Theta)$
[add.; sect. *Peyronellaea*]
[known from Australasia, Eurasia and North
America]

- esp. *Delphinium* spp., but also recorded on *Aconitum*
(Disease: Leaf Spot, Stem Rot)
- Rutaceae
Dictamnus albus
(Disease: Leaf Spot)
- Scrophulariaceae
semi-parasitic species of *Melampyrum*, *Pedicularis* and *Rhinanthus*
- Solanaceae
Lycium halimifolium
(Disease: Leaf Spot)
- Umbelliferae
wild plants and cultivars of *Daucus carota*, *Pastinaca sativa* and *Petroselinum crispum*
(Disease: Canker, Leaf Spot)
- no. 8 *P. delphinii*: o(+θ), + (O+)θ(+θ)
(synanam. *S. delphinii*)
[only recorded in Europe]
- no. 16 *P. dictamnica*: o(+θ), (O+)θ(+θ)
[add.; sect. *Sclerophomella*]
[recorded in Eurasia and North America]
- no. 15 *P. alectorolophi*: o, + θ)
[add.; sect. *Sclerophomella*]
(teleom. *Didymella alectorolophi*)
[only recorded in Europe]
- no. 13 *P. protuberans* (o + θ)
[add.; sect. *Phyllostictoides*]
[occasionally recorded in Europe and North America]
- no. 17 *P. complanata*: o, + θ, + θ)
[add.; sect. *Sclerophomella*]
[common in temperate Eurasia and North America]

FUNGUS-HOST INDEX

- P. actaeae* (3)
(synanam. *S. actaeae*)
- P. alectorolophi* (15; addendum)
[sect. *Sclerophomella*]
(teleom. *Didymella alectorolophi*)
- P. aquilegiicola* (6)
(synanam. *S. aquilegiae*)
- P. clematidina* (18; addendum)
[sect. *Peyronellaea*]
- P. complanata* (17)
- P. cucurbitaceae* (14; addendum)
[sect. *Phyllostictoides*]
(teleom. *Didymella bryoniae*)
- P. delphinii* (8)
(synanam. *S. delphinii*)
- Actaea* and *Cimicifuga* spp.
(Ranunculaceae)
- Melampyrum*, *Pedicularis* and *Rhinanthus* spp., esp. *R. angustifolius*
(semi-parasitic Scrophulariaceae)
esp. *Aquilegia* and *Aconitum* spp., but also on perennial *Delphinium*
(Ranunculaceae)
- Clematis* spp.
(Ranunculaceae)
- Umbelliferae
wild plants and cultivars of *Daucus carota*, *Pastinaca sativa* and *Petroselinum crispum*
- Cucurbitaceae
wild plants and cultivars of *Cucumis*, *Cucurbita* and *Citrullus* spp.
esp. *Delphinium* spp., but also recorded on *Aconitum*
(Ranunculaceae)

- P. dennisii* var. *dennisii* (4a)
(synanam. *S. dennisii*)
- P. dictamnica* (16; addendum)
[sect. *Sclerophomella*]
- P. dimorphospora* (2)
- P. glaucii* (5)
(synanam. *S. chelidonii*)
- P. heteromorphospora* (1)
- P. ligulicola* var. *ligulicola* (12; addendum)
[sect. *Phyllostictoides*]
(teleom. *Didymella ligulicola* var. *ligulicola*)
- P. narcissi* (19; addendum)
[sect. *Peyronellaea*]
(synanam. *S. curtisii*)
- P. nigripycnidia* (7)
(synanam. *S. nigripycnidiicola*)
- P. protuberans* (13; addendum)
[sect. *Phyllostictoides*]
- P. subboltshauseri* (9)
(synanam. *S. hortensis*)
- P. trachelii* (10)
(synanam. *S. bohémica*)
- Solidago* spp.
(Compositae)
- Dictamnus albus*
(Rutaceae)
- Chenopodium* spp., esp. *C. quinoa*
(Chenopodiaceae)
- Papaveraceae
e.g. wild species of *Chelidonium*, *Corydalis*, *Dicentra* and *Glaucium*
- Chenopodium* spp., esp. *C. album*
(Chenopodiaceae)
- Chrysanthemum morifolium*
(Compositae)
- esp. *Narcissus* and *Hippeastrum* spp.
(Amaryllidaceae)
- Vicia* spp., esp. *V. cracca*
(Leguminosae)
- Lycium halimifolium*
(Solanaceae)
- Phaseolus vulgaris* and *Vigna unguiculata*
(Leguminosae)
- Campanula* spp., esp. *C. isophylla*,
Trachelium spp.
(Campanulaceae)

DESCRIPTIVE PART

Section Heterospora

1. *Phoma heteromorphospora* v.d. Aa & v. Kest. — Fig. 1A

Conidial dimorph large, aseptate and 1(2–3)-septate. Ascochytoïd-stagonosporoid.

Phoma heteromorphospora van der Aa & van Kesteren, *Persoonia* 10 (4) (1980) 542. — *Phoma variopora* van der Aa & van Kesteren, *Persoonia* 10 (2) (Nov. 1979) 268; not *Phoma variopora* Shreemali, *Indian J. Mycol. Pl. Path.* 8 (July 1979 [‘1978’]) 221. — *Phyllosticta chenopodii* Westendorp, *Bull. Acad. r. Sci. Lett. Beaux-Arts Belg.* [Bull. Acad. r. Belg. Cl. Sci.] II, 2 (1857) 567; not *Phoma chenopodii* Ahmad, *Sydowia* 2 (1948) 79 [belongs to sect. ‘*Macrospora*’ (Boerema, in prep.)]. — *Septoria westendorpii* Winter, *Hedwigia* 26 (1887) 26; not *Phoma westendorpii* Tosquinet in Westendorp, *Bull. Acad. r. Sci. Lett. Beaux-Arts Belg.* [Bull. Acad. r. Belg. Cl. Sci.] II, 2 (1857) 564.

Selected literature. Van der Aa & van Kesteren (1979).

Description in vitro

OA: growth rate 11–14 mm (14 days: 29 mm), somewhat irregular, with velvety, white aerial mycelium; colony pale luteous; reverse similar.

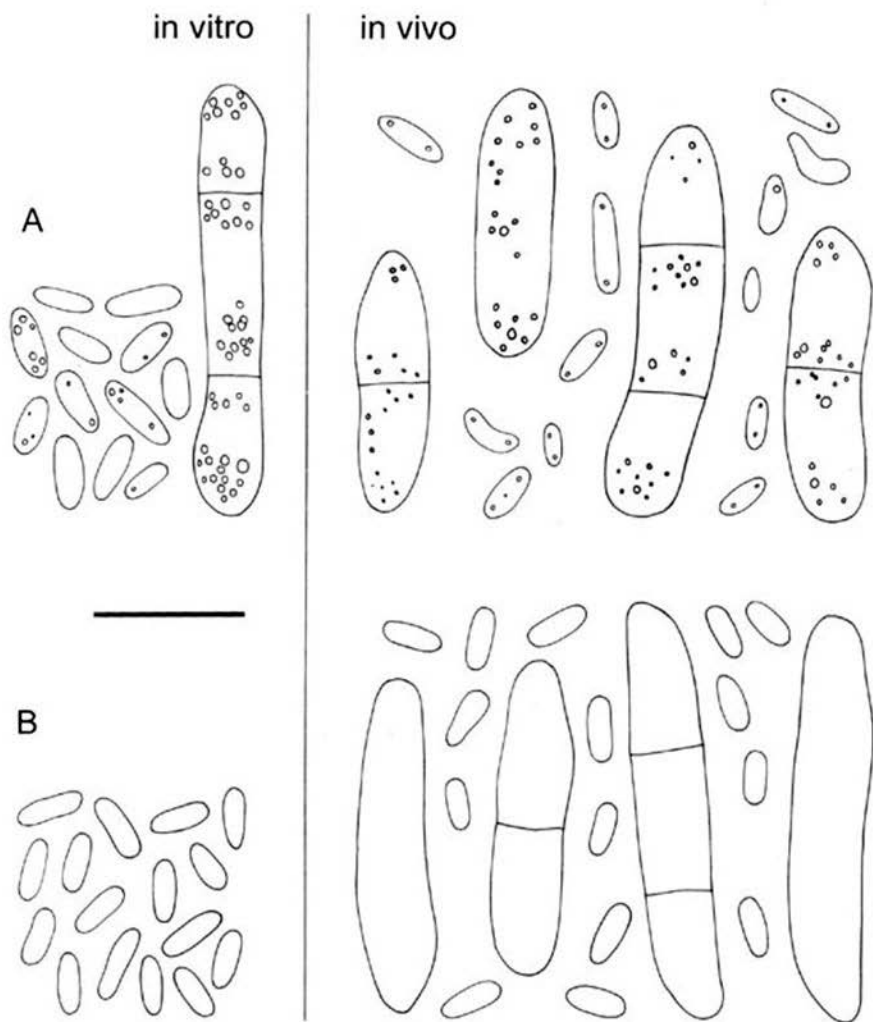


Fig. 1. A. *Phoma heteromorphospora*, type species of section *Heterospora*. Conidial shape and size. In vitro the pycnidia contain mainly small aseptate conidia, but also a few large and mostly 1–2-septate conidia are usually present. In vivo the pycnidia are always heterosporous; the macroconidia vary in shape, size and septation. — B. *Phoma dimorphospora*, closely related to the type species. Conidia generally eguttulate. In vitro the pycnidia usually contain only small aseptate conidia. Bar 10 μ m.

MA: growth rate 12–15 mm (14 days: 28 mm), somewhat irregular, with compact velvety-finely woolly, white to some grey olivaceous aerial mycelium, covering the colony; reverse pale luteous with grey olivaceous, citrine green and hazel patches.

CA: growth rate 19–22 mm (14 days: 30–31 mm), somewhat irregular, with finely floccose or velvety, white aerial mycelium, covering the colony; reverse saffron to ochraceous, centre chestnut.

Pycnidia on the agar, 120–350 µm diam., globose to subglobose, solitary or aggregated, glabrous or with mycelial outgrowths, with 1(–8) papillate ostioles; honey-citrate to cinnamon, later olivaceous black; walls made up of 5–10 layers, outer layers pigmented; conidial exudate white to primrose. Micropycnidia also present, 50–100 µm diam. Conidiogenous cells 5–7 × 3.5–8 µm. Conidia of two types: mainly small and aseptate, (3–)4–7 × (1–)1.5–2(–2.5) µm, av. 4.6 × 1.7 µm, Q = 2.0–3.8, av. Q = 2.7, subcylindrical to ellipsoidal, without or with some inconspicuous guttules; but also much larger, mostly 1–2-septate, 12.5–26.5 × 3–5 µm, av. 21 × 4 µm, Q = 3.6–6.9, av. Q = 5.0, subcylindrical with abundant guttules.

Chlamydospores absent.
NaOH spot test: negative.
Crystals absent.

Description in vivo (especially on *Chenopodium album*)

Pycnidia (in pale yellowish brown or whitish leaf spots with narrow purplish-brown border) similar to those in vitro, but up to 550 µm diam. and usually distinctly papillate. Conidia always heterosporous: partly small, narrow, 3–6 × 1–1.5 µm, aseptate, subcylindrical to ellipsoidal, sometimes curved, minutely biguttulate; some clearly larger, but very variable in dimensions, (8–)15–20(–27) × (3–)3.5–4.5(–7) µm, mostly aseptate, but sometimes 1-septate or, rarely, 2–3-septate, ellipsoidal-cylindrical or somewhat irregular in shape, irregularly multiguttulate.

Ecology and distribution. A very common pathogen on various species of *Chenopodium* in Europe: Leaf Spot. Very similar and closely related to the American *Phoma dimorphospora* (Speg.) v.d. Aa & v. Kest. (no. 2). In vitro, they can be distinguished easily by the fact that the latter does not produce large conidia on artificial media.

Cultures studied. CBS 513.77 (PD 76/1022) and CBS 115.96 (PD 94/1576) ex *Chenopodium album*, the Netherlands.

Note. Owing to the septate macroconidia this fungus is sometimes confused with *Ascochyta caulina* v.d. Aa & v. Kest., teleomorph *Pleospora calvescens* (Fr. ex Desm.) Tul. Most *Ascochyta*-, *Stagonospora*- and *Stagonosporopsis* binomials reported on *Chenopodiaceae* refer to *Ascochyta caulina*, see van der Aa & van Kesteren l.c. and Boerema, Loerakker & Hamers, 1987.

2. *Phoma dimorphospora* (Speg.) v.d. Aa & v. Kest. — Fig. 1B

Conidial dimorph large, aseptate and 1(occ.2)-septate. Ascochytoïd(-stagonosporoid) [Not obtained in vitro.]

Phoma dimorphospora (Speg.) van der Aa & van Kesteren, *Persoonia* 10 (2) (1979) 269–270. — *Phyllosticta dimorphospora* Spegazzini, *An. Mus. nac. Host. nat. B. Aires* III, 20 (1910) 334.

Stagonospora chenopodii Peck, *Rep. N.Y. St. Mus. nat. Hist.* 40 (1887) 60 [erroneously sometimes ascribed to House in *Bull. N.Y. St. Mus.* 219/220 (1920) = reprint of Peck's Report]; not *Phoma chenopodii* Ahmad, *Sydowia* 2 (1948) 79 [belongs to sect. '*Macrospora*' (Boerema, in prep.)].

Selected literature. Van der Aa & van Kesteren (1979).

Description in vitro

OA: growth rate 21–23 mm (14 days: 28–36 mm), regular, with finely felted, white aerial mycelium; colony colourless to pale luteous; reverse pale luteous to cinnamon.

MA: growth rate 25–28 mm (14 days: 44–50 mm), regular, with compact, felted, white aerial mycelium; colony citrine green; reverse pale luteous to citrine green, later ochraceous to isabelline.

CA: growth rate 28–31 mm (14 days: 45–61 mm), regular, with finely floccose, white aerial mycelium; colony colourless with grey tinge, centre with olivaceous tinges; reverse vinaceous buff with fawn or hazel concentric zones.

Pycnidia on the agar, 110–470 µm diam., globose to subglobose, solitary or aggregated, glabrous or with mycelial outgrowths, with 1(–8) papillate ostioles; honey-citric to cinnamon, later olivaceous to olivaceous black; walls made up of 4–10 layers of cells, outer layers pigmented; conidial exudate sordid white to buff or saffron. Micropycnidia also present, 60–100 µm in diam. Conidiogenous cells 4–6 × 4–6 µm in diam., globose to bottle-shaped. Conidia always aseptate, 3–5.5 × 1.5–2 µm, av. 4–4.5 × 1.5 µm, Q = 2.0–3.6, av. Q = 2.6–3.0, cylindrical to ellipsoidal without guttules.

Chlamydospores absent.

NaOH spot test: negative, but on OA and MA a non-specific reddish discolouring may occur.

Crystals absent.

Description in vivo (especially on *Chenopodium quinoa*)

Pycnidia (in very pale brown leaf spots or in eye-shaped lesions on stems) resembling those in vitro, but seldom over 300 µm diam. and only with rather flat papillae. Conidia always dimorphic: some small, mostly 4–5 × 2–2.5 µm, aseptate, short cylindrical or ellipsoidal, eguttulate; some much larger, 16–22.5(–25) × 4–4.5(–7) µm, mostly aseptate, but also 1-, or seldom 2-septate, ellipsoidal to cylindrical, straight or slightly curved, mostly without guttules.

Ecology and distribution. A common pathogen on species of *Chenopodium* in North and South America: Leaf and Stem Spot. Closely allied to the European *Phoma heteromorphospora* v.d. Aa & v. Kest. (no. 1), but easy to distinguish in vitro by the absence of large conidia.

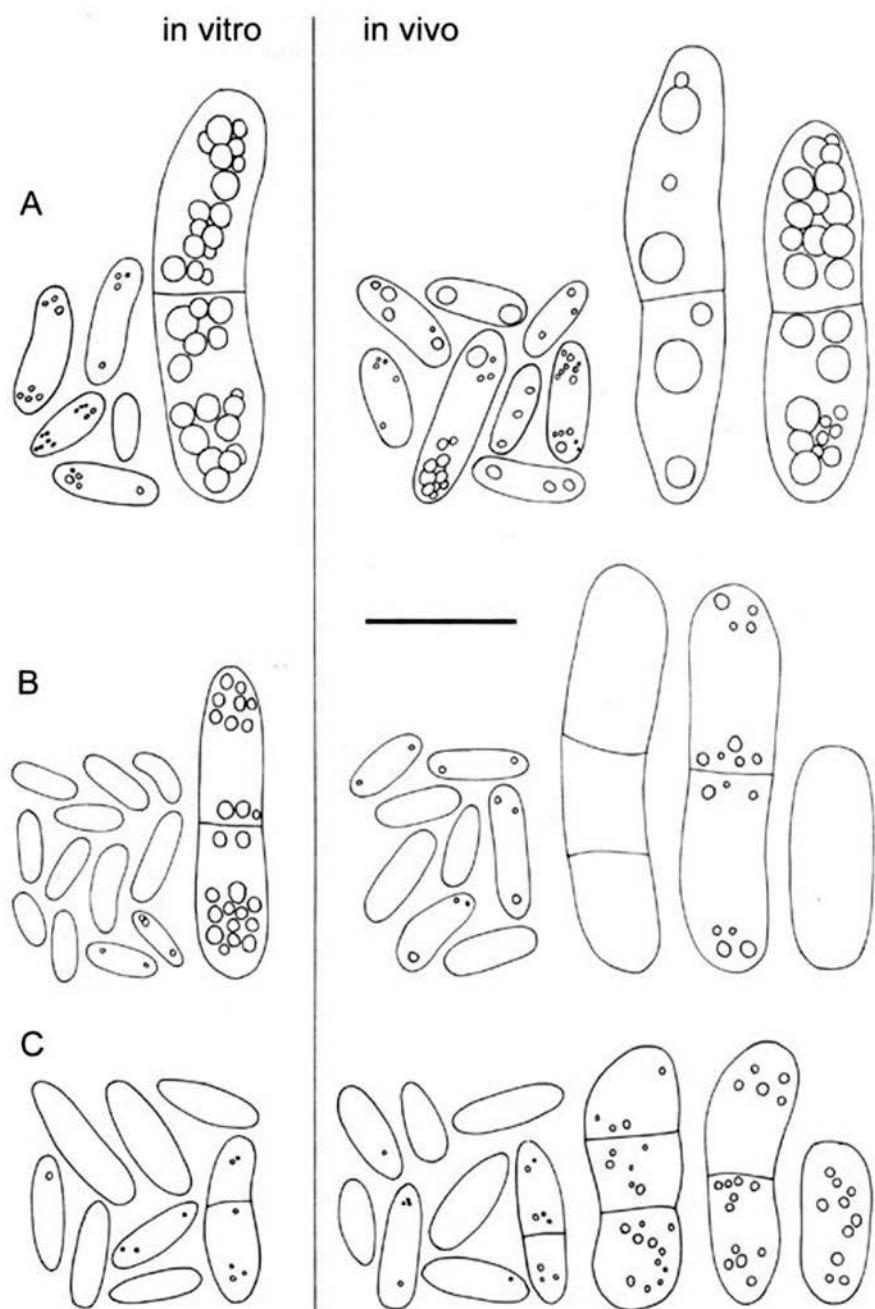
Cultures studied. CBS 165.78 (PD 77/884) and CBS 345.78 (PD 76/1015) ex *Chenopodium quinoa* (Chenopodiaceae), Peru.

3. *Phoma actaeae* Boerema, de Gruyter & Noordel., spec. nov. — Fig. 2A

Conidial dimorph large, 1 (occ. 2)-septate. Ascochytoïd(-stagonosporoid): *Stagonosporopsis actaeae*, see below.

Pycnidia in vitro 80–250 µm diam., irregulariter globosa, solitaria vel confluentia, nonnullis hyphis-emanentibus, uno (vel duobus) ostioli papillatis vel non-papillatis praedita. Cellulae conidiogenae 4–8 × 3–8 µm, globosae vel lageniformes; conidia unicellularia, 4.5–10 × 2–3 µm, (sub-)cylindrica vel ellipsoidea, nonnullis guttulis plus minusve polaribus repleta. [Nonnumquam nonnulla conidia maiora, septata praesentia, synanamorphae *Stagonosporopsis* similia.]

Holotypus: L 992.167-501, cultura exsiccata, viva CBS 106.96 (PD 94/1318), isolatus e macula foliarum ad *Actaeam spicatum*, Schaelsbergerbos prope Valkenburg (Limburg), in Neerlandia, Septembre 1994.



Synanamorph: *Stagonosporopsis actaeae* (Allescher) Diedicke, *Annl. mycol.* 10 (1912) 141. — *Actinonema actaeae* Allescher, *Ber. bayer. bot. Ges.* 5 (1897) 7.

Marssonia actaeae Bresadola, *Hedwigia* 32 (1893) 33. — *Ascochyta actaeae* (Bres.) J.J. Davis, *Trans. Wis. Acad. Sci. Arts Lett.* 19 (1919) 656.

Selected literature. Diedicke (1912a) and Davis (1919; as *Ascochyta actaeae*).

Description in vitro

OA: growth rate 65–82 mm, regular to somewhat irregular, with finely floccose to coarsely floccose-woolly, pale olivaceous grey aerial mycelium; colony pale luteous to amber-ochraceous, due to a diffusible pigment; reverse pale luteous to ochraceous-sepia, with citrine due to crystal production.

MA: growth rate 65–76 mm, slightly irregular, with compact, fine woolly-floccose, white to pale olivaceous grey-greenish grey aerial mycelium; colony pale luteous with amber-fulvous to umber-sepia; reverse similar, with citrine green due to abundant crystal production.

CA: growth rate 65–82 mm, regular, with finely floccose to floccose-woolly, white to pale olivaceous grey aerial mycelium; colony pale luteous to amber-ochraceous, due to a diffusible pigment production, reverse similar, with partly citrine-green due to crystal production.

Pycnidia on and in the agar, also in aerial mycelium, 80–250 µm diam., irregularly globose, solitary or confluent, glabrous or with some hyphal outgrowths, with 1(–2) non-papillate or papillate ostioles; honey to sienna at first, darkening with age to cinnamon-olivaceous finally olivaceous black, often with a yellowish pigmentation in the agar around the pycnidia; walls made up of 3–6 layers of cells, outer layers pigmented; conidial exudate white to salmon. Micropycnidia also present, 40–80 µm diam. Conidigenous cells 4–8 × 3–8 µm, globose to bottle-shaped. Conidia mostly aseptate, 4.5–10 × 2–3 µm, av. 6.4 × 2.1 µm, Q = 1.6–3.7, av. Q = 2.6–2.8, (sub-)cylindrical to ellipsoidal, with several small, more or less polar guttules; occasionally some much larger and 1-septate, 14–28.5 × 4–7 µm, av. 20.7–21.4 × 4.9–5.8 µm, Q = 2.5–5.5, av. Q = 3.7–4.2, usually with several large guttules, resembling the conidia of the *Stagonosporopsis* synanamorph commonly occurring in vivo, see below.

Chlamydospores absent.

NaOH spot test: positive, on OA and MA a scarlet-vinaceous discolouring occurs.

Crystals needle-like, citrine green, especially on MA, on OA also small yellowish-brownish crystals are formed in the agar.

Description in vivo (especially on *Actaea spicata*)

Pycnidia (on indefinite blackened areas of the leaves, epiphyllous, scattered) mostly 100–130 µm diam., subglobose with 1(–2) more or less papillate ostioles. Conidia some-

Fig. 2. *A. Phoma actaeae*. In vitro conidia variable, mainly relatively small and aseptate, occasionally larger and 1-septate. In vivo the pycnidia sometimes contain only small aseptate phomoid conidia, but usually only large 1(–2)-septate conidia, synanamorph *Stagonosporopsis actaeae*. — *B. Phoma dennisii*. In vitro conidia are mainly small and aseptate, but occasionally also some larger 1-septate conidia are present. In vivo pycnidia usually contain only small aseptate conidia, but also pycnidia with large, mainly 1–2-septate conidia may occur, synanamorph *Stagonosporopsis dennisii*. — *C. Phoma glaucii*. In vitro conidia variable phomoid, mostly aseptate, occasionally 1-septate. In vivo pycnidia may contain similar phomoid conidia, but also much larger 0–2-septate conidia, synanamorph *Stagonosporopsis chelidonii*. Bar 10 µm.

times small and aseptate, but usually large and septate, characteristic for the synanamorph *Stagonosporopsis actaeae*: cylindrical, straight or somewhat curved, usually with several guttules, 1(–2)-septate, mostly $17\text{--}24 \times 5\text{--}6 \mu\text{m}$, hyaline but becoming somewhat olivaceous with age.

Ecology and distribution. In Europe and North America (USA) the *Stagonosporopsis* synanamorph is recorded on living and wilting leaves of wild and cultivated *Actaea* and *Cimicifuga* species. The fungus seems to be a specific pathogen of these perennial plants belonging to the Ranunculaceae.

Cultures studied. CBS 105.96 (PD 74/230) ex *Cimicifuga simplex* (Ranunculaceae), the Netherlands; CBS 106.96 (PD 94 1318) ex *Actaea spicata* (Ranunculaceae), the Netherlands.

4a. *Phoma dennisii* Boerema var. *dennisii* — Fig. 2B

Conidial dimorph large, mainly 1–2-septate. Ascochytoïd-stagonosporoid: *Stagonosporopsis dennisii*, see below.

Phoma dennisii Boerema, Trans. Br. mycol. Soc. 67 (1976) 307, var. *dennisii* [autonym created by the separation of the variety *oculo-hominis*, see below]. — *Phoma oleracea* var. *solidaginis* Saccardo, Michelia 2 (2) (1881) 337; Sylloge Fung. 3 (1884) 135; not *Phoma solidaginis* Cooke, Grevillea 13 (1885) 95.

Synanamorph: *Stagonosporopsis dennisii*, *synanamorphis* nov. *Phomae dennisii*.

Pycnidia in vitro *Phomae dennisii* similia, sed conidia maiora, plerumque $15.5\text{--}28 \times 4\text{--}6 \mu\text{m}$, plerumque 1–2-septata (*Ascochytae* similia).

Holotypus: L 996.047-028 in caulibus *Solidaginis virgaureae*, Wageningen in Neerlandia, lectus a M. M. J. Dorenbosch, Octobre 1976 (isol. PD 76/842).

Selected literature. Boerema & Bollen (1975), Boerema (1976).

Description in vitro

OA: growth rate 68–78 mm, regular, with coarsely floccose, white to smoke grey aerial mycelium; colony colourless to primrose-olivaceous buff, due to a diffusible pigment, often with dull green to olivaceous sectors, with salmon appearance due to conidial exudate; reverse similar.

MA: growth rate 72–83 mm, regular, with compact floccose to woolly, white to pale olivaceous grey aerial mycelium; colony luteous, due to a diffusible pigment; reverse luteous to sienna with chestnut and leaden grey to leaden black sectors, and partly citrine-green due to crystal production.

CA: growth rate 82–83 mm, regular, with floccose, white aerial mycelium; colony salmon with iron grey tinges; reverse ochraceous to fulvous, with iron grey to leaden black sectors.

Pycnidia mainly on the agar, sometimes formed in the agar, 80–260 μm in diam., globose to irregular, confluent, glabrous, with 1–2 non-papillate or papillate ostioles, often developing a long neck, pale citrine-sienna at first, darkening with age to olivaceous black; walls made up of 2–5 layers of cells, outer layer pigmented; conidial exudate white to buff. Conidiogenous cells $3\text{--}7 \times 4\text{--}8 \mu\text{m}$, globose to bottle-shaped. Conidia usually aseptate, $4\text{--}6.5 \times 1.5\text{--}2 \mu\text{m}$, average $5.1\text{--}1.8 \mu\text{m}$, $Q = 2.1\text{--}3.6$, av. $Q = 2.9$, ellipsoidal to cylindrical with or without a few, small guttules. Occasionally some large secondarily 1-septate conidia are produced, $14.5\text{--}24 \times 4\text{--}7 \mu\text{m}$ ('ascochytoïd').

Chlamydospores absent.

NaOH spot test: on OA and MA a coral discoloration occurs.

Crystals are usually formed abundantly on MA. They are of the 'foveata-type', i.e. look like the yellow-green crystals of the anthrachinon pigment-complex found in old cultures of *Phoma foveata* Foister (sect. *Phyllostictoides*; for a coloured plate of the crystals see Tichelaar, 1979).

Description in vivo (especially on *Solidago virgaurea*)

Pycnidia (superficial on dead stems) mostly 100–150 µm diam. and globose ostiolate. In most collections they contain only aseptate conidia resembling those of *Phoma dennisii* in vitro, (4–)5–6(–7) × 1.5–2(–2.5) µm. Sometimes, however, pycnidia with large, mainly 1–2-septate conidia also occur, synanamorph *Stagonosporopsis dennisii*: conidia subcylindrical-ellipsoidal, usually with several guttules, 15.5–28 × 4.0–6.0 µm (single identity proved by cultures).

