

NOTULAE AD FLORAM AGARICINAM NEERLANDICAM – XXXVIII
Leucoagaricus subgenus *Sericomyces*

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Leucoagaricus crystallifer spec. nov. is described; this species was formerly known as *L. serenus* in the interpretation of Bon and other authors. *Leucoagaricus serenus* sensu Kühner is neotypified, and the following new combinations are made: *Leucoagaricus sericifer*, and *L. sericifer* f. *sericatellus*.

Leucoagaricus subg. *Sericomyces* (Heinem.) M. Bon consists of rather elegant, mostly white species, with a dry or slightly viscid pileus covering which is made up of adnate to ascending radially arranged hyphae. The species look disconcertingly similar in the field, and only microscopical examination reveals the differences. Cheilocystidia, pileus covering, and to a lesser extent, spores, yield the best characters for identification. However, spore shape and size are very variable, in part due to the presence of 2- or 1-spored basidia. Furthermore, the number of misshapen spores is often quite high, as it is in sect. *Rubrotincti* Sing. p. p. [*L. sublittoralis* (Kühner ex Hora) Sing. and allies]. The shape of the spores changes late during the maturation process; as a result, spores which are still on the lamella when examined, might have a slightly different shape from those which have been discharged, and studied in a spore print or on the stipe or pileus surface.

Despite the facts that Bon (1993) gave an overview of all taxa published up to that date in Europe, and that several taxa have been described since (e.g. *Sericomyces cinereo-pallidus* by Contu, 1994; *S. sardous* by Zecchin & Migliozi, 1998), there still is confusion about the interpretation of names and not all collections can be assigned to a species. The name *Leucoagaricus serenus* (Fr.) Bon & Boiffard has been used for several different species; this history is here unraveled, *L. serenus* neotypified, and a second taxon currently known under that name is described as a new species.

Due to the application of phylogenetics based on sequences of ribosomal nuclear Large Subunit (LSU) and Internal Transcribed Spacer (ITS) (e.g. Hopple & Vilgalys, 1999; Moncalvo et al., 2000), systematics of the Agaricales in general and of the family Agaricaceae (Johnson & Vilgalys, 1998; Johnson, 1999; Vellinga, in prep.) are quite unsettled and turbulent. Furthermore, the trend in systematics is to arrive at a rankless classification based on phylogenetics (e.g. de Queiroz & Gauthier, 1992, 1994; Hibbett & Donoghue, 1998; Pleijel, 1999). In view of these recent developments, my preference would be to refrain from making new combinations, and from placing the new species in a genus. However, the present survey has a practical aspect in the form of a contribution to the Flora agaricina neerlandica, in which all species have to be placed in a genus. As there are strong indications that *Sericomyces* Heinem. does not form a monophyletic group (Vellinga, in prep.), a

conservative approach is taken, and *Sericeomyces* is here treated as a subgenus of *Leucoagaricus*.

The notation 'Spores [45, 3, 2]' indicates that measurements were made on 45 spores from 3 samples originating from 2 collections. The following abbreviations are used: avl (average length), avw (average width), Q (quotient of length and width), and avQ (average quotient).

All collections studied and depicted, unless stated otherwise, are deposited in the Nationaal Herbarium Nederland, Universiteit Leiden branch, The Netherlands (L).

1. *Leucoagaricus serenus* (Fr.) Bon & Boiffard — Fig. 1

Agaricus serenus Fr., Hymenomyces. Eur. (1874) 38; *Lepiota serena* (Fr.) Quél., Bull. Soc. bot. France 26 (1880) 45; *Pseudobaespora serena* (Fr.) Locq., Bull. trimest. Soc. mycol. Fr. 68 (1952) 169; *Leucoagaricus serenus* (Fr.) Bon & Boiffard, Bull. trimest. Soc. mycol. Fr. 90 (1974) 301; *Sericeomyces serenus* (Fr.) Heinem., Bull. Jard. bot. natn. Belg. 48 (1978) 403.

Excluded. *Lepiota serena* sensu J. Lange, Fl. agar. dan. 1 (1935) pl. 11B (= *L. sericifer*). — *Lepiota serena* sensu A. Pears., Trans. Br. mycol. Soc. 32 (1949) 258 (= *L. pinguipes*). — *Leucoagaricus serenus* sensu M. Bon, Doc. mycol. 11 (43) (1981) 52; sensu Candusso, Riv. Micol. 33 (1990) 19; sensu Chr. Lange, Doc. mycol. 25 (98–100) (1995) 251; *Sericeomyces serenus* sensu M. Bon, Fl. mycol. Eur. 3, Lépiotes (1993) 85; sensu Migl. & Bizzi, Micol. ital. 24 (3) (1995) 80; sensu Rodríguez Armas et al., Doc. mycol. 18 (72) (1988) 67 (in all cases *L. crystallifer*).

