

## FOLIICOLOUS LICHENS FROM MADEIRA, WITH THE DESCRIPTION OF A NEW GENUS AND TWO NEW SPECIES AND A WORLD-WIDE KEY OF FOLIICOLOUS *FELLHANERA*

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**Abstract:** A preliminary annotated list of the foliicolous lichens and of their lichenicolous fungi occurring in the laurisilva in Madeira is presented. *Fellhaneropsis* Sérus. & Coppins gen. nov. is introduced to accommodate *Bacidia myrtillicola* Erichsen and *Bacidia vezdae* Coppins & James, both being present in Madeira on living leaves. Two new species are described: *Byssoloma kalbii* Sérus. sp. nov. and *Fellhanera seroexspectata* Sérus. sp. nov. The following combinations are introduced: *Fellhanera lambinonii* (Sérus.) Lücking & Sérus., *Fellhaneropsis myrtillicola* (Erichsen) Sérus. & Coppins, *F. vezdae* (Coppins & James) Sérus. & Coppins, *Woessia apiahica* (Müll. Arg.) Sérus., *W. canariensis* (Lumbsch & Vězda) Sérus. and *W. vasakii* (Vězda) Sérus. A key to all foliicolous species of *Fellhanera* is presented. *Bacidia buxi* Vězda & Vivant and *Bacidia gorgonea* Vězda & Poelt are reduced into synonymy with *Fellhaneropsis myrtillicola*, *Tapellaria similis* Kalb with *Byssoloma marginatum* (Arnold) Sérus., and *Bacidia michaeliana* Sérus. with *Bacidia lambinonii* Sérus.

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### Introduction

Madeira is a volcanic island in the North Atlantic Ocean, 565 km W of the African coast of Morocco and 32°45'N, 17°00'W. It is a serrated mountain range reaching 1861 m a.s.l. at the Pico Ruivo, and many deep rugged ravines run to the coast. Madeira belongs to the 'macaronesian' phytogeographical zone, together with the Canary Islands and the Azores, well known for its high level of endemism in flowering plants and for the persistence of an evergreen subtropical cloud forest, usually known as the laurisilva. In Madeira, this forest is best developed at 700-1200 m on the southern flank of the island and between 300 and 1300 m on the northern flank, if one includes the bushes dominated by *Erica arborea* and *Myrica faya* that top it on its higher parts. The tree and shrub flora (nomenclature following Hansen & Sunding 1993) is dominated by four species of Lauraceae (*Appolonias barbuiana* (Cav.) Bornm., *Laurus azorica* (Seub.) Franco, *Ocotea foetens* (Ait.) Baill., and *Persea indica* (L.) K. Spreng.), together with *Clethra arborea* Ait. (Clethraceae), *Myrica faya* Ait. (Myricaceae), *Ilex canariensis* Poir. (Aquifoliaceae), *Picconia excelsa* (Ait.) DC. (Oleaceae), *Heberdenia excelsa* (Ait.) Banks ex DC. (Myrsinaceae), *Euphorbia mellifera* Ait. (Euphorbiaceae), *Isoplexis sceptrum* (L. fil.) Loud. (Scrophulariaceae), *Erica arborea* L. (Ericaceae), *Vaccinium padifolium* J. E. Sm. ex Rees (Ericaceae) and several others. The ground layer is extremely rich in ferns, including several endemic species. The laurisilva represents the

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Miocene forests of southern Europe, which vanished during the glacial times of the Pleistocene period, and is therefore of tremendous ecogeographical interest.

Knowledge of the lichen flora of the island, as well as of the other islands of the archipelago, especially Porto Santo, has made great progress during recent years, the last contribution being that of Kalb & Hafellner (1992). That flora includes several endemics, e.g. *Nephroma areolatum* P. James & F. J. White for the main island, and *Anzia centrifuga* Haugan and several species of *Ramalina* for Porto Santo. A checklist has been prepared by Hafellner (1992) and is of great help for any study of the lichen flora of the archipelago.

Foliicolous lichens have been reported from the island (see Santesson 1952) and, in the framework of a thorough study of this ecological group in western Europe (Sérusiaux 1993), I visited the laurisilva in February 1988 and in May 1992 to gather comprehensive collections of these species. This paper deals with the first results of the study, and also includes collections made on the island by fellow botanists, especially L. Arvidsson, M. S. Christiansen, J. Duvalignaud, G. Een, J. Etayo, K. Kalb, H. Persson, S. Schuhmacher, C. Tavares and L. Tibell. This paper must, however, be considered as preliminary, as several taxa (at least three lichens and one lichenicolous fungus) have not yet been studied in detail and are not included in the list presented below. The study led to the reassessment of the generic position of *Bacidia myrtillicola* and of *Bacidia vezdae*, two species previously studied by my colleague and friend B. J. Coppins. He is therefore associated with the new genus described for them and to the two new combinations.

The laurisilva has suffered much damage from human activities since the discovery of the island early in the fifteenth century and is now very reduced and severely degraded. The best remnants were explored, the localities visited being: Ribeiro Frio, along the Levada do Furado, 800–850 m alt.; Portela, along the Levada de Portela, near Lamaceiros, 800 m alt.; Casa de Queimadas, track towards Caldeirão Verde, 850 m alt.; Chão do Louros, N of Encumeada pass, 800 m alt.; the Riba da Seixal, S of Seixal at 300–400 m alt.

Foliicolous lichens have been found on the following tree or shrub species: *Appolonias barbujana*, *Laurus azorica*, *Persea indica*, *Ocotea foetens*, *Picconia excelsa*, *Ilex canariensis*, *Heberdenia excelsa*, *Clethra arborea*, and on the following herbaceous plants growing at ground level: *Ruscus streptophyllus* P. F. Yeo (Liliaceae) and *Trichomanes speciosum* Willd. (Hymenophyllaceae). Several introduced species also have foliicolous species, e.g. *Camellia japonica* (Theaceae), when they are planted in suitable localities.

### The Genus

#### *Fellhaneropsis* Sérus. & Coppins gen. nov.

Thallus crustaceus, tenuis, sine cortice, et algas verosimiliter Chlorococcaceae continens. Ascوماتa apothecia, 0.1–0.4 mm diam., basi arcte constricta, cum margine tenui mox evanescenti. Excipulum tenue sed proprium, cum ellipticis et polyedralibus cellulis, in  $\pm$  verticalibus seriebus dispositis, typicam paraplectenchymaticam texturam non formantibus; hamathecium cum ramosis et anastomosantibus paraphysibus; asci ad *Byssoloma* typum (sensu Hafellner 1984: 315) pertinentes, octospori; sporae oblongae-fusifformes ad fere aciculares, cum transversalibus septis. Pycnidia longa filiformiaque conidia producentia, et (solum in *Bacidia myrtillicola*) parva bacilliformiaque.

Type: *Bacidia myrtillicola* Erichsen

*Thallus* crustose, thin, without cortex and with most probably a species of Chlorococcaceae as photobiont. *Ascomata* apothecia, 0.1–0.4 mm diam., distinctly constricted at their base, with a thin, soon disappearing margin. *Excipulum* thin but distinct, with elliptical to polyhedral cells, arranged in  $\pm$  upright rows, not forming a typical paraplectenchymatous tissue. *Hamathecium* of branched and anastomosed paraphyses. *Asci* of the *Byssoloma*-type (sensu Hafellner 1984: 315), 8-spored. *Ascospores* oblong-fusiform to almost acicular, with transverse septa. *Pycnidia* producing long and filiform conidia, and in addition (in *Bacidia myrtillicola* only) smaller bacilliform conidia.

*Bacidia myrtillicola* and *Bacidia vezdae* are obviously close to the genus *Fellhanera* Vězda in the Pilocarpaceae (Vainio) Zahlbr. (Vězda 1986). Both species here transferred to the new genus *Fellhaneropsis* share all typical characters of the Pilocarpaceae and could be referred to *Fellhanera*, as accepted by several authors. We consider, however, that their excipulum type (elliptical to polyhedral lumina,  $\pm$  arranged in rows) and their filiform-sigmoid conidia are good apomorphies that require the recognition of a different genus. *Fellhanera* s.str. includes species with a typically paraplectenchymatous excipulum (isodiametric cells), and bacilliform to ellipsoid, or pyriform-clavate conidia.

Most species of *Fellhanera* Vězda have pyriform-clavate conidia, as do the most common species in Europe (*F. bouteillei* (Desm.) Vězda and *F. subtilis* (Vězda) Diederich & Sérus.). The type species (*F. fuscata* (Müll. Arg.) Vězda), however, has bacilliform to mostly ellipsoid conidia (a feature not quoted by Vězda 1986: 201). This type of conidium is also present in *Bacidia myrtillicola* (microconidia; see below), but this species cannot be considered as congeneric with *F. fuscata* as the latter has a typically paraplectenchymatous excipulum and never produces filiform conidia (numerous collections seen, mainly from tropical Africa, LG). Indeed, the filiform-sigmoid conidia produced by both species here referred to the new genus are probably the best apomorphy for it, as well as the apothecial origin of the pycnidia producing them. This is clearly demonstrated for *Fellhaneropsis myrtillicola* in this paper and is strongly suspected for *F. vezdae*. This feature appears to be unique in lichenized fungi and clearly merit the generic status within the Pilocarpaceae. The genus *Badimia* Vězda, so far assigned to the same family, produces highly specialized pycnidia (campylidia) with extraordinary conidia (very long and filiform, multi-septate, with crooked ends and lateral appendages terminated by a tiny, sticky mass) (Sérusiaux 1986). The primordia of these campylidia are impossible to distinguish from those of apothecia and their ontogeny shows that they are transformed apothecia.

### The Species

#### ***Fellhaneropsis myrtillicola* (Erichsen) Sérus. & Coppins comb. nov.**

*Bacidia myrtillicola* Erichsen, *Mitt. Inst. Allg. Bot. Hamb.* 10: 414 (1939). *Fellhanera myrtillicola* (Erichsen) Hafellner, In Vězda, *Lich. Sel. Exs.* 95, No. 2358 (1989); type: Germany, Schleswig-Holstein, Lauenburg, im Sachsenwald bei Friedrichsruh, an *Vaccinium myrtillus* am Rande des Reviere Saupark, 2 xi 1924, C. F. E. Erichsen (HBG—holotypus!).

*Bacidia myriocarpa* Erichsen, *Mitt. Inst. Allg. Bot. Hamb.* **10**: 413 (1939); type: Germany, Schleswig-Holstein, Niedersachsen, Kreis Lüneburg, Findling im Frost Einemhof, bei Radburch, 14 iii 1937, *Lehr* (HBG—lectotypus!), selected by Jacobsen & Coppins 1989: 259).

*Bacidia nitschkeana* var. *perpusilloides* Erichsen, *Ann. Mycol.* **41**: 206 (1943); type: Germany, Schleswig-Holstein, Flenburg, Forst Clusries, near Wasserleben, on *Picea* twigs, 6 x 1923, C. F. E. Erichsen (HBG—holotypus!).

*Bacidia buxi* Vězda & Vivant, *Bull. Soc. Bot. Fr.* **119**: 256 (1972). *Fellhanera buxi* (Vězda & Vivant) Vězda, *Folia Geobot. Phytotax. (Praha)* **21**: 214 (1986); type: France, Dépt. Pyrénées-Atlantiques, Sauveterre-de-Béarn, île sur le gave d'Oléron, sur feuilles de *Buxus sempervirens*, 28 i 1972, *Vivant* (hb. Vězda-holotypus!; UPS—isotypus!, isotypi also distributed in Vězda *Lich. Sel. Exs.* No. 1161, BM, G, LG!).

*Bacidia gorgonea* Vězda & Poelt, in Poelt & Vězda, *Herzogia* **9**: 241 (1992); type: Österreich, Steiermark, Windische Bühel, enger W-E-verlaufender westlicher Seitengraben des Gamlitzbach-Tales, S Kranach, WSW Gamlitz, auf Nadeln von *Abies alba*, 6 x 1991, *Poelt & Giral* (GZU—lectotypus, selected here, see below!).