Ecology and distribution. In Europe and North America (Canada) found on, and isolated from last year's dead stems of golden rod, i.e. *Solidago* species of both Eurasian and North American origin. The fungus is especially frequently recorded on *S. canadensis*. So far no data on pathogenicity.

Cultures studied. CBS 631.68 (PD 68/147) ex *Solidago floribunda*, the Netherlands; CBS 110.96 (PD 94/1575) ex *Solidago virgaurea*, the Netherlands; CBS 135.96 (PD 95/4756) ex *Solidago canadensis*, Canada.

Note. The dimensions of the 'ascochytoïd' conidia are in the same range of size as those recorded for *Ascochyta solidaginis* (Schw.: Fr.) Starbäck, Bih. K. svenska Vetensk. Akad. Handl. 19, Afd. III (2) (1894) 52, and *Ascochyta solidaginis* (Thümen) Keissler, Beih. bot. Centbl. [Zentbl.] II, 29 (1912) 427. However, both these names refer to the anamorph of a mycoparasite of rusts, *Sphaerellopsis filum* (Biv.-Bern.: Fr.) Sutton, commonly known as *Darluca filum* (Biv.-Bern.: Fr.) Cast. [teleom. *Eudarluca caricis* (Fr.) O. Eriksson], see Melnik (1977: 195).

4b. ***Phoma dennisii* var. *oculo-hominis*** (Punith.) Boerema, de Gruyter & Noordel., *comb. nov.*

Conidial dimorph large, mainly 1-septate. Ascochytoïd [only known in vitro].

Phoma oculo-hominis Punithalingam, Trans. Br. mycol. Soc. 67 (1976) 142–143 (basionym; holotype IMI 193307).

Selected literature. Punithalingam (1976: original description on PDA).

Description in vitro

On all media growth rate and cultural characteristics about the same as those of *P. dennisii* var. *dennisii*; on OA and MA differing in the absence of a diffusible pigment. In general *P. dennisii* var. *oculo-hominis* has a more dull green appearance.

Pycnidia do not differ essentially from those of the type variety, but the conidia are more variable in shape and size. The 1-septate conidia are in comparison with those of the type variety relatively small, mostly 9–16 × 4.5 µm.

Chlamydospores absent.

NaOH spot test: no coral discoloration on OA and MA as in cultures of the type variety.

Crystals of 'foveata-type', similar to those of the type variety, may be formed abundantly on MA.

Ecology and distribution. Once isolated from a human cornea (ulcer) in the United States (Tennessee). The cultural characteristics of this fungus suggest a natural relation with the 'golden rod fungus', *P. dennisii* (var. *dennisii*, No. 4a; e.g. common on dead stems of *Solidago canadensis*).

Culture studied. IMI 193307 (CBS 634.92).

5. *Phoma glaucii* Brun. — Fig. 2C

Conidial dimorph large, occ. aseptate, mostly 1(–2)-septate. Ascochytoïd-stagonosporoid; *Stagonosporopsis chelidonii*, see below.

Phoma glaucii Brunaud, Anns Soc. Sci. nat. La Rochelle (1892) 97 [= *Glanules mycol.* III: p. 5] [as '*glauci*']; not *Phoma glaucii* Thery, Revue mycol. 13 (1891) 10 [nomen nudum; cf. Roum., Fungi gall. No. 5561 an immature ascomycete].

Diplodina glaucii Cooke & Massee, Grevillea 17 (1889) 79. — *Ascochyta glaucii* (Cooke & Massee) Diedicke, Krypt.-Fl. Mark Brandenb. 9, Pilze 7 (1915) 383–384 [in both cases as '*glauci*'].

Ascochyta dicentra Oudemans, Ned. kruidk. Archf III, 2 (3) (1902) 721–722.

Diplodina chelidonii Naumov, Bull. Soc. oural Amat. Sci. nat. [= Zap. ural' Obshch. Lyub. Estest.] 35 (1915) 32 [extrait].

Diplodina chelidonii Ade, Mitt. bad. Landesver. Naturk. II [N.F.], 1 (1924) 332 [illegitimate as later homonym].

Phyllosticta corydalina Picbauer, Sb. vys. Sk. zeméd. Brné Fak. hospodárska/lesnická 18 (1931) 20.

Ascochyta papaveris var. *dicentra* Grove, Br. Coelomycetes 1 (1935) 301.

Phoma chelidonii Brezhnev, Bot. Mater. Ofd. spor. Rast. Bot. Inst. Akademii nauk SSSR 7 (1951) 190.

Synanamorph: *Stagonosporopsis chelidonii* (Bres.) Diedicke, Krypt.-Fl. Mark Brandenb. 9, Pilze 7 (1912) 398. — *Phyllosticta chelidonii* Bresadola, Hedwigia 35 (1896) 199.

Ascochyta chelidoniicola Melnik, Nov. Sist. niz. Rast. 12 (1975) 204. — *Ascochyta chelidonii* Kabát & Bubák, Hedwigia 46 (1907) 290 [illegitimate as a later homonym of *Ascochyta chelidonii* Libert, Pl. cryptog. Ard. Fasc. 3 (1834) No. 204 (= *Septoria chelidonii* (Lib.) Desm.)].

Description in vitro

OA: growth rate 78–82 mm, regular, with scarce to abundant, coarsely floccose, white aerial mycelium; colony colourless, sometimes pale citrine-green at margin, the agar staining saffron to fulvous due to a diffusible pigment; reverse similar.

MA: growth rate 71–84 mm after 6 days, regular, with compact floccose to woolly, white, sometimes more like olivaceous grey aerial mycelium; colony colourless to olivaceous-olivaceous grey to dull green in a stellate pattern, the agar staining pale luteous to amber due to a diffusible pigment; reverse similar, or leaden grey to fulvous.

CA: growth rate 73–83 mm after 6 days, regular, with floccose, white to pale olivaceous grey aerial mycelium; colony colourless to olivaceous grey in a stellate pattern, the agar staining scarlet, due to a diffusible pigment production; reverse rust, scarlet, blood-colour or cinnamon, sometimes with olivaceous tinges.

Pycnidia abundant, on and in the agar, and in aerial mycelium, 90–320 µm diam., globose to irregular, solitary or confluent, glabrous or with mycelial outgrowths, with 1 or 2(–4) often papillate ostioles, honey to cinnamon-olivaceous; walls made up of 2–5 layers of cells, outer layer(s) pigmented; conidial exudate rosy buff to salmon-saffron. Micro-pycnidia also present, 60–90 µm diam. Conidiogenous cells 3–8 × 4–7 µm, globose to bottle-shaped. Conidia aseptate, 6–10.5 × 2–4 µm, av. 6.9–8.2 × 2.2–3.0 µm, Q = 2.0–4.0, av. Q = 2.7–3.2, subcylindrical-ellipsoidal to more or less obclavate-fusiform, without distinct guttules. Occasionally some 1-septate conidia are present, up to 13 × 5 µm.

Chlamydospores absent.

NaOH spot test: positive on OA and MA: greenish, then red (E+ reaction).

Crystals absent.

Description in vivo (especially on *Chelidonium majus*)

Pycnidia (subepidermal on irregular yellowish brown leaf spots with darker border; also in long stretches on dead stems, on dried seed capsules and on fading or dead leaves) mostly 100–200 µm diam., usually depressed globose to ellipsoidal, brown to black with 1 small inconspicuous ostiole. The conidia usually display about the same range of variability as those of *P. glaucii* in vitro, subcylindrical to fusiform, often aseptate, mostly 7–8 (–8.5) × (2.5–)3(–3.5) µm, but frequently becoming 1-septate, (7–)10–13(–15) × (2.5–)3–4 µm; they are often microguttulate. Sometimes, especially under dry circumstances, the pycnidia may contain distinctly larger conidia, representing the synanamorph *Stagonosporopsis chelidonii*, (13.5–)15–21(–23) × 4–5(–6.5) µm, subcylindrical to ellipsoidal and rounded at the ends, mostly 1-septate, but occasionally also aseptate or 2-septate; they may be very pale brown tinged and always have small guttules.

Ecology and distribution. This fungus has been isolated and reported from quite different wild Papaveraceae throughout Europe, e.g. species of *Chelidonium*, *Corydalis*, *Dicentra* and *Glaucium*. It is known as a pathogen causing a leaf spot, but most records and synonyms refer to phomoid phenotypes (aseptate and 1-septate conidia) colonising fading leaves and dead stems.

Cultures studied. CBS 113.96 (PD 74/140) ex *Glaucium flavum* (Papaveraceae), the Netherlands; CBS 112.96 (PD 79/765) ex *Dicentra* sp. (Papaveraceae), the Netherlands; CBS 111.96 (PD 75/855) ex *Corydalis* sp. (Papaveraceae), the Netherlands; CBS 114.96 (PD 94/888) ex *Chelidonium majus*, the Netherlands.

Note. The German collection on leaves of *Chelidonium majus* studied by Bresadola (l.c.) illustrates the influence of desiccation on the occurrence of *Stagonosporopsis* conidia. In the pycnidia of the fresh collection apparently only phomoid conidia ('7–8 × 3 µm, becoming 1-septate and 10–3.5 µm') were present, but during the drying process numerous large, mainly septate (ascochytoïd-stagonosporoid) conidia (13.5–23 × 4.5–5 µm, in holotype; compare Diedicke l.c.) have developed. These changes have been observed in reverse with a Dutch collection on leaves of *Chelidonium majus*: pycnidia with many large, mainly septate conidia, contained numerous small phomoid conidia after 5 days under humid conditions (single identity proved by conidial isolates).

6. *Phoma aquilegiicola* Petrov — Fig. 3A

Conidial dimorph large, occ. aseptate, mostly 1(–2)-septate. Ascochytoïd-stagonosporoid: *Stagonosporopsis aquilegiae*, see below.

Phoma aquilegiicola Petrov, Acta Inst. Bot. Acad. Sci. USSR Pl. crypt. [Trudy bot. Inst. Akad. Nauk SSSR] Fasc. 1 (1933) 281.

Phyllosticta aquilegiicola Brunaud, Act. Soc. linn. Bordeaux 54 (1890) 244 [Misc. mycol. 2 (1889) 33] [as 'aquilegicola'].

Sclerophomella aconiticola Petrak, Hedwigia 65 (1925) 308. — *Phoma aconiticola* Petrak, Fungi polon. exs. (1921) No. 643 [nomen nudum; syntype U].

Phoma aconiticola Nagai, Shishido & Tsuyama, J. Fac. Agric. Iwate Univ. 10 (1) (1970) 23.

Synanamorph: *Stagonosporopsis aquilegiae* (Rabenh.) comb. nov.

Depazea aquilegiae Rabenhorst, Klotzschii Herb. mycol. Cent. 17 (1852) No. 1651 (basonym; syn-type B). — *Ascochyta aquilegiae* (Rabenh.) Höhnelt, Anns mycol. 3 (1905) 406 [later homonym of *A. aquilegiae* (Roum. & Pat.) Sacc., see below].

Phyllosticta aquilegiae Roumeuguère & Patouillard, Revue mycol. 5 (1883) 28. — *Ascochyta aquilegiae* (Roum. & Pat.) Saccardo, Sylloge Fung. 3 (1884) 396. — *Ascochyta aquilegiae* (Roum. & Pat.) Tassi, Boll. R. Orto bot. [Boll. Lab. Bot. Orto bot.] Siena 5 (1902) 27. — *Actinonema aquilegiae* (Roum. & Pat.) Grove, J. Bot., Lond. 56 (1918) 343.

Diplodina delphinii Laskaris, Phytopathology 40 (1950) 620 [July]¹. — *Ascochyta laskarisii* Melnik, Nov. Sist. niz. Rast. (1971) 211; Mikol. Fitopatol. 7, 2 (1973) 142².

Diplodina delphinii Golovin, Cent. Asian Univ. Studies II [N.S.] 14, 5 (1950) 34 [December; illegitimate as later homonym].

Selected literature. Laskaris (1950, as *Diplodina delphinii*), Cejp (1965: 346 as *Phyllosticta aquilegiae*) and Buchanan (1987: 17–18 as *Ascochyta aquilegiae*).

Description in vitro

OA: growth rate 56–75 mm, regular, with finely woolly-floccose, white to pale olivaceous grey aerial mycelium; colony colourless, some isolates staining the agar rosy buff-saffron with a diffusible pigment; reverse similar.

MA: growth rate 58–80 mm, regular, with finely woolly-floccose, white to pale olivaceous grey aerial mycelium; colony olivaceous buff to honey with a diffusible pigment, tinged peach by conidial exudate, margin greenish olivaceous; reverse amber with pale luteous and isabelline patches.

CA: growth rate 67–79 mm, regular, with finely woolly-floccose, white to pale olivaceous grey aerial mycelium; colony colourless, some isolates staining the agar scarlet with a diffusible pigment; reverse of these isolates scarlet to rust, otherwise honey to isabelline.

Pycnidia abundant, on and in the agar, and in aerial mycelium, 120–300 µm diam., globose to subglobose, solitary, glabrous or with mycelial outgrowths, with usually 1 non-papillate or slightly papillate ostiole; colour of saffron becoming partly olivaceous black; walls made up of 3–7 layers of cells, outer layers pigmented; conidial exudate white, occasionally rosy buff. Micropycnidia also present, 30–60 µm diam. Conidiogenous cells 4–7 × 4–7 µm, globose. Conidia usually aseptate, 5–8 × 2–2.5 µm, av. 6.3–6.5 × 2.3 µm, Q = 2.2–3.9, av. Q = 2.7–2.8, ellipsoidal to more or less obclavate-fusiform, with or without guttules. Occasionally some larger 1-septate conidia are present, up to 15 × 5 µm.

Chlamydospores absent, but chains and clusters of dark swollen cells may be formed especially on CA.

NaOH spot test: positive on OA and MA: greenish, then red (E+ reaction). Crystals absent.

Description in vivo (especially on *Aquilegia vulgaris*)

Pycnidia (subepidermal on leaf lesions which are usually marginal, grey to brown with a dark brown border and sometimes with radiating mycelial fibrils; also on carpels and old stems) mostly 80–170 µm diam., relatively thick-walled, globose to subglobose with 1 distinct ostiole. Conidia in pycnidia on leaf lesions mostly large and septate, ascochytoïd,

¹) Type specimens should be deposited in NY, but are apparently lost; neotype designated herein: BPI, collection F.J. Berek on *Delphinium* sp., Washington DC., 4 June 1956.

²) Created as substitute name for *Diplodina delphinii* Laskaris l.c. to avoid homonymy with *Ascochyta delphinii* Melnik, Nov. Sist. niz. Rast. (1968) 173, a synonym of *Phoma delphinii* Rabenh., no. 8 in this paper.

typical of the synanamorph *Stagonosporopsis aquilegiae*: cylindrical or somewhat irregular, guttulate or eguttulate, 1(–2) septate and occasionally broken at the septa, but sometimes aseptate, mostly $(10\text{--}13\text{--}20 \times (3\text{--}4\text{--}5\text{--}5.5) \mu\text{m}$. In pycnidia on withered leaves, stems and on carpels phomoid conidia often predominate, mostly aseptate but occasionally

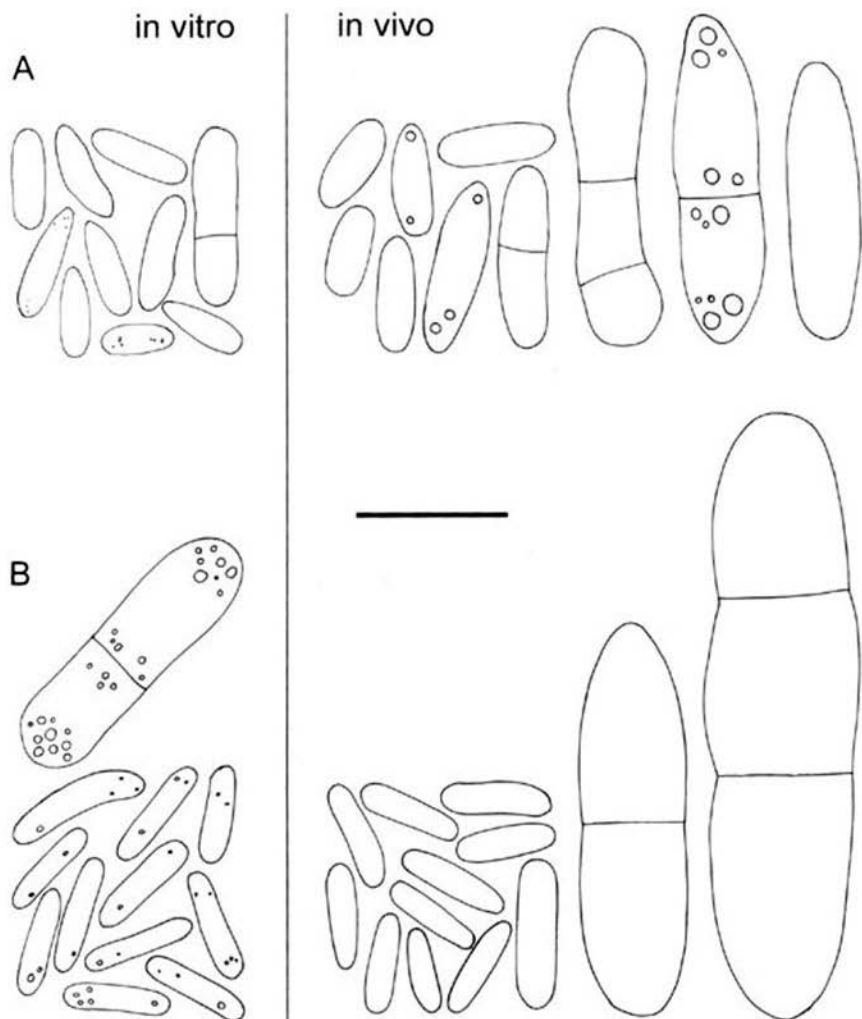


Fig. 3. A. *Phoma aquilegiicola*. Conidia phomoid in vitro, usually aseptate, but some larger ones 1-septate. Pycnidia in vivo may contain similar conidia, aseptate and occasionally 1-septate, but mostly much larger conidia, usually 1(–2)-septate, synanamorph *Stagonosporopsis aquilegiae*. — B. *Phoma nigripycnidia*. Conidia usually small and aseptate in vitro but some large 1-septate conidia may be present, especially in fresh cultures. Pycnidia sometimes contain only small aseptate conidia in vivo, but usually only very large 1–2(–4)-septate conidia are present, synanamorph *Stagonosporopsis nigripycnidicola*. Bar $10 \mu\text{m}$.

1-septate, similar to conidia produced in vitro, but they are usually larger and more variable in shape, eguttulate or guttulate, $(5-6-9(-14) \times (2-2.5-3.5(-5) \mu\text{m})$.

Ecology and distribution. In Eurasia this fungus is frequently found in association with dark leaf spots and stem lesions on wild and cultivated *Aquilegia* spp. (perennials), especially *A. vulgaris*. However, it occurs also on other Ranunculaceae, e.g. perennial *Aconitum* and *Delphinium* spp. In the United States it has been an important cause of crown rot of cultivated Delphiniums (as *Diplodina delphinii*). In Japan the fungus has recently caused severe damage on cultivated Aconitums (as *Phoma aconiticola*). The *Stagonosporopsis* synanamorph is also recorded in Australasia (New Zealand). *Phoma aquilegicola*/*S. aquilegiae* differs from the related *P. delphiniicola*/*S. delphinii* (no. 8) by faster growth rate, positive E-reaction and different shape and size of the conidia (compare the figures 3A and 4A).

Cultures studied. CBS 108.96 (PD 79/611) and CBS 109.96 (PD 83/832) ex *Aquilegia* sp. (Ranunculaceae), the Netherlands; CBS 107.96 (PD 73/598) ex *Aconitum pyramidale* (Ranunculaceae), the Netherlands.

Note. *Didymella inaequalis* Corbaz (1957: 397-400), described from dead stems of *Aconitum lycoctonum* in southern France, may represent the teleomorph of the fungus. The conidia of the pycnidial anamorph of *D. inaequalis* resemble those of *Phoma aquilegicola* on dead stems of *Aconitum* spp., but the cultures could not be compared.

7. *Phoma nigripycnidia* Boerema, de Gruyter & Noordel., *spec. nov.* — Fig. 3B

Conidial dimorph large, 1-2(occ.3-4)-septate. Stagonosporoid: *Stagonosporopsis nigripycnidicola*, see below.

Pycnidia in vitro nigris, 220-360 μm diam., irregulariter globosa, plerumque solitaria, glabra, ostiolo inconspicuo praedita, nonnumquam papillata. Cellulae conidiogenae 5-10 \times 4-8 μm , globosae vel lageniformes. Conidia unicellularia, 5.5-9 \times 1.5-2 μm , cylindrica vel allantoidea, nonnullis guttulis parvis repleta. [Nonnumquam conidia paulo maiora, septata praesentia, illis synanamorphae *Stagonosporopsis* similia.]

Holotypus: L 992.163-150 cultura exsiccata, viva CBS 116.96 (CCMF 243, PD 95/7930), isolatus ab M. Ondřej e macula foliari ad *Vicia craccam*, Libina prope Šumperk, in Republica Czechia, Augusto 1969.

Synanamorph: *Stagonosporopsis nigripycnidicola* (Ondřej) *comb. nov.*

Ascochyta nigripycnidicola Ondřej, *Biologija*, Bratisl. 23 (1968) 8116 (basionym; holotype PR).

Selected literature. Ondřej (1968), Ondřej (1970), Boerema & Bollen (1975).

Description in vitro

OA: growth rate 61-63 mm, regular, with floccose, white to olivaceous grey aerial mycelium; colony colourless to dull green, becoming pale luteous-citrine; reverse similar.

MA: growth rate 59-61 mm, regular, with compact velvety to floccose, white to citrine-grey olivaceous aerial mycelium; colony covered by aerial mycelium, later with honey to amber background; reverse grey olivaceous to honey, partly olivaceous black.

CA: growth rate 54-57 cm, regular, with compact floccose white to dull green aerial mycelium; colony covered by aerial mycelium; reverse buff, olivaceous in centre.

Pycnidia on the agar and in the aerial mycelium, 220-360 μm diam., irregularly globose, usually solitary, glabrous, ostiole(s) not clear, sometimes papillate, olivaceous black; walls made up to 8 layers of cells, outer layers pigmented; conidia exudate not observed. Conidiogenous cells 5-10 \times 4-8 μm , globose to bottle-shaped. Conidia usually aseptate, 5.5-9 \times 1.5-2 μm , av. 6.8 \times 1.8 μm , Q = 3.2-4.5, av. Q = 3.8, cylindrical to

allantoid, with some small guttules; some 1-septate conidia may be present, often 9–15 × 2–4 µm, but in fresh cultures they may be three or four times as large and more-celled, resembling those of *Stagonosporopsis nigripycnidiicola* in vivo.

Chlamydospores absent.

NaOH spot test: negative, but a weak non-specific greenish discolouring may occur.

Crystals absent.

Description in vivo (on *Vicia cracca*)

Pycnidia (subepidermal, scattered in ochreous-brown circular leaf spots and elongated stem lesions) 120–250 µm diam., subglobose-papillate, dark with inconspicuous ostiole. Conidia usually very large, mostly 20–45 × 7–12 µm, 1–2 (occasionally 3–4)-septate, i.e. stagonosporoid, typical of the synanamorph *Stagonosporopsis nigripycnidiicola*. Sometimes, however, the dark papillate pycnidia in the leaf spots contain only small aseptate conidia, resembling those of *Phoma nigripycnidia* in vitro.

Ecology and distribution. This fungus is in south-eastern Europe (esp. Czech Republic and Slovakia) frequently recorded as a pathogen of *Vicia cracca*: Leaf and Stem Spot. The fungus has been found occasionally on *Vicia sepium* and *V. sativa* (susceptibility proved by inoculation).

Cultures studied. CBS 116.96 (CCMF 243, PD 95/7930) ex *Vicia cracca* (Leguminosac), Czechia.

8. *Phoma delphinii* (Rabenh.) Cooke — Fig. 4A

Conidial dimorph large, mostly 1(–2)-septate. Ascochytoïd(-stagonosporoid): *Stagonosporopsis delphinii*, see below.

Phoma delphinii (Rabenh.) Cooke, Grevillea 20 (1892) 113 [misapplied, see Grove, Br. Coelomyces 1 (1935) 80]. — *Sphaeria delphinii* Rabenhorst, Klotzschii Herb. mycol., ed. 2, Cent. 8 (1845) No. 747 [Fiedler's Exs.].

Phyllosticta delphinii Lobik, Bolez. Rast. 17 [1928] 3–4 [Morbi plant. 17 (1929) 167] [holotype LE].

Ascochyta delphinii Melnik, Nov. Sist. niz. Rast. (1968) 173 [holotype LE; according to Melnik (1977: 183) referring to *Phyllosticta ajacis* Thümen (= *Phoma ajacis* (Thümen) v. d. Aa & Boerema, see de Gruyter et al., 1993), but the occasional occurrence of septate phomoid conidia points to *P. delphinii*].

Synanamorph: *Stagonosporopsis delphinii* Lebedeva, Notul. syst. Inst. cryptog. Horti bot. petropol. 1, 8 (1922) 156.

Description in vitro

OA: growth rate 33–45 mm, regular, with scarce, finely woolly, pale olivaceous grey aerial mycelium; colony colourless to grey olivaceous; reverse olivaceous buff to grey olivaceous.

MA: growth rate 30–50 mm, regular, with finely floccose to woolly, white to olivaceous grey-dull green aerial mycelium; colony greenish olivaceous to grey olivaceous, at centre olivaceous black; reverse similar, with leaden grey.

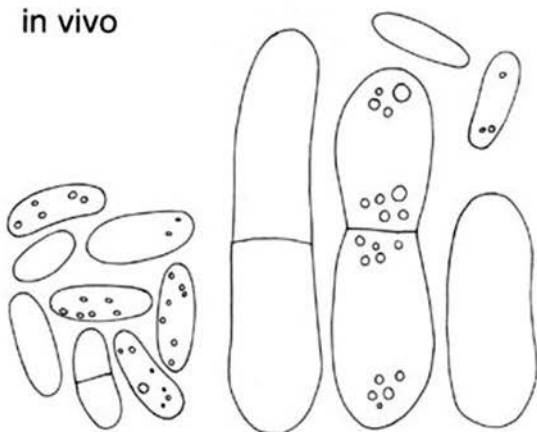
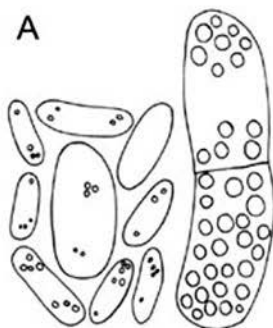
CA: growth rate 21–49 mm, regular, with finely floccose, pale olivaceous grey to grey olivaceous aerial mycelium; colony grey olivaceous to olivaceous-olivaceous black, buff at the margin; reverse similar, with leaden black.

Pycnidia abundant, on and in the agar, and in aerial mycelium, 90–300 µm diam., globose to subglobose, solitary or aggregated, glabrous, with 1–2 ostioles; citrine to honey,

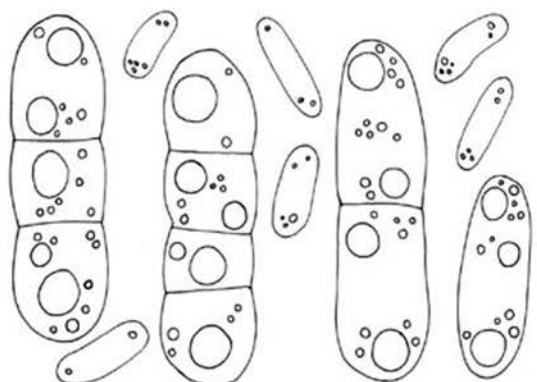
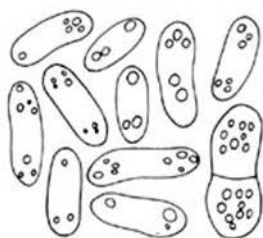
in vitro

in vivo

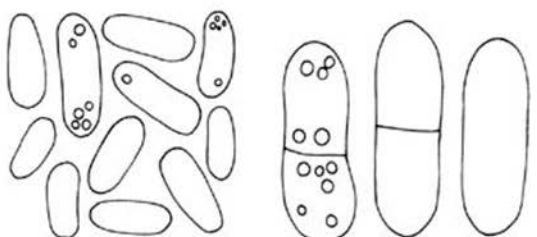
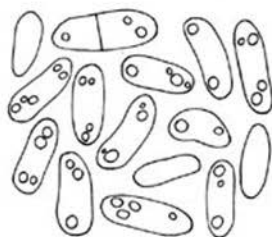
A



B



C



later olivaceous to olivaceous black; walls made up of 2–4 layers of cells, outer layers pigmented; conidial exudate rosy buff to salmon-saffron. Micropycnidia also present, 30–70 µm diam. Conidiogenous cells 4–8 × 4–6 µm, globose to bottle-shaped. Conidia of two types: aseptate conidia, 4–15 × 1.5–5 µm, av. 5.7–8.5 × 2.0–3.2 µm, Q = 1.6–4.8, av. Q = 2.7–2.9, ellipsoidal to fusiform-allantoid, usually with several guttules, 1-septate conidia 15.5–22 × 4–5 µm, av. 18.2 × 4.5 µm, Q = 3.2–5.3, av. Q = 4.1 (ascochytoid).

