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Byssoloma llimonae sp nov., from continental Spain, Madeira and the Canary Islands

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Abstract: *Byssoloma llimonae*, a new species described from NE Spain, Madeira and the Canary Islands (Gomera, La Palma and Tenerife), is a mostly corticolous species, closely related to the more widespread and usually foliicolous *Bapalmuia kakouettae* (=*Byssoloma aptrootii*). The generic position of this group of species within the *Pilocarpaceae* is still unclear. The new combination *Byssoloma kakouettae* (Sérus.) R. Lücking & Sérus. is introduced.

Key words: *Byssoloma*, Canary Islands, Madeira, *Pilocarpaceae*, Spain.

Introduction

In a preliminary study of the taxonomy of foliicolous lichens in Western Europe and Macaronesia, Sérusiaux (1993) described the new genus *Bapalmuia* based on a very typical group of tropical foliicolous species around *Bacidia palmularis* (Müll. Arg.) Zahlbr. and included in it the new species, *Bapalmuia kakouettae* (described from leaves and twigs of *Buxus sempervirens* in the gorges of Kakouetta in SW France). He also described the foliicolous *Byssoloma aptrootii* from the Canary Islands (Tenerife) and Madeira.

The abundant material now available clearly indicates that *Byssoloma aptrootii* is merely a form (probably neotenic) of *Balpalmuia kakouettae*. In their recent world-wide revision of the genus *Bapalmuia*, Kalb *et al.* (2000) concluded that a single taxon is involved and furthermore, on the basis of its excipular structure and shape of conidia, excluded it from typical *Bapalmuia*. They did not transfer the species to another genus but suggested that other representatives of the *Pilocarpaceae*, such as *Byssoloma syzygii* Vězda & Vivant and *Fellhanera pilomarginata* Lücking, might be related, as well as two corticolous or saxicolous (especially at water level by streams) species of *Bacidia* from Western Europe, viz. *Bacidia carneoglauca* (Nyl.) A. L. Sm. and *B. viridifarinosa* Coppins & P. James. The original intention was to describe a new genus within the *Pilocarpaceae* to accommodate these two *Bacidia* species, *Bapalmuia kakouettae* and possibly several other tropical species. However, closer examination of the material revealed several features that clearly separate *Bapalmuia kakouettae* from the two *Bacidia* species mentioned above, especially the shape of their conidia and the presence of secondary compounds (xanthones).

Meanwhile, the study of corticolous *Bacidia* s. lat. from the laurisilva of Macaronesia continued and a further species quite close to *Balpalmuia kakouettae* but differing mainly by the size and septation of

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its ascospores has been found. During their work on the lichen flora of Catalunya, A. Gómez-Bolea and A. Longán collected the same species from NE Spain. The species had previously been collected by A. Gómez-Bolea, and also by P. Diederich and J. Etayo in the same region (near Oix) from a site rich in foliicolous lichens growing on *Buxus sempervirens*. As no epithet appears available for it, this species is described as new to science in this paper, and is named after our friend and colleague Prof. Xavier Llimona in recognition of his remarkable contribution to knowledge of the Spanish lichen flora. However, no final decision has been taken regarding its generic position but its closest relative *Bapalmuia kakouettae* is here transferred to *Byssoloma*.

Byssoloma llimonae Sérus., Gómez-Bolea, Longán & Lücking sp. nov.

A specie *Byssoloma kakouettae* sporis 3–5(–7)-septatis et (13–)15–25 × (3–)4–5 µm magnis differt.

Typus: Spain, Catalonia, prov. Barcelona, Vallès Occidental, Matadepera, Serra de Sant Llorenç del Munt, Canal Freda (31TDG1811), 700 m, on *Quercus ilex*, 14 March 1997, *A. Gómez-Bolea & A. Longán* (BCC-Lich. 13747—holotype, LG—isotype).

