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Studies in arctic and alpine *Lamprospora* species

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Thirteen species of *Lamprospora* de Not. from arctic and alpine habitats of Svalbard, Norway and Central Europe are treated, *viz. Lamprospora ascoboloides*, *L. cailletii*, *L. carbonicola*, *L. dictydiola*, *L. hanfii*, *L. leptodictya*, *L. lutziana*, *L. miniata*, *L. minuta*, *L. norvegica*, *L. rugensis*, *L. seaveri*, and *L. spitsbergensis* spec. nov. Accounts of their morphology, taxonomy, and ecology are presented. SEM illustrations of ascospores of all species are provided.

Keywords: arctic–alpine, Pezizales, taxonomy, ecology.

The discomycete genus *Lamprospora* de Not. [Pezizales: Pyronemataceae] includes ca. 30 species which grow on mosses or on the soil in association with mosses. An intimate fungus–host relationship has been demonstrated micro–anatomically for some species (Döbbeler, 1979; Benkert, 1990), and is probably a characteristic feature for the genus; the hyphae of the fungus form a 'cap' around the rhizoids and leaf cells, and primitive appressoria and haustoria penetrate the rhizoidal cells (Döbbeler, 1979). Some species have a restricted host range and are associated with a single host species or genus, others have a wider spectrum of host genera and families.

Seaver (1912, 1914, 1928) and Benkert (1976, 1987) have studied the taxonomy of *Lamprospora*. The genus is at present under revision (Benkert, 1987, 1990; Benkert & al., 1991). Benkert (1987) emphasizes ascospore ornamentation characteristics and fungus–host associations as the most important characters to distinguish species.

This study was undertaken to study *Lamprospora* species of the arctic and alpine zones. *Lamprospora miniatopsis* Spooner, known from the maritime Antarctica, has been treated in a previous paper (Schumacher, 1986). In the present paper the taxonomy and ecology of 13 species are discussed and the ascospore ornamentation is documented by scanning electron microscopy (SEM) pictures for each species.

Materials and methods

Apothecia from fresh and dried specimens were studied by light microscopy in squash mounts and sections cut by hand and embedded

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in water, Melzer's reagent and methylene blue in lactic acid (Cotton blue). Measurements were made on sections and squash mounts in either H_2O or Melzer's reagent. Twenty fully mature ascospores from each collection were measured under oil immersion (x 1000). Measurements do not include spore ornamentation. Camera lucida drawings were made with a Wild drawing tube mounted on a Zeiss WL microscope. SEM was carried out on ascospores taken from fresh or dried specimens following the techniques outlined by Schumacher (1990, 1991). The preparations, on circular cover glasses, were placed directly on the SEM stubs in a drop of silver-solution, sputtered with gold-palladium in an argon atmosphere and observed with a Jeol 6000 scanning electron microscope.

Micro-anatomical terms are those of Starbäck (1895), as revised and defined by Korf (1952, 1973). The nomenclature of mosses follows Smith (1980).

Taxonomy and ecology

Key to the species treated

1. Ascospore sculpturing of ± interconnecting ridges making a reticulum or not 2
1. Ascospore sculpturing of isolated warts, 0.5–1.5 µm high, 0.3–0.8 µm broad; in association with *Philonotis fontana* ..... *L. lutziana*

2. Ascospore sculpturing of anastomosing ridges not composing a regular reticulum 3
2. Ascospore sculpturing a ± complete reticulum 8

3. Ascospore sculpturing of coarse ridges exceeding 1 µm in thickness 4
3. Ascospore sculpturing of delicate ridges less than 1 µm broad ... 5

4. Ascospore sculpturing composed of ridges and tubercles, 1.0–3.6 µm broad, 0.8–2.8 µm high, ascospores 13.0–14.8 µm; in association with *Dicranella* spp. ..... *L. ascoboloides*
4. Ascospore sculpturing of prominent ridges, 0.8–1.8 µm broad, 0.5–1.2 µm high, and thin, secondary ridges, 0.3–0.7 µm broad, making a pseudoreticulate pattern, ascospores 13.0–14.8 µm; in association with *Tortella* spp. and *Ditrichium* spp. ..... *L. cailletii*

5. Ascospores 14–17.5 µm diam 6
5. Ascospores 13.0–14.4 µm diam, ascospore sculpturing of 0.3–0.9 µm broad ridges, ca.0.5 µm high, ridges curved, anastomosing, intermixed with tiny strings, making a secondary pseudoreticulate

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pattern on the spore wall; in association with *Pohlia* spp. and *Bryum* spp. ..... *L. norvegica*

6. Ascospores subglobose 7
6. Ascospores globose, 14.0–17.2 µm diam; sculpturing of partly anastomosing ridges, 0.2–0.6 µm broad, by 0.5 µm high, ridges with nodular thickenings at points of interception, in some spores interconnecting to a ± complete reticulum; in association with bryaceous and ditrichaceous hosts ..... *L. minuta*

7. Ascospores 15.5–17.4 x 13.6–15.5 µm, sculpturing of delicate and partly anastomosing, curved ridges, 0.5–0.9 µm broad, 0.3–0.5 µm high; in association with various acrocarpous moss genera .... *L. leptodictya*
7. Ascospores 14.0–16.8 x 12.8–16.6 µm, sculpturing an irregular reticulum formed by ± curved, anastomosing ridges, 0.5–0.9 µm broad, ca. 0.5 µm high, in association with various acrocarpous mosses ..... *L. seaveri*

8. Ascospore sculpturing a fine-meshed reticulum, (6)–8–20 meshes per diam. 9
8. Ascospore sculpturing a large-meshed reticulum, 3–10 meshes per diam. 11

9. Reticulum of delicate ridges, 0.2–0.4 µm broad, 0.2–0.5 µm high, 10–20 meshes per diam; ascospores globose to subglobose, 12.8–15.0 x 12.0–14.4 µm; on carbonaceous soils, with *Pohlia* sp. .....*L. carbonicola*
9. Ridges broader, 0.3–1.5 µm broad 10

10. Ridges 0.3–0.8 µm broad, 0.3–0.6 µm high, at points of interceptions with nodular thickenings to 1.5–2.0 µm broad; 6–12 meshes per diam; ascospores 14.2–16.0 x 13.6–15.6 µm; on calcareous soils, with *Tortula* spp. ..... *L. dictydiola*
10. Ridges of variable thickness, 0.4–1.5 µm broad, 0.3–0.5 µm high, meshes mostly 1.5–2.5(–5) µm broad, 8–15 meshes per diam; ascospores globose, 13.8–15.5 µm, in association with *Pohlia* sp.... .....*L. spitsbergensis*

11. Ascospore sculpturing of low ridges, 0.3–0.7 µm high 12
11. Ascospore sculpturing of prominent ridges, 0.6–1.2 µm broad, 0.5–1.0 µm high, at points of interception with nodular thickenings to 1.0–1.5 µm high, forming a regular, large-meshed reticulum, 4–5 meshes per diam; ascospores globose, 15.6–18.8 µm diam;

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in association with *Pohlia* spp., *Bryum* spp. and ?*Ceratodon purpureus* ..... *L. retinosa*

12. Ascospores 14–17 µm diam 13
12. Ascospores large, 16.4–19.3 µm diam, ridges 0.4–1.2 µm broad, 0.4–0.8 µm high, meshes polygonate, 4–6 µm broad, 5–9 per diam; in association with *Pohlia* spp. and *Bryum* spp. .....*L. rugensis*

13. Ridges of variable thickness, 0.4–1.2 µm broad, ca. 0.5 µm high, meshes uneven-sized, 2–4–6 µm broad, 5–9 meshes per diam, ascospores globose, 14.5–16.8 µm diam; in association with *Pohlia* spp. and *Dicranella cerviculata* ..... *L. hanfii*
13. Ridges 0.3–0.7 µm broad, 0.2–0.5 µm high, making a large-meshed, complete reticulum; ascospores globose, 14.2–16.4 µm diam; in association with *Encalypta* spp., *Bryum* spp. and *Pohlia* spp. ..... *L. miniata*

Lamprospora ascoboloides Seaver, Mycologia 4: 10. 1912. – Plates 1A–B, 10B.

Syn. : ?*L. dicranellae* Benkert, Z. Mykol. 53: 217. 1987.

Apothecia 1–3 mm diam., discoid to slightly turbinate, disc orange, drying pale yellowish, with a prominent, dentate margin, hymenium flat to slightly convex, receptacle concolorous. – Ectal excipulum of *textura angularis*, individual cells mostly small, 5–30 µm broad, towards the margin cells more elongate, prismatic, 25–40 x 6–15 µm, forming a dentate–fimbriate margin projecting to ca. 250 µm beyond the disc. – Medullary excipulum of compact interwoven hyphae, individual cells 8–10 µm broad. – Subhymenium a zone of densely packed isodiametric to prismatic cells, ca. 5 µm broad. – Asci cylindric, 260–290 x 18–22 µm, with a long sterile lower part, gradually tapering into a pleurorhynchous base. – Ascospores uniseriate, perfectly globose, 13.0 – 14.8 µm, the sculpturing consisting of irregular, uneven, and partly interconnecting coarse ridges, 1.0–3.6 µm broad, 0.8–2.8 µm high, 2–4 (5) per diam, which may sometimes unite into a reticulate pattern, between ridges ± prominent warts (tubercles), 0.5–4.0 µm broad, to 3.0 µm high. – Paraphyses straight, septate, mostly unbranched from below, 2.0–3.5 µm broad, with orange, granular content, at tips gradually enlarged to 6–8 µm.