Chlamydospores absent, but clusters of dark swollen cells may be present.

NaOH spot test: a weak greenish bluish discoloration may occur, but does not change to red (E-negative).

Description in vivo (especially on *Delphinium consolida*)

Pycnidia (subepidermal scattered in dark brown leaf spots, also superficial on capsules and old stems), mostly 120–270 µm diam., globose to subglobose, initially light brown, then black, with 1(–3) distinct non-papillate ostiole(s). The conidia may be all aseptate phomoid, (3–)4–7.5 × 1.5–2.5 µm, but often they are mixed with some larger, ultimately septate conidia, 15–22(–25) × 4–5(–5.5) µm. Sometimes these large, 1(–2)-septate ascochytoid conidia predominate, synanamorph: *Stagonosporopsis delphinii*.

Ecology and distribution. Most records of this fungus are on species of *Delphinium* (inclusive *Consolida*) in Europe. In Russia it has also been reported from a species of *Aconitum* (same tribus as *Delphinium*). The most common host seems to be Forking Lakspur, *D. consolida* (*Consolida regalis*). The fungus causes angular, often marginal, dark leaf spots and appears as necrophyte on capsules and old stems. It closely resembles *Phoma aquilegiicola* (synanam. *Stagonosporopsis aquilegiae*), no. 6 in this paper, which also may occur on *Delphinium* and *Aconitum* spp. *Phoma delphinii* can be easily differentiated in vitro from *P. aquilegiicola* by its slower growth rate, the negative E-reaction and different shape and size of the conidia (compare the figures 3A and 4A).

Finally it should be noted that frequently also a *Phoma* species of the section '*Macrospora*' occurs on *Delphinium* spp. in Europe (Boerema, in prep.), which may produce large 1-septate conidia.

Cultures studied. CBS 134.96 (PD 84/676) ex *Delphinium consolida*, the Netherlands.

Note. In the '*Ascochyta*-monograph' by Melnik (1977) *Stagonosporopsis delphinii* Lebedeva (l.c.) is erroneously listed as a synonym of '*Ascochyta*' (*Stagonosporopsis*) *actaeae* (treated in this paper under *Phoma actaeae*, no. 3). Melnik's interpretation was apparently based on the similarity in conidial dimensions of both pathogens, but they clearly differ in their cultural characters.

Fig. 4. A. *Phoma delphinii*. Conidia in vitro mostly aseptate and notably variable in shape and size, but always including a number of large 1-septate conidia. Pycnidia in vivo may contain mainly aseptate conidia, but these are usually less variable than in vitro; most conidia, however, may also be large and 1(–2)-septate; synanamorph *Stagonosporopsis delphinii*. — B. *Phoma subboltshauseri*. Conidia in vitro phomoid, mostly aseptate, occasionally 1-septate. Conidia in vivo, predominantly large and 1–3(–5)-septate, synanamorph *Stagonosporopsis hortensis*; but the pycnidia usually also contain some small aseptate conidia. — C. *Phoma trachelii*. Conidia in vitro, phomoid, usually aseptate, occasionally the larger ones 1-septate. Conidia in vivo, sometimes all relatively small and aseptate (phomoid), but usually much larger, 0–1(–2)-septate; synanamorph *Stagonosporopsis bohémica*. Bar 10 µm.

9. *Phoma subboltshauseri* Boerema, de Gruyter & Noordel., *spec. nov.* — Fig. 4B

Conidial dimorph large, 1–3(–5)-septate. Stagonosporoid: *Stagonosporopsis hortensis*, see below.

Pycnidia in vitro 90–230 µm diam., globosa vel subglobosa, solitaria, nonnumquam confluentia, glabra, uno ostiolo non-papillato aperientia. Cellulae conidiogenae 4–8 × 3–7 µm, globosae cellageniformes. Conidia plerumque unicellularia, 3.5–9 × 1.5–2.5 µm, cylindrica vel ellipsoidea, una vel compluribus guttulis utrinque praedita. [Nonnumquam conidia paulo maiora, 1-septata praesentia, 11 × 3.5 µm.]

Holotypus L 992.165-395 cultura exsiccata, viva CBS 380.96 (PD 71/604), isolatus e macula foliari ad *Phaseolum vulgarem*, Wageningen in Neerlandia, Julio 1971.

Synanamorph: *Stagonosporopsis hortensis* (Sacc. & Malbr.) Petrak, *Annls mycol.* 19 (1921) 21. — *Hendersonia hortensis* Saccardo & Malbranche, *Michelia* 2 (3) (1882) 629 [as '*Hendersonia (Stagonospora) hortensis*']. — *Stagonospora hortensis* (Sacc. & Malbr.) Saccardo & Malbranche, *Sylloge Fung.* 3 (1884) 446. — *Ascochyta hortensis* (Sacc. & Malbr.) Jörstad [Jørstad], *Meld. St. plpatol. Inst.* 1 (1945) 74; not *Ascochyta hortensis* Kabát & Bubák, *Hedwigia* 44 (1905) 353.

Stagonosporopsis boltshauseri (Sacc.) Diedicke, *Annls mycol.* 10 (1912) 141–142; *Krypt.-Fl. Mark Brandenb.* 9, *Pilze* 7 (1912) 400. — *Ascochyta boltshauseri* Saccardo in Boltshausen, *Z. PflKrankh.* 1 [Midsummer] (1891) 136. — *Stagonospora boltshauseri* (Sacc.) Grigoriu, *Annls Inst. phytopath. Benaki* II, 11 (1975). — *Phoma boltshauseri* (Sacc.) Boerema, Pieters & Hamers, *Neth. J. Pl. Path.* 99, *Suppl.* 1 (1993) 17 [proposed with the intention to cover both conidial phenotypes].

Stagonopsis phaseoli Eriksson, *Bot. Cent. [Zentbl.]* 12 [47, Sept.] (1891) 298.

Selected literature. Grigoriu (1975), Boerema & Verhoeven (1979), Boerema, Pieters & Hamers (1993).

Description in vitro

OA: growth rate 46–57 mm, regular, with coarsely floccose, white to olivaceous grey aerial mycelium; colony greenish olivaceous, grey olivaceous or dull green, margin usually more like citrine green; reverse olivaceous at centre, towards margin greenish olivaceous, grey olivaceous to citrine green.

MA: growth rate 52–54 mm, regular to somewhat irregular, with compact woolly-floccose, white to pale olivaceous grey aerial mycelium; colony greenish olivaceous to grey olivaceous, margin citrine green; reverse olivaceous black with leaden grey patches, margin grey olivaceous to citrine green.

CA: growth rate 46–62 mm, regular to irregular, with floccose to woolly, white to grey olivaceous aerial mycelium; colony grey olivaceous to olivaceous; reverse olivaceous-ochraceous with fuscous black or grey olivaceous patches, sometimes also leaden grey.

Pycnidia on or in the agar, and in aerial mycelium, 90–230 µm diam., globose to subglobose, solitary, sometimes confluent, glabrous, with one non-papillate ostiole; honey to olivaceous later olivaceous black; walls made up of 2–5 layers, outer layer pigmented; conidial exudate white to buff. Micropycnidia usually also present, 30–70 µm diam. Conidiogenous cells 4–8 × 3–7 µm, globose to bottle-shaped. Conidia usually aseptate, 3.5–9 × 1.5–2.5 µm, av. 5.8–6.2 × 2.1–2.2 µm, Q = 1.8–4.2, av. Q = 2.7–2.9, cylindrical to ellipsoidal, 1–several small guttules, at each end. Occasionally some 1-septate conidia are formed, up to 11 × 3.5 µm.

Chlamydospores absent.

NaOH spot test: negative, but on MA a non-specific reddish brown discoloration may occur.

Crystals absent.

Description in vivo (on *Phaseolus vulgaris*)

Pycnidia (subepidermal in concentric rings on reddish-brown leaf spots; and occasionally scattered in sunken dark reddish-brown lesions on stems and pods) mostly 100–200 µm diam., globose to subglobose with 1 distinct ostiole. Large conidia always predominate and are 1–3(–5)-septate, i.e. stagonosporoid, typical of the synanamorph *Stagonosporopsis hortensis*: cylindrical with obtuse ends, constricted at the septa and usually with four large and several small guttules, mostly (16–)18–22(–34) × (4–)5–8(–9) µm. Usually the pycnidia also contain some relatively small aseptate conidia, 5–10 × 1.5–2.5 µm, resembling those of *Phoma subbolshauseri* in vitro.

Ecology and distribution. A world-wide pathogen of dwarf beans (*Phaseolus vulgaris*), causing stunting and red-brown blotches on stems, leaves and pods: Leaf Spot Disease. Recently the fungus has also been found on cowpea, *Vigna unguiculata*; this is not surprising because the African genus *Vigna* and the American genus *Phaseolus* are closely related and susceptible to their mutual pathogens.

Cultures studied. CBS 572.85 (PD 79/269) and CBS 131.96 (PD 79/1158) ex *Phaseolus vulgaris* (Leguminosae), the Netherlands; CBS 130.96 (PD 87/525) ex *Phaseolus vulgaris* (Leguminosae), Colombia.

10. *Phoma trachelii* Allescher — Fig. 4C

Conidial dimorph large, 1(–2)-septate. Ascocythoid: *Stagonosporopsis bohémica*, see below.

Phoma trachelii Allescher, Fungi bavar. exs. [Ed. Allescher & Schnabl] Cent. 4 (1894) No. 360; Allg. bot. Z. 1 (1895) 26.

Phyllosticta alliariae-foliae Allescher, Rabenh. Krypt.-Fl. [ed. 2] Pilze 6 [Lief. 60] (1898 [vol. dated '1901'] 109. — *Phyllosticta fallax* Allescher, Hedwigia 36 (1897) 159; not *Phyllosticta fallax* Saccardo & Roumeguère, Michelia 2 (3) (1882) 620.

Synanamorph: *Stagonosporopsis bohémica* (Kabát & Bubák) *comb. nov.*

Ascochyta bohémica Kabát & Bubák in Bubák & Kabát, Hedwigia 44 (1905) 352–353 (basonym; cf. Kabát & Bubák, Fungi imp. exs. No. 261 in B). — *Stagonospora bohémica* (Kabát & Bubák) Tobisch, Öst. bot. Z. 83 (1934) 142.

Selected literature. Sauthoff (1962), Boerema & Bollen (1975).

Description in vitro

OA: growth rate 41–45 mm, regular, initially with white, floccose aerial mycelium, but without obvious aerial mycelium after 14 days; colony rather colourless, but with greenish grey olivaceous centre, or with grey olivaceous to olivaceous sector; reverse similar.

MA: growth rate 29–51 mm, irregular, with rather compact woolly-floccose, olivaceous grey aerial mycelium; colony olivaceous grey to grey olivaceous or olivaceous black, with nearly colourless margin; reverse similar.

CA: growth rate 60–66 mm, regular, with poorly developed, finely velvety, white to pale olivaceous grey aerial mycelium; colony colourless with grey olivaceous, olivaceous or olivaceous black sectors; reverse similar.

Pycnidia abundant, mostly on, or partly in the agar, 110–300 µm diam., globose or compressed to more or less bottle-shaped, solitary or confluent, glabrous, with 1 to 3 distinct, papillate ostioles, sometimes with elongated necks; citrine to honey, later olivaceous to olivaceous black; walls made up of 3–7 layers of cells, outer layers pigmented, conidial

exudate sordid white to pale vinaceous-buff. Conidiogenous cells 4–8 × 3–7 µm, globose to bottle-shaped, thin-walled. Conidia usually aseptate, 4–8.5 × 1.5–3 µm, av. 5.6 × 1.9 µm, Q = 2.2–4.0, av. Q = 3.0, ellipsoidal to cylindrical, sometimes eguttulate but usually with distinct polar guttules. Occasionally some 1-septate conidia occur, 7–16 × 2–3.5 µm (i.e. intermediate between the common aseptate conidia and the large septate ascochyoid conidia found *in vivo*).

Chlamydospores absent.

NaOH spot test: negative.

Crystals absent.

Description in vivo (especially on *Campanula isophylla*)

Pycnidia (subepidermal, usually concentrically arranged in large grey brown to black leaf spots; also on roundish or elongated lesions on petals and stems) resembling those *in vitro*, mostly 75–255 µm diam., depressed globose to ellipsoidal, with 1, only slightly papillate dark bordered ostiole. Conidia sometimes all relatively small and aseptate, similar to those of *Phoma trachelii* *in vitro*. However, the pycnidia may also contain many large conidia, which mostly become 1(–2)-septate. These ascochyoid conidia are cylindrical in shape, rounded at both ends, often slightly curved and mostly eguttulate, (11–)13–23 × 4–6 µm. The mature 1-septate conidia easily break into two parts and are typical of the synanamorph *Stagonosporopsis bohémica*. Together with the ascochyoid conidia some small aseptate phomoid conidia usually occur (see note).

Ecology and distribution. A common seed-borne pathogen of wild and cultivated species of *Campanula* and *Trachelium* in Eurasia and in North and South America. Found most frequently on *C. isophylla* 'Alba', the 'Star of Bethlehem'; causing Leaf, Stem and Flower Spot.

Cultures studied. CBS 379.91 (PD 77/675) ex *Campanula isophylla* (Campanulaceae), the Netherlands; CBS 380.91 (PD 88/162) ex *Trachelium* sp. (Campanulaceae), the Netherlands.

Note. Experiments by Sauthoff (l.c.) have shown that the phomoid aseptate conidia develop at high humidity, whereas the large septate ascochyoid conidia are produced at varying humidity and with desiccation. This links up with an observation we made *in vitro*. In pycnidia of an old plate culture on OA the conidiogenous layer had many large cylindrical cells resembling initials of the large conidial phenotype; however, wetting the pycnidia, these cells became phialidic conidiogenous cells producing numerous small aseptate conidia (Boerema & Bollen l.c.: fig. 6c). The large septate conidia germinated much more quickly than the small aseptate conidia.

11. *Phoma samarorum* Desm. — Fig. 5

Conidial dimorph large, 1–3-septate. Stagonosporoid: *Stagonosporopsis fraxini* (Allscheuer) Died., see below.

Phoma samarorum Desmazières, Pl. cryptog. N. France [ed. 1] Fasc. 7 (1828) No. 349. — *Phomopsis samarorum* (Desm.) Höhnelt, Hedwigia 62 (1921) 87 [misapplied]. — *Diplodina samarorum* (Desm.) Nevo-dovsky, Fungi of the USSR Fasc. 1 (1952) No. 14 [as 'samarorum']. — *Septoria samarorum* (Desm.) Wollenweber & Hochapfel, Z. ParasitKde 8 (1936) 604. — *Stagonospora samarorum* (Desm.) Boerema, Persoonia 6 (1970) 25.

Phoma fusispora Wehmeyer, Mycologia 38 (1946) 320–321 (holotype Herb. Wehmeyer No. 1090).

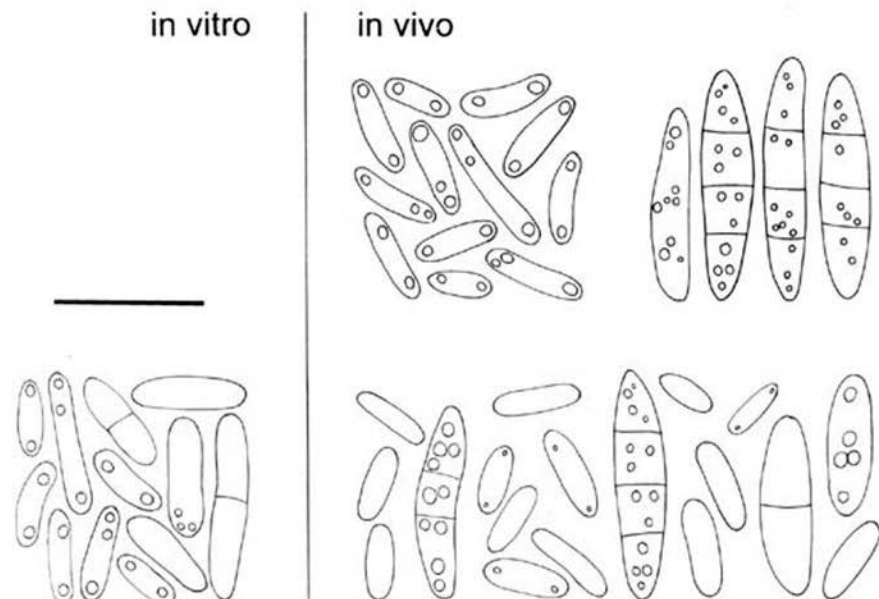


Fig. 5. *Phoma samarorum*. Conidia in vitro, phomoid and variable, mainly aseptate, but the larger ones often 1(-2)-septate. Conidia in vivo, sometimes mostly aseptate phomoid and sometimes mainly larger, fusoid in shape and 1-3-septate; synanamorph *Stagonosporopsis fraxini*. However, mixtures with various intermediate conidia forms may also occur. Bar 10 μ m.

Synanamorph: *Stagonosporopsis fraxini* (Allischer) Diederich, Krypt.-Fl. Mark Brandenb. 9, Pilze 7 (Heft 2) (1912) 399 [as '(Oud.) Died.'; description literally adopted from Allischer, see after this]. — *Diplodina fraxini* Allischer, Rabenh. Krypt.-Fl. [ed. 2], Pilze 6 (Lief. 69) (1899 [vol. dated '1901']) 687 [based on *Ascochyta fraxini* Oudemans, Ned. kruidk. Archf II, 5 (1889) 497, but the latter name is illegitimate as a later homonym of *Ascochyta fraxini* Libert, Pl. cryptog. Ard. Fasc. 1 (1830) No. 48; the resultant combination therefore has to be treated as a new name dating from 1899 (Art. 72.1)]. — *Ascochyta fraxini* (Allischer) Petrak in H. Sydow & P. Sydow, Annl. mycol. 22 (1924) 266 [as '(Oud.)']. — *Pseudodiplodia fraxini* (Allischer) Petrak, Sydowia 7 (1953) 304 [as '(Oud.)'].

For other synonyms see Boerema & Dorenbosch (1973).

Description in vitro

OA: growth rate 21-27 mm (14 days: 47-52 mm), regular, with felted to finely floccose-woolly, white aerial mycelium; colony colourless to primrose or rosy buff to salmon, due to a diffusible pigment, later with olivaceous grey tinges; reverse similar.

MA: growth rate 21-23 mm (14 days: 30-41 mm), regular, with compact finely floccose to woolly, white to pale olivaceous grey or smoke grey aerial mycelium; colony buff to olivaceous grey with straw to citrine green centre; reverse similar with saffron to luteous centre, partly tinged bluish green.

CA: growth rate 25-27 mm (14 days 50-51 mm), regular, with finely floccose to woolly, white to citrine green or glaucous aerial mycelium; colony pale olivaceous grey to citrine green-dull green in centre, margin colourless; reverse saffron with dark herbage green to dull green, olivaceous patches.

Pycnidia on the agar, 120–270 µm diam., globose to irregularly shaped, solitary or confluent to large pycnidial bodies up to 900 µm, with mycelial outgrowths, and 1–3 usually papillate ostioles, sometimes developing long necks, honey to olivaceous black, walls made up to 10 layers of cells, outer layers pigmented; conidial exudate ochraceous. Conidiogenous cells 3–5 × 3–7 µm, subglobose to bottle-shaped. Conidia mainly aseptate, mostly 4–8.5 × 1.5–3 µm, av. 6.0 × 2.2 µm, Q = 1.4–4.0, av. Q = 2.8, sometimes larger and often 1(–2)-septate, 7–16 × 2–3 µm, slightly yellowish, with or without distinct polar guttules, ellipsoidal to cylindrical, usually attenuate at one end.

Chlamydospores absent.

NaOH spot test: negative.

Crystals absent.

Description in vivo

Pycnidia (in necrotic host tissue) resemble those in vitro, usually solitary, often with interwoven hyphae and obvious papillate ostioles. The conidia always show the characteristic yellow tinge as noted above; they are much more variable in size and shape than those in vitro, sometimes fusoid. Pycnidia may contain only aseptate conidia, 5.5–10 × 1.5–3 µm, only 1–3-septate conidia, up to 17 × 3.5 µm, or a mixture of both types of conidia. Sometimes the conidia are explicitly large, 17–25 × 2.5–3.5 µm. They may be distinctly guttulate, but also eguttulate.

Ecology and distribution. The sources of the isolates indicate that it is a common saprophytic soil fungus in the whole of Eurasia. The fungus also has been isolated and described from different substrata in North America (USA). It has been found on necrotic tissue of quite different herbaceous and gramineous plants as well as deciduous trees and shrubs. The epithet of the species refers to key-fruits (samarae) of ash.

Cultures studied. CBS 138.96 (PD 82/653) ex *Phlox paniculata* (Polemoniaceae), the Netherlands; CBS 139.96 (PD 82/905) ex undetermined Gramineae, the Netherlands.

Addendum (12–19)

12. *Phoma ligulicola* Boerema var. *ligulicola*

Conidia usually of normal phomoid size with secondary septation (sect. *Phyllostictoides*), but sometimes distinctly large, aseptate or 1(–2)-septate (ascochytoid) conidia occur.

Teleomorph: *Didymella ligulicola* (Baker et al.) von Arx, var. *ligulicola*

Phoma ligulicola Boerema in Van der Aa, Noordeloos & de Gruyter, Stud. Mycol. 32 (1990) 9, var. *ligulicola*. — *Ascochyta chrysanthemi* F.L. Stevens, Bot. Gaz. 44 (1907) 246; not *Phoma chrysanthemi* Voglino, Malpighia 15 (1902) 332.

For nomenclature see Van der Aa, Noordeloos & de Gruyter (1990).

Characters in vitro

A detailed description in vitro will be given under sect. *Phyllostictoides* (in prep.). A distinctive taxonomic characteristic in that section is the usual presence of some 1-septate conidia of normal phomoid size. The aseptate conidia of this species are mostly 3.5–7.5 (–12) × 2–3(–4) µm (av. 5.4–5.6 × 2.4–2.5 µm), ellipsoidal to oblong, with several small

guttules. The dimensions of the 1-septate conidia usually range between $9-15 \times 3-5 \mu\text{m}$ (av. $11.3 \times 3.5 \mu\text{m}$), but sometimes they are distinctly large, up to $23 \times 8 \mu\text{m}$. Pseudothecia have not been observed in vitro.

Characters in vivo (on *Chrysanthemum morifolium* [indicum])

Conidia from pycnidia on the host (in black leaf blotches and stem lesions, blackened petals) are mostly irregular, cylindrical-ellipsoidal and extremely variable in size, usually either aseptate (10–40%), (6–)8.5–13(–22) \times 2.5–8 μm , or 1(–2)-septate, (9–)13–15.5(–23) \times (3–)4–5(–6.5) μm . Pseudothecia occur only occasionally.

Ecology and distribution. A specific pathogen of florists' chrysanthemum, *Chrysanthemum morifolium* (Compositae), at present occurring nearly everywhere the host is cultivated. The disease is known as Chrysanthemum Ray (flower) Blight, but all plant parts, roots, stems, leaves and flowers may be attacked. Cuttings, being easily infected, are the main cause of the world-wide spread of the fungus.

Representative culture. CBS 137.96 (PD 84/75) ex *Chrysanthemum morifolium* (Compositae), the Netherlands.

13. *Phoma protuberans* Lév.

Conidia mostly of normal phomoid size with secondary septation (sect. *Phyllostictoides*), but occasionally in vitro some distinctly large, 1-septate (ascochytoid) conidia occur.

Phoma protuberans Léveillé, *Annls Sci. nat. (Bot.)* III, 5 (1846) 281.

Phyllosticta lycii Ellis & Kellerman, *Am. Nat.* 17 (1883) 1166.

Characters in vitro

A detailed description will appear under sect. *Phyllostictoides* (in prep.). The usual presence of some 1-septate conidia, at times becoming extremely large (ascochytoid) in agar-cultures, is distinctive. The common aseptate or 1-septate conidia are $4-10.5 \times 2-5 \mu\text{m}$, ellipsoidal to subcylindrical and without guttules. The occasional large ascochytoid conidia (up to $12-20.5 \times 3.5-5 \mu\text{m}$) usually have some guttules.

Characters in vivo (on *Lycium halimifolium*)

The pycnidia (scattered in circular leaf spots, initially brown but turning pale-yellow or whitish) usually produce mainly variably sized aseptate conidia with only a few 1-septate ones, $6-10 \times 2-3 \mu\text{m}$. Large ascochytoid conidia are so far not recorded in the fields.

Ecology and distribution. A specific pathogen of *Lycium halimifolium* occasionally found in Europe and North America, causing Leaf Spot. The shrubby solanaceous host is indigenous to southern Eurasia; the fungus probably occurs wherever the host has become naturalized or planted.

Representative culture. CBS 381.96 (PD 71/706) ex *Lycium halimifolium* (Solanaceae), the Netherlands.

14. *Phoma cucurbitacearum* (Fr.: Fr.) Sacc.

Conidia usually of normal phomoid size with secondary septation (sect. *Phyllostictoides*), but in vivo some strains also produce distinctly large, 1-septate (ascochytoid) conidia.

Teleomorph: *Didymella bryoniae* (Auersw.) Rehm

Phoma cucurbitacearum (Fr.: Fr.) Saecardo, Sylloge Fung. 3 (1884) 148. — *Sphaeria cucurbitacearum* Fries; Fries, Syst. mycol. 2 [Sect. 2] (1823) 502 [type material not known to be extant; the anamorphic interpretation is confirmed by a collection of *S. cucurbitacearum* Fr. in Schweinitz's herbarium, PH, being predominantly anamorphic with only a few immature ascogonia].

Ascochyta cucumis Fautrey & Roumeguère, Revue mycol. 13 (1891) 79.

Full synonymy will be given under section *Phyllostictoides* (in prep.).

Characters in vitro

A detailed description *in vitro* will appear under sect. *Phyllostictoides*. The presence of some 1-septate normal phomoid sized conidia and the occasional development of pseudothecia in the cultures are distinctive features.

Aseptate conidia, mostly $4-8 \times 2-3 \mu\text{m}$ (av. $5.3 \times 2.2-2.3 \mu\text{m}$), ellipsoidal to cylindrical with several small guttules. The 1-septate conidia are usually at most $10 \times 4.5 \mu\text{m}$, but the observations *in vivo* (see below) suggest that some strains may produce larger, ascochytoïd conidia up to $20-24 \mu\text{m}$ in length.

Characters in vivo (Cucurbitaceae)

Pycnidia (in yellow-brown lesions on stems and leaves, also on infected seedlings and in dark, cracked, sunken lesions on fruits) usually followed by pseudothecia. Conidia variable in size and septation. Sometimes mostly aseptate with some 1-septate and a few 2-septate; but usually 1(-2)-septate, with a small percentage unicellular. Commonly (6-) $8-10(-13) \times (2.5-)3-4(-5) \mu\text{m}$, but with some strains producing extremely large 1-septate ascochytoïd conidia up to $20-24 \times 4-5 \mu\text{m}$. On seed coats pycnidia usually contain only small aseptate conidia, resembling those *in vitro*.

Ecology and distribution. A world-wide seed-borne pathogen of Cucurbitaceae causing the disease, known as Gummy Stem Blight, which includes various symptoms such as leaf spot, stem canker, vine wilt and black fruit rot.

Representative culture. CBS 133.96 (PD 79/127) ex *Cucurbita pepo* (Cucurbitaceae), New Zealand.

15. *Phoma alectorolophi* Boerema, de Gruyter & Noordel., *spec. nov.*

Pycnidia sclerophomoid (sect. *Sclerophomella*).

Conidia usually of normal phomoid size, with occasionally some distinctly large, 1-septate (ascochytoïd) conidia.

Teleomorph: *Didymella alectorolophi* Rehm

Pycnidia *in vitro* $90-310 \mu\text{m}$ diam., globosa vel forma irregularia, uno vel duobus poris, saepe indistinctis, nonnumquam papillatis aperientia, fere crassitunicata. Cellulae conidiogenae $4-7 \times 5-9 \mu\text{m}$, lageniformes. Conidia plerumque unicellularis, forma et magnitudine variabilia, plerumque $4-7.5 \times 2-3.5 \mu\text{m}$, cylindrica vel oblonge ellipsoidalia, nonnullis guttulis parvis praedita vel eguttulata. Nonnumquam pauca conidia maiora, ellipsoidea vel ovoidea, extra medium uniseptata, $(10-)14-18 \times (4-)5-6(-8) \mu\text{m}$, praesentia.

Holotypus L 992.167-515 cultura exsiccata, viva CBS 132.96 (PD 93/853) isolatus e calyce exsiccato *Rhinanthi angustifolii*, Wageningen in Neerlandia, Junio 1993.