There are four different interpretations of the name 'serenus'. Fries (1874) described it as a beautiful white mushroom, without giving any microscopic details. In this group of macroscopically extremely similar, white, non-viscid species, microscopical characters are the only differentiating characters. Lange (1935) interpreted *Lepiota serena* as a species with striking, lageniform cheilocystidia; this species is now commonly known as *Sericeomyces sericifer* (Locq.) Døssing. Kühner (1936) denounced this interpretation, and used the name 'serenus' for a species with broadly clavate cheilocystidia. This interpretation has generally been followed (Huijsman, 1943; Wichanský, 1959; Malençon & Bertault, 1970; Wuilbaut, 1986), though of course it has been used for several other species. Pearson

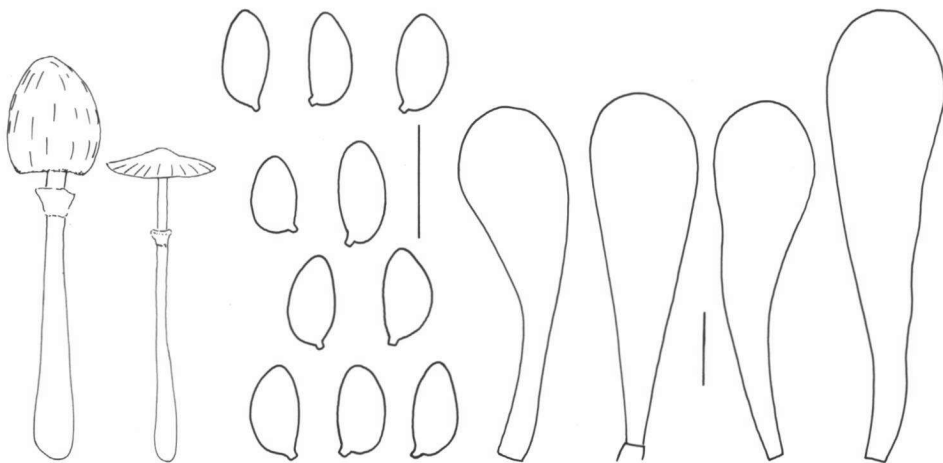


Fig. 1. *Leucoagaricus serenus*. Basidiocarps ($\times 1$), spores, cheilocystidia (all from neotype, *E. C. Vellinga 1604*). Bar is 10 μm .

(1949) misinterpreted the name for a species he was later (in 1952) to describe as *L. pinguipes*, a robust species with ellipsoid spores, close to *L. leucothites* (Vittad.) Wasser. Several authors (Bon, 1981, 1993; Rodríguez Armas et al., 1988; Lange, 1995; Candusso, 1990; Migliozi & Bizzi, 1995) gave a fourth interpretation. In their descriptions the cheilocystidia are narrowly clavate, with crystals at the apex. Rodríguez Armas et al. (1988) expressed severe doubt whether this really was *S. serenus*; this doubt was supported by Malençon (in Rodríguez Armas et al., 1988), but Bon affirmed the determination (but of course, Bon used the name *S. serenus* for this taxon). In the descriptions given by Candusso (1990), Migliozi & Bizzi (1995), and Breitenbach & Kränzlin (1995) the cheilocystidia are rather wide, wider than in the more typical collections, and their collections might belong to a different taxon, e.g. *L. menieri* (Sacc.) Sing. Moser (1983) merged the two interpretations, as he stated that 'sterile hairs are clavate or cylindrical'. The species with narrow cystidia with crystals on the top is here described as new, viz. as *L. crystallifer*. The second species, *Leucoagaricus serenus* (Fr.) Bon & Boiffard, is neotypified here in agreement with the interpretations of Kühner (1936) and Huijsman (1943) with the following collection: 'the Netherlands, prov. Limburg, Cadier en Keer, Örenberg, 4-X-1989, E.C. Vellinga 1604 (L)'. Its field notes and microscopical description are as follows:

Pileus 12–35 mm, when young paraboloid, later applanate with umbo, creamish at umbo, around umbo white and shiny radially fibrillose. Lamellae, in small specimen L = 32, l = (0–)1, moderately crowded, free, slightly ventricose, more or less white, creamish with age, with white finely flocculose edge. Stipe 35–45 × 1.5–3.5 mm, broadening downwards, hollow, whitish cream, with above and below annulus finely pubescent-fibrillose covering. Annulus white, ascending, cottony. Context white and dull in pileus, white and shiny in stipe. Smell not distinct, when cut like rubber component of *Lepiota cristata*-smell.

