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STUDIES IN COPRINUS-I
Subsections Auricomi and Glabri of Coprinus section Pseudocoprinus

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A key is given to the Netherlands' species of subsect. *Auricomi* Sing. and *Glabri* J. Lange of *Coprinus* sect. *Pseudocoprinus* (Kühn.) Orton & Watling. All species concerned are concisely described and amply discussed. *Coprinus plicatilis* var. *microsporus* Kühn. is raised to species level as *C. kuehneri* and described in detail.

Although much has been written about the *Coprinus hemerobius*-group (inclusive or exclusive of *C. auricomus*), quite a few taxonomic problems in this fairly well-defined complex of species and varieties remain to be solved. In this paper we want to expound our present views, based on many observations, on these problems, hoping to contribute to the solvation of at least a few of these.

New concepts, the raising to the rank of species of *C. plicatilis* var. *microsporus*, and the inclusion of our recently described *C. hercules*, necessitated the construction of a new identification key which is presented here.

As most of the accepted taxa have been extensively described and illustrated elsewhere, we restrict ourselves to giving concise diagnostic descriptions and illustrations of the most important characters, simultaneously referring to the selected descriptions in literature.

This study is based on examination by the first author of all the collections of species concerned present in his own herbarium, at the Rijksherbarium Leiden and of collections from several private herbaria of members of the Nederlandse Mycologische Vereniging. In addition a number of collections borrowed from institutes in Great Britain and West Germany have been investigated.

PRESENTATION

In the descriptions is referred to the colour codes of Munsell (1975) and Kornerup & Wanscher (1978), respectively indicated as Mu. and K. & W. Other abbreviations used are: L = length, W = width of the spores in side view, B = breadth of the spores in frontal view and Q = length divided by breadth. The sizes of the spores, given in the descriptions of the species, relate to L × B or L × B × W. The colour of the spores, as indicated, gives the colour as seen under the microscope. A notation like (80/8/2) stands for '80 spores from 8 basidiocarps from 2 collections measured'. The enlargement of the drawings is × 1000 for the spores and × 800 for the other microscopical details.

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COPRINUS (Pers.: Fr.) S. F. Gray

Section Pseudocoprinus (Kühn.) Orton & Watling

KEY TO THE SUBSECTIONS

1. Stipe and pileus with setulae (not treated here) . . . . . Subsection *Setulosi*
1. Stipe glabrous; pileus glabrous or with scattered, microscopical, long, brown hairs.
   2. Stipe and pileus glabrous. Spores with excentric germ pore . . . . . Subsection *Glabri*
   2. Stipe glabrous; pileus under microscope with scattered, long, brown hairs (> 200 µm). Spores with central germ pore . . . . . Subsection *Auricomi*

Subsection Auricomi Sing. 1948

Long (up to 350 µm), brown, thick-walled hairs present on pileus; spores ellipsoid with central germ pore . . . . . *C. auricomus*

Subsection Glabri J. Lange 1915

KEY TO THE SPECIES

1. Average breadth of spores < 10 µm.
   2. Average breadth of spores < 7.8 µm; average length < 10 µm; spores 7.5–10 × 6–8 µm, not or weakly lemon-shaped, rounded-triangular or quadrangular in frontal view . . *C. kuehneri*
   2. Average breadth of spores > 7.8 µm or average length > 12 µm.
      3. Pileus small, < 10 mm; spores 7–10.5 × 6.5–10 µm; pleurocystidia absent; on dung *C. miser*
      3. Pileus usually larger; if growing on dung then length of the spores > 12 µm; pleurocystidia present.
         4. Average length of spores < 11 µm.
            5. Spores in frontal view heart-shaped or weakly to strongly lemon-shaped with rounded angles (usually 5) . . . . . *C. leiocephalus*
            5. Spores in frontal view subglobose to globose, without angles *C. galericuliformis* Watling
         4. Average length of spores > 11 µm.
            6. Average length of spores 11–13 µm, average breadth 8.1–9.5 µm; spores usually somewhat heart-shaped or ovoid and subangular, more rarely ellipsoid . *C. plicatilis*

6. Average length of spores 14–15.5 µm, average breadth 9.5–10 µm; spores conspicuously ellipsoid . . . . . *C. megaspermus*

1. Average breadth of spores > 10 µm.
   7. Basidiocarps small: pileus c. 13 mm in diam., stipe up to 1.5 mm thick; spores 12–17 × 11.5–15 µm, average breadth 11.8–13.3 µm; up to 8 pseudoparaphyses around each basidium *C. hercules*
   7. Basidiocarps usually larger: stipe 1.5–3 mm thick; average breadth of spores 9.5–11.6 µm; up to 7 pseudoparaphyses around each basidium.
      8. Average Q of spores < 1.3; spores 11–15 × 10–13 µm, usually broadly heart-shaped *C. nudiceps*
      8. Average Q of spores c. 1.5; spores 12–17 × 8.5–11 µm, distinctly ellipsoid *C. megaspermus*

Subsection **Auricomi** Sing.

Notwithstanding the macroscopical similarities between *C. auricomus*, the sole species of this subsection, and species of the *plicatilis*-group, we think that a separate subsection for the former is justified by its microscopical characters. Not only the brown thick-walled hairs on the pileus, but also the ellipsoid spores with a central germ pore warrant its classification outside subsect. *Glabri.*

Coprinus auricomus Pat. — Figs. 1 & 12

Coprinus auricomus Pat., Tab. anal.: 200. 1886.

Coprinus hansenii J. Lange in Dansk bot. Ark. 2 (3): 48. 1915.

Misapplied names. — *Coprinus crenatus* s. Rick., Blätterpilze: 66. 1915; *Coprinus hemerobius* s. J. Lange, Fl. agar. dan. 4: 118. 1939.

Selected descriptions. — Kühn. & Joss. in Bull. trimest. Soc. mycol. Fr. 50: 53. 1934; Bender & al. in Z. Mykol. 50: 34–39. 1984; Donelli & Simonini in Boll. Grup. micol. G. Bres. 29: 106. 1986.