Characters in vitro

A detailed description will be given under sect. *Sclerophomella* (in prep.). Distinguished by the initially closed pycnidia, which are relatively thick-walled and pseudoparenchymatous (contents of inner hyaline wall cells stain red with JKJ). The conidia are usually aseptate, variable in size, $4-9(-14) \times 2-6 \mu\text{m}$, but mostly $4-7.5 \times 2-3.5 \mu\text{m}$ (av. $5.2-$

$6.0 \times 2.2-2.8 \mu\text{m}$), cylindrical to oblong ellipsoidal, with or without a few small guttules. Occasionally some large 1-septate ascochytoïd conidia occur, $(10-14-18 \times (4-5-6(-8) \mu\text{m}$, ellipsoidal or ovoid, septum usually not medianly.

Characters in vivo (on semi-parasitic Scrophulariaceae)

Pycnidia (on dry calyces, capsules, peduncles and stems) usually followed by pseudothecia (single identity proved by Corbaz, 1957); pycnidial primordia stromatic ('pynco-sclerotia'), often indistinguishable from immature ascocarps. Conidia mostly oval to cylindrical and less variable than those in vitro, $(4-5-7(-9) \times 2-2.5(-4) \mu\text{m}$. Large ascochytoïd conidia have so far only been found occasionally in old pycnidia.

Ecology and distribution. The records of this fungus are on dead tissue of various semi-parasitic Scrophulariaceae in Europe: species of *Melampyrum*, *Rhinanthus* and *Pedicularis*. Immature ascomata have been reported under different Coelomycete names, e.g. as '*Phoma deusta* Fuckel' and '*Phoma melampyri* Karsten'.

Representative culture. CBS 132.96 (PD 93/853) ex *Rhinanthus angustifolius* (Scrophulariaceae), the Netherlands.

16. *Phoma dictamnica* Boerema, de Gruyter & Noordel.

Pycnidia sclerophomoid (sect. *Sclerophomella*).

Conidia of normal phomoid size, but in vivo also distinctly large and mainly 1-septate (ascochytoïd). Chlamydo-spores solitary or catenate.

Phoma dictamnica Boerema, de Gruyter & Noordeloos in de Gruyter & Noordeloos, Persoonia 15 (1) (1992) 90-91. — *Ascochyta nobilis* Kabát & Bubák, Öst. bot. Z. 54 (1904) 3; not *Phoma nobilis* Saccardo, Michelia 2 (3) (1882) 16 [= *Phomopsis* sp.].

Additional data in the provisional treatment under sect. *Sclerophomella* in Contribution I-1 no. 20 (de Gruyter & Noordeloos, 1992).

Characters in vitro

A detailed description in vitro is given in Contribution I-1. Most distinctive are the subglobose, initially closed thick-walled pycnidia, greenish olivaceous in colour. Conidia relatively small, always aseptate, $4-5.5 \times 1.5-2.5 \mu\text{m}$ (av. $4.6 \times 1.8 \mu\text{m}$), ellipsoidal to reniform, eguttulate. Usually intercalary chains of chlamydo-spores develop.

Characters in vivo (on *Dictamnus albus*)

The pycnidia in host tissue (irregular leaf spots and dead stems) are subglobose-conical with a central pore, dark brown to black in colour. The conidia may be extremely variable. Those from pycnidia on dead stems are usually aseptate, $4-5 \times 2 \mu\text{m}$, resembling conidia in vitro, but sometimes also larger, $6-8 \times 3-4 \mu\text{m}$ and then often 1-septate. The pycnidia on leaf spots always contain relatively large conidia, usually some aseptate, $(8-11-14(-14.5) \times 3-3.5 \mu\text{m}$, but most ascochytoïd, 1(-2)-septate, $13.5-15.5(-16) \times 3.5-4(-4.5) \mu\text{m}$.

Ecology and distribution. A specific pathogen of the 'firework plant', *Dictamnus albus* (Rutaceae), frequently recorded in Eurasia and North America. The fungus causes a Leaf Spot, white or light-brown irregular spots on the tips or margins of the leaves. Pycnidia on dead stems may enable the fungus to survive from one season to the next.

Representative culture. CBS 507.91 (PD 74/148) ex *Dictamnus albus* (Rutaceae), the Netherlands.

17. *Phoma complanata* (Tode: Fr.) Desm.

Pycnidia sclerophomoid (sect. *Sclerophomella*).

Conidia of normal phomoid size, but in some strains distinctly large and 1-septate (ascochytoïd) also occur.

Phoma complanata (Tode: Fr.) Desmazières, *Annls Sci. nat. (Bot.)* III, 16 (1851) 299–300. — *Sphaeria complanata* Tode, *Fungi mecklenb. Sel.* 2 (1791) 22; Fries, *Syst. mycol.* 2 [Sect. 2] (1823) 508. — *Sclerophomella complanata* (Tode: Fr.) Höhnelt, *Hedwigia* 59 (1918) 238.

Full synonymy will appear under sect. *Sclerophomella*, for which it represents the type (Boerema, in prep.).

Characters in vitro

A detailed description will be given later. Most distinctive are the massive pycnidia, initially closed, at first yellow-brown, ultimately black. The conidia are variable in shape and dimensions, mainly aseptate, $(3-4-10(-11) \times (1.5-2-3(-4) \mu\text{m})$, but in some strains also 1-septate and then often much larger, $(10-20-34 \times (4-6-10 \mu\text{m})$, thus ascochytoïd; they are usually ellipsoidal to cylindrical, but also fusiform or globose, eguttulate or with several small guttules.

Characters in vivo (Umbelliferae)

Pycnidia (on dead stems and in lesions on leaves, petioles and roots) often contain only aseptate ellipsoidal conidia, mostly between $5-9 \times 2-3.5 \mu\text{m}$, but in some strains a high percentage of the conidia becomes larger and 1-septate, often $10-15 \times 2.5-3.5 \mu\text{m}$. Pycnidia on old stem lesions may contain distinctly large 1-septate ascochytoïd conidia, often $27 \times 8 \mu\text{m}$, resembling those sometimes found in vitro. In pycnidia from stored root tissue, many swollen, dark septate conidia may occur.

Ecology and distribution. In temperate Eurasia and North America a very common fungus on the previous year's dead stems of wild Umbelliferae. A seed-borne pathogen, it is known on parsnip (*Pastinaca sativa*), parsley (*Petroselinum crispum*) and carrot (*Daucus carota*) causing Canker (lesions on petioles and roots) and a Leaf Spot.

Representative culture. CBS 268.92 (PD 75/3) ex *Angelica sylvestris* (Umbelliferae), the Netherlands.

18. *Phoma clematidina* (Thümen) Boerema

Conidia of normal phomoid size, but in vivo some are also distinctly larger and 1(-2)-septate (ascochytoïd).

Chlamydospores uni- and multicellular (sect. *Peyronellaea*).

Phoma clematidina (Thümen) Boerema in Boerema & Dorenbosch, *Versl. Meded. plziektenk. Dienst Wageningen* 153 (Jaarb. 1978) (1979) 17–18. — *Ascochyta clematidina* Thümen, *Bull. Soc. imp. Nat. Moscou* 55 (1880) 98.

For additional synonyms see the treatment under sect. *Peyronellaea*, Contribution II no. 11 (Boerema, 1993).

Characters in vitro

A description in vitro is given in Contribution II. Most distinctive are the irregular dictyo/phragmosporous chlamydospores, $3-50 \times 12-25 \mu\text{m}$, usually with some unicellular chlamydospores, $8-10 \mu\text{m}$ in diam. Conidia mostly $(3.5-4-8.5(-9) \times 2-3(-3.5) \mu\text{m})$,

occasionally larger and 1-septate, $9-13 \times 3-4 \mu\text{m}$, subellipsoidal to cylindrical, usually guttulate.

Characters in vivo (Clematis spp.)

Pycnidia (subepidermal in leaf spots, also in stem lesions and on dead stubs) may contain conidia quite different in size. They are generally phomoid, but larger than those in vitro, aseptate or 1-septate, $(6-8-10(-13) \times 3-4 \mu\text{m}$ (av. $9.5 \times 3.2 \mu\text{m}$). Sometimes, however, the septate conidia are considerably larger, i.e. ascochytoïd, $(10-12-22(-28) \times 4.5-6(-6.5) \mu\text{m}$ (av. $18.5 \times 5.8 \mu\text{m}$). In old pycnidia the conidia become dark and occasionally 2-septate.

Ecology and distribution. Frequently found in association with leaf spots and stem lesions on naturally-wilting cultivars and hybrids of *Clematis* spp. in Eurasia, Australasia and North America.

Representative culture. CBS 108.79 (PD 78/522) ex *Clematis* sp. (Ranunculaceae), the Netherlands.

19. *Phoma narcissi* (Aderh.) Boerema, de Gruyter & Noordel.

Conidia of normal phomoid size, but in vivo some are also distinctly larger and mostly 3-septate (stagonosporoid): synanamorph *Stagonosporopsis curtisii*.

Chlamydospores uni- and multicellular (sect. *Peyronellaea*).

Phoma narcissi (Aderh.) Boerema, de Gruyter & Noordeloos in Boerema, Persoonia 15 (2) (1993) 215.

— *Phyllosticta narcissi* Aderhold, Centbl. [Zentbl.] Bakt. ParasitKde Abt. 2, 6 (1900) 632-633.

Synanamorph: *Stagonosporopsis curtisii* (Berk.) Boerema in Boerema & Dorenbosch, Versl. Meded. plziekten. Dienst Wageningen 157 (Jaarb. 1980) (1981) 19-20. — *Stagonospora curtisii* (Berk.) Saccardo, Sylloge Fung. 3 (1884) 451. — *Hendersonia curtisii* Berkeley in Cooke, Nuovo G. bot. ital. 10 (1878) 19 [‘Berk., herb. Curt.’]; not *Phoma curtisii* Saccardo, Sylloge Fung. 3 (1884) 860.

For additional synonyms see the treatment under sect. *Peyronellaea*, Contribution II, no. 10 (Boerema, 1993).

Characters in vitro

A description in vitro is given in Contribution II. Most distinctive are the irregular, often curved, botryoid-dictyosporous chlamydospores, usually bearing droplet-like deposits. Conidia are usually aseptate, $4-7.5(-8) \times (2-2.5-3.5(-4) \mu\text{m}$, occasionally larger and septate, $8-15 \times 3-5.5 \mu\text{m}$, broadly ellipsoidal, with numerous small guttules.

Characters in vivo (Amaryllidaceae)

The pycnidia (subepidermal in dead leaf tips and in spots on leaves and scales) often contain mainly aseptate conidia and only a few 1-septate ones, $4.5-8(-10) \times 2.5-4(-5) \mu\text{m}$ (av. $6.8-7.5 \times 3-3.8 \mu\text{m}$). However, the pycnidia in vivo sometimes produce larger conidia, which are in majority 3-septate, $13.5-28 \times 5-8 \mu\text{m}$ (av. $21 \times 6.5 \mu\text{m}$): synanamorph *Stagonosporopsis curtisii*. In this case aseptate conidia are relatively rare, but 1-septate ones may also be present, $8-16 \times 3-6.5 \mu\text{m}$ (av. $11.5 \times 4.5 \mu\text{m}$).

Ecology and distribution. A world-wide pathogen of *Narcissus*, *Hippeastrum* and various other Amaryllidaceae causing Leaf Scorch, Neck Rot, Red Spot Disease, Red Leaf Spot.

Representative culture. CBS 251.92 (PD 86/1145) ex *Nerine* (Amaryllidaceae), the Netherlands.

ACKNOWLEDGEMENTS

Important material for this study has been obtained thanks to the cooperation of the staff of institutes at Baarn, Beltsville, Berlin, Kew, Nepean, New York, St. Petersburg (Leningrad) and Prague.

Special thanks are due to Ms Maria M.J. Dorenbosch, who first established the occurrence of conidial dimorphism in comparative culture studies of various species treated in this paper.

Dr R.T.A. Cook kindly improved the English of this paper. Thanks are also due to Dr W. Gams for the Latin translations of the descriptions.

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ADDITIONAL STUDIES IN COPRINUS SUBSECTION GLABRI

C. B. ULJÉ¹ & H. BENDER²

First *Coprinus lilatinctus*, belonging to subsect. *Glabri*, is described as new. Secondly, nomenclatural reasons are given for *Coprinus nudiceps* P.D. Orton to be replaced by the older name *C. schroeteri* P. Karst. Type studies of both taxa are given and their synonymy is discussed. To facilitate identification an updated key is given for the species in subsect. *Glabri*.

In 1982 the second author collected for the first time a taxon rather similar to *Coprinus leiocephalus* P.D. Orton but with distinct lilac colours in the young specimens. This character, and the fact that the basidiocarps were larger and more cylindrical than usual in *Coprinus leiocephalus*, made a closer study of the specimens necessary and microscopically a number of characters also proved to be different. The material was labelled by Bender under the provisional herbarium name *Coprinus lilatinctus*, but not published. A few years later the first author recognized the same species, but, at the time, took no action to publish it. Now more material has been collected which confirms the constancy of the differences from *Coprinus leiocephalus*, and we are convinced that we are dealing with an undescribed species.

For the abbreviations used in this paper we refer to Uljé & Noordeloos (1993: 258).

ACKNOWLEDGEMENTS

Machiel Noordeloos critically reviewed and improved the text of this paper, for which we are very grateful. John Lennie is cordially thanked for editing the English text of this paper. Dr. R. A. Maas Geesteranus kindly corrected the Latin diagnosis.

***Coprinus lilatinctus* Bender & Uljé, spec. nov.** — Plate 1, Fig. 1

Pileus junior usque ad 30 mm altus, 16 mm latus, cylindricus, ellipsoideus vel conicus, adultus ad 50 mm latus, junior distincte lilacino-tinctus, demum lilaceo-griseo-brunneus vel pallide griseo-brunneus vel griseus, glaber. Lamellae, L = 36–45, l = 1–3(–5), liberae, primo albae demum griseae vel atrae acie pallidior. Stipes usque ad 100 × 2–3 mm, versus basim incrassatus vel bulbosus, albus vel griseo-albus.

Sporae 9.6–13.3 × 9.0–11.2 × 6.1–8.3 µm, 5-angulatae, cordiformes, poro germinativo excentrico praeditae. Basidia 20–45 × 9–12 µm, tetrasporigera. Pleurocystidia 30–95 × 22–38 µm, vesiculosa, subcylindracea, ellipsoidea vel subtriformia. Cheilocystidia 25–70 × 12–28 µm, vesiculosa, ellipsoidea, obovoidea vel subcylindracea, interdum utriformia. Fibulae presentes. Pileipellis hymeniformis e elementis clavatis vel vesiculosis. Elementae microscopicae, praesertim in pileipelle vel hymenio cum granulis griseo-alutacis. Ad terram argillaceam vel ad fragmentam lignosam, gregarius vel fasciculatus.

Holotypus: Netherlands, Alphen a/d Rijn, near Zegerplas, 27-VIII-1988, C. B. Uljé 987 (L).

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Plate 1. *Coprinus lilatinctus*. Fruit-bodies in situ XI. Holotype.

Pileus up to 30 mm high and 16 mm wide when still closed, cylindrical ellipsoid or conical, expanded pileus convex, up to 50 mm wide, lilac when young and fresh, then lilaceous grey-brown, the lilac tinge remaining longest at centre, later pale greyish brown or in most cases greyish, especially at centre; smooth. Lamellae $L = 36-45$, $l = 1-3(-5)$, free, white at first then grey to black with pale edge. Stipe up to $100 \times 2-3$ mm, slightly widened downwards, white or greyish white, at base somewhat swollen (-5 mm).

Spores [160, 8, 6] $9.6-13.3 \times 9.0-11.2 \times 6.1-8.3 \mu\text{m}$, $Q = 1.05-1.30$, av. $Q = 1.12-1.22$; av. $L = 10.7-12.3$, av. $B = 9.5-10.1 \mu\text{m}$, 5-angular and heart-shaped with slightly elongate apex in frontal view, ellipsoid in side view, dark red-brown under the microscope, with eccentric germ pore. Basidia $20-45 \times 9-12 \mu\text{m}$, 4-spored, surrounded by (4-)5-8(-9) pseudoparaphyses. Pleurocystidia $30-95 \times 22-38 \mu\text{m}$, vesiculose, subcylindric, ellipsoid or subutriform. Cheilocystidia $25-70 \times 12-28 \mu\text{m}$, vesiculose, ellipsoid, obovoid or subcylindric, sometimes a few utriform. Clamp-connections present. Pileipellis hymeniform, made up of clavate or balloon-shaped cells. Part of all microscopic elements, especially pileipellis, cheilocystidia and basidia with grey yellowish granules, probably consisting of oil drops.

Habitat & distribution — In small groups, more or less fasciculate; on paths of clayey soil covered with wood-chips. Rare, only known from Germany and the Netherlands; July-Sept.

Collections examined. GERMANY: Mönchengladbach, Volksgarten, 28 Aug. 1982, H. Bender, on debris of deciduous wood. — NETHERLANDS: prov. Flevoland, Muiderzand, 19 July 1988, C.B. Uljé 932; prov. Zuid-Holland, Leiden, Leiden-Noord, near allotment gardens, 23 Aug. 1987, C.B. Uljé 858; idem,

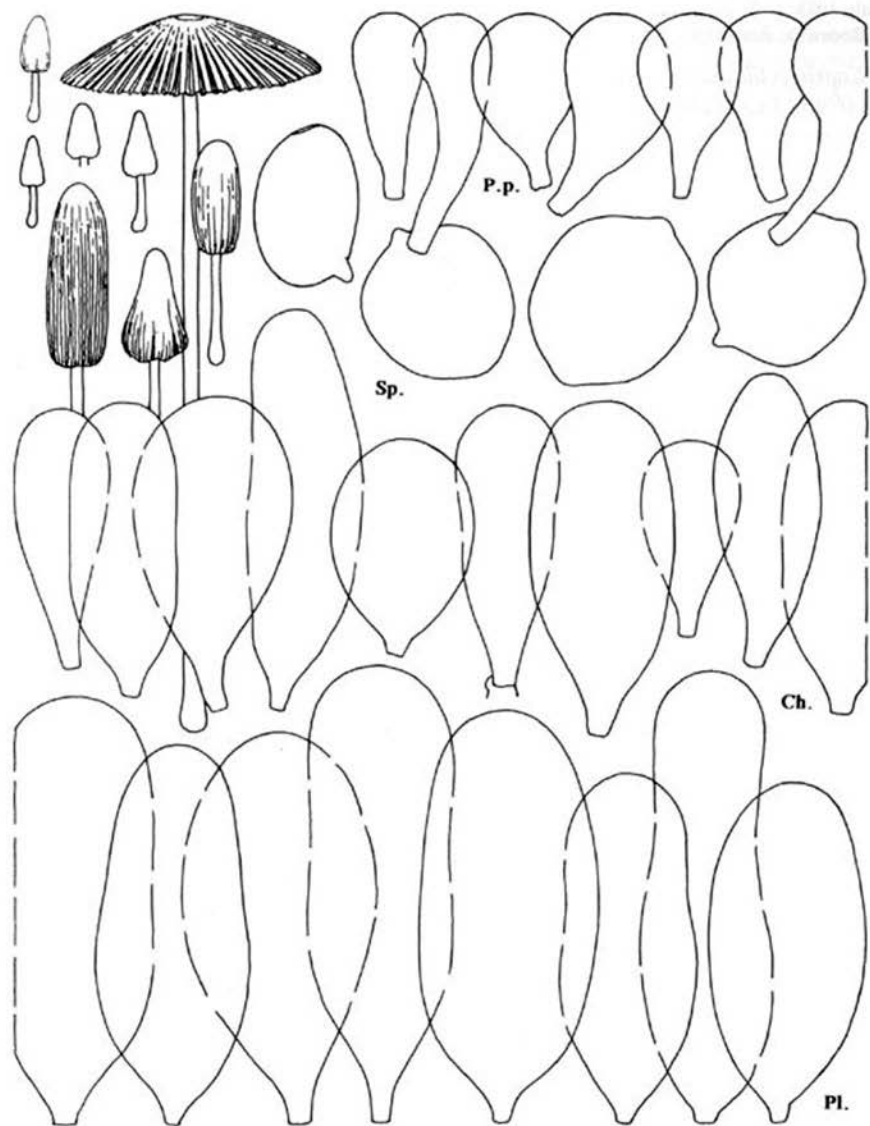


Fig. 1. *Coprinus lilatinctus*. Basidiocarps, $\times 1$; spores, $\times 2000$; pileipellis, pleuro- and cheilocystidia, $\times 800$ (all from type).

6 July 1988, *C. B. Uljé 944*; Alphen a/d Rijn, near Zegerplas, 27 Aug. 1988, *C. B. Uljé 987* (holotype, L); Recuwwijk, Recuwwijkse Hout, 10 Sept. 1995, *C. B. Uljé 1272*.

Coprinus lilatinctus is a species rather close to *C. leiocephalus* P.D. Orton and *C. plicatilis* (Curt.: Fr.) Fr. It differs from both in shape, size and colour of the basidiocarps, size of the spores, and the grey yellowish granules in the microscopical elements, though in dried material the granules are not always clear. The shape of the spores is similar to that of *C. leiocephalus*, but they are distinctly larger (av. length of spores in *C. leiocephalus*: 9.0–10.7, in *C. lilatinctus*: 11.3–11.5 μm). In *C. plicatilis* the spores are more elongate and on average, just as in *C. leiocephalus*, less than 9.5 (9.8) μm wide (in *C. lilatinctus* 9.5–10.1 μm). *Coprinus nudiceps* P.D. Orton agrees in spore size, but that species is smaller, lacks lilaceous tints and never grows on wood-chips. However, the most important difference is the shape of the spores which is rounded triangular in *C. nudiceps* and without the lemon-shaped apex that is characteristic in *C. lilatinctus*, *C. leiocephalus* and *C. plicatilis*.

In the literature no colour illustrations of our new species are available.

ON COPRINUS NUDICEPS

In the past *Coprinus nudiceps* P.D. Orton has been described under several names from different substrates (Uljé & Bas, 1988: 443). Until recently, the only species we had studied, for which type material was available, was that of *Coprinus nudiceps* P.D. Orton and we used that name for the taxon. The first author has now studied the type of *Coprinus schroeteri* P. Karst. and found the material identical to *C. nudiceps* except in the size of the basidiocarps, which is smaller in *C. schroeteri* than commonly found in *C. nudiceps*. However, the microscopical characters agree in all respects. Since the name of Karsten has priority over *Coprinus nudiceps*, and also seems to be the oldest name that may refer to this species (Uljé & Bas, 1988: 444) we introduce here the name *Coprinus schroeteri* P. Karst. for *C. nudiceps*. The original diagnoses of both taxa are given below and supplemented with data and illustrations obtained from the type-studies.

Although both *Coprinus schroeteri* and *C. nudiceps* are described from dung, the species frequently is collected from soil. The colour of the basidiocarp differs according to the substrate on which it has been collected: specimens from dung are generally yellowish or nice ochre-brown, those from soil (generally in lawns) are usually somewhat darker brown or red-brown. Because of this macroscopical difference there may appear to be two taxa but both types are indistinguishable microscopically. In addition dark brown specimens have also been found on dung. In our experience, other dung-inhabiting species also tend to have yellow colours, possibly under the influence of the substrate, and the character is, therefore, of restricted taxonomical value. We attach more importance to the microscopical characters and, in the case of *Coprinus schroeteri*, we see no reason to keep the yellowish specimens apart from the brown ones.

Colour photographs of *C. schroeteri* (as *C. nudiceps*) have been published by Bender & Enderle (1988: opposite p. 48) and by Cacialli et al. (1995: 227).

Type studies:

Coprinus schroeteri P. Karst., Meddn Soc. Fl. Fauna fenn. 5 (1879) 20 (Symb. Mycol. fenn. VI). — Fig. 2

Original diagnosis:

Pileus tenerrimus, ex ellipsoideo vel ovoideo expansus revolutusque, sulcatus, glaber, ochreo-isabellinus vel subgilvus, expallens, demum dilute fuliginatus, ad 1 cm usque latus. Stipes aequalis, sursum leviter striatulus, primitus puberulus, 1–2 cm longus. Lamellae fuscae. Sporae angulato-ovoideae, subinde anguloso-sphaeroideae vel sphaeroideo-ellipsoideae, fuscae (s.l.), pellucidae, longit. 13–15 μ m, crassit. 8–12 μ m.

In fimo bovino prope Mustiala die 20 m. Aug. h. a. semel. Priori proximus.

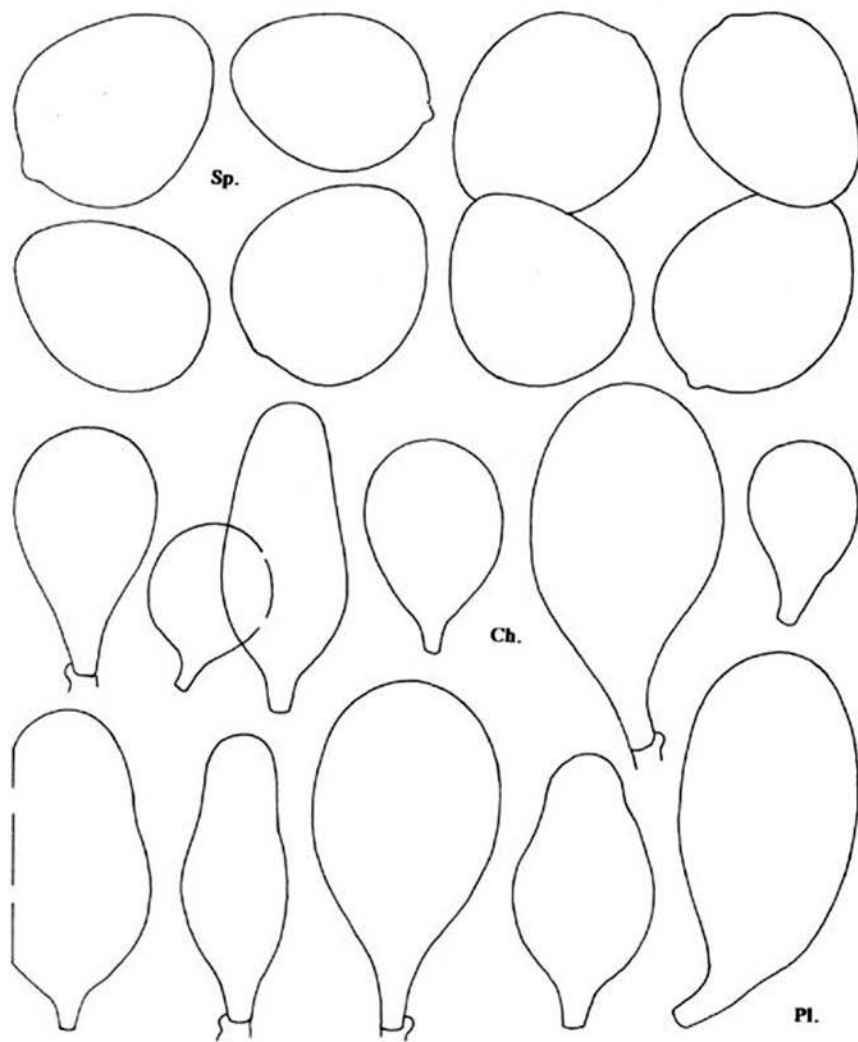


Fig. 2. *Coprinus schroeteri*. Spores, $\times 2000$; pleuro- and cheilocystidia, $\times 800$ (all from type).

Observations on the type

Spores [20, 1, 1] 11.3–14.2 × 10.7–12.3 μm; Q = 1.05–1.20, av. Q = 1.15; av. L = 13.1, av. B = 11.4 μm. Basidia 22–42 × 10–13 μm, 4-spored, surrounded by 6–7 pseudoparaphyses. Pleurocystidia 50–75 × 18–32 μm, ellipsoid, vesiculose or utriform. Cheilocystidia 35–65 × 18–35 μm, subglobose, ellipsoid or slightly utriform. The cystidia are only slightly developed because of the young stage of the basidiocarps used for studying cystidia.

Collection examined. FINLAND: Fennia Travastia australis, Tammela, Mustiala, 20 Aug. 1878. P. Karsten 3762 (holotype, H).

