

Lamproderma retirugisporum* spec. nova, a misinterpreted species of the *Myxomycetes

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Abstract: The type of *Lamproderma cribrarioides* has been studied and proved to be *Lamproderma atrosporum* var. *pseudocribrarioides*. *Lamproderma retirugisporum* is described as a new species. New nomenclatural changes are proposed, supported by LM and SEM photographs.

Zusammenfassung: Der Typus von *Lamproderma cribrarioides* wurde untersucht und es stellte sich heraus, daß es sich dabei um *Lamproderma atrosporum* var. *pseudocribrarioides* handelt. *Lamproderma retirugisporum* wird als neue Art vorgestellt. Änderungen in der Nomenklatur werden vorgeschlagen, ergänzt mit LM und REM Photographien.

Currently we are carrying out an exhaustive compilation of all the world-wide citations of nivicolous *Myxomycetes* (ILLANA & al. 2002). At the same time we contribute to biodiversity studies with abundant collections from different European localities (MORENO & al. 2002): Austria, in the region of Tyrol (SINGER & al. 2001 a, b), France, in the province of Savoie, and Spain, in the centre of the Iberian Peninsula, the Sierra de Guadarrama (SÁNCHEZ & al. 2002 a), which forms part of the provinces Madrid and Segovia, and in the southern part, the Sierra Nevada, in the province of Granada (SÁNCHEZ & al. 2002 b).

An important problem for some species of nivicolous *Myxomycetes* is to get to understand the macro- and microscopic characteristics according to the original descriptions, which frequently are quite old, rather scanty and do not go into sufficient detail regarding the morphology of capillitium and spore ornamentation. Naturally, this is partly due to the greater emphasis that has been paid on the macroscopic characters facilitating the recognition of the species in the field, rather than the microscopic ones and, in some cases, to the difficulty of observation of microscopic characters at high magnifications.

Moreover, we often were confronted with difficulties of locating type material in the different international herbaria and sometimes, if we were able to locate type collections, with the bad state of the material, simply on account of age or inappropriate conservation.

The above mentioned problems lead to constant nomenclatural changes, as we find

type specimens that do not match the original species description and which have been misapplied for generations. This is the case with *Diderma meyeriae* SINGER, MORENO, ILLANA & SÁNCHEZ (MORENO & al. 2003) and the new species of *Lamproderma* which we describe below.

Materials and methods

All the specimens, apart from the loaned types, are deposited in the herbarium of the Department of Vegetal Biology in the University of Alcalá de Henares (AH), Spain.

The material collected was studied with a binocular and, after mounting in Hoyer's medium, with a Nikon (Optiphot) microscope. Spore measurements were made under the oil immersion objective and include surface structures such as spines or warts. Scanning electron microscopy (SEM) micrographs were taken in the University of Alcalá de Henares using a Zeiss DSM-950.

SEM-preparation was made as follows: Sporocarps were rehydrated in concentrated ammonium hydroxide (28-30%) for 30 min., dehydrated in aqueous ethanol (70%) for 30 min., fixed for 2 h in pure ethylene glycol dimethyl ether (= 1,2-dimethoxymethane) and finally immersed in pure acetone for at least 2 h followed by critical point drying and sputtering with gold-palladium.

Description of the taxa

***Lamproderma retirugisporum* G. MORENO, H. SINGER, C. ILLANA & A. SÁNCHEZ, spec. nova** (Colour Fig. I, Figs. 9-12)

= *L. cribrarioides* (FR.) R. E. FR., sensu auct. pluribus non FR.

Specimens examined: Austria: Tyrol, Innsbruck, Seegrube (1905 m s. m.), 21. 5. 2000, on grass, leg. H. SINGER, AH 27378, AH 27379, IB 2000/0266; - - on leaf and grass, IB 2000/0256.

France: Esserts-Blay, Savoie, 1100 m s. m., 10. 5. 1997, on *Gentiana lutea* L., leg. A. CASTILLO, C. ILLANA, A. SÁNCHEZ & G. MORENO, AH 27245.

Spain: Puerto de Navacerrada, Segovia, 2100-2200 m s. m., 24. 5. 1997, on stems of *Digitalis purpurea* L., leg. A. SÁNCHEZ, AH 18420; - - on stems of *Senecio pyrenaicus* L., AH 18576; - - on stem of *Cryptogramma crispa* (L.) R. BR. ex HOOKER, AH 18433, leg. A. SÁNCHEZ & M. A. TABANERA, AH 18622, AH 18936 holotype, isotype in MA-Fungi 53861.

