

## Studies in *Lepista* (Fr.) W. G. SMITH section *Lepista* (Basidiomycotina, Agaricales)

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Abstract. – Five species of *Lepista* sect. *Lepista* from boreal and arcto-alpine habitats are revised and described, viz., *L. densifolia* (FAVRE) SING. & CLÉM., *L. multiforme* (ROMELL) comb. nov. (= *Clitocybe polygonarum* LAURSEN, MILLER & BIGELOW), *L. ovispora* (LANGE) comb. nov. (= *Lyophyllum ovisporum* (LANGE) REID), *L. pseudoectypa* (M. LANGE) comb. nov. (= *Clitocybe subalpina* BIGELOW & SMITH) and *L. subconnexa* (MURR.) HARMAJA. Neotypes are selected for *L. multiforme* and *L. ovispora* and a key to the species is presented.

### Introduction

Finds of several rare or little known *Lepista* species in northern and subarctic-arctic habitats promoted the present study. They represent a group of species with a caespitose habit. Some of them have been confused with *Lyophyllum* species of section *Difformiae*. From examination of this material and type material of species previously described in *Tricholoma*, *Clitocybe*, *Lepista* and *Lyophyllum*, it turned out that a number of names could be reduced to synonymy and that a few new combinations had to be made.

A stable nomenclature depends on a consensus as to the correct taxonomic status and circumscription of the genus *Lepista*. The correct generic name to be used depends i. a. on the identity of the type species *Paxillus lepista* (Fr.) Fr. A complete discussion of the case is not attempted here, but my position and main arguments are outlined below.

The genus *Lepista* is accepted as a distinct genus in the sense of SINGER (1975), with three sections: Sect. *Lepista* (to which belong the species dealt with in the present paper), sect. *Nuda* HARM. 1978 (= sect. *Genuinae* KONR. & MAUBL., 1937 = sect. *Spongiosae* (Fr.) KÜHN., 1976) and sect. *Gilva* HARM., 1978 (= subgen. *Eulepista* KONR. & MAUBL., 1937 = sect. *Inversae* SING. & CLÉM., 1972). The name *Spongiosae* adopted by KÜHNER (1976) is invalid since a full reference to original publication and sectional type is missing. The status of the other names is discussed by HARMAJA (1978).

With this circumscription, a *Lepista* species will be recognizable as such in the field as a tricholomatoid or clitocyboid agaric with gills that separate easily from cap and stem. A set of colours, odours

and growth habits further helps to characterize the lepistas. The feature of the separating gills was crucial for FRIES (1836) when he separated genus *Paxillus* (of which tribus *Lepista* became part in 1836–38) from *Agaricus* and for MAIRE (1913) when he erected *Rhodopaxillus* to accomodate *L. nuda*, *L. personata* and related species.

Characteristic of genus *Lepista* are furthermore spores that have a verruculose and cyanophilous outer wall layer and form a pinkish deposit, except for sect. *Gilva* where the ornamentation is more spiny and generally yellowish. The size and number of warts can vary considerably in spores from a single basidiocarp (cp. Pl. 26 of *Lepista irina* spores in PEGLER & YOUNG (1974) and Figs. 1–3 of the present paper). In Fig. 2 spores still attached to a basidium are seen as distinctly warted while in Fig. 3 most of the shed spores are smooth or almost so. BIGELOW (1982), who includes *Lepista* in *Clitocybe* finds support in the variable ornamentation that obscures a hiatus between the genera. HARMAJA (1978) on the other hand draws the limit between *Lepista* and *Clitocybe* where absolute no positive reaction can be seen to cotton blue, thus including in *Lepista* also species with smooth and hardly visibly cyanophilous spores. To me both these concepts seem to rest too much on single features of the spores, albeit other characters to some extent are considered.

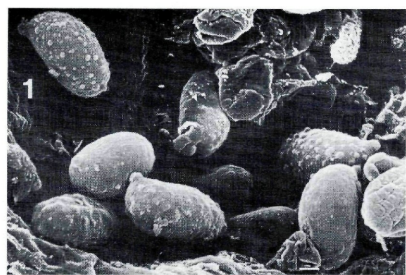
Characters of the spores and also of the basidia, which in *Lepista* are without the taxonomically important macrotype of siderophilous granules (cp. CLÉMENÇON, 1978), help to distinguish *Lepista* species from the macroscopically similar *Lyophyllum* species of sect. *Difformiae*.

With the acceptance of the identity of *Paxillus lepista* (Fr.) Fr. with *L. densifolia* (Favre) Sing. & Clém. (see discussion under the latter) the name *Lepista* (Fr.) W. G. Smith (1870) can not be dismissed as a nomen dubium or confusum as has been argued (cp. Balletto, 1974; Romagnesi, 1976). And it takes priority over *Rhodopaxillus* R. Maire (1913) since there is a clear reference by Smith to tribus *Lepista* of genus *Paxillus* in Fries (1836–38: 315) that makes it perfectly clear what Smith had in mind although he did not mention any particular species (cp. Donk, 1962).

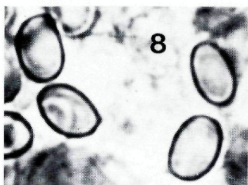
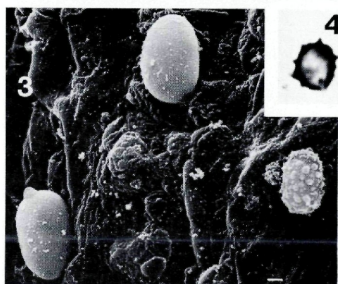
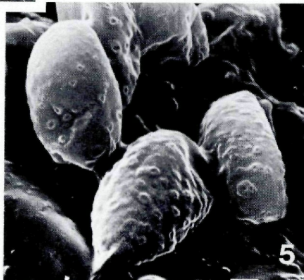
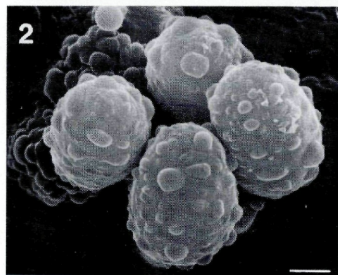
## Material and Methods

Descriptions of the species are based partly on fresh specimens from my own collections and partly on fresh or dried material sent me for identification.