Young pileus ellipsoid, often somewhat conical, expanding to 2–60 mm in diam., chestnut-colour, red-brown or orange-brown (Mu. 2.5 YR 2.5/2, 3/2, 2.5/4, 3/4; 5 YR 2.5/2, 3/3, 3/4, 4/4, 4/6, 4.5/7.5; 7.5 YR 5.5/4, 4/6, 5/8; 10 YR 4/6, 5/6; K. & W. 7 F G) at centre, paler at margin, glabrous. Lamellae free but not remote from apex of stipe, first whitish, then brown (Mu. 5 YR 2.5/1, 3/1, 3/3), finally black. Stipe 70–120 × 2–3 mm, with subbulbous base, sordidly white to sordidly yellow-brown (Mu. 10 YR 8/1).

Spores (340/17/17) 10–14.3 × 5.8–8.2 µm, average L. 10.8–13.1 µm, average B. 6.8–7.5 µm, Q = 1.36–2.07, average Q = 1.47–1.93, ellipsoid with central germ pore. Basidia 4-spored. Cheilo- and pleurocystidia as in Figs. 7 and 8, but slightly larger and somewhat slenderer. Pileipellis hymeniform with scattered long, brown, thick-walled hairs. Clamps present.

Habitat. — Terrestrial at grassy places, road-sides, etc., but also locally very abundant on woodchips used to pave paths and tracks.

In discussions concerning *C. auricomus* frequently the names *C. hansenii* J. Lange (1915) and *C. hemerobius* Fr. (1838: 253) are mentioned.

Although Lange (l.c.) did not describe the presence of hairs on the pileus we are convinced that his *C. hansenii* is a younger synonym of *C. auricomus* for the following

reasons: (i) Lange's illustration of *C. hansenii* fits *C. auricomus* perfectly. (ii) Spore-shape and size given by Lange for *C. hansenii* agree very well with *C. auricomus*. (iii) Lange's mentioning of *C. crenatus* s. Rick. as identical with *C. hansenii*. Ricken's description and particularly his coloured illustration (1911: 66) under that name leave little room for doubt about the identity with *C. auricomus*. (iv) Although *C. auricomus* is a fairly common species, it is not described elsewhere in Lange's work.

It is sometimes argued that it is improbable that an excellent mycologist as J. Lange would have missed the hairs on the pileus. It is our experience, however, that because of their scarcity these hairs are often not found in a radial section of the pileipellis and sometimes are lacking even in scalps, notwithstanding the fact that, probably contrarily to Lange, we know what we are looking for. Besides, these hairs can be rather short and pale and then difficult to detect. It happened several times that in a collection of a *C. plicatilis*-like fungus with ellipsoid spores and central germ pore we did not immediately find hairs on the pileus. Because of the characters of the spores we then nevertheless supposed that we were dealing with *C. auricomus* and until now never failed to find hairs on the pileus in a further number of scalps.

Coprinus hemerobius s. Lange (1939: 118) too is identical with *C. auricomus*. Lange himself remarked upon its resemblance to small *C. hansenii* and the similarity of the microscopical characters to those of that species and thus to *C. auricomus*. No collarium is mentioned in connection with the attachment of the gills. In fact it is only the small size that seems to differentiate *C. hemerobius* s. Lange from *C. auricomus*. In this context it seems useful to mention that a locality is known to one of us, where several tens of basidiocarps of *C. auricomus* have been found with caps between 2 and 10 mm in diameter.

A discussion on the original *C. hemerobius* Fr. is to be found at the end of this paper.

Agaricus subtilirugatus Secr. (1883: 423; invalid name) resembles *C. auricomus* very much. Particularly the red-brown colour of the pileus and the fact that the lamellae are said to reach the stipe are indicative.

Coprinus sociatus Fr. (1838: 252), also sometimes mentioned in connection with *C. auricomus*, has a pileus described as subsquamulose and farinaceous, which hardly seems to apply to *C. auricomus* or any member of subsection *Glabri* J. Lange.

Other names possibly relating to *C. auricomus:*

Agaricus campanulatus Bolt.	(1788)	*C. hemerobius* s. Cooke	(1886–1888)
C. hemerobius s. Quél.	(1872)	*C. hemerobius* s. Rea	(1922)
C. hemerobius s. Britz.	(1883)	*C. hemerobius* s. Bres.	(1931)

Subsection Glabri J. Lange

Macroscopical characters. — All species in this subsection have a glabrous pileus which is radially sulcate up to the centre and a glabrous hollow stipe attenuate towards the apex and usually subbulbous at the base. The size of the basidiocarps differs from collection to collection. Although for each species a maximum size can be given, that is hardly possible for a minimum size (see discussion on *C. auricomus*).

The lamellae are free and remote, which means that they do not reach the stipe so that a circular empty space is visible around the apex of the stipe. In literature it is often said that the lamellae are attached to a collarium, but that is an incorrect interpretation of the situation. When the pileus expands, its membranous part becomes slightly elevated above the somewhat fleshy central disc. The result is then that the proximal end of the lamellae seems to be attached to the more or less vertical side of the disc (Fig. 4), a situation quite different from that in e.g. species of *Marasmius* where the proximal ends of the lamellae are united, forming a small tube around the apex of the stipe.

Most species of subsection *Glabri* grow terrestrial or on woody fragments, but *C. nudiceps* and *C. megaspermus* sometimes grow on dung and *C. miser* always. The basidiocarps usually grow singly, but in some species occasionally they are fasciculate, particularly when growing on woodchips. No special smell or taste is known.

Microscopical characters. — All species of subsection *Glabri* known to us have spores with an excentric germ pore. Orton & Watling (1979) stated that *C. hemerobius, C. megaspermus* and *C. nudiceps* have a central germ pore. As the original *C. hemerobius* is unknown to us (see elsewhere in this paper), we leave that species out of consideration. But examination by one of us (C.B.U.) of the type of *C. megaspermus* and *C. nudiceps* have shown that both species have an excentric germ pore. The drawings of the spores of *C. megaspermus* given by Orton & Watling (but note that the illustrations of the spores of *C. megaspermus* and *C. hemerobius* have been interchanged) show indeed a centric, but those of *C. nudiceps* an excentric germ pore, this in contradiction with the description. The spores in subsection *Glabri* are usually strongly lentiform (in other words: in frontal view they are much broader than in side view). Sometimes, however, the spores in *C. plicatilis* are very narrow and rather long and then they are only weakly lentiform (Fig. 13C). In *C. megaspermus* the spores are more or less ellipsoid. The degree of shifting of the germ pore towards the abaxial side of the spores varies from one collection to another from weakly to strongly excentric.

