A reassessment of the genera Chromatochlamys and Thelenella, and a new species of Strigula from the British Isles

Alan M. FRYDAY and Brian J. COPPINS

Abstract: Strigula confusa Fryday, Coppins & Common is described from the western British Isles, where it grows over bryophytes on mildly basic rocks. The concept of the genus Thelenella is expanded to include Chromatochlamys and the following new combinations are made: Thelenella larbalestieri (A. L. Sm.) Coppins & Fryday, Thelenella muscorum var. octospora (Nyl.) Coppins & Fryday, Thelenella vezdae (H. Mayrhofer & Poelt) Coppins & Fryday. Thelenella sordidula (Th. Fr.) H. Mayrhofer is reported for the first time from Europe (Svalbard).

Key words: Aspidothelium, pyrenolichens, Strigulaceae, Thelenellaceae

Introduction

The recent revival of interest in the lichen vegetation of high-altitude areas of the British Isles has resulted in numerous puzzling species being discovered (Gilbert et al. 1988; Gilbert & Coppins 1992; Fryday & Coppins 1996; Fryday 1996, 1997, 2000, 2002, in preparation). Among these is a species that was originally identified as Chromatochlamys muscorum var. octospora (Nyl.) H. Mayrhofer & Poelt (e.g. Gilbert & Fryday 1996), but it was later realized that it was not this taxon and provisionally renamed Chromatochlamys muscorum (Fryday 1996a). However, a more critical investigation has shown it to be referable to the genus Strigula Fr., and it is here described as Strigula confusa.

Our investigations have found the separation of Chromatochlamys Trevis. from Thelenella Nyl. to be untenable, and the appropriate new combinations are made.

Materials and Methods

Apothecial characteristics were examined by light microscopy on hand-cut sections mounted in water, 10% KOH (K) or 50% HNO3 (N). The ascus structure was studied in 0·15% aqueous IKI, both without prior treatment and after pretreatment with 10% KOH. All ascospore measurements were made in 10% KOH. For photography, all sections were prebleached and stained in 0·15% aqueous IKI (0·15IKI) without prior treatment (Common 1991).

Additional comparative material examined:


Aspidothelium geminipara (Malme) R. Sant.—Trinidad: ridge west of ‘Arima—Blanchisseuse Road’ along Las Lapas Road (west of Morne Bleu), c. 2000 ft.,


*Srijula johnsonii* P. M. McCarthy—*New Zealand*: South Island: North Otago: Leith valley, below Morrisons Creek, on rounded volcanic stones in bank of flood-prone stream, 1993, *P. N. Johnson* 757 (CHR—holotype); Bethunes Gulley, below Mt Cargill, grid ref. 144/198837, alt 135 m, on shaded volcanic stones in bank of flood-prone incised stream, 1993, *P. N. Johnson* 732 (CHR).

**Chromatochlamys and Thelenella**

The genera *Chromatochlamys* and *Thelenella* have been the subject of modern taxonomic treatments by Mayrhofer & Poelt (1985) and Mayrhofer (1987). The two genera, along with *Jutella* Fabre, forming the family *Thelenellaceae* H. Mayrhofer (1987) (Eriksson *et al.* 2003), although Harris (1995) considered *Jutella* to be ‘clearly a member of the *Arthopyreniaceae* and should be excluded from the *Thelenellaceae*'. Harris (1995) also expanded the concept of *Thelenella* by including within it the tropical genus *Aspidothelium* Vain., which was previously included in the *Aspidotheliaceae* Räsänen ex J. C. David & D. Hawksw. However, Santesson (1952) considered that *Aspidothelium* was related to *Clathroporina* Müll. Arg. in the *Trichotheliaceae* (Müll. Arg.) Bitter & F. Schill. but not to *Thelenella*, and Eriksson & Hawksworth (1998) recommended not uniting the *Aspidotheliaceae* with the *Thelenellaceae* pending further studies. Lücking (1998) discussed the differences between *Thelenella* and *Aspidothelium* and also recommended that they should not be united because he found several differences, especially the type of ascospore septation, which he considered significant at the generic level. Although Farkas & Sipman (1997) followed Harris in uniting the two genera, most other authors have continued to recognize *Aspidothelium* as a distinct genus (e.g. McCarthy 1999; McCarthy *et al.* 2001; Sérusiaux & Lücking 2001; Sipman 1997).