### (Figs 1–2)

Illustrations: Vězda & Vivant (1972: 257); Coppins (1983: 197, fig. 56A); Poelt & Vězda (1992: 245) and Arup & Ekman (1994: 37, fig. 3C & 39, fig. 4C).

*Thallus* formed of small roundish patches that eventually merge to form a continuous thallus up to several centimetres in diam., thin and smooth or slightly verrucose, or  $\pm$  convex and formed of agglutinated granules, especially when the thallus grows along the main vein of a leaf, or near the nodes of a twig or on a rough surface (rock or bark), greenish grey to bluish grey (the typical specimens have a distinct bluish tinge), usually with a bluish pellucid prothallus, best seen on foliicolous specimens, with a shiny green to dark green surface colour when invaded by epiphytic green algae and cyanobacteria. *Photobiont*: most probably a species of Chlorococcaceae, with spherical, green cells, 5–12  $\mu\text{m}$  diam. Thallus reactions: K – , C – , P – .

*Apothecia* usually numerous, sometimes absent, very rarely agglutinated and never proliferating, circular or rarely with a swollen or irregular edge, distinctly constricted at the base, 0.1–0.2 mm diam., mostly not exceeding 0.15 mm, exceptionally up to 0.3 mm diam., less than 0.1 mm in height, at first  $\pm$  flat and with a thin and pale but nevertheless distinct margin, soon convex and immarginate; disc pale brown to bluish grey, sometimes almost mauvish (some specimens show a patchwork of pale brown and bluish grey apothecia). *Excipulum* distinct but not exceeding 15  $\mu\text{m}$  in thickness, with elliptical polyhedral lumina, arranged in  $\pm$  upright rows, never forming a typical paraplectenchymatous tissue (isodiametric lumina), hyaline but with a brownish to greenish colour in the zone adjacent to the hymenium. *Hypothecium* less than 10  $\mu\text{m}$  thick, dark brown, K+ greenish brown to aeruginose green, usually with the K+ reaction restricted to the central and basal parts. *Hamathecium* of branched and anastomosed paraphyses, 1–1.5  $\mu\text{m}$  thick, much branched in the upper parts to form a densely interwoven network around the ascus tops and in the epithecium. *Asci* of the *Byssoloma*-type (sensu Hafellner 1984: 315), 30–40  $\times$  12–16  $\mu\text{m}$ , 8-spored. *Ascospores* oblong-fusiform, straight or slightly curved, sometimes deformed, rarely tapering towards one end, sometimes with a thin perispore, 3(–5)-septate, 16–25(–28)  $\times$  3–4  $\mu\text{m}$  (one spore seen reached 31  $\times$  4  $\mu\text{m}$ ), several times seen with germinating tubes at one end while in the asci.

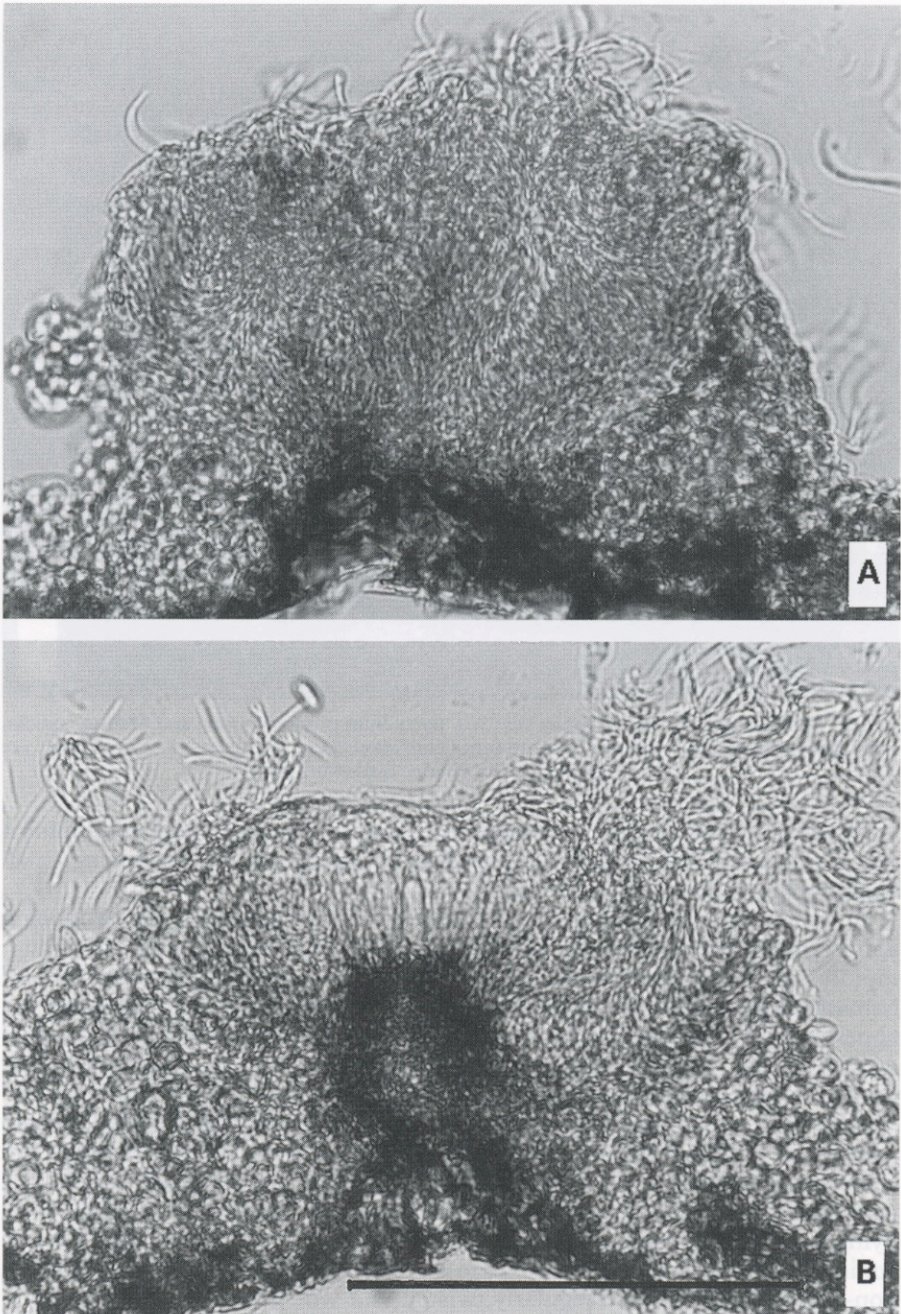


FIG. 1. *Fellhaneropsis myrtillicola* (Spier W5030), pycnidia producing long and filiform conidia, at their early stage of development in spore-producing apothecia. A, Marginal section; B, Radial section, a fully-developed ascus is clearly seen in the centre. Scale=0.1 mm.

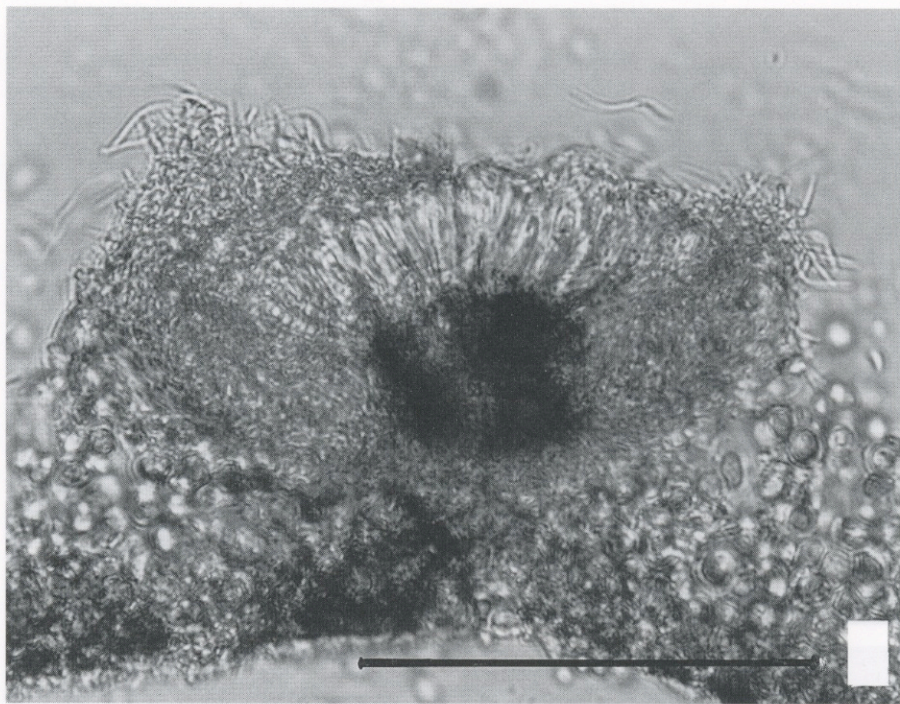


FIG. 2. *Fellhaneropsis myrtillicola* (Spier W5030), pycnidium producing long and filiform conidia, at its early stage of development in a spore-producing apothecium. Radial section; several asci are still producing ascospores. Scale=0.1 mm.

*Pycnidia* of two types: (i) usually present, producing long and filiform conidia (macroconidia) and (ii) abundant or totally absent, producing small bacilliform conidia (microconidia).

(i) Conidiogenous layer first appearing as a circlet deep in spore-producing apothecia, in the basal zone between the hypothecium and the excipulum, rapidly expanding and producing conidia, and ejecting the hymenium and hamathecium, which degenerate and finally disappear; some time after the appearance of the conidia, the upper part of the excipulum (=apothecial margin) starts growing upwards long, thin-walled hyphae, gently tapering towards their top and thus forming a vertical to oblique cylinder of 'palisadic' hyphae with a fimbriate rim at the top, and containing the conidia; mature pycnidia 0.1–0.15 mm diam. and up to 0.2 mm in height, but usually not exceeding 0.1 mm; in the best developed ones, the conidial mass is seen as a translucent ball under the dissecting microscope, whereas in eroded or in dying pycnidia, conidia and/or the 'palisadic' hyphae can be totally absent; conidiogenous cells elongate,  $10\text{--}20 \times 3\text{--}5 \mu\text{m}$ . *Conidia* long, filiform-sigmoid, non-septate, sometimes irregularly twisted and with a swollen end,  $20\text{--}45 \times 1\text{--}1.5 \mu\text{m}$ .

(ii) Sessile and globose, sometimes deformed, usually constricted at their base, 0.05–0.08 mm diam., sometimes with a glut of conidia at their apical

ostiole; wall green-brown to bluish green; conidiogenous cells carpeting the base of the pycnidium, elongated-polyhedral. *Conidia* rare or numerous, bacilliform to cylindrical, sometimes narrowly ellipsoid, often deformed (with swollen parts, irregularly bent),  $4\text{--}8 \times 0.5\text{--}1 \mu\text{m}$  (in some specimens, conidia reaching  $10\text{--}13 \times 1 \mu\text{m}$  are present, mixed with 'normal' ones).

*Notes:* *Fellhaneropsis myrtillicola* is usually difficult to detect on any substratum on which it can grow: it rarely forms a dominant feature of any community, its thallus is easily passed over as a dying crust and its apothecia are tiny and without any brightness of colour. The best criterion to identify it is to search for the pycnidia producing macroconidia. They are usually present and highly characteristic: the 'palisadic' hyphae in the pycnidia are, to our knowledge, unique for European and Macaronesian lichens.