The basidia are nearly always 4-spored, but in some collections of *C. miser* they are 2-spored.

The pileipellis is hymeniform. The pedicels of the cells of the pileipellis are long at the centre and gradually shorter towards the margin of the pileus. The pedicels are often brownish and have slightly thickened walls. In *C. miser* the cells of the pileipellis have short pedicels at the centre and almost none at the margin of the pileus and thus vary to almost globose (Figs. 2 and 3).

Clamps are present in all species.

Cheilocystidia are usually lageniform (Fig. 7) and very similar in most species, but somewhat more cylindrical to ellipsoid or at least have a somewhat broader apical part in *C. kuehneri, C. nudiceps* and *C. hercules* (Fig. 6). Of both *C. kuehneri* and *C. nudiceps* collections have been found with practically only globose to ellipsoid cheilocystidia. *Coprinus miser* only has always c. globose cheilocystidia.

Pleurocystidia are present in all species but *C. miser*.

So far little attention has been paid to the pseudoparaphyses. The number of these sterile hymenial cells may vary from 3–6 to 5–8 around each basidium and is given here for each species separately as it seems to have some taxonomic value.

Coprinus kuehneri Uljé & Bas, *spec. nov.* — Figs. 2, 6, 9

C. plicatilis var. *microsporus* Kühn. in Bull. trimest. Soc. mycol. Fr. 50: 57. 1934.

Selected description. — Donelli & Simonini in Boll. Grup. micol. G. Bres. 29: 115 1986 (as *C. leiocephalus* P. D. Orton).

Pileus ad 35 mm latus, sulcatus, obscure rubrobrunneus, interdum aurantiobrunneus vel flavobrunneus, postea cinerascens, glaber. Lamellae stipite remotae, primo albidae, dein griseobrunneae vel atrogriseae. Stipes ad 100 × 3 mm, sordide albidus vel sordide flavobrunneus. Sporae 6.5–10.5 × 5.5–8 × 5–6 µm, Q = 1.05–1.6, $\bar{Q}$ = 1.16–1.45, cordiformes, ad rhombeae vel mitriformes inclinatae, 3-4-, raro 5-angulatae, poro germinali excentrico praeditae. Cheilocystidia 30–80 × 12–28 µm, collo 11–23 µm lata, cylindrica vel utriformes, interdum sublageniformes vel elongato-ellipsoidea, raro fere solum globosa. Pleurocystidia 40–100 × 22–40 µm, collo 21–32 µm lata, plus minusve cheilocystidiis similia. Fibulae adsunt.

Typus: '*C. B. Uljé*, 31 V 1987, Netherlands, prov. Zuid-Holland, Leiden, park Leiden-Noord (L)'.

Pileus in bud-stages up to 16 × 11 mm, later expanding to paraboloid or convex, rarely becoming flat, up to 35 mm in diam., sulcate-striate up to centre, at first rather dark red-brown, less frequently orange- or yellow-brown, later with greyish tinges (at centre Mu. 2.5 YR 2.5/2–4, 3/2–4; 5 YR 3/2–4; 7.5 YR 3/2–4, 4/4, 5/4; 10 YR 7/4; at margin Mu. 5 YR 4/4–8, 5/4; 7.5 YR 4/2–6, 5/4, 6/5; 10 YR 4/1–3, 5/2–3, 6/2–3, 7/3–4; K. & W. 7F7, 8F4, 7E/F5, 8E/F4, 7F5, 6E6, 6E/F7, 6D4, 6C6, 5C4). Lamellae free, remote from stipe, first whitish, then greyish brown (Mu. 10 YR 5/3, 6/3–4), finally blackish grey, L = 32–50, l = 1–3. Stipe up to 100 × 3 mm, sordid white to sordid yellowish brown.

Spores (500/25/25) 6.6–10.8 × 5.5–8.2 × 5.1–6.0 µm, average L 7.9–9.9, average B 6.3–7.7, Q 1.07–1.58, average Q 1.16–1.45, heart-shaped, tending to rhomboid or mitriform, 3–4-, rarely 5-angular, not or weakly lemoniform, rather pale to rather dark red-brown, with excentric germ pore. Basidia 19–38 × 8–12 µm, 4-spored. Cheilocystidia (Fig. 6) 30–80 × 12–28 µm, with 11–23 µm wide neck, cylindrical to utriform, sometimes weakly lageniform, or elongate-ellipsoid, rarely almost exclusively globose. Pleurocystidia 40–100 × 22–40 µm with neck 21–32 µm wide, more or less similar to cheilocystidia. Pileipellis made up of spheropedunculate cells up to 100 × 25 µm. Clamps present. Number of pseudoparaphyses around each basidium (3–)4–6.

Habitat. — Usually terrestrial on naked soil under trees or shrub, more rarely at grassy places. Basidiocarps single or subfasciculate. Rather common in the Netherlands.

Collections examined. — NETHERLANDS: prov. Overijssel, Delden, 4 mei 1956, *H. S. C. Huijsman 4004*; 1 Oct. 1979, *E. Kits van Waveren*; prov. Gelderland, Buren, 18 Oct. 1970, *H. S. C. Huijsman 70–168*; prov. Noord-Holland, Amsterdam, Amsterdamse Bos, 29 June 1960, 29 July 1962, *E. Kits van Waveren*; 28 May 1985, 17 June 1985, *C. B. Uljé*; Vondelpark, 1 May 1957, *E. Kits van Waveren*; prov. Zuid-Holland, Leiden, Hortus Botanicus, 25 Oct. 1943, *A. C. Perdeck 110*; 26 June 1956, *G. A. Leygraaf*; 5 May 1960, *C. Bas 1863*; Wandelpark Leiden-Noord, 18 June, 5 July, 27 July 1985 and 31 May 1987 (type), *C. B. Uljé*; Voorschoten, Noord-Hofland, 24 June 1985, *C. B. Uljé*; Oegstgeest, Oud Poelgeest, 11 June 1954, *C. Bas*; Poelgeesterweg, 18 May and 21 May 1986, *C. B. Uljé*; Alphen a/d Rijn, Zegerplas, 31 July 1985, *C. B. Uljé*; Gouda, de la Reijstraat, 27 May 1979, *C. den Held-Jager*; prov. Limburg, Slavante, Sint Pietersberg, 9 Nov. 1951, *R. A. Maas Geesteranus*. — FRANCE: Coye, North of Paris, 1953, *H. Romagnesi*; Villeret 'Rockefort', 9 Oct. 1965, *H. S. C. Huijsman*. (All collections of C. B. Uljé in herbarium Uljé, except type; type and other collections in L.)