Voucher material from the herbaria in Copenhagen, Helsinki, Kew, Lyon, Massachusetts, Michigan, Stockholm, Tromsø and Trondheim has also been examined and is referred to in the text according to Index Herbariorum (Stapleu, 1981). All other collections are kept in the herbarium of Botanical Museum in Oslo.



Figs. 1–9. Spores of *Lepista* spp.: Fig. 1. *L. ovispora*, spores from pileipellis showing almost smooth and clearly verrucose spores. SKÅRDALSMO (GG, 177/82). – Fig. 2. *L. aff. panaeola*, spores still attached to a basidium, LUND (GG, 176/82). – Fig. 3. Do., spores from pileipellis showing smooth and verrucose spores. – Fig. 4. *L. inversa*, spore from hymenium with spiny ornamentation, BIGELOW



& GG, 760/80. – Fig. 5. *L. multiforme*, spores from deposit; note the dimpled warts, GG, 196/77. – Fig. 6. *L. multiforme*, spores from pileipellis, neotypus. – Fig. 7. *L. ovispora*, spores from hymenium, neotypus. – Fig. 8. *L. ovispora*, spores from pileipellis, WEHOLT, 1981. – Fig. 9. *L. pseudooctypa*, spore from pileipellis, holotypus. – Bar in SEM-pictures = 1  $\mu$ m. LM-pictures of spores mounted in cotton blue/lactic acid,  $\times$  ca. 700.





Colours are indicated by references to the following colour standards: Ca = Cailleux (1981?) (replaces Code Expolaire), K & W = Kornerup & Wansher (1962) (= Methuen Handbook of Colour), Lge = J. E. Lange's colour map (LANGE, 1926) and Mo = Moser's colour map (MOSER, 1978).

As a standard, spores have been studied and measured either in preparations from spore deposits or from the cap surface, in order to include only mature spores. The size is presented in the following way: Spores (150/10): 5–5.8–6.5×3.5–3.7–4.2 µm. The number in parentheses tell that 150 spores from 10 collections have been measured. The two numbers in italics are mean values of length and width. Measurements in cotton blue/80% lactic acid and in 5% KOH have been compared and not found to vary significantly. Basidia have been examined for siderophilous granules according to the method described in CLEMENÇON (1978). Features of the pileipellis have been studied in preparations with 5% KOH and with phase contrast equipment. The drawings have been made with the aid of a Zeiss drawing mirror.

For the scanning microscopy small pieces taken from gills and caps of fresh fruitbodies were prefixed in 2% buffered glutaraldehyd or in glacial acetic acid: 10% ethanol (1:1) followed by an OsO<sub>4</sub> fixation. Also spores from a 5 year old spore deposit (*L. multiforme*) were studied in SEM. After inflation in water for 1 hour, spores trapped on a double sided tape were kept for 1 hour in 45% acetic acid, then dehydrated in glacial acetic acid: 100% ethanol (1:1) and washed three times in 100% ethanol. All preparations were CO<sub>2</sub> critical point dried before a covering by gold/palladium in an argon atmosphere. A JEOL Scanning Microscope, Model JSM-35C, was used for observation and photographing at the Electron Microscopical Unit for Biological Sciences at the University of Oslo.

### Features of spores and basidia

Light microscopy (LM) transmission (TEM) and scanning electron microscopy (SEM) have brought out a set of characteristic features of the *Lepista* spore (cp. PERREAU-BERTRAND, 1967; BIGELOW & ROWLEY, 1968; BESSON, 1970; PEGLER & YOUNG, 1971, 1974; and BIGELOW, 1981). It is ellipsoid-ovoid to ellipsoid-cylindric (or sub-globose in sect. *Gilva*), thin-walled and ornamented, non-amyloid and cyanophilous. Somewhat contrary to a statement in HARMAJA (1978: 50) I have found a positive reaction to carmine in the species described below. And contrary to the statement in BIGELOW (1982: 43) there is a plage not only in sect. *Gilva* (= *C. inversa* et al.) but also in sections *Lepista* and *Nuda* (see e. g. BIGELOW, 1981, Fig. 18 of *L. nuda*). Like KÜHNER (1980: 850–851) I have found a positive correlation between degree of ornamentation and darkness of spore deposit. This correlation is not present in sect. *Gilva* where also the deposit typically is white to yellowish in contrast to sordid pink in the other two sections.

Crucial points in the delimitation of *Lepista* towards *Clitocybe* have been the spore ornamentation and the reaction of the spore wall to cotton blue (cyanophilous-phobous). There are expressions of these features which may be taken to represent intermediates between the ornamented and cyanophilous *Lepista* spore and the smooth and cyanophobous *Clitocybe* spore.