Material examined. – NORWAY. Sogn og Fjordane. Lærdal. Near Storgrovnuten, 1300 m, at road 243, among *Dicranella* sp., 8. Aug. 1989 R. Kristiansen 89. 42 (O). Oppland. N. Land. Haukedal N lake Ullsjøen, 560 m, along pathway

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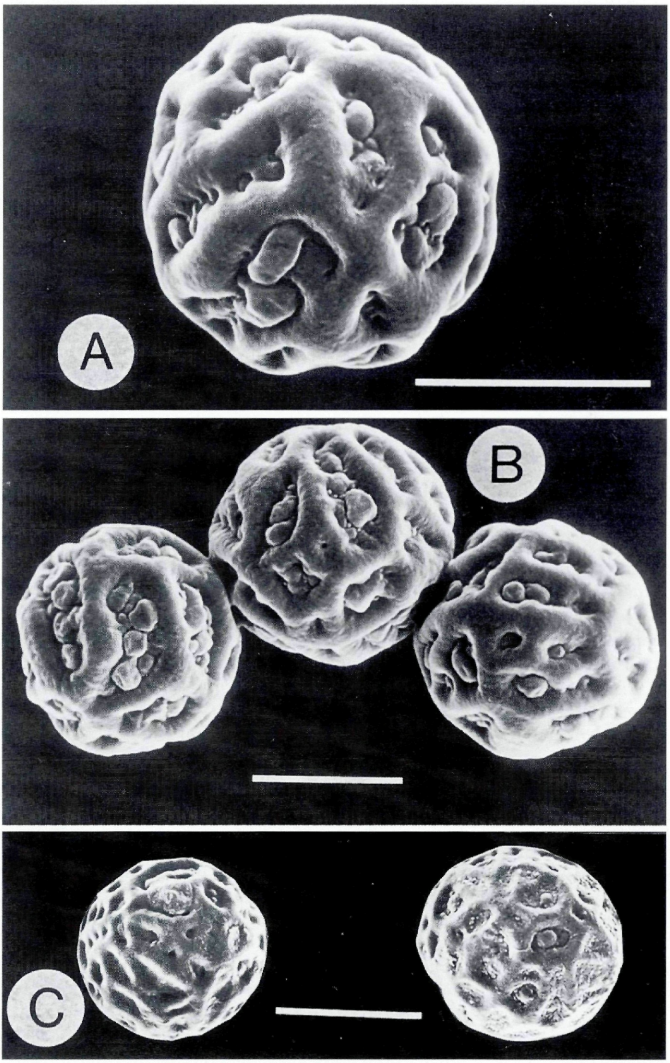


Plate 1. – SEM pictures of *Lamprospora* ascospores. – A, B. *L. ascoboloides*, coll. Oppland. N. Land (O). – C. *L. cailletii*, coll. F47/92 (O). – Bar = 10 µm.

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in *Picea* forest, among shoots of *Dicranella* sp., 11 Sept. 1984 T. Schumacher (O). Oppland. Vågå. Blåhø, 1450 m, at the road, among shoots of *Dicranella* sp., 22 July 1988 R. Kristiansen BL 1/88 (O).

L. ascoboloides is easily recognized on the basis of the prominent spore markings of coarse ridges in combination with large, tubercle–like warts. There is a striking variation in ascospore sculpturing from one specimen to another and from ascus to ascus within the hymenium. Aside from the 'typical' ascospores sharing characteristics as described above, there are some asci containing mature ascospores with more delicate ridges, 0.5–1.5 µm broad, on an otherwise rough ascospore surface, which is reminiscent of *L. seaveri* (see below). The characteristics of this latter spore type has not been encoded in the formal species description. It is not clear whether this variation, observed in all collections examined, represents a consistent feature, or is rather an aberration.

The species concept of *L. ascoboloides* presented here includes also material which was referred to *L. dicranellae* by Benkert (1987). After study of authentic material of *L. ascoboloides*, which grows associated with *Dicranella heteromalla* (Hedw.) Schimp. in North America, Benkert (1987) erected the new species, *L. dicranellae*, to accommodate very similar material on *Dicranella* from Europe. *L. ascoboloides* was distinguished from *L. dicranellae* by the more delicate ridges and no distinct warts on the ascospore surface (Benkert, 1987). The characteristics of the alleged type specimens of *L. ascoboloides* and *L. dicranellae* (Dissing, 1981; Benkert, 1987) and the increasing evidence for considerable variation in ascospore ornamentation in both arctic–alpine and lowland specimens of *L. ascoboloides* do not justify the segregation of two species. Apparently, *L. ascoboloides* has a rather restricted host range; most or all collections have been found associated with *Dicranella*, preferably *D. heteromalla* (cf. Benkert, 1987, as *L. dicranellae*).

Lamprospora cailletii Benkert, Z. Mykol. 53: 211. 1987. – Plate 1C.

Apothecia 0.5–2.3 mm broad, shallow cupulate to turbinate, partly submerged in the soil, disc orange, surface slightly convex, with a fringed, raised margin. – Ectal excipulum of angular to globose cells, individual cells 6–30 µm broad, towards the margin cells more elongate, running out in subparallel rows of a *textura porrecta*, cells 8–12 µm broad, building up the membranous, fringed margin which projects 150–250 µm above the hymenium. – Medullary excipulum of interwoven hyphae, 6–10 µm broad. – Subhymenium of densely packed cells, 5–8 µm broad. – Asci cylindric, 230–270 x 17–21 µm, with a long sterile lower part, gradually tapering

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to a pleurorhynchous base. – Ascospores uniseriate, globose, 13.0–14.8 µm diam, spore sculpturing consisting of more or less even ridges, 0.8–1.8 µm broad, by 0.5 –1.2 µm high, mostly curved and partly anastomozing, giving rise to tiny secondary ridges, 0.3–0.7 µm broad, the ridges building an irregular reticulum of uneven-sized meshes, 2–5 µm broad. – Paraphyses straight, septate, mostly unbranched from below, 2.0–2.5 µm broad, at the tips enlarged to 5–8 µm.

Material examined. – FRANCE. Savoie. Le Vallon, National Park Vanoise, 2600 m; between shoots of *Ditrichium flexicaule* (Schimp.) Hampe, 28 Aug. 1992 S. Huhtinen F 47/92 (O).

L. cailletii was recently described based on material from Germany and France (Benkert, 1987). Caillet & Moyne (1980) described and illustrated this taxon from France under the name *Octospora laetirubra* (Cooke) Caillet & Moyne [= *Lamprospora laetirubra* (Cooke) Lagarde]. For the untenability of this name for the present taxon, see the discussion in Benkert (1987: 244).

All previous records of this apparently rare species have been found in association with *Tortella tortuosa* (Hedw.) Limpr. (Pottiaceae). The collection on *Ditrichium flexicaule* extends the host range to include a host of the family Ditrichaceae.

L. cailletii is similar to *L. ascoboloides*, but in *L. cailletii* the ridges of the spores are more narrow and variable in width and form an irregular, incomplete reticulum on the spore wall. In this respect *L. cailletii* is close to *L. seaveri*, which, however, has ± subglobose ascospores with an even more delicate reticulation.

Lamprospora carbonicola Boud., Hist. Class. discom. 68. 1907. – Plate 2A–B.

Apothecia 1–5 mm broad, urnate, orange, partly submerged in the soil among shoots of its host, with a prominent, fimbriate margin. – Ectal excipulum of angular to prismatic cells, 10–24 x 8–36 µm, towards the margin cells more elongate, 20–40 µm long, 6–10 µm broad, extending into a margin of *textura porrecta*, protruding to 100–350 µm beyond the disc. – Medullary excipulum of a loose *textura intricata*, cells 6–10 µm broad. – Asci cylindric, 230–310 x 16–19 µm, with a long sterile lower part, gradually tapering to a pleurorhynchous base. – Ascospores uniseriate, globose to subglobose, 12.8–15.0 x 12.0–14.4 µm, sculpturing consisting of uneven ridges 0.2–0.4 µm broad, 0.2–0.5 µm high, building a reticulum of irregular, uneven-sized, fine-meshed and non-angular meshes, 0.5–2.5 µm in diam., 10–20 meshes per diameter. – Paraphyses

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straight, septate, 2.5–3.5 µm broad, with orange, granular content, at tips distinctly enlarged to 7–8 µm.

Material examined. – SVALBARD. Ny-Ålesund. At Nordhotellet, on carbonaceous soils amongst *Pohlia* sp. and juvenile shoots of ?*Barbula* sp., 11 Aug. 1988, T. Schumacher Spitsbergen 11 (O).

This is the first record in arctic-alpine environments of this rather large species, which according to Benkert (1987) is fairly common in Central Europe. The material fits well in the description and illustrations of material collected by Caillet & Moyne (1980) from prealpine and alpine sites in France under the name *Octospora polytrichii* (Schum.: Fr.) Caillet & Moyne [= *Lamprospora polytrichi* (Schum.: Fr.) Le Gal]. Benkert (1987: 217) has discussed the reasons why the name *L. carbonicola* Boud. must be used for this taxon. The lectotype of *L. carbonicola* from herb. Boudier (PC), selected by Benkert (1987), fits the concept of *L. carbonicola* adopted here. Benkert (1987) presented a concept of this species that included also specimens associated with *Funaria hygrometrica* Hedw. characterised by 'larger' and more regular meshes on the ascospore wall (6–10 meshes per diam: cf. Benkert, 1987: Plate 15, Fig. 5–6, Plate 16, Fig. 1–4). Such material has been referred to *L. carbonaria* (Fuck.) Seaver or *L. dictydiola* Boud. by most contemporary authors. The possibility of two closely related species here, both growing in burnt places, should be seriously reconsidered (for a discussion, see Benkert, 1987: 215; 219).

Lamprospora dictydiola Boud., Hist. Class. discom. 68. 1907. – Plate 2C–D.