Etymology: lat. rete (= network), lat. ruga (= wrinkle), and lat. spora (= spore) meaning spores wrinkled in the form of network or in other words reticulate spores.

Latin diagnosis: Sporocarpia gregaria, breviter stipitata, 1-2 mm alta. Sporotheca globosa vel subglobosa, 0,8-1,5(-1,8) mm in diametro, argenteo-grisea, brunneo-grisea vel brunnea. Stipes rufo-brunneus usque ad niger, tertia usque ad dimidia parte sporocarpium formans. Peridium membranaceum, persistens, griseo-hyalinum, perlucidum usque ad iridescens. Columella stipitis concolor, plus minusve cylindracea, usque ad dimidia parte sporotheca formans. Capillitium ex parte supera columellae originatum, ramosum, ramis primaris reticulatis, rigidis, rufo-brunneis, ramis externis tenuioribus, delicatioribus, pallioribus, apicibus hyalinis acutis. Sporae in massa nigro-fuscae, globosae, violaceo-brunneae luce transmissa, 13-15 µm in diametro, reticulatae, 7-9 maculae per diametrum dispersae.

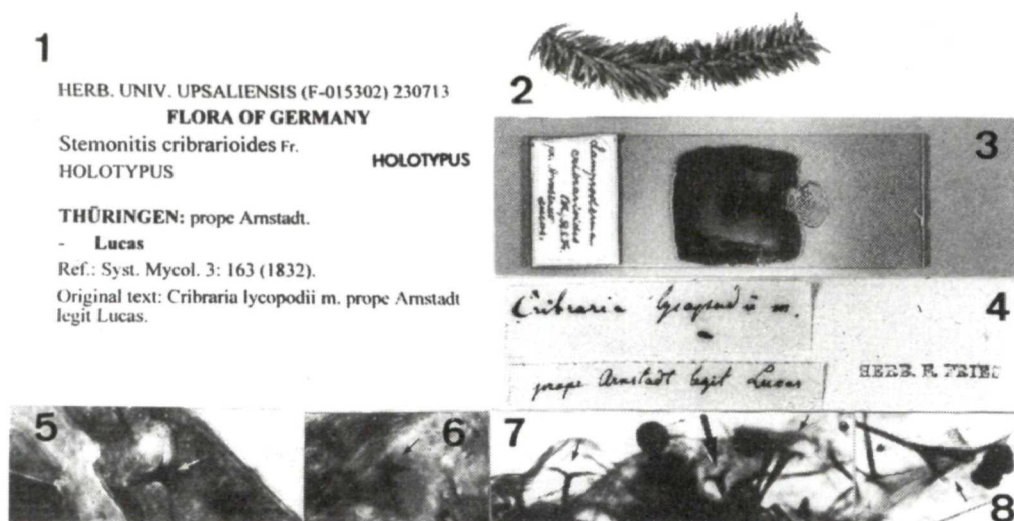
Holotypus: Hispania, Segovia, Puerto de Navacerrada, 2100-2200 m alt., 24. 5. 1997, in caule *Cryptogrammae crispae*, A. SÁNCHEZ & M. A. TABANERA legerunt, AH 18936 (isotypus in MA-Fungi, no. 53861 conservatur).

Sporocarps crowded, short-stalked, rarely substipitate, 1-2 mm total height. Sporotheca globose to subglobose, 0.8-1.5(-1.8) mm in diam., silvery grey, brownish grey to brown; stipe reddish brown to black, widened towards the base, erect, generally

from one third to half the height of the sporotheca; peridium membranous, thin, persistent, dehiscing irregularly in large patches which usually cover the sporotheca, smooth to lightly rugose, greyish hyaline, very shiny to iridescent; hypothallus well developed, continuous, reddish brown to dark brown, darker towards the stipe; columella concolorous with the stipe, more or less cylindrical, blunt at the apex, attaining half the height of the sporotheca; capillitium originating from the upper part of the columella, branching to form a loose net, primary branches radiating, rigid, reddish brown, thicker than the delicate outer branches, paler towards the hyaline, pointed – not funnel-shaped – tips; spores blackish brown in the mass, violaceous brown by transmitted light, 13-15 μm diam., covered with a complete reticulum with 7-9 meshes per diam., the meshes 1-1.5 μm high, 1-2 μm in diam.