Macroscopically *C. kuehneri* can usually be distinguished from its closest relative *C. leiocephalus* by the dark red-brown colour of the pileus, which is paler and yellow-brown in the latter. Microscopically *C. kuehneri* is characterized by the narrower, 3–4-angular spores with a tendency to being rhomboid or mitriform and the more cylindrical cheilocystidia. In collections of *C. kuehneri* in which the cheilocystidia are predominantly lageniform, these cells have a broader upper part than those of *C. leiocephalus*.

Although Orton (1969: 88) considers *C. plicatilis* var. *microsporus* Kühn. identical with his *C. leiocephalus*, we have come to a different conclusion. In Kühner's original description of *C. plicatilis* var. *microsporus* (1934: 57), the breadth of the spores is given as 5.5–7.5 μm. Moreover, the shape of the spores in his drawings leaves no doubt about the fact that Kühner's variety is identical with *C. kuehneri* as described here.

Orton gives the breadth of the spores of his *C. leiocephalus* as 7–8.5 μm and the spores in his drawings differ markedly from those of Kühner for *C. plicatilis* var. *microsporus*.

In Kühner's publication (l.c.: figs. 10a, c–h and 13a–c) the spores are illustrated of 9 collections attributed to *C. plicatilis* (1934: 56, fig. 3a–i). In our opinion this set of collections is a mixture of *C. plicatilis* var. *plicatilis* and *C. leiocephalus*. The spores of the type of *C. leiocephalus* (Fig. 10 D in the present publication) agree perfectly with those in Kühner's fig. 3a. Therefore it is clear that *C. plicatilis* var. *microsporus* Kühn. and *C. leiocephalus* P. D. Orton are not identical.

It is very well possible that *C. velaris* Fr. as described and illustrated by Patouillard (1886: 194) represents *C. kuehneri* as the spores as drawn by Patouillard for that species are very similar to those of *C. kuehneri*. We cannot say with certainty that *C. velaris* s. Pat. is identical with *C. velaris* Fr. (1838), which agrees with almost any species in the *C. plicatilis* group on account of the very brief original description.

Coprinus miser P. Karst. — Figs. 3, 5, 15

Coprinus miser P. Karst. in Symb. mycol. fenn. 9: 61. 1882.
Selected description. — Joss. in Bull. trimest. Soc. mycol. Fr. 78: 247. 1962.

Pileus very small, up to 8 mm in diam. when expanded, first orange-brown to greyish brown (rarely whitish), later grey and transparent with brownish centre (Mu. 5 YR 4.5/6; 7.5 YR 6/8, 7/8, 8/2; 10 YR 3.5/2; K. & W. 5B5-B2). Lamellae free, reaching stipe, L = 9–16, l = 0–1. Stipe up to 50 × 0.5 mm, glabrous but at base often with loose fibrils.

Spores (120/6/6) 7.0–10.5 × 6.6–10.1 μm, average L 7.7–9.6 μm, average B 7.5–9.2 μm, Q 0.94–1.17, average Q 1.02–1.05, heart-shaped (Fig. 15). Basidia 4-spored, rarely all 2-spored (in the 2-spored form spores not noticeable larger). Cheilocystidia (sub)globose (Fig. 5). Pleurocystidia absent. Number of pseudoparaphyses around each basidium 4–6. Pileipellis composed of spheropedunculate cells with short stalk at centre and sessile globose cells at margin. Clamps present.

Habitat. — Always growing on dung from several animals.

Coprinus miser is easy to recognize because of the very small basidiocarps always growing on dung, the heart-shaped rounded triangular spores almost as broad as they are long, the absence of pleurocystidia and the globose cheilocystidia, but the cheilocystidia

are not always easy to detect. The shape of the spores is sometimes somewhat aberrant, more rounded quadrangular and with a slightly elongate apex (Fig. 15B), more or less like the spores of *C. patouillardii* Quél., but with excentric germ pore.

Coprinus leiocephalus P. D. Orton — Figs. 2, 7, 8, 10A, C–H

Coprinus leiocephalus P. D. Orton in Notes R. bot. Gdn Edinb. 29: 88. 1969.

Pileus expanded up to 50 mm in diam., sordid yellowish to reddish-brownish (Mu. 7.5 YR 4/6–5/8; 10 YR 4/6, 5/5–6; 2.5 Y 6/4). Lamellae free, c. 1 mm remote from stipe, whitish to blackish; L = 21–48, l = 1–3. Stipe up to 140 × 3 mm, sordid whitish to sordid yellowish-brownish.

Spores (940/47/47) 8.1–11.8 × 7.1–10.5 × 5.3–7.0 µm, average L 9.0–10.7 µm, average B 8.1–9.8, Q 0.97–1.42, average Q 1.07–1.32, rather variably shaped, mostly 5-angular and heart-shaped with slightly elongate apex (Fig. 10), dark red-brown to almost black. Basidia 20–40 × 9.5–12 µm, 4-spored. Cheilocystidia 30–80 × 14–30 µm with 6–15(–18) µm wide upper part, most lageniform. Pleurocystidia 50–110 × 25–35 × 16–23, lageniform to weakly utriform (Figs. 7, 8). Number of pseudoparaphyses around each basidium 4–6(–7). Pileipellis hymeniform. Clamps present.

Habitat. — Terrestrial on bare soil or at grassy places, particularly under trees and shrub, but also on open lawns and meadows; moreover rather frequent on paths covered with woodchips.

Morphologically *C. leiocephalus* is intermediate between *C. kuehneri* and *C. plicatilis*, but closer to the second than to the first of these two species. The only reliable character is the shape and the size of the spores but there is also a somewhat different ecology, particularly between *C. plicatilis* and *C. leiocephalus*. Although the latter sometimes grows on lawns and meadows, it shows a great preference for habitats under trees and shrub, whereas the former grows mainly on open grassy places and rarely under trees and shrub. On woodchips used for covering paths and tracks, *C. plicatilis* has never been found by us; in contrast *C. leiocephalus* is fairly common there.

We found the shape of the spores of the type of *C. leiocephalus* to be the most common one in other collections of this species.