Apothecia 1–2 mm broad, shallow cupulate to turbinate, partly submerged among shoots of its host, disc orange, hymenium slightly convex, with a prominent, fimbriate margin. – Ectal excipulum of angular to prismatic cells, 10–16 x 8–36 µm, towards the margin cells elongate, 8–30 µm long, 6–14 µm broad, building a margin of *textura prismatica* to *textura porrecta*, projecting to as much as 300 µm beyond the disc. – Medullary excipulum of a dense *textura intricata*, hyphae 6–12 µm broad. – Asci cylindric, 250–310 x 20–26 µm, with a long sterile lower part, gradually tapering to a short, pleurorhynchous base. – Ascospores uniseriate, globose to subglobose, 14.2–16.0 x 13.6–15.6 µm, sculpturing consisting of ridges 0.3–0.8 µm broad, 0.3–0.6 µm high, ridges with nodular thickenings to 1.5–2.0 µm broad, most prominent at points of intersection, in fully mature spores nodular thickenings mostly disappearing, ridges building a more or less complete reticulum of uneven-sized, mostly

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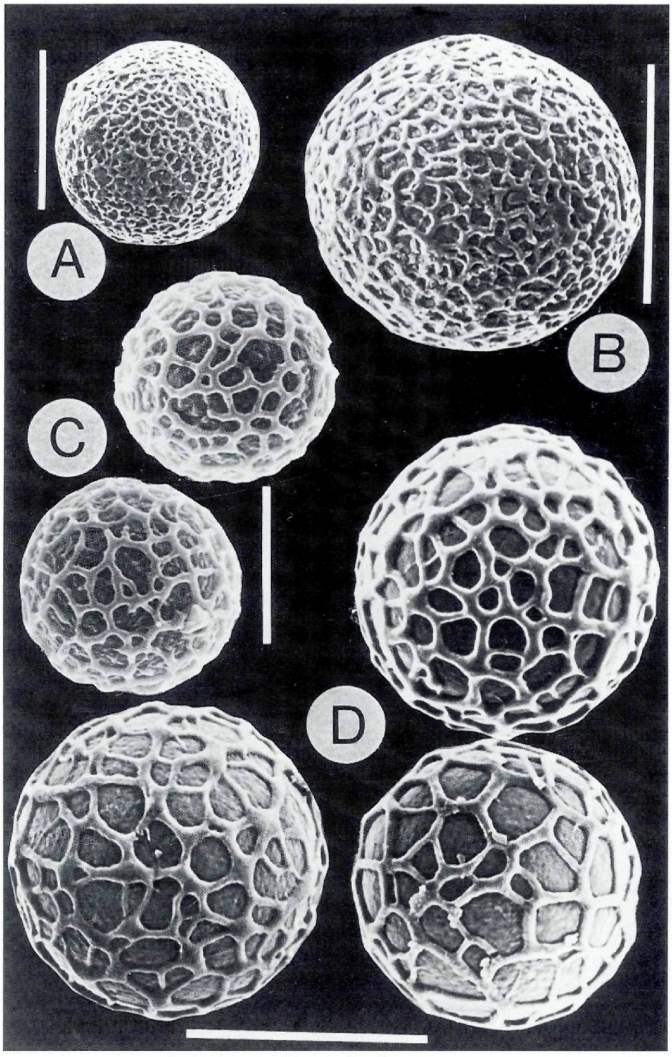


Plate 2. – SEM pictures of *Lamprospora* ascospores. – A, B. *L. carbonicola*, Spitsbergen 11 (O). – C, D. *L. dictydiola*. C: coll. G 60/89 (O); D: coll. F 88/92 (O). – Bar = 10 µm.

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rounded meshes. – Paraphyses straight, 2.2–3.6 µm broad, sparsely branched from below, filled with orange, granular content, at tips distinctly enlarged to 5–8 µm broad.

Material examined. – NORWAY. Oppland. Dovre. Grimsdalen. Tverrliseter, among juvenile shoots of ?*Tortula* sp. at road verge, 6 Aug. 1989, T. Schumacher G 60/89 (O). FRANCE. Savoie. Val d'Isère, river terrace among shoots of *Tortula ruralis* (Hedw.) Gaertn., Meyer & Scherb., 31 Aug. 1992, F 88/92 T. Schumacher (O).

The species was recently neotypified based on material from herb. Boudier (PC) growing in cushions of *Tortula muralis* Hedw. (Benkert, 1987: 221). *Tortula* seems to be the only host for the fungus; in Central Europe *L. dictydiola* is most frequently found on basic rocks and wall constructions in cushions of *T. muralis*. The concept of *L. dictydiola* as presented by Benkert (1987) and adopted here, agrees well with the original annotations ('sur des coussinets de mousses murales') and illustrations of Boudier (1905–1910); the detailed iconographic depiction of the associated moss leaves little doubt about the host being a *Tortula* sp. (Boudier 1910, vol. 2: Pl. 403). The taxon has been misinterpreted and frequently confused with *L. carbonicola* (cf. Seaver, 1928; Maas Geesteranus, 1969; Benkert, 1976).

Lamprospora hanfii Benkert, Z. Mykol. 53: 225. 1987. – Plate 3A.

Apothecia sessile, 0.6–1.5 mm diam., urnate to turbinate, disk plane to convex, reddish, drying orange, outside concolorous, with a prominent, raised margin. – Ectal excipulum consisting of undulating, short-celled hyphae, 6–16 µm broad, that gradually pass into an inner layer of angular to subglobose cells, 10–20 µm diam., towards the margin cells more elongate, 10–40 x 8–25 µm, becoming narrower and running in subparallel rows (*textura prismatica* to *textura porrecta*) into the protruding margin. – Medullary excipulum of densely packed angular to prismatic cells, 15–40 x 12–18 µm, with their long axes running parallel to the receptacular surface. – Subhymenium of a dense *textura intricata*, hyphae 5–10 µm diam. – Asci cylindric, 210–260 x 16–20 µm, with a pleurorhynchous base. – Ascospores uniseriate, globose, 14.5–16.8 µm diam., spore sculpturing consisting of ridges of variable thickness, 0.4–1.2 µm broad, ca 0.5 µm high, ridges running across the spore in more or less curved lines,intersected by transverse ridges, the ornamentation taking the form of a low, alveolate reticulum, meshes uneven-sized, (1)2–4–6 µm broad, 5–9 meshes per diam. – Paraphyses straight, 2.0–2.5 µm broad, simple or branched from below, with reddish orange, granular contents, at the tips enlarged to 5–7 µm.

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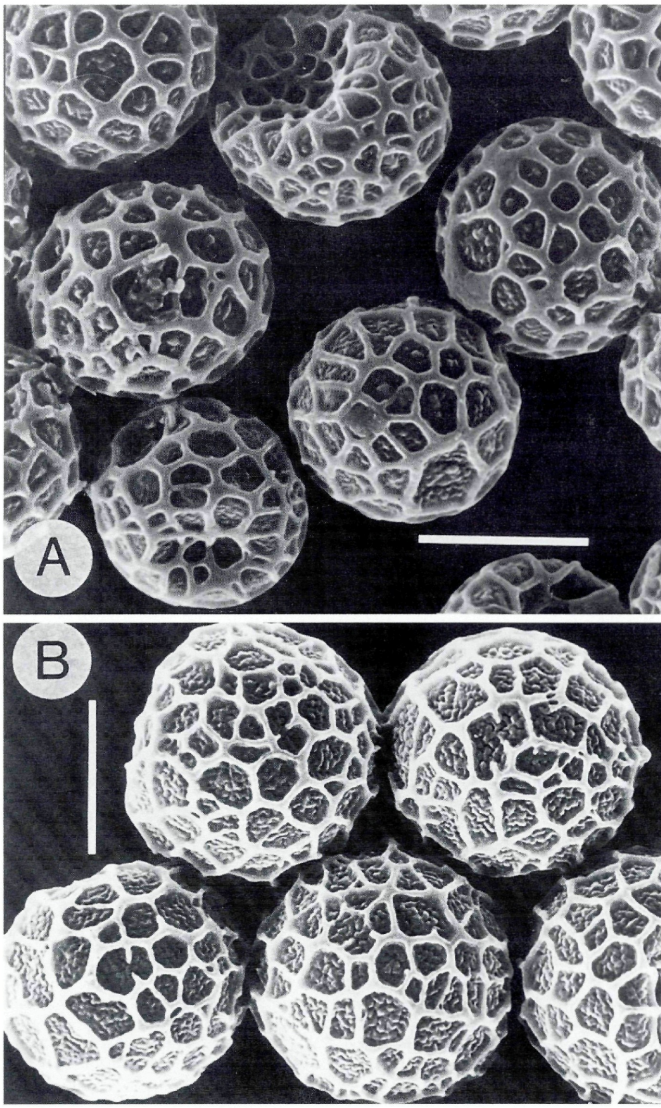


Plate 3. – SEM pictures of *Lamprospora* ascospores. – A. *L. hanfii,* coll. Spitsbergen 94 (O). – B. *L. rugensis,* coll. Spitsbergen 54 (O). – Bar = 10 µm.

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Material examined. – SVALBARD. Spitsbergen. Longyearbyen, on soil amongst *Pohlia drumondii* (C. Müll.) Andrews and *Cephaloziella* sp., 18 Aug. 1988, T. Schumacher Spitsbergen 94 (O). Spitsbergen. Longyearbyen, on soil between shoots of *Pohlia* sp., 19 Aug. 1988, T. Schumacher Spitsbergen 98 (O).

L. hanfii was described recently based on alpine material from Germany and France (Benkert, 1987) and is characterized by small, reddish apothecia, and an ascospore sculpturing of regular, diametral running ridges crossed by transverse ridges that build an alveolate reticulum of uneven-sized meshes. The species is close to *L. rugensis*, which, among other differential characters, has larger ascospores. The type of *L. hanfii* was found growing in cushions of *Dicranella cerviculata* (Hedw.) Schimp. (Benkert, 1987). The two Spitsbergen collections were associated with *Pohlia* spp.

Lamprospora leptodictya Dissing, Mycologia 73: 263. 1981. – Plate 4A–B.
Syn.: *L. paechnatzii* Benkert, Z. Mykol. 53: 237. 1987.