Coprinus nudiceps P.D. Orton, Notes R. bot. Gdn Edinb. 32 (1972) 142 (Notes on British Agarics. IV). — Fig. 3

A *C. misero* a sporis majoribus et habitu robustiore differt. Pileus ellipsoideus vel ovoideus 7–15/4–8 mm, dein expansus 9–24 mm interdum ad discum depressus, luteolus vel ochraceus dein ad discum fulvum vel cinnamomeum versus griseascens, primo laevis leviter nitidus, mox ad marginem dein ad discum versus sulcatus vel plicato-striatus, ad marginem postremo manifeste laceratus vel radialiter fissuratus. Lamellae liberae vel anguste adnatae, e pallide luteolo vel ochraceo mox umbrinae vel nigricantes, subconferatae, ad aciem primo albo-flocculosae. Stipes 30–60/0.5–1 mm, sursum attenuatus, leviter bulbosus (ad basim 1.5–3 mm latus) ex albedo sordide cremeus vel cremeo-luteolofuscus, minute adpresse sericeostriatus, ad basim primo fibrillis albosericeis manifestis obtectus. Caro pilei concolorata ad discum admodum crassa. Odor nullus. Sporae lentiformes, ellipsoideo-ovoideae vel subgloboso-triangularis interdum leviter 5- vel 6-angulatae, 13–15.5/8.5–9.5/10–12 μm (Fig. 4A, B), poro germinativo medio, in cumulo violaceoneonigrae. Basidia 4-sporigera. Cystidia aciei lamellarum pyriformia vel utriformia interdum irregularia vel late fusiformia vel vesiculosa, 30–60/14–28 μm. Cystidia faciei lamellarum non vidi. Cellulae cuticulae pilei 10–26 μm latae. Setulae et sphaerocystes desunt.

Inverness-shire, Tomich, ad fimum equinum, 3 ix 1971, Orton 4133 (holotype, E).

Cap ellipsoid or ovoid 7–15/4–8 mm, then expanded ± plane 9–24 mm, margin becoming conspicuously split or lacerate radially, saffron or ochraceous (G in Colour Chart), then becoming grey from margin inwards and fulvous, sienna or cinnamon at centre, smooth and rather shiny at first then soon plicate or grooved-striate from margin inwards. *Gills* free or narrowly adnate, pale saffron or pale ochraceous then buff, soon umber or date-brown to blackish, fairly crowded, edge white flocculose when fresh. *Stem* 30–60/0.5–1 mm (1.5–3 mm at the base), attenuated upwards from slightly bulbous base, whitish then dirty cream or pale creamy-buff, minutely adpressedly silky fibrillose and ± interruptedly striate, base with conspicuous adpressed white silky fibrils when fresh. *Flesh* concolorous in cap, often fairly thick at centre. *Smell* none. *Spore-print* violaceous-black.

Spores lentiform, ellipsoid in side-view, subglobose-triangular or slightly 5- or 6-angled in face-view, 13–15.5/8.5–9.5/10–12 μm (Fig. 4A, B), germ-pore central. *Basidia* 4-spored. *Marginal cystidia* pyriform to ± utriform or irregularly or broadly fusiform or vesiculose, 30–60/14–28 μm. *Facial cystidia* not seen. *Cells of cap cuticle* 10–26 μm broad. *Setules and sphaerocysts* absent.

Inverness-shire, Tomich, on horse dung, 3 ix 1971, Orton 4133 (holotype, E). Midlothian, Selm Muir Plantation, on (?cow) dung, 7 x 1967, leg. R. Watling. Mull. Torosay House, 10 ix 1968, leg. P. James, Watling 7859.

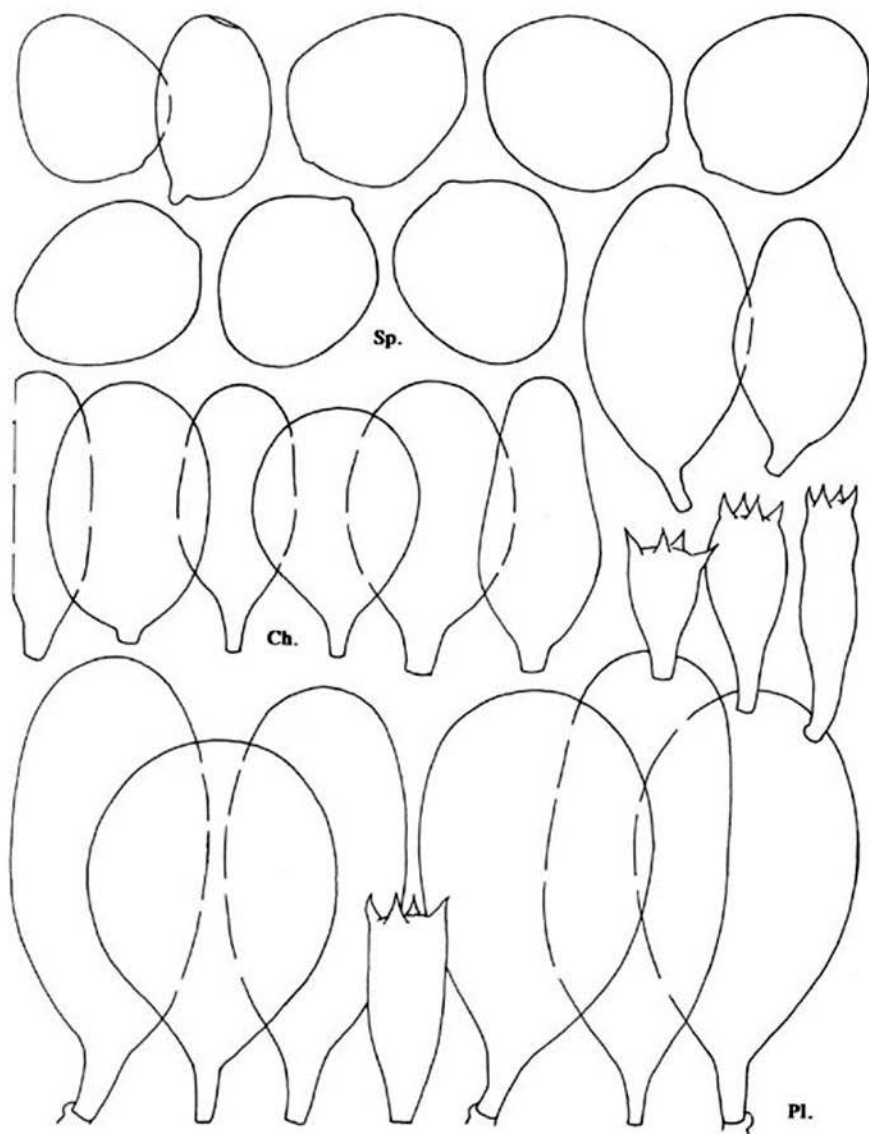


Fig. 3. *Coprinus nudiceps*. Spores, $\times 2000$; basidia, pleuro- and cheilocystidia, $\times 800$ (all from type).

Observations on the type

Spores [40, 1, 1] 11.6–14.6 × 10.6–12.4 μm; Q = 1.05–1.20, av. Q = 1.15; av. L = 13.3, av. B = 11.6 μm. Basidia 22–44 × 10–15 μm, 4-spored, surrounded by 5–7 pseudoparaphyses. Pleurocystidia 40–70 × 18–30 μm, ellipsoid, vesiculose or utriform. Cheilocystidia 60–90 × 25–40 μm, subglobose, ellipsoid or slightly utriform. Clamp-connections present.

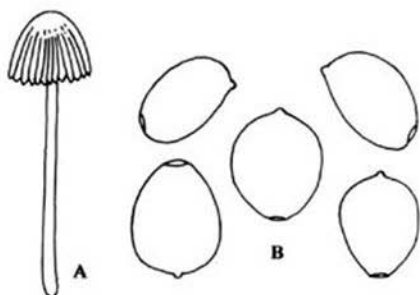


Fig. 4. *Coprinus nudiceps* (after Orton). A. Basidiocarp, × 1; B. spores, × 1000.

REVISED KEY TO THE SPECIES OF SUBSECT. GLABRI

(For nomenclature and full descriptions see Uljé & Bas, 1988)

1. Basidiocarps growing on pure dung.
 2. Pileus > 10 mm wide when expanded; length of spores 10–15 μm.
 3. Spores heart-shaped with average Q less than 1.4 *C. schroeteri* P. Karst.
 3. Spores ellipsoid with average Q more than 1.4 . . . *C. megaspermus* P.D. Orton
 2. Pileus < 10 mm wide when expanded; length of spores < 11 μm
C. miser P. Karst.
1. Basidiocarps not on dung.
 4. Average breadth of spores > 7.8 μm; spores (sub)globose or rounded 5–6 angular. If rounded triangular then on average more than 9 μm broad.
 5. Pileus without lilaceous tinges; spores on average 8–9.5 μm broad when 5–6 angular; cheilocystidia without oily granules.
 6. Average length of spores < 11 μm.
 7. Spores heart-shaped in frontal view with rounded angles
C. leiocephalus P.D. Orton
 7. Spores (sub)globose in frontal view without angles
C. galericuliformis Watl.
 6. Average length of spores > 11 μm.
 8. Expanded pileus up to 30 mm wide; spores less than 14 μm broad.
 9. Spores 10–14 × 7.5–10 μm, elongate 5–6 angular
C. plicatilis (Curt.: Fr.) Fr.
 9. Spores 10–16 × 9–13 μm, rounded triangular . . . *C. schroeteri* P. Karst.
 8. Expanded pileus small, up to 13(–17) mm; spores 12–17 × 11.5–16 μm
C. hercules Uljé & Bas
 5. Pileus lilaceous when young and fresh; spores 10–13 × 9–11 × 6–8 μm, 5–6 angular; pileipellis and cheilocystidia with oily granules
C. lilatinctus Bender & Uljé
 4. Average breadth of spores < 7.8 μm; spores rounded triangular
C. kuehneri Uljé & Bas

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**BRYOSCYPHUS ATROMARGINATUS SPEC. NOV. (LEOTIACEAE),
A NEW ASCOMYCETE PARASITIZING THE THALLUS OF
MARCHANTIA POLYMORPHA**GERARD J. M. VERKLEY¹, HUUB A. VAN DER AA¹ & GEERT W. DE COCK²

Bryoscyphus atromarginatus spec. nov. from dying thalli of *Marchantia polymorpha* is described *in vivo* and *in vitro*. Differences with *B. marchantiae* and other representatives of the genus are discussed. A key to the species of *Bryoscyphus* is given.

The genus *Bryoscyphus* was erected by Spooner to accommodate four species of inoperculate discomycetes occurring on thalli of Bryophyta (Kirk & Spooner, 1984). The structure of the excipulum, the truncate apices of the asci and fusoid and frequently rhomboidal ascospores are characteristic of the genus. Most species are known from few collections. Recently, a fungus rapidly killing thalli of *Marchantia polymorpha* L. was collected in the Netherlands. The anatomy of its excipulum is typical of *Bryoscyphus*, but it differs from all known species of the genus, including *B. marchantiae* (Berk.) Spooner. The type collection of *B. marchantiae* was in fact on *Reboulia haemisphaerica* (L.) Raddi (Kirk & Spooner, 1984). The description given by Naumov (1964) of the collection he reported as *Hymenoscyphus marchantiae* (Berk.) Dennis on *M. polymorpha* agrees well with the new species proposed in this paper.

The new species is described *in vivo* and *in vitro* and a key to the species of *Bryoscyphus* is given.

***Bryoscyphus atromarginatus* Verkley, van der Aa & G. de Cock, spec. nov.** — Figs. 1–3

Apothecia superficialia, solitaria vel gregaria, cupulata, stipitibus brevibus crassis centralibus. Discus initio concavus, postea quasi planus, 0.5–4.0 mm diametro, pallide ochraceus. Margo initio plerumque albidus, deinde ad atroviolaceum fuscescens. Receptaculum concolor, apprime margine minute tomentellum.

Excipulum ectale (corticale) e duobus stratis compositum. Cellulae strati interioris globosae vel angulares, isodiametricae, tenuitunicatae, plerumque 10–17 µm diametro, marginem versus gradatim in cellulas prismaticas transeuntes. Cellulae strati exterioris isodiametricae usque prismaticae, plerumque 5.0–7.5 µm diametro, modice crassitunicatae, contentu viridi-brunneo, in series undulatas adpressas dispositae, marginem versus gradatim in cellulas minus adpressas graciles transeuntes, parallele radiantes, saepe in procesus liberos trichoideos terminantes.

Excipulum medullosum ex hyphis tenuibus et leviter intertextis, plerumque 2.0–3.5 µm diametro, prope excipulum ectale plus minusve parallelis.

Asci cylindrico-clavati, apice truncato-rotundato et intus iodo caerulescente, deorsum in stipitem attenuati, octospori, 100–125 × 5.5–7.0 µm. Ascospores inaequilaterales, ellipticae, clavato-obovoideae, hya-

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linae, continuae (post dehiscenciam rarissime uniseptatae), (10.2–)11.0–13.2(–15.5) × (3.4–)3.6–4.2(–4.8) μm. Paraphyses simplices, filiformes, obtusae, apicem versus plerumque 3.0 μm latae, contentu granulati brunneo-flavo.

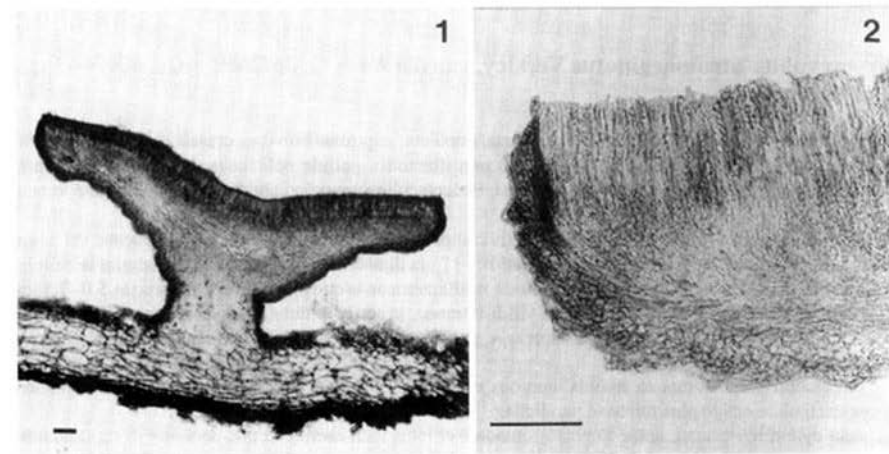
In thallo emoriente *Marchantiae polymorphae*.

Apothecia superficial, solitary or gregarious, cupulate, with a short and stout central stalk. *Disc* at first concave, becoming almost flattened, 0.5–4.0 mm in diameter, pale ochreous, smooth (dark vinaceous-brown when dry). *Receptacle* at first concolorous, later with a shade of yellow-green, more intense towards the stalk, minutely downy especially near the slightly elevated margin (powdery on a dark brown background when dry). *Margin* at first often whitish, but soon darkening to dark violaceous.

Ectal excipulum differentiated into two layers. Cells of the inner layer thin-walled, globose to angular, isodiametric, mostly 10–17 μm in diameter, towards the margin of the disc gradually transformed into prismatic elements lying at a low angle to the surface. Cells of the outer layer isodiametric to brick-shaped, mostly 5.0–7.5 μm in diameter, with somewhat thickened walls and greenish brown cytoplasmic inclusions, lying in meandering, adpressed rows, towards the margin gradually replaced by less adpressed slender cells, running parallel and often terminating in free hair-like processes, with two to several septa.

Medullary excipulum consisting of slender, thin-walled, hyphal elements, 2.0–3.5 μm in diameter, running closely parallel near the ectal excipulum and slightly interwoven more inwards. Subhymenium scarcely differentiated from medullary excipulum.

Asci narrowly cylindrical-clavate, with a truncate to rounded apex, the narrow ring blueing most intensely with IKI in the lower part which may protrude into the epiplasm; asci attenuating into a long, stalk-like base with crozier, 8-spored, biseriate when fresh, uniseriate or partly biseriate in rehydrated material, 100–125 × 5.5–7.0 μm (rehydrated state, with mature spores). *Ascospores* inequilateral, ellipsoidal to clavate-obovoid, with



Figs. 1, 2. *Bryoscyphus atromarginatus*, holotype. — Fig. 1. Cryosection of mature apothecium on thallus of *Marchantia polymorpha*, cotton blue (scale bar = 100 μm). — Fig. 2. Detail of hymenium and excipulum (scale bar = 10 μm).

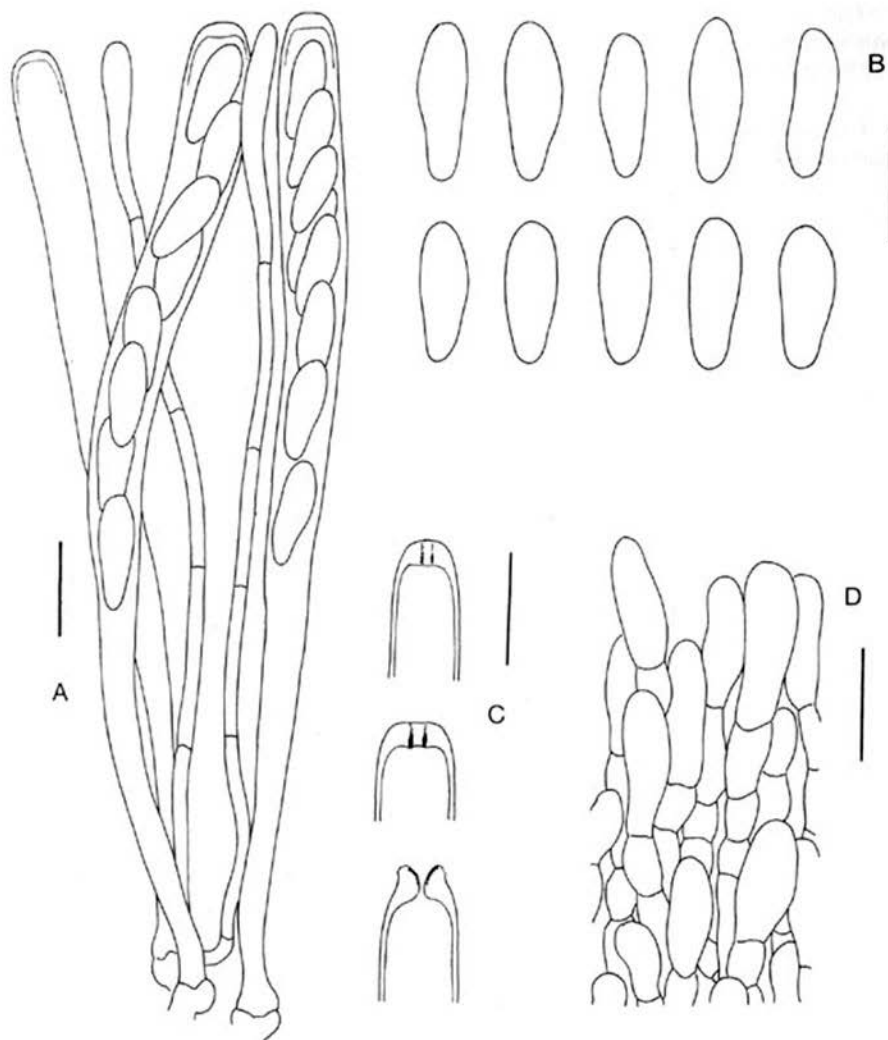


Fig. 3. *Bryoscyphus atromarginatus*, holotype. A. Asci with ascospores; B. ascospores in water; C. detail of ascus apical apparatus in IKI; D. surface view of marginal hyphae (all scale bars = 10 μ m).

rounded ends, hyaline, one-celled (two-celled ones occasionally observed after liberation), with one or two large and often several smaller greenish oil-droplets, $(10.2\text{--})11.0\text{--}13.2(-15.5) \times (3.4\text{--})3.6\text{--}4.2(-4.8) \mu\text{m}$. *Paraphyses* simple, filiform, obtuse, apical cells often slightly broadening to up to 3.0 μm near the tip, contents granular, brownish yellow.

Type — The Netherlands, Rijen, prov. Noord-Brabant, on dying thallus of *Marchantia polymorpha* L. in a garden pot, *G. de Cock* s.n., IV–VI.1995 (CBS, holotype; CBS 211.96, monosporic isolate from type).

Cultural characters — Colonies growing slowly, reaching a diameter of 55 mm on 2% malt extraction agar (MEA) and 50 mm on oatmeal agar (OA) after 6 weeks (room temperature, diffuse daylight). Aerial mycelium rather felty on MEA 2% and 4%, but almost lacking or restricted to the centre of the colony on OA. Aerial and submerged mycelium soon turn ochraceous, developing shades of rose and purple with age, most strikingly on MEA. Colony reverse shows similar colour and distinct furrows which radiate from the centre in an irregular pattern. After about 4 weeks scattered pustulate aggregations of white mycelium appearing on OA, resulting in sterile apothecia.

Mycelium hyaline, thin-walled, septate and scarcely branched, densely filled with large, irregularly shaped green guttules. Hyphal tips 2–3 µm wide, soon becoming somewhat thicker and developing single or catenate swollen cells, roundish or elongated, mostly 20, but up to 35 µm long and 10–15 µm thick, with slightly thicker walls, more abundant in submerged mycelium.

The fungus was first noted by Mr. C. Buter in a garden pot on a roof terrace. Green and sporulating thalli of the liverwort quickly turned brown and bore many apothecia soon afterwards. Thus, most of the plants were killed between mid April and the end of June, 1995. From October till December the fungus occurred again with less apothecia.

Material of this species has apparently been collected from the same host by Benkert (1981), who provisionally identified it as *Hymenoscyphus marchantiae*. Spooner (Kirk & Spooner, 1984) suspected that this material pertained to an undescribed species, but he did not see any material on *Marchantia polymorpha*.

Bryoscyphus atromarginatus shares its distinctly stalked asci with *Bryoscyphus marchantiae* and *B. dicrani* (Ade & Höhnelt) Spooner. However, it differs from *B. marchantiae* by its narrower spores and the presence of hair-like processes in the ectal excipulum. Its ascospores are never rhomboidal like those of *B. marchantiae*, *B. dicrani*, and *B. conocephali* (Boyd) Spooner. The ascospores in *B. dicrani* and *B. turbinatus* (Fuekel) Spooner are longer, the asci are broader and the apothecial margin is glabrous.

A number of Leotiaceae from Bryophyta occur in the literature. According to their descriptions, none of these is conspecific with the presently proposed taxon. *Hymenoscyphus rhytidiadelphii* Svrček from *Rhytidiadelphus triquetrus* (Hedw.) Warnst. has long stalked asci measuring 90–110 × 8–10 µm, ascospores 15.5–17 × 5–6 and a denticulate margin without hair-like processes (Svrček, 1978). *Hymenoscyphus atlanticus* Candoussseau from *Bryum capillare* Hedw. has longer 1-septate ascospores (15–18 × 3.5–4 µm) and only elongated excipular elements (Candoussseau, 1976). *Hymenoscyphus erythropus* Döbb. has much smaller asci and ascospores (Döbbeler, 1981). The sphagnicolous species also differ from *B. atromarginatus* in several characters. *Hymenoscyphus vasaënsis* (P.A. Karst.) Dennis has narrower spores (10–14 × 3 µm) and only elongated elements in the ectal excipulum (Dennis, 1964). *H. sphagnisedus* (Velen.) Svrček has translucent apothecia and shorter, broader and short-stalked asci and narrower ascospores (Svrček, 1979). *Hymenoscyphus schimperi* (Nawaschin) Eckblad (= *Discinella schimperi* (Nawa-

schin) Redhead & Spicer, 1981) has a smooth excipulum, longer and broader ascospores and is only known from *Sphagnum squarrosum* Crome. Study of type material may warrant a transfer of some of these species to *Bryoscyphus* in due course.

KEY TO THE SPECIES OF BRYOSCYPHUS

- 1a. Asci distinctly stalked (at least lower one-third part very narrow) 2
 b. Asci without such a distinct stalk 4
 2a. Asci mostly shorter than 125 μm , ascospores 3.6–4.2 μm in width, never rhomboidal, on *Marchantia* *B. atromarginatus*
 b. Asci mostly longer than 140 μm , ascospores wider than 6.0 μm , at least some rhomboidal, on other hosts 3
 3a. Ascospores 16–24 \times 6.5–10 μm , with hair-like processes on ectal excipulum, on *Ceratodon* and *Dicranium* *B. dicrani*
 b. Ascospores 12–15.5 \times 6–7 μm , no hair-like processes on ectal excipulum, on *Reboulia* *B. marchantiae*
 4a. Ascospores wider than 4.0, asci 112–130 \times 9–11 μm , excipulum with multiseptate hairs at the margin, 30–70 \times 4–9 μm , on *Conocephalum* *B. conocephali*
 b. Ascospores 3.5–4.0 in width, asci 95–102 \times 11–12 μm , excipulum without such long hairs at the margin, on *Dicranum*, *Hypnum* and *Polytrichum* (?) . *B. turbinatus*

ACKNOWLEDGEMENTS

Dr. B.M. Spooner is gratefully acknowledged for critical reading of the manuscript. Dr. W. Gams is thanked for commenting on the text and correcting the Latin diagnosis, and Mr. C. Buter for drawing our attention to the fungus.

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**COLTRICIA CONFLUENS:
A NEW POLYPORE FROM THE NETHERLANDS**P. J. KEIZER¹

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Recently, a fungus has been reported from young, planted parks (e.g. Keizer, 1985) which shows some resemblance to *Coltricia perennis* (L.: Fr.) Murrill, but which differs from that species in several respects: 1) growth habit; 2) zonation of the pileus; 3) colours; 4) shape of the pileus; 5) ecology. As this fungus is already known from several places in the Netherlands and invariably seems to differ from any species described in the literature it is described here as a new species.

***Coltricia confluens* Keizer, nov. spec. — Fig. 1**

Pileus 16–70 mm latus, irregularis, expansus vel infundibuliformis, clare vel interdum obscure ochraceo-cinnamomeus, splendore carens, leviter zonatus. Pori subrotundi, subangulati, 2–4 per mm, cinnamomeo-fulvi, clariores pileo, decurrentes. Stipes 7–25 × 1–4 mm, irregularis, saepe tuberosus, saepe fissus. Contextus coriaceus, cinnamomeus. Crescit gregatim, plerumque multa basidiomata lateraliter concrecentes. Sporae (6.8–)7.1–8.5(–8.9) × (4.0–)4.6–5.2(–5.5) μm, ellipsoideae vel breviter cylindraceae, laeves. Basidia 4-sporigera. Fibulae absentes.

In nemoribus et hortis frondosis.

Typus: Netherlands, prov. Utrecht, Maarsseveense plas, 15.IX.1993, Keizer 93060, Herb. Wag-W, isotypus: L.

Basidiocarps 16–70 mm broad, expanded to irregularly infundibuliform, circular or, more often, irregularly lobed, gregarious and usually few to many (2–approx. 25, often 4–7) interconnected, forming flat, multi-stipitate units; in that case individual specimens hardly recognizable; surface of pileus dark or light rusty brown, dull, velvety, weakly zonate, very weakly radially wrinkled, growing margin yellowish brown, sometimes margin distinctly blackening. Tubes 1–2(–3) mm long, light greyish brown inside, decurrent on the stipes. Pores circular or polygonal, 2–4 per mm. Stipe 7–25 × 1–4 mm, partially cylindrical, often broader upwards, usually irregularly flattened and frequently bifurcate, rusty brown, base enlarged and usually holding together a certain amount of litter; mostly several stipes under a cluster of confluent pilei. Context tough, rusty brown. Smell indistinct. Spore-print rusty brown with olive hue.

Spores [30, 3, 3] (6.8–)7.1–8.5(–8.9) × (4.0–)4.6–5.2(–5.5) μm, Q = 1.4–1.8(–1.9) and average Q = 1.51–1.70, ellipsoid or ellipsoid-oblong, smooth, very pale brownish to almost hyaline, uniguttulate. Basidia 4-spored. Surface of pileus consisting of irregularly branched, thick-walled, brown hyphae with hyaline apices, 3–6 μm broad with walls up to 2 μm thick. Context of pileus made up of thin-walled, brown, radially arranged hyphae. Subhymenium 3–4(–5) μm thick, made up of pale brown to almost hyaline, thin-walled hyphae. Clamp-connections absent from all tissues.

¹) Communication no. 533 of the Biological Station, Wijster.

Habitat — In artificial plantations of deciduous trees and shrubs (once in a grassfield) in parks on fertile soils (humose sand or clay), growing on soil, in litter or on chips of wood, apparently saprotrophic.