Observations: *Lamproderma retirugisporum* has previously been wrongly interpreted and mistaken for *L. cribrarioides*. This erroneous treatment is found in all the classical and modern literature dealing with the taxonomy of Myxomycetes: MEYLAN (1914), LISTER (1925), MARTIN & ALEXOPOULOS (1969), NEUBERT & al. (2000) and MORENO & al. (2002), to name just a few.

The capillitium, forming a weak reddish-brown net with hyaline, pointed free ends, together with its unique reticulate spore ornamentation formed by complete and not perforated homogeneous bands uniquely characterise *Lamproderma retirugisporum*.



Figs. 1-8. 1. Label of the holotype of *Stemonitis cribrarioides*. 2. Stem of *Lycopodium annotinum* L., upon which *S. cribrarioides* fructified. 3. Microscope slide of the holotype of *S. cribrarioides*. 4. Original note on the card on which the stem of *Lycopodium annotinum* is stuck. 5-6. Two funnel- or Y-shaped, free capillitium ends of the holotype of *S. cribrarioides*. 7-8. Four funnel- or Y-shaped, free capillitium ends of the holotype of *Lamproderma atrosporum* var. *pseudocribrarioides*.

Nevertheless, this species can be confused with *L. cribrarioides* var. *cribrarioides* s. str. (= *L. atrosporum* var. *pseudocribrarioides*), which also can show a reticulate spore ornamentation formed by complete and non-perforated homogeneous bands (MORENO & al. 2002). *Lamproderma cribrarioides* var. *cribrarioides* can be distinguished macroscopically by its very dark, blackish sporotheca and its usually evanescent peridium leaving minute flakes attached to the widened capillitium tips; microscopically by its uniformly dark capillitium without hyaline free ends, the latter being typically funnel-shaped or Y-shaped.

***Lamproderma cribrarioides* (FR.) R. E. FR.**, Svensk. Bot. Tidskr. 4: 259. 1911 (Figs. 1-8)

= *Stemonitis cribrarioides* FR., Syst. Myc. 3: 163. 1829

= *Lamproderma atrosporum* var. *pseudocribrarioides* MAR. MEY., G. MORENO, A. SÁNCHEZ, H. SINGER & C. ILLANA, Fungi non delineati 19: 22. 2002

Specimens examined: France: Col de la Madelaine, Savoie, 1800 m s. m., 3. 6. 2000, on *Vaccinium* spec., leg. A. CASTILLO, C. ILLANA, G. MORENO & A. SÁNCHEZ, AH 27257. Esserts-Blay, near Fontaine Froide, 1400 m s. m., 3. 5. 2000, leg. M. MEYER, Herb. MEYER 20975. Méribel, 10. 5. 1997, on *Vaccinium* spec., leg. A. CASTILLO, C. ILLANA, G. MORENO & A. SÁNCHEZ, AH 27184.

Germany: Thüringen, near Arnstadt, on *Lycopodium annotinum*, leg. LUCAS, UPS (F-015302) 230713, holotype of *Stemonitis cribrarioides* FR.

