

## Nivicolous myxomycetes from the Pyrenees: notes on the taxonomy and species diversity. Part 2. Stemonitales

by

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With 16 figures and 1 table

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**Abstract:** A list of sixteen species of myxomycetes belonging to the order Stemonitales, collected near melting snow in different localities of the Pyrenees is given. Taxonomic notes on some species and descriptions, with SEM illustrations, of *Comatricha sinuatocolumellata*, *C. suksdorfii* and *Lamproderma pulchellum*, are provided. The relationship between the species of the *Comatricha suksdorfii* complex is discussed. The distribution of the species in Spain is also summarized. Nine species are reported from the Pyrenees for the first time, three taxa are new to Spain and two others are new to Andorra.

**Key words:** Amoebozoa, Andorra, biotic survey, Mycetozoa, SEM, slime moulds, Spain, species diversity, taxonomy.

### Introduction

The nivicolous myxomycetes constitute an ecological group of species developing on plants or plant remnants near the melting snow in the mountains (Lado 2004). Preliminary results of the extensive research on the myxomycetes in the Spanish Pyrenees were summarized by Lado (2004) and Lado & Ronikier (2008). The present paper is the second part of a detailed analysis of the collections mentioned in these reviews and devoted to the snow-line myxomycetes of the Pyrenees. While the first part dealt with representatives of the orders Physarales and Trichiales (Lado & Ronikier 2008), this paper provides information on the order Stemonitales, including taxonomy and distribution. Seven species of the order have so far been reported

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from the Spanish side of the Pyrenees. Some of this material, however, has been misidentified. *Lamproderma carestiae* (Ces. & De Not) Meyl. illustrated by Gorris et al. (1999) is in our opinion *Collaria nigricapillitia* (Nann.-Bremek. & Bozonet) Lado, and *Lamproderma sauteri* Rostaf., illustrated in two different papers (Vila & Llimona 1998, Gorris et al. 1999), is *Lamproderma ovoideum* Meyl. or another species of this complex. Additionally, only one nivicolous species belonging to this order, namely *Lamproderma carestiae* (Ces. & De Not) Meyl. [cited as *Lamproderma violaceum* var. *carestiae* (Ces. & De Not) Lister], has previously been found in the French part of the Pyrenees (Buchet 1941).

### Material and methods

The Pyrenees is a mountain chain that forms a natural barrier between Spain and France. It extends for 450 km, and is an important part of the European mountain system, including many peaks exceeding 3000 m. In general, the forest belt stretches up to 1800–1900 m in the Pyrenees, the subalpine zone reaches up to about 2400 m and the alpine belt goes up to 3000 m. Further details of the study area and the collecting sites can be found in our previous paper (Lado & Ronikier 2008). Several field surveys were carried out in May and June of the years 1992–1997 (Table 1). The material was collected at 21 localities of the central and eastern range of the Spanish Pyrenees, within the borders of three Spanish provinces (Gerona, Huesca and Lérida), as well as in Andorra. Almost all the specimens were collected by C.Lado and S.Santamaría near the melting snow; for exceptions, the collector's name is listed under the material studied.

In the framework of the present study, 136 collections were examined and 123 of them were identified. Some collections were immature or moulded and could not be determined with certainty and therefore are not included. Descriptions are based exclusively on the specimens studied. All the collections are preserved at the herbarium MA-Fungi (sub C.Lado) and all the samples have been georeferenced. A few duplicates are in KRAM.

Microscopic preparations and measurements were made in PVA or Hoyer's medium. Spore measurements were taken under an oil-immersion objective and include ornamentation.

The critical-point drying technique was used for scanning electron microscopy (SEM) preparations and specimens were examined under a Hitachi-S-3000N scanning electron microscope at 10–15 kV. SEM analyses were made in the Service of Scanning Electron Microscopy of the Real Jardín Botánico, CSIC of Madrid.

The nomenclature of myxomycetes follows Hernández-Crespo & Lado (2005) and Lado (2008).

### Results and discussion

Sixteen species are listed below. Among them, nine are reported from the Pyrenees for the first time. These are marked in the list with an asterisk "\*". Three species, *Lamproderma aeneum* Mar.Mey. & Poulain and *L. pseudomaculatum* Mar.Mey. & Poulain, described recently from the French Alps, and *L. pulchellum* Meyl., described from the Jura Mountains, are reported from Spain for the first time, whereas *L. echinosporum* Meyl. and *L. pulveratum* Meyl. are new to Andorra. Due to some recent taxonomic changes or nomenclatural proposals made by several authors, notes and comments have been included for some species. The known distribution of each taxon in the mountains of Spain is also given.

Table 1. List of collection sites of nivicolous myxomycetes. Locality numbers refer to those cited for each species.