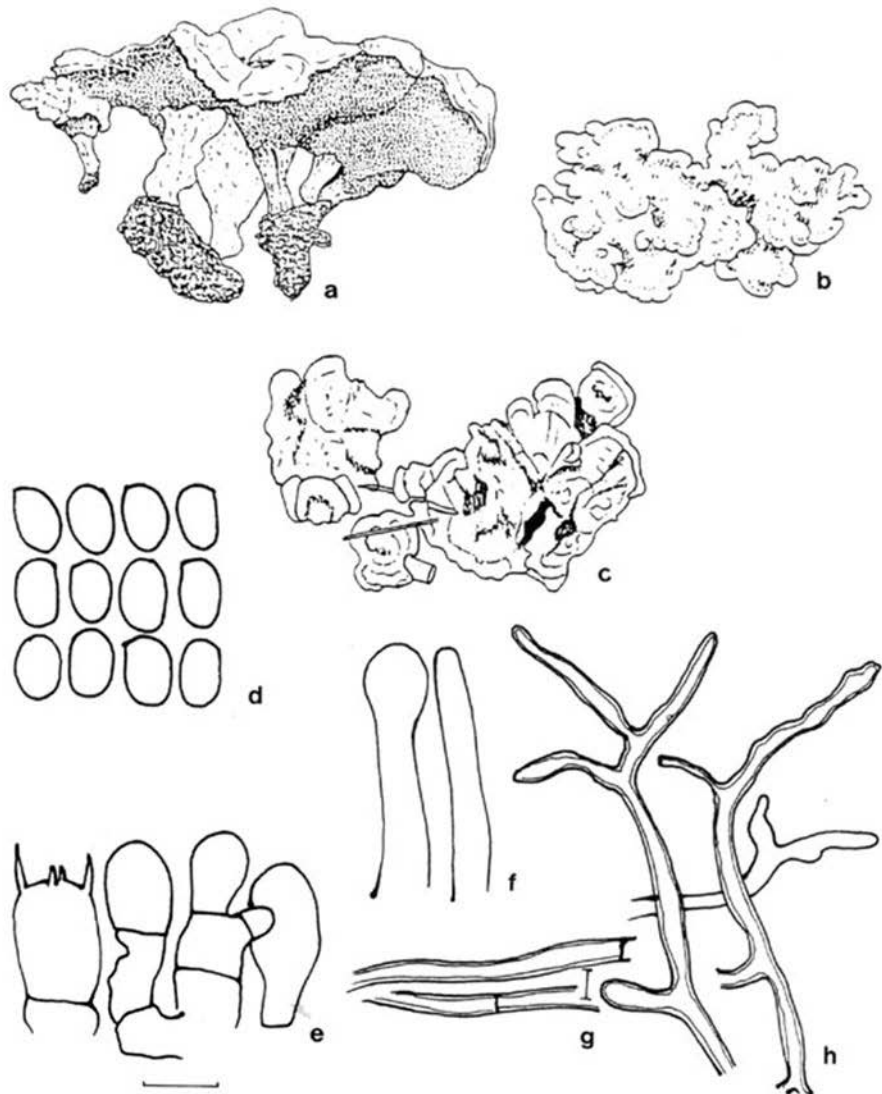


Fig. 1. *Coltricia confluens*. a. Habit in side-view; b, c. habit in top-view (all about life-size); d. spores; e. basidia; f. terminal hyphae of dissepiments; g. subicular hyphae; h. hyphae of tomentum of pileus. — Scale bar = 10 μ m.

The main differences between *Coltricia confluens* and *C. perennis* are: 1) The almost invariable growth-habit in which many carpophores are growing together. *Coltricia perennis* usually grows solitarily, occasionally with a few confluent pilei, but not as many as in *C. confluens*. 2) The weak to almost absent circular zonation of the pileus. If this zonation is present, the zones are concolorous with the rest of the pileus in *C. confluens* whereas in *C. perennis* the zones are often darker or grey to dark grey. In exsiccata of *C. confluens* the pileus is only weakly or not at all radially wrinkled, in exsiccata of *C. perennis* the pileus usually is radially wrinkled. 3) *Coltricia confluens* is often brighter and more uniformly brown (to almost yellowish brown) than *C. perennis*. The uniform colour is due to the even felty layer on the pileus. 4) *Coltricia perennis* has regular circular pilei; in *C. confluens* the pilei are mostly irregular: lobed, incised, undulate. 5) The difference in habitat is striking: *C. perennis* occurs on dry, sandy soils, usually under *Pinus*, less frequently under *Fagus* or *Quercus* and has been proven to form ectomycorrhiza (Danielson, 1984). It has strongly decreased recently in the Netherlands (Arnolds, 1989). *Coltricia confluens* grows in artificial parks and plantations, on fertile soils (humose sand, clay) under *Crataegus*, *Ulmus*, *Acer*, *Quercus*, *Prunus*, etc. and one collection was found in a grassland without neighbouring trees. Frequently it is attached to chipped wood or other organic debris. It has been observed in the Netherlands only rather recently (first collection from 1984), and is probably increasing, especially in urban or otherwise human-influenced areas. This species seems to be non-mycorrhizal, but saprotrophic instead.

No microscopical differences between *C. confluens* and *C. perennis* have been found.

Coltricia confluens may erroneously be identified as *C. cinnamomea* (Jacq.) Murrill. The latter species is clearly different from *C. confluens* (and *C. perennis*), as is pointed out by Jahn (1986): 1) The pileus has a radial sheen in *C. cinnamomea* due to the absence of a velvety layer of branched, thick-walled hyphae, which makes the radially arranged hyphae of the surface of the pileus visible. The surface of the pileus of *C. confluens* (and *C. perennis*) is covered by a layer of ascending, branched, thick-walled hyphae. 2) The length-width ratio (average Q) of the spores of *C. cinnamomea* is 1.3–1.4; in *C. confluens* (and *C. perennis*) average Q = 1.4–1.8.

The spores of *C. cinnamomea* measure 6–8 × 4.5–6 µm or 4.9–7.1 × 3.8–5.2 µm (Jahn, l.c., showing considerable variation in spore dimensions) and (6.8–)7.1–8.5(–8.9) × (4.0–)4.6–5.2(–5.5) µm in *C. confluens*.

ACKNOWLEDGEMENT

I am grateful to Dr. E. Arnolds for his comments on an earlier version of this paper.

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A NEW SPECIES AND NEW SECTION OF *MYCENA*
FROM COSTA RICAR.A. MAAS GEESTERANUS¹ & CLARK L. OVREBO²

Mycena seclusa is newly described from the lowland rain forests of Costa Rica; it is the type species of the new section *Seclusae*.

In this paper, we report on a new species of *Mycena* which is very common in the lowland tropical rain forest around La Selva Biological Station and Reserve, Costa Rica. See Ovrebo & Baroni (1988) for a description of the site.

As implied by the specific epithet, the species exhibits a combination of features separating it from any other member of *Mycena*, which justifies the erection of a new section.

***Mycena seclusa* Maas G. & Ovrebo, spec. nov.** — Fig. 1

Basidiomata dispersa. Pileus 4–12 mm latus, late convexus vel applanatus, centro aetate depressus, sulcatus, striatus, quasi glaber, siccus, griseus, centro plerumque albidus. Caro tenuis, odore chlorinoideo. Lamellae 22–27 stipitem attingentes, molles, adscendentes, liberae, albae, margine concolores. Stipes 10–34 × c. 1 mm, cavus, fragilis, aequalis, cylindraceus, siccus, levis, glaber, basi tamen minute puberulus, albus, e disco basali natus.

Basidia 15–18 × 8–9 µm, late clavata, 4-sporigera, fibulata. Sporae 6.5–9 × 4–5.5 µm, inaequilateraliter ellipsoideae, leves, amyloideae. Cheilocystidia 13.5–27 × 8–11 µm, clavata atque apice late rotundata vel fusiformia atque apice rostrata, fibulata, levia. Pleurocystidia nulla. Trama lamellarum iodi ope brunneovinescens. Hyphae pileipellis 1.8–2.5 µm latae, fibulatae, haud in materiam gelatinosam immersae, leves vel surculis raris munitae; cellulae terminales 30–60 × 8–14.5 µm, fusiformes, clavatae, ellipsoideae, surculis cylindraceis 1.8–3.5 × 0.5 µm instructae. Hyphae stipitis corticales 1.8–2.5 µm latae, fibulatae, leves, haud in materiam gelatinosam immersae, stipitis basi caulocystidiis levibus 14.5–100 × 4.5–13.5 µm praeditae.

Corticola et lignicola.

Holotypus: *Ovrebo 2115* (L, No. 991.343-731).

Etymology: *seclusus*, separated, in reference to the combination of features separating this species from the other members of the genus.

Basidiomata scattered. Pileus 4–12 mm across, broadly convex to plane, with age centrally depressed, sulcate from edge of disc to margin, striate, appearing glabrous, dry, opaque, the striae medium grey, paler between the striae, often whitish at the centre. Context thin, translucent grey, with chlorine-like odour. Lamellae 22–27 reaching the stipe, tender, ascending, up to 1 mm broad, free, white, with entire to fimbriate, concolorous edge; lamellulae numerous but not in distinct tiers. Stipe 10–34 × c. 1 mm, hollow, fragile, equal, terete, dry, smooth, glabrous for the greater part, translucent white, minutely puberulous below, springing from an unobtrusive, glabrous disc 1 mm across.

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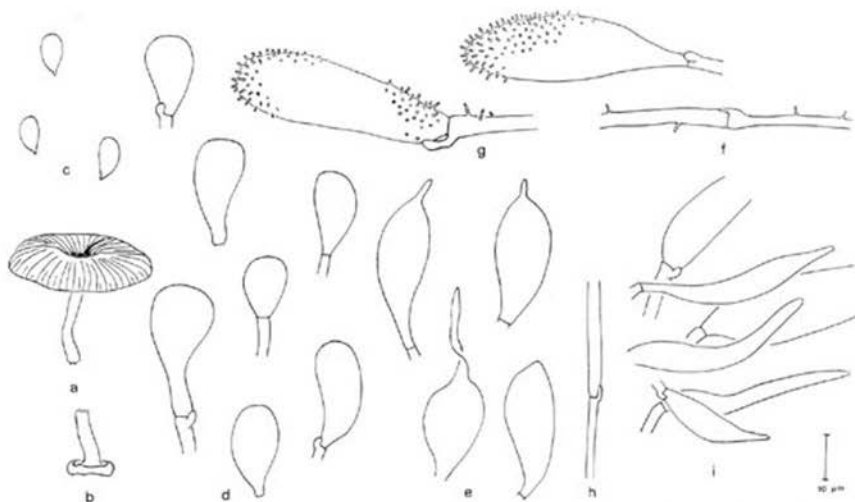


Fig. 1. *Mycena seclusa*. a. Habit; b. basal disc and part of the stipe; c. spores; d. cheilocystidia; e. cheilocystidia near the pileus margin; f. hypha of the pileipellis; g. terminal cells; h. hypha of the cortical layer of the stipe; i. caulocystidia. (Figs. a, b, $\times 5$; all others, $\times 700$; bar = 10 μm .)

Basidia 15–18 \times 8–9 μm , broadly clavate, 4-spored, clamped (difficult to recover in sections). Spores 6.5–9 \times 4–5.5 μm (average \times = 7.78 \times 4.86 μm , $Q = 1.41$ –1.91; average $Q = 1.6$), pip-shaped, smooth, amyloid. Cheilocystidia 13.5–27 \times 8–11 μm , in places forming a sterile band, (a) near the middle of the lamella clavate, clamped, sessile to stalked, thin-walled, smooth, apically broadly rounded, (b) near the margin of the pileus fusiform, apically rostrate, with the apical part 4.5–18 \times 2–3.5 μm . Pleurocystidia absent. Lamellar trama made up of subparallel hyphae 4–10 μm wide, thin-walled, smooth, hyaline, brownish vinous in Melzer's reagent (but rather more brownish than vinaceous). Pileipellis a cutis of repent hyphae which are 1.8–2.5 μm wide, clamped, not embedded in gelatinous matter, smooth or with rare cylindrical excrescences, terminated by inflated cells 30–60 \times 8–14.5 μm , fusiform, clavate or ellipsoid, apically and mostly on the upper surface sparsely to densely covered with evenly spaced, cylindrical excrescences 1.8–3.5 \times 0.5 μm . Hypoderm consisting of parallel hyphae with much inflated cells up to 25 μm wide. Hyphae of the cortical layer of the stipe 1.8–2.5 μm wide, clamped, smooth, not embedded in gelatinous matter; caulocystidia near the base of the stipe 14.5–100 \times 4.5–13.5 μm , clustered or not, slender-conical to sublageniform, thin-walled, smooth, apically 1.5–4.5 μm wide.

Corticolous and lignicolous, found on large logs of dicotyledonous trees that are decaying but still firm, but also occasionally on the wood of planks lining many of the trails throughout the reserve.

A very common fungus at La Selva.

Material examined. COSTA RICA: Heredia Prov.: La Selva Biol. Station and Reserve, near Puerto Viejo: Sendero Oriental, 6 July 1986, *Ovrebo 2115* (holotype; L. No. 991.343-731), 28 May 1991, *Ovrebo 3206* (USJ) & 11 May 1992, *Ovrebo 3235* (L. No. 991.343-739); Sendero El Surá, 16 July 1986, *Ovrebo 2207* (USJ); Sendero Hartshorn, 10 July 1986, *Ovrebo 2147* (USJ); Sendero Holdridge, 28 July 1989, *Ovrebo 2804* (F); Camino Experimental Sur, 13 May 1991, *Ovrebo 3038* (CSU).

Singer described two species from the South American area that require a closer look. His *Mycena costaricensis* (Singer & Gomez P., 1982: 41) can be readily dismissed on account of its subglobose spores $4.5-6.3 \times 4.5-5.5 \mu\text{m}$ and its cheilocystidia which are stated to be "ad apicem setulis $5-6 \mu\text{m}$ longis subdigitaliformibus ornatis."

The second species, *Mycena multicaudata* (Singer, 1973: 44), has several features in common with *M. seclusa*, such as a convex pileus with depressed centre, free or almost free white lamellae, a chlorinaceous odour, a white stipe, and occurrence on wood of dicotyledonous trees. The differences, however, are in the pileus of *M. multicaudata* which is golden brown, papillate in the central depression and squamulose; in the 'pilose' cheilocystidia; in the hyphae of the pileipellis which emit 'hairs' of the kind as seen in *Crinipellis*; and in the hyphae of the stipe cortex which produce similar 'hairs'.

A chlorine-like odour is not common in *Mycenas*, but it is quite possible that, as is the case in the present species, it is not apparent in freshly picked specimens; it is easily detected upon opening the wax paper in which the specimens have been kept.

This odour together with such characters as basal disc, smooth cheilocystidia, smooth caulocystidia and strikingly spinulose terminal cells of the hyphae of the pileipellis constitutes a combination not seen in any other species of the genus *Mycena*. It warrants the erection of a new section which, with much doubt, may be seen as remotely related with section *Polyadelphia* Sing. ex Maas G. (Maas Geesteranus, 1986: 159).

Mycena section *Seclusae* Maas G. & Ovrebo, *sect. nov.*

Basidiomata parva. Pileus siccus, sulcatus, griseus. Caro tenuis, odore chlorinoideo. Lamellae molles, liberae, albae. Stipes fragilis, siccus, glaber, albus, basi minute puberulus, e disco basali natus.

Basidia clavata, 4-sporigera, fibulata. Sporae inaequilateraliter ellipsoideae, leves, amyloideae. Cheilocystidia clavata vel fusiformia, levia. Pleurocystidia nulla. Trama lamellarum iodi ope brunneovinescens. Hyphae pileipellis fibulatae, levia vel sparse diverticulatae, cellulis terminalibus inflatis spinulosisque praeditae. Hyphae stipitis corticales fibulatae, leves, stipitis basi caulocystidiis levibus munitae.

Corticola et lignicola.

Species typica: *Mycena seclusa*.

ACKNOWLEDGEMENTS

The junior author would like to thank the Organization for Tropical Studies for granting permission to collect and use the facilities at La Selva. Fieldwork in Costa Rica was supported by grants from the Tinker Foundation administered by the Mesoamerican Ecology Institute, Tulane University, and by faculty research grants from the Graduate College, University of Central Oklahoma.

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MYCENA AGRESTIS, A NEW SPECIES OF SECTION FULIGINELLAE
FROM SOUTHERN NORWAYA. ARONSEN¹ & R.A. MAAS GEESTERANUS²

Mycena agrestis is a new species of section *Fuliginellae*. It is compared with the section's type species, *M. vulgaris*, and shown to differ from the other members known from North America. Thus far, section *Fuliginellae* has not been recorded with certainty from the Southern Hemisphere.

It is remarkable that the first author, in an area stretching not more than about 500 m, has found six new species in recent years: *Mycena ustalis* Aronsen & Maas G. (1989: 61), *M. oligophylla* Aronsen & Maas G. (1990: 183), *M. terena* Aronsen & Maas G. (1992: 105), *M. parca* Aronsen (1994a: 533), *M. juniperina* Aronsen (1996: 257), and in addition *M. citrinovirens* M. Lange (Aronsen, 1994b: 54), the first find outside the type locality. In this paper another new species from the same area is proposed. It may be that this type of coast landscape has scarcely been investigated, but a more plausible explanation is that there still are many undiscovered species in *Mycena*.

***Mycena agrestis* Aronsen & Maas G., spec. nov.** — Figs. 1-9

Basidiomata gregaria. Pileus usque ad 18 mm latus, e conico planoconvexus, subumbonatus, tenuiter sulcatus, striatus, pruinosis, glabrescens, viscidus, obscure griseobrunneus. Caro tenuis, odore indistincto vel farinaceo. Lamellae 20-23 stipitem attingentes, molles, arcuatae, c. 1 mm latae, aetate subrugulosae, dente decurrentes, pallide vel obscure griseae, margine separabile, pallidiore. Stipes c. 60 × 1.5-3.5 mm, cavus, aequalis vel supra sublatis, cylindraceus, levis, pruinosis, magna ex parte glabrescens, viscidus, griseolus, basi fibrillis sparsis munitus.

Basidia 30-40 × 7-9 µm, clavata, 4-sporigera, fibulata. Sporae 9.2-10.3 × 4.7-5.4 µm, inaequilatelliter ellipsoideae, leves, amyloideae. Cheilocystidia 18-32 × 5.5-7 µm, clavata, fibulata, in materiam gelatinosam immersa, apice surculis haud numerosis, crassis instructa. Pleurocystidia nulla. Trama lamellarum iodi ope brunneovinescens. Hyphae pilcipellis 1.5-2.5 µm latae, fibulatae, ramosae, in materiam gelatinosam immersae, leves, cellulae terminales diverticulatae, apice ramosae. Hyphae stipitis corticales 1.5-2.5 µm latae, fibulatae, in materiam gelatinosam immersae, leves.

In agro graminoso.

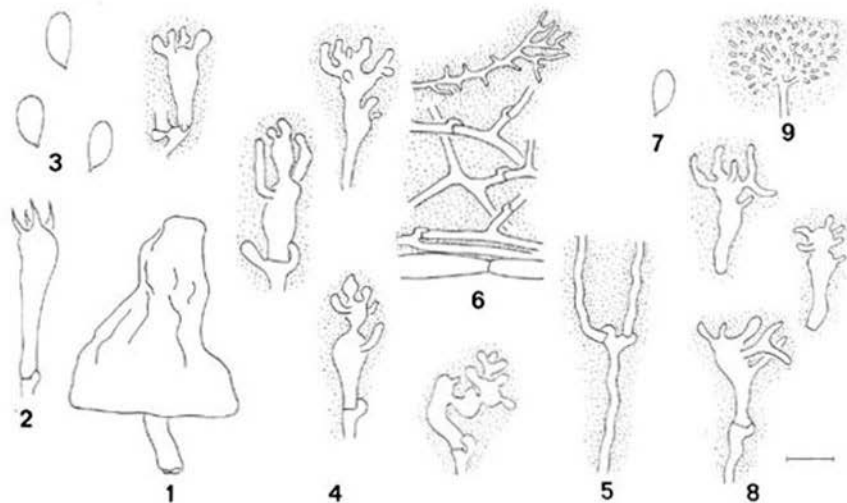
Holotypus: Norway, Vestfold, Tjøme, Moutmarka, 9 Oct. 1993. Leg. A. Aronsen A 66/93 (L, no. 993.342-087).

Etymology: *agrestis*, native to the field.

Basidiomata gregarious. Pileus up to 18 mm across, at first acutely conical, flattening with age and becoming planoconvex, more or less umbonate, little to shallowly sulcate, translucent-striate, pruinose, glabrescent, viscid, covered with a gelatinous separable pel-

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Figs. 1–9. *Mycena agrestis*. Figs. 1–6 (holotype). 1. Pileus (of dried specimen); 2. basidium; 3. spores; 4. cheilocystidia; 5. hypha of the cortical layer of the stipe; 6. hypha of the pileipellis and terminal cell. — Figs. 7–9. (Aronsen A53/92). 7. Immature spore; 8. cheilocystidia; 9. densely diverticulate terminal cell of a hypha of the pileipellis. — Fig. 1, $\times 4$; all others, $\times 700$; bar = 10 μm .

licle, dark grey-brown, paler when dry. Context thin. Odour indistinct or somewhat farinaceous. Lamellae 20–23 reaching the stipe, tender, arcuate, c. 1 mm broad, more or less rugulose with age, decurrent with a tooth, pale to dark grey, with a separable paler edge. Stipe up to 60×1.5 – 3.5 mm, hollow, equal or somewhat broadened above, curved below, terete, smooth, pruinose, glabrescent except for the apex, viscid, greyish, covered with few fibrils at the base.

Basidia 30 – 40×7 – 9 μm , slender-clavate, 4-spored, clamped, with sterigmata up to 6.5 μm long. Spores 9.2 – 10.3×4.7 – 5.4 μm , pip-shaped, smooth, weakly amyloid. Cheilocystidia 18 – 32×5.5 – 7 μm , forming a sterile band, clavate, clamped, embedded in gelatinous matter, apically covered with comparatively few, unevenly spaced, coarse, occasionally curved, cylindrical to clavate excrescences 2.5 – 14.5×1.5 – 5.5 μm . Pleurocystidia absent. Lamellar trama brownish vinescent in Melzer's reagent. Pileipellis an ixocutis of much branched, smooth, clamped hyphae 1.5 – 2.5 μm wide, the terminal cells 1 – 1.5 μm wide, apically diverticulate and much branched, with the excrescences 0.9 – 3.5×0.9 μm . Hypoderm made up of parallel, inflated hyphae up to 20 μm wide. Hyphae of the cortical layer of the stipe 1.5 – 2.5 μm wide, clamped, embedded in gelatinous matter, smooth, terminal cells not observed.

Among grass in an open field, together with *Mycena leptocephala* (Pers.: Fr.) Gillet.

Collections examined. 'NORWAY: Vestfold, Tjøme, Moutmarka, 7 Nov. 1992, A. Aronsen A 53/92' (L, no. 993.342-029); 'same locality 9 Oct. 1993, A. Aronsen A 66/93' (holotype; L, no. 993.342-087).

Mycena agrestis is a species of section *Fuliginellae* (A.H. Smith ex Sing.) Maas G., of which until now five members are known, four in North America and *M. vulgaris* (Pers.: Fr.) Kummer in Europe. Three species have, like *M. agrestis*, arcuate lamellae but two of these – *M. austinii* (Peck) Kühn. and *M. mackinawensis* A.H. Smith – can be excluded, the former because of its white pileus, presence of a basal disc and smaller spores; the latter because of smaller spores, differently shaped terminal cells of the hyphae of the pileipellis, and occurrence on coniferous branches. This leaves the third species – *M. vulgaris* – to be considered and this species can be differentiated from *M. agrestis* as shown in the following table.

Table 1. A comparison between *M. vulgaris* and *M. agrestis*.

	<i>Mycena vulgaris</i>	<i>Mycena agrestis</i>
Pileus	parabolaical to convex, occasionally with a low umbo	acutely conical, becoming planoconvex, more or less umbonate
Spores	6.7–8.3 × 3.6–4.9 µm	9.2–10.3 × 4.7–5.4 µm
Cheilocystidia	not clavate, apically densely branched, with fine, cylindrical excrescences	clavate, with rather few, very coarse excrescences
Habitat	associated with conifers	not noticeably associated with conifers

The discovery of a sixth member of the *Fuliginellae*, once more a species of the North Temperate area, raises the question whether the section does not occur in the Southern Hemisphere. The following shows that as yet no definitive answer can be given.

Corner (1994: 246, fig. 36a) described a *Mycena viscidipileus* from Borneo which he thought to be “near to the north temperate *Mycena vulgaris* ...”, but its stipe was said to be dry and the cheilocystidia do not appear to be embedded in gelatinous matter.

Mycena lanipes Maas G. & Horak (1995: 173), a species from Papua New Guinea, was with much doubt placed in section *Fuliginellae*, since “Both the pileus and stipe ... feel dry to the touch when fresh” although “their hyphae show gelatinous parts under the microscope.” Also, a “very close look [was needed] to detect the presence of gelatinous matter among the cheilocystidia.”

A species that could be thought to belong to section *Fuliginellae* is *Mycena myxocaulis* Pegler (1977: 228, fig. 47/1) from East Africa on account of the viscosity of pileus, lamellar edge and stipe, but the fact that no cheilocystidia were found seems to exclude this possibility.

No representatives of section *Fuliginellae* were reported by Pegler (1986) from Sri Lanka.

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**COPRINUS IDAE ULJÉ (COPRINACEAE, AGARICALES)
FOUND IN SPAIN**

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A new record of *Coprinus idae* Uljé, this time collected from Spain, is briefly described, and some taxonomic and ecologic observations are made. Up to now, this species has been reported from the Netherlands, only twice from the type-locality.

Cultures made from soil samples from a locality in the province of Valladolid, yielded fructifications of *Coprinus idae* Uljé. The soil samples were gathered from several spots in a lawn on an ephemeral salt-pond, on a groundwater discharge zone. The vegetation belongs to an alkalynophyte community, almost completely dominated by the grass *Puccinellia rupestris*, accompanied by *Crypsis aculeatus*, *Polygonum aviculare*, *Spergularia marina* and, on the drowned zone, by *Lamprothamnium papulosum* (*Puccinellietum rupestris* association).

The fungal specimens have been deposited at AH (Mycological Herbarium of the University of Alcalá de Henares).

***Coprinus idae* Uljé — Fig. 1**

Coprinus idae Uljé, Persoonia 15 (3) (1993) 278.

Pileus up to 3.5 × 2 mm, campanulate to ovoid, then plano-convex to applanate, up to 5 mm wide, white becoming beige, then grey, with powdery surface. Lamellae, L = 10–15, free, white at first, then grey to black, deliquescent. Stipe up to 40 × 0.8(–1.5) mm, cylindrical with bulbous base, hyaline, smooth except for the pruinose-fibrillose base, reminiscent of pileus surface. Smell absent.

Spores L × l = 8.5–10 × 4.8–6.2 μm, Q = 1.49–1.78, average L × l = 7.8–8.9–10 × (4.8–)4.9–5.5–6.13(–6.2), average Q = 1.42–1.6–1.8 (n = 20), ellipsoid to broadly ellipsoid, tapering to the apex, showing sometimes a subhexagonal appearance, greyish to pale brown, with central, large, to 1.2 μm wide germ-pore. Basidia 14–17 × 9–11 μm, 4-spored. Cheilocystidia 25–40 × 15–21 μm, globose, ellipsoid, utriform, vesiculose. Pleurocystidia ellipsoid to utriform, similar to cheilocystidia. Veil on pileus formed by smooth to somewhat rugulose globose hyaline cells, up to 30 μm wide, mixed with thin-walled cylindrical, branched hyphae. Clamp-connections absent.

Material studied. SPAIN: Valladolid, Bocigas, Bodón Blanco, (UTM 30TUL4065), after soil culture, 1 April 1995, AH 16935. Ibid., 10 April 1995, AH 16935. Ibid., 14 May 1995, AH 16945. Ibid., 25 May 1995, AH 16953.

Our collections fit both macro- and microscopically rather well with the original description by Uljé & Noordeloos (1993). Although the spores in our material are narrower, they

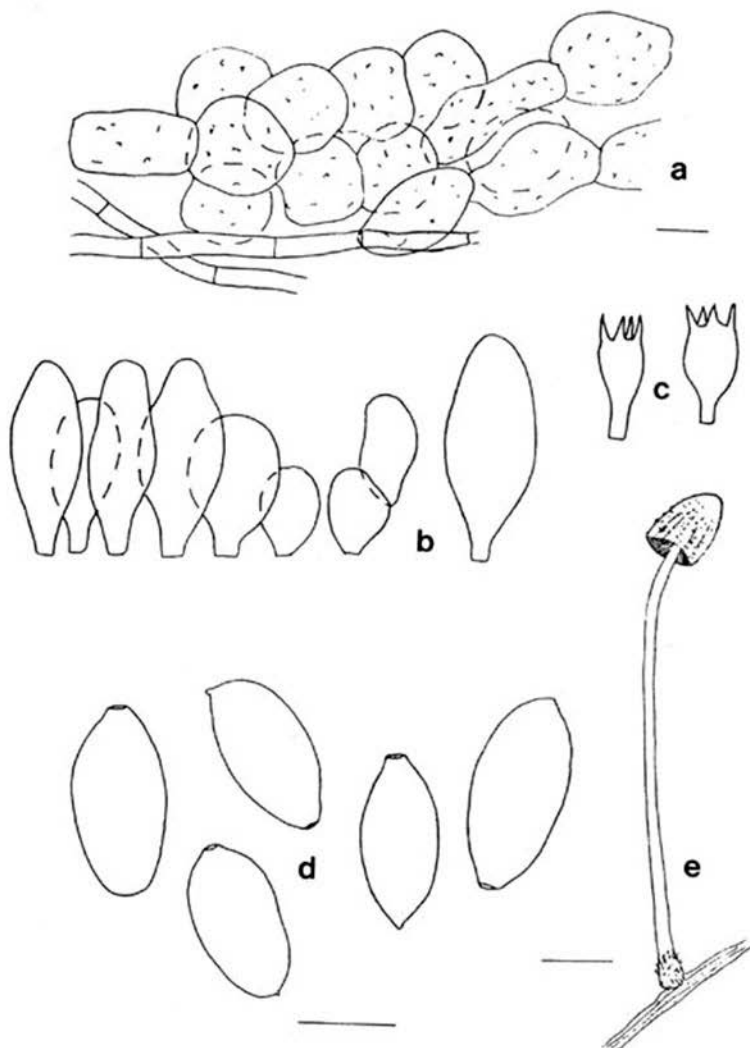


Fig. 1. *Coprinus idae*. a. Veil on pileal surface; b. cheilocystidia and one pleurocystidium (right); c. basidia; d. spores; e. habit sketch (bar spores = 5 μ m and habit = 3 mm, all other figures = 10 μ m).

fit within the range given by Uljé. The diagnostic microscopic character of this species in subsection *Nivei* seems to be the spore morphology, ellipsoid to ovoid with a tapering apex, giving a subtriangular appearance to the apical half, sometimes looking subhexagonal in frontal view. Little is said about the ecological preferences of this species for the

Dutch material ('terrestrial, in lawn'); the Spanish collections have been obtained after soil cultures, the soil samples taken from a continental saline area, which shows a particular floristic composition.