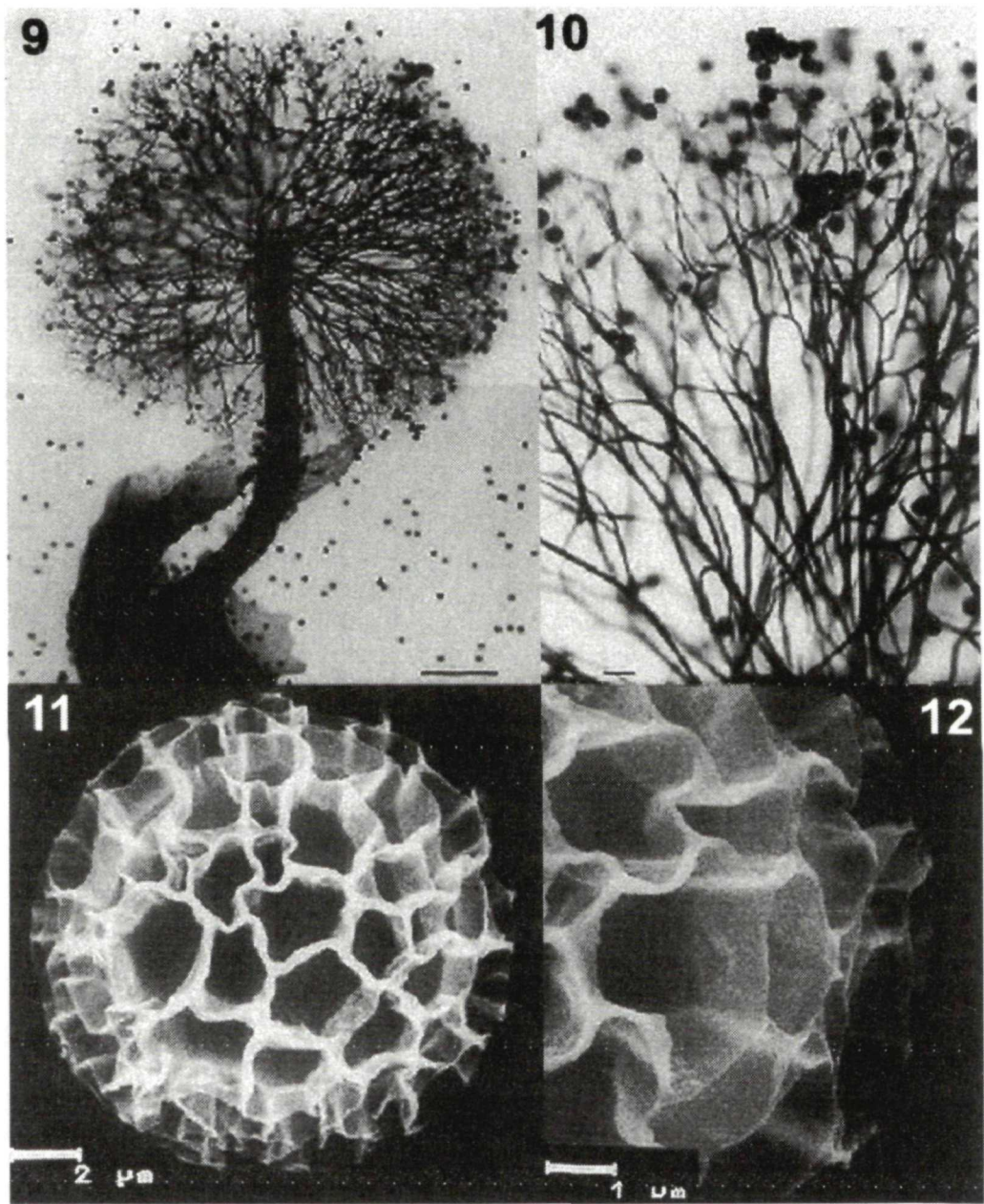
Spain: Hoya de la Mora, Sierra Nevada, Granada, 10. 5. 2001, on *Cytisus oromediterraneus* RIVAS MART. & al., leg. G. MORENO & A. SÁNCHEZ, AH 29035, AH 29039; - - 11. 5. 2001, AH 29152, AH 29136; - - 2500 m s. m., 14. 7. 2001, leg. A. SÁNCHEZ & M. SÁNCHEZ, AH 19660. Puerto de Cotos, Valdesqui, Madrid, 1850 m s. m., 15. 3. 2001, on *Cytisus oromediterraneus*, leg. A. SÁNCHEZ, AH 26476, holotype of *Lamproderma atrosporum* var. *pseudocribrarioides*.

Original diagnosis: Sessiles, peridio atro basi persistente, capillitio globoso nigricante ad medium stylidio percurso. Cribaria Lycopodii, Fr. Nees! In litt.

In apicibus foliorum Lycopodii annotini, nigricantibus (quibus pseudostipitatum) nascuntur sparsim absque hypothallo, in adultis quidem perspicuo, peridia globosa, fugacia, persistente excipulo exiguo ad basin. Huic impositum est, capillitium globosum, omnio Stemonitis, floccis sporidiis deflatis nigricantibus, sed stylidium ne ad medium quidem penetrat. Lectum in Thuringia prope Arnstadt. Lucas. (v.s.)

Observations: The type material (Figs. 1-6) is kept in an envelope, and consists of an approximately 5 cm long stem of *Lycopodium annotinum* stuck to a white card, hiding a single piece of a dried up and badly developed sporocarp, plus a microscope slide. The material found on the substrate was picked up by us in order to make a new preparation on a microscope slide, which helped to complete our observations, mainly of the spores, as the capillitium is badly developed. This slide was returned to the herbarium UPS.