(Fig. 1)

Thallus crustose, yellowish green when fresh, pale greenish when dry, with a slightly farinose appearance, usually continuous, up to 100 µm thick; cortex thin and irregular, formed by transverse hyphae, covering an irregular layer of algal cells which sometimes forms small granules similar to goniocysts, 20–30 µm diam., comprising 10–15 algal cells surrounded by short-celled hyphae; occasionally, some thalli are entirely composed of these granules. TLC: no compounds detected. *Photobiont*, spherical, green cells, 5–10 µm diam., probably belonging to the *Chlorococcaceae*.

Apothecia rounded, 0·2–0·5(–0·6) mm diam., sometimes proliferating from old apothecia and thus forming clusters up to 0·8 mm diam.; disc plane in young apothecia, soon becoming convex in old ones, variable in colour, usually bluish grey to blackish when young, becoming brown or greenish grey when mature, sometimes with a piebald mixture of these colours (a single individual may show apothecia with different colours), rarely slightly pruinose; margin at first distinct and rather thick (and sometimes slightly prominent), becoming thin or excluded in old apothecia, usually paler than the disc in old apothecia (sometimes almost white), but usually dark bluish or bluish grey in young apothecia, smooth or shortly byssoid and sometimes with anchoring hyphae, especially in young apothecia. *Excipulum* 50–65(–80) µm thick at the margins but composed of short hyphae with elongate or globose cells which can be separated from one another and thus form the minutely byssoid margin seen under the dissecting microscope; inner part up to 75 µm thick, usually typically paraplectenchymatous, composed of rather polyhedral brown cells (with cells reaching sometimes 6–8 µm across), KOH+ purple-brown, ± arranged in radiating rows. *Hypothecium* 100–150 µm thick, orange to reddish brown, sometimes almost brown, KOH+ usually darker reddish brown. *Hymenium* hyaline or yellowish, 60–75 µm thick. *Paraphyses* rather coherent, slightly branched and anastomosing especially in the upper part, 1–1·5 µm thick, with irregularly inflated apices, up to 3 µm wide. *Asci* clavate, of the *Byssoloma*-type (Hafellner 1984). *Ascospores* 8 per ascus, hyaline, narrowly ellipsoid to fusiform, sometimes slightly tapering towards the proximal end, 3–5(–7) septate, clearly constricted at the septa, (13–)15–25 × (3–)4–5 µm.

Conidiomata abundant, flask-shaped, whitish to bluish grey or black, 0·1–0·15 mm diam., usually with a very wide ostiole. *Conidia* usually biclavate to obpyriform, sometimes almost bacilliform, 3–4(–5) × *c.* 1 µm.

Discussion. Byssoloma llimonae has a very similar thallus, apothecia (incl. the colour variation) and pycnidia to *Bapalmuia kakouettae* but differs in its habitat (mainly corticolous for *llimonae* vs mainly foliicolous for

