

## *Vahliella*, a new lichen genus

Per M. JØRGENSEN

**Abstract:** The new genus *Vahliella* is recognized as a genus since molecular studies have shown that the subgenus *Micropannaria* of *Fuscopannaria* differs so much from this genus that it cannot even be placed in the *Pannariaceae*. While its family position remains unclear, it is certainly best established as a genus, as it is recognizable also on morphological and chemical characters. Unlike the mainly warm-temperate genus *Fuscopannaria*, it is restricted to cold-temperate regions. Presently it is known to contain eight species, a key to which is given. The following new combinations are introduced: *Vahliella adnata* (P. M. Jørg. & Upreti), *Vahliella atlantica* (P. M. Jørg. & P. W. James), *Vahliella californica* (Tuck.), *Vahliella globuligera* (Fryday & P. M. Jørg.), *Vahliella hookerioides* (P. M. Jørg.), *Vahliella labrata* (P. M. Jørg.), *Vahliella leucophaea* (Vahl), *Vahliella saubinetii* (Mont.).

**Key words:** *Fuscopannaria* subgen. *Micropannaria*, key to species, new genus and combinations, phytogeography

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### Introduction

In my redefinition of the genera within the *Pannariaceae* (Jørgensen 1994), I erected a new genus *Fuscopannaria* and divided it into two subgenera. The second subgenus, *Micropannaria* P. M. Jørg. with only two species, differed mainly in the apical apparatus, amyloid sheets rather than a ring structure (see Fig. 1), a distinguishing character that at the time appeared too minor to justify its recognition at a higher taxonomic level. However, molecular studies (Ekman & Jørgensen 2002) indicated that this was not so, and in a more recent study (Wedin *et al.* 2007) it was concluded that this group does not even belong in the *Pannariaceae*, a fact that has surprised me. Though I hesitate to exclude it from this family before its position is more firmly established, I realize that the difference once thought to be of minor importance, indicates that a separate genus, not closely related to *Fuscopannaria*, is at

hand; one which needs recognition. Since the generic name *Hueella* Zahlbr., which was based on a doubtful, poorly developed specimen, has been rejected (following a proposal by Jørgensen 2000), there is no name available at generic level. I have chosen to rename it, rather than to elevate the subgeneric name to generic rank since that would give an incorrect taxonomic implication, as allowed by ICBN Art. 9.

The new generic name is based on that of the first Norwegian professor of botany, Martin Vahl (1749–1804), who had a keen interest in cryptogams and was the first one to describe the type species of this new genus. However, since there already exists a genus *Vahlia* Thunb. for an African flowering plant (Jørgensen 1999), I use it in a diminutive form.

### Materials and Methods

The material is that cited. For morphological, anatomical and chemical methods used in all previous papers, see e.g. Jørgensen (1978). For the molecular methods applied in Wedin *et al.* (2007), see that paper.

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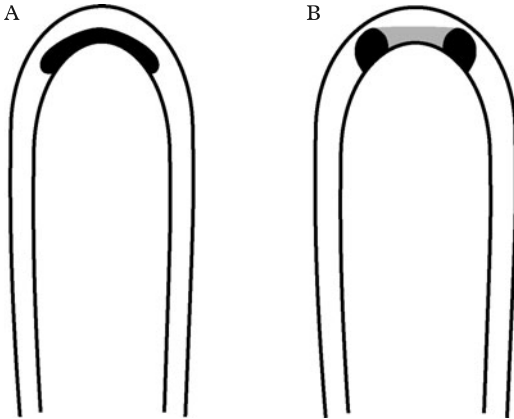


FIG. 1. Asci with apical structures. A, *Vahliella leucophaea*; B, *Fuscopannaria leucosticta*. (Drawn by Beate Helle.)

### The New Genus

#### *Vahliella* P. M. Jørg. gen. nov.

Thallus squamulosus, paginis supernis corticatis, subtus ecorticatus cum prothallo nigrescens; photobiontus *Nostoc* glomerulis. Sine acida lichenosa. Apothecia sessilia, fusca, saepe convexa cum marginem variabile, plerumque excipulis thallinis male evolutis; hymenium hemiamyloideum; asci stratis amyloideis appicalis. Ascospores precipue sine exosporio.