In the original slide three portions can clearly be distinguished: One of them corresponds to a leaf of *Lycopodium annotinum*, the second consists of remains of stalk and hypothallus, the last consists of capillitium, peridium and spores. The following observations were made: Stalk dark brown. Peridium greyish brown. Columella not recognisable. Capillitium dark brown, even in the funnel- or Y-shaped extremities; filaments 2-3 µm in diam., branched, forming a net with widened nodes; surface smooth.



Figs. 9-12. *Lamproderma retirugisporum* (AH 18936, holotype). 9. Sporocarp. Bar = 0.2 mm. 10. Capillitium. Bar = 30 μ m. 11-12. Spore and detail of spore ornamentation.

Spores dark brown to blackish brown, about 15 µm in diam., completely reticulate, wide-meshed, meshes up to about 1 µm high. The spores had collapsed and do not permit precise measurement of spore diameters.

In the new preparation made by us we observe very variable spore diameters due to the poor state of development of the fructification, 14–20 µm in diam., and a spore ornamentation consisting of a wide-meshed, loose reticulum; meshes 5–7 µm in diam., up to 1 µm high; 3–5 meshes per hemisphere; sometimes the reticulum is incomplete.

FRIES (1829) describes this species as sessile or pseudostipitate, with a black evanescent globose peridium persistent in the base, a blackish capillitium, a columella attaining half the height of the sporotheca and blackish spores. Without doubts he gives us a description of *Lamproderma atrosporum* var. *pseudocribrarioides* (MORENO & al. 2002). We can identify the type material unambiguously, despite of its bad state, confirming the main characteristics mentioned by FRIES, especially the dark, homogeneously coloured capillitium. We can also clearly see the typical funnel- or Y-shaped free ends (Figs. 5–6) and the subreticulate to reticulate spores, which are not included in the original diagnosis. The funnel- or Y-shaped free ends of the capillitium are typical of the type material of *L. atrosporum* var. *pseudocribrarioides* (Figs. 7–8).

However, as already indicated in observations on *Lamproderma retirugisporum*, the majority of myxomycetologists did not follow the original concept of this species, attributing the pale(r) capillitium that is typical for *L. retirugisporum* to *L. cribrarioides* thus mixing up these two species.

Apparently, KOWALSKI (1970) interpreted *L. cribrarioides* correctly, as he described the dark capillitium throughout and the free ends forming inverted funnels and being attached to small peridial flakes. He synonymized the macrosporic variety *Lamproderma atrosporum* var. *macrosporum* with it and separated *L. atrosporum* var. *atrosporum*, also having funnel-shaped tips, by its spore ornamentation being spinulose, spinose, partially or completely reticulate in *L. atrosporum*, if completely reticulate with reticulations in the form of spiny lines. Nevertheless, completely reticulate spores with smooth, homogenous – and not spiny – lines can also be found in *L. atrosporum*. The spiny lines which can be observed with the light microscope simply indicate that the reticulum possesses arch-shaped perforations in the lower region of the bands, as is present in the spores of *Stemonitis fusca*.

KOWALSKI (1970) observed specimens that he considered to be hybrids between *Lamproderma cribrarioides* and *L. atrosporum*. It is probable that he did not have in his hands the new species we are proposing, which differs clearly with its hyaline, pointed capillitium terminations.

The description of *Lamproderma cribrarioides* is identical to that of *L. cribrarioides* var. *atrosporum*, with the exception of spore characters which we describe below. The differences are indicated in the observations of both taxa.

***Lamproderma cribrarioides* var. *atrosporum* (MEYL.) G. MORENO, H. SINGER, C. ILLANA & A. SÁNCHEZ, comb. nova**

= *L. atrosporum* MEYL., Bull. Soc. Vaud. Sci. Nat. 46: 51. 1910

= *L. atrosporum* var. *echinulatum* MEYL., Bull. Soc. Vaud. Sci. Nat. 57: 368. 1932

= *L. atrosporum* var. *macrosporum* MEYL., Bull. Soc. Vaud. Sci. Nat. 57: 372. 1932

Specimens examined: Austria: Tyrol, Gallzein (1200 m s. m.), 22. 4. 2000, on living woody

plant, leg. H. SINGER, IB 2000/0260. Tyrol, Gramais (1328 m s. m.), 26. 4. 2000, on living woody plant, partly covered by snow, leg. H. SINGER, IB 2000/0261, IB 2000/0262. Tyrol, Innsbruck, near Höttinger Bild (905 m s. m.), on rotten trunk beside avalanche, 13. 5. 2000, leg. H. SINGER, AH 27374. Tyrol, Kolsaßberg, near Studlalm (1600 m s. m.), 5. 5. 2000, on living moss and living woody plant, leg. M. KIRCHMAIR, AH 27373.