N°	Locality	Coordinates	Altitude
1	SPAIN: Huesca: Canfranc, Barranco de Izas, Barranco las Negras	42°45'20"N; 0°27'35"W	1800 m
2	SPAIN: Huesca: Bielsa, Urdiceto lake	42°40'44"N; 0°15'54"E	1900 m
3	SPAIN: Huesca: Plan, collado del Ibón de Plan	42°33'14"N; 0°18'25"E	1900 m
4	SPAIN: Huesca: Plan, collado de Sahún, Barranco de los Espuzos	42°33'21"N; 0°23'31"E	1960 m
5	SPAIN: Huesca: Chia, collado de Sahún	42°33'24"N; 0°25'43"E	1900 m
6	SPAIN: Huesca: Benasque, Plan d'Estan	42°40'41"N; 0°37'52"E	1900 m
7	SPAIN: Huesca: Benasque, Turonet del Plan d'Estan	42°40'42"N; 0°38'36"E	1940 m
8	SPAIN: Huesca: Benasque, Palanca de Remuñe	42°40'06"N; 0°35'41"E	1800 m
9	SPAIN: Lérida: Naut Arán, Salardú, Aiguamotx, estany de la Restanca	42°37'42"N; 0°50'25"E	2100 m
10	SPAIN: Lérida: Naut Arán, Arties, Coll de Pruedo	42°39'23"N; 0°54'01"E	2000 m
11	SPAIN: Lérida: Naut Arán, Salardú, estany Major de Colomers	42°37'14"N; 0°54'49"E	2120 m
12	SPAIN: Lérida: Naut Arán, Salardú, Aiguamotx, La Muntanyeta	42°37'47"N; 0°54'48"E	2000 m
13	SPAIN: Lérida: Naut Arán, Salardú, Aiguamotx Valley, Estany Mort	42°37'14"N; 0°54'49"E	2200 m
14	SPAIN: Lérida: Naut Arán, Salardú, Aiguamotx Valley, near to Estany de la Llosa	42°37'47"N; 0°54'48"E	2040 m
15	SPAIN: Lérida: Naut Arán, Baqueira, Pla de Baqueira	42°41'03"N; 0°56'53"E	2120 m
16	SPAIN: Lérida: Alt Aneu, Valencia d'Aneu, Ruda valley, circo de Saboredo	42°37'50"N; 0°57'44"E	2000 m
17	SPAIN: Lérida: Vielha e Mijaran (Viella), Pla de l' Artiga de Lin, Canal de la Ribereta	42°39'41"N; 0°41'34"E	1700 m
18	SPAIN: Lérida: Lladorre, Tavascan, road to Certascan, Naorte lake	42°40'52"N; 1°18'08"E	2000 m
19	SPAIN: Lérida: Alins, Tor, Port de Cabrís	42°32'51"N; 1°24'56"E	2200 m
20	SPAIN: Gerona: Setcases, Vallter, Ull de Ter	42°25'16"N; 2°16'10"E	2140 m
21	ANDORRA: Andorra: Soldeu, Envalira mountain pass	42°32'32"N; 1°42'28"E	2300 m

### *Collaria nigricapillitia* (Nann.-Bremek. & Bozonnet) Lado

≡ *Lamproderma nigricapillitium* Nann.-Bremek. & Bozonnet

*Comatricha nigricapillitia* (Nann.-Bremek. & Bozonnet) A.Castillo, G.Moreno & Illana

= *Collaria chionophila* Lado

*Comatricha chionophila* (Lado) G.Moreno

MATERIAL STUDIED: LOC. 2, on trunk of *Pinus uncinata*, 19-VI-1991, C.Lado & M.Dueñas, Lado 5273 (MA-Fungi 75667). LOC. 6, on trunk of *Pinus uncinata*, 6-VI-1996, Lado 8261 (MA-Fungi 75664). LOC. 9, on branch of *Pinus uncinata*, 28-VI-1994, Lado 6760 (MA-Fungi 75670). LOC. 10, on trunk of *Pinus uncinata*, 5-VI-1996, Lado 8173 (MA-Fungi 75673), Lado 8179 (MA-Fungi 75676), Lado 8185 (MA-Fungi 75668), Lado 8186 (MA-Fungi 75675), Lado 8190 (MA-Fungi 75665). LOC. 12, on branch of *Pinus uncinata*, 29-VI-1994, Lado 6775 (MA-Fungi 75671), Lado 6777 (MA-Fungi 75669). LOC. 14, on trunk of *Pinus uncinata*, 29-VI-1994, Lado 6804 (MA-Fungi 75672). LOC. 16, on trunk of *Pinus uncinata*, 5-VI-1996, Lado 8168 (MA-Fungi 75674). LOC. 18, on trunk of *Pinus uncinata*, 4-VI-1996, Lado 8112 (MA-Fungi 75666).

TAXONOMIC NOTES: We maintain the inclusion of this species in the genus *Collaria* because the peridium is generally evanescent, except at the base where it remains as a well defined collar. This character was selected by Nannenga-Bremekamp (1967) to distinguish the genus from *Comatricha*.

Two similar species of *Collaria*, considered synonyms, have been described in the literature: *Collaria (Lamproderma) nigricapillitia*, characterized by the dark brown colour of sporocarps and spores in mass (Nannenga-Bremekamp 1989), and *C. chionophila*, characterized by purple-black to blackish sporocarps and spores in mass (Lado 1992). These two species could possibly represent two genetically distinct morphotypes suggested by Fiore-Donno et al. (2008).

NOTES ON DISTRIBUTION: *Collaria nigricapillitia* is a common nivicolous species in Spain. It has already been reported from the Sierra de Guadarrama (Lado 1992, Illana et al. 1993, Sánchez et al. 2002, 2007), the Sierra de Gredos Mountains (Lado et al. 2005) as well as the Pyrenees (Lado 1992). Another collection from the Pyrenees, identified as *Lamproderma carestiae* and illustrated with a good photograph by Gorris et al. (1999), also represents *C. nigricapillitia*. This species seems to be common in the Pyrenees as it is well represented in our collections.

**\**Comatricha laxa* Rostaf.**

MATERIAL STUDIED: LOC. 12, on branch of *Pinus uncinata*, 29-VI-1994, Lado 6772 (MA-Fungi 75682), Lado 6773 (MA-Fungi 75685), Lado 6795 (MA-Fungi 75683). LOC. 16, on trunk of *Pinus uncinata*, 5-VI-1996, Lado 8155 (MA-Fungi 75684). LOC. 18, on trunk of *Pinus uncinata*, 4-VI-1996, Lado 8114 (MA-Fungi 75681). LOC. 20, on trunk of *Pinus uncinata*, 27-V-1992, C.Lado & M.I. del Teso, Lado 5598 (MA-Fungi 75680), Lado 5599 (MA-Fungi 75677), Lado 5600 (MA-Fungi 75678, duplicate in KRAM M-1309), Lado 5601 (MA-Fungi 75679).

NOTES ON DISTRIBUTION: *Comatricha laxa* is not a strictly nivicolous myxomycete, but is often found near melting snow in spring. It is a common species in Spain (Lado 1993), but our findings represent the first records in the Pyrenees.