Apothecia immersed in soil or growing on the moss, 0.8–1.8 mm broad, 0.5–1.0 mm high, disc-shaped to turbinate, disc flat to slightly convex, with a raised, dentate margin; hymenium orange, drying yellowish, outside glabrous. – Ectal excipulum of *textura epidermoidea* to *textura angularis*, outermost cells 5–12 x 8–14 µm, in the inner layer individual cells elongate, 8–20 x 15–30 µm, towards the margin cells more narrow, forming subparallel rows of prismatic cells, 6–10 x 30–50 µm, building the dentate-fimbriate margin. – Medullary excipulum of interwoven *textura intricata*, cells 5–15 µm um broad. – Subhymenium of densely interwoven short-segmented hyphae, 4–10 µm broad. – Asci cylindric, 330–370 x 18–22 µm, gradually tapering into a pleurorhynchous base. – Ascospores subglobose, 15.5–16.4–17.4 x 13.6–14.5–15.5 µm, uniseriate, the spore sculpturing consisting of low, delicate ridges, 0.5–0.9 µm broad, running in curves across the spore wall, partly anastomosing, conspicuously narrowing and acuminate towards their blunt ends. – Paraphyses straight, 2.8–3.3 µm broad, branching or not from below, gradually enlarged to 8–14 µm at the tips.

Material examined. – NORWAY. Oppland. Dovre. Grimsdalen. Grimsa at Tverrliseter, among *Barbula* sp. and *Onchophorus wahlenbergii* Brid., 19 Sept. 1983, T. Schumacher & K. Østmoe D 238/83 (O). Dovre. Grimsdalen. Tverråi, in association with *Barbula* sp. /*O. wahlenbergii*, 6 Aug. 1984, T. Schumacher & K. Østmoe D 142/84 (O). Dovre. Grimsdalen. Buåi, amongst *Barbula* sp. /*Dicranella* sp., 29 July 1983, T. Schumacher D70/83 (O). Dovre. Grimsdalen. Verkenseter, amongst *Pohlia* sp., 9 Aug. 1984, T. Schumacher & K. Østmoe D 184/84 (O). Dovre. Grimsdalen. Buåi, amongst *Bryum* sp., 12 Aug. 1981, T. Schumacher & K. Østmoe 203/81 (O). Dovre. Grimsdalen. Tverråi, among shoots of *Pohlia* sp. and *Ditrichum* sp., 7 Aug.

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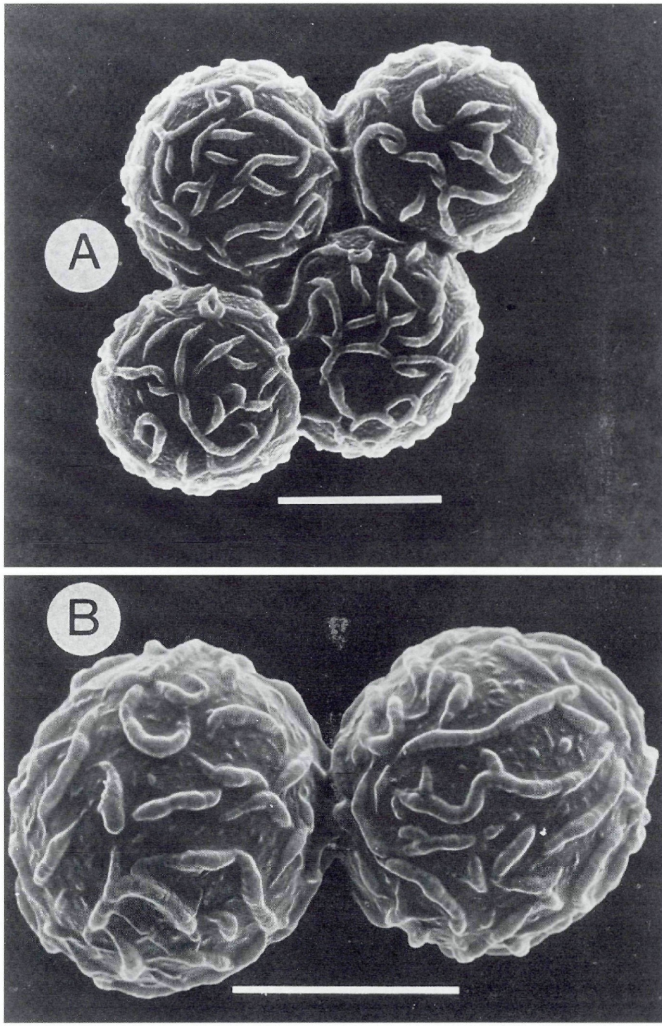


Plate 4. – SEM pictures of *Lamprospora* ascospores. – A, B. *L. leptodictya*. A: coll. G 70/89 (O); B: coll. G 203/81 (O). – Bar = 10 µm.

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1989, T. Schumacher G 70/89 (O). Vågå. Krokåi at Slådalsveien, in cushions of *Bryum* sp., 7. Aug 1984, T. Schumacher & K. Østmoe TS 6/84 (O). Sør–Trøndelag. Oppdal. Kongsvoll, amongst juvenile shoots of *Bryum* sp., 10 Aug. 1984, T. Schumacher & K. Østmoe TS 23/84 (O). FRANCE. Savoie. Le Vallon, National Park Vanoise, 2600 m, in *Salix herbacea* snow bed in association with juvenile shoots of *Bryum* sp., 28 Aug. 1992, T. Schumacher F 40/92 (O).

L. leptodictya was first described from Greenland in association with the mosses *Angstroemia longipes* Somm. and *Bryum* sp. (Dissing, 1981). In Norway *L. leptodictya* has been found in the alpine region associated with *Barbula* sp. (on the moss and on soil), *Pohlia* spp. and *Bryum* spp. From the description, *Lamprospora paechnatzii* Benkert (1987), described from subalpine and alpine sites in Czechoslovakia and Germany, is probably a recent synonym of *L. leptodictya*.

Lamprospora lutziana Boud., Bull. Soc. mycol. Fr. 33: 15. 1917. – Plate 5A.

Apothecia partly immersed in soil among the host moss, 1.4–3.0 mm broad, 0.5–1.0 mm high, disc–shaped to cupulate, with a prominent, fimbriate–dentate margin; disc orange, drying yellowish, flat to slightly convex, receptacle glabrous, concolorous. – Ectal excipulum of *textura angularis* to *textura globulosa*, cells 5–30 µm broad, towards the margin cells more elongate, prismatic, 4–10 x 15–25 µm, gradually forming a layer of dense subparallel short-segmented hyphae, 2.0–4.5 µm broad building a membranous margin projecting up to 400–500 µm beyond the disc. – Medullary excipulum of loosely interwoven *textura intricata*, cells 5.5–8 µm broad. – Subhymenium of densely interwoven short–segmented hyphae. – Asci cylindric, 250–300 x 20–25 µm, gradually tapering into a short, pleurorhynchous base. – Ascospores uniseriate, globose, 12.8–15.0–16. 2 µm, spore sculpturing consisting of isolated, rounded warts, 0.5–1.5 µm high, by 0.3–0.8 µm broad. – Paraphyses straight, septate, 2.0–2.8 µm broad, branching from below or unbranched, with orange granular content, at the tips gradually enlarged to 6–10 µm.

Material examined. – NORWAY. Oppland. Dovre. Grimsdalen, Buåi, on sandy soil, among shoots of *Philonotis fontana* (Hedw.) Brid., 17 Sept. 1983, T. Schumacher & K. Østmoe D 153/83 (O). Same locality and substrate, 29 July 1984, T. Schumacher & K. Østmoe D 109/84 (O). Same locality and substrate, 9 Aug. 1984, T. Schumacher & K. Østmoe D 165/84 (O). Oppland. Dovre. Grimsdalen. Sjøberget–Skridubekken, amongst *P. fontana*, 6 Aug. 1983, T. Schumacher & K. Østmoe D 101/83 (0). Oppland. Dovre. Grimsdalen. Gravhøi–Kvannbekken, in cushions of *P. fontana*, 12 Sept. 1982, T. Schumacher & K. Østmoe 506/82 (O). FRANCE. Savoie. Le Vallon, National Park Vanoise, 2600 m; epibryic on shoot of *P. fontana* along rivulet, 28 Aug. 1992, T. Schumacher F 48/92 (O).

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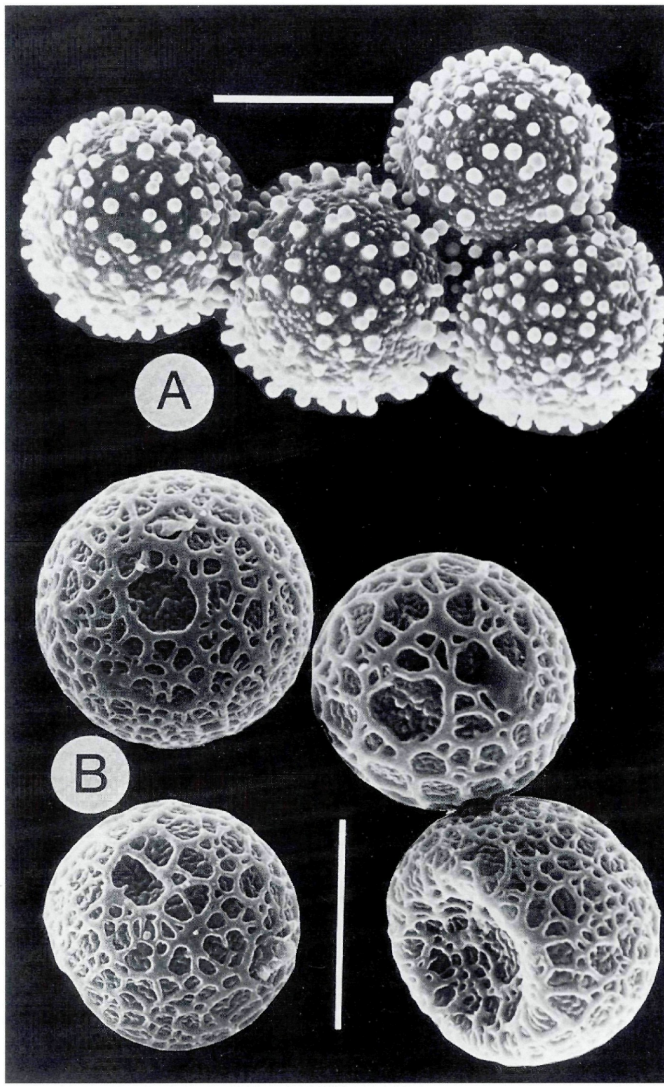


Plate 5. – SEM pictures of *Lamprospora* ascospores. – A. *L. lutziana*, coll. D 109/84 (O). – B. *L. spitsbergensis*, coll. Spitsbergen 55 (O). – Bar = 10 µm.