France: Col de la Madeleine, Savoie, 1800-2000 m s. m., 3. 6. 2000, on twigs of *Alnus viridis* (CHAIX) DC., leg. C. ILLANA, A. CASTILLO, A. SÁNCHEZ & G. MORENO, AH 27270, AH 27306; - - on *Rhododendron spec.*, *Vaccinium spec.*, AH 27341. Esserts-Blay, Savoie, 1100 m s. m., 9. 5. 1997, on *Sorbus aria* (L.) CRANTZ., leg. A. CASTILLO, C. ILLANA, A. SÁNCHEZ & G. MORENO, AH 27207, AH 27219; - - 10. 5. 1997, with *Diderma niveum* ROSTAF., AH 27251. Méribel, 10. 5. 1997, on *Juniperus communis* subsp. *alpina* (SUTER) ČELAK, with *Comatricha alpina*, leg. A. CASTILLO, C. ILLANA, A. SÁNCHEZ & G. MORENO, AH 27175.

Spain: high road Navacerrada to Cotos, 4. 6. 1996, on living twigs of *Juniperus communis* subsp. *alpina*, AH 21812. Puerto de Cotos, Madrid, 1850 m s. m., 11. 4. 1999, on twig of *Pinus sylvestris* L., leg. A. SÁNCHEZ, AH 25743. Puerto de Cotos, Segovia, 1950-1975 m s. m., 30. 4. 1996, on bark of *Pinus sylvestris*, leg. A. SÁNCHEZ, AH 18639; - - 5. 5. 1996, on living twigs of *Juniperus communis* subsp. *alpina*, AH 18535; - - 21. 5. 1996, on living twigs of *Cytisus oromediterraneus*, AH 18643; - - 23. 5. 1996, AH 18510; - - 26. 5. 1996, AH 18640. Puerto de Navacerrada, Segovia, 1975 m s. m., 7. 4. 1997, on grass stems, leg. A. SÁNCHEZ, AH 18570. Puerto de Navafria, Segovia, 1750 m s. m., 23. 3. 1997, on bark of *Pinus sylvestris*, leg. A. SÁNCHEZ, AH 18496, AH 19590; - - on twigs of *Pinus sylvestris*, AH 25733. Carretera Navacerrada-Cotos, Segovia, 1900 m s. m., 4. 6. 1996, on *Juniperus communis* subsp. *alpina*, leg. M. LIZÁRRAGA & G. MORENO, AH 21812.

Lamproderma atrosporum var. echinulatum: Switzerland: Le Chasseron, Canton Vaud, 1560 m s. m., 5. 1931, on living twigs, leg. C. MEYLAN, lectotype.

Lamproderma atrosporum var. macrosporum: France: Les Arcs, Savoie, 2000 m s. m., 2. 6. 2000, on *Rhododendron spec.*, with *Trichia alpina*, leg. G. MORENO, C. ILLANA, A. SÁNCHEZ & A. CASTILLO, AH 27302.

Spain: Carretera Navacerrada-Cotos, Segovia, 1900 m s. m., 4. 6. 1996, on *Cytisus oromediterraneus*, leg. M. LIZÁRRAGA & G. MORENO, AH 21810; - - leg. G. MORENO, M. LIZÁRRAGA, V. BANDALA, L. MONTOYA, AH 21809. Puerto de Cotos, Madrid, 1875 m s. m., twigs of *Pinus sylvestris*, 15. 4. 1999, leg. A. SÁNCHEZ, AH 25757. Puerto de Cotos, Segovia, 1950 m s. m., 5. 5. 1996, on living twigs of *Juniperus communis* subsp. *alpina*, leg. A. SÁNCHEZ, AH 18530. Puerto de Navafria, Segovia, 1800 m s. m., 15. 5. 1997, on bark of *Pinus sylvestris*, leg. A. SÁNCHEZ, AH 18495.