***Comatricha nigra* (Pers. ex J.F.Gmel.) J.Schröt.**

MATERIAL STUDIED: LOC. 4, on branch of *Pinus uncinata*, 6-VI-1996, Lado 8250 (MA-Fungi 75686). LOC. 7, on trunk of *Pinus uncinata*, 1-VII-1994, Lado 6848 (MA-Fungi 75690). LOC. 12, on trunk of *Pinus uncinata*, 29-VI-1994, Lado 6774 (MA-Fungi 75687), Lado 6790 (MA-Fungi 75688). LOC. 19, on trunk of *Pinus uncinata*, 4-VI-1996, Lado 8072 (MA-Fungi 75689).

NOTES ON DISTRIBUTION: This very common, typically autumnal species is known from numerous localities in Spain (Lado 1993); it has also been reported from nivicolous locations in the Pyrenees (Vila & Llimona 1998).

**\**Comatricha rigidireta* Nann.-Bremek.**

MATERIAL STUDIED: LOC. 3, on trunk of *Pinus uncinata*, 6-VI-1996, Lado 8257 (MA-Fungi 75691). LOC. 12, on branch of *Pinus uncinata*, 29-VI-1994, Lado 6776 (MA-Fungi 75693), Lado 6800 (MA-Fungi 75692). LOC. 19, on trunk of *Pinus uncinata*, 4-VI-1996, Lado 8097 (MA-Fungi 75694).

NOTES ON DISTRIBUTION: The species is rare in Spain; the only known locality is from the Sierra de Gredos Mountains (Lado et al. 2005). Our material agrees with the original description provided by Nannenga-Bremekamp (1966).

\**Comatricha sinuatocolumellata* G.Moreno, H.Singer, A.Sánchez & Illana

Figs 1–6

MATERIAL STUDIED: LOC. 6, on trunk of *Pinus uncinata*, 17-VI-1991, Lado 5230 (MA-Fungi 75697, duplicate in KRAM M-1296). LOC. 10, on trunk of *Pinus uncinata*, 5-VI-1996, Lado 8184 (MA-Fungi 75698), Lado 8191 (MA-Fungi 75695). LOC. 12, on trunk of *Pinus uncinata*, 29-VI-1994, Lado 6793 (MA-Fungi 75696).

TAXONOMIC NOTES: Our material has sporocarps distributed in loose groups or scattered, stalked, 2–3.5 mm in length. The sporotheca is cylindrical, often tapering toward the apex, fusiform, 0.9–2.4 × 0.6–1.1 mm (0.4–0.7 mm in diam. in upper part), black. The hypothallus is dark brown. The stalks are usually shorter than the sporotheca, 0.4–1.4 mm long, black. The peridium is evanescent and no remnants remain on fully developed sporocarps (Fig. 4). The columella gradually tapers toward the apex, usually reaching the top of the sporotheca and sometimes even protruding from its top; it is always sinuously bent and sometimes forked at the end (Fig. 5). The capillitium is very dark, almost blackish, smooth, dense, originating from the whole length of the columella, the capillitial threads are 1–2 µm wide in the peripheral part, with many pointed, rigid free ends (Fig. 6). The spores are dark brown in mass, grey-brown by transmitted light, 10–12 µm diam. and covered with densely and regularly distributed spines (Figs 1–3).

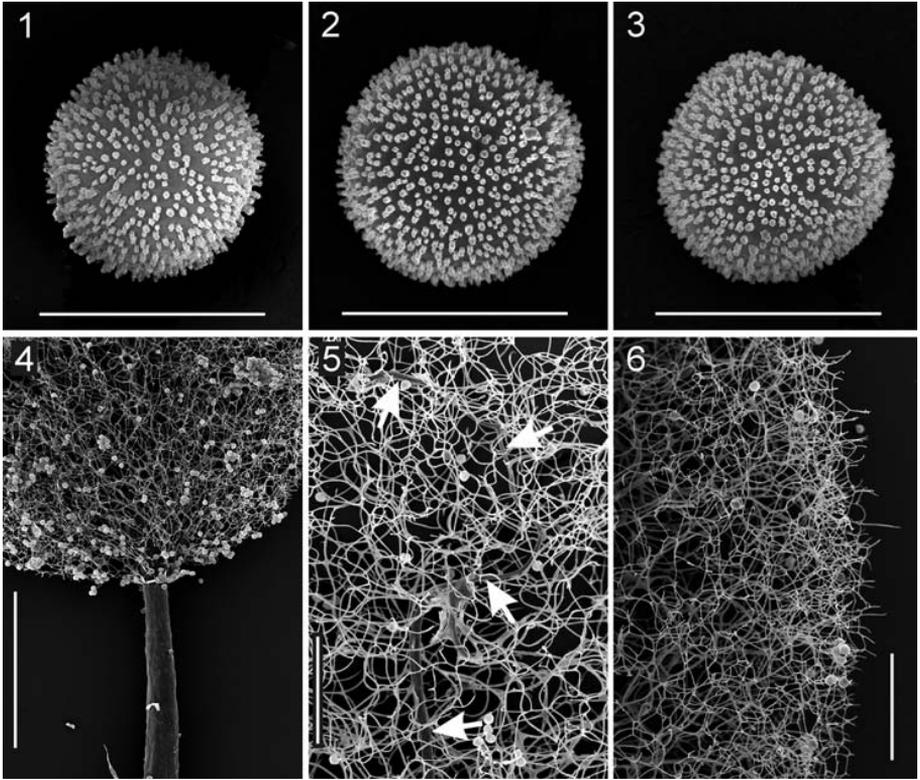
*Comatricha sinuatocolumellata* has recently been described by Moreno et al. (2004) based on the material from the Sierra de Guadarrama Mountains (Spain). Among the key characters distinguishing this species from *C. suksdorfii* Ellis & Everh., the authors indicate stalk length, columella shape and spore size. But as already pointed out by Moreno et al. (2004), some collections of *Comatricha suksdorfii* have shorter stalks and larger spores than the original material, therefore stalk length and spore size do not seem to be good characters for distinguishing the two species. We would like to emphasize some differences between the two species which were very clear in our material. These are: (i) the lack of peridium remnants in *C. sinuatocolumellata* (Fig. 4), present in *C. suksdorfii* (Fig. 9), (ii) the columella sinuous at the top in *C. sinuatocolumellata* (Fig. 5), straight in *C. suksdorfii*, (iii) the rigid capillitium with numerous free, pointed ends in *C. sinuatocolumellata* (Fig. 6) and the very sinuous, more delicate (often also rough) capillitial threads, with few free ends in *C. suksdorfii* (Fig. 10). The shape of the sporocarp, usually tapering at the apex in *C. sinuatocolumellata* and most often obtuse in *C. suksdorfii*, is also a helpful character.

