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New species in *Tetramelas*

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Abstract: Three species are added to the recently reintroduced genus *Tetramelas*, *T. chloroleucus* comb. nov., *T. confusus* sp. nov. and *T. granulosus* comb. nov. *Tetramelas confusus* was first reported under the name of *Buellia papillata* but is more similar to *T. insignis*. Distinguishing characters are given in a Table. *Tetramelas poeltii* is reduced to synonymy with *T. chloroleucus*.

Key words: *Buellia granulosa*, *Buellia insignis*, *Buellia papillata*, *Tetramelas*

Introduction

The genus *Tetramelas* Norman, including *Tetramelas geophilus* (Sommerf.) Norman was recently reintroduced by Marbach (2000), who added a South American species, *T. regiomontanus* Marbach. Kalb (2004) combined five additional species into *Tetramelas*, *T. graminicolus* (Øvstedal) Kalb, *T. insignis* (Nägeli ex Hepp) Kalb, *T. papillatus* (Sommerf.) Kalb, *T. poeltii* (T. Schauer) Kalb, and *T. terricolus* (A. Nordin) Kalb. Nordin (2000*a*) included four of the species in a parsimony analysis based on morphological and chemical characters, in which they formed a monophyletic group. By that time Nordin preferred to treat *Buellia* in a broad sense and refrained from making new combinations, partly due to the uncertainty concerning a proposition to conserve *Buellia* with a new type (Moberg *et al.* 1999), regrettably not yet finally decided upon. However, *Tetramelas* seems to be a relatively well-founded segregate, which will not be affected by the decision. Here a new species will be introduced and two new combinations made. The new species has been reported under the name of *Buellia papillata* (Galloway *et al.* 1998). In addition *Tetramelas poeltii* is reduced to synonymy.

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According to Kalb (2004), the characteristic features of *Tetramelas* are large spores, a mainly muscicolous habitat, the presence of 6-*O*-methylarthothelin and an arctic-antarctic or (sub-) alpine distribution. However, *T. papillatus* does not contain 6-*O*-methylarthothelin, '*T. poeltii*' is a corticolous and lignicolous species and the spores are rather small, and *T. terricolus* only occasionally contains 6-*O*-methylarthothelin. Nevertheless these species seem to be closely related. Another more consistent character is shared by all members of the group: the pigmented parts of the spore wall consist of a thick proper wall and a thin, irregularly cracked perispore, which is less than half as thick as the proper wall (Fig. 1). In the *Diplotomma*-group, in comparison, the perispore is thicker than the proper wall (Nordin 2000*a*), but in other groups in *Buellia* s. lat. there is a great variation in spore wall characters.

Material and Methods

The study is based on herbarium material from FH, M, MSC, S, UC and UPS. Microscopical measurements were made in water. Spore measurements are given only as minimum and maximum values. Transmission electron microscope investigations were carried out using methods described in Nordin (2000*a*). Thin layer chromatography was performed in accordance with standard methods (Orange *et al.* 2001).

FIG. 1. *Tetramelas confusus* (isotype, UPS), germinating spore. TEM micrograph showing details of the spore wall layers; the dominating dark part is the proper wall, which is more than twice as thick as the cracked, blackish perispore. Scale = 3 μm.

The Species

Tetramelas chloroleucus (Körb.) A.Nordin comb. nov.

Buellia chloroleuca Körb., *Parerg. lich.*: 191 (1860); type: Sudeten, *Körber* (UPS—lectotype!).

Buellia poeltii T. Schauer, *Mitt. Bot. Staatssammlung München* **5**: 616 (1965).—*Tetramelas poeltii* (T. Schauer) Kalb, *Biblioth. Lichenol.* **88**: 325 (2004); type: Germany, Oberbayern, Lanhenwies-Graben prope Garmisch, alt 1470 m, 4 ix 1963, *T. Schauer* (M—holotype!).

For descriptions, discussions of nomenclatural problems, lists of localities etc., see Giralt *et al.* (2000) and Nordin (2000*b*).

Tetramelas confusus A.Nordin sp. nov.

Tetramelas insignis similis sed sporae parviores, apothecia latiora, basi constricta, margo apotheciorum persistens, saepe flexuosus.

Typus: New Zealand, Otago, Potters, Old Man Range, 1200 m, 26 Febrary 1998, *D. J. Galloway* 0239 (CHR—holotypus; UPS—isotypus!).

(Figs 1 & 2)

Thallus crustose, irregularly spreading, verrucose to papillate, creamy to greyish white.

Apothecia crowded to scattered, sessile, constricted at base, up to 2·5 mm wide; disc blackish, concave to slightly convex, uneven; margin persistent, often flexuose. *Spores* ellipsoid, brown when mature, 1-septate, thin-walled, apices pointed, 13·5–25 × 5–7·5 μm.