Long, filiform-sigmoid conidia are not common in crustose lichens; there is a risk of confusion with the *Micarea peliocarpa*-group (Coppins 1983: 99 & 112), which also produce long and curved conidia and which can also have pale bluish apothecia with 3-septate ascospores. They are easily distinguished by their apothecium size (mostly over 0.2 mm diam., and reaching at least 0.4 mm diam.; such sizes are never reached in *F. myrtillicola*), by their excipulum (made of richly branched and anastomosing, radiating hyphae, never with elliptical-polyhedral lumina as in *F. myrtillicola*), by their thallus and apothecia reacting C+ red (production of gyrophoric acid, which is absent in *F. myrtillicola*) and by their pycnidia, not arising from apothecia and devoid of any 'palisadic' hyphae.

The species can also be confused with immature or foliicolous forms of *Byssoloma marginatum* (Arnold) Sérus.; the differences between these species are provided in the following paragraph, under the analysis of the epithet *gorgonea*.

#### Notes on the Use of the Epithets

—*myrtillicola*. This epithet was introduced simultaneously with *myriocarpa* by Erichsen and was adopted for the species dealt with here by Jacobsen & Coppins (1989: 258) on the basis of Art. 57.2 of the ICBN. It was erroneously used by Hafellner (in Vězda *Lich. Sel. Exs.* No. 2358 & 2359, 1989) and by Poelt & Vězda (1990: 389) for *Fellhanera subtilis* (Vězda) Diederich & Sérus. This error has been detected by Diederich *et al.* (1991: 3) and by Arup & Ekman (1994: 37–38). The type specimen of *Bacidia myrtillicola* has already been studied by Coppins (1983: 196).

This epithet has been scarcely used in the literature: apart from the examination of the Erichsen's original collections by Coppins (1983: 196) and by Jacobsen & Coppins (1989: 258–259), we have noted the records by Benfield (1992: 42; specimen checked), Jacobsen (1992: 78; one specimen seen), and by Arup & Ekman (1994; specimens examined).

—*myriocarpa*. I had the opportunity to study the type collection as well as the other specimen mentioned by Jacobsen & Coppins (1989: 259): 'Same locality [as the lectotype], 12 iv 1937, C. F. E. Erichsen' (HBG). *Bacidia myriocarpa* Vězda (Vězda 1975a: 123–124) is a later homonym, and is now regarded as a synonym of *Fellhanera rhapidophylli* (Rehm) Vězda.

—*perpusilloides*. B. J. Coppins (Coppins 1983: 196) has examined the lectotype and paratypes. A further specimen annotated *Bacidia nitschkeana* var. *perpusilloides* by Erichsen ('Kreis Lanenburg, an jungen Fichtenzweigen im Sachsenwald, 11 v 1924, C. F. E. Erichsen', HBG) has also been examined: it contains only *Fellhanera subtilis* and *Scoliciosporum chlorococcum* (Graewe ex Stenh.) Vězda.

—*buxi*. The type collection is plentiful and I have been able to examine several parts of it; moreover I visited the locality in 1985 and again in 1989, together with P. W. James, F. Rose and J. Vivant. This population shows all the characters of *Fellhaneropsis myrtillicola*: thallus, apothecia and both types of pycnidia. Some isotypes distributed in the Vězda *Lich. Sel. Exs.* may be disconcerting as they exuberantly produce apothecia that are pale brown and lack the typical bluish tinge of the species; moreover in such specimens, the pycnidia with filiform conidia are absent. Otherwise, the collections gathered in this locality are typical.

A great deal of confusion is present in the literature concerning the use of this epithet: the specimens mentioned under this name from Tenerife (Lumbsch & Vězda 1992: 25) belong to *Fellhanera christiansenii* Sérus. & Vězda (see below); those mentioned from S Austria (Poelt & Vězda 1992: 243; specimens seen, GZU!) are typical *Fellhanera subtilis*, and those reported from the western Caucasus (Vězda 1983: 63; specimens seen, LG and hb. Vězda!) belong to a further, still undescribed species of *Fellhanera*. Indeed, these Caucasian specimens have a typical paraplectenchymatous excipulum and pyriform to obclavate conidia. E. Sérusiaux will deal with this taxon as soon as its relationships with a foliicolous population of a puzzling *Fellhanera* from Spain/Cataluña are solved. The material mentioned from Costa Rica by Lücking (1992: 136; Costa Rica, *Lücking* 88-158, hb. Lücking!) is too scanty for a definite identification but there is no doubt it is not *Fellhaneropsis myrtillicola*. *Fellhanera buxi* has also been reported in very small quantity on *Calluna* stems in Ireland (McCarthy *et al.* 1985: 96) but the material received on loan (1978, M. G. C. Schouten, GALW!) does not contain this species.

Associate foliicolous species at the type locality include: *Woessia chloroticula* (Nyl.) comb. ined. (= *Bacidia chloroticula* (Nyl.) A. L. Sm.), *Byssoloma leucoblepharum* (Nyl.) Vainio, *Fellhanera bouteillei* (Desm.) Vězda with *Wentomyces lichenicola* (Hansf.) D. Hawksw. subsp. *bouteillei* Bricaud *et al.* (Roux *et al.* 1994: 473) growing on its thallus, *Porina hoehneliana* (Jaap) R. Sant., *P. leptosperma* Müll. Arg. and *P. oxneri* R. Sant. Phorophytes are cladodes of *Ruscus aculeatus*, leaves of *Buxus sempervirens* and of introduced species of *Elaeagnus* and of *Diospyros*. *Fellhaneropsis myrtillicola* grows on leaves of *Buxus* and of *Elaeagnus*.

—*gorgonea*. The type collection (GZU!), which is plentiful and covers rather large parts of needles and twigs of *Abies*, is a mixture of *Byssoloma marginatum* (Arnold) Sérus. and of *Fellhaneropsis myrtillicola*. The original description (Poelt & Vězda 1992: 241-242) is based on the *Byssoloma* for the apothecia and on the *Fellhaneropsis* for the pycnidia. The only pycnidia present (with macroconidia) are very typical of *F. myrtillicola* and show almost all stages between immature ones and 'fully-mature' ones with a glut of macroconidia



raised between the typical walls of the species' pycnidia, including the circlet of elongate thin-walled hyphae (named 'Palisaden-Hyphen' by Poelt & Vězda; their fig. 1, pv is an old, collapsing pycnidium).

Two different types of apothecia are present: those of *F. myrtillicola*, distinctly constricted at their base, with almost immarginate,  $\pm$  convex, pale bluish and sometimes pale brown discs, and those of *B. marginatum*, almost sessile, with flat, clearly marginate ( $\pm$  swollen, livid pale bluish grey), and bluish grey discs. Sections of the apothecia of both species are very similar, especially as the asci both belong to the *Byssoloma*-type (sensu Hafellner 1984: 315) and as the hypothecium pigment is closely related (K+ greenish brown to green-aeruginose in *F. myrtillicola* and K+ dark aeruginose, or greenish brown to purple-brown in *B. marginatum*). Only a detailed study can give prominence to the differences: in *F. myrtillicola*, the excipulum is made of hyphae with elliptical to polyhedral lumina,  $\pm$  arranged in upright rows (in squash preparations, it is usually possible to see fragments that can be described as paraplectenchymatous) while in *B. marginatum*, the excipulum is made of tightly interwoven hyphae that separate with difficulty in a KOH solution. In the type collection, the original authors have separated an *Abies* needle with typical apothecia of *B. marginatum* in a small envelope, labelled as 'Holo'. They describe the excipulum as 'prosoplektenchymatisch, die strahlig angeordneten Hyphen dicht meist ungeteilt', which clearly points to *B. marginatum*, and their description of the ascospores ('oft schlecht entwickelt, ellipsoid oder ellipsoid-spindelrig, oft an einem Ende verschmälert, 3-, selten 1-septiert,  $14-18 \times 3-3.5 \mu\text{m}$ ') is a perfect one for young stages of *B. marginatum*. Indeed, this usually corticolous species normally produces rather large apothecia (up to  $0.5-0.7 \text{ mm}$  diam.) with ellipsoid, straight or hardly curved, 3-septate ascospores, measuring when fully mature  $20-22 \times 4-5 \mu\text{m}$ . However, the species is also follicolous (especially in Madeira) and then rapidly produces apothecia with ascospores that are 1-3-septate,  $\pm$  curved, attenuated at one end and measure  $12-18 \times 3-4 \mu\text{m}$ . Field experience of that species in Madeira shows that this is only an immature stage. The ascospores of *F. myrtillicola* very quickly reach their final septation and dimensions, and are oblong-fusiform, straight or slightly curved, rarely tapering towards one end, 3(-5)-septate,  $16-25(-28) \times 3-4 \mu\text{m}$ ; usually there is no problem in distinguishing between both species on the basis of mature ascospores.

Poelt & Vězda (1992) obviously based their new species on the pycnidia producing long and filiform conidia. In spite of their marking of an *Abies* needle with apothecia of *Byssoloma marginatum* as the holotype, we lectotypify the epithet *gorgonea* on the apothecia and pycnidia of the species named *Fellhaneropsis myrtillicola* in this paper. This decision is in accordance with art. 9.10 of ICBN. However, we could have decided to follow Rec. 9 A.3 of ICBN and lectotypify the epithet on the material marked as 'holotype'; in this case, *Bacidia gorgonea* would have become a synonym of *Byssoloma marginatum* (Arnold) Sérus.

Pending a final decision on the status of *myrtillicola*, *buxi* and *gorgonea*, E. Sérusiaux has used this latter epithet to name specimens from southern France submitted to him by Dr C. Roux. They have been published under that name (Bricaud *et al.* 1993: 100).

—*Lecidea quintula* Ny., *Flora* 48: 5 (1865). Type: France, Brest, on stem of *Calluna*, Crouan (H-NYL 19061, 19062 & 19063—syntypi!).

Dr C. Printzen kindly drew my attention to this forgotten name and arranged for the loan of the syntypes preserved in H. All syntypes contain fragments of a species that might be *Fellhaneropsis myrtillicola*. A short description follows: thallus thin, greyish; apothecia 0.16–0.35(–0.4) mm diam., convex and without margin, dark brown to black; excipulum of outwardly radiating hyphae with polyhedral lumina; hypothecium brown, with a K+ olivaceous reaction; hamathecium of branched and anastomosed paraphyses; asci of the *Byssoloma*-type; ascospores oblong-fusiform, 3–5-septate, with a thin perispore, 20–26 × 3–4(–4.5) µm, some with a germinating tube.

This description clearly points to *Fellhaneropsis myrtillicola*, except for a few details regarding the apothecia (size and colour). I do not know of any other European species with *Byssoloma*-type asci and such long ascospores to which these collections may be referred, and their ecology (epiphytic on *Calluna* stem) is compatible with that of *F. myrtillicola* (see below). I have, however, refrained from using this epithet (which is much older than *myrtillicola*) for the following reasons: the type material is very scanty and obviously badly preserved, and does not allow a thorough investigation; no pycnidia can be found on them (macroconidia are definitely the best criterion to identify *F. myrtillicola*); the colour of the apothecia and of the thallus are not typical of the species (but these features might be explained by the bad preservation of the material); the apothecia size is abnormal for the species (but this may be explained by its growing on a much more stable substratum than twigs and leaves); and the flora of *Calluna* stems in Brittany is very poorly documented and may yield further, little studied species. I have, therefore, decided to wait until fresh data on this flora are available to decide upon the status of *Lecidea quintula* Nyl.

The syntype H-NYL 19061 also contains fragments of *Byssoloma subdiscordans*, and H-NYL 19062 has poor but typical (apothecia and pycnidia) *B. marginatum*. As the protologue says that the ascospores are 5-septate and measure 21–25 × 5–6 µm, it is clear that Nylander was not dealing with these two species in describing *Lecidea quintula*.

*Fellhaneropsis myrtillicola*, as circumscribed in this paper, is a widespread but overlooked species. It is now known from western and central Europe, and from Macaronesia. I expect that more attention to this tiny species will demonstrate that it is not rare in suitable habitats. As is the case with several other 'foliicolous' lichens, such as *Fellhanera bouteillei*, *Fellhaneropsis myrtillicola* is a weak competitor but is able to proliferate on quite different substrata in very different habitats, including semi-natural disturbed ones.