NOTES ON DISTRIBUTION: Only known from the Sierra de Guadarrama Mountains in Spain (Moreno et al. 2004). Our collections from the Pyrenees are the second record of this species and confirm its identity.

*Comatricha suksdorfii* Ellis & Everh.

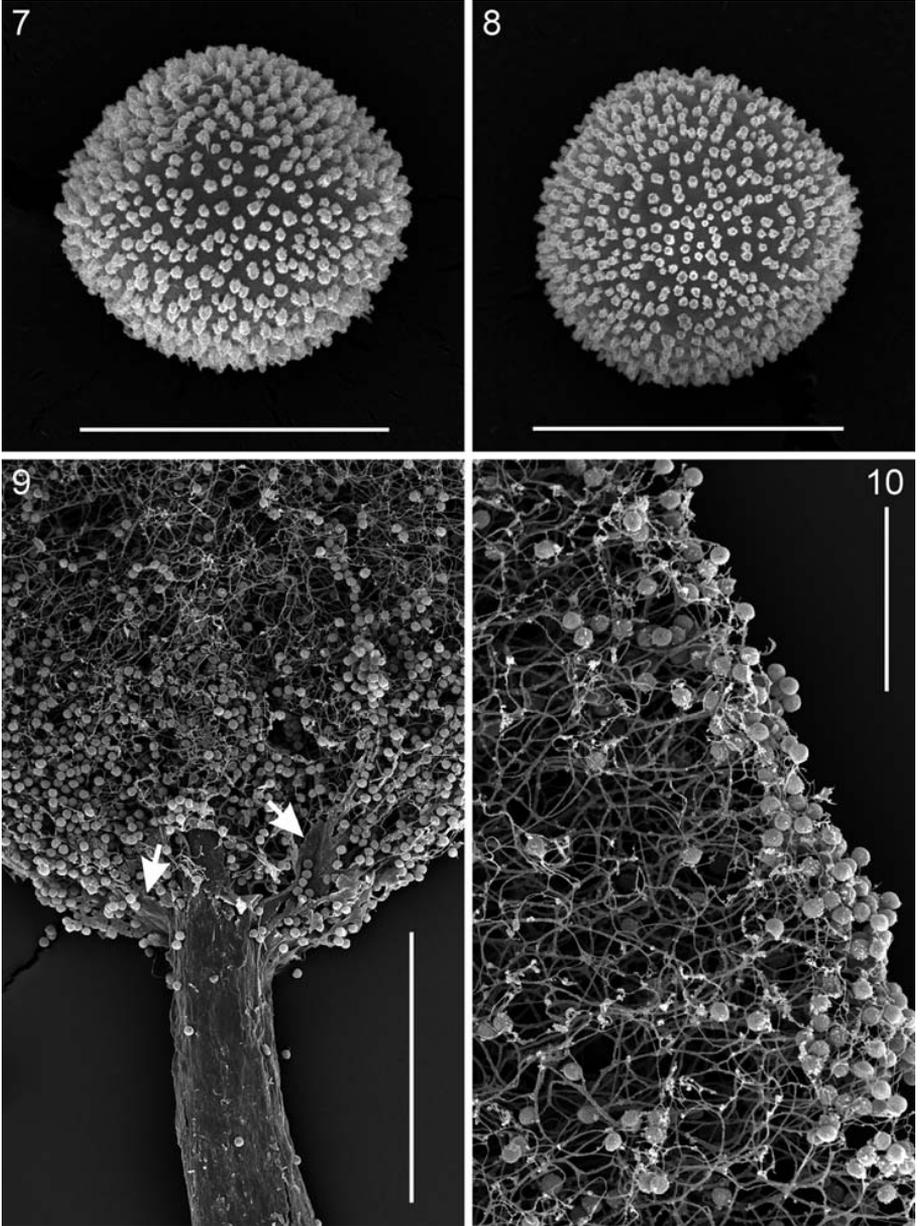
Figs 7–10

MATERIAL STUDIED: LOC. 6, on trunk of *Pinus uncinata*, 6-VI-1996, Lado 8260 (MA-Fungi 75705). LOC. 10, on trunk of *Pinus uncinata*, 5-VI-1996, Lado 8179 (MA-Fungi 75703), Lado 8180 (MA-Fungi 75700), Lado 8185 (MA-Fungi 75701, duplicate in KRAM M-1302), Lado 8188 (MA-Fungi 75699), Lado 8191 (MA-Fungi 75702). LOC. 14, on branch of *Rhododendron ferrugineum*, 29-VI-1994, Lado 6802 (MA-Fungi 75704). LOC. 19, on trunk of *Pinus uncinata*, 4-VI-1996, Lado 8080 (MA-Fungi 78185).



Figs 1–6. *Comatrixa sinuatocolumellata* (Lado 6793). Figs 1–3. Spores. Fig. 4. Lower part of the sporotheca, note the absence of peridium remnants. Fig. 5. Columella, note the sinuous shape (arrows). Fig. 6. Peripheral net of the capillitium, note the numerous, spiny, rigid ends. Scale bars: Figs 1–3 = 10  $\mu\text{m}$ , Fig. 4 = 300  $\mu\text{m}$ , Figs 5–6 = 100  $\mu\text{m}$ .