Typus: *Vahliella leucophaea* (Vahl) P. M. Jørg.

(Figs 1A & 2A)

*Thallus* squamulose, individual squamules to 2 mm diam., forming a crust-like cover on a thin, blue-black hypothallus, the development of which varies. The often imbricating squamules, which are up to 200  $\mu\text{m}$  thick, are mostly grey-brown above with distinct cellular cortex in upper part; below it there is a distinct, often quite thick, to 150  $\mu\text{m}$ , photobiont layer, usually with clusters of *Nostoc*. *Medullary layer* rather thin, up to 25  $\mu\text{m}$  wide of intricate hyphae, 3–4  $\mu\text{m}$  thick, gradually merging into the blue-black hypothallus and hence without a lower cortex. Most species have apothecia; very rarely soredia are developed on the margins of the squamules.

*Apothecia* laminal, up to 1 mm diam., often proliferating and occurring in clusters, with brownish discs which eventually may be convex. They have a variable thalline margin,

up to 150  $\mu\text{m}$  wide, which is often suppressed and not at all developed in some apothecia. *Proper margin* likewise variably developed, but always present, up to 50  $\mu\text{m}$  wide, consisting of oblong cells. The subhymenial layers may be substantial, up to 150  $\mu\text{m}$  high, sometimes brownish, of intricately interwoven hyphae. *Hymenium*, up to 150  $\mu\text{m}$  high, upper part brownish, the remainder colourless, reacting I+ blue-green rapidly changing to red-brown (hemiamyloid). *Paraphyses* simple, septate, c. 2  $\mu\text{m}$  thick with clavate, pigmented apices. *Asci* clavate to subcylindrical, to 100  $\times$  15  $\mu\text{m}$ , with sheet-like apical structures which are persistently I+ blue-green. *Ascospores* eight per ascus, colourless, simple, ellipsoid lacking epispore, but often with internal oil droplets that tend to adhere forming plasma-bridges which may appear as incipient septa, but which dissolve in K.

*Chemistry*. All reactions are negative, and no lichen substances detected by TLC.

*Note*. Species of *Vahliella* are superficially rather like species of *Fuscopannaria*, but usually the apothecia have irregularly developed thalline margins and the thallus lacks fatty acids and terpenoids. The best distinguishing character is the layered apical amyloid sheet(s) of the asci (Fig. 1A). In addition all known species lack lichen acids and a well-developed epispore of the ascospores, unlike the majority of species in *Fuscopannaria*.

### The Species

#### *Vahliella adnata* (P. M. Jørg. & Upreti) P. M. Jørg. comb. nov.

*Fuscopannaria adnata* P. M. Jørg. & Upreti, *Nova Hedwigia* 81: 100 (2005); type: India, Nilgiri Hills, Avalanche, Hatchery Shola, 7000 ft, 23 December 1971, K. P. Singh 71672 (LWU—holotype!).

A rather unusual saxicolous species with adnate, feather-like incised squamules. For a more detailed description see Upreti *et al.* (2005). It is outside the main range of the genus, and evidently part of the northern element in the mountains of South India.