The ornamentation in *Lepista* has been shown to consist of dome-shaped warts from the outermost spore wall layer (tectum) and can in some species like *L. multiforme* and *L. pseudoectypa* be extremely low. In sections *Lepista* and *Nuda* the warts are initially homogeneously electron-dense, but gradually they develop an electron-transparent core. For altogether 9 species an apical depression of the warts has been demonstrated (cp. Fig. 5) while no such depression has been found in species of sect. *Gilva*. Here the ornamentation also is homogeneously electron-dense, the projections more spine-like and the tectum thicker between the spines. In some species size and number of warts may vary considerably even between spores originating from one the same basidiocarp, cp. Pl. 26 in PEGLER & YOUNG (1974) and Figs. 1–3 here. Such a variation could well be genetically based, or some internal or external factor may produce changes in the ornamentation as the spore develops. BIGELOW (1981: 131) has indicated that the very few protuberances on the spores of *C. pseudoirina* may result from secretion of material through the wall. Also features observed in my material (e. g. in *Lepista* sp. aff. *panaeola*) could indicate that warts are lost during maturation. Spores still attached to the basidium (Fig. 2) were generally warted, while a majority of spores deposited on the cap surface (from another cap in the cluster) were smooth (Fig. 3). This variable ornamentation seems to me to be a very particular feature of the *Lepista* spore, which further distinguishes *Lepista* as a genus.

HARMAJA (1978) refers to a weak cyanophilous reaction in the smooth spore walls of some *Clitocybe* species (i. a. subgen. *Pseudolyophyllum*) and a moderate reaction in e. g. *L. fragrans* (Fr.) HARM. In material of the latter, kept in herb. O and identified by HARMAJA, I recognize spores that are clearly cyanophilous, warted and pinkish in deposit and I consider this a true species of *Lepista*, sect. *Lepista*. A distinction between a weakly cyanophilous and a cyanophobic reaction is extremely difficult (cp. BIGELOW, 1980: 43). To me information on the chemical basis for the reaction and its localization in the smooth spore wall seems necessary before taxonomic consequences should be drawn.

HARMAJA (1978) refers to a group of species showing characters diagnostic to *Lepista* but with small, weakly staining carminophilous granules in their basidia, among them *C. polygonarum* LAURSEN et al. and *C. festivoidea* LAMOURE. *Lyophyllum ovisporum* (LANGE) REID (1968) has also been described with carminophilous (= siderophilous) basidia. I have tested the siderophilous reaction in material of these species (type material of *C. festivoidea*). In the young still dikaryotic basidia a rather diffuse and faintly stained granulation could be seen in the plasma. In more developed basidia there was even less or no apparent granulation. The stained parts

gave a more elongate impression than the well delimited, globose and strongly staining bodies found in *Calocybe gambosa* that was tested for comparison. Also material of *L. nuda* was compared, which showed the same type of reaction as in the tested species. Furthermore, in nonsiderophilous basidia nuclei are easily seen, while in the siderophilous basidia nuclei are  $\pm$  shadowed by the siderophilous granules. This type of reaction does not agree with the macrotype of granulation taxonomically important in the Lyophyllae (CLÉMENCON, 1978). *Clitocybe festivoidea* is a true *Clitocybe*; the other two belong in *Lepista*.

### Key to the species treated

1. Cap pale, almost white from a  $\pm$  canescent surface, or pinkish brown as moist and whitish when dry, gills crowded . . . . . 2
- 1\*. Cap brown in moist and dry condition, gills close . . . . . 3
2. Gills deeply decurrent and attenuated on stem, flesh  $\pm$  discolouring reddish, cap not hygrophanous, spores  $4-4.5 \times 3-3.5 \mu\text{m}$  . . . . . 1. *L. densifolia*
- 2\*. Gills rounded at the stem, becoming somewhat decurrent, flesh not discolouring, cap hygrophanous, spores  $4.5-5.8(-7) \times 3-4(-4.5) \mu\text{m}$  . . . . . 5. *L. subconnexa*
3. Pigments encrusting, in places seen as transverse lines on the hyphal wall in pileipellis . . . . . 4
- 3\*. Pigments not encrusting . . . . . 5
4. Habit slender, cap soon flaccid and flexuous, stem soon hollow, spores  $5.3-7(-8.5) \times 3.5-4.5 \mu\text{m}$ , in grassy habitats, often lawns . . . . . 3. *L. ovispora*
- 4\*. Habit robust, cap fleshy, stem stuffed, finally hollow, spores  $6-7.5(-9) \times 3.5-5 \mu\text{m}$ , in disturbed habitats such as construction sites and peat cracks, arctic-alpine . . . . . 2. *L. multiforme*
5. Dry cap usually with patches of white tomentum-like crystals, spores  $4.5-6.5 \times 3-3.8 \mu\text{m}$ , arctic-alpine . . . . . 4. *L. pseudoectypa*
- [5\*. Dry cap naked, spores  $6-8 \times 4-5 \mu\text{m}$ , California . . . . . *L. harperi*]

### List of species

1. *Lepista densifolia* (FAVRE) SING. & CLÉM.

Synonyms: *Rhodopaxillus densifolius* FAVRE, 1948.

*Agaricus lepista* FR., 1821.

*Paxillus lepista* (FR.) FR., 1836-38.

Cap up to 5 cm wide, convex with incurved, pubescent margin, becoming plane to slightly depressed, canescent to glabrous, dry or somewhat viscid, white to brownish, darkening to brown (Mo A2, B5) on handling and where injured, the darkening caused by the effect of the canescent layer disintegrating when pressed, margin in

places with short,  $\pm$  dark ribs. – Gills deeply decurrent, attenuated towards both ends, crowded, narrow, 1.5–2 mm high, somewhat forked, easily separated from the cap context, beige (Mo D8). – Stem 8–10 $\times$ 0.5–1 (–1.5 base) cm, clavate, stuffed, becoming slightly hollow from base upwards, glabrous, young  $\pm$  whitish and canescent, becoming dark fibrillose and darkening on bruising, base somewhat white tomentose. – Flesh soft, whitish in cap and stem, but brownish to coffee brown in a layer above the gills and in the stem cortex, changing slowly to rusty brown (Mo D5), with a strong unpleasant smell; taste mild. – Spore deposit not obtained.