In addition, Mayrhofer (1987) reported thinly falcate, 9–15 × 0·6–1·2 μm conidia in *Thelenella*, whereas Santesson (1952) reported oblong, slightly curved, 3–4 × 1 μm conidia for *Aspidothelium cinerecens* Vain. (the type species of *Aspidothelium*). Consequently, we also prefer to keep the two genera separate.

Mayrhofer & Poelt (1985) distinguished *Chromatochlamys* from *Thelenella* by its periphysoids in the ostiole and a recessed (‘Einbuchtung’) ocular chamber in the ascus apex. Mayrhofer (1987) abandoned the first character, so that the two genera were then separated only on the presence or absence of an ocular chamber. Harris (1995) questioned this distinction as he observed an ocular chamber in several *Thelenella* species, especially in freshly collected material. Although he noted differences in the paraphysoids of *Thelenella* and *Chromatochlamys*, he questioned whether this was significant at the generic level. However, he declined to unite the two genera owing to the limited material of *Chromatochlamys* available to him. We confirm Harris’s observations of an ocular chamber in the specimens of *Thelenella* species available to us (see Materials and Methods), including material of the type of the genus, *T. modesta*. Indeed, an ocular chamber (‘cone-shaped dimple’) is clearly illustrated for this species by Morgan-Jones & Swinscow (1965: fig. 2). Although the paraphysoids of *T. modesta* tend to be more branched than those of *C. muscorum* (the type species of
Chromatochlamys), we consider this to be of minor importance and not significant at the generic level. As we have ample material of Chromatochlamys for comparison, we, accordingly, consider Chromatochlamys to be a synonym of Thelenella and make the necessary new combinations. The combination T. muscorum (Fr.) Vain. has already been made.

Thelenella larbalestieri (A. L. Sm.) Coppins & Fryday comb. nov.

Microgaena larbalestieri (‘larbalestieri’) A. L. Sm., j. Bot. 49: 42 (1911).—Chromatochlamys larbalestieri (A. L. Sm.) H. Mayrhofer & Poelt, Herzogia 7: 27 (1985); type: Ireland, Connemara, Twelve Pines, 1876, Larbalaster (BM—holotype!).

There are four collections referred to T. larbalestieri in BM, two each from Ireland and Scotland. The two Irish records, which include the holotype, have a thickish, rimose, brown thallus and are apparently epiphytic on other lichens (Verrucaria sp., Porphidia sp.) whereas the two Scottish collections have a thin, white thallus and are growing directly on rock, one of which was not semi-inundated. One of the Scottish collections (James 1966) supported only a single perithecium and was not examined microscopically, but the ascospores of the other collection (Swinscow 1962) were similar in size and shape to those of T. larbalestieri.


Thelenella muscorum var. octospora (Nyl.) Coppins & Fryday comb. nov.


Selected specimens examined. Great Britain: England: V.C. 70, Cumberland: Melmerby Low Scar, 35/6.3, 410–470 m, over mosses on limestone, 1979, Coppins 4265 (E). Scotland: V.C. 96, Easternness: Drumdorchit, by Divach Burn, near Divach Lodge, 28/49.27, c. 200 m, 1976, Coppins 3810 (E); 11 km WSW of Inverness, South Clunes, 28/55.40, on Hypnum on Salix, 1984, Coppins 10551 (E).

Thelenella vezdae (H. Mayrhofer & Poelt) Coppins & Fryday comb. nov.

Chromatochlamys vezdae H. Mayrhofer & Poelt, Herzogia 7: 39 (1985); type: Österreich, Steiermark, 1340–1400 m, 18 vi 1972, P. Döbbeler s.n. (GZU—holotype!).

This species should be compared with Thelenella sychognonioides (Zahlber.) R.C. Harris (syn. T. harrisii H. Mayrhofer), which Mayrhofer (1987), erroneously, considered to be a synonym of T. hassei (Zahlbr.) H. Mayrhofer.

Additional specimens examined. Austria: Steiermark: Koralpe, Herzogberg E von Modriach, beim Gehöft Aiblwirt, c. 1250 m, Tannen-Fichtenwald, an einem Strunk, 1985, Hafellner 13176, (GZU); 10 km W