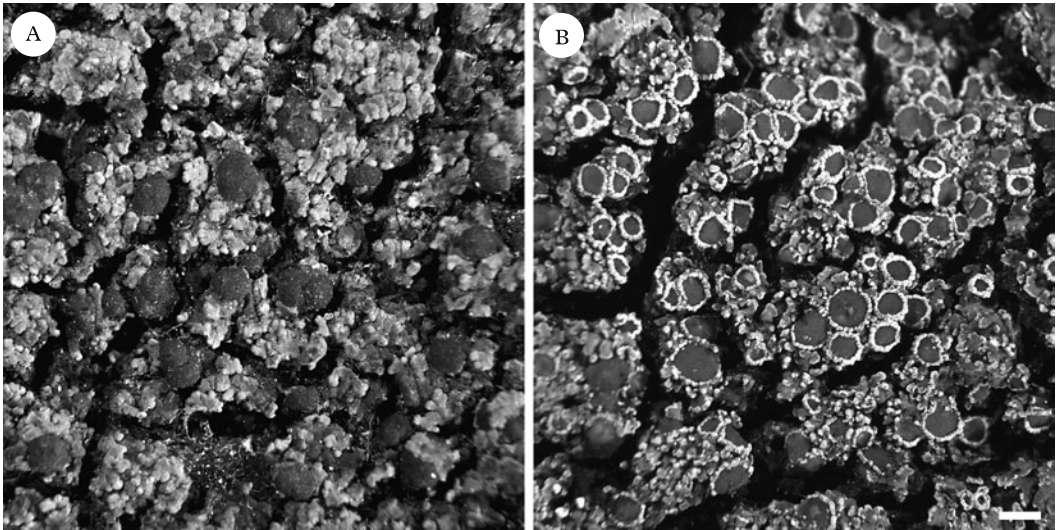


FIG. 2. Habitus of *Vahliella leucophaea* (A) and *Fuscopannaria leucosticta* (B) (Photographed by Jan Berge.) Scale=1 mm.

***Vahliella atlantica* (P. M. Jørg. & P. W. James) P. M. Jørg., comb. nov.**

*Fuscopannaria atlantica* P. M. Jørg & P. W. James, *Lichenologist* 37: 221 (2005); type: Azores, Sta Maria, 1 km W of Arrebentao, 14 April 1977, P. W. James (BM—holotype!).

A species which was long confused with *Moelleropsis nebulosa* (Hoffm.) Gyeln. though with a darker blue-grey thallus which does not dissolve into a pulverulent mass, larger spores, as well as different ascus tips. It is apparently related most closely to *V. californica*. For a more detailed description see Jørgensen (2005). It is a species of stabilized maritime soils occurring from the Azores northwards to SW Scandinavia (Jørgensen 2007).

***Vahliella californica* (Tuck.) P. M. Jørg., comb. nov.**

*Pannaria microphylla* var. *californica* Tuck., *Synopsis of N. Am. Lichens* 1: 121 (1882); type: USA, California, Yosemite, 1866, Bolander (FH—holotype!).

A characteristic species which usually forms small cushions consisting of narrow imbricating squamules. For further description see Jørgensen (2001). This species is

confined to dry habitats in California and neighbouring states.

***Vahliella globuligera* (Fryday & P. M. Jørg.) P. M. Jørg., comb. nov.**

*Fuscopannaria globuligera* Fryday & P. M. Jørg. in Fryday, *Bryologist* 107: 173 (2004); type: USA, Alaska, North Slope Borough, Barrow, low bank beside track to ITEX site, sea level, 17 July 2001, A. Fryday 8343 (MSC—holotype!).

This is the only species in the genus known to contain green algae. It also has small, globular spores ( $8-10 \times 7-9 \mu\text{m}$ ) and is found on bryophytes on acidic soil in the Arctic. For further description see Fryday (2004).

***Vahliella hookerioides* (P. M. Jørg.) P. M. Jørg., comb. nov.**

*Fuscopannaria hookerioides* P. M. Jørg., *Bryologist* 103: 682 (2001); type: USA, Colorado, Endovalley Camping, R. Andersson 3996 (COLO—holotype!).

An arctic-alpine member of the genus, a taxon close to *V. leucophaea* with blackish apothecia always with a strong thalline margin and smaller, rounder spores. For further description see Jørgensen (2001).

**Vahliella labrata (P. M. Jørg.) P. M. Jørg., comb. nov.**

*Fuscopannaria labrata* P. M. Jørg., *Bryologist* **108**: 256 (2005); type: USA, California, Sta. Cruz Isl., headland W of Coches Prietos, 2. April 1989, C. C. Bratt 6259 (SBBG—holotype!).

The only sorediate species of the genus with noteworthy labriform soralia, obviously closely related to *V. californica*. For further description see Jørgensen (2005). Probably a local endemic in the Channel Islands of California as are so many other plants there (Thorne 1969).