Spores [25, 2, 1] in side-view 6.7–9.1 × 3.6–4.3 µm, avl × avw = 7.7 × 4.0 µm, Q = 1.6–2.4, avQ = 1.9, oblong, oblong-amygdaloid, with rounded or slightly acute apex, dextrinoid, congophilous, with metachromatic wall in Cresyl Blue. Basidia 23–29 × 8.5–9.5 µm, 4-spored. Cheilocystidia 35–60 × 12–15.5 µm, clavate, thin-walled, with long pedicel. Pleurocystidia absent. Clamp-connections absent. Pileus covering with adnate, narrow, cylindrical, colourless hyphae, c. 3.0 µm in diameter. Stipitipellis a cutis of 3.0–5.0 µm wide cylindrical, colourless hyphae, with some, irregular, loose, slightly wider hyphae. Clamp-connections absent.

The characters of this collection fit well with the description by Kühner (1936), though his basidiocarps were slightly bigger. In most collections studied, the spores were shorter, but otherwise no differences were noted.

It is impossible to distinguish *L. serenus* from *L. crystallifer* in the field. *Leucoagaricus sericifer* and its f. *sericatellus* can also be very similar, and all four taxa may be found growing in a single wood.

The basidiocarps of both *L. serenus* and *L. crystallifer* retain a cream colour in exsiccates, and do not discolour brown on drying, like *L. sericifer* and its f. *sericatellus*.

2. *Leucoagaricus crystallifer* Vellinga, *spec. nov.* — Fig. 2

Leucoagarico sereno simillissimus sed cheilocystidia anguste clavata apice crystallis obtecta.

Holotypus: 'The Netherlands, prov. Limburg, Cadier en Keer, Örenberg, 9-X-1991, E.C. Vellinga 1762 (L)'.

Etymology: 'crystallifer' derived from the Greek, bearing crystals, referring to the crystals on top of the cheilocystidia.

Misapplied. *Leucoagaricus serenus* sensu M. Bon, Doc. mycol. 11 (43) (1981) 52; sensu Candusso, Riv. Micol. 33 (1990) 19; sensu Chr. Lange, Doc. mycol. 25 (98–100) (1995) 251; *Sericeomyces serenus* sensu M. Bon, Fl. mycol. Eur. 3, Lépiotes (193) 85; sensu Migl. & Bizzi in Micol. ital. 24 (3) (1995) 80; sensu Rodríguez Armas et al. in Doc. mycol. 18 (72) (1988) 67.

Pileus 15–40 mm, campanulate, expanding to plano-convex, and applanate with low umbo, with slightly inflexed margin, with cream to pale ochre coloured umbo, becoming more intensely coloured by two days after picking, around umbo white and radially short-fibrillose to silky-fibrillose, sometimes slightly squamose, with margin slightly exceeding lamellae, rarely with part of annulus attached to it. Lamellae, L = 45–70, l = 0–5, moderately crowded to very crowded, free, and often remote from stipe, sometimes anastomosing, sub-ventricose, 1–3.5 mm wide, cream, very pale beige, with concolorous to white flocculose, rarely even, edge. Stipe 20–70 × 2.5–6 mm, broadening downwards to often bulbous base (up to 8 mm), hollow, white and shiny, lengthwise fibrillose, white-tomentose at basal part, becoming yellow with damage. Annulus white, ascending, sometimes with a very distinct cuff around stipe with a straight lower edge, and a fringed upper margin, and a narrow flaring part. Context white and dull in pileus, white and shiny in stipe. Smell of intact basidiocarp indistinct, of cut basidiocarp variably reported: fungoid, unpleasant, astringent-fungoid, slightly rubberish (like *Lepiota cristata*). Taste indistinct or absent. Spore print probably white.