It should be mentioned here that mature spores of *C. plicatilis* and *C. leiocephalus* are very dark red-brown, frequently even almost black under the microscope. The spores of *C. kuehneri* are usually distinctly paler. For further notes on the differentiation of *C. leiocephalus* from *C. plicatilis* and *C. kuehneri*, see also the discussions under these two species.

On woodchips we have found what probably is a variant of *C. leiocephalus*, in which the young basidiocarps have a lilacinous tinge. This tinge is probably caused by oily contents of cells of the pileipellis, also noted by Mr. H. Bender (pers. comm.) who collected and studied the same variant in Germany. It has slightly larger spores than typical *C. leiocephalus* and its cheilocystidia are ellipsoid to subellipsoid-subcylindrical. The pileus is rather strongly cylindrical and measures up to 30 × 12 mm when still closed and becomes up to 50 mm wide and greyish brown when expanded. Further collections have to proof that these characters are constant and if so whether this is indeed a form of variety of *C. leiocephalus* or should be described as an independent species.

Names possibly relating to *C. leiocephalus:*

C. superiusculus Britz.	(1883)	*C. plicatilis* Fr. s. Bres.	(1931)
C. rapidus Fr. s. Quélet	(1888)	*C. plicatilis* Fr. s. Lge.	(1939)
C. plicatilis Fr. s. Rick.	(1911)	*Pseudocoprinus lacteus* Smith	(1946)
C. plicatilis Fr. s. Sacc.	(1916)	*P. brunneolus* McKnight & Allison	(1969)

Coprinus galericuliformis Watl. — Fig. 10B

Coprinus galericuliformis Watl. in Notes R. bot. Gdn Edinb. 18: 42. 1967.

The characters of *C. galericuliformis* agree with those of *C. leiocephalus*, with the exception of the shape of the spores. Among the in frontal view almost globose spores of *C. galericuliformis* (Fig. 10B), however, one can find also spores with a shape very close to that of the spores of *C. leiocephalus*. That was clearly the case in a Netherlands' collection studied by us (Breda, 15 Sept. 1980, *P. B. Jansen 80-215*). Moreover, in contradiction with Watling's description, the type of *C. galericuliformis* turned out to possess pleurocystidia. Therefore it seems possible that *C. galericuliformis* Watl. represents a rare aberrant variant of *C. leiocephalus*.

Watling (1967: 42) validated for his taxon the invalid name *C. galericuliformis* Losa (1943: 154). But in Losa's rather poor original description the spore size is given as 10 × 6 µm, which would fit *C. kuehneri* better. As Watling described *C. galericuliformis* with a Latin diagnosis and a new type, it seems better to suppress the notation 'Losa ex'.

Coprinus plicatilis (Curt.: Fr.) Fr. — Figs. 2, 7, 8, 13A–C

Agaricus plicatilis Curt., Fl. londin. Fasc., 57. 1787.

Agaricus plicatilis Curt.: Fr., Syst. mycol. 1: 313. 1821. — *Coprinus plicatilis* (Curt.: Fr.) Fr., Epicr.: 252. 1838.

Selected descriptions. — Kühner in Bull. trimest. Soc. mycol. Fr. 50: 55–59. 1934; Donelli & Simonini in Boll. Gruppo micol. G. Bres. 29: 111. 1986.

Pileus expanded up to 35 mm diam., sordid yellow-brown (Mu. 7.5 YR 3/4, 4/4–6; 10 YR 4/4–5, 5/5, 6/6, 7/3, 6/2). Lamellae free and remote from stipe; L = 24–40, l = 0–3. Stipe up to 120 × 2.5 mm, sordid whitish to sordid yellow-brown. Spores (280/14/14) 9.9–14.3 × 7.2–10.3 × 6.5–8.1 µm, average L 11.1–12.8, average B 8.1–9.5 µm, Q 1.07–1.81, average Q 1.17–1.54, rather variably shaped, mostly angularly ovoid with five rounded angles, sometimes almost ellipsoid (Fig. 13A–C). Basidia 20–42 × 9–12 µm, 4-spored. Cheilo- and pleurocystidia as in *C. leiocephalus*. Number of pseudoparaphyses around each basidium (4–)5–6(–7). Pileipellis hymeniform. Clamps present.

Habitat. — On lawns and other grassy places, seldom in the shade.

As mentioned before, we consider *C. plicatilis* and *C. leiocephalus* very closely related and wonder if they do not represent variants of one species. If one studies, however, a great many collections of both taxa simultaneously it appears that the most common type of the complex is not found in the middle of the range of variation, but that there

are two main types that occur very frequently and that other variants are rarer in proportion to their degree of deviation from these main types. The shape and size of the spores that belong to the main type that represents *C. leiocephalus* (Figs. 10D–F) can easily be distinguished from the shape and size that belong to the spores of the type representing *C. plicatilis* (Fig. 13A).

As one of these two types has been described by P. D. Orton as *C. leiocephalus* and we are far from sure that this taxon should be reduced to variety of *C. plicatilis*, we prefer to treat *C. leiocephalus* as an independent species.

There is a rather general consensus in literature about the application of the name *C. plicatilis* to the taxon with the large spores (c. 10–14 μm long).

Other names possibly relating to *C. plicatilis:*

Agaricus striatus Bull.	(1809)	*C. velaris* s. Quél.	(1888)
Coprinus hemerobius s. Pat.	(1886)		

Coprinus megaspermus P. D. Orton — Figs. 2, 7, 8, 14

Coprinus megaspermus P. D. Orton in Notes R. bot. Gdn Edinb. 32: 141. 1972.

Pileus 25–30 mm in diam. when expanded, at first rusty tawny, then fulvous, sienna or cinnamon, outer part clay buff. Lamellae free, slightly remote from stipe, L = 30–50, l = 1–3, white to blackish. Stipe up to 100 × 2.5 μm, whitish to pale greyish brown.

Spores (80/4/2) 12.3–17.3 × 8.8–11.3 × 7.5–10 μm, average L 14.3–15.3 μm, average B 9.5–10 μm, Q 1.32–1.68, average Q 1.48–1.53, more or less ellipsoid. Basidia 20–40 × 9–12 μm, 4-spored. Cheilocystidia 40–60 × 13–24 μm, lageniform to weakly utriform, sometimes ellipsoid (as in Fig. 7). Pleurocystidia 55–75 × 20–24 μm, shape like cheilocystidia (as in Fig. 8). Number of pseudoparaphyses around each basidium 5–7.