It is known on acidic rocks in W England and N Germany (Jacobsen 1992: 78), in shaded and humid environments. It grows on *Vaccinium* twigs in dense thickets at forest margins or inside forests in S Sweden (see Arup & Ekman 1994 for more details) and in the Belgian Ardennes. In central Germany, it has recently been found in *Calluna* twigs in a cemetery, which clearly shows that the species is able to invade highly artificial habitats. It is also present on *Abies*

twigs in hilly or mountainous areas of Germany, Austria and of Calabria in southern Italy; its ecology in such habitats is thoroughly described by Poelt & Vězda (1992). It is also present on *Buxus* leaves and twigs in S Belgium, in southern (s. lat.) France and in the eastern parts of the Spanish Pyrenees. In Belgium, the locality is the last remnants of *Buxus* shrubs at the bottom of a humid, shaded valley (a more detailed account of this fascinating site is in preparation by P. van den Boom and E. Sérusiaux), while in France and in Spain, it tolerates drier and fluctuating conditions in the summer but nevertheless requires a very humid atmosphere at certain periods of the year, at least during winter (O. Bricaud is studying the ecological conditions of the numerous sites with a foliicolous lichen flora in Provence/France). In the laurisilva of Tenerife and Madeira, it develops only small, dispersed and ill-looking thalli; it is obviously unable to compete with the most common foliicolous species (*Byssoloma* and *Fellhanera* species) and is sometimes the only species present, usually along the main vein, together with *Gyalectidium colchicum*, which grows mainly on the leaf surface.

*Additional specimens examined:* **Sweden:** *Västergötland*, *Kinnarunna* par.: Flenstorp, mixed coniferous-deciduous forest, on twigs of *Vaccinium myrtillus*, viii 1993, *Arup & Ekman* (LD). *Småland*, *Annerstad* par.: V. Ringbergsholmen, small islet of damp *Picea-Populus* forest in a large bog, on twigs of *V. myrtillus*, vi 1993, *Arup & Ekman* (LD); *Hemmesjö* par.: c. 200 m SSW of Vitarör, on small twigs of *Frangula alnus* in a rather old *Picea* forest, vii 1993, *Arup* (LD); 650 m NW of Fridhem, E of Store mosse, old coniferous forest, on twigs of *V. myrtillus*, iii 1994, *Arup* (LD); c. 500 m S of Vitarör, rather old *Picea* forest, on twigs of *V. myrtillus*, vi 1993, *Arup* (LD). *Skåne*, *Örkened* par.: Nytebodaskogen, at Lommagylet, old *Picea* forest, on twigs of *V. myrtillus*, xii 1993, *Ekman* (LD).—**Germany:** See type collections *Bacidia myriocarpa* and of *Bacidia nitschkeana* var. *perpusilloides*. 'An Zweigen junger Fichten am Nordosthange der Kalkenberges, bei Klängenfurt', s.d., *J. Steiner* (B); another specimen is preserved in B but the label is illegible. Feldweg zwischen Emkendort und Brux, an Steinen auf einem flachen, erdbebedeckten Blockwall am Waldrand sowie an Steinem unmittelbar auf den Waldboden, iv 1989, *Jacobsen* 6122 (E). Nord-Niedersachsen, LK Harburg, cemetery in Lübberstedt, on *Calluna* twigs, ix 1994, *G. Ernst* s.n. (E).—**Great Britain:** *N Devon*, v.c. 4: Oakford, near Spurway Baston, Combe Water, on top of a stream boulder, 1992, *Benfield* s.n. (E).—**Netherlands:** Den Treek, 4 km SE of Amersfoort, on *Vaccinium myrtillus*, ii 1994, *Spier* W5030 (hb. Spier).—**Belgium:** *Namur* prov.: Waulsort, Fonds des Vaux, small wooded valley with mature *Buxus sempervirens*, on twigs and leaves of *Buxus*, 14 iv 1993, *van den Boom* 13871 (hb. van den Boom); *ibid.*, vi 1994, *Sérusiaux* s.n., *Diederich* 4996 & *van den Boom* (LG, hb. Diederich). *Luxembourg* prov.: Anlier, rivulet 'Fond du Gris Boffet', shrubs of *Calluna vulgaris* and of *Vaccinium myrtillus* by a disused meadow, on twigs of *Calluna* and *Vaccinium*, x 1988, *Sérusiaux* 10246a (LG).—**Austria:** see type collection of *Bacidia gorgonea*.—**France:** see type collection of *Bacidia buxi*. *Dépt. Isère:* Cognin-les-Gorges, Gorges de Nant, dense wood with *Buxus sempervirens* and *Corylus avellana*, on leaves of *Buxus*, viii 1986, *Sérusiaux* s.n. (LG). *Dépt. Aveyron:* Gorges of the Lot, along the road to Issac and Florentin-la-Chapelle, dense wood with *B. sempervirens*, on leaves of *Buxus*, viii 1986, *Sérusiaux* s.n. (LG). *Dépt. Pyrénées-Occidentales:* Sauveterre-le-Béarn, île sur le Gave d'Oloron, disturbed forest with mature *B. sempervirens*, on leaves of *Buxus*, vii 1985, *Sérusiaux* s.n. (LG); *ibid.*, on leaves of *Buxus* and of *Elaeagnus*, vii 1989, *Sérusiaux* s.n. with *James, Rose & Vivant* (LG) (type locality of *Bacidia buxi*); Ste-Engrâce, Gorges of Ujarre, mixed vegetation with *B. sempervirens* and *Corylus avellana*, on leaves of *Buxus*, 18 vii 1991, *Diederich & Etayo* (LG). *Dépt. Vaucluse:* Méthamis, 'vallon Peynier', dense shrubs of *B. sempervirens* in a disturbed wood, on leaves of *Buxus* 3 v 1989, *Roux* s.n. with *Bricaud & Clauzade* (MARSSJ, LG); *ibid.*, vii 1993, *Sérusiaux* s.n. with *Bricaud & Roux* (LG); Petit Lubéron, Ménherbes, small valley E of Mau Vallon, dense shrubs of *B. sempervirens* in a *Quercus pubescens* wood, on leaves of *Buxus*, vii 1993, *Sérusiaux* s.n. with *Bricaud & Roux* (LG); Petit Lubéron, Sivergues, Chantebelle, 'vallon de l'enfer', dense shrubs of *B. sempervirens*, on leaves of *Buxus*, vii 1993, *Sérusiaux* s.n. with *Bricaud & Roux* (LG).—**Spain:** *Cataluña*, *Girona* prov.: Oïx, Riera d'Oïx, forest with *B. sempervirens* and *Quercus pubescens*, on leaves of *Buxus*, ii 1991, *Etayo* (hb. Etayo, LG).—**Italy:** *Calabria:* Vibo Valentia,

Serra San Bruno, nel Bosco di Santa Maria, on needles of *Abies*, iv 1993 and vi 1993, *Puntillo* s.n. (LG).—**Madeira:** Along the levada between Ribeiro Frio and Lombo Capitão Mormo, on leaves of Lauraceae, vi 1952, *H. Persson* 98 (S); Ribeiro Frio, along the levada de Portela, disturbed laurisilva along the river, on leaves of Lauraceae and of an unknown introduced shrub, ii 1988, *Sérusiaux* s.n. (LG, 2 specimens); Chão do Louros, N of Encumeada pass, disturbed laurisilva, on leaves of *Clethra arborea*, ii 1988, *Sérusiaux* s.n. (LG); Chão do Louros, little disturbed laurisilva, on fronds of *Trichomanes speciosum*, v 1992, *Sérusiaux* s.n. (LG); Casa das Queimadas, track to Caldeirão Verde, ± disturbed laurisilva, on Lauraceae, v 1992, *Sérusiaux* s.n. (LG); Riba do Seixal, S of Seixal, pristine laurisilva, on leaves of Lauraceae, v 1992, *Sérusiaux* s.n. (LG).—**Canary Islands:** *Tenerife:* Montaña de Anaga, near Pico del Inglés, laurisilva, on leaves of *Ilex canariensis*, xii 1978, *Arvidsson* s.n. (GB).

***Fellhaneropsis vezdae* (Coppins & James) Sérus. & Coppins comb. nov.**

*Bacidia vezdae* Coppins & James, *Lichenologist* 10: 190 (1978). *Fellhanera vezdae* (Coppins & James) V. Wirth, *Die Flechten Baden-Württembergs*: 511 (1987).

Type: Great Britain, England, West Sussex, Midhurst, ad corticem *Querci*, 8 December 1970, Coppins & Rose s.n. (BM—holotypus!).

Illustrations: Coppins & James (1978: 192, fig. 2).

A thorough description of this species is provided by Coppins & James (1978: 190–194). There is no doubt that this species is congeneric with *myrtillicola* as it has the same type of ascus structure, of ascospores and conidia. The main differences are the colour of its apothecia (livid brown to pinkish brown versus bluish to pale brown in *myrtillicola*) that frequently become tuberculate (very rarely in *myrtillicola*), the absence of any K reaction in the hypothecium (usually K+ greenish brown to green-aeruginose in *myrtillicola*), the septation and the size of its ascospores [(3–)5–7, 30–35(–42) × 3–4.5 µm versus 3(–5), 16–28 × 3–4 µm in *myrtillicola*]. The relationships between both species were already highlighted by Coppins (1983: 196; under *Bacidia nitschkeana* var. *perpusilloides*).

Although many collections were carefully examined, we are not able to demonstrate, as is the case in *Fellhaneropsis myrtillicola*, that the pycnidia arise within ascospore-producing apothecia and that the ‘excipulum’ elongate to form a circlet of raised hyphae around the ostiole. There are however clues that the pycnidia of *F. vezdae* derive from apothecia: the pycnidial wall has the same structure as the excipulum and the same pale brown K – pigment, and well-preserved pycnidia have a ‘fimbriate rim’ (as already pointed by Coppins & James 1978: 191).

*Fellhaneropsis vezdae* is known from western and central Europe (Purvis *et al.* 1992: 112), usually growing on bark, and more rarely on bryophytes, other lichens or rock. It usually occurs in shaded habitats and tolerates a moderately polluted atmosphere. In Madeira, this species has been found several times in the laurisilva, but always in small quantities on living leaves, including *Trichomanes speciosum* fronds. It has just been reported from Madeira by Kalb & Hafellner (1992: 64) growing on branches of *Erica arborea*.

***Byssoloma kalbii* Sérus. sp. nov.**

Foliicola *Byssoloma* species insignis apotheciis minutissimis et albidis, hypothecio hyalino et pycnidiis albidis.



FIG. 3. *Byssoloma kalbii* (holotype), thallus with apothecia and pycnidia on frond of *Trichomanes speciosum*. A, General view; B, Young apothecia; C, Ripe apothecium with marginal pycnidia. Scale=1 mm.

Type: Portugal, Madeira, S of Seixal, Riba do Seixal, alt. 300–400 m, little disturbed laurisilva, on fronds of *Trichomanes speciosum* growing on the ground, May 1992, Sérusiaux s.n. (LG—holotypus).

*Thallus* epiphyllous, farinose but rather compact, with an irregular surface, matt, pale green with tinges of yellow or blue,  $\pm$  continuous over the leaf surface. *Photobiont*: most probably a species of the Chlorococcaceae, with spherical, green cells, 5–12  $\mu\text{m}$  diam.

*Apothecia* usually numerous, sometimes absent, circular when young, eventually becoming lobulate, with an irregular edge, 0.15–0.2(–0.3) mm diam., less than 0.1 mm in height, without any distinct margin, disc very pale to pale brownish orange, almost white when young; becoming brownish when old, flat or convex. *Excipulum* poorly developed, best seen in young apothecia, almost absent in older ones, hyaline and without crystals, made of a loose network of branched and anastomosed hyphae, cells without any swelling at the margin. *Hypothecium* hyaline, less than 10  $\mu\text{m}$  thick. *Hamathecium* of branched and anastomosed paraphyses. *Asci* of the *Byssoloma*-type (sensu Hafellner 1984: 315), 35–45  $\times$  10–15  $\mu\text{m}$ , 8-spored. *Ascospores* ellipsoid, 3-septate, not constricted at their septa, with a distinct gelatinous halo, 10–14  $\times$  2.5–4  $\mu\text{m}$ .