ACNOWLEDGEMENT

We wish to thank the DGICYT (Dirección General de Investigación Científica y Técnica), Ministerio de Educación y Ciencia, for granting the Project PB92-0012 'Flora Micológica Ibérica II', in which this brief article is included.

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**MARASMIELLUS PHAEOMARASMIOIDES SPEC. NOV.
(TRICHOLOMATACEAE, AGARICALES) FROM SPAIN**G. MORENO¹, M. HEYKOOP¹, F. ESTEVE-RAVENTÓS¹ & E. HORAK²

Marasmiellus phaeomarasmioides, a new species growing on bark of *Juniperus thurifera* trees in Spain, is described and illustrated. Besides, it is compared with other related species of subsect. *Sphaerosporini* Singer, viz. *M. guzmanii* Singer and *M. parlatoresi* Singer.

In the autumn of 1995, which has been exceptionally rainy in the Iberian Peninsula, we carried out several forays to the autochthonous forests of *Juniperus thurifera* L., in the province of Guadalajara – see comments on the botanical and mycological interest of this vegetation in a previous paper (Moreno et Heykoop, 1996) and the references cited therein – and collected a very characteristic and abundant species of *Marasmiellus* on bark of these trees which we are now describing as new.

Marasmiellus Murrill is mainly characterized by its collybioid to omphalioid habit, pileipellis normally a cutis, sometimes tending to be a trichodermium, stipe with poorly developed basal mycelium and non dextrinoid context hyphae.

Two important monographical works on this genus are available: i.e. Singer (1976), which deals mainly with tropical species, and Antonín & Noordeloos (1993), which includes a revision of all European taxa. The latter gathers all the bibliographical references about this genus. Recently, another new species in this genus has been described from Spain (Barcelona and Cáceres) by Robich et al. (1994), viz. *Marasmiellus virgatocutis* Robich, Esteve-Raventós & G. Moreno, in that occasion growing on dead branches of *Quercus ilex* subsp. *ballota*.

Marasmiellus phaeomarasmioides G. Moreno, Heykoop, Esteve-Raventós & E. Horak, *spec. nov.* (Figs. 1–32)

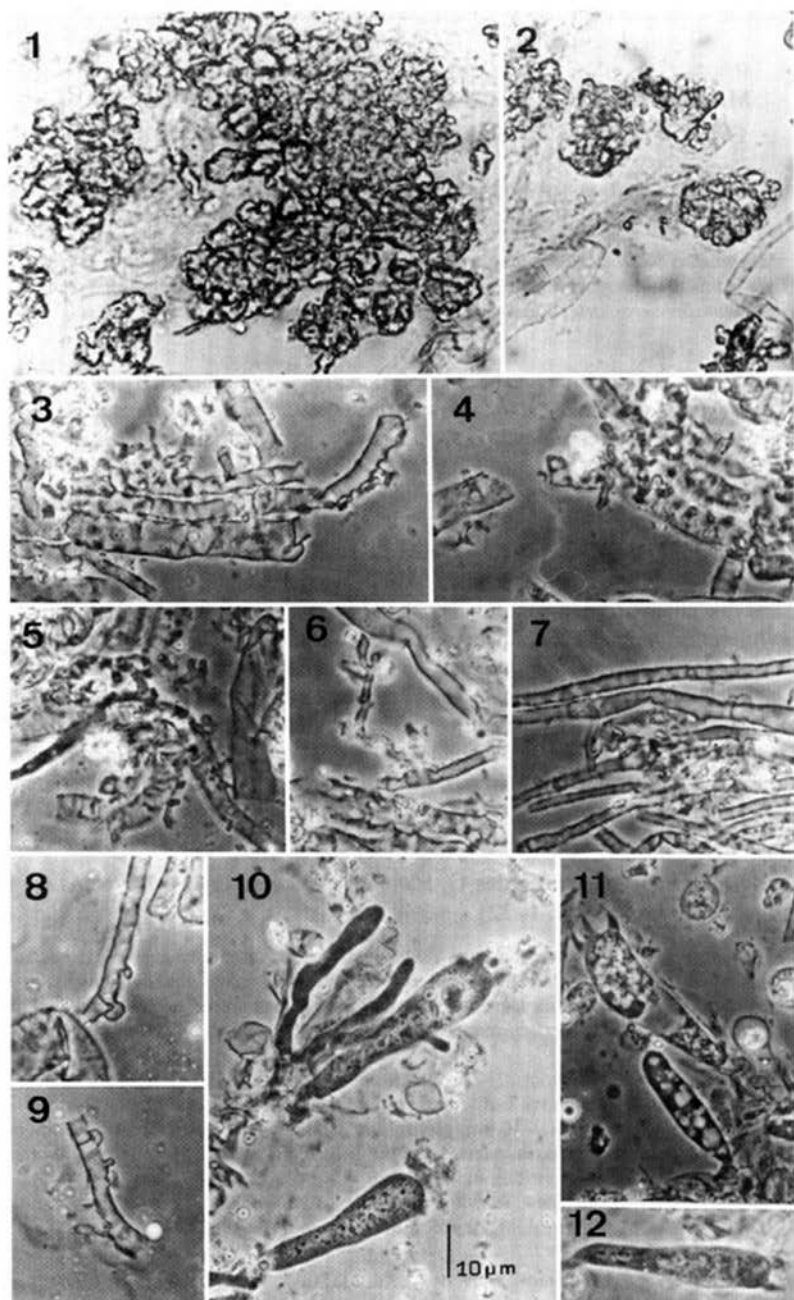
Pileus 2–7 (9) mm diam., conico-convexus vel plano convexus, fusco-cremeus vel griseus, in sicco griseus, plus minusve plicatus; pileipellis granulatus, granulis albo-griseis abundantibus exornatis, in sicco persistentibus. Hymenophorum laeve, leniter plicato seu lamellis bene evolutis interdum anastomosantibus, adnatis vel adnato-subdecurrentibus, concoloribus. Stipes 1–3 × 0.1–0.5 mm, cylindricus, excentricus, concoloribus.

Pileipellis ab cutis hyphis cylindricis, 2–7 µm diam., fibulatis efformatibus pigmento membranae flavo, diverticulatis; diverticulis plus minusve curtis, extremis in curta trichodermis coralloidea crystallis aggregatis exornatis. Basidiis 45–48 × 9–10 µm, claviformis, hyalinis, tetrasporis, fibulatis, guttis oleosis abundantibus, inamyloideam indextrinoideis. Cystidiis hymenialis paucis, filiformibus plus minusve variabilis, e. gr. 35 × 7 µm. Caulocystidiis simulantibus.

Holotypus: Hispaniae, Guadalajara, Tamajón, Ermita de los Enebrales, sub cortice *Juniperi thuriferi*, 28-XII-95, leg. A. Altés, M. Villarreal, M. Heykoop & G. Moreno, AH 18355.

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2) Geobotanisches Institut ETH, Herbarium, Zollikerstrasse 107, CH-8008 Zürich, Schweiz.



Etymology: *phaeomarasmioides* on account of its great resemblance with species of the genus *Phaeomarasmius*.

Pileus 2–7 (9) mm in diam., convex-flabelliform to plano-convex, cream-brown to greyish depending on moisture, grey when dry, more or less strongly plicate or wrinkled, pileipellis granulose with very abundant white-greyish granules remaining in dried material. Margin straight, concolorous. Hymenophore smooth or slightly folded or with well-developed gills sometimes anastomosing, adnate becoming adnate-subdecurrent, concolorous with pileus. Stipe 1–3 × 0.1–0.5 mm, cylindrical, eccentric, curved, concolorous with pileus or greyish, velutinous-furfuraceous.

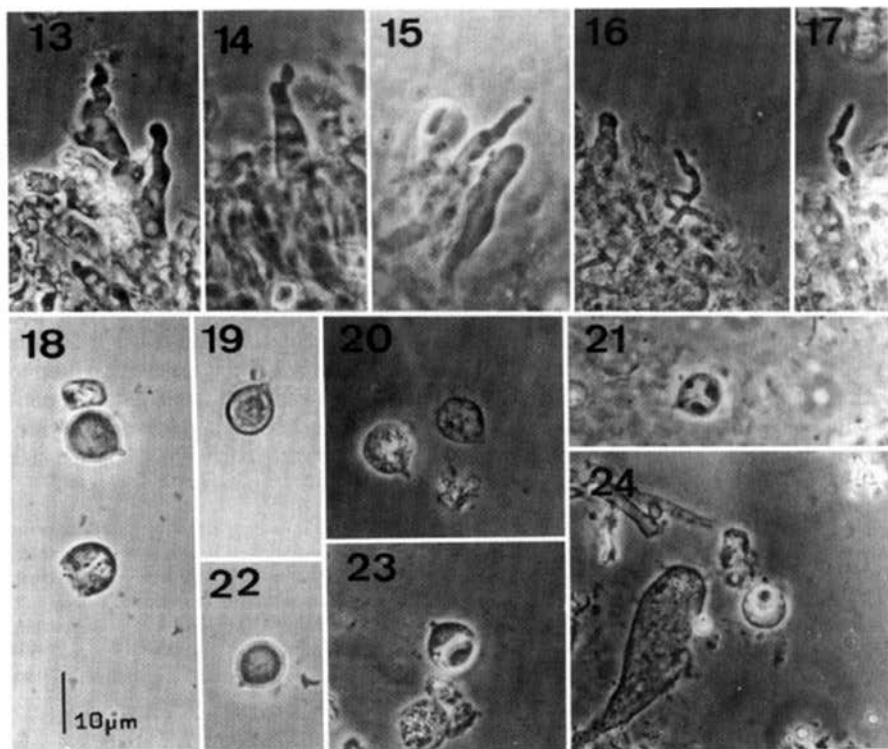
Pileipellis a cutis formed by cylindrical clamped hyphae, 2–7 µm in diam., with yellowish parietal pigment, with abundant more or less short outgrowths (Figs. 3–6 and 8–9) which form a short coraloid trichodermium, covered by abundant crystals. Basidia 45–48 × 9–10 µm, clavate, hyaline, tetrasporic and clamped. Sterigmata curved, up to 7 µm. Spores 7–9.5(10) µm, globose, smooth, hyaline with abundant lipid guttules, non-amyloid, non-dextrinoid. Hymenophoral trama non-amyloid and non-dextrinoid. Hymenial cystidia scarce, filiform, sometimes with few outgrowths, variable in shape and size (e.g. 35 × 7 µm). Caulocystidia similar to hymenial cystidia.

Material studied. SPAIN: Guadalajara, Tamajón, Ermita de los Enebrales, growing on bark of *Juniperus thurifera*, 11-XII-95, leg. G. Moreno, M. Lizárraga, F. Esteve-Raventós & E. Horak, AH 18353; *ibid.*, 21-XII-95, leg. M. Heykoop & G. Moreno AH 18354; *ibid.*, 28-XII-95, leg. A. Altés, M. Villarreal, M. Heykoop & G. Moreno, AH 18355 (holotype).

Other collections examined: *Marasmiellus guzmanii* Singer, Mexico, Morelos, NW of Tepoxtlán, 2200 m alt., "ad ramos delapsos in querceto", 27-VI-1969, leg. R. Singer, M 8210 typus (F). *Idem*, 27-VI-1969, M 8210 a (F). *Marasmiellus parlatorei* Singer, Argentina, Ciudad Universitaria, Tucumán, on bark of living *Piptadenia* in forest at 1250 m, 3-III-1957, leg. R. Singer, T 3054 (F).

Marasmiellus phaeomarasmioides is characterized by its flabelliform pileus densely covered by excreted crystals, its well developed eccentric stipe and its globose spores. These characters clearly separate it from the known species of the genus *Marasmiellus* in Europe. However, due to its eccentric stipe, it shows some macroscopic similarities with *M. lateralis* Bas & Noordel. (Antonín & Noordeloos, 1993), a taxon from the Netherlands, which is characterized, however, by its different pileipellis and oblong to subcylindrical spores.

Singer (1973) created the subsection *Sphaerosporini* Singer for the neotropical species of *Marasmiellus* with characteristically broad spores, the majority of them having a Q value (= L/l) of 1.1–1.5. According to literature, two species of this subject (*Marasmiellus guzmanii* Singer and *M. parlatorei* Singer) seem to be close to *M. phaeomarasmioides* and, therefore, have been revised by us. The first one, *M. guzmanii* Singer, was described, and is actually known only from Morelos in Mexico, on branches of several dicotyledonous trees (e.g. *Quercus*). The latter differs, however, from *M. phaeomarasmioides* by the presence of well-developed gills and lamellulae, the absence of crystals on the pilei-

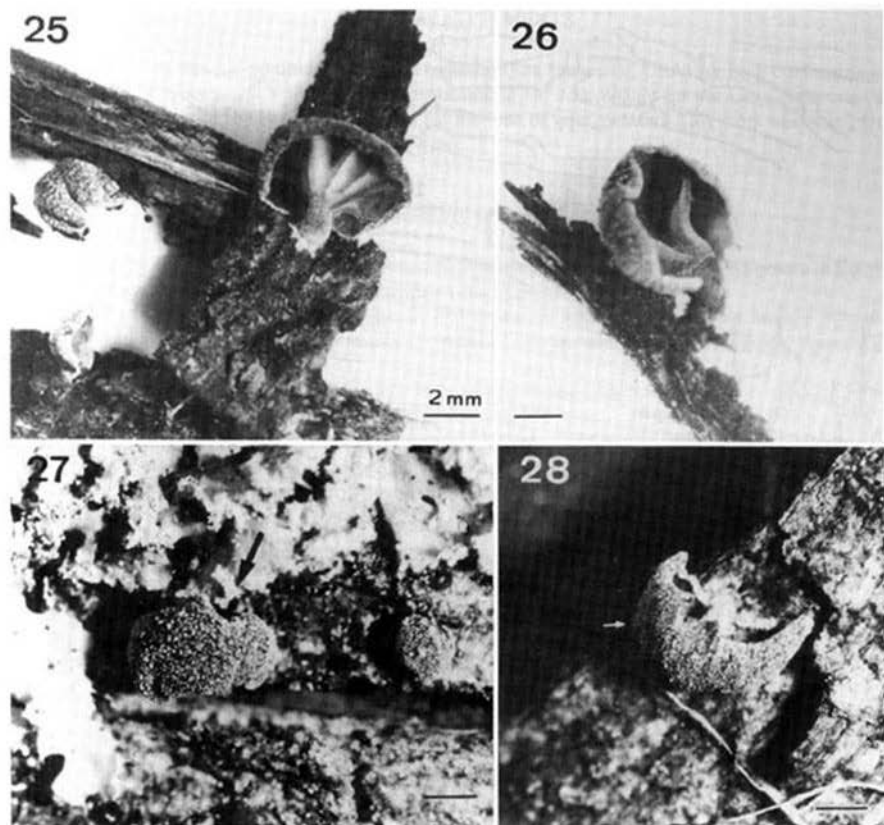


Figs. 13–24. *Marasmiellus phaeomarasmioides* (AH 18355 holotypus). 13–17. Hymenial cystidia; 18–24. spores.

pellis, the frequently up to 10 µm long sterigmata, the very abundant, diverticulate and thick (8–15 µm in diam.) cheilocystidia, sometimes septate, and the different spores (10–13 × 7.5–11.5 µm) and basidia (25–42 × 13–16 µm); in addition, its pileipellis is formed by strongly ramified and thick-walled hyphae (up to 2 µm), with obtuse and sometimes encrusted apices.

Marasmiellus parlatoresi Singer, described from Northern Argentina growing on *Piptadenia* sp. and *Podocarpus parlatoresi*, differs from *M. phaeomarasmioides* by the larger (8–30 × 5–20 mm) and whitish basidiocarps with well-developed stipes (3–11 × 1–2.5 mm), the absence of crystals on the pileus and the larger subglobose to broadly ellipsoid spores (8–12 × 7–11 µm). Furthermore, *Marasmius parlatoresi* is characterized by scattered cheilocystidia, larger basidia (55–60 × 12.5–16 µm), which are morphologically similar to those of *M. phaeomarasmioides*, and the pileipellis with typical *Rameales*-structure.

Hibbett et al. (1995) described a fossil agaric preserved in amber of *Cupressaceae* in New Jersey (USA), which bears a strong resemblance to an extant species of either

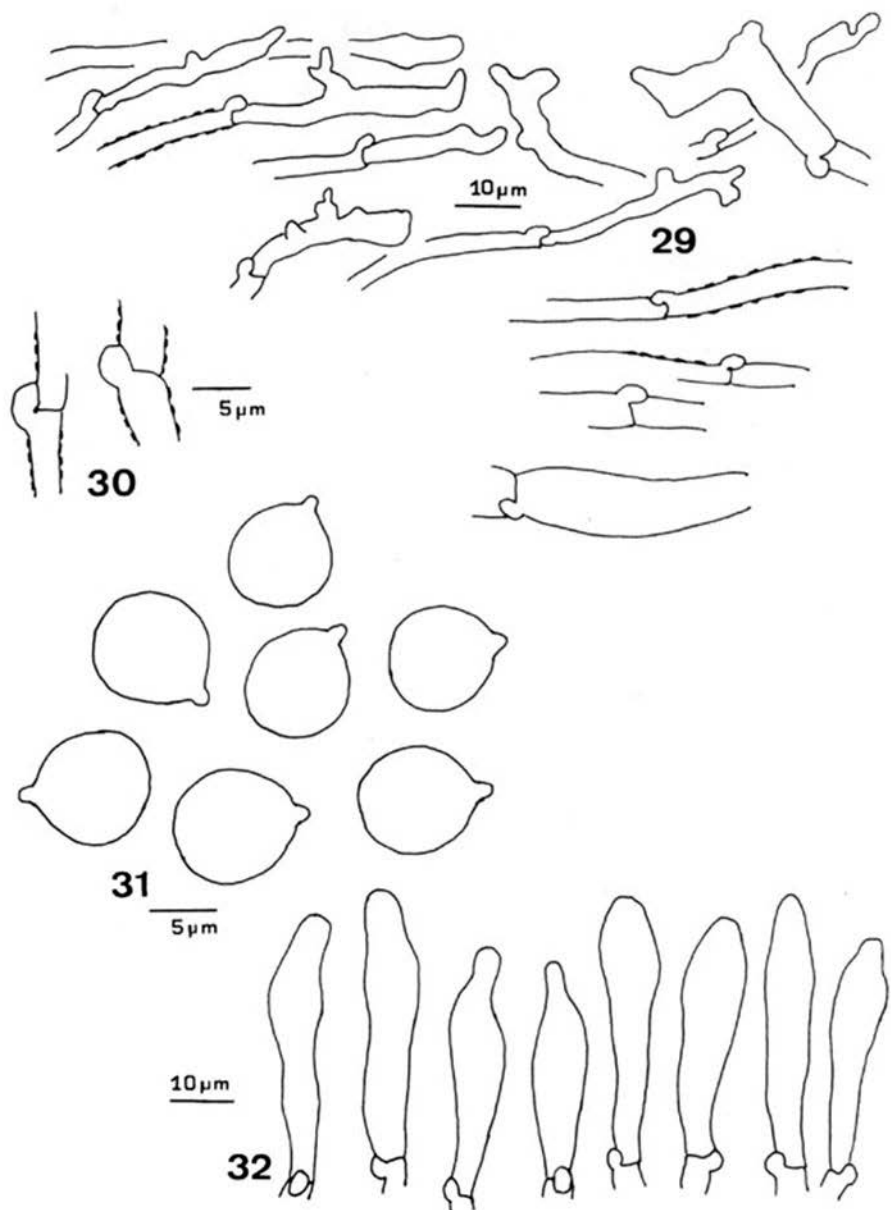


Figs. 25–28. *Marasmiellus phaeomarasmoides* (AH 18355 holotypus). 25, 26. Detail of gills and stipe; 27, 28. detail of the encrusted surface of pileus.

Marasmius or more probably *Marasmiellus*. This material seems to be related to *M. phaeomarasmoides*, sharing the same habitat on *Cupressaceae* (*Juniperus thurifera* in our case); it differs, however, in having ellipsoid spores.

Without exception, *Marasmiellus phaeomarasmoides* grows on bark of living trees of *Juniperus thurifera*, though sometimes it has been observed on dead branches attached to the tree, or even more rarely on fallen branches.

In the field it can be mistaken macroscopically with several species of the genus *Phaeomarasmius* Scherffel, especially *P. rimulincola* (Rabenh.) P.D. Orton, which shares the same corticolous habitat, and hence the taxon's name has been chosen for this new species.



Figs. 29–32. *Marasmiellus phaeomarasmioides* (AH 18355 holotypus). 29. Pileipellis; 30. clamp-connections on hyphae of stipe; 31. spores; 32. hymenial cystidia.

ACKNOWLEDGEMENTS

We wish to express our gratitude to Dr. D. Desjardin (San Francisco, USA) for both confirming our material as a new species and his critical comments, and to Dr. J.E. Wright for the Latin diagnosis. We also thank the Curator of the Farlow Herbarium for the loan of type material. This work has been partly financed by the research project DGICYT PB 91-0165.

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MYCENA SCHILDIANA, A NEW SPECIES FROM ITALY

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Mycena schildiana is described as a new species in section *Rubromarginatae*, although some of its characters do not entirely tally with those of the section.

During a foray into the Pine woods bordering the Tyrrhenian Sea NW of Rome, a strikingly coloured *Mycena* was found, of which the collector, better known for his work on the genus *Ramaria*, made detailed notes and prepared a water-colour.

Mycena schildiana Maas G., *spec. nov.* — Figs. 1-5

Basidiomata dispersa. Pileus usque ad 14 mm latus, conicus, centro applanatus, sulcatus, striatus, quasi glaber, siccus, pallide albo-cremeus, centro leviter vinosobrunneolus. Caro tenuis, pileo concolor, odore subraphanoideo. Lamellae c. 14 stipitem attingentes, molles, adscendentes, ventricosae, anguste adnatae vel dente decurrentes, pilei margine concolore, margine cremeo-aurantiacea. Stipes 50-70 × 1-1.5 mm, cavus, fragilis, aequalis, cylindraceus, siccus, levis, glaber, sursum albidus, deorsum flavidulus, basi fibrillis sparsis obtectus.

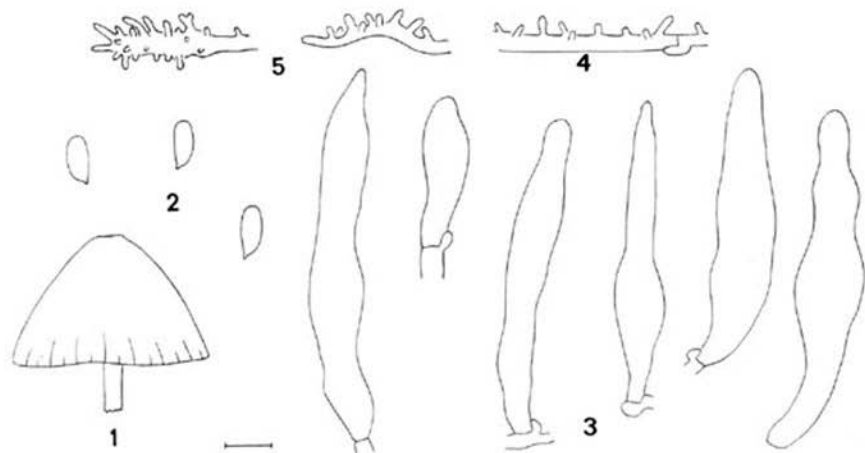
Basidia 27-30 × 6.5-7 µm, anguste clavata, 4-sporigera, fibulata. Sporae 8.9-9.8 × 4.5-4.9 µm, inaequilateraliter ellipsoideae, leves, amyloideae. Cheilocystidia 30-80 × 10-22 × 2.5-11.5 µm, fusiformia, subcylindracea, sublageniformia, fibulata, levia, materiam oleosam repleta. Pleurocystidia similia, haud numerosa. Trama lamellarum iodi ope rubrobrunnescens. Hyphae pileipellis 2.7-4.5 µm latae, fibulatae, haud in materiam gelatinosam immersae, diverticulatae; cellulae terminales usque ad 6.5 µm latae, diverticulatae. Hyphae stipitis corticales 1.8-2.5 µm latae, fibulatae, leves, haud in materiam gelatinosam immersae, cellulis terminalibus destitutae.

In silva coniferarum.

Holotypus: *E. Schild*, sine numero (L, No. 993.342-060).

Etymology: specific epithet referring to Mr. E. Schild, Brienz, Switzerland, who in the course of many years has contributed numerous collections to the Rijksherbarium.

Basidiomata scattered. Pileus up to 14 mm across, broadly conical, apically flattened to somewhat depressed, shallowly sulcate, translucent-striate, appearing glabrous, dry, pale creamy white to pale brownish white, towards the centre more isabelline (rather pale cream with an orange touch), with the disc delicately brownish wine-coloured. Context thin, concolorous with pileus. Odour experienced as raphanoid (like *Mycena pura* but less strong) mixed with an alkaline component. Lamellae c. 14 reaching the stipe, tender, ascending, ventricose, 2 mm broad, narrowly adnate or even somewhat emarginate, a few decurrent with a tooth, concolorous with the pileus, with very faintly creamy orange edge. Stipe 50-70 × 1-1.5 mm, hollow, fragile, equal, terete, dry, smooth, glabrous, watery creamy white above (paler than the pileus), more yellowish with an isabelline flush below, with age from the base upwards turning sooty brown or almost black-brown, the base covered with sparse fibrils.



Figs. 1–5. *Mycena schildiana* (holotype). 1. Pileus; 2. spores; 3. cheilocystidia; 4. hyphae of the pileipellis; 5. terminal cells. Fig. 1, $\times 2$, all others, $\times 700$; bar = 10 μm .

Basidia 27–30 \times 6.5–7 μm , narrowly clavate, 4-spored, clamped, with sterigmata 5.5 μm long. Spores 8.9–9.8 \times 4.5–4.9 μm , pip-shaped, almost cylindrical, smooth, amyloid. Cheilocystidia 30–80 \times 10–22 \times 2.5–11.5 μm , forming a sterile band, fusiform, subcylindrical, sublageniform, clamped, smooth, with oily contents. Pleurocystidia similar, not numerous. Lamellar trama turning reddish brown in Melzer's reagent. Pileipellis a cutis of repent, radially aligned hyphae which are 2.7–4.5 μm wide, clamped, not embedded in gelatinous matter, rather sparsely covered with wart-like to cylindrical excrescences 2.5–6.5 \times 1.3–1.8 μm , with terminal cells up to 6.5 μm wide and more densely diverticulate. Hypoderm made up of parallel hyphae with inflated cells up to 35 μm wide. Hyphae of the cortical layer of the stipe 1.8–2.5 μm wide, clamped, smooth, not embedded in gelatinous matter, without terminal cells.

Growing among fallen, decaying pine needles, moss and grass in a *Pinus* wood bordering the beach.

Material examined. ITALY: along the coast of the Tyrrhenian Sea, between Tarquinia and Civitavecchia, NW of Rome, 6 Nov. 1994, E. Schild (holotype: L, no. 993.342-060).

Several features may make one doubt whether the present species is a true member of section *Rubromarginatae*. The collector claimed that the pellicle of the fresh pileus was fully separable right to the disc, but microscopically there is no trace of the hyphae of the pileipellis being embedded in gelatinous matter, as one would expect. Unusual for a species of the *Rubromarginatae* is that it is the hyphae running parallel to the lamellar edge which form the sterile band and from which arise the cheilocystidia. A further unusual (but not entirely unknown) feature is that the cheilocystidia are filled with some oily matter which is so faintly coloured as to make it difficult to perceive the lamellar edge of the fresh fungus being differently coloured from the lamellar sides. The edge turns an unambiguous reddish brown when the material is dried, however.