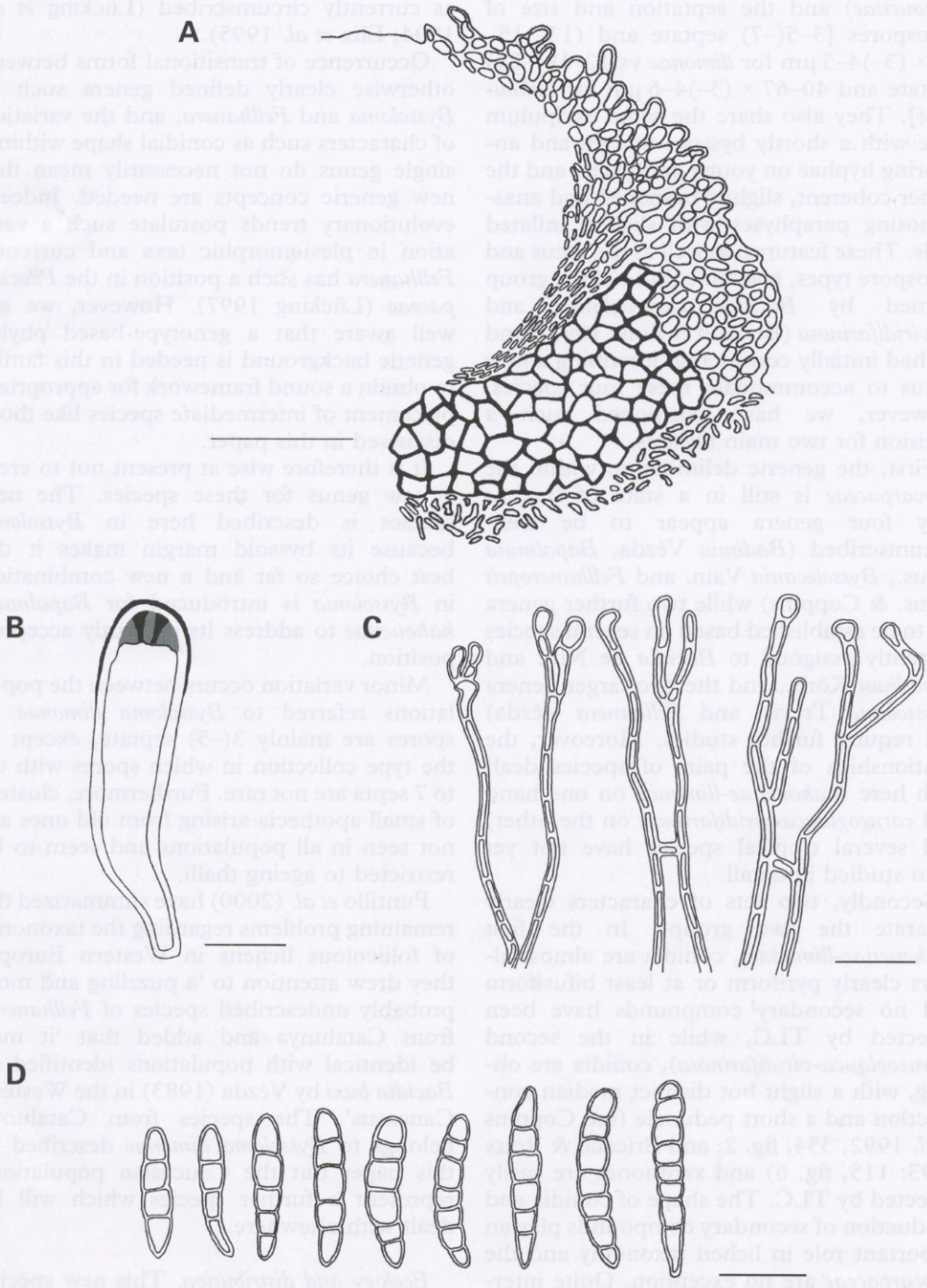

FIG. 1. *Byssoloma llimonae* (type collection). A, exciple; B, ascus (in Lugol); C, paraphyses; D, ascospores. Scales: A=30 µm; B–D=10 µm.

kakouettae) and the septation and size of ascospores [3–5(–7) septate and (13–)15–25 × (3–)4–5 µm for *llimonae* vs 12–19(–23) septate and 40–67 × (3–)4–6 µm for *kakouettae*]. They also share the same excipulum type with a shortly byssoid margin and anchoring hyphae on young apothecia, and the rather coherent, slightly branched and anastomosing paraphyses with slightly inflated ends. These features, as well as the ascus and ascospore types, resemble those of the group formed by *Bacidia carneoglauca* and *B. viridifarinosa* (Bricaud & Roux 1993), and we had initially considered describing a new genus to accommodate these four species. However, we have postponed such a decision for two main reasons.

First, the generic delimitation within the *Pilocarpaceae* is still in a state of flux as only four genera appear to be well-circumscribed (*Badimia* Vězda, *Bapalmuia* Sérus., *Byssolecania* Vain. and *Fellhaneropsis* Sérus. & Coppins) while two further genera are to be established based on several species currently assigned to *Bacidia* de Not. and *Lopadium* Körb., and the two larger genera (*Byssoloma* Trevis. and *Fellhanera* Vězda) still require further studies. Moreover, the relationships of the pairs of species dealt with here (*kakouettae-llimonae* on one hand and *carneoglauca-viridifarinosa* on the other) and several tropical species have not yet been studied in detail.