Switzerland: Aiguille des Baulmes, Canton Vaud, 1450 m s. m., 5. 1936, on twigs, leg. C. MEYLAN, lectotype.

Although this taxon has been described exhaustively by different authors, we provide a new complete description, due to the existing confusion regarding its taxonomic treatment and in order to facilitate comparison with the newly-described species.

Sporocarps gregarious to crowded, stalked, rarely sessile, 1-2.5 mm total height. Sporotheca globose to subglobose, oval to obovoid, 0.6-1.2 x 1-1.5(-1.8) mm, brownish black to black; stipe shiny black, erect, flattened, longitudinally striate, conical at the base, up to one third to half the height of the sporotheca; peridium membranous, thin, usually evanescent in the upper two thirds of the sporotheca with minute pieces firmly attached to the tips of the capillitium, usually long persistent in the base, smooth, blackish brown with a silver shine; hypothallus well developed, continuous, light brown to reddish brown, darker towards the stipe; columella concolorous with the stipe, more or less cylindrical, blunt or thickened at the apex, attaining half the height of the sporotheca; capillitium originating from the length of the columella but mainly from the upper part, branching to form a dense, uniformly dark brown to blackish brown net and generally with axial expansions, primary branches thicker than the more delicate outer branches, tips typically funnel- or Y-shaped; spores blackish brown to black in mass, greyish brown to blackish brown by transmitted light, 12-15 µm in

diam., spinose, spinulose, crested or subreticulate.

Observations: *Lamproderma cribrarioides* var. *atrosporum* is a variety of *L. cribrarioides* with a very variable spore ornamentation, which has been studied by MEYER (pers. comm.), NEUBERT & al. (1989), SINGER & al. (2001 b) and MORENO & al. (2002), being spinulose, spinose or showing a subreticulate to completely reticulate pattern with distinct crests, spongy in the lower part (resembling the arches of an aqueduct) or without perforations. Completely reticulated spores show similarity to the spore ornamentation of *L. retirugisporum*, which differs mainly in its lax, reddish brown capillitium with pointed, hyaline extremities which are never funnel- or Y-shaped.

The variable spore ornamentation is accompanied by differences in spore size, which varies from 12 to 18 µm. Therefore MEYLAN (1932) distinguished the three varieties *L. atrosporum* var. *atrosporum*, *L. atrosporum* var. *echinulatum* and *L. atrosporum* var. *macrosporum*. MEYER (pers. comm.) recognises ten varieties and four forms, whereas NEUBERT & al. (2000) propose a collective species, including all the specimens with a dark capillitium and funnel-shaped extremities. We are in agreement with their treatment.

Regarding *Lamproderma atrosporum* var. *echinulatum* and *L. atrosporum* var. *macrosporum*, we have been able to study their lectotypes (MORENO & al. 2002), and came to the conclusion that due to the similar spore sizes and ornamentations they can be synonymised with *L. cribrarioides* var. *atrosporum*, in accordance with KOWALSKI (1975).

MEYLAN (1932) recognised and distinguished the two species *Lamproderma cribrarioides* and *L. atrosporum* by their capillitium and spores, without emphasizing the free capillitial tips: *L. cribrarioides* having a pale capillitium and completely reticulate spores; *L. atrosporum* with black capillitium and black spores, warted to completely or incompletely reticulate. Obviously, he misinterpreted *L. cribrarioides*, maybe because he had not studied the type material and, as a result, described *L. atrosporum* as a new species (MEYLAN 1910).

In reference to the relationship between *Lamproderma cribrarioides* and *L. atrosporum* he indicated that *L. atrosporum* in the future might turn out to be a variety *atrosporum* of *L. cribrarioides*: *Lamproderma cribrarioides* var. *atrosporum*!

Simply due to practical purposes, we prefer to differentiate the two varieties of *Lamproderma cribrarioides*: *Lamproderma cribrarioides* var. *cribrarioides* with completely reticulate spores, and *L. cribrarioides* var. *atrosporum* with spinose, spinulose, crested or subreticulate spores.

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Colour Fig. I. *Lamproderma retirugisporum* (AH 18936, holotype). Sporocarps.



II



III

Colour fig. II. *Galerella floriformis*, holotype. – Phot. INGRID HAUSKNECHT. Colour fig. III. *Galerella plicatella* (Sardinia). – Phot. G. CONSIGLIO.

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