**TAXONOMIC NOTES:** Our material is characterized by stalked sporocarps in dense groups, 1.9–4 mm in total length. The sporotheca is cylindrical, 1.1–3  $\times$  0.6–1.2 mm, dark brown to black. The hypothallus is dark brown. The stalk is usually shorter than the sporotheca, 0.5–1.5 mm long, black. The peridium is partially evanescent, remnants are present especially in the lower part of the sporotheca (readily visible in preparations) (Fig. 9). The columella is thick in the lower part, narrower and straight at the apex, not reaching the top of the sporotheca, it ends 0.2–0.4 mm below the top of the sporotheca. The capillitium is dark brown, dense, originating from the whole length of the columella, it is usually covered with delicate warts giving it a rough appearance, in the peripheral part the threads are dense, sinuous and delicate, 0.5–1  $\mu\text{m}$  wide, with very few free ends (Fig. 10). The spores are dark brown in mass, dark grey-brown by transmitted light, 10–12  $\mu\text{m}$  diam., covered with densely and regularly distributed spines (Figs 7–8).



Figs 7–10. *Comatrixa suksdorfii* (Lado 8185). Figs 7–8. Spores. Fig. 9. Lower part of the sporotheca, the peridium remnants are visible (arrow). Fig. 10. Peripheral net of the capillitium, note the very sinuous delicate net with very few free ends. Scale bars: Figs 7–8 = 10  $\mu\text{m}$ , Fig. 9 = 300  $\mu\text{m}$ , Fig. 10 = 100  $\mu\text{m}$ .

In a critical study of some species of the Stemonitales made recently by Moreno et al. (2004), the authors described a new species, *Comatricha pseudoalpina* G Moreno, H.Singer, A.Sánchez & Illana, characterized by its strongly aggregated fructifications, very short stalk and long and broad sporotheca. According to these authors, *C. suksdorfii* differs from *C. pseudoalpina* by “larger sporocarps, with cylindrical sporothecae, very long stalks, about half the height of the sporocarp, evanescent peridium that remains only as a collar at the base of the sporotheca, and smaller spores, 9–10 µm in diam. (in the type material)” (Moreno et al. 2004). On the other hand, the same authors, point out in the “Observations” of *C. suksdorfii* that: “our collections from Spain generally present smaller fructifications with shorter stalks than some American specimens” and “we also find larger spore diameter of 10–12 µm”, which suggests that the differences in the size of sporangia and spores - a key character distinguishing the two species - are not significant. According to the same authors, *Comatricha suksdorfii* and *C. pseudoalpina* differ also in the type of spore ornamentation by SEM, being in the form of “dense and irregularly distributed baculae” in *C. pseudoalpina* and “dense, strong baculae of regular distribution” in *C. suksdorfii*. However, we could not see any difference between spore ornamentation in the figures presented (see Moreno et al. 2004: Figs 13–15, 31–33). Based on the descriptions of the two species provided by these authors, we would say that the degree of persistence of the peridium, a character of difficult interpretation in mature fructifications, is the only difference between them. In our opinion, a re-examination of the type material of the two species is needed to clarify their taxonomic position and to determine whether the two taxa are conspecific.

NOTES ON DISTRIBUTION: As already pointed out by Moreno et al. (2004), the confusion of the species with other similar ones makes it difficult to provide an accurate distribution of *C. suksdorfii* in Spain, but it is undoubtedly present in the Sierra de Guadarrama Mountains (Illana et al. 1993, Moreno et al. 2004). The descriptions of the collections from the Pyrenees provided by Gràcia (1986) and Gorris et al. (1999) also fit the present concept of *C. suksdorfii*.

***Enerthenema melanospermum* T.Macbr. & G.W.Martin**

MATERIAL STUDIED: LOC. 3, on trunk of *Pinus uncinata*, 6-VI-1996, Lado 8254 (MA-Fungi 75706), Lado 8258 (MA-Fungi 75708). LOC. 4, on branch of *Pinus uncinata*, 6-VI-1996, Lado 8248 (MA-Fungi 75713). LOC. 12, on branch of *Pinus uncinata*, 29-VI-1994, Lado 6778 (MA-Fungi 75709), Lado 6783 (MA-Fungi 75710), Lado 6789 (MA-Fungi 75712), Lado 6796 (MA-Fungi 75711). LOC. 19, on trunk of *Pinus uncinata*, 4-VI-1996, Lado 8088 (MA-Fungi 75707).

NOTES ON DISTRIBUTION: The species is fairly common in Spain, reported from the Sierra de Gredos (Lado et al. 2005), Sierra de Guadarrama (Illana et al. 1993, Sánchez et al. 2002) and from the Pyrenees (Gràcia 1977).

**\**Lamproderma aeneum* Mar.Mey. & Poulain**

MATERIAL STUDIED: LOC. 15, on herbaceous plants, 5-VI-1996, Lado 8148 (MA-Fungi 75714, duplicate in KRAM M-1294).

TAXONOMIC NOTES: *Lamproderma aeneum* is characterised by brown, globose, stipitate sporothecae with silvery, blue and green reflections, by a dark brown capillitium

and by small spores, 9.5–11(–11.5) µm diam. (Poulain et al. 2002). It is close to *L. ovoideum* Meyl. in general habit, but the latter has usually ovoid sporothecae and bigger spores (12–13.5 µm diam). The small spores of *L. aeneum* liken it to *L. splendens* Meyl., which differs in having a paler capillitium.

NOTES ON DISTRIBUTION: *Lamproderma aeneum* was described from the French Alps and it is reported from different countries of the Northern hemisphere such as Canada, Germany, Austria, Switzerland and Japan (Poulain et al. 2002). It was also recently found in the Polish Carpathians (Ronikier et al. 2008). It seems to be a widely distributed species. Our collection is the first in the Pyrenees as well as in Spain.

***Lamproderma carestiae* (Ces. & De Not) Meyl.**

= *L. atrosporum* Meyl.

= *L. cribrarioides* var. *carestiae* (Ces. & De Not) G. Moreno & H. Singer

MATERIAL STUDIED: LOC. 6, on herbaceous plants, 6-VI-1996, Lado 8267 (MA-Fungi 75717). LOC. 10, on branch of *Rhododendron ferrugineum*, 5-VI-1996, Lado 8169 (MA-Fungi 75721, duplicate in KRAM M-1311), Lado 8170 (MA-Fungi 75720), Lado 8175 (MA-Fungi 75725), Lado 8176 (MA-Fungi 75719); on herbaceous plants, 5-VI-1996, Lado 8201 (MA-Fungi 75716). LOC. 15, on herbaceous plants, 5-VI-1996, Lado 8139 (MA-Fungi 75718), Lado 8148 (MA-Fungi 75723), Lado 8149 (MA-Fungi 75724). LOC. 18, on branch of *Rhododendron ferrugineum*, 4-VI-1996, Lado 8119 (MA-Fungi 75722). LOC. 19, on branch of *Rhododendron ferrugineum*, 4-VI-1996, Lado 8084 (MA-Fungi 75715).