Spores (10/1): 4–4.2–4.5 $\times$ 3–3.2–3.5  $\mu$ m, broadly ellipsoid, verruculose, cyanophilous. – Basidia 21.6 $\times$ 6  $\mu$ m, 4-spored, without siderophilous granulation. – Cystidia absent. – Pileipellis of filamentous, subparallel, hyaline hyphae, 3–5(–8)  $\mu$ m wide, with rather long segments. – Clamps present at all septa.

Habit and habitat. – One group of 4 specimens in a cluster, among grass at road-side near *Betula*, in the upper boreal zone.

Material examined. – NORWAY: Nord-Trøndelag: Lierne, Skraptjørnfloen in Sørli, UTM VM 3915, 29 July 1977, CONRADI & WISCHMANN.

Distribution. – Fennoscandia, Central European mountain areas (The Alps, The Pyrénées), U.S.A. (California – Alaska).

Remarks: *L. densifolia* is a species likely to be neglected or overlooked, due to a strong resemblance to notoriously difficult species of *Clitocybe* sect. *Candicans*. Only the discolouring of the flesh and the fairly dark and separating gills are good field characters. However, the spores clearly show it is a *Lepista*. Also *Lyophyllum connatum* resembles, but this has permanently white gills which are less crowded and less decurrent and a white spore deposit. Among the *lepistas*, there seem to be one or a few species with slightly larger spores that easily can be confused viz., *L. subconnexa*, *L. caespitosa* and *L. piperata*. The special features of these species are discussed under *L. subconnexa*. The two latter species I have never seen, but they are distinguished primarily by organo-leptic features. In view of the wide range of organo-leptic accounts that has been given for *L. densifolia* (see below), it is possible that more of these species have been confused, but also that only a single species is involved with a very complex organo-leptic composition.

The following accounts of smell and taste in *L. densifolia* have been recorded: Smell: Little agreeable (FAVRE, 1948), rather strong, not disagreeable (LAMOURE & FICHET, 1962), not distinctive, not constant from one collection to another, at times recalling bitter almonds (BIGELOW & SMITH, 1969), none or pleasant (BIGELOW, 1982). – Taste: Rather strong, little agreeable (FAVRE), not agreeable, then very burning (KÜHNER in LAMOURE & FICHET), not constant, at times slightly peppery (BIGELOW & SMITH), and mild (BIGELOW). My own notes, referring to material that had been transported for half a day in a plastic bag, but still in good condition, run: "Smell very strong, reminding of *Cortinarius traganus*, filling the whole room for hours; taste mild."

One main objection against all attempts to interpret the identity of *Paxillus lepista* (FR.) has been FRIES' varying accounts of smell and taste. In FRIES' *Systema* (1821) nothing is said on this matter, whereas in 1836–38 smell and taste are described as "non ingratus, nec farinae". In 1863 "odor farinaceus, subrancidus", we



find (repeated in 1877–84), but again in 1874 nothing is said about smell and taste. With the exception of the farinaceous component in these accounts, we find the same variation in records of smell and taste in modern descriptions of *L. densifolia*. A farinaceous component has, however, been indicated in *L. caespitosa* (BRESADOLA, 1881, and BIGELOW, 1982) and in *L. piperata* (RICEK, 1965) and is thus present in the complex. In later descriptions by FRIES (1836–38, 1863, 1874, 1877–84) *Paxillus lepista* is also described with a cap that becomes rimulosesquamulose towards the margin. This feature is not typical of *L. densifolia* and can neither be seen on the illustration in FRIES (1877–84, Tab. 164 Fig. 1) of *P. lepista*. Possibly the expression refers to a disintegrating canescent layer in older specimens. But in spite of these apparent discrepancies, I find it probable that *P. lepista* is identical with *L. densifolia*. The equation *Paxillus lepista* (Fr.) Fr. = *Agaricus subaequalis* BRITZ. proposed by SINGER (1951) has later been abandoned (SINGER & CLÉMENÇON, 1972). An identity with *L. subconnexa* as proposed by HARMAJA (1978) also seems improbable. Both these species deviate from FRIES' descriptions and the illustration by having only shortly decurrent gills that are emarginate to rounded at the stem, whereas *L. densifolia* clearly accords with regard to gill attachment. Also the discolouration of the flesh seen in *L. densifolia* corresponds with Friesian accounts of *P. lepista*.

BRESADOLA's account of *P. lepista* (1930) has added much to the confusion. This appears to be a member of the section *Gilva*, judging from the illustration (Tab. 676), the description and also from the description given by HORAK (1968). HORAK analysed the microscopic features in material collected by BRESADOLA in 1924, supposed to have been the basis for BRESADOLA's account, and reports slightly larger spores than in *L. densifolia*, 4.5–5 × 3.5–4 µm with warts and spines, and also vacuolar pigment in the hyphae of the pileipellis.

Apart from an entry in a floristic list from northern Finland by ULVINEN & al. (1981), this is the first report of *L. densifolia* in Fennoscandia since FRIES reported *Paxillus lepista* from Sweden.

## 2. *Lepista multiforme* (ROMELL) GULDEN comb. nov. – Fig. 5, 6

Basionym: *Tricholoma multiforme* ROMELL, Ark. Bot. 11, 3: 3. 1911.

NEOTYPUS, here designated: SWEDEN: Torne Lappmark: Jukkasjärvi; Abisko, 22 Aug. 1916, L. ROMELL (STH, no. 9142).

Synonyms: *Clitocybe polygonarum* LAURSEN, MILLER & BIGELOW, 1976.