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L. lutziana has so far been collected only in association with *Philonotis fontana*. It grows on the moss or submerged in the soil in the dense carpets of the moss. *L. lutziana* was first collected from Cantal, France, by Boudier (1917). Except from a single record from Czechoslovakia (Kubicka, 1972), the species was never collected later again. According to Benkert (1987), there is no material of Boudier's left in PC. The Norwegian collections are rich in specimens, fit Boudier's description in all important details and could be used for neotypification. *L. cashiae* Gamundí is a similar species recorded from the southern temperate and maritime subantarctic zones (Gamundí, 1973, 1975; Pegler & al., 1980).

Lamprospora miniata De Notaris, Comm. Soc. Critt. Ital. 1: 338. 1863 ('1864'). – Plate 6A.

Apothecia sessile, 0.8–2.5 mm diam., shallow cup–shaped to turbinate; disc orange, drying pale orange, receptacle concolorous, with a convex hymenium, margin raised. – Ectal excipulum of globose to angular cells, individual cells 10–25 µm in diam., towards the margin cells more elongate, running into the margin composed of thick–walled, subhyaline rows of septate hyphae forming a *textura prismatica* to *textura porrecta*, individual cells 6–10 µm broad, 15–40 µm long. – Medullary excipulum of a dense *textura epidermoidea* to *textura intricata*, cells 6–20 µm broad, by 10–30 µm long. – Subhymenium of intricate hyphae, 5–10 µm broad. – Asci cylindric, 220–260 x 17–24 µm, with a pleurorhynchous base. – Ascospores hyaline, globose, 14.2–16.4 µm, spore sculpturing consisting of low, delicate ridges, 0.3–0.7 µm broad, 0.2–0,5 µm high, taking the form of a large–meshed, complete reticulum on an otherwise smooth ascospore wall. – Paraphyses straight, 2.0–3.0 µm broad, simple or branched from below, with orange, granular contents, at tips enlarged to 5–8 µm.

Material examined. – SVALBARD. Spitsbergen. Longyearbyen, among shoots of *Pohlia* sp. and *Bryum* sp., 18 Aug. 1988, T. Schumacher Spitsbergen 87 (O). Spitsbergen. Longyearbyen, amongst *Bryum* sp., 18 Aug. 1988, T. Schumacher Spitsbergen 78 (O). Spitsbergen. Longyearbyen, on sandy soil among shoots of *Pohlia bulbifera* (Warnst.) Warnst., 18 Aug. 1988, T. Schumacher Spitsbergen 79 (O).

The present concept of *L. miniata* is narrow. The species is characterized by relatively small ascospores and a low, delicate reticulation of the ascospore wall (Benkert, 1987). Benkert (1987) erected a number of new species in the complex around *L. miniata*. Many of the species, however, are based on a single or a few collec-

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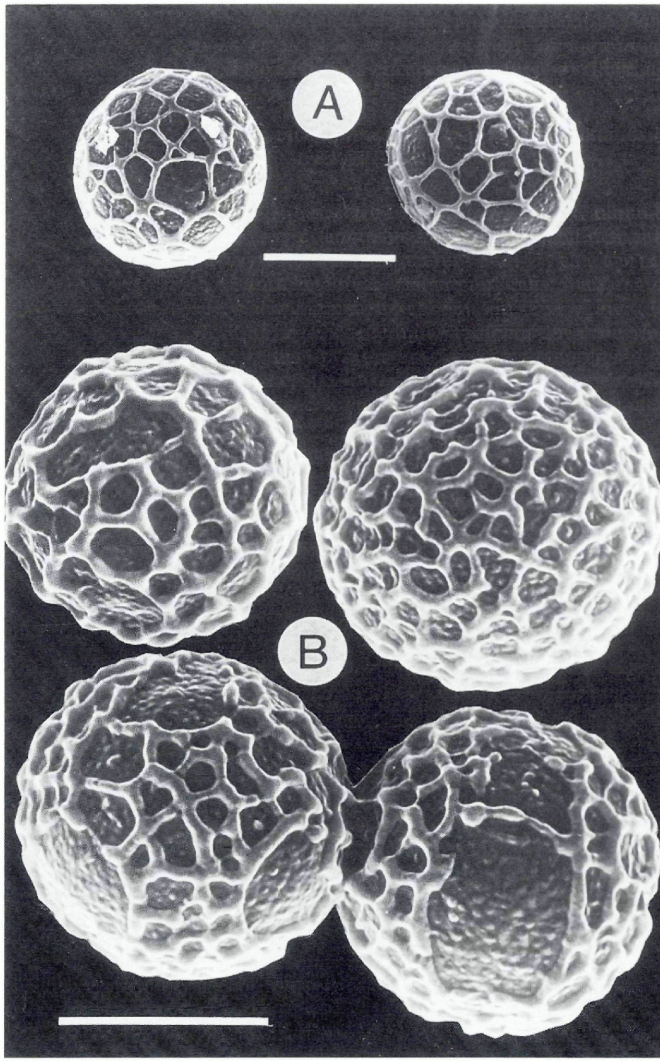


Plate 6. – SEM pictures of *Lamprospora* ascospores. – A. *L. miniata*, coll. Spitsbergen 87 (O). – B. *L. minuta*, coll. D 154/84 (O). – Bar = 10 µm.

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tions, and additional material is needed to fully explain species variation and diversity in this complex. According to Benkert (1987), *L. miniata s. str.* in Central Europe is associated with *Encalypta* spp. (Encalyptaceae) and representatives of the family Pottiaceae; the Spitsbergen collections were found associated with *Pohlia* and *Bryum* (Bryaceae).

Lamprospora minuta (Vel.) Svr., Acta Mus. Pragae 32 B: 126. 1979 ('1976'). – Plates 6B, 7A–D.
Syn. : *Lamprospora ditrichi* Benkert, Z. Mykol. 53: 221. 1987.

Apothecia 0.5–1.5 mm diam, disc orange red, drying yellowish, hymenium flat or slightly convex, receptacle concolorous, shallow cup–shaped, with a prominent, raised, dentate–fimbriate margin projecting to 200–350 µm beyond the disc. – Ectal excipulum 35–60 µm wide, of more or less angular cells, 8–25 µm diam, outermost cells giving rise to scattered tomentum hyphae, towards the margin ectal excipulum of prismatic cells, 15–45 µm long, 8–15 µm broad, running out in subparallel rows, forming the dentate–fimbriate margin. – Medullary excipulum 20–40 µm wide, of a compact *textura epidermoidea* to *textura intricata*, hyphae 10–15 µm broad, short–celled. – Subhymenium a compact zone of densely packed, elongate cells 5–7 µm broad. – Asci cylindric, 260–295 x 18–22 µm, with a long sterile lower part, gradually tapering to a pleurorhynchous base. – Ascospores uniseriate, globose, 14.0–17.2 µm diam, spore sculpturing consisting of partly anastomosing ridges with nodular thickenings, in some spores forming a more or less complete reticulum, meshes irregular in size and outline, 2–5 µm broad, ridges 0.2–0.6 µm broad, 0.5 µm high, at crosses 1.3–2.0 µm broad. – Paraphyses straight, septate, 2.5–3.5 µm broad, with orange, granular content, at tips gradually enlarged to 5–8 µm.

Material examined. – NORWAY. Oppland. Dovre. Grimsdalen. Tverråi, gregarious, associated with *Ditrichum flexicaule*, 6 Aug. 1984, T. Schumacher & K. Østmoe D 154/84 (O). Oppland. Dovre. Grimsdalen. Tverråi, in silty soil along river slope with *Distichium capillaceum* Hedw., *Pohlia* sp. and *Drepanocladus revolvens* (Sw.) Warnst., 18 Sept. 1983, T. Schumacher & K. Østmoe D 203/83 (O). SVALBARD. Spitsbergen. Barentsburg, among shoots of *Bryum* sp. /*Dicranella cerviculata*, 15 Aug. 1988, T. Schumacher Spitsbergen 33 (O). Same locality and date, among shoots of *Pohlia* sp., T Schumacher Spitsbergen 35 (O).

L. minuta has a characteristic and easily recognizable type of ascospore ornamentation, consisting of uneven, 'knotted' ridges, which form an incomplete or rarely complete reticulum. The species concept adopted includes material referable to *L. ditrichi* and apparently also to *L. feurichiana p. p. sensu* Benkert (1987; cf. Plate 18, fig.