Spores [10, 10, 150] in side-view 5.5–9.0 × 3.5–4.5 (–5.0) μm , $\text{av}l \times \text{avw} = 6.3\text{--}7.7 \times 3.9\text{--}4.2 \mu\text{m}$, $Q = 1.45\text{--}2.1$, $\text{av}Q = 1.65\text{--}1.9$, varying from ellipsoid to oblong with rounded apex to oblong-amygdaloid without or with apical papilla, oblong-ovoid, ellipsoid to oblong, some with apical papilla, dextrinoid, congophilous, cyanophilous, and metachromatic in Cresyl Blue. Basidia 17–28 × 6.5–8.5 μm , 4-spored. Lamella edge sterile. Cheilocystidia

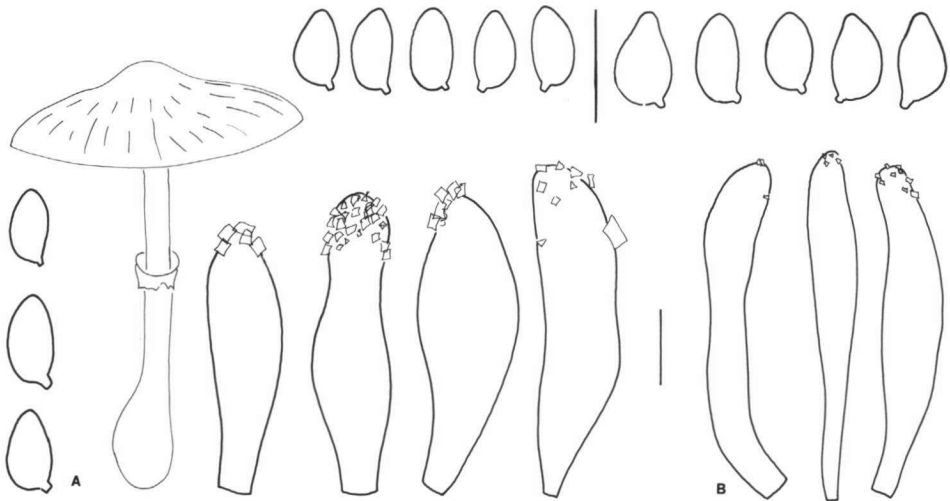


Fig. 2. *Leucoagaricus crystallifer*. Basidiocarp ($\times 1$), spores, cheilocystidia (A. from holotype, E. C. Vellinga 1762; B. from J. P. H. M. Adema). Bar is 10 μm .

in tufts, 23–51 × 5.5–13 µm, cylindrical, cylindrical-fusiform, narrowly clavate, some with a tendency to be utriform, colourless, slightly thick-walled, with (a few without) small to big crystals at apex. Pleurocystidia not observed. Pileus covering a cutis with bundles of adnate radially arranged hyphae, 3.0–12 µm wide, with adnate to slightly ascending terminal elements with rounded apex, colourless, rarely with some pale brown intracellular pigment in lower lying wider hyphae. Stipitipellis a cutis of narrow, colourless, 2.0–4.0 µm wide cylindrical hyphae, rarely with a loose covering of wider, cylindrical and branched, colourless, hyphae. Clamp-connections absent.

Habitat & distribution — Solitary or in small groups, saprotrophic and terrestrial in humus-rich sandy and loamy soils, in deciduous woods, rather rare in the Netherlands. Sept.–Oct. Widespread in Europe.

Collections examined. THE NETHERLANDS: prov. Noord-Holland, Santpoort, Duin & Kruidberg, 19-IX-1983, A. G. Becker; Bloemendaal, Koningshof, 2-X-1995, E. C. Vellinga 1944; ibidem, 20-IX-1997, A. G. Becker; prov. Zuid-Holland, Wassenaar, Raaphorst, 30-IX-1989, J. P. H. M. Adema; prov. Limburg, Bemelen, Bemelerberg, 22-VIII-1993, J. C. Lennie (coll. E. C. Vellinga 1896); Cadier en Keer, Orenberg, 9-X-1991, E. C. Vellinga 1762 (holotype, L); Elsloo-Geulle, Bunderbos, 7-IX-1996, E. C. Vellinga 2019; Gronsveld, Savelsbos, 22-IX-1979, Th. W. Kuyper 1308. — GERMANY: Baden-Württemberg, Gottenheim, Wasenweiler Wald, 3-IX-1998, H. A. Huijser 6112 and s. n. (herb. Huijser).

Leucoagaricus crystallifer was commonly known as *L. serenus* (see also discussion under the latter, and the misapplied names). However, it is easily separated from that species by the narrow, slightly thick-walled cheilocystidia with a distinct crystalliferous apex.