*Lepista polycephala* HARMAJA, 1976.

This a robust, caespitose *Lepista*, characterized by large spores and incrusting pigments. A short but very pertinent description of this species from Swedish Lapland is found in ROMELL (1911). Informations on habit, habitat and spore size (7–8 × 4–5 µm) and the allusion made to *Lyophyllum* section *Difformiae*, leave little doubt as to the identity of ROMELL's species. Authentic material is also kept in Stockholm. A more recent and modern description of the species, under the name of *Clitocybe polygonarum*, was made by LAURSEN & al. (1976) on material from Arctic Alaska. A very short note in HARMAJA (1976) describing a new species of *Lepista* from northern Finland called *L. polycephala* relates to the same species.

The following description of *L. multiforme* is based on several collections from alpine and subarctic habitats in Norway. Authentic material of *Tricholoma multiforme* from Sweden, the type collection

of *L. polycephala* from Finland and fresh material from Alaska have also been examined.

Cap 4–12 cm, convex, occasionally somewhat umbonate, with incurved and faintly white pubescent margin, becoming centrally depressed and often with  $\pm$  flexuous and reflexed margin, margin sometimes faintly and shortly translucently striate or shallowly grooved, smooth but often becoming cracked mainly at desk, hygrophorous, moist fatty and evenly brown, (dark grey brown, liver brown to vinaceous brown or flesh coloured, Ca T30, 29, S69, 67, 53, R53, 49, P53, 49, Mo D6, C6, Lge h2), upon drying becoming matt, innately radially fibrillose and yellow brown (Ca P69, 67, N67, 65, M77, 70, 60, Lge g2), drying from centre, often with a pale centre and a dark marginal belt and/or with moist dark patches mainly in the central part. – Gills decurrent, close, with several tiers of lamellulae from margin, up to 1 cm high, easily separable from stem and cap tissue, young pale greyish cream to beige or putty coloured, (Ca K73, K91, 92, L91, 92, K & W 6B2) becoming pinkish brown (Mo B5, Lge g6, h4), always darker than the dry flesh, old often with reddish discolouring of edge. – Stem 3.5–11 $\times$ 0.5–1.8(–2.5) cm, equal or more often tapering downwards, often  $\pm$  excentric, solid, old hollow and sometimes laterally compressed, concolorous with the cap, but generally paler,  $\pm$  fibrillose, occasionally white tomentated at base. – Flesh elastic to tough, hyaline greyish beige in the moist fruitbody, drying to whitish but remains coloured for a long time in a thin zone above gills and in the central core of the cap. – Smell aromatic, somewhat reminding of coumarine, stronger in dry specimens and long persisting. Taste mild; edible and good. – Spore deposit almost white, only with a very faint touch of pinkish.

Spores (117/10) 6–6.9–7.5(–9) $\times$ 3.5–4.4–5  $\mu$ m, ellipsoid-cylindric, cyanophilous with very low warts, dimpled as seen in SEM. – Basidia 4-spored, 27–37 $\times$ 8–10  $\mu$ m, not siderophilous. Cystidia absent. – Pileipellis of  $\pm$  radially repent, pale pinkish to yellow brown hyphae, 3–10  $\mu$ m wide and medium-celled. – Pigment encrusting, in places seen as transverse lines on the walls. – Clamps present at all septa.

Habit and habitats. – Grows caespitously often forming rings and arcs, in sand and clay in disturbed habitats such as road-sides, dikes, construction sites, along railways, in court-yards; also found on turf and peat, once in a palse mire. From Alaska reported in various kinds of habitats connected to polygon formations. Apparently restricted to upper boreal-high arctic areas.

Material examined. – (number in parentheses indicate number of collections) NORWAY: Oppland (6), Hedmark (1), Buskerud (2), Telemark (1), Hordaland (9), Sør-Trøndelag (1), Nord-Trøndelag (2, TRH), Troms (2+1 TROM). – SWEDEN: ROMELL, 12 Aug. 1915 and 22



Aug. 1916 (NEOTYPE of *Tricholoma multiforme* ROMELL) (STH). – FINLAND: HARMAJA, 21. Aug. 1971 (HOLOTYPE of *Lepista polycephala* HARM.) (H). – SVALBARD: LANGE 44–82 (C). – U.S.A.: Alaska: Barrow, GG 165/80, 168/80, 200/80. *Lepista harperi* (MURR.) SING.: U.S.A.: California, D. Arora 1975 and 1981, WRIGHT 1977 (MASS).

Distribution. – Fennoscandia, Svalbard, Alaska.

Remarks: The material here selected as neotype for *L. multiforme* consists of one intact specimen and fractions of others and was collected in 1916 by ROMELL, in the same area around the scientific station at Abisko as the original material was found in 1909.

The fruitbodies of *L. multiforme* are extraordinarily persistent. I once had the opportunity to follow the same group of fruitbodies for more than one month. Siderophilous bodies in the basidia, as reported by HARMAJA (1978), have not been seen. Rhizomorphs as recorded by LAURSEN & al. (1976) has not been seen, but twice supposed rhizomorphs turned out to be rootlets when examined microscopically.

*L. multiforme* closely resembles *L. pseudoectypa* (see p. 69) and *L. ovispora*. In fact, *L. ovispora* is so similar to *L. multiforme* that I have doubted their specificity. It could be a question of a single species with a broad ecological amplitude, being able to grow in lowlands as well as alpine habitats, on well established lawns as well as on disturbed ground such as peat cracks in *palsa* mires and polygon fields, and recently exposed soils resulting from construction work (roads, dams, railways, yards, electric power lines etc.). The following features, however, seem to distinguish the two: *L. multiforme* has a somewhat more robust habit, the stem in *L. ovispora* is paler and earlier hollow than in *L. multiforme* and is also pruinose at apex and more tomentated at base. The spore deposit is rather deep sordid pink in *L. ovispora* compared to nearly white in *L. multiforme* and its spores are coarser ornamented than in *L. multiforme*. There is a slight difference in spore form and size, those of *L. multiforme* being on an average more cylindrical and larger, those of *L. ovispora* more ellipsoid and slightly smaller.