Secondly, two sets of characters clearly separate the two groups. In the first (*kakouettae-llimonae*), conidia are almost always clearly pyriform or at least bifusiform and no secondary compounds have been detected by TLC, while in the second (*carneoglauca-viridifarinosa*), conidia are oblong, with a slight but distinct median constriction and a short peduncle (see Coppins *et al.* 1992, 354, fig. 2; and Bricaud & Roux 1993: 115, fig. 6) and xanthones are easily detected by TLC. The shape of conidia and production of secondary compounds play an important role in lichen taxonomy and the *Pilocarpaceae* are no exception. Quite interestingly however, heterogeneity regarding these two sets of characters occurs in both the large genera, *Byssoloma* and *Fellhanera*, as currently circumscribed (Lücking *et al.* 1994; Elix *et al.* 1995).

Occurrence of transitional forms between otherwise clearly defined genera such as *Byssoloma* and *Fellhanera*, and the variation of characters such as conidial shape within a single genus do not necessarily mean that new generic concepts are needed. Indeed, evolutionary trends postulate such a variation in plesiomorphic taxa and currently *Fellhanera* has such a position in the *Pilocarpaceae* (Lücking 1997). However, we are well aware that a genotype-based phylogenetic background is needed in this family to obtain a sound framework for appropriate placement of intermediate species like those discussed in this paper.

It is therefore wise at present not to erect a new genus for these species. The new species is described here in *Byssoloma* because its byssoid margin makes it the best choice so far and a new combination in *Byssoloma* is introduced for *Bapalmuia kakouettae* to address its currently accepted position.

Minor variation occurs between the populations referred to *Byssoloma llimonae* as spores are mainly 3(–5) septate, except in the type collection in which spores with up to 7 septa are not rare. Furthermore, clusters of small apothecia arising from old ones are not seen in all populations and seem to be restricted to ageing thalli.

Puntillo *et al.* (2000) have summarized the remaining problems regarding the taxonomy of foliicolous lichens in Western Europe; they drew attention to 'a puzzling and most probably undescribed species of *Fellhanera*' from Catalunya and added that 'it may be identical with populations identified as *Bacidia buxi* by Vězda (1983) in the Western Caucasus'. The species from Catalunya belongs to *Byssoloma llimonae* described in this paper but the Caucasian populations represent a further species which will be dealt with elsewhere.

Ecology and distribution. This new species is so far known from several islands in Macaronesia and NE Spain. In the type locality in NE Spain, it was found in a very

humid and warm *Quercus ilex* forest at mid elevation (700 m), probably a well-preserved stand of Mediterranean sclerophyllous forest. It was growing on the base of trees, together with *Dimerella pineti*, *Porina borreri* and *Porina leptalea*; higher up on the trunks, *Anisomeridium polypori*, *Bacidia laurocerasi*, *Bactrospora patellarioides* var. *convexa*, *Graphis scripta*, *Hyperphyscia adglutinata*, *Macentina dictyospora*, *Opegrapha atra*, *O. varia*, *O. viridis*, *Phlyctis agelaea*, *Ramonia subsphaeroides*, *Schismatomma decolorans* and *Zamenhofia hibernica* were present. The second locality in Catalunya has the same type of forest but *Buxus sempervirens* is quite abundant in the understorey near a small river; several foliicolous lichens have been detected there, including *Bacidia chloroticula*, *Byssoloma subdiscordans* (with the lichenicolous hyphomycete *Ampullifera foliicola*), *Fellhanera bouteillei*, *Gyalectidium puntilloi*, *Porina hoehneliana*, *P. oxneri*, *Strigula minor*, *S. smaragdula* together with *Anisomeridium polypori* and *Bacidia arceutina*, both being more common on young twigs than on leaves.