Sericeomyces cinereopallidus Contu comes close, has also relatively narrow, but thick-walled, cheilocystidia with coarse crystals at the top, but the pileus is pale grey, at least at centre, and viscid (Contu, 1994; Migliozi, 1998).

Three species, viz. *Leucoagaricus menieri*, *L. subvolvatus* (Mal. & Bert.) M. Bon, and *Sericeomyces singeri* M. Bon ex Contu & Signor., are closely related to *L. crystallifer*, as they all have crystals on the cystidia. All three species were described from sandy habitats in the Mediterranean region; they all have a bulbous base, with volval remnants present in *L. menieri* and *L. subvolvatus*, and they differ from each other in spore shape and the extent to which the pileus covering is differentiated (Bon, 1993; Signorello & Contu, 1998). These characters, and the shape of the cystidia, differentiate them from *L. crystallifer*.

Leucoagaricus crystallifer is not uncommon in the Netherlands, and has been collected both in the dune area, and in southern Limburg. Surprisingly, Kelderman (1994) did not describe the present species in his overview of southern Limburg species.

3. *Leucoagaricus sericifer* (Locq.) Vellinga, *comb. nov.* — Fig. 3

Basionym: *Pseudobaespora sericifera* Locq., Bull. trimest. Soc. mycol. Fr. 68 (1952) 169, nom. nov. for *Lepiota sericea* (Cool) Huijsman, Meded. Ned. mycol. Vereen. 28 (1943) 46, non *L. sericea* Mass. (1912); *Lepiota cristata* var. *sericea* Cool, Meded. Ned. mycol. Vereen. 12 (1922) 23; *Leucoagaricus sericeus* (Cool) Bon & Boiffard in M. Bon, Doc. mycol. 9 (35) (1979) 40; *Sericeomyces sericeus* (Cool) Contu, Cryptog., Mycol. 12 (1991) 6; *Lepiota sericata* Kühn. & Romagn., Fl. anal. Champ. sup. (1953) 405, superfl. nom. nov. for *Lepiota sericea* (Cool) Huijsman; *Sericeomyces sericatus* (Kühn. & Romagn.) Heinem., Bull. Jard. bot. natn. Belg. 48 (1978) 404; *Lepiota sericifera* (Locq.) Locq., Friesia 5 (1956) 294; *Sericeomyces sericifer* (Locq.) Døssing in Knudsen & Hansen, Nordic J. Bot. 11 (1991) 481.

Despite the complicated nomenclatorial history of the name ‘sericifer’, the combination in *Leucoagaricus* had not been made; this lacuna is now filled.

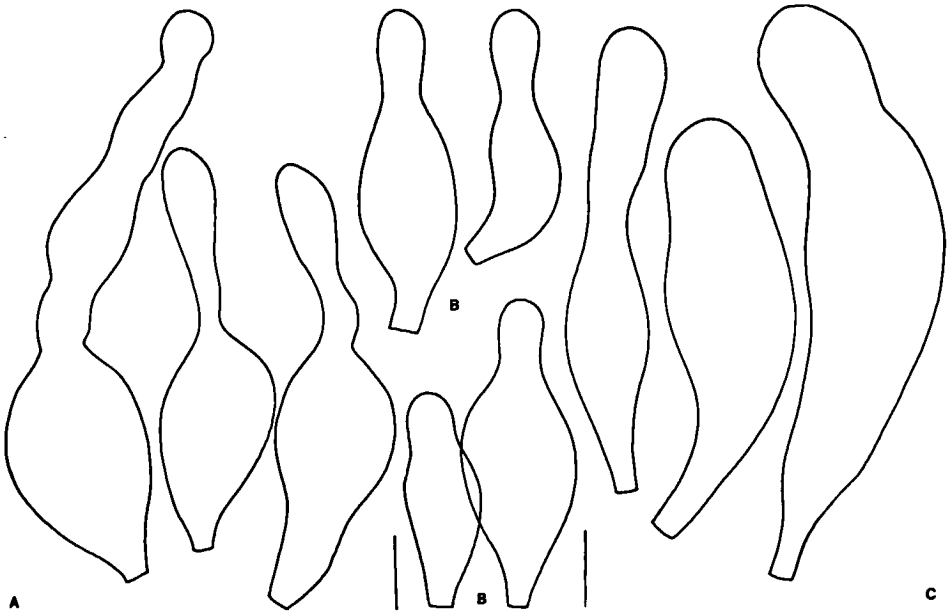


Fig. 3. *Leucoagaricus sericifer* f. *sericifer*. Cheilocystidia (A. from *E. C. Vellinga* 2116; B. from *Jalink & Nauta* 6208; C. from *A. A. R. de Meijer* 604). Bar is 10 μ m.