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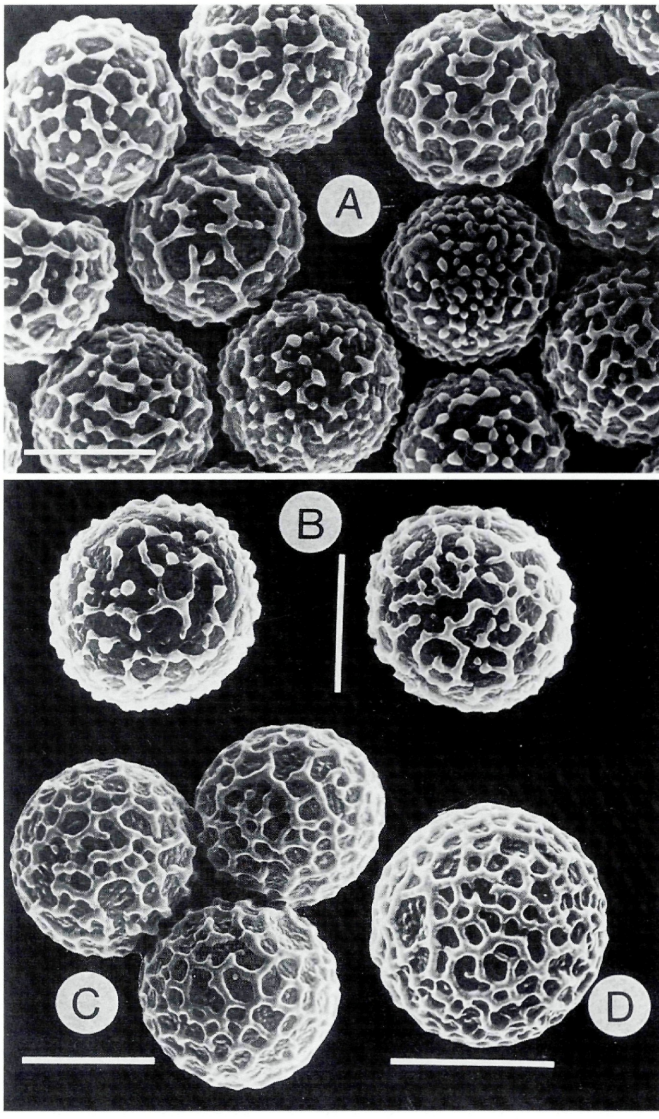


Plate 7. – SEM pictures of *Lamprospora* ascospores. – A–D. *L. minuta*. A: Spitsbergen 35 (O); B: Spitsbergen 33 (O); C: D 154/84 (O); D: D203/83 (O). – Bar = 10 µm.

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1–4). *L. minuta* was originally described from specimens growing in association with *Bryum* sp. (Bryaceae), but *Pohlia* spp. (Bryaceae) as well as *Ditrichium flexicaule* and *Distichium capillaceum* (Ditrichaceae) are also hosts to this fungus (cf. Benkert, 1987, as *L. ditrichi*).

Lamprospora norvegica Benkert, Aas & Kristiansen, Z. Mykol. 57: 196. 1991. – Plate 8A–B.

Apothecia 0.7–1.3 mm broad, shallow cupulate to turbinate, partly submerged in the soil, with a membranous, fringed raised margin; hymenium orange. – Ectal excipulum of *textura globulosa* to *textura angularis*, cells 8–20 µm broad, towards the margin cells elongate, running out in parallel rows (*textura porrecta*) of hyphae, 8–12 µm broad, building the raised, membranous margin, which project to 300 µm above the hymenium. – Medullary excipulum of interwoven hyphae forming a compact *textura intricata*, cells 6–12 µm broad. – Subhymenium of densely packed cells, 6–8 µm broad. – Asci cylindric, 230–300 x 16–20 µm, gradually tapering to a pleurorhynchous base. – Ascospores uniseriate, globose, 13.0–14.4 µm diam, spore sculpturing consisting of ridges 0.3–0.9 µm broad and 0.5 µm high; ridges mostly curved, anastomosing, with connecting tiny strings, making a secondary pseudoreticulate pattern on the spore wall. – Paraphyses straight, septate, mostly unbranched from below, 1.5–2.5 µm broad, at the tips enlarged to 4–7 µm.

Material examined. – NORWAY. Buskerud. Bergstølen at Strandavatn, ca. 1000 m, in cushions of *Pohlia filum* (Schimp.) Mårt. at road verge, 14 July 1984, R. Kristiansen ST 84.04 (Herb. R. Kristiansen), 16 July 1983, R. Kristiansen ST 83.88 (Herb. R. Kristiansen). SVALBARD. Spitsbergen. Longyearbyen. Adventdalen, inbetween shoots of ?*Bryum* sp. along river, 18 Aug. 1988, T. Schumacher Spitsbergen 88 (O).

L. norvegica is characterized by small, globose ascospores with an ornamentation of curved, delicate connecting ridges. It resembles *L. seaveri*, which has larger apothecia and subglobose ascospores with ridges building an irregular, incomplete reticulation. *L. norvegica* has been recorded in association with *Pohlia* and *Bryum* (Bryaceae) (cf. Benkert & al., 1991).

Lamprospora retinosa (Vel.) T. Schum. comb. nov. – Plates 9A–B, 10A, 11A–C.

Basionym: *Barlaea retinosa* Vel., Mon. Discom. Boh. 1: 323. 1934.

Syn. : *L. feurichiana* (Kirschst.) Benkert, Feddes Repert. 17: 639. 1976.

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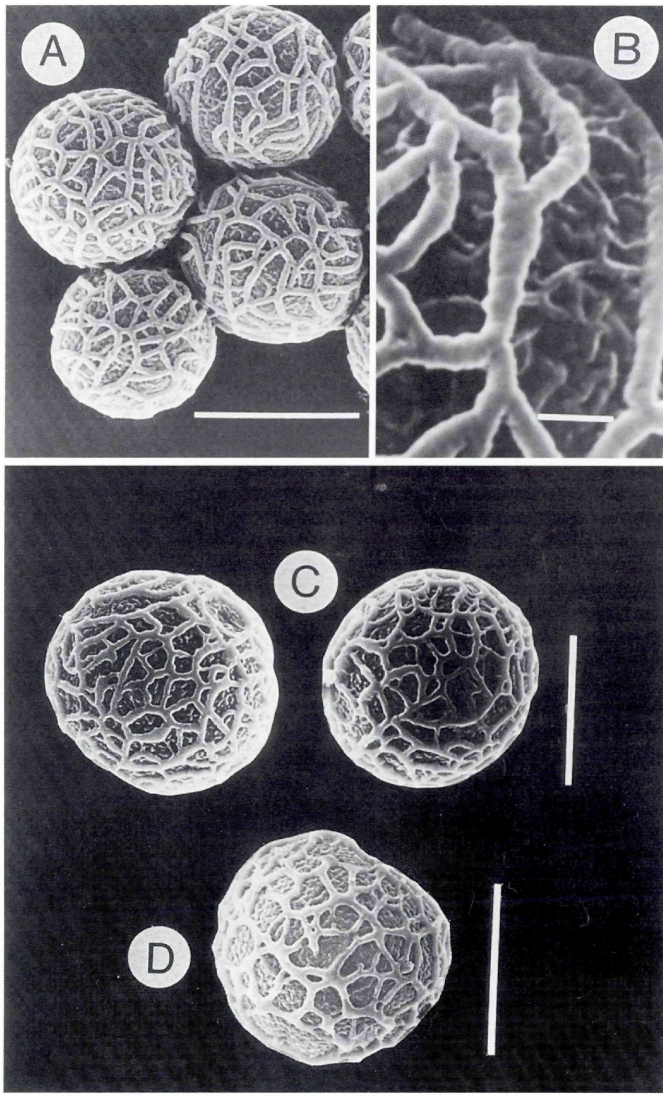


Plate 8. – SEM pictures of *Lamprospora* ascospores. – A, B. *L. norvegica*, coll. Spitsbergen 88 (O). – C, D. *L. seaveri*. C:coll. Spitsbergen 75 (O); D: coll. Spitsbergen 10 (O). – A,C,D: Bar = 10 µm; B: Bar = 1 µm.

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Apothecia 0.5–2mm in diam, urnate, disc yellowish orange, with a prominent, fimbriate margin, growing on mosses or on the soil among its host. – Ectal excipulum 4–6 cells thick, of angular to prismatic cells, 5–30 x 10–20 µm. Towards the margin cells more elongate, running in parallel rows of hyphae (*textura porrecta*) into the protruding margin, hyphae 8–12 µm broad. – Medullary excipulum of a densely interwoven *textura intricata*, hyphae short–celled, 6–12 µm broad. – Asci cylindric, 250–290 x 18–23 µm, gradually tapering to a pleurorhynchous base. – Ascospores uniseriate, globose, 15.6–18.8 µm, sculpturing consisting of prominent ridges forming a regular, large–meshed reticulum, ridges 0.6–1.2 µm broad, 0.5–1.0 µm high, at crosses with nodular thickenings up to 1.0–1.5 µm high, giving the fully mature ascospore a somewhat angular appearance (3)–4–5–(6) meshes per diameter. – Paraphyses straight, septate, 2.5–3.8 µm broad, at tips clavately enlarged to 6.0–9.2 µm.

Material examined. – NORWAY. Dovre. Grimsdalen. Tverråi, on river slopes, 930–980 m, among sterile shoots of *Pohlia* sp., 27 July 1984, T. Schumacher & K. Østmoe D 84/84 (O), D86/84 (O). SWITZERLAND. Graubünden. Val Sesvenna 2300 m, in wet moss carpet of *Pohlia drummondii*, 31 Aug. 1984, T. Schumacher H 51 (O). FRANCE. Savoie. Plan des Evettes, 2500 m, among *Bryum* sp., 26 Aug. 1992, T. Schumacher F 3/92 (O).

This is *L. areolata* Seaver as interpreted by Le Gal (1947) and Caillet & Moyne [1980; as *Octospora areolata* (Seaver) Caillet & Moyne]. From the paucity of authentic material of *L. areolata*, re-examined by Benkert (1987), the concept of *L. areolata* remains unclear. Benkert (1987) dropped *L. areolata* for the more recent name *L. feurichiana*. *Barlaea retispora* Vel. (1934), which was referred to the misinterpreted taxon *L. dictydiola* Boud. by Svrcek (1979), clearly is identical with our fungus, as judged from the examination and description of the holotype specimen of *Barlaea retispora* Vel. by Svrcek (1979). A recombination in *Lamprospora* is therefore needed. *L. campylopodis* Buckley (1923) is a similar taxon, maintained as a distinct species by Benkert (1987) on the basis of larger ascospores, broader ridges on the ascospore wall, and the association with *Campylopus* spp.