TAXONOMIC NOTES: The species seems to be greatly variable. Sessile as well as stipitate sporocarps are present in the collections from the Pyrenees, and most specimens have spores of 12–14 µm diam, with ornamentation in the form of spines, many arranged in lines and short ridges. Some authors consider these differences to be sufficient to place various morphotypes in different infraspecific taxa, but we feel that the variability in spore size and ornamentation is a response to extreme environmental conditions since all gradations are present in our material.

Based on the studies of the type material of *L. carestiae* and *L. cribrarioides*, Poulain et al. (2003) and Singer et al. (2003) have independently concluded that the two species are conspecific with *L. atrosporum*. Many nomenclatural changes have been proposed, causing confusion in the group. Based on a previous study by Martín et al. (2003), we think that *L. carestiae* and *L. cribrarioides* should be recognized as distinct species because of the distant genetic position of the collections of *L. carestiae* (as *L. atrosporum*) and *L. cribrarioides* (as *L. cf. atrosporum*). Further molecular studies are needed to solve the problems in the complex, to establish the species concept in this group and to delimitate inter- and intraspecific morphological variability.

NOTES ON DISTRIBUTION: This variable species is one of the most common nivicolous myxomycetes. It has already been reported in Spain from all the important mountain chains such as the Sierra de Guadarrama (Moreno et al. 2002, Sánchez et al. 2007), the Sierra Nevada (Moreno et al. 2003), the Sierra de Gredos (Lado et al. 2005) as well as from the Pyrenees (Martín et al. 2003).

***Lamproderma cribrarioides* (Fr.) R.E.Fr.**

MATERIAL STUDIED: LOC. 16, on branch of *Rhododendron ferrugineum*, 5-VI-1996, Lado 8154 (MA-Fungi 75726, duplicate in KRAM M-1306).

TAXONOMIC NOTES: A collection cited as *Lamproderma* cf. *atrosporum* by Martín et al. (2003) is currently *L. cribrarioides* (funnel-shaped capillitial ends and completely reticulate spores). The distant genetic position of this collection shown by these authors seems to confirm the opinion that it is a separate species, distinct from *L. carestiae*. The spores of *L. cribrarioides* are always covered with a complete reticulum, while the spores of *L. carestiae* are always covered with spines (although sometimes fused in a sub-reticulate pattern).

NOTES ON DISTRIBUTION: *Lamproderma cribrarioides* seems to occur less frequently than the previous species. In Spain, it was reported from single localities in the Sierra Nevada (Moreno et al. 2002, 2003), Sierra de Guadarrama Mountains (Moreno et al. 2002, Sánchez et al. 2007) and also from the Pyrenees (Martín et al. 2003). This collection represents the second one in the Pyrenees.

**\**Lamproderma echinosporum* Meyl.**

MATERIAL STUDIED: LOC. 6, on herbaceous plants, 17-VI-1991, Lado 5232 (MA-Fungi 75741). LOC. 10, on branch of *Erica* sp., 5-VI-1996, Lado 8177 (MA-Fungi 75735); on branch of *Vaccinium myrtillus*, 5-VI-1996, Lado 8178 (MA-Fungi 75737); on herbaceous plants, 5-VI-1996, Lado 8197 (MA-Fungi 75729), Lado 8205 (MA-Fungi 75731); on pteridophyte, 5-VI-1996, Lado 8202 (MA-Fungi 75730); on branch of *Rhododendron ferrugineum*, Lado 8174 (MA-Fungi 75743). LOC. 15, on herbaceous plants, 5-VI-1996, Lado 8140 (MA-Fungi 75738). LOC. 18, on branch of *Rhododendron ferrugineum*, 4-VI-1996, Lado 8104 (MA-Fungi 75728, duplicate in KRAM M-1297), Lado 8117 (MA-Fungi 75734), Lado 8121 (MA-Fungi 75736), Lado 8122 (MA-Fungi 75733). LOC. 19, on branch of *Rhododendron ferrugineum*, 4-VI-1996, Lado 8085 (MA-Fungi 75727), Lado 8098 (MA-Fungi 75732); on herbaceous plants, Lado 8075 (MA-Fungi 73216). LOC. 21, on herbaceous plants, 26-V-1992, Lado 5490 (MA-Fungi 75742), Lado 5491 (MA-Fungi 75740).

TAXONOMIC NOTES: *Lamproderma echinosporum* belongs to the group of species characterized by a peridium that is non-uniformly coloured and has marked brown areas (Bozonnet et al. 1995). Brown areas are visible even under a stereoscope as dark spots on the peridium surface. Large spores covered with relatively long (about 1 µm long) spines are the most characteristic feature of *L. echinosporum*. The spores usually have an easily visible germ pore.

NOTES ON DISTRIBUTION: *Lamproderma echinosporum* has a few known localities in Spain, only in the Sierra de Guadarrama (Moreno et al. 2002, Sánchez et al. 2007) and the Sierra Nevada Mountains (Moreno et al. 2003). Our records are the first from the Pyrenees, where the species seems to be one of the more common representatives of the genus. The collection from locality 21 is the first record for Andorra.

**\**Lamproderma maculatum* Kowalski**

MATERIAL STUDIED: LOC. 10, on branch of *Rhododendron ferrugineum*, 5-VI-1996, Lado 8176 (MA-Fungi 75744, duplicate in KRAM M-1307). LOC.13, on grasses, 30-VI-1994, Lado 6839 (MA-Fungi 75745).