*Pycnidia* always numerous, sessile, globose, usually distinctly constricted at their base, 0.1–0.15 mm high, 0.05–0.1 mm diam., sometimes with a spherical glut of conidia at their apical ostiole, wall white to very pale brown. *Conidia* numerous, bifusiform to slightly clavate, 4–5  $\times$  1–1.5  $\mu\text{m}$ .

*Byssoloma kalbii* belongs to a small group of foliicolous *Byssoloma* species with tiny apothecia almost devoid of a margin and with 3-septate ascospores. These species are weak competitors and are usually present in atypical niches, such as the leaf margins or the fronds of fragile ferns, or at early stages of the colonization of leaves by foliicolous organisms. *Byssoloma kalbii* is easily distinguished from related species by the very pale apothecia, hyaline hypothecium and the abundant, white globose pycnidia.

The related species are (Vězda 1975b: 426–427, Kalb & Vězda 1990: 445–447, Barillas & Lücking 1991: 314, Lücking 1992: 143):

—*Byssoloma subpolychromum* Vězda, known from Africa/Tanzania and Zaïre and from 'Amerika' (fide Vězda 1987: 74, but not mentioned in Kalb & Vězda 1990), and which has pale brown to brown apothecia, 0.3–0.5 mm diam. and a dark brown hypothecium. Pycnidia are also abundant and have a dark brown wall.

—*Byssoloma minutissimum* Kalb & Vězda, widespread in Brazil, also found in Guatemala and Costa Rica, and which has pale ochre apothecia, 0.15–0.2 mm diam. and a brown hypothecium. Pycnidia have not yet been found in this species.

Further data about species of *Byssoloma* with tiny apothecia and hardly distinct excipulum not producing any crystals can be found in Farkas & Vězda (1993: 324).

*Byssoloma kalbii* is known from only one locality in Madeira, where it colonizes the fronds of the fern *Trichomanes speciosum*, growing on the ground; other foliicolous species present on the same phorophyte are *Byssoloma leucoblepharum* and *Porina leptosperma*. The Riba do Seixal shelters the best

stand of laurisilva studied so far on Madeira; it is located at the lowest elevation seen for remnants of the laurisilva on the island.

This new species is dedicated to Dr K. Kalb from Neumarkt (Germany) who, together with Prof. J. Hafellner, recently made an important contribution to the lichen flora of Madeira (Kalb & Hafellner 1992), including the description of several new taxa.

***Fellhanera seroexpectata* Sérus. sp. nov.**

Foliicola *Fellhanera* species insignis thallo cum citrinis sorediis.

Type: Portugal, Madeira, Casa de Queimadas, alt. 850–900 m, track towards Caldeirão Verde, degraded laurisilva, on leaves of Lauraceae, mainly *Laurus azorica* and *Persea indica*, v 1992, Sérusiaux s.n. (LG—holotypus).

(Fig. 4)

*Thallus* epiphyllous, in the best preserved material formed of very tiny flattened greenish granules, tightly pressed against each other and forming a rugose surface when seen under high magnification ( $40\times$ ), more loosely arranged at the thallus margin where they are separated by a photobiont-free whitish prothallus, usually dark green but sometimes greyish to pale brown, sometimes almost absent or reduced to a thin uniform film. *Photobiont* most probably a species of Chlorococcaceae, with spherical, green cells, 6–12  $\mu\text{m}$  diam. *Soralia* always present, circular, 0.2–0.3(–0.4) mm diam., usually distributed all over the thallus, but sometimes almost confluent in its centre or irregularly arranged at its margins, rarely dissolving into a soredial mass that spreads over the thallus surface, flattened or slightly convex, in the best preserved material distinctly crateriform with a thin membrane maintaining the soredia together, citrine to greenish yellow when fresh, becoming more greenish when dry and almost losing any colour in old herbarium specimens (then dirty white). Soredia farinose, formed of several (2–10) glomerules, each containing one algal cell when young (10–15  $\mu\text{m}$  diam.) and up to 10 when older (15–20  $\mu\text{m}$  diam.) surrounded by globose or cylindrical hyphal filaments, with a few short hyphal projections, without any pigmentation or crystals.

*Apothecia* very rare, circular, 0.2–0.3(–0.5) mm diam.,  $\pm 0.15$  mm in height, flat or slightly convex, with a dark brown disc, with a reddish hue and a non-prominent but persistent, paler margin. *Excipulum* well-developed, typically paraplectenchymatous, hyaline in sections, 50–60  $\mu\text{m}$  thick under the hypothecium and less than 30  $\mu\text{m}$  in lateral parts. *Hypothecium* brownish, slightly reddish, without any reaction in K. *Hamathecium* of coherent, simple or rarely branched paraphyses, slightly swollen at the spices, some of them containing the pigment present in the hypothecium. *Asci* of the *Byssoloma*-type (Hafellner 1984: 315), 50–60  $\times$  15  $\mu\text{m}$ , 4–8-spored. *Ascospores* ellipsoid or nearly cylindrical, with rounded ends, 3–(4)-septate, not or very slightly constricted at the septa (even in a 10% KOH solution), with a thin gelatinous halo (best seen in KOH solution), (16–)19–22  $\times$  5–7  $\mu\text{m}$ .

*Pycnidia* very rare, sessile, globose, slightly constricted at their base, 0.1–0.2 mm diam., wall dark bluish brown. *Conidia* usually numerous, bacilliform to ellipsoid but often deformed, sometimes slightly curved, 5–8  $\times$  1–1.5  $\mu\text{m}$ .

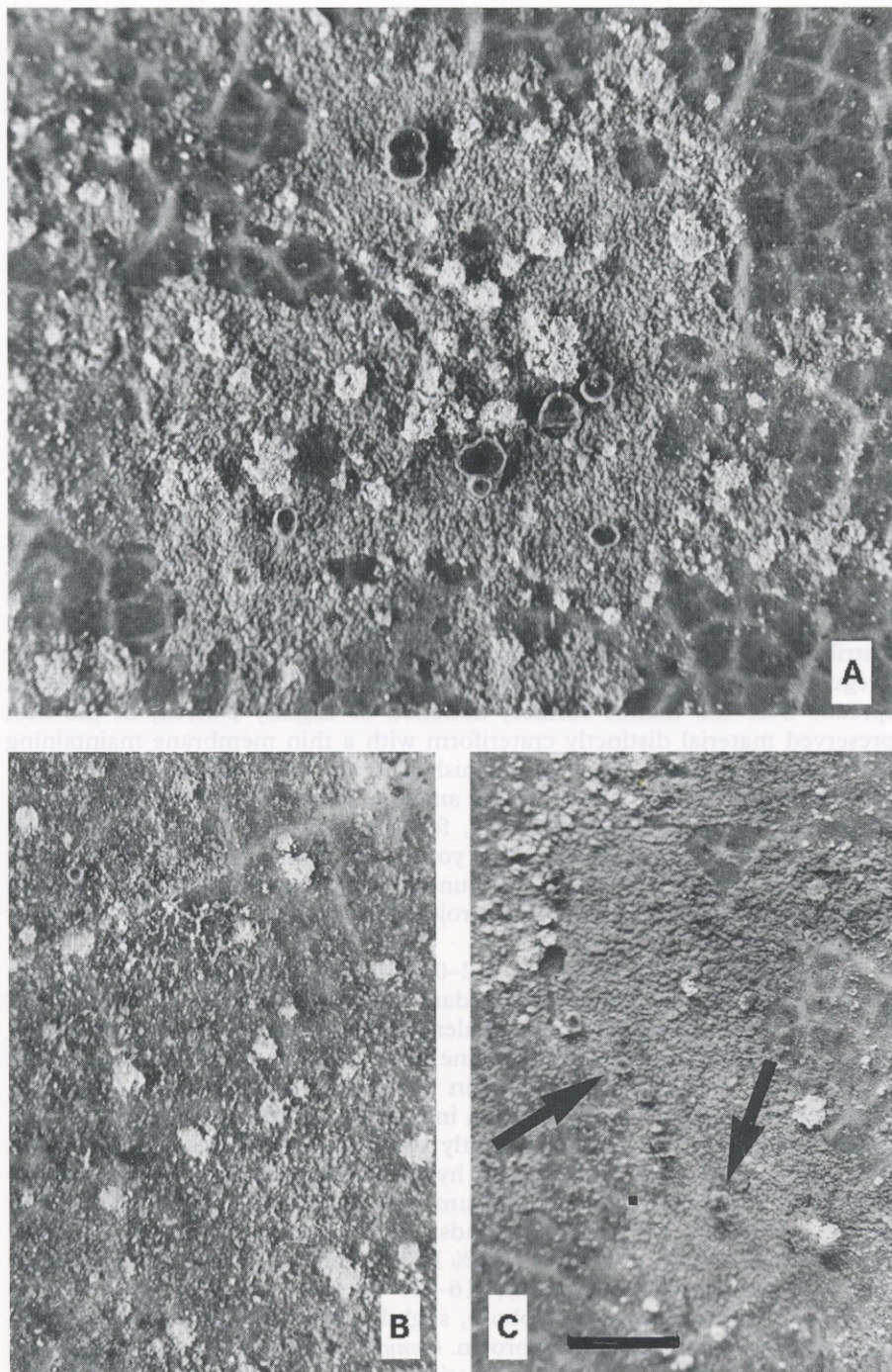


FIG. 4. *Fellhanera seroexpectata* (holotype). A, Thallus with apothecia and soredia; B, Sterile thallus; C, Thallus with pycnidia (arrows) and soredia. Scale=1 mm.



This new species clearly belongs to *Fellhanera* and is easily distinguished by the presence of soredia, a rare feature in foliicolous lichens. Although uncommon, it is easily detected in the field or in fresh material by its citrine or greenish yellow discrete soralia. The pigment that gives this characteristic colour has not been identified but the soralia do not react with K, C or P. The soredia can be described as consoredia as understood by Tønsberg (1992: 34–37) as each of them consists of aggregated glomerules made of algal cells surrounded by globose to cylindrical hyphae. Although it could apply for each glomerule, the term gonocyst is avoided as it has been used for many different structures in the literature and I have suggested it should be restricted to the diaspores produced in some foliicolous *Opegrapha* species (Sérusiaux 1985). A comprehensive key to all described foliicolous species of *Fellhanera* is provided below.

*Fellhanera seroexpectata* is known only from Madeira where it is reported from several laurisilva localities on the island. It does not require undisturbed forests as I collected it at Ribeiro Frio in a severely degraded spot near the tourist compound. It is not common but is usually seen as sterile thalli with scattered yellowish soredia. I first found this species in 1978 when examining a small collection of foliicolous lichens gathered at Ribeiro Frio by J. Duvigneaud, a Belgian botanist; the specimen has only three apothecia and did not provide enough material for a good type specimen. I had to wait until May 1992 to find a suitable specimen; from my point of view, the epithet chosen to describe this attractive species (*seroexpectata*) is therefore appropriate.

*Additional specimens examined:* **Madeira:** Ribeiro Frio, alt. 850 m, on *Ruscus streptophyllus*, vii 1975, J. Duvigneaud 75.M.696 (LG); *ibid.*, on leaves of *Laurus azorica*, xii 1979, Arvidsson (GB); *ibid.*, ii 1988 and v 1992, Sérusiaux s.n. (LG, 3 specimens); Chão de Louros, N of Encumeada pass, alt. 800 m, ii 1988 and v 1992, Sérusiaux s.n. (LG, 3 specimens); Riba da Seixal, alt. 300–400 m, v 1992, Sérusiaux s.n. (LG).