According to Benkert (1987, as *L. feurichiana*), *L. retinosa* is associated with *Bryum* spp. and ?*Ceratodon purpureus* (Hedw.) Brid. in Central Europe and Britain. The alpine specimens from Norway and Switzerland were growing in cushions of *Pohlia* spp. The Swiss and French collections have ascospores 15.6–17.3 µm, in the Norwegian material the ascospore dimensions are 16.0–18.8 µm.

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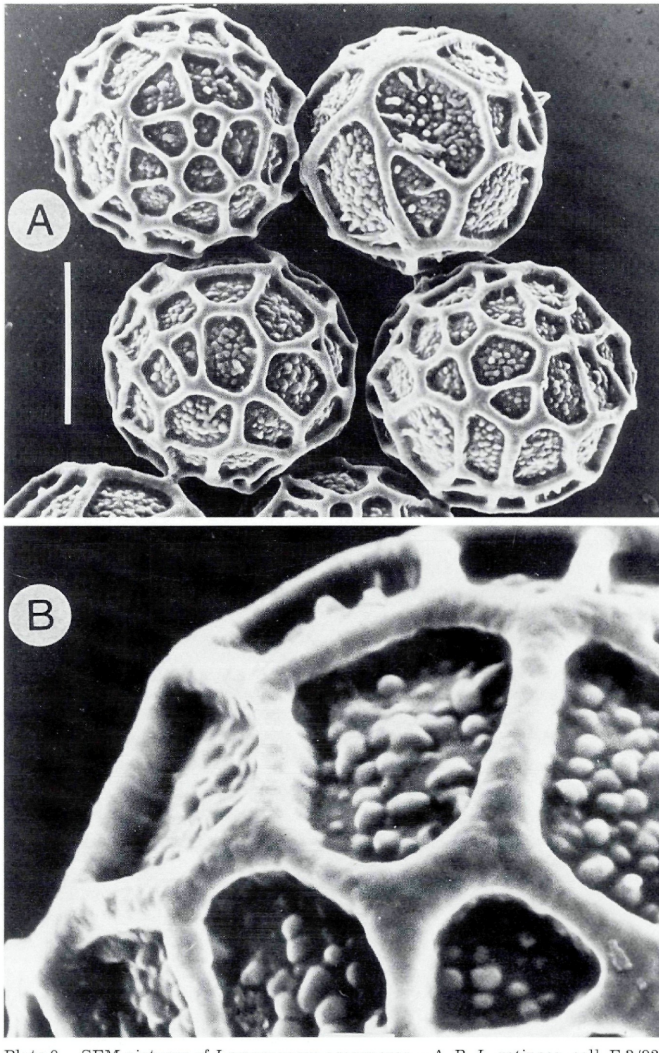


Plate 9. – SEM pictures of *Lamprospora* ascospores. – A, B. *L. retinosa*, coll. F 3/92 (O). – Bar = 10 µm.

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Lamprospora rugensis Benkert, Z. Mykol. 53: 240. 1987. – Plates 3B, 11D–E.

Apothecia sessile, gregarious, 0.8–3 mm diam., shallow cup–shaped to turbinate, with a convex hymenium and a prominent, fimbriate margin projecting to 200–400 µm beyond the disc. Hymenium orange red, drying pale orange, receptacle concolorous. – Excipulum without a sharp boundary between ectal and medullary excipulum; ectal excipulum of *textura globulosa–angularis*, cells 10–30 µm in diam., towards the margin cells more elongate, prismatic, running parallel into the fimbriate margin composed of thick-walled, subhyaline to pale yellowish, septate hyphae forming a *textura porrecta*, individual cells 6–12 µm broad, 18–50 µm long, outermost excipular cells giving rise to a covering layer of loose, intricate hyphal elements, 6–10 µm broad. – Medullary excipulum of angular, elongated cells, 6–20 µm broad, 20–60 µm long. – Subhymenium of compacted, intricate hyphae, 4–12 µm broad. – Asci cylindric, 210–250 x 18.0–21.5 µm, gradually tapering to a pleurorhynchous base. – Ascospores uniseriate, globose, 16.4–19.3 µm in diam., sculpturing taking the form of a regular, large–meshed reticulum of polygonate meshes, 4–6 um broad, 5–9 per diam, ridges of variable thickness, 0.4–1.2 µm broad, 0.4–0.8 µm high. – Paraphyses 1.5–2.5 µm broad, straight, simple or branched from below, with orange, granular contents, at the tips enlarged to 5–8 µm.

Material examined. – NORWAY. Oppland. Dovre. Grimsdalen. Svartknattin, with *Pohlia drummondii*, 11 Aug. 1982, T. Schumacher & K. Østmoe 284/82 (O). Dovre. Grimsdalen. Buåi, in association with *Bryum* sp., 17 Sept. 1983, T. Schumacher & K. Østmoe D 158/83 (O). Dovre. Grimsdalen, in cushions of *Pohlia* sp., 9 Aug. 1984, T. Schumacher & K. Østmoe D 178/84, D 179/84 (O). Dovre. Grimsdalen. Svartknattin, 1450 m, among shoots of *P. drummondii*, 5 Aug. 1989, T. Schumacher G5/89 (O). Dovre. Grimsdalen. Grønbakkin, with *Pohlia* sp., 4 Aug. 1989, T. Schumacher G 26/89 (O). Oppland. Vågå. Krokåi at Slådalsveien, in association with *P. drummondii*, 7 Aug. 1984, T. Schumacher & K. Østmoe TS 4/84 (O). Vågå. Storhaugen at Slådalsveien, among shoots of *P. drummondii*, 7 Aug. 1984, T. Schumacher & K. Østmoe T. S. 7/84 (O). Hedmark. Folldal. Råtåsjøhøi N, with *Pohlia* sp., 11 Aug. 1984, T. Schumacher & K. Østmoe TS 31/84 (O). SVALBARD. Spitsbergen. Longyearbyen. Endalen, among juvenile shoots of *Pohlia* sp., 17 Aug. 1988, T. Schumacher Spitsbergen 54 (O). Spitsbergen. Longyearbyen, associated with *Pohlia* sp., 18 Aug. 1988, T. Schumacher Spitsbergen 92 (O). SWITZERLAND. Graubünden. Alp Clünas, with *P. drummondii*, 27 Aug. 1984, T. Schumacher H 2 (O). Graubünden. Val Sesvenna, among shoots of *Pohlia* sp., 31 Aug. 1984, T. Schumacher H 32 (O). Graubünden. Val Sesvenna, with *Bryum* sp., 31 Aug. 1984, T. Schumacher H 33B (O). FRANCE. Savoie. Plan des Evettes, 2500 m, on river terraces on soil among shoots of *Pohlia* sp., 26 Aug. 1992, T. Schumacher F 2/92 (O). Savoie. Les Vallions. National Park Vanoise, 2600 m, among *Pohlia* sp., 28 Aug. 1992, T. Schumacher F 50/92, F 51/92 (O).

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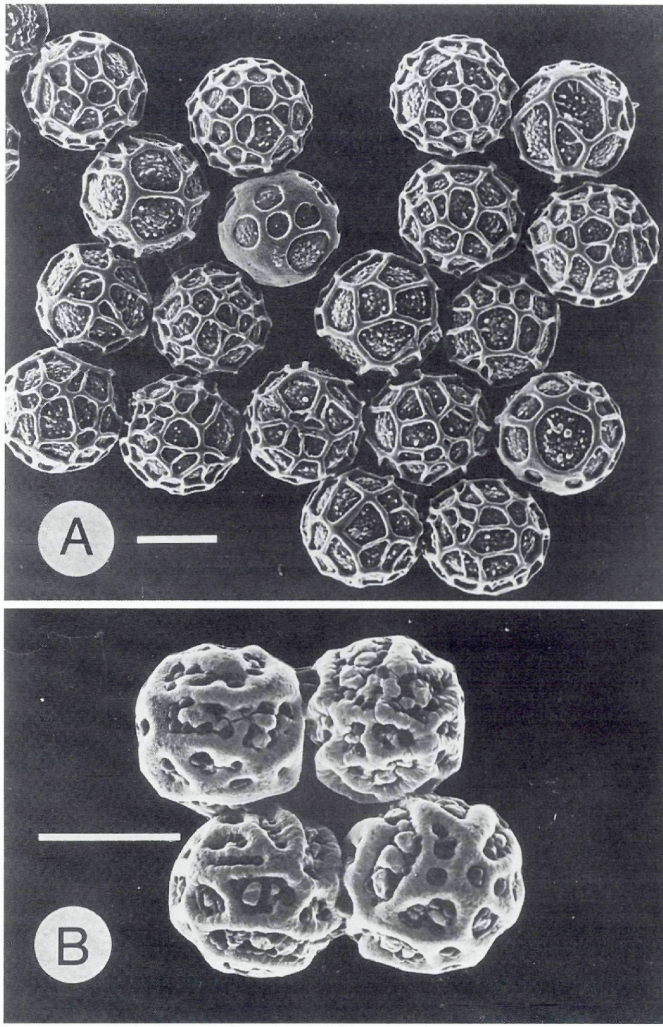


Plate 10. – SEM pictures of *Lamprospora* ascospores. – A. *L. retinosa*, coll. F 3/92 (O). – B. *L. ascoboloides*, coll. Oppland. N. Land. (O). – Bar = 10 µm.

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L. rugensis is a recent segregate of the *L. miniata*-complex (Benkert, 1987). The relatively large ascospores with a regular reticulum of medium-sized, polygonal meshes are characteristic for this species. *L. rugensis* is common in mountaineous areas of Norway and in Svalbard, where it grows in carpets of *Bryum* and *Pohlia*. The species is also regularly encountered in boreo-temperate and alpine regions of Central Europe (Benkert, 1987).

Lamprospora seaveri Benkert, Z. Mykol. 53: 241. 1987. – Plate 8C.