Chemistry. Thallus K+ yellowish, C+ yellow-orange; containing atranorin (minor) and 6-*O*-methylarthothelin (major).

Habitat and distribution. On dead grass, decaying mosses, plant detritus and old rabbit droppings. So far only known from the Central Otago Mts in South Island, New Zealand, where it is locally common in alpine grasslands.

For a more detailed description, see the description of *Buellia papillata* given by Galloway *et al.* (1998).

Remarks. In its character traits *Tetramelas confusus* is intermediate between *T. papillatus* and *T. insignis*. *Tetramelas papillatus* has a thicker, whiter and more coherent thallus; smaller, broadly sessile apothecia, with margins not flexuose and often excluded; and it does not contain 6-*O*-methylarthothelin. In *T. insignis* the apothecia are similar to those of *T. papillatus*, but somewhat wider (up to 1·5 mm); the spores are distinctly larger than

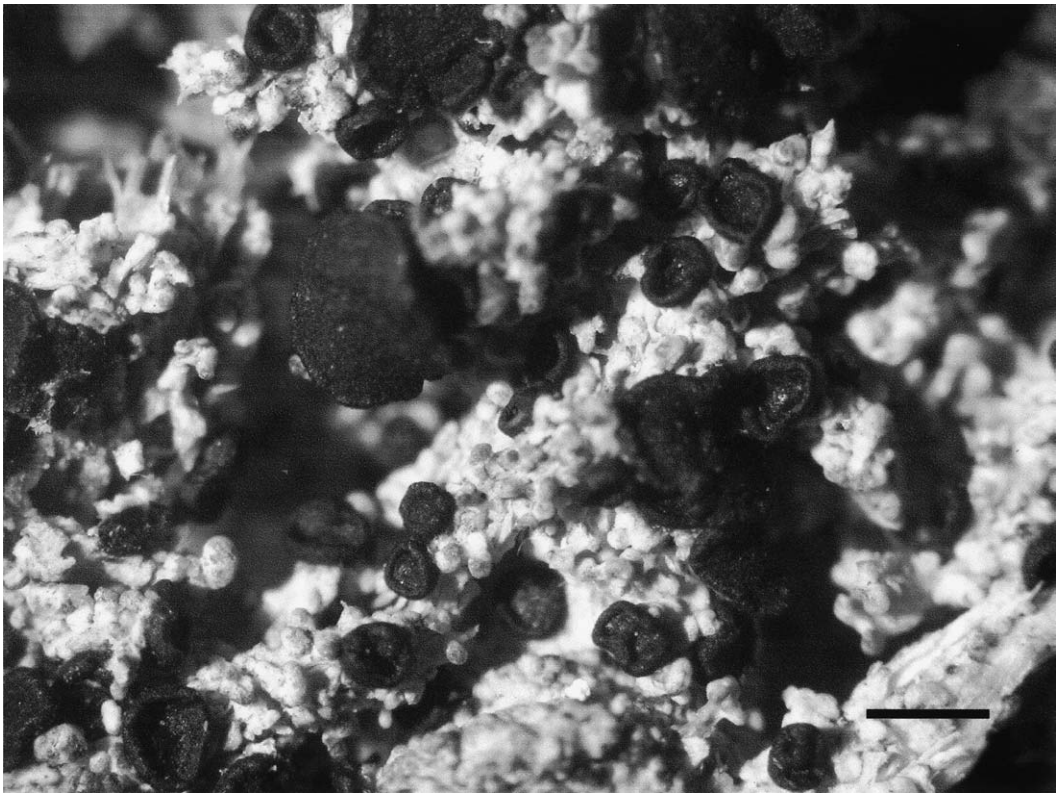

FIG. 2. *Tetramelas confusus* (isotype, UPS), thallus and mainly concave apothecia with a persistent margin.

TABLE 1. *Comparison of* Tetramelas confusus, T. insignis *and* T. papillatus

Character	*T. confusus*	*T. insignis*	*T. papillatus*
Thallus			
colour	creamy to greyish white	creamy to grey or white	chalky white
appearance	thin, irregularly spreading	thin, irregularly spreading	thick, in coherent patches
Apothecia			
width	up to 2·5 mm	up to 1·5 mm	up to 1 mm
shape	with constricted base	broadly sessile	broadly sessile
margin	persistent, often flexuose	often excluded, not flexuose	often excluded, not flexuose
disc	concave to slightly convex	plane to strongly convex	plane to strongly convex
Spore size	13–25 × 5–7·5 µm	23–32 × 9–13 µm	15–25 × 7–10 µm
Secondary products	6-*O*-methylarthothelin, atranorin	6-*O*-methylarthothelin	± atranorin

in the other two species; and the thallus does not contain atranorin (Table 1, Fig. 3). Another similar species is the South Georgian *Tetramelas graminicolus*, which, however, has 3-septate, longer spores.