**Vahliella leucophaea (Vahl) P. M. Jørg., comb. nov.**

*Lichen leucophaeus* Vahl, *Flora danica* **6** (16): 8 (1787); type: Fig. 955,1 in that work; Norway, Hordaland, Granvin, 1903 *ŷ. ŷ. Havaas* (BG—epitype *ŷide* Jørgensen 2001).

This is the most variable and widespread species of the genus occurring in several forms which are still in need of further clarification. For a more detailed description and discussion of its variation see Jørgensen (1978).

**Vahliella saubinetii (Mont.) P. M. Jørg., comb. nov.**

*Parmelia saubinetii* Mont., *Ann. Soc. Sci. Nat. Bot. Ser.* **2**, **6**: 331 (1836); type: France, Aisne, Soisson, Coucy-le-Chateau, *Saubinet* (UPS—lectotype *ŷide* Jørgensen 1978).

This is the only regularly corticolous species of the genus, and is normally grey-blue with small, pinkish caraneous apothecia. For further description see Jørgensen (1978). Unlike the other species it has a preference for the European Mediterranean region (Spain to the Crimea), but also rarely occurring in North America (Atlantic and Pacific coastal regions).

**Key to *Vahliella* species**

- 1 Thallus sorediate; maritime California . . . . . **V. labrata**  
Thallus not sorediate; mainly non-maritime and if so not in California . . . . . 2
- 2(1) Thallus with green algae; on Arctic soil . . . . . **V. globigera**  
Thallus with cyanobacteria; if on soil not in the Arctic . . . . . 3
- 3(2) Corticolous with bluish grey squamules and pinkish apothecia . . **V. saubinetii**  
Saxicolous or terricolous with pure grey to brown squamules and brown to blackish apothecia . . . . . 4
- (3) Squamules delicately incised, adnate, forming flat circles; S. India . **V. adnata**  
Squamules mostly entire, often in loose cushions; outside India . . . . . 5
- 5(4) Terricolous, maritime species with lead-grey thallus; W Europe . **V. atlantica**  
Saxicolous, non-maritime, brownish species; widespread . . . . . 6
- 6(5) Apothecia with black discs and broad thalline margin; arctic-alpine . . . . .  
. . . . . **V. hookerioides**  
Apothecia with brown discs and poorly developed thalline margin; not arctic-alpine  
. . . . . 7
- 7(6) Squamules narrow and square in outline, crowded in cushions, spores 17–25 ×  
7–10 µm; drier regions of California and neighbouring states . . . . .  
. . . . . **V. californica**  
Squamules rounded, usually in flat aggregations, spores smaller, not longer than  
15 µm; on wet rocks throughout the Northern Hemisphere . . **V. leucophaea**

### Conclusion

Molecular studies have shown that the differences in the amyloid structures of the asci between *Fuscopannaria* subgenus *Fuscopannaria* and subgenus *Micropannaria* P. M. Jørg. are more important than previously understood. The subgenus *Micropannaria* groups with the *Massalongiaceae* and the *Lobariaceae* and should in all probability be excluded from the *Pannariaceae*. It certainly needs acceptance at the generic level as it cannot be included in any known genus though its family placement remains uncertain.

This new genus, *Vahliella*, is at the moment known to contain seven closely related species, surrounding the type species *V. leucophaea* (previously usually called *Pannaria microphylla*). It is mainly found in cool-temperate to arctic parts of Europe and North America, with one outlier in the mountains of India. The type species *V. leucophaea* (Fig. 2A) appears to originate in the Arcto-Tertiary of Laurasia, while *F. leucosticta* (Fig. 2B), the type of *Fuscopannaria* has a Madro-Tethyan connection (Jørgensen & Sipman 2007). Unlike that mainly warm-temperate genus, *Vahliella* is a mainly saxicolous genus which has adapted to rather extreme habitats on maritime coasts (two species) and arctic-alpine or desert conditions. Only one species, *V. saubinetii*, is mainly corticolous and tends to be more warm-temperate (Mediterranean).

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