In California grows another similar species, *L. harperi* (MURR.) SING. (= *Clitocybe brunneocephala* BIGELOW). Exsiccate material of this species shows a more *Tricholoma*-like fungus with thicker flesh and more adnate gills and it corresponds, except in colour shades, more to species like *L. personata* and *L. nuda*. The spores of *L. harperi* are coarser ornamented than those of *L. multiforme* and the pileipellis consists of narrower hyphae without incrustations.

### 3. *Lepista ovispora* (J. E. LANGE) GULDEN comb. nov. – Figs. 1, 7, 8

Basionym: *Clitocybe aggregata* var. *ovispora* J. E. LANGE, Dansk Bot. Ark. 6, 5: 58. 1930.

NEOTYPUS, here designated: NORWAY: Østfold: Kråkerøy: Lunde, on lawn among tall grass, under *Pinus sylvestris*, 22 Sept. 1982, leg. WEHOLT (O).

Synonyms: *Lyophyllum ovisporum* (LANGE) REID, 1968.  
*Lepista fasciculata* HARMAJA, 1974.

This is probably the most widely distributed and most common of the caespitose *Lepista* species dealt with here. By habit and habitat preferences it strongly reminds one of members of *Lyophyllum* section *Difformiae* and undoubtedly it has caused confusion. Its microscopic features, however, e. g., spores that are minutely ver-

ruculose and basidia that lack siderophilous granulation, clearly show the species to belong in *Lepista*. Also the spore deposit is pinkish, the gills more decurrent and the colour more brown than in the *Difformiae*. The description below is based on 10 Norwegian collections seen in fresh condition.

Cap 4–7.5(–16) cm, initially convex or somewhat umbonate, soon becoming depressed, margin young incurved and white pubescent, becoming reflexed, lobed and smooth, often with short ribs, not translucently striate, surface completely smooth, even somewhat shiny in moist condition, strongly hygrophanous, upon drying becoming matt and a radial orientation of hyphae becomes apparent, upper hyphae then appearing  $\pm$  hyaline, occasional darker spots or a minutely mottled appearance may be present, the drying up usually starts in central parts and may temporarily leave concentric, darker zones; moist cap dark liver brown (Ca R67, R69, S30, S33, S50, T29, T30, K & W 6D6), drying paler pinkish brown to yellow or greyish brown (Ca N30, P53, P69, R69, Lge c4). – Gills distinctly decurrent and narrower towards both ends, close, rather narrow 0.3–0.6 cm, up to 1.1 cm in larger specimens, easily removed from the cap, beige, distinctly paler than the cap (Ca K75, M70–75, N70). – Stem 3–7(–12.5) $\times$ 0.3–1.5(–2.7) cm, cylindric or somewhat attenuated or clavate at base, stuffed when young, rather soon becoming hollow, often  $\pm$  compressed and somewhat excentric, pale with  $\pm$  fibrils concolorous to the cap, paler than cap, apex  $\pm$  white pruinose, base white toment. – Flesh rather thin, firm to elastic, concolorous with the moist cap, drying to very pale buff or whitish with a narrow horn grey to beige layer above the gills. – Smell pleasant, “*Lepista*” – like but not like *L. nuda*. – Taste mild; edible. – Spore deposit sordid pink.

Spores (153/11) 5.3–6.4–7(–8.5) $\times$ 3.5–4.0–4.8  $\mu$ m, ellipsoid to ellipsoid-cylindric, cyanophilous, verruculose to almost smooth, plage present, verrucae often larger towards apex, dimpled (SEM). – Basidia 4-spored, ca. 25–45 $\times$ 6.5–8  $\mu$ m, without siderophilous granulation. Cystidia absent. – Pileipellis of repent, mainly parallel, medium to long-celled hyphae, 2–5(–14)  $\mu$ m wide, evenly pale yellow brown, or in places with transverse lines of incrusting pigment. – Clamps present at all septa.

Habit and habitats. – Densely caespitose, forming arcs and rings, in grassy habitats, often lawns, also road-sides and ditches.

Material examined. – (Number in parentheses indicate number of collections) NORWAY: Østfold (2, NEOTYPE and topotype), Akershus (7), Oppland (4), Vestfold (1), Sør-Trøndelag (1), Troms (2). – FINLAND: Lohja (HOLOTYPE of *L. fasciculata* HARM.) (H): St. Lappland: Rohdainen Loukosten, 20 Sept. 1957, SÄLTIN (H). – ENGLAND: Warwickshire: Sutton Park, SHACK, 20 April 1966 (K).

Distribution: Fennoscandia, Denmark, England, France, Switzerland.

Remarks: Our material fits the descriptions and illustration in LANGE (1930; 1935) of *Clitocybe aggregata* var. *ovispora* very well, with the notable exception that LANGE has not observed any ornamentation of the spores. The cyanophilous and very minute warts are, however, hardly visible in mounts without cotton blue or other dyes. They also escaped REID (1968), who nevertheless, just because of the deviating spores, raised the variety to specific rank. None of these authors refer to spore deposit colour. A sufficiently thick deposit to show the pinkish colour is difficult to obtain at room temperature from this species, but considerably better deposits are obtained when the caps are left in a cool place. (This also applies to *L. multiforme*.) There is no authentic or any other material of this species in the Botanical Museum of Copenhagen. A collection from South Norway is therefore herewith selected as neotype for *Lepista ovispora* (= *Clitocybe aggregata* var. *ovispora* J. E. LANGE).