Habitat. — Terrestrial but also on dung. Rare.

Coprinus megaspermus distinguishes itself from the other species of subsection *Glabri* by its large ellipsoid spores. Of the two collections studied, one (the type) was terrestrial and the second (*R. A. Maas Geesteranus 3601*, Netherlands, 24 August 1944, prov. Zuid-Holland, Oegstgeest) growing on horse dung.

Although Orton & Watling (1979: 100) indicate a central germ pore for his species, examination of the type has shown that in that collection the germ pore is excentric albeit not strongly. In *Maas Geesteranus 3601* the germ pore is even strongly excentric.

Coprinus hercules Uljé & Bas — Figs. 2, 6, 16

Coprinus hercules Uljé & Bas in Persoonia 12: 483. 1985.

Pileus usually 8–14(–20) mm in diam. when expanded, orange-brown to red-brown (Mu. 5 YR 3/4–4/6, 7.5 YR 4–5/6, 10 YR 5/3; K. & W. 6D/E6, 6E/F6, 5D5). Lamellae free, not distinctly remote from stipe, L = 16–24, l = 0–1(–3), whitish to blackish. Stipe up to 70 × 1.5 mm, whitish to pale watery brown.

Spores (400/20/8) 12.4–17.2 × 11.3–15.2 × 8.2–10.8 μm, average L 13.6–15.7 μm, average B 11.8–13.3 μm, Q 1.04–1.28, average Q 1.07–1.19, very dark red-brown

to almost black. Basidia 22–51 × 13–16 μm, 4-spored. Cheilo- and pleurocystidia more or less like in *C. kuehneri*, 40–70 × 10–28 and 50–105 × 22–30 μm. Number of pseudoparaphyses around each basidium 5–8. Clamps present.

Habitat. — Terrestrial on lawns.

Coprinus hercules is recognized by its small basidiocarps and large, lentiform spores. The pseudoparaphyses around each basidium frequently reach the number of eight. The diameter of the pilei of this rather common species very rarely exceeds 15 mm. Recently we were enabled to study two collections with larger basidiocarps. The first of these two (*P. B. Jansen 85-490*, Canarian Islands, La Palma, El Paso, 1 Dec. 1985, herb. Jansen) had pilei up to 20 mm in diam. (estimated on the basis of the size in dried condition as the size in fresh condition was not recorded). The spores of this collection are somewhat larger than usual in *C. hercules*, viz. 12.6–19.3 × 11.6–17.3 (4-spored basidia!), but the other characters agree fairly well with those of *C. hercules*, including the small number of lamellae, viz. 20–24.

The second collection (*Uljé 722b*, 19 Sept. 1986, herb. Uljé, Netherlands, prov. Gelderland, Lochem) with pilei up to 20 mm wide has spores fitting well in the range of spore sizes found thusfar in *C. hercules*, but here the number of lamellae is larger than normal, viz. up to 30 whereas until now the highest number found in *C. hercules* was 24.

Although the number of collections with larger pilei is still restricted, it is possible that in other (warmer?) regions basidiocarps of this species are normally larger. We would be very grateful for records of such collections.

Since its publication *C. hercules* has been recorded frequently from various parts of the Netherlands, once from West Germany and once from the Canarian Islands.

Coprinus nudiceps P. D. Orton — Fig. 2, 6, 11

Coprinus nudiceps P. D. Orton in Notes R. bot. Gdn Edinb. 32: 142. 1972.

Pileus up to 30 mm wide when expanded, ochraceous brown, yellow-brown, greyish red-brown (Mu. 7.5 YR 4/4; 10 YR 6–8/6 as far as 5/1–2). Lamellae free, somewhat remote from stipe, L = 24–36, l = 1–3, white, grey-brown to blackish. Stipe up to 80 × 2 mm, white to yellowish or pale greyish brown.

Spores (280/14/10) 10.1–15.1 × 9.0–13.0 × 8.0–8.6 μm, average L 11.5–13.6 μm, average B 10.2–11.6 μm, Q 1.03–1.32, average Q 1.11–1.21, rounded triangular, dark red-brown to almost black. Basidia 22–48 × 10–14 μm, 4-spored. Cheilo- and pleurocystidia as in *C. kuehneri*, 30–70 × 14–32 and 45–100 × 16–38 μm. Number of pseudoparaphyses around each basidium 5–7. Clamps present.

Habitat. — On dung, also terrestrial. Rather rare.

Coprinus nudiceps differs from *C. hercules* in smaller spores, larger basidiocarps, a larger number of lamellae and a preference for dung.

In a former publication by one of us (C.B.U.) *C. longipes* Buller (Bisby & al., 1929: 118) is mentioned as a species with a strong resemblance to *C. nudiceps*. It turned out to be impossible to trace the type of *C. longipes*. We received on loan, however, spore-

prints on slides under this name, from which W. F. Hanna made mono spore-cultures. The spores of these prints are 6-angular and measure 9.8–14.3 × 6.4–8.7 μm. Therefore they probably belong to *C. marculentus* Britz. (1883) (= *C. hexagonosporus* Joss.). But it should be noted that these spore sizes do not agree with those given by Buller. We think that *C. longipes* Buller has to be declared a nomen dubium.

It seems to us that *C. galericuliformis* s. Locq. (1947: 86) and s. Kühn. & Romagn. (1953: 377) are identical with *C. nudiceps*. Descriptions, drawings and the spore size all plead in favour of this view.

According, however, to H. Bender (pers. comm.), who knows *C. nudiceps* fairly well, this species and *C. galericuliformis* s. Locq. are not identical. Although he agrees that both have the same size and shape of the spores, Bender mentions the following differences: (i) habitat (*C. nudiceps* on dung, *C. galericuliformis* s. Locq. terrestrial) and in *C. nudiceps*, (ii) the lamellae more crowded, (iii) more lamellulae present and (iv) the margin of the pileus crenate.

The following names possibly relate to *C. nudiceps:*

C. hemerobius s. Quél.	(1888)	*C. hemerobius* s. Ricken	(1911)
C. pseudonycthemerus Britz.	(1893)	*C. longipes* Buller (in Bisby & al. 1929)	
C. rimosus Copeland	(1905)		

ON THE IDENTITY OF COPRINUS HEMEROBIUS FR.