Apothecia 1–3.5 mm diam, shallow cupulate to turbinate, partly submerged in the soil, with a prominent, raised margin; disc orange, drying yellowish, with a slightly convex hymenium. – Ectal excipulum of *textura globulosa* to short-celled *textura epidermoidea*, cells 8–15 x 8–28 µm, towards the margin cells more elongate and narrow, 6–10 µm broad, running in dense, subparallel rows (*textura prismatica*) into the projecting margin. – Medullary excipulum of broad, inflated, interwoven hyphae, 6–18 µm broad, building a compact *textura intricata*. – Asci cylindric, 240–320 x 18–23 µm, with a pleurorhynchous base. – Ascospores uniseriate, globose to subglobose, 14.0–16.8 x 12.8–16.6 µm, spore sculpturing consisting of partly regular and even and partly uneven 'knobbed' ridges, 0.5–0.9 µm broad, ca.0.5 µm high, ridges mostly curved and undulating on the spore wall, blunt-ended or anastomosing, making a pseudoreticulum of irregular, uneven-sized meshes, 0.8–6.0 µm broad, within meshes with tiny warts and strings which may partly interconnect. – Paraphyses straight, unbranched or branched from below, 2.5–3.5 µm broad, with orange granular content, at tips enlarged to 6–9 µm.

Material examined. – SVALBARD. Spitsbergen, Ny-Ålesund, at the field station, on soil among juvenile shoots of *Encalypta ciliata* Hedw., 11 Aug. 1988, T. Schumacher Spitsbergen 10 (O). Spitsbergen. Longyearbyen. Adventdalen, among shoots of *Bryum* sp. along river, 18 Aug. 1988, T. Schumacher Spitsbergen 75 (O), Spitsbergen 89 (O). Longyearbyen, in carpet of *Pohlia drummondii*, 18 Aug. 1988, T. Schumacher Spitsbergen 91 (O).

L. seaveri is easily recognized by its large orange apothecia and medium-sized subglobose ascospores, having a characteristic ascospore sculpturing of undulating, partly anastomosing ridges which form a pseudoreticulum of non-angular, uneven-sized meshes. For a distinction against *L. norvegica*, see this species above. *L. seaveri* has a broad host range, being associated with bryaceous hosts such as *Pohlia* spp. and *Bryum* spp., as well as with *Encalypta*

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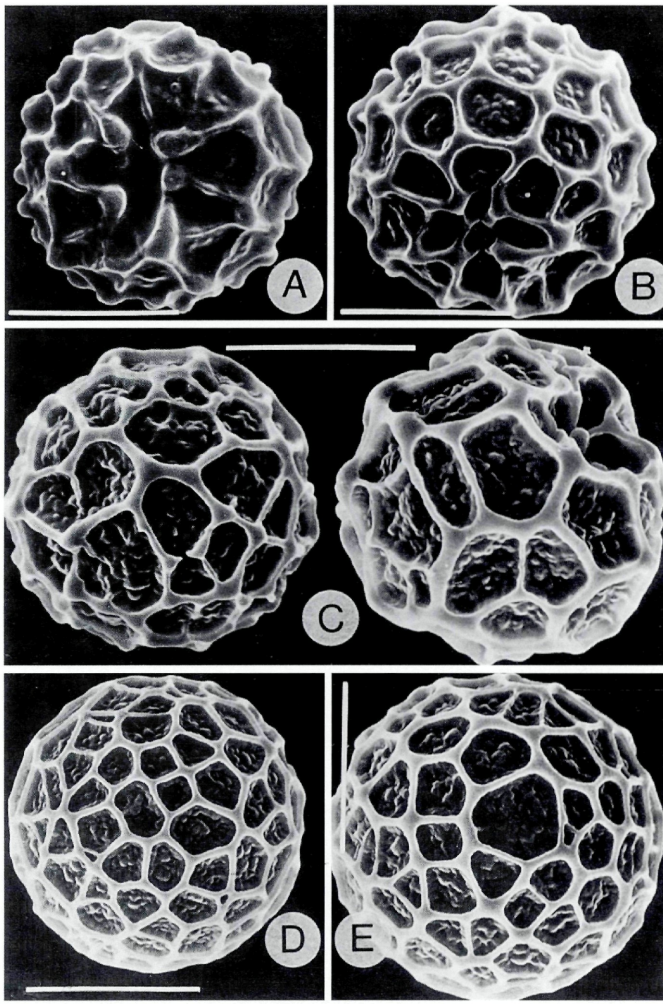


Plate 11. – SEM pictures of *Lamprospora* ascospores. – A–C. *L. retinosa*. A: coll. D 86/84 (O), immature ascospore; B: coll. D 84/84 (O); C: coll. D 84/84 (O). – D, E. *L. rugensis*. D: coll. TS 7/84 (O); E: coll. H 32 (O). – Bar = 10 µm.

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spp. (Encalyptaceae) and *Ceratodon purpureus* (Dicranaceae) (see also Benkert, 1987).

Lamprospora spitsbergensis T. Schum., sp. nov. – Plates 5B, 12A–B.

Apothecia gregaria, parva, 0.5–2 mm diam. Discus planus vel concavus, aurantiacus. Receptaculum concolor vel pallidum, breviter late cupulare, margine distincte dentato-fimbriato. Asci cylindrici, apice late rotundati, iodo non caerulescentes, 180–220 x 19–22 µm, octospori. Ascosporae uniseriatae, globosae, hyalinae, uniguttulatae, 13.8–15.5 µm, reticulo irregulari ornatae, interstitiis polygonis usque irregularibus 1.5–5 µm diam. Paraphyses graciles, simplices, inferne 2.0–3.0 µm lati, apice usque 5–8 µm leviter ampliati.

Typus: Svalbard. Spitsbergen, T. Schumacher Spitsbergen 55 (O – HOLOTYPE).

Apothecia 0.5–2 mm broad, partly submerged in the soil among the shoots of its host moss, disc shallow cupulate to urnulate, yellowish orange to orange, with a dentate, fimbriate margin. – Ectal excipulum a layer of angular and slightly elongate cells, 6–18 x 5–10 µm, covering an inner layer of mostly isodiametric cells (*textura angularis*), individual cells 8–18 µm, towards the margin cells elongate and densely packed forming a *textura prismatica* to *textura porrecta* composed of parallel, septate hyphae, 15–35 µm long, 6–10 um broad, building the protruding margin. – Medullary excipulum of densely interwoven hyphae, 6–14 µm broad. – Subhymenium a narrow zone of densely packed prismatic cells, 4–7 x 6–12 µm. – Asci cylindric, 180–220 x 19–22 µm, with a pleurorhynchous base. – Ascospores uniseriate, globose, 13.8–15.5 µm, sculpturing consisting of ridges of variable thickness, 0.4–1.5 µm broad, 0.3–0.5 µm high, irregular in outline, building a low, alveolate, small-meshed reticulum, meshes of variable shape and size, mostly 1.5–2.5 µm diam, some meshes reaching 5.0 µm, broad ridges frequently with small meshes within ridges. – Paraphyses 2.0–3.0 µm broad, straight, septate, branched from lower or middle third, at the tips enlarged to 5–8 µm broad.

Material examined. – SVALBARD. Spitsbergen. Longyearbyen, among juvenile shoots of *Pohlia* cf. *drummondii*, 16 Aug. 1988, T. Schumacher Spitsbergen 50 (O). Spitsbergen. Longyearbyen. Endalen, among *Pohlia* sp., 17 Aug. 1988, T. Schumacher Spitsbergen 55 (O– holotype).

This very characteristic species seems to have no close counterpart within the genus. The flat, irregular, uneven-sized, fine-meshed reticulum of the ascospores is diagnostic. *L. spitsbergensis* has been found growing on saline soils among *Pohlia* sp. in a seashore estuary

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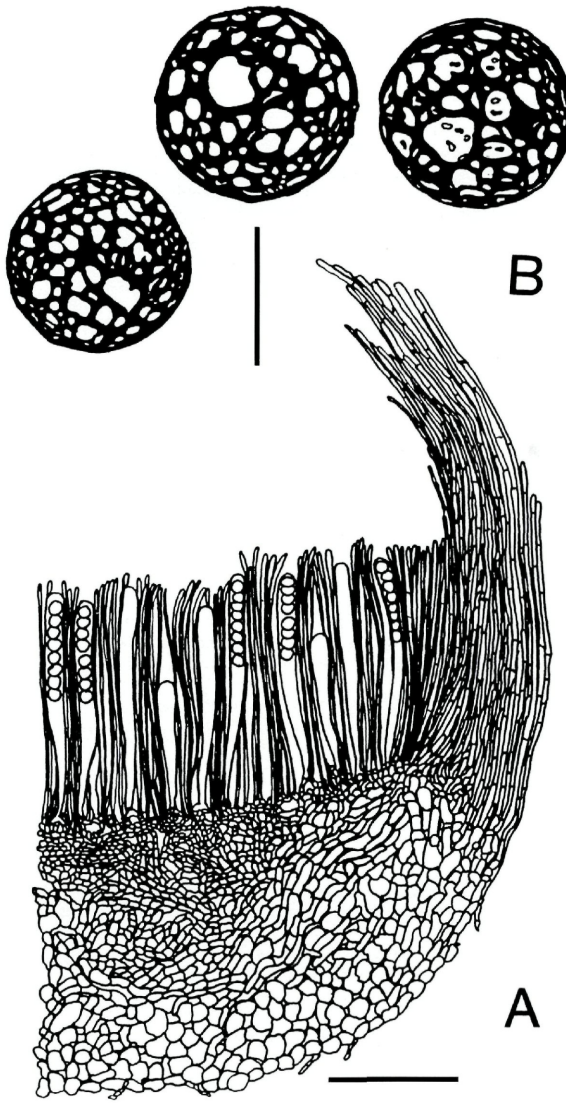


Plate 12. – *Lamprospora spitsbergensis* [holotype, T. Schumacher Spitsbergen 55 (O)]. – A. Section of margin of apothecium. Bar = 100 µm. – B. Ascospores, mounted in Cotton blue. – Bar = 10 µm.

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of a large glacial river, which may reflect characteristic autecological conditions for the species.

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