In Madeira and the Canary Islands, the species has been found in well-preserved stands of the laurisilva or at higher elevations in the 'Fayal-Brezal'. The evergreen subtropical cloud forest of these islands is well-known for its rich lichen flora, and the complete list of the taxa which favour this habitat is still far from complete. *Byssoloma llimonae* is a small and rather inconspicuous species that seems to be quite rare but this might be an artefact due to the abundance of macrolichens and pleurocarpous mosses which attract the attention of cryptogamic botanists.

Additional specimens examined. **Spain**: *Catalunya*: Girona prov., Oix, Riera d'Oix, on leaves of *Buxus sempervirens*, 500 m, 1981, *A. Gómez-Bolea* 1524 (LG); *ibid.*, 13 ii 1991, *J. Etayo* s. n. (LG) & *P. Diederich* s. n. (LG).—**Madeira**: Route Funchal-Faial, Ribeiro Frio, chemin allant vers les Balcoes, laurisilve ± dégradée, sur tronc, 850–900 m, ii 1988, *E. Sérusiaux* 10020 (LG).—**Canary Islands:** *Gomera*: Parque Nacional de Garajonay, Bosque del Cedro, chemin au départ de la route des crêtes (San Sebastian—Valle Grand Rey), 1300–1350 m, Fayal-Brezal de crête, sur tronc de Lauraceae, 25 vii 1994, *E. Sérusiaux* s. n. (LG). *La Palma*: Los Tilos, W de Las Lomados, laurisilve dominée par *Ocotea foetens* et riche en *Hedera canariensis*, sur tronc, 19 & 22 vii 1997, *E. Sérusiaux* s. n. (LG). *Tenerife*: laurisilve de Monte del Agua, chemin au départ de Las Portelas vers Erjos, sur tronc, 850–900 m, 2 iii 1997, *E. Sérusiaux* s. n. (LG).

Byssoloma kakouettae (Sérus.) R. Lücking & Sérus. comb. nov.

Bapalmuia kakouettae Sérus., *Nord. J. Bot.* 13: 449 (1993); type: France, Dépt. Pyrénées-Atlantiques, Gorges de Kakouetta, 400 m, sur tiges et feuilles de *Buxus*, viii 1985, *E. Sérusiaux* 7703 (LG—holotype!; hb. Lücking—isotype!).

Byssoloma aptrootii Sérus., *Nord. J. Bot.* 13: 451 (1993); type: Madeira, route Ribeira Brava-São Vicente, un peu au N du col de Encumeada, 800 m, laurisylve ± dégradée le long d'une rivière, sur feuilles de *Ocotea foetens*, ii 1988, *E. Sérusiaux* s. n. (LG—holotype!; BM, E, hb. Lücking, hb. Vězda—isotypes!).

Ecology and distribution. Bapalmuia kakouettae has been reported from several localities on the northern side of the Pyrenees in France (from the gorges S of Mauléon-Licharre to the Lourdes area), in Campania/Italy (Puntillo *et al.* 2000) and in Macaronesia. In continental Europe, it is restricted to shaded and very humid valleys where it grows on twigs and on leaves of *Buxus sempervirens*. It is locally abundant in suitable localities such as those sampled in 2000 near St-Pé de Bigorre in the central parts of the Pyrenees in France; it forms a typical community with other rarities such as *Bacidia colchica* and the recently described *Gyalectidium puntilloi* (Ferraro *et al.* 2001). In Macaronesia, the species is known from Madeira and three of the Canary Islands (Gomera, La Palma and Tenerife), which support extensive and rather well-preserved stands of the laurisilva. It is common on living leaves, mainly those of the *Lauraceae*, but can also be found on the chlorophyllous stems of *Smilax canariensis*, and very rarely on the bark of laurel trees.