Besides *C. plicatilis*, *C. hemerobius* is perhaps the most frequently mentioned name in the *C. plicatilis-auricomus* complex. Unfortunately, however, the rather vague and concise protologue of *C. hemerobius* by Fries (1838: 253) has led to various interpretations.

In the original description we hardly find characters distinguishing *C. hemerobius* from other members of the *C. plicatilis-auricomus* complex except the indistinct collarium ('lamellis ... collario obsolete adnexis' = 'with lamellae ... adnexed to an indistinct/rudimentary collarium' and 'collarium vix manifestum' = 'collarium hardly evident') and the fairly large size ('habitus omnino praeced sed stipes longior 4–5 unc' = 'habit entirely like that of the preceding (*C. plicatilis*) but stipe longer, 10–12.5 cm'). The centre of the pileus is described as 'spadiceus', which is a dark reddish brown usually called date colour.

Thus *C. hemerobius* Fr. emerges as a species with basidiocarps resembling those of *C. plicatilis*, but in general larger, with lamellae not or hardly remote from the stipe and a dark reddish brown centre of the pileus. Judging strictly from these characters, *C. auricomus*, *C. kuehneri* (in which the collarium is not always very distinct) and *C. megaspermus* are the most likely candidates for the classical name *C. hemerobius*.

It is remarkable that the description of *C. auricomus* by Patouillard in 1886 remained long unnoticed. Presumably, however, most mycologists of the second half of the past and the first half of the present century did know this rather common species. Where this is evident in literature they often named it *C. hemerobius* (see under *C. auricomus*).

In 1915 J.E. Lange described the new species *C. hansenii* which we firmly believe to be identical with *C. auricomus* (see the discussion under that species), although Lange

did not mention the microscopical hairs on the pileipellis. The same author accepted in his Flora agaricina danica (1939: 118) a *C. hemerobius* side by side with *C. hansenii*. This *C. hemerobius* was said to be similar to *C. plicatilis* but with a much more brownish cap, without a distinct collarium and very similar to *C. hansenii* but smaller. The tradition to describe *C. hemerobius* as a small species contrary to Fries' original diagnosis seems to have started then.

Kühner & Josserand (1934: 53) rediscovered and redescribed Patouillard's *C. auricomus*. With the acceptance of this species by Kühner & Romagnesi (1953: 376) in the Flore analytique and by Dennis & al. (1960: 37) in the British Check List the use of the name became well established. It should be mentioned here that Kühner & Romagnesi considered both *C. hansenii* Lange and *C. hemerobius* sensu Lange as identical with *C. auricomus*.

In the British Check List and later by Orton & Watling (1979: 99) in the British Fungus Flora and also by Moser (e.g. 1978: 263) *C. hemerobius* is accepted in the concept of Lange. For the British authors it is a species without microscopical hairs and with ellipsoid spores, 11.5–12.5 × 7–8 × 6.5–7 µm, with a central germ pore. As we do not know such a species the first author of this paper examined all the material under the name *C. hemerobius* in the herbaria at Edinburgh, Kew, München and Leiden and in some private herbaria in the Netherlands; altogether 32 collections. He found these to represent:

12 × *C. plicatilis*
5 × *C. auricomus*
4 × *C.* spp. (*Setulosi*)
3 × *C. leiocephalus*
2 × *C. nudiceps*
2 × *C. micaceus*
2 × *Psathyrella* spp.
1 × *C. domesticus*
1 × *C. callinus*

We think therefore that there are solid grounds to believe that a *C. hemerobius* as described in modern literature does not exist. We are also inclined to believe that *C. auricomus* Pat. is the true *C. hemerobius* but cannot exclude *C. kuehneri* or *C. megaspermus*. Moreover, it is not a very attractive idea to replace a well-known and well-founded name like *C. auricomus* by one so variously applied in the past as the name *C. hemerobius*. If nevertheless considered necessary it should be done only in a European or Scandinavian monograph on *Coprinus* by indicating a well-annotated Swedish collection of *C. auricomus* as neotype of *C. hemerobius*.