### Key to the Foliicolous Species of *Fellhanera*

This key deals only with foliicolous species of *Fellhanera* Vězda, a typical representative of the Pilocarpaceae. The main apomorphy of this family, best represented in tropical and subtropical areas, is its ascus type, known as the *Byssoloma*-type (see Hafellner 1984: 315).

Within the family, *Fellhanera* is characterized by the paraplectenchymatous structure of its excipulum: solely species with such an excipulum are accepted in the genus and therefore included in the key. The only exception is *F. stanhopeae*, the excipulum structure of which is impossible to distinguish as it is filled with crystals. Both species of *Fellhaneropsis* are, however, included for the absence of pycnidia may entail some confusion. Indeed the key is based on easily observable characters.

The relationships between *Fellhanera* and *Badimia* Vězda, a genus suspected to belong to the Pilocarpaceae (Sérusiaux 1986: 6), are studied in detail by Lücking *et al.* (1994). Species that were mentioned as 'ad int.' by Lücking (1992: 136–138) and not formally described are not included in the key. I expect that many more species, either foliicolous or corticolous, will be discovered in the future, especially in tropical regions.

- 1 Ascospores 1-septate . . . . . 2  
 Ascospores with at least 3 septa . . . . . 7
- 2(1) Pycnidia blue-grey, with a long beak, 0.15–0.3 mm long; apothecia  
 0.15–0.5 mm diam., with a beige-brown to chocolate-brown disc  
 and a persistent, beige, hardly prominent margin; ascospores  
 9–12(–13) × 4–5 µm. Africa (Zimbabwe) . . . . .  
*Fellhanera vandenberghenii* (Sérus.) Vězda  
 Pycnidia, if present, without a long beak . . . . . 3
- 3(2) Apothecia black or brownish black, with a hardly distinct margin,  
 0.2–0.25 mm diam.; epithecium with dark granules; ascospores  
 10–12 × 3.5–4.5 µm. Africa (Zaire) . . . . .  
*Fellhanera encephalarti* (Vězda) Vězda  
 Apothecia not black, or, if dark brown, without any dark granules in  
 the epithecium, with or without a distinct margin . . . . . 4
- 4(3) Ascospores not exceeding 12 × 2.5 µm . . . . . 5  
 Ascospores when mature always exceeding 12 × 2.5 µm . . . . . 6
- 5(4) Apothecia very small, 0.08–0.2 mm diam., whitish to pale yellow,  
 usually without any margin; hypothecium hyaline; ascospores  
 6–11 × 2.5 µm. South America (Brazil) and Africa (Guinea) . . . . .  
*Fellhanera parvula* (Vězda) Vězda  
 Apothecia larger, 0.2–0.4 mm diam., brownish red to dark brown,  
 with a pale yellowish brown margin; hypothecium dark brown;  
 ascospores 6–10 × 1.5–2 µm. Africa (Tanzania) . . . . .  
*Fellhanera congesta* (Vězda) Vězda
- 6(4) Thallus usually distinctly farinose, continuous, always with a bluish  
 tinge; apothecia 0.1–0.3 mm diam., with an orange disc, some-  
 times yellowish or reddish, and with a distinct, whitish, slightly  
 prominent margin. Subcosmopolitan and locally abundant,  
 ubiquitous (not strictly foliicolous) . . . . .  
*Fellhanera bouteillei* (Desm.) Vězda  
 Thallus smooth or farinose, without any bluish tinge; apothecia  
 0.1–0.2 mm diam., with a pale brown or lightly reddish brown  
 disc, and a faintly visible whitish margin. Pantropical and rare . . . . .  
*Fellhanera semecarpi* (Vainio) Vězda
- 7(1) Ascospores 3-septate, very rarely 5-septate . . . . . 8  
 Ascospores, when mature, with at least 5 septa, or variable but always  
 with most ascospores with more than 3 septa, or submuriform 26
- 8(7) Apothecia very small, 0.1–0.2 mm diam., convex and without any  
 margin when mature, dark brown to almost black . . . . . 9  
 Apothecia larger, very rarely less than 0.2 mm diam., convex or not  
 when mature, margin present or not; apothecia colour dark brown  
 or not . . . . . 10

9(8) Ascospores 12–16 × 3–5.5 μm; apothecia strongly convex when mature. Pantropical . . . . .

**Fellhanera rhapidophylli (Rhem) Vězda**  
**=Bacidia myriocarpa Vězda**

Ascospores 18–25(–28) × 3–4 μm; apothecia slightly convex when mature. Western and central Europe, Tenerife and Madeira, a rather ubiquitous species, usually abundant on twigs . . . . .

**Fellhaneropsis myrtillicola (Erichsen) Sérus. & Coppins**

10(8) Thallus formed of isolated, rarely confluent, whitish, and convex verrucae, or with a continuous thallus with distinct verrucae that may eventually break up into a soredial mass, or with a continuous thallus and typical soredia . . . . . 11

Thallus never with typical soredia, nor with verrucae . . . . . 16

11(10) Thallus formed only of isolated, rarely confluent, whitish and convex verrucae; apothecia growing on the thin pellucid prothallus or on the margin of the verrucae, 0.3–0.35 mm diam. with pale or dark brown disc and a thin but distinct paler margin. Australia (Queensland), Papua New Guinea and New Caledonia. [See note 1.] . . . . .

**Fellhanera bullata Kalb & Vězda**

Thallus not formed only of verrucae, but verrucae present or not over the thallus surface . . . . . 12

12(11) Thallus continuous with whitish hemispherical verrucae, pale bluish grey; apothecia 0.25–0.4 mm diam. with a yellowish red disc and a white, sharply delimited margin. Central America (Costa Rica) .

**Fellhanera badimoides Lücking, Lumbsch & Elix**

Thallus with distinct verrucae that eventually break up into a soredial mass and then thallus greenish and apothecial disc dark brown, or with soredia . . . . . 13

13(12) Thallus with distinct verrucae that eventually break up into a soredial mass, rarely with large and sometimes confluent soralia that spread over the thallus surface . . . . . 14

Thallus never with verrucae, but with soredia . . . . . 15

14(13) Excipulum encrusted with colourless crystals (the paraplectenchymatous structure of the excipulum is therefore indistinct); thallus with verrucae of various size, that frequently break up into a coarse soredial mass; thallus smooth to farinose. Distribution: see note 2

**Fellhanera stanhopeae (Müll. Arg.) Lücking, Lumbsch & Elix**

Excipulum not encrusted with crystals, with a distinct paraplectenchymatous structure; thallus with verrucae that very frequently break up into a soredial mass, or with abundant, large, yellowish soralia that are often confluent and cover large parts of the thallus;

thallus farinose to coarsely farinose. Africa (Zaire and Rwanda).  
[See note 3] . . . . .

**Fellhanera lambinonii (Sérus.) Lücking & Sérus.**  
= *Bacidia michaeliana* Sérus.

15(13) Thallus smooth, continuous, whitish or brownish, reacting K+ red brown, with a distinct dark violaceous prothallus; soredia whitish, punctiform, loose and dispersed, becoming confluent and larger on older thalli; apothecia 0.4–0.7 mm diam., with a pale orange to yellowish brown disc and a pale orange distinct margin that eventually vanishes; ascospores 13–16 × 4–4.5 µm. Africa (Zaire and Ivory Coast) . . . **Fellhanera solediantha (Vězda) Vězda**

Thallus rugose under high magnification and formed of packed greenish granules in well-preserved material, sometimes absent or formed by a thin brownish membrane; soredia citrine to greenish yellow, losing their colour in herbaria, rarely confluent and coalescing; apothecia very rare, 0.2–0.3(–0.5) mm diam., with a dark brown disc and a paler, distinct and persistent margin; ascospores (16–)19–22 × 5–7 µm. Macaronesia (Madeira) . . . .

**Fellhanera seroexpectata Sérus.**

16(10) Apothecia almost black, or brown, possibly with a red tinge but never ochre, nor with a vivid red colour. . . . . 17  
Apothecia paler, never blackish or brown . . . . . 22

17(16) Ascospores not exceeding 13 µm in length and 2.5 µm in width (8–13 × 2–2.5 µm); apothecia 0.3–0.8 mm diam. with a red-brown disc and a pale reddish margin, at first distinct and hardly prominent but soon disappearing; hypothecium dark-brown, K+ purple-red. Africa (Zaire). **Fellhanera wirthii (Vězda) Vězda**

Ascospores always exceeding 13 µm in length and 2.5 µm in width when mature; hypothecium K+ purple-red or not. . . . . 18

18(17) Hypothecium brownish red, usually K+ purple-red, rarely K+ brown; apothecia 0.3–0.5 mm diam. with a brownish red disc, at first with a distinct, slightly prominent, pale reddish brown margin; ascospores 18–25 × 3.5–4 µm. Australia (Queensland and New South Wales) **Fellhanera endopurpurea Hafellner & Vězda**

Hypothecium never reacting K+ purple-red, even when dark brown or brownish . . . . . 19

19(18) Apothecia mainly developed on a hypophyllous, marginal, non-lichenized mycelium, 0.3–0.5 mm diam.; disc first plane, soon convex, bluish grey to blackish brown, usually with a greyish white pruina, with a pale greyish margin, at first prominent but soon thinner and almost disappearing in old apothecia; ascospores 17–27 × 3.5–5 µm. Central America (Cocos Is) . . . . .

**Fellhanera avilezii Lücking**

Apothecia mainly epiphyllous, developed on lichenized thallus . 20

- 20(19) Thallus green to pale green; apothecia 0.3–0.45(–0.5) mm diam., with a dark brown to carbonaceous black disc and a concolorous or slightly paler margin which at first is thick and prominent but becomes thinner and not prominent; pruina on the disc absent or, if present, very thin and bluish; ascospores 14–17 × 3–5 µm. Pycnidia usually present, black. Europe (Italy/Calabria) and Macaronesia (Madeira and Tenerife) . . . . .
- Fellhanera christiansenii* Sérus. & Vězda**
- Thallus greenish grey or bluish white; apothecia and pycnidia different . . . . . 21
- 21(20) Thallus greenish grey; apothecia 0.2–0.4 mm diam., with a grey to livid black disc and a distinct, whitish, hardly prominent margin; pruina on the disc whitish, always present on young apothecia; ascospores 15–20 × 3.5–4 µm. Pycnidia unknown. Central America (Costa Rica, Guatemala, St. Lucia) . . . . .
- Fellhanera santessonii* Barillas & Lücking**
- Thallus bluish white, or rarely bluish grey; apothecia 0.2–0.4 mm diam., with a dark brown disc and a distinct but thin, non-prominent, pale brown margin; pruina on the disc very rare; ascospores 12–18 × 3.5–5.5 µm. Pycnidia rare, pale yellowish grey. Pantropical but mostly common in Africa. . . . .
- Fellhanera sublecanorina* (Nyl.) Vězda**
- 22(16) Hypothecium K+ red-brown or red. . . . . 23  
Hypothecium K– . . . . . 24
- 23(22) Apothecia 0.4–0.5(–0.6) mm diam., with an orange-red to brownish disc and a pale orange, thin, non-prominent margin; thin whitish pruina sometimes present on the disc; excipulum sometimes filled with small yellowish brown granules that dissolve in K; ascospores 15–20 × 4.5–5 µm. Central America (Costa Rica and Guadeloupe) and Africa (Zaire) . . . . .
- Fellhanera lisowskii* (Vězda) Vězda**
- Apothecia 0.3–0.4 mm diam., with an orange-red disc and a distinct, pale orange or white, at first thick but soon non-prominent margin; excipulum and hypothecium hyaline but K+ vivid yellow to red; ascospores 12–15 × 4–4.5 µm. North America (USA—Florida) and Africa (Guinea and Zaire) . . . . .
- Fellhanera aurantiaca* (Vězda) Vězda**
- 24(22) Thallus granular, grey green to ochraceous; apothecia 0.2–0.4 mm diam., with a pale orange, sometimes pruinose disc and a thin, non-prominent, very pale orange to almost white margin; ascospores 11–16 × 2.5–4.5 µm; apical parts of paraphyses with 1–3 irregular swellings; pycnidia frequent. NW Europe, mostly corticolous, but sometimes growing on *Vaccinium* or *Buxus* leaves, or on *Picea* or *Abies* needles . . . . .
- Fellhanera subtilis* (Vězda) Diederich & Sérus.**