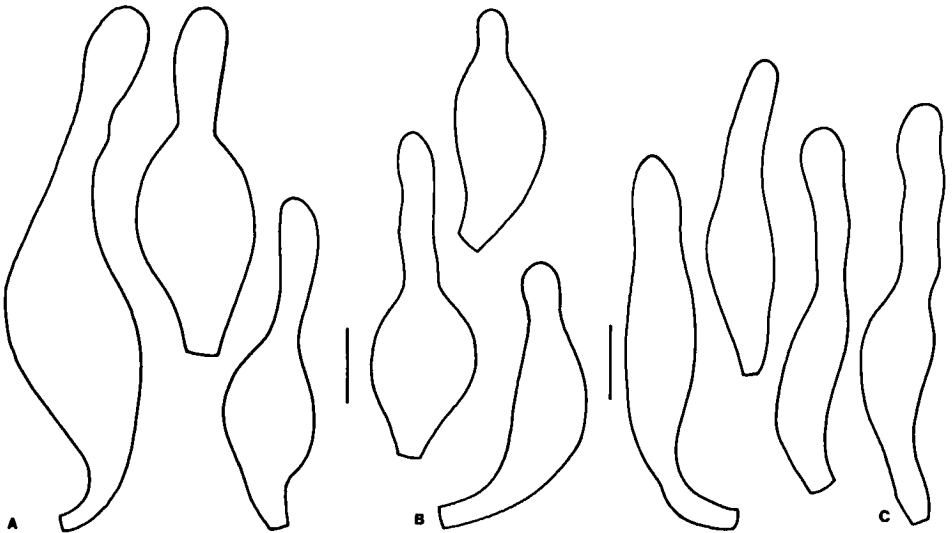


Fig. 4. *Leucoagaricus sericifer* f. *sericatellus*. Cheilocystidia (A. from *E. C. Vellinga* 1929; B. from *E. C. Vellinga* 2013; C. from *C. Bas* 8842). Bar is 10 μ m.

4. *Leucoagaricus sericifer* f. *sericatellus* (Malençon) Vellinga, *comb. & stat. nov.* — Fig. 4

Basionym: *Lepiota sericatella* Malençon. in Mal. & Bert., Fl. Champ. sup. Maroc 1 (1970) 152; *Leucoagaricus sericatellus* (Malençon) M. Bon, Doc. mycol. 9 (35) (1979) 40; *Sericeomyces sericatellus* (Malençon) M. Bon, Bull. trimest. Soc. mycol. Fr. 96 (1980) 172; *Sericeomyces sericatus* var. *sericatellus* (Malençon) Heinem., Bull. Jard. bot. natn. Belg. 48 (1978) 404.

This taxon has been considered a species by some authors (Malençon in Malençon & Bertault, 1970; Bon, 1980, 1981, 1993), by others a variety of *L. sericifer* (Heinemann, 1978). The main characters to separate the two taxa are the number of spores per basidium (4 in *L. sericifer*, and 2 in *L. sericatellus*), and the shape of the cheilocystidia: big, and distinctly lageniform with a long neck and a slightly widened capitulum in *L. sericifer*, and relatively small and lacking a widened capitulum in *L. sericatellus*. Bon (1980) warned of the existence of variants with a high number of 2-spored basidia in *L. sericifer*. The collections examined for this study yielded a huge variation in shape and size of the cheilocystidia, combined with 2-spored and 4-spored basidia (Figs. 3 & 4). Collections exist with 4-spored basidia and relatively small cystidia, alongside collections with 2-spored basidia and big 'typical' *sericifer* cheilocystidia, and all intermediates. Crystals on the cystidia were never found, though are reportedly present in *L. sericifer* (e.g. Kelderman, 1994). Another difference between the two taxa is said to be the size of the trama elements, relatively narrow in *L. sericifer*, and relatively broad in *L. sericatellus*.

Both *L. sericifer* f. *sericifer* and f. *sericatellus* show the typical brown discoloration of the basidiocarps on drying; exsiccates are easily distinguished from *L. serenus* and *L. crystallifer*.

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