TAXONOMIC NOTES: Like the previous species, *L. maculatum* belongs to the group characterized by a peridium with darker areas (Bozonnet et al. 1995). Its spores, however, are covered with a very fine ornamentation in the form of warts. As in *L. echinosporum*, dark areas on the peridium surface are easily visible under low magnifications.

NOTES ON DISTRIBUTION: The species was found in Spain in the Sierra de Guadarrama (Moreno et al. 2002, Sánchez et al. 2007), the Sierra Nevada (Moreno et al. 2003), and the Sierra de Gredos Mountains (Lado et al. 2005). This species is new to the Pyrenees.

### ***Lamproderma ovoideum* Meyl.**

MATERIAL STUDIED: LOC. 1, on herbaceous plants, 28-III-1997, Lado 8472 (MA-Fungi 75762), Lado 8473 (MA-Fungi 75761), Lado 8482 (MA-Fungi 75770). LOC. 4, on herbaceous plants and on branch of *Pinus uncinata*, 6-VI-1996, Lado 8244 (MA-Fungi 75751); on branch of *Abies alba*, 6-VI-1996, Lado 8245 (MA-Fungi 75756), Lado 8246 (MA-Fungi 75753); on herbaceous plants, 6-VI-1996, Lado 8251 (MA-Fungi 75754). LOC. 5, on branch of *Betula* sp., 6-VI-1996, Lado 8210 (MA-Fungi 75750), Lado 8211 (MA-Fungi 75747), Lado 8228 (MA-Fungi 75749). LOC. 10, on branch of *Pinus uncinata*, 5-VI-1996, Lado 8195 (MA-Fungi 75755); on branch of *Rhododendron ferrugineum*, Lado 8170 (MA-Fungi 75763), Lado 8175 (MA-Fungi 75768). LOC. 11, on herbaceous plants, 29-VI-1994, Lado 6805 (MA-Fungi 75766); on branch, Lado 6807 (MA-Fungi 75765); on herbaceous plants, Lado 6812 (MA-Fungi 78186); on branch of *Sambucus* sp., Lado 6837 (MA-Fungi 75769). LOC. 12, on pteridophyte, Lado 6784 (MA-Fungi 75764); on herbaceous plants, Lado 6786 (MA-Fungi 75767). LOC. 16, on branch of *Rhododendron ferrugineum*, 5-VI-1996, Lado 8166 (MA-Fungi 75759). LOC. 18, on branch of *Betula* sp., 4-VI-1996, Lado 8107 (MA-Fungi 75748), Lado 8110 (MA-Fungi 75746), Lado 8119 (MA-Fungi 75760). LOC. 19, on branch of *Rhododendron ferrugineum*, 4-VI-1996, Lado 8086 (MA-Fungi 75752), Lado 8092 (MA-Fungi 75758), Lado 8098 (MA-Fungi 75757).

NOTES ON DISTRIBUTION: *Lamproderma ovoideum* is one of the most common nivicolous species of the genus *Lamproderma* and has been reported from many mountainous regions of Spain, such as the Sierra de Guadarrama (Moreno et al. 2002, Sánchez et al. 2007), the Sierra Nevada (Moreno et al. 2003), the Sierra de Gredos (Lado et al. 2005) and the Pyrenees (Martín et al. 2003).

### **\**Lamproderma pseudomaculatum* Mar.Mey. & Poulain**

MATERIAL STUDIED: LOC. 10, on branch of *Pinus uncinata*, 5-VI-1996, Lado 8194 (MA-Fungi 75771, duplicate in KRAM M-1300). LOC. 17, on herbaceous plants, 30-VI-1994, Lado 6832 (MA-Fungi 75772).

TAXONOMIC NOTES: *L. pseudomaculatum* is characterized by brown areas present on the peridium surface (Bozonnet et al. 1995). This feature is, however, less distinct than in other species of the group and can sometimes be observed only under the microscope. In one of our collections (Lado 6832) the areas were hardly visible under a stereoscope, while other specimens (Lado 8194) had more distinct brown spots at the base of the sporothecae. The peridium was covered with needle-shaped crystals in both collections, which is also a typical feature of the species (Bozonnet et al. 1995).

NOTES ON DISTRIBUTION: This is the first record for Spain as well as for the Pyrenees.

\**Lamproderma* cf. *pulchellum* Meyl.

Figs 11–16

MATERIAL STUDIED: LOC. 15, on dung, 5-VI-1996, Lado 8129 (MA-Fungi 75777). LOC. 18, on branch of *Rhododendron ferrugineum*, 4-VI-1996, Lado 8102 (MA-Fungi 75775), Lado 8118 (MA-Fungi 75776), Lado 8120 (MA-Fungi 75778, duplicate in KRAM M-1298); on branch of *Erica* sp., 4-VI-1996, Lado 8108 (MA-Fungi 75773), Lado 8109 (MA-Fungi 75774).

TAXONOMIC NOTES: Our material is characterized by the stipitate, more rarely sessile sporocarps. The sporotheca is globose, sometimes slightly wider than high, up to 2 mm in diameter. The hypothallus is thin, brown. The stalk is blackish-brown, up to 1 mm in height. The peridium is smooth, shining, with violet and blue reflections, brownish by transmitted light, not uniformly coloured, but without well marked darker areas. The columella is short, reaching 1/3–1/2 of the sporotheca height, sometimes broadened at apex. The capillitium is dense, very pale, almost white when the spores have been dispersed, pale brown by transmitted light, built up of pale, delicate, flattened threads forming a dense net without visible primary branches and with wide expansions at the junctions (Figs 14–16). The spores are very dark brown in mass, pale greyish-brown by transmitted light, slightly darker on one side, 12.5–14 µm diam., finely and densely spinulose (Figs 11–13).