In spite of the somewhat deviating features mentioned above, *Mycena schildiana* is retained in section *Rubromarginatae*, more particularly since it appears close to *M. decora* Maas G. (Maas Geesteranus, 1986: 292), an equally light-coloured species, which differs in having a pink pileus and a violet stipe.

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**MYCENA VALIDA, A NEW MEMBER OF SECTION FRAGILIPEDES
FROM GERMANY**R. A. MAAS GEESTERANUS¹ & TH. MÜNZMAY²

Mycena valida, collected in the 'Schwarzwald', Germany, and one of the few nitrous-smelling members of section *Fragilipedes* associated with conifers, is proposed as a new species.

The present species, found in the part of Germany called 'Schwarzwald', drew the attention by the large size of its fruit-bodies and their robust stature. The second author made colour photos and took some material home for inspection, only to find that it could not be satisfactorily named. Subsequent analysis disclosed a sufficient number of macro- and microscopic elements to warrant the proposal of a new species.

***Mycena valida* Maas G. & Münzmay, spec. nov. — Figs. 1-7**

Basidiomata partim caespitosa. Pileus 20-40 mm latus, e conico applanatus, umbonatus, margine sulcatus, striatus, albo-pruinoseus, flavido-brunneus. Caro tenuis, odore nitroso. Lamellae 17-20 stipitem attingentes, molles, ascendentes, usque ad 4 mm latae, ventricosae, liberae, aetate venosae et intervenosae, albae, roseo-afflata, margine concolores. Stipes 45-60(-100) × 2-4 mm, cavus, fragilis, aequalis, cylindraceus, levis, tenuiter pruinoseus, griseobrunneus, apice albidus, basi albo-fibrillosus.

Basidia 30-38 × 7-8 µm, clavata, 4-sporigera, fibulata. Sporae 8.1-10.7 × 5.4-6.3 µm, inaequilaterale ellipsoideae, leves, amyloideae. Cheilocystidia 28-60 × 7-15 × 2.5-4.5 µm, fusiformia, fibulata, levia vel apice subramosa. Pleurocystidia subfusiformia, cylindracea, sublageniformia. Trama lamellarum iode ope vivescens. Hyphae pileipellis 1.8-3.5 µm latae, fibulatae, praecipue apicem versus ramosae, haud in materiam gelatinosam immersae. Hyphae stipitis corticales 1.8-2.5 µm latae, fibulatae, leves, in materiam gelatinosam immersae, cellululae terminales diverticulatae.

Piceicola.

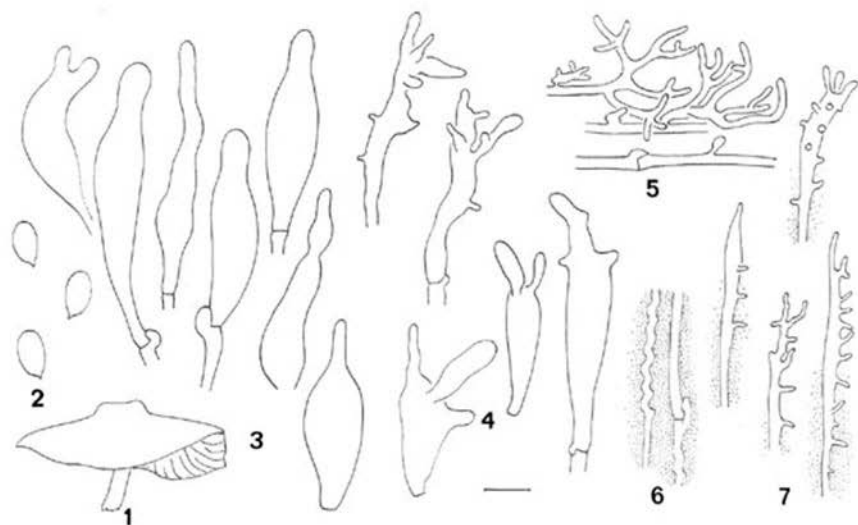
Holotypus: *G. Saar & Th. Münzmay H18-95* (L, No. 993.342-028).

Etymology: validus, robust, in reference to the robust habitus.

Basidiomata in part caespitose. Pileus 20-40 mm across, at first conical, flattening with age, conspicuously umbonate, sulcate at the margin, translucent-striate, entirely white-pruinose, evenly coloured warm beige-brown. Context thin, pale. Odour nitrous, taste not recorded. Lamellae 17-20 reaching the stipe, tender, ascending, up to 4 mm broad, ventricose, free, with age developing veins and becoming intervenose, white to greyish-whitish, becoming flushed with pink, with convex, concolorous edge. Stipe 45-60(-100) × 2-4 mm, hollow, fragile, equal, terete, smooth, delicately pruinose, at first watery horn grey, then from the base upwards turning reddish brown, the apex remaining pale for a long time (resulting in the stipe appearing two-coloured), the base densely covered with coarse, long, whitish fibrils.

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Figs. 1–7. *Mycena valida* (holotype). 1. Pileus (of dried specimen); 2. spores; 3 cheilocystidia (near the middle of the lamella); 4. cheilocystidia (near the margin of the pileus); 5. hyphae of the pileipellis; 6. hyphae of the cortical layer of the stipe; 7. terminal cells of hyphae of the cortical layer of the stipe. Fig. 1, $\times 1.5$; all others, $\times 700$; bar = 10 μm .

Basidia 30–38 \times 7–8 μm , slender-clavate, 4-spored, clamped, with sterigmata up to 5.5 μm long. Spores 8.1–10.7 \times 5.4–6.3 μm , pip-shaped, smooth, (greyish) amyloid. Cheilocystidia 28–60 \times 7–15 \times 2.5–4.5 μm , forming a sterile band, (a) near the middle of the lamella fusiform, clamped, thin-walled, smooth, upwards passing into a more or less strongly narrowed but always round-tipped neck, (b) near the pileus margin often sub-clavate, apically branched or covered with coarse excrescences 2.5–18 \times 2.5–6.5 μm . Pleurocystidia frequently more slender than the cheilocystidia, subfusiform, cylindrical or sublageniform. Lamellar trama violet-vinescent in Melzer's reagent when fresh, orange-brown when dried. Pileipellis a cutis of repent, radiately aligned hyphae which are 1.8–3.5 μm wide, clamped, not embedded in gelatinous matter, partly smooth, much branched towards their apices, with side-branches 0.9–1.8 μm wide. Hypoderm made up of parallel hyphae with inflated cells up to 30 μm wide. Hyphae of the cortical layer of the stipe 1.8–2.5 μm wide, clamped, smooth, embedded in gelatinous matter, the terminal cells 3.5–4.5 μm wide, covered with not very numerous, cylindrical, simple to furcate, straight to curved excrescences 1.8–10 \times 0.9–2 μm .

Growing on and around *Picea* stumps, c. 900 alt.

Material examined. 'Germany, Schwarzwald, Bräunlingen, Kirnbergsee, on calcareous soil ('Muschelkalk'), 5 October 1995, G. Saar and Th. Münzmay H18-95' (holotype; L. No. 993.342-028; isotype in Herb. Münzmay).

Mycena valida is yet another member of the ever growing section *Fragilipedes* ((Fr.) Quél.) which contains several species characterized by a nitrous smell. Perhaps, *M. abram-*

sii (Murrill) Murrill and *M. stipata* Maas G. & Schwöbel are the two species most likely to be confused with *M. valida*.

In *M. abramsii* (Maas Geesteranus, 1988: 50), the spores are rather more cylindrical than pip-shaped; many of the cheilocystidia have acute apices; the hyphae of the cortical layer of the stipe are not embedded in gelatinous matter.

Mycena stipata (Maas Geesteranus, 1988: 287) differs from *M. valida* in having adnate lamellae, decurrent with a short tooth; yellowish shades in the colour of the stipe; and hyphae of the pileipellis being embedded in gelatinous matter.

Of these two species, *Mycena stipata* is more closely related to *M. valida*.

A further pronouncedly umbonate, nitrous-smelling species, macroscopically not unlike *Mycena valida*, is *M. algeriense* Maire apud Kühner (1938: 490, 685, fig. 166). However, the latter is a species associated with broad-leaved trees, its pileus is said to be "glaber," its lamellae "adnées," and the "Epicutis pileique ... nettement gélatineux."

Following the key to the *Fragilipedes* (Maas Geesteranus, 1988: 45), one is led to *M. leptcephala* (Pers.: Fr.) Gillet, but this is an entirely different species, slender-stalked and with characteristically inflated terminal parts of the caulocystidia.

REFERENCES

- Kühner, R. 1938. Le genre *Mycena* (Fries). *Encycl. mycol.* 10.
Maas Geesteranus, R.A. 1988. Conspectus of the *Mycenas* of the Northern Hemisphere - 9. Section *Fragilipedes*, species S-Z. *Proc. K. Ned. Akad. Wet. (Ser. C)* 91: 283-314.

BOOKS RECEIVED BY THE RIJKSHERBARIUM LIBRARY

- R. Agerer (Ed.). *Colour atlas of ectomycorrhizae, Issue 9*. (Einhorn Verlag, Eduard Dietenberger GmbH, Schwäbisch Gmünd. 1996.) ISBN 3-921703-77-8. Pp. 27, 6 col. pls. Price: DM 45.-.

The ninth issue of this colour atlas of ectomycorrhizae provides 6 colour plates, descriptions and micrographs of mycorrhizae of *Pisolithus tinctorius* (host *Shorea parviflora* Dyer), *Quercirhiza squamosa* and *Xerocomus subtomentosus* (host *Quercus robur* L.), and three truffles, *Tuber melanosporum*, *T. mesentericum*, and *T. rufum* with the host *Corylus avellana*. In addition (updated) keys are given for the identification of mycorrhizae on *Quercus*, *Corylus*, and *Shorea* as well as additional references on literature and an appendix on identified mycorrhizae and how to arrange the plates in issue 1 through 9. This most valuable series will be continued.

- D. Boertmann. *The genus Hygrocybe (Fungi of Northern Europe - vol. 1)*. (Svampetryk, The Danish Mycological Society, P.O. Box 168, DK-2670 Greve, Denmark. 1995.) ISBN 87-983581-1-1. Pp. 184, many colour photographs and line-drawings.

This study of the genus *Hygrocybe* in Northern Europe is meant to be the first of a series of book on the fungi of Northern Europe, initiated by the Danish Mycological Society. Each volume will give identification keys, detailed descriptions and colour photographs. With this first volume a good start has been made. The keys are well written and easy to use. The descriptions are short, but contain all important diagnostic features. Of the microscopical characters, only the spores are illustrated. The most attractive part of the book are the excellent colour photographs of each species. It will certainly be of great help in identifying these beautiful, but not always easy to identify mushrooms. In addition to the taxonomic treatment of the genus, also extensive information is given on the ecology of the species, and their value as indicator organisms for certain habitats with a high biological diversity. As such the book is also a valuable tool for nature conservationists.

- C.J. Bos (Ed). *Fungal Genetics, Principles and Practice*. (M. Dekker, New York, Basel, Hong Kong. 1996.) ISBN 0-8247-9544-X. Pp. 442, numerous text-figs. Price: US\$ 175.-.

The book covers formal and molecular genetics and techniques as a guide for biochemists and other scientists who use molecular genetic analysis and gene manipulation, but may have little genetic background. The first part of the book deals with genetic principles. The second part contains case studies on the genetics of specific fungi, indicating what the interesting features are of each organism for genetic studies. Numerous specialists have been asked to provide chapters on particular subjects. Examples of such chapters are in the first part on genetic principles: Biology of Fungi, Mutation, Meiotic and Somatic Recom-

bination, Molecular Genetic Analysis. In the second part case studies are given of e.g. Construction of a Physical Map of the *Candida albicans* genome, Mutation in *Neurospora crassa*, Horizontal Transmission in Fungal Populations, Production and Analysis of Meiotic Mutants in *Coprinus cinereus*, and Genetic Analysis in the Oomycetous Fungus: *Phytophthora infestans*. The book is well-written and very suitable to use in courses and teaching. References are given for further reading.

E. Gerhardt. *Taxonomische Revision der Gattungen Panaeolus und Panaeolina (Fungi, Agaricales, Coprinaceae)*. (Bibliotheca Botanica, Heft 147, E. Schweizerbart'sche Verlagsbuchhandlung, Stuttgart, Germany. 1996.) ISSN 0067-7892. Pp. 149, 77 text-figs. Price: DM 186.-.

We have long been waiting for this new world monograph of *Panaeolus* sensu lato, which has become available now. The genus *Panaeolus* has a wide distribution, including many taxa that occur in anthropogenous habitats all over the world. To solve the big taxonomic problems in this genus, a revision on a world-wide scale appeared to be necessary. The author studied numerous fresh and dried collections, including types. Much attention has been paid to the variability of characters such as basidiocarp size, expression of veil, hygrophanicity, etc. The author reduced about the 160 taxa existing in literature to 32 species and varieties. The former genera *Annellaria* and *Copelandia* are treated as subgenera within *Panaeolus*, but *Panaeolina*, with slightly paler, roughened spores, is still maintained as a separate genus. Good analytical keys, in German as well as in English, are followed by very extensive descriptions, amply illustrated with drawings of basidiocarps and microscopical characters. Much information is also given on ecology and distribution. Type-studies gave way to some name changes. An account is given of excluded and dubious names.

S. Gravesen, J. C. Frisvad & R. A. Samson. *Microfungi*. (Munksgaard, Copenhagen, Denmark. 1994.) ISBN 87-16-11436-1. Pp. 168, about 100 colour and 50 black-and-white photographs. Price: DEK 320.-, US\$ 52.- excl. VAT.

This attractive book on microfungi gives a concise introduction into the world of filamentous microfungi. The first part concentrates on themes such as biodeterioration and spoilage, biotechnological aspects, mycotoxins and allergies, and fungal infection, whereas the second part gives descriptions of a selection of common microfungi. The book is very well illustrated. It is highly recommended as a guide for students and professionals in various disciplines who want to get acquainted with the subject.

D. H. Jennings & G. Lysek. *Fungal biology: understanding the fungal lifestyle*. (Bios Scientific Publishers, Oxford/Washington. 1996.) ISBN 1-85996-15-09. Pp. 176, numerous text-figs. Price: £ 16.95.

This is a text book for students starting a course in mycology or microbiology, who have never been trained in mycology. It is not an introduction in taxonomy of fungi or an overview of life-cycles, but claims to give an overview of the fundamental properties and ac-

tivities of fungi. The book falls apart in three main sections. Part one, called "The fungal lifestyle" gives an introduction to hyphae and mycelium, and how they explore their substrate, also in connection with saprotrophism and parasitism. Part two, called "The environment" deals with the fungal response to external factors such as water, oxygen, light and temperature, as well as with fungal competition. The third part of the book deals with reproduction, including sexuality, spores, and spore germination. Appendices give an overview of five representative fungal lifestyles and the classification of fungi as used in the book. A glossary and list of abbreviation facilitates the use of this book. Altogether this is a clearly written introduction to fungal biology, and recommended for students and teachers in mycology.

U. Jungehülsing. *Genomanalyse bei Claviceps purpurea*. (Bibliotheca mycologica 161, J. Cramer in der Gebrüder Borntraeger Verlagsbuchhandlung, Stuttgart. 1995.) ISBN 3-443-59063-2. Pp. 125, 50 text-figs. Price: DM 160.-.

This paper presents data on 29 isolates of *Claviceps purpurea*, which have been analyzed genetically to study their relation. RAPD analysis of DNA showed that isolates from *Secale cereale* are more closely related phylogenetically than isolates from other grasses. Infection experiments confirmed the existence of varying virulence for *Secale cereale* in relation to the origin of the isolates. Karyotyping showed a great deal of variability as to chromosome numbers and size in such an extent, that for every isolate a specific karyotype could be discovered. Both haploid and diploid isolates occur, as well as some triploid and aneuploid ones. Crossing experiments showed a high degree of rearrangements and recombination in the genome.

The book is clearly written and well-edited. Unfortunately an English summary is lacking.

U. Køljalg. *Tomentella (Basidiomycota) and related genera in Temperate Eurasia. Synopsis Fungorum 9*. (Fungiflora, Oslo, Norway. 1995.) ISBN 82-90724-16-0. Pp. 213, 171 text-figs. Price: unknown.

This is the result of a study over many years of tomentelloid fungi in the Baltic countries and the Russian Far East by the author. It presents the conclusions of a study of the systematics of these fungi with contemporary methods. Following a brief introduction with the taxonomic history, attention is paid to the different methods used. The taxonomic descriptions are made up in the DELTA format. The resulting data matrix is used for cladistic analysis with the programs PAUP and Pee-Wee. The suggested phylogenetic relationships are reflected in the proposed classification of genera, subgenera, and sections in this group. In the tomentelloid fungi the genera *Amaurodon* (6 sp.), *Pseudotomentella* (8 sp.), *Tomentellopsis* (3 sp.), and *Tomentella* (43 sp.) are distinguished; while *Tomentella* is subdivided in two subgenera each with several sections. Nine new combinations for names are proposed. Keys to the genera and species treated are included. Most species are fully described and illustrated, but in some cases there are only references to other descriptions in literature. Of most species a distribution map, drawings after microscopic details, and SEM-graphs of the basidiospores are shown.

- K. Mallett & C. Grgurinovic (Eds.). *Fungi of Australia Vol. 1A. Introduction—Classification*. (CSIRO Publishing, P.O. Box 1139, Collingwood 3066, Victoria, Australia. 1996.) ISBN 06-43058-02-8 (hardcover), 06-43058-89-3 (softcover). Pp. 413, 85 figs. in colour and black-and-white. Price: hardcover US\$ 69.95, softcover US\$ 54.95.
- K. Mallett & C. Grgurinovic (Eds.). *Fungi of Australia Vol. 1B. Introduction—Fungi in the environment*. (CSIRO Publishing, P.O. Box 1139, Collingwood 3066, Victoria, Australia. 1996.) ISBN 06-43059-35-0 (hardcover), 06-43059-36-9 (softcover). Pp. 405, 78 figs. in colour and black-and-white. Price: hardcover US\$ 69.95, softcover US\$ 54.95.

This is the result of a major new initiative for the Australian Biological Resources Study. The 'Fungi of Australia' is planned as an ambitious new series of 60 volumes, dealing with fungi in a very broad sense. It will incorporate all those organisms traditionally studied by mycologists, and covers organisms belonging to at least three Kingdoms. Included are *Myxomycota*, *Oomycota*, *Hypochytriomycota*, *Chytridiomycota*, *Zygomycota*, *Ascomycota*, and *Basidiomycota*; all in accordance with a classification by J. Walker, adopted for this series. For historical reasons nine orders of lichenized fungi, that are treated in volumes of the 'Flora of Australia', will not be included in the 'Fungi of Australia'.

The first volume provides an introduction to the many aspects of Australian mycology, in the form of a series of reviews. These reviews summarize the state of knowledge with some accent on the Australian situation, but placed in a world context. The first part (Vol. 1A) contains chapters by Australian mycologists on classification, keys to orders of fungi, a bibliography of Australian myco-taxonomy, history, biology, biogeography, and fossil fungi. A glossary of terms frequently used in mycology and an index close the first part.

The second part (Vol. 1B) completes the introduction to Australian mycology with a series of thirteen reviews on fungi in relation to their environment, their interaction with other organisms, and their use as food. There are chapters on freshwater and marine fungi, toxin-producing fungi, parasitic fungi, and on fungi causing mycoses in animals and humans. In a substantial contribution the association between arthropods and fungi is treated. Fungi as a food resource for mammals reveals interesting aspects of mycophagy and the taxonomy of Australian hypogeous fungi.

In an fascinating chapter the aboriginal knowledge and use of fungi is summarized.

This first volume of the 'Fungi of Australia' is high quality, both in content and in production. Great care has been paid to lay-out and print of text and illustrations. It certainly is of general interest to mycologists, not only in Australia but also in other parts of the world.

- M.P. Martin. *The genus Rhizopogon in Europe*. (Societat Catalana der Micologie, Apt. de Correus 186, 08330 Premià de Mar, Spain. 1996.) ISBN 84-92161-70-1. Pp. 166, 80 figs., 5 col. pls. Price: Pts 3900.

This modern monograph of the hypogeous or semihypogeous Gasteromycete genus *Rhizopogon* gives keys and full descriptions of all 21 accepted species in Europe. The book is well illustrated with good line-drawings, distribution maps, SEM pictures of spores and colour plates illustrating a selection of species. The author has a rather wide species concept, which is also based on electron microscopical, chemical and molecular studies. The book is recommended for all interested in this genus.

M. Nuñez & L. Ryvar den. *Polyporus (Basidiomycotina) and related genera. Synopsis Fungorum 10.* (Fungiflora, Oslo, Norway. 1995.) ISBN 82-90724-15-2. Pp. 85, 20 text-figs. Price: unknown.

This flora is a modified part of the doctoral thesis of Maria Nunez. It presents a concise treatment of the world species of *Polyporus* and its allies. After a short introduction on history, typification, species concept, taxonomic characters, and ecology, the delimitation of genera and the distinction of five infrageneric groups within *Polyporus* are discussed. Here anatomical characters of the hyphal system play a major role. Keys to the genera and species of *Echinochaete* (4 sp.), *Laccocephalum* (5 sp.), *Pseudofavolus* (4 sp.), and *Polyporus* (32 sp.) are presented. Of each taxon treated a restricted synonymy and a clear description are given. The illustrations are line-drawings of basidiospores and of hyphal elements, as far as relevant. There are four new combinations (all under *Laccocephalum*) and a new species (*Polyporus centrafricanus*). A list of specific names which are excluded from *Polyporus sensu stricto* terminates this study. It is a valuable and handy book for the identification of species of *Polyporus* and its allies.

S.C. Redlin & L.M. Carris (Eds.). *Endophytic fungi in Grasses and Woody Plants. Systematics, Ecology, and Evolution.* (APS Press, St. Paul, Minnesota, USA. 1996.) ISBN 0-89054-213-9. Pp. 223, 31 figs., 20 tables. Price: US\$ 49.- (in USA US\$ 39.-).

This book is a collection of papers presented at a discussion session of the APS Mycology Committee in 1991, supplemented by invited papers on the subject. Topics include Latent infections vs. endophytic colonisation by fungi, isolation and analysis, ecology and distribution of endophytes, interactions and response to terpenoids, special chapters on the endophytes of palms and grasses, and finally the effects of anthropogenic environmental changes on endophytes, and the possible use of manipulated endophytic fungi for vegetation biocontrol.

J.L. Rodriguez-Armas & E. Beltràn Tejera. *Contribución al estudio de los Aphyllophorales (Basidiomycotina) del Monteverde de las Islas Canarias.* (Bibliotheca mycologica 160, J. Cramer in der Gebrüder Borntraeger Verlagsbuchhandlung, Stuttgart. 1995.) ISBN 3-443-59062-4. Pp. 456, 101 text-figs, 14 plates. Price: DM 190.-.

245 species of Aphyllophorales have been studied, mainly from the evergreen Laurisilva forest (*Pruno-Laureta azorica* and *Myrica-Erica* communities) on the Canarian Islands (Spain), with special emphasis on the wood-inhabiting taxa (88.4 % of all studied species). Although many collections were made on typical Canarian/Mediterranean woody plants, such as *Laurus azorica*, *Myrica faya*, *Ocotea foetens*, *Persea indica*, *Pinus canariensis*, and *Ilex canariensis*, most of the fungi found belong to species with a much wider host-spectrum and contribution. Contrary to the situation in Phanerogams, the Aphyllophorales flora of the Canarian Islands does not seem to be influenced by the isolated position of the island, and did not develop endemism to such an extent.

The book gives extensive descriptions of most taxa with a selection of microscopical details in the form of text-figures, and black-and-white photographs of fruiting bodies. Also extensive data are given on ecology, distribution on the islands, and a list of col-

lections. The nomenclature used and the taxonomy that has been applied fit modern standards. With the present publication much information has become available, and therefore it is warmly recommended for all people interested in Aphyllophorales as well as those interested in biogeography.

L. Ryvarden & R.L. Gilbertson. *European Polypores, part 2. Synopsis fungorum 7.* (Fungiflora, Oslo, Norway. 1994.) ISBN 82-90724-13-6. Pp. 394-743. Price: unknown.

The first volume of this practical guide to European Polypores is discussed in *Persoonia* 15 (3): 403. 1993. The second volume of this flora treats the genera *Meripilus* through *Tyromyces* with generic diagnoses, and keys and descriptions of all taxa known to occur in Europe. The book is nicely illustrated with line-drawings of microscopical characters and rather simple distribution maps. Some descriptions are accompanied by elaborate, highly detailed line drawings of basidiocarps. Both volumes form a very valuable identification tool for this group of economically important fungi.

H.O. Schwantes. *Biologie der Pilze. Eine Einführung in die angewandte Mykologie.* (Eugen Ulmer Verlag, Stuttgart. 1996.) ISBN 3-80012-69-15. Pp. 478, 60 text-figs. Price: DM 42.80.

This pocket-size paperback is a concise introduction to fungal biology and taxonomy. A short introduction on fungal biology and history of mycology is followed by chapters on the mycelium, vegetative and sexual reproduction, fungal lifestyle, secondary metabolites, damage caused by fungi, the commercial and industrial use of fungi, fungi and environment and fungal biogeography. About 250 pages are devoted to fungal taxonomy, with very much information in a rather condensed form. The line-drawings are generally small and vary in quality. In its rather traditional approach the book offers much information at low cost, and will certainly be welcomed by many German-speaking students in mycology.

P. Stamets. *Psilocybin Mushrooms of the world. An identification guide.* (Ten Speed Press, Berkeley, California. 1996.) ISBN 0-89815-839-7. Pp. 256, numerous illustrations, incl. colour photographs. Price: US\$ 24.95.

This is the most comprehensive guide to psilocybin mushrooms available at present. It is not only an identification guide, but offers also a thorough survey of the history of the use of *Psilocybe* with ethnomycological facts and information on how to collect these mushrooms, the content of psilocybin and related compounds, and tips for dose and ritual settings. But the main part of the book is devoted to the mushrooms themselves: identification tools and extensive, scientific descriptions of all species known to contain psilocybin. Not only the main psilocybin genera *Psilocybe* and *Panaeolus* are treated, but also representatives of the genera *Conocybe*, *Gymnopilus*, *Inocybe* and *Pluteus*. Also information is provided on deadly look-alikes. The descriptions are accompanied by good to excellent colour photographs. A glossary and extensive literature guide is also provided. The text is written in an easy to read, spontaneous style. Warmly recommended.

S.C. Teng. *Fungi of China*. Edited by P. Korf. (Mycotaxon Ltd., Ithaca, 1996.) ISBN 0-930845-05-6. Pp. xiv + 586, 426 illus. Price US\$ 79.-.

This most remarkable and important contribution to the knowledge of Chinese fungi by Shu Chün Teng (1902–1970) has become available now in English thanks to the efforts made by Teng's daughter, R.C. Teng, and Prof. P. Korf, who did the editing of this book, which surely has been a time-consuming, but rewarding job. The introductory chapters include a brief account of Teng's life and work, written by his daughter, and a map of China's provinces. The descriptive part of the book contains an account of all Myxomycetes, Phycomycetes, Ascomycetes, Basidiomycetes, and Deuteromycetes known from China, including the new taxa described by Teng, with numerous keys, and short diagnostic descriptions of the species with data on ecology and distribution. Sometimes remarks on edibility or pathology are added. The book is illustrated with numerous line drawings of fruit-bodies and microscopical details. An extensive index to all taxa, prepared by P. Korf, makes this book readily accessible for the user. The editor is to be complemented with the result of his work, that enables mycologists and pathologists to learn about the fungi of China. It should be present in every public and private mycological library.

K. Vanky. *European Smut Fungi*. (Gustav Fischer Verlag, Stuttgart, Jena, New York, 1994.) ISBN 3-437-30745-2. Pp. 570, 1003 text-figs. Price: DM 398.-.

This book, written by one of the leading smut specialists of the world, gives an account of about 400 smut fungi that are known so far from Europe, with further 70 taxa that are not yet known from this continent. Keys to the genera are given and a host plant/smut index to facilitate identification. The genera are treated in alphabetical order, with generic diagnosis followed by keys to the species and descriptions, host range and distribution of all taxa. The book is very well illustrated with line drawings of infected host plants, details of infected structures, and micro- and scanning photographs of spores and basidia. Although the author sticks to a rather conservative species and generic concept, the book provides a very welcome source of information and identification tool for everyone interested in these parasitic fungi. And what is most important: the well edited book invites you to start looking for these intriguing organisms! It is a must in every mycological library.

T.J. Volk & H.H. Burdsall, jr. *A nomenclatural study of Armillaria and Armillariella species. Synopsis fungorum 8*. (Fungiflora, Oslo, Norway, 1995.) ISBN 82-90724-14-4. Pp. 121. Price: unknown.

After a short introduction to the delimitation of *Armillaria* and *Armillariella*, the authors give a list of all specific epithets that have been published in connection with the two generic names, with, when appropriate, the basionym, the current accepted name for the fungus involved, synonyms, and sometimes a short note as to nomenclature and/or taxonomy. As such it is a good start for everyone interested in the genus, but cannot be used for identification purposes.