Selected specimens examined. See Sérusiaux (1993: 451 & 454, under *Bapalmuia kakouettae* and *Byssoloma aptrootii*) for earlier reports from France (Dept. Pyrénées-Atlantiques), Madeira and the Canary Islands (Tenerife).—**Italy**: *Campania:* valley of the Bussento river at Cilento, Salerno, on leaves of *Buxus sempervirens*, 1997, *D. Puntillo* 10391 (CLU, LG).—**France:** *Dept. Hautes-Pyrénées:* forêt de St-Pé-de-Bigorre, vallée de Génie Longue, fourrés de *Buxus* et *Corylus* en fond

de vallon, sur feuilles et branchettes de *Buxus*, 9 viii 2000, *E. Sérusiaux* s. n. (LG).—**Canary Islands:** *Gomera*: Parque Nacional de Garajonay, Bosque del Cedro, chemin depuis le village jusqu'à l'Ermita le long du barranco, laurisilve de fond de vallée avec *Persea indica*, sur tronc, 900–950 m, 26 vii 1994, *E. Sérusiaux* s. n. (LG); *ibid.*, chemin forestier de Chorros de Epina vers le Presa de Los Gallos, laurisilve à *Ocotea foetens* dans un creux de vallon, sur feuilles, 700–800 m, 31 vii 1974, *E. Sérusiaux* s. n. (LG). *La Palma*: Los Tilos, W de Las Lomados, laurisilve riche en *Hedera canariensis* et en fougères (e. a. *Woodwardia radicans*), sur feuilles de *Lauraceae*, 800–850 m, 22 vii 1997, *E. Sérusiaux* s. n. (LG).

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References

Bricaud, O. & Roux, C. (1993) Les apothécies de *Bacidia viridifarinosa* Coppins & P. James. *Bulletin de la Société linéenne de Provence* **44:** 111–116.

Coppins, B. J., James, P. W. & Hawksworth, D. L. (1992) New species and combinations in *The Lichen Flora of Great Britain and Ireland*. *Lichenologist* **24:** 351–369.

Elix, J. A., Lumbsch, T. & Lücking, R. (1995) The chemistry of foliicolous lichens 2. Constituents of *Byssoloma* and *Sporopodium* species. *Bibliotheca Lichenologica* **58:** 81–96.

Ferraro, L. I., Lücking, R. & Sérusiaux, E. (2001) A world monograph of the lichen genus *Gyalectidium* (Gomphillaceae). *Botanical Journal of the Linnean Society* **137:** 311–345.

Hafellner, J. (1984) Studien in Richtung einer natürlicheren Gliederung der Sammelfamilien Lecanoraceae und Lecideaceae. *Nova Hedwigia, Beiheft* **79:** 241–371.

Kalb, K., Lücking, R. & Sérusiaux, E. (2000) Studies in *Bacidia* sensu lato (lichenized Ascomycetes: Lecanorales). I. The genus *Bapalmuia* Sérus. *Mycotaxon* **75:** 281–309.

Lücking, R. (1997) Additions and corrections to the knowledge of the foliicolous lichen flora of Costa Rica. The genus *Fellhanera*, with notes on *Bacidia pauciseptata*. *Tropical Bryology* **13:** 141–173.

Lücking, R., Lumbsch, H. T. & Elix, J. A. (1994) Chemistry, anatomy and morphology of foliicolous species of *Fellhanera* and *Badimia* (Lichenized Ascomycotina: Lecanorales). *Botanica Acta* **107:** 393–401.

Puntillo, D., Bricaud, O. & Sérusiaux, E. (2000) A further locality with foliicolous lichens in Italy, with taxonomical and ecological data on foliicolous lichens in Western Europe. *Cryptogamie, Mycologie* **21:** 171–186.

Sérusiaux, E. (1993) New taxa of foliicolous lichens from western Europe and Macaronesia. *Nordic Journal of Botany* **13:** 447–461.

Vězda, A. (1983) Foliicole Flechten aus der Kolchis (West-Transkaukasien, UdSSR). *Folia Geobotanica et Phytotaxonomica, Praha* **18:** 45–70.

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