Full descriptions and a coloured illustration of *Lepista ovispora* are also found in REID (1968, p. 14, Pl. 21a) and in HARMAJA (1974b) as *Lyophyllum ovisporum* and *Lepista fasciculata* respectively. I have examined REID's and HARMAJA's collections and found them to belong to one and the same *Lepista* species, the one described here. The spores in both collections are cyanophilous and verruculose, but I found them to be slightly larger than described viz., 6–6.8–7.8×3.8–3.9–4 µm in the British and 6–6.4–7×3.8–4.1–4.2 µm in the Finnish material. There were no siderophilous basidia. The pigment could in places clearly be seen as narrow zebra-like lines in material from both countries.

From my own and from other collectors' descriptions, as well as from those of LANGE, REID and HARMAJA, can be seen that the moisture state of the cap is difficult to estimate. LANGE used the expression "expallent", REID "hygrophanous" and HARMAJA "not hygrophanous". My experience with this species is that the character is particularly difficult to estimate, because specimens that appear perfectly fresh and "sappy" can actually be in a late stage of dehydration. However, when really moist and dark evenly liver brown specimens are found, the colour change upon drying, which is associated with an apparent change in surface texture to a more fibrillose type, can hardly escape observation.

LANGE (1930, 1935) cited *Clitocybe decastes* FR. sensu NÜESCH as a synonym for *C. aggregata* var. *ovispora*, a name which NÜESCH (1923) applied for a species in the group of caespitose *Clitocybe* species with ellipsoid spores, 6–7.5×3–5 µm. However, it seems that neither NÜESCH' nor FRIES' *Clitocybe (Agaricus) decastes* can be the same species as our, since it is described with a mainly grey and convex to plane cap and with whitish gills and stem.

Apparently *L. ovispora* is unknown in North-America. The key in BIGELOW (1982) leads to *Clitocybe brunneocephala* (= *L. harperi*) or to *C. tarda* (= *L. sordida*). *Lepista harperi* is a much more robust fungus with smaller spores. *L. sordida* is a ± violet brown species, closely related to *L. nuda*, that lacks encrusting pigment. BIGELOW recalls two colour forms of this species, one of them brown to cap and stem, with dull pinkish gills. There is no indication of the type of pigment in the latter form, which possibly could cover our species.

The close resemblance between *L. ovispora* and *L. multiforme* is discussed with the latter.

#### 4. *Lepista pseudoectypa* (M. LANGE) GULDEN comb. nov. – Fig. 9

Basionym: *Clitocybe pseudoectypa* M. LANGE, Medd. Grönl. 147, 11: 33. 1955.

Synonyms: *Clitocybe subalpina* BIGELOW & SMITH, 1969.

*Lepista subalpina* (BIGELOW & SMITH) HARMAJA, 1974.

This is a red to vinaceous brown and caespitose *Lepista*, distinguished by small spores and lack of encrusting pigment. I have not

seen fresh material of this species. The macroscopic description below is based on P. M. PETERSENS descriptions of fresh material from Greenland.

Cap 4–8.5 cm, irregularly convex, plano-convex or centrally depressed, for a long time with an incurved margin, smooth or slightly and finely scaly, young margin  $\pm$  pruinose, becoming striate and  $\pm$  reflexed and lobed, somewhat hygrophanous, moist red brown (Lge h1–g8), dehydrated g7. (Exsiccate material very often has patches with white, tomentum-like crystals.) – Gills decurrent, close, concolorous with cap but paler (g6 to g7 and h4). – Stem 3–7.5  $\times$  0.3–1.6 cm, cylindric or attenuated downwards, sometimes hollow,  $\pm$  concolorous with cap (j1 to j3), finely pruinose at apex, downwards fibrillose striate, base white felty. – Flesh rather thick in cap, pale reddish brown (b8), darker in cortex. – Smell slightly sweetish or like aniseed. – Spore deposit pale pinkish (Mo B1).

Spores (100/8) 4.5–5.3–6.5  $\times$  3–3.3–3.8  $\mu$ m, ellipsoid-ovoid, verruculose, cyanophilous. – Basidia 27–31  $\times$  5–6.5  $\mu$ m, 4-spored, without siderophilous granules. Cystidia absent. – Pileipellis apparently consisting of a thin ixoepicutis of narrow hyphae and a cutis of radial, repent, medium- to long-celled, evenly pale pinkish hyphae, 3–8  $\mu$ m wide. Pigment apparently membranous, no transverse lines seen. – Clamps present at all septa.

Habit and habitats: Caespitose, also forming fairy rings. It seem to prefer newly uncovered of unstable soils as it is reported from a solifluction lobe, a *Salix herbacea* snow-bed and from sandy soil along road. The type locality was a steep slope with deep moss and lichens. The Swedish material was found on virgin, partly trampled heather soils according to notes in ROMELL's field journal.

Material examined. – SWEDEN: Torne Lappmark, Jukkasjärvi; Abisko, 21 Aug. 1915, ROMELL 1777 (STH). – SVALBARD: Dicksonfjorden, Kapp Thorsden, 8 Aug. 1960, JS 11742, Blomsterdalen NW of Longyearbyen, 9 Aug. 1960, FALKANGER, and Adventfjorden, Revneset, 13 Aug. 1960, FALKANGER & SUNDING. – GREENLAND: Søndre Strømfjord: Hassel Fjeld, 28 Aug. 1946, LANGE 405 HOLOTYPE (C); Disko, Pjedurssons Moræne, 18 Aug. 1971, PETERSEN 71–86 (C) and Blæsedalen, 30 Aug. 1971, PETERSEN 71–153 (C). – U.S.A.: Washington: Mt. Rainier National Park, SMITH 30460 (HOLOTYPE for *Clitocybe subalpina* BIGELOW & SMITH), 30474, 39833 and 40285 (MICH).