- Thallus farinose, very thin, bluish grey to bluish white; apical parts of paraphyses without swellings . . . . . 25
- 25(24) Apothecial margin at first thick, prominent, pale orange and very minutely pruinose, then becoming thinner and almost non-pruinose; paraphyses sinuous, branched and anastomosed and 2  $\mu\text{m}$  thick; apothecia 0.2–0.4 mm diam., with an orange to pinkish orange disc; hypothecium brownish; ascospores 14–19  $\times$  4–5  $\mu\text{m}$ . Central America (Trinidad) and Africa (Guinea). . . . . ***Fellhanera carnea* (Vězda) Vězda**  
 Apothecial margin thin, non-prominent, almost white and epruinose; paraphyses almost simple,  $\pm$  straight and 1  $\mu\text{m}$  thick; apothecia 0.2–0.4 mm diam., with a pinkish orange to pale brown disc; hypothecium pale brownish; ascospores 10–15  $\times$  2.5–4.5  $\mu\text{m}$ . Pantropical but rare . . . ***Fellhanera subternella* (Nyl.) Vězda**
- 26(7) Ascospores 2–8 per ascus; mature ascospores of various shapes and irregularly with (3–)5–7(–9) transverse septa and sometimes with a longitudinal septum, 15–37  $\times$  4.5–8  $\mu\text{m}$ ; apothecia 0.3–0.4 mm diam., with a red brown disc and a thin, orange-red, slightly prominent margin. Central America (Costa Rica) and Africa (Guinea and Tanzania). ***Fellhanera paradoxa* (Vězda) Vězda**  
 Ascospores mostly 8 per ascus, of regular shape . . . . . 27
- 27(26) Ascospores submuriform, with 7–9 transverse and 1–3 longitudinal septa, 26–33  $\times$  5–10  $\mu\text{m}$ ; apothecia 0.3–0.5 mm diam., with a yellowish or reddish brown disc and a thin, pale brown, slightly prominent margin. Central America (Costa Rica and St. Vincent) and South America (Brazil). . . . . ***Fellhanera elliottii* (Vain.) Vězda**  
 Ascospores (3–)5–7-septate, never submuriform . . . . . 28
- 28(27) Ascospores (3–)4–7-septate, acicular-fusiform, usually with one end attenuated and more or less irregularly curved, 30–35(–42)  $\times$  3–4.5  $\mu\text{m}$ ; apothecia 0.2–0.4 mm diam., with a flat, livid brown to pinkish brown disc, at first with a thick, slightly raised margin, eventually immarginate, convex and tuberculate. Western and central Europe, and Macaronesia (Madeira); corticolous, occasionally found on leaves (in Madeira only) . . . . . ***Fellhaneropsis vezdae* (Coppins & P. James) Sérus. & Coppins**  
 Ascospores mostly with a regular number of septa (5 or 7), ellipsoid to fusiform; sometimes with one end attenuated and slightly curved (*F. microdiscus*); apothecia never becoming tuberculate 29
- 29(28) Ascospores 7-septate, 18–24  $\times$  4–4.5  $\mu\text{m}$ ; apothecia 0.2–0.4 mm diam., with a brown disc and a thin, pale brown, slightly prominent margin. Central and South America (where the species is mostly

- abundant), Australia (New South Wales) and Africa (Ivory Coast and ? Tanzania [see note 4]) . . . . .
- Fellhanera dominicana* (Vainio) Vězda**
- Ascospores 5-septate, rarely a few ascospores with 6 or 7 septa . . . . . 30
- 30(29) Most ascospores exceeding 25 µm in length [24–32(–34) × 4–5 µm]; pruina present, at least in young apothecia . . . . . 31
- Most ascospores not reaching 25 µm in length [14–26 × 3–5 µm]; pruina never present, even in young apothecia . . . . . 32
- 31(30) Apothecia developed on an epiphyllous, lichenized thallus; apothecia 0.2–0.4 mm diam., with a brownish disc, sometimes almost black or with a distinct red tinge, when young usually with a thin whitish pruina, and with a distinct pale brown margin. Central America (Costa Rica and Cuba) . . . ***Fellhanera winkleriana* Lücking**
- Apothecia mostly developed on a hypophyllous, marginal, unlichenized mycelium; apothecia 0.5–0.6 mm diam., with a dark brown disc; whitish to bluish pruina present on the disc and on the margin in young apothecia, but thick and persistent only on the margin. Central America (Cuba) . . . . .
- Fellhanera ekmanii* (Vězda) Lücking**
- 32(30) Apothecial disc pale to dark brown; margin pale brown, thin and non-prominent; ascospores bacilliform to ellipsoid, usually not curved and not tapering towards one end. Pantropical but mostly abundant only in Africa . . . . .
- Fellhanera fuscatula* (Müll. Arg.) Vězda**
- Apothecial disc red-brown; margin pale reddish brown, thin and non-prominent; ascospores ellipsoid, usually slightly curved and attenuated at one end. Asia (Philippines and Vietnam) and Australia (Queensland). ***Fellhanera microdiscus* (Vainio) Vězda**

#### Notes

1. Dr K. Kalb has recently collected *Fellhanera bullata* in New Caledonia: Prov. Sud, Mts Koghis-Dumbéa, 550 m alt., tropical rain forest, 23 viii 1994, K. & A. Kalb (hb. Kalb!). A collection from that country has just been distributed in *Lücking Lich. Fol. Exs.* No. 136 (1995). The species is also present in Papua New Guinea: Eastern Highlands prov., Gahavisuka Provincial Park, 2300–2450 m, mossy mountain forest, 11 viii 1992, Sérusiaux 13762–45 (LG).

2. *Fellhanera stanhoepae* is said to be present in Central and South America and in Africa by Santesson (1952: 474–475) and by Vězda (1980: 93) but typical specimens, examined by R. Lücking and myself, are all from the Neotropics. Those from Africa may all belong to *F. lambinonii*. *Bacidia stanhoepae* has been transferred to *Badimia* by Vězda (in *Lich. Sel. Exs.* No. 2307, 1989) but does not belong there.

3. *Fellhanera lambinonii* (Sérus.) Lücking & Sérus. comb. nov. Bas.: *Bacidia lambinonii* Sérus., *Lejeunia* N.S., 90: 12 (1978).

*Bacidia michaeliana* Sérus. represents the sorediate form of that species. Several collections (LG) that were not available in 1978 for the original description of this taxon (Sérusiaux 1978: 15–16) show all intermediate stages between typical *Bacidia lambinonii* and *Bacidia michaeliana*.

4. *Fellhanera dominicana* is mentioned as 'cf. *dominicana*' from Tanzania by Vězda (1975: 417).

**Preliminary List of Foliicolous Lichens and Their Lichenicolous Fungi from Madeira**

***Ampullifera foliicola* Deighton**

This lichenicolous hyphomycete was first mentioned from the island by Arvidsson & Wall (1985: 42) and by M. S. Christiansen (in Santesson 1986: 1) on the thallus of *Byssoloma subdiscordans*. It is indeed common on this abundant foliicolous species and was found only on it. When abundant it can hamper the development or production of its host's apothecia and spreads over the leaf surface, but it is nevertheless unable to colonize other lichen species. It is also present on the same species in the French Pyrenees. *Ampullifera foliicola* is probably a pantropical species, and interestingly grows over several different hosts in other parts of the world.

***Arthonia muscigena* Th.Fr.**

This species is thoroughly described in Purvis *et al.* (1992: 84) and is usually known as *A. leucodontis* (Poelt & Döbbeler) Coppins, which is a synonym. It is a rather common, ubiquitous species of lowland western Europe and is tolerant of suburban conditions. It is not surprising to find it on leaves. Foliicolous specimens have, however, been named *A. microsticta* Vain. (Vězda *Lich. Sel. Exs.* No. 1676, 1980). The type collection of this forgotten species (West Indies, Dominica, Elliott 517, BM!) is a small leaf fragment with several apothecia of the *Arthonia* growing over the leaf surface, or over a smooth bluish lichen thallus. This group of tiny *Arthonia* with 1-septate ascospores is very little known and it cannot be ruled out that *A. microsticta* is just a form of the widespread *A. muscigena* Th.Fr. More material from the West Indies is needed to understand correctly this taxon.

In Madeira, *Arthonia muscigena* grows directly on the leaf surface or forms its own very thin greenish thallus; it is locally abundant. In western Europe (S Belgium, S France, Spanish side of the Pyrenees), it specializes on the goniocysts of *Woessia* species on *Buxus* leaves and twigs; it does not seem to damage its host.

***Aulaxina* sp.**

A sterile specimen collected in 1988 at Chão do Louros with numerous hyphophores definitely belongs to that genus; the hyphophores are typical of the pantropical *Aulaxina quadrangula* (Stirt.) R. Sant. but the absence of ascomata precludes any definite identification.

***Byssoloma aptrootii* Sérus.**

This recently described species (Sérusiaux 1993: 451–454) is one of the most common foliicolous lichen in the laurisilva of Madeira, at least in the less disturbed localities. Outside Madeira, it is known only from Tenerife and Gomera where it is also common.

***Byssoloma leucoblepharum* (Nyl.) Vain**

A common species in Madeira, also found on twigs and bark. It is a common foliicolous lichen in SW Europe on *Buxus* leaves and is also found on



bark, especially on *Corylus* and on *Quercus*. Its general distribution can be described as pantropical, expanding into warm temperate regions.

***Byssoloma marginatum* (Arnold) Sérus.**

*Tapellaria similis* Kalb in Kalb & Hafellner, *Herzogia* 9: 90 (1992).

This species is known mainly as corticolous in western and central Europe, and as foliicolous and corticolous in Madeira and in Tenerife. So far I have seen specimens from Germany (Bavaria), Austria (Steiermark), the British Isles, S and SW France, Spain/Galicia (see Lopez de Silanes & Carballal 1991: 48; specimen seen by myself), from Portugal (van den Boom *et al.* 1990: 470; the specimen mentioned as '*Byssoloma* sp.' from the Serra de Sintra belongs to *B. marginatum*), from Italy/Calabria (the species is present on living needles and on bark of *Abies* in a set of lichens sent to me by D. Puntillo, but it is not mentioned in Puntillo & Vězda 1994) and from Tenerife (where it is common on *Erica* in the 'Fayal-Brezal', together with *Byssoloma leucoblepharum* and *Micarea pycnidiphora* Coppins & James). The species is also mentioned from S Sweden by Santesson (1993: 42). In Madeira, it is not uncommon on leaves but never develops conspicuous thalli; it also grows on twigs and on bark of several trees in the laurisilva. *Tapellaria similis* Kalb, just described on bark of *Laurus azorica* in Madeira (Kalb & Hafellner 1992: 90), is typical *Byssoloma marginatum* (holotype: K. Kalb 23296, hb. Kalb!).

***Byssoloma subdiscordans* (Nyl.) James**

This is one of the most common foliicolous lichens in Madeira, also colonizing the living leaves of introduced species in suitable conditions, and rarely epiphytic on twigs or on bark. It was reported from Madeira by Santesson (1952: 493) and is a widely distributed species in the tropics as well as in temperate Europe where it is known as either saxicolous, corticolous on spruce and fir twigs, or foliicolous on spruce and fir needles and on *Buxus* leaves.

***Dimerella luteola* Kalb**

This recently described species (Kalb & Hafellner 1992: 62–63) is the Madeiran vicariant of the European *D. lutea* (Dickson) Trevisan. It is a common epiphytic species in the laurisilva and is occasionally present on living leaves, especially at Seixal.