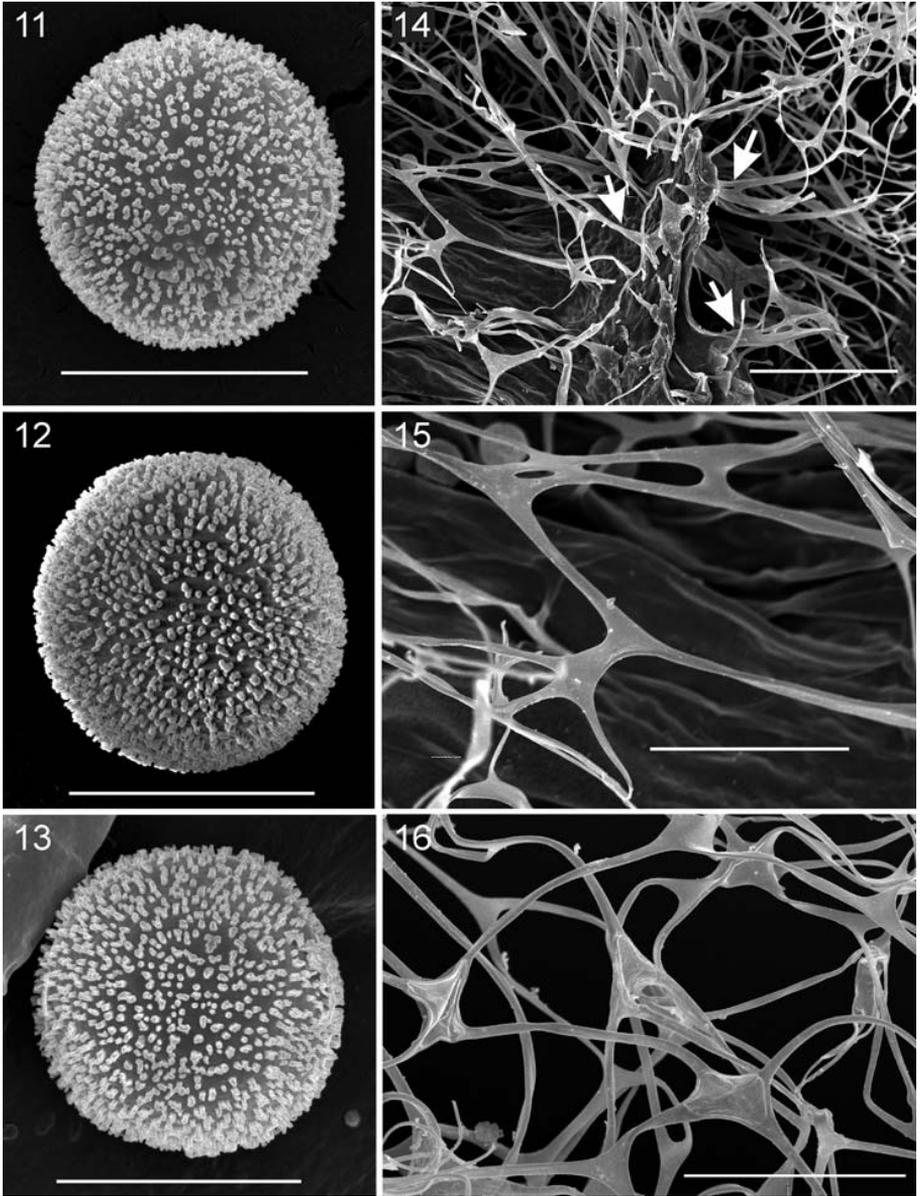
Some features of our specimens differ slightly from those specified in the original description (Meylan 1932). Sporangia are mostly stipitate, not sessile. But Martin & Alexopoulos (1969) have already noticed that Meylan's collection contained shortly stipitate sporangia as well as sessile ones in the same collection. Moreno et al. (2002) also found stalked sporangia in the collections examined by them, including the lectotype. Most of the other characters of our specimens fit the description and illustrations provided by these authors. We also found a short columella, usually not reaching 1/2 of the sporotheca height, and a densely branched capillitium of flat and wide threads, with numerous expansions at capillitial junctions (Figs 15–16) and without visible primary branches (Fig. 14). Only the spore size in our collections is different from that provided by Moreno et al. (2002). According to these authors, spores are 10–12 µm diam., while they reach 12.5–14 µm in diam. in our collections. Our measurements agree with those reported by Meylan (1932) in his original collection (12–14 µm in diam.) and also by Neubert et al. (2000) [12–13(–14) µm diam.]

NOTES ON DISTRIBUTION: *Lamproderma pulchellum* was described from Switzerland (Meylan 1932) and was known only from the type locality for a long time. It was recently reported from Germany, France and Austria (Neubert et al. 2000, Moreno et al. 2002). Our record is the first from Spain.

\**Lamproderma pulveratum* Mar.Mey. & Poulain

MATERIAL STUDIED: LOC. 1, on herbaceous plants, 28-III-1997, Lado 8489 (MA-Fungi 75783). LOC. 8, on trunk of *Abies alba*, 18-VI-1991, Lado 5242 (MA-Fungi 75779). LOC. 13, on grasses, 30-VI-1994, Lado 6838 (MA-Fungi 75781, duplicate in KRAM M-1290). LOC. 17, on herbaceous plants, 30-VI-1994, Lado 6830 (MA-Fungi 75780). LOC. 21, on herbaceous plants, 26-V-1992, Lado 5489 (MA-Fungi 75782), Lado 5492 (MA-Fungi 75784).

TAXONOMIC NOTES: Some collections from the Pyrenees did not have calcareous needles on the peridium surface, but other characters such as spore ornamentation, peridium features and the general habit allowed us to identify the specimens as *L. pulveratum*.



Figs 11–16. *Lamproderma* cf. *pulchellum* (Lado 8108, Lado 8120). Figs 11–13. Spores. Fig. 14. Columella, with flat capillitial threads originating from the columella (arrows). Figs 15–16. Detail of the capillitium, note the flat capillitial threads and wide expansions at the capillitial junctions. Scale bars: Figs 11–13 = 10  $\mu$ m, Fig. 14 = 100  $\mu$ m, Fig. 15 = 50  $\mu$ m, Fig. 16 = 30  $\mu$ m.

NOTES ON DISTRIBUTION: *Lamproderma pulveratum* has recently been reported from Spain (Sánchez et al. 2007) from the Sierra de Guadarrama Mountains, our findings are the first for the Pyrenees and Andorra.

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