Distribution. – Fennoscandia (Sweden), Svalbard, Greenland and U.S.A. (Washington).

Remarks. – *L. pseudoectypa* is very similar to *L. multiforme*, but seems generally to be somewhat smaller. The habitat preferences seem to be more or less the same. The spores are, however, considerably smaller in *L. pseudoectypa*. Also its pileipellis hyphae are quite evenly coloured, never showing darker transverse lines as in *L. multiforme* and *L. ovispora*. Patches of white crystals are present on the caps in



most fruitbodies of all but two of the examined collections. This is probably also the feature LANGE (1955) has pointed out for the type material. The American material of *C. subalpina* cited above agrees in all examined features with *L. pseudooctypa*.

*Clitocybe pseudooctypa* as illustrated and described by LANGE (1955), has a rather prominent umbo, ("small but distinct") and "indistinct, waxy scales" on the cap. When more material is compared, these features seem to be less prominent than indicated by LANGE, especially in the figure. The cap appears to be mainly convex to plane, sometimes somewhat depressed at centre or with reflexed margins and the scales when present are inconspicuous on dried material. The surface is "smooth to slightly and finely scaly" in PETERSEN's words, "usually but very minutely appressed squamulose" according to BIGELOW (1982).

This is the first record of *L. pseudooctypa* from the old world. The main distribution area of *L. pseudooctypa* could seem to be North America and Greenland, but the two finds in Svalbard and the one in Sweden indicate that the area of distribution is more or less the same for *L. pseudooctypa* and *L. multiforme*.

The material described and reported as *Lepista* species by WATLING (1977) from Greenland, also clearly belongs to the present species. The small spores and the smell resembling that of *Lactarius camphoratus* are good indications. No material was, however, available for examination. The material recorded as *C. cf. pseudooctypa* in LAMOURE & al. (1982) is LANGE's and PETERSEN's material cited above.

##### 5. *Lepista subconnexa* (MURR.) HARM.

Synonyms: *Clitocybe subconnexa* MURR., 1915.

? *Lepista caespitosa* (BRES.) SING., 1939

(= *Clitocybe fasciculata* BIGELOW & SMITH, 1969).

? *Lepista piperata* RICEK, 1965.

The salient features of this species are the densely caespitose habit, the hygrophanous and canescent cap that is almost white in dry specimens, and the crowded, hardly decurrent gills. A deep pinkish spore deposit, a sweetish smell and a mild taste further characterize the Norwegian material.

Microscopic data: Spores (53/5): 4.5–5.4–5.8(–7) × 3–3.6–4(–4.5) μm, ellipsoid, verruculose, warts often coarser at apex, cyanophilous, – Basidia 22.8–26.4 × 6–7 μm, 4-spored, without siderophilous granulation. Cystidia absent. – Pileipellis of repent, subparallel hyphae, 3.5–8 μm wide and with medium long segments, appearing almost hyaline. – Clamps present at all septa.

Habit and habitat. – Densely caespitose, among grass in fields and pasture.

Material examined. – NORWAY: Oppland: KLYKKEN, 1924. – Buskerud: GG 642/67. – Nordland: JAKOWLEV (GG 81/76). – Troms: JENSSEN 47/82. – U.S.A.: Massachusetts, BIGELOW 9383 (O and MASS).

Distribution. – Fennoscandia, U.S.A., ? Central Europe (*L. caespitosa*, *L. piperata*), ? Central Asia (*L. caespitosa*).

Remarks. – For full description of the species, see BIGELOW & SMITH (1969) and BIGELOW (1982). *L. subconnexa* closely resembles *L. densifolia* but has another type of gill attachment and slightly larger spores. Also there is no discolouring of the flesh in *L. subconnexa*.

According to BIGELOW & SMITH (1969) and BIGELOW (1982) there exists another very similar species, *L. caespitosa* (BRES.) SING. (= *Clitocybe fasciculata* BIGELOW & SMITH), mainly differing from *L. subconnexa* by organo-leptic features. Also RICEK (1965) has described a species in this complex, *L. piperata* RICEK, distinguished by an initially farinaceous, then peppery taste and a  $\pm$  farinaceous smell. Type material of these species has not been available. Since the characters of smell and taste apparently occur in numerous combinations within the species group, caution should be exercised in distinguishing separate species until other correlated characters have been found. Cp. also the organo-leptic situation described under *L. densifolia*.

The hygrophanity observed in the Norwegian material of *L. subconnexa* seems to be a somewhat deviating feature, since neither the original (MURRILL, 1915) nor more modern descriptions (BIGELOW & SMITH, 1969; BIGELOW, 1982) refer to this feature. Also for *L. caespitosa* and *L. piperata* clear indications with regard to this feature are lacking.

*Lepista panaeola*, as very thoroughly described from the Alps by KÜHNER (1976), can be distinguished from *L. subconnexa* on a matt, minutely tomentod, brownish but never pinkish cap cuticle, formed by entangled hyphae. In lowland material KÜHNER reports brown pigment located in transverse lines on the hyphae, while no information on the pigment is given for the paler alpine material. Interfertility tests, however, were positive between alpine and lowland material.

The only previous records of *L. subconnexa* in Europe are found in HARMAJA (1970; 1974a) and in ULVINEN & al. (1981), from localities in Finland and Norway.

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