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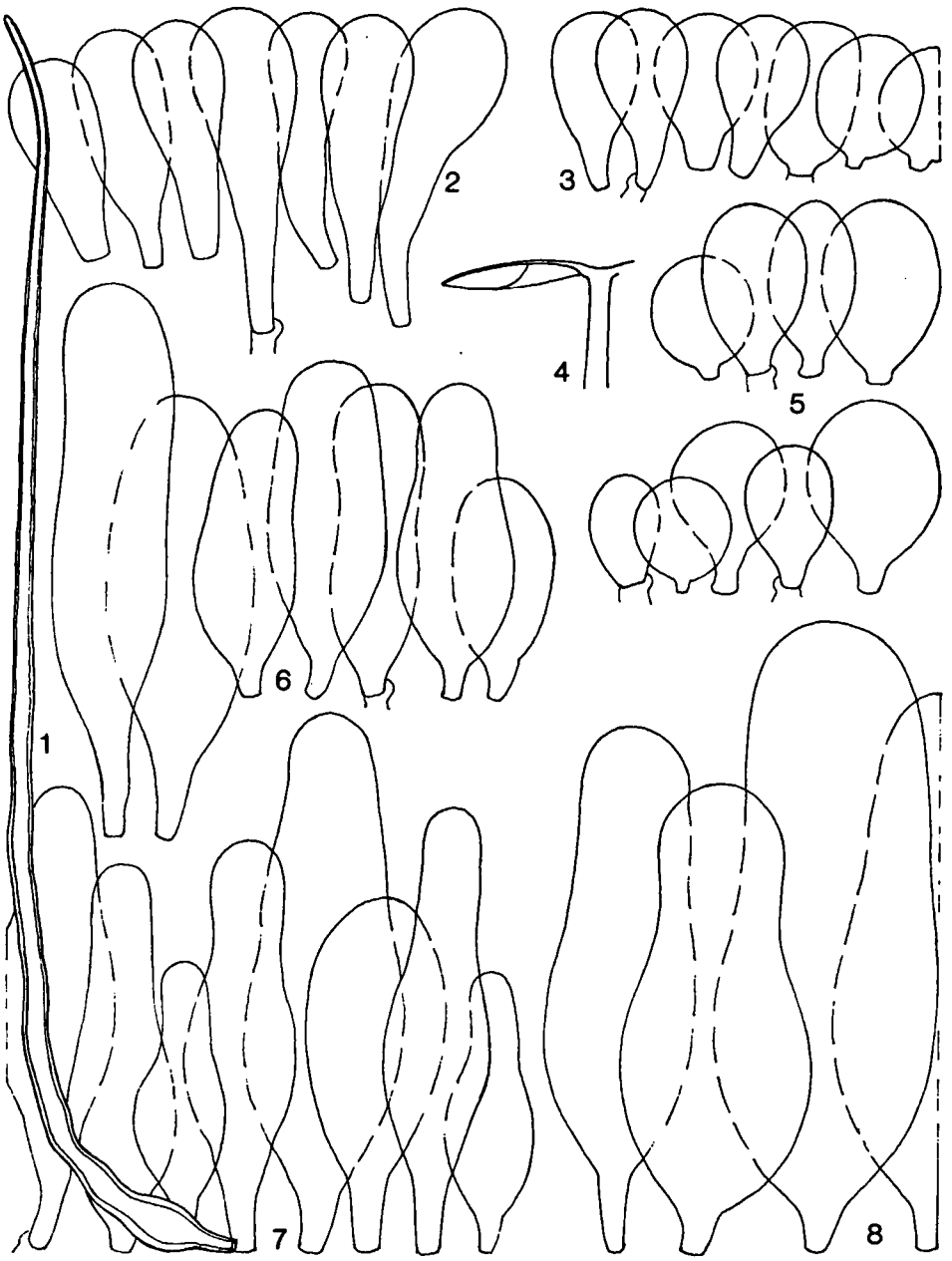
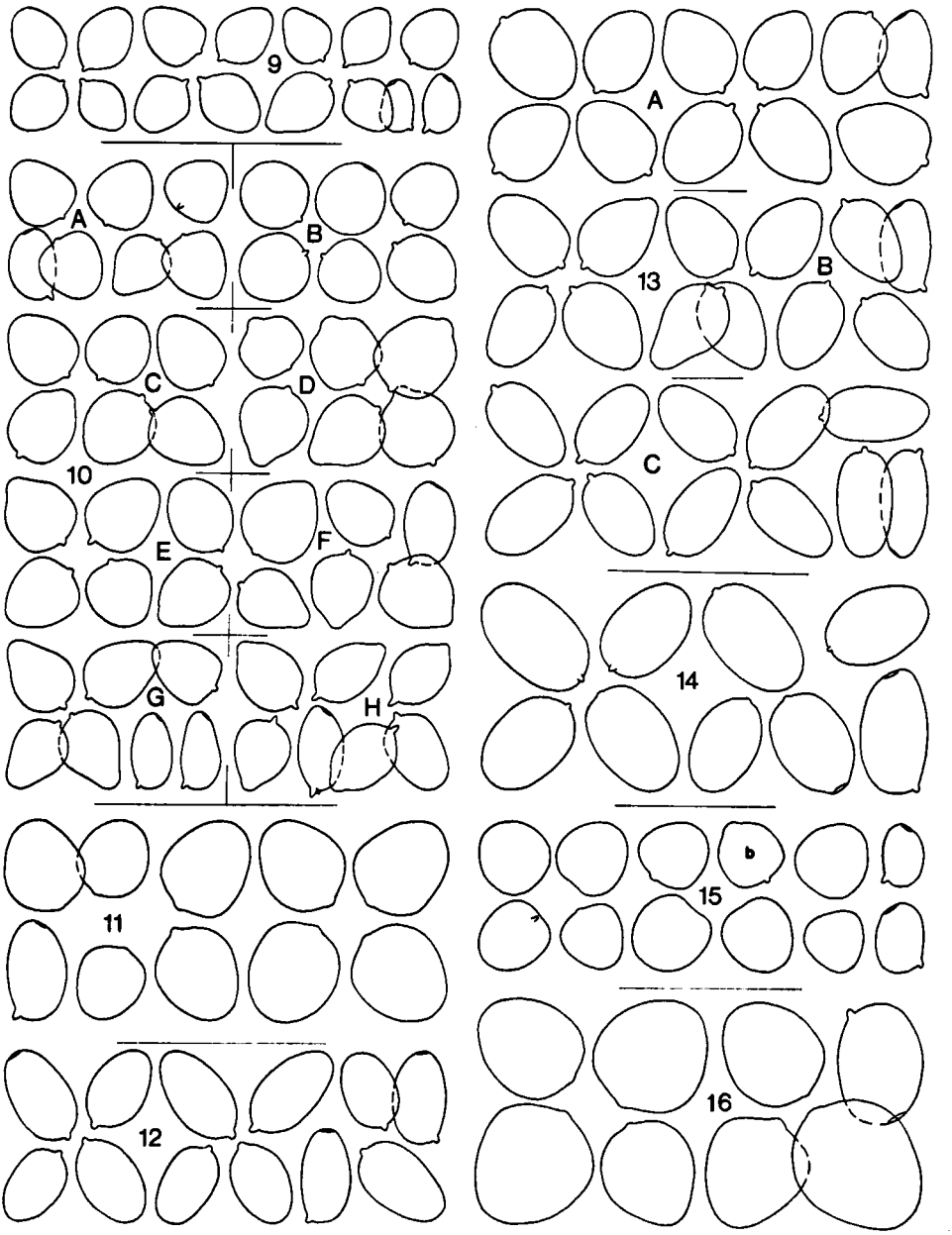


Figs. 1–8. *Coprinus* subsections *Auricomii* and *Glabri*. — 1. Hair in pileipellis of *C. auricomus*. — 2. Pileipellis in most species. — 3. Pileipellis in *C. miser*. — 4. Attachment of lamellae in species with 'collarium'. — 5. Cheilocystidia of *C. miser*. — 6. Cheilocystidia of *C. kuehneri*. — 7. Cheilocystidia of *C. plicatilis* and *C. leiocephalus*. — 8. Pleurocystidia of all species except *C. miser*. (All Figs. × 800, but Fig. 4 × 1.)



Figs. 9–16. Spores in *Coprinus* subsections *Auricomi* and *Glabri*. — 9. *C. kuehneri*. — 10. A, C–H. *C. leiocephalus* (D. from type); B. *C. galericuliformis* (from type). — 11. *C. nudiceps*. — 12. *C. auricomus*. — 13. *C. plicatilis*. — 14. *C. megaspermus*. — 15. *C. miser*. — 16. *C. hercules*. (All Figs. × 1000.)