The confusion concerning the circumscription of *Tetramelas papillatus* at least partly emanates from Tuckerman. When Tuckerman (1866) transferred *Lecidea papillata* Sommerf. to *Buellia*, he included

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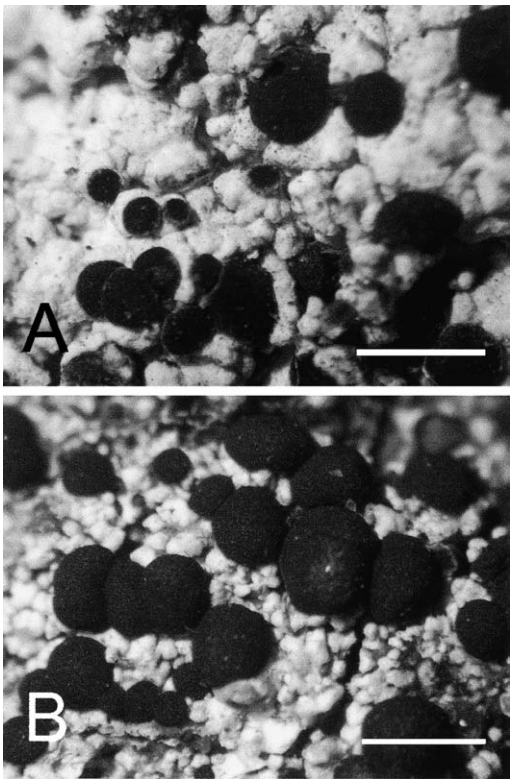

FIG. 3. Thallus and apothecia of *Tetramelas* species. A, *T. papillatus* (*Nordin* 4428, UPS); B, *T. insignis* (*Nordin* 5464, UPS). Scales: A & B=1 mm.

B. insignis as a synonym. Imshaug (1951) followed Tuckerman in that respect, and this concept has apparently been widely accepted in North America. Out of 44 collections of *B. papillata* borrowed in 1999 from FH, MSC and UC only 10 belonged to *Tetramelas papillatus*. The remaining 34 all belonged to *T. insignis*.

In Fennoscandia the two species have usually been kept well apart, even if the treatment by Degelius (1945) was rather confusing: the saxicolous *B. concinna* was included in *B. papillata* as v. *nodulosa*. But when comparing terricolous material of the two species, Degelius correctly noted that *T. papillatus* had a whiter, thicker and more broadly papillate thallus and shorter and thinner spores. However, the striking difference in thallus chemistry was neglected. The 6-*O*-methylarthothelin of *T. insignis* could easily have been detected (if not identified) by use of C under the microscope. In Fennoscandia *T. papillatus* is a rare species, restricted to subalpine and alpine areas. *Tetramelas insignis* is more widespread and common. In UPS there are, for example, 125 Fennoscandian collections of *T. insignis* but only 16 of *T. papillatus*. Both species were recently treated as *Buellia* species in The Nordic Lichen Flora (Foucard *et al.* 2001).

Also in Central Europe the two species have been separated, which is confirmed by two collections in Vězda *Lich. sel. exs.*, no 621 (*Buellia insignis*) and no 622 (*Buellia papillata*), collected by J. Poelt, M. Steiner and A. Vězda at the same locality in Graubünden, Switzerland. Although the two species look very much the same under the stereomicroscope—*B. insignis* has an unusually whitish thallus—they have been correctly determined.

Tetramelas granulosus (Darb.) A. Nordin comb. nov.

Bacidia granulosa Darb., Schwed. *Südpolar-Exp.*: 6 (1912).—*Buellia granulosa* (Darb.) C. W. Dodge, *B. A. N. Z. A. R. E. Rept. B7*: 244 (1948).—*Diplotomma granulosum* (Darb.) C. W. Dodge, *Lich. fl. Antarctic Isl. adj. isl.*: 345 (1973); type: Graham Land, Louis Philippe Peninsula, Hope Bay, 11 January 1902, *C. Skottsberg* (S—holotype!)

For taxonomic synonyms, see Nordin (2000*a*).

This is an Antarctic species containing 6-*O*-methyarthothelin and having relatively large spores (17–28 × 8–11·5 µm) with a thick proper wall and a thin, cracked perispore (see fig. 11b in Nordin 2000*a*). Contrary to other *Tetramelas* species it is saxicolous. For a more detailed description and list of localities, see Nordin (2000*a*).

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