***Fellhanera bouteillei* (Desm.) Vězda**

This is one of the most widespread species on the planet, being present in boreal, temperate and tropical areas, growing on coastal rocks, on twigs, on bark and on living leaves. It was known in Madeira by Santesson (1952: 434) where it is abundant on leaves.

***Fellhanera christiansenii* Sérus. & Vězda**

The abundance of this species in Madeira is comparable with that of *Byssoloma aptrootii* with which it often grows. I first collected it in 1988 in large

quantities and was ready to describe it as new (under the name *Fellhanera nigra*) when Dr A. Vězda sent to me a preliminary version of a manuscript dealing with new taxa of foliicolous lichens, including this new species of *Fellhanera*. It was then decided to describe it together under the epithet *christiansenii*. I have, however, spread the epithet *nigra* for several years and the curators of herbaria should be aware that '*F. nigra* Sérus. ad int.' is the same as *F. christiansenii* Sérus. & Vězda (in Vězda 1994: 130–131). The species is described on a collection from Tenerife where it is common; it is also known from Calabria in Italy (Puntillo & Vězda 1994; several specimens checked by myself). The reports of *Fellhanera buxi* (Vězda & Vivant) Vězda from Tenerife by Lumbsch & Vězda (1992: 25) are all based on typical specimens of *F. christiansenii* (both specimens cited seen).

### ***Gyalectidium colchicum* Vězda**

This species was described by Vězda (1983: 58–60) from collections made in the western Caucasus (Georgia and Russia). The foliicolous populations of *Gyalectidium* from Madeira are referred to that species as they have hyphophores typical of the genus (see Sérusiaux & De Sloover 1986: 282–289) and identical with those of that species [size: 0.15–0.2(–0.3) mm in total length]. They do not belong to *G. filicinum* Müll. Arg. as claimed by Arvidsson & Wall (1985: 42; specimens mentioned by these authors examined, GB!). Vězda (1983: 58–60) has described pycnidia in that species; they are also present in Madeira. They are seen as slightly raised, dark bluish spots on the thallus surface, and their conidia are bacilliform to slightly bifusiform and measure  $2\text{--}3 \times 0.75 \mu\text{m}$ . Apothecia are absent in the Caucasus material but are sometimes present in Madeira; they are typical of the genus and are seen as rounded sessile discs, 1–2(–10) per thallus with a pale grey or green disc, 0.2–0.3 mm diam., and the ascospores are single in the asci, muriform and measure  $32\text{--}38 \times 13\text{--}18 \mu\text{m}$ . The species is sometimes attacked by the hyphomycete *Hansfordiellopsis lichenicola* (see under that species). *Gyalectidium colchicum* is also present in the Azores but is unknown in the Canary Islands. It is the only species of the genus present in Madeira, whereas the recently described *G. setiferum* Vězda & Sérus. (in Sérusiaux 1993: 454–458) and *G. caucasicum* (Elenkin & Woron.) Vězda are observed in continental Europe, the latter being extremely rare in Western Europe (two localities known: France/Atlantic Pyrenees and Spain/Cataluña).

### ***Hansfordiellopsis lichenicola* (Batista & Maia) Deighton**

This lichenicolous hyphomycete is widespread in tropical areas on the three continents (see Hawksworth 1979: 227), infecting several species, mostly those with setae. In Madeira it is strictly confined to *Gyalectidium colchicum* and when abundant is able to damage its host; it is also present on the same species in the western Caucasus.

### ***Porina hoehneliana* (Jaap) R. Sant.**

This species is very common in western Europe [France, Spain (Navarra and Cataluña), Croatia], and in the western Caucasus (Russia and Georgia)

and has also been reported in the Himalaya range (Vězda & Poelt 1988: 425). In Madeira I have found it in one locality only, the Seixal laurisilva, where it is very common. This locality shelters the only laurisilva at low elevation (300–400 m vs 800–850 m for the other localities). It was, however, found at Chão de Louros by C. Tavares in 1951 and published by Santesson (1952: 260) under *Porina semecarpi* Vainio, which is absent from the island.

#### ***Porina leptosperma* Müll. Arg.**

The species was already mentioned in Madeira by Santesson (1952: 258); it is common on the island. It is also abundant in the western Pyrenees in France, where it has been confused with *P. hoehneliana*; the No. 1083 and 1084 of the Vězda *Lich. Sel. Exs.*, collected in France on *Buxus* leaves and on *Ruscus cladodes* and distributed as *P. hoehneliana*, represent typical *P. leptosperma*. The species is otherwise pantropical.

#### ***Psoroglaena stigonemoides* (Orange) Henssen**

This species is common in western Europe [especially as an epiphyte on *Sambucus*, frequently associated with *Anisomeridium nyssaegenum* (Ellis & Everh.) Harris] and has just been reported from Madeira (Kalb & Hafellner 1992: 70). It is a common epiphytic and muscicolous species in the laurisilva of the island and is occasionally present on living leaves. The same situation occurs in SW France where the species is locally extremely abundant and can invade *Buxus* twigs and leaves. The taxonomic affinities of this species have just been established by Henssen (1995) and are accepted here.

#### ***Strigula angustata* Sérus. & Roux ad int.**

This species is close to *Raciborskiella minor* Vězda, described from Georgia in the western Caucasus (Vězda 1983: 49–51), and widespread on *Buxus* twigs in southern France. It is more closely related to the bulk of *Strigula* species than to the type species of *Raciborskiella* [*R. janeirensis* (Müll. Arg.) R. Sant.]. The status of *S. angustata* is currently being studied with Dr C. Roux (see Roux & Bricaud 1993) and this taxon may end as a variety of *R. minor* as the only diagnostic character is the size of macroconidia. It is known from Madeira and from two localities in France (Lot and Vercors).

#### ***Strigula nitidula* Mont.**

This species is reported from Madeira by Santesson (1952: 182) and is indeed common on the island. Specimens with an effigurate thallus and distinct lobes and a thin black line at the margins come close to *S. concreta* (Fée) R. Sant., a pantropical species. Following Lücking (1992: 39), they nevertheless belong to *S. nitidula*: *S. concreta* has a thickened thallus and never has a metallic thallus with scattered small black points. *Strigula nitidula* is common in SW Europe, reaching Brittany in W France (Josien 1967: 829, de Foucault *et al.* 1982: 75).

#### ***Tapellaria epiphylla* (Müll. Arg.) R. Sant.**

Santesson (1952: 506) reports this species in the Azores and in Madeira where it is one of the most common foliicolous species. It also grows on living

leaves of introduced species (e.g. *Camellia*) in suitable localities. In the Canary Islands, it is known only in Gomera. *Tapellaria epiphylla* is a common foliicolous species in the Neotropics and in Africa.

### *Vezdaea dawsoniae* Döbbeler

This very tiny pedicellate *Vezdaea* was first described from Papua New Guinea (where it is common in the mountains, pers. obs.) and was later reported from Cuba (Vězda 1984: 192; as 'cf. *dawsoniae*'), from the Pyrenees in France (Sérusiaux 1989: 90) and from the Caucasus (Giralt *et al.* 1993: mentioned in the key page 716, but not in the conspectus on page 720; for unknown reasons, *Vezdaea obscura*, described by Döbbeler 1981: 461–464 from Tasmania and New Guinea, is not studied in that survey of the genus). In Madeira, *V. dawsoniae* has been found as foliicolous (in small quantities) only at Chão do Louros.

### *Woessia apiahica* (Müll. Arg.) Sérus. comb. nov.

*Patellaria apiahica* Müll. Arg., Lichenes epiphylli novi: 9, 1890.

*Bacidia apiahica* (Müll. Arg.) Zahlbr., Catal. Lich. Univ. 4: 174, 1926.

*Bacidina apiahica* (Müll. Arg.) Vězda, Folia Geobot. Phytotax. (Praha) 25: 432, 1990.

The generic name *Woessia* Hawksw. & Poelt antedates *Bacidina* Vězda and is now used for the rather well-delimited group of species of *Bacidia* s.l. with a thallus made of goniocysts s.lat., pale orange to dark brown apothecia, a typically paraplectenchymatous excipulum, simple paraphyses with swollen apices, acicular ascospores spirally arranged in the asci and filiform-sigmoid conidia forming a coiled mass in the pycnidia (Sérusiaux 1995). The necessary combinations of the species mentioned in this paper are introduced. *Woessia apiahica* was already mentioned in Madeira by Santesson (1952: 443) and indeed *Woessia* with small pale orange apothecia are common on leaves in the island. The status of those populations as well as the genuine identity of *W. apiahica* are, however, still a great challenge to me. In Madeira I suspect that two taxa are involved and I am quite sure that *Woessia vasakii* (Vězda) Sérus. comb. nov. [*Bacidia vasakii* Vězda, Folia Geobot. Phytotax. (Praha) 18: 64, 1983], which is abundant in southern France, is not present.

### *Woessia canariensis* (Lumbsch & Vězda) Sérus. comb. nov.

*Bacidina canariensis* Lumbsch & Vězda, Lichenologist 24: 22, 1992.

I first collected this species in Madeira in 1988 where it is rather rare; in contrast it is more frequent in Tenerife where I gathered large samples, including several with almost black apothecia. The species prefers rather dry laurisilva, a niche which is more frequent in Tenerife than in Madeira. The type collection (hb. Lumbsch!) comes from the Anaga Mts in Tenerife (Lumbsch & Vězda 1992: 22–24). One of the specimens mentioned by Lumbsch & Vězda (Tenerife, Las Montanas de Anaga, 25 iii 1976, Santesson 26837, hb. Lumbsch!) contains only *Byssoloma aptrootii*.

### Species to be Excluded from the Madeiran Flora

#### *Dimerella epiphylla* (Müll. Arg.) Malme

This common pantropical species is reported from Madeira by Follmann (1990: 100). The only specimen cited (Ribeiro Frio, vi 1987, S. Schuhmacher, KOELN 33244) has not been examined, but another one, also collected at Ribeiro Frio in June 1987 by S. Schuhmacher and annotated *Dimerella epiphylla* (No. 708, KOELN), has been studied: it is a pale but nevertheless typical *Fellhanera bouteillei*. *Dimerella epiphylla* has not been found in my own collections. It should probably be removed from the Madeiran flora.

#### *Dimerella lutea* (Dicks.) Trevisan

This species is reported as foliicolous in Madeira by Santesson (1952: 403) on the basis of a collection made by Tavares. R. Santesson had a rather wide concept of that species, including the now easily distinguished *Dimerella fallaciosa* (Müll. Arg.) Vězda. The specimen is preserved at LISU and has been examined (Chão do Louros, 31 vii 1951, C. Tavares No. 4428-Q): it contains only two apothecia. Therefore I have not made any section of them; I suspect it is a foliicolous *Dimerella luteola* Kalb, which is a common epiphytic species in the laurisilva of the island and which is occasionally present on living leaves.

#### *Porina semecarpi* Vain.

The species is reported from Madeira by Santesson (1952: 260); the single mentioned collection is preserved at LISU and has been examined (Entre a Encumeada e a Chão do Louros, 31 vii 1951, C. Tavares No. 4428-F): it is a typical *Porina hoehneliana*. *Porina semecarpi* must therefore be removed from the Madeiran flora.

#### *Tricharia triseptata* R. Sant.

The only specimen cited by Follmann (1990: 101) for this species in Madeira has been studied (v 1987, S. Schuhmacher KOELN 33258); it contains only unlichenized fungi amongst which *Dennisiella babingtonii* (Berk.) Bat. & Cif. is abundant and has obviously been confused with *Tricharia triseptata*. This species should therefore be removed from the Madeiran flora. *Dennisiella babingtonii* is a member of the Coccodiniaceae, widespread worldwide on living leaves, especially in humid areas; it is very common in Madeira (description in Batista & Ciferri 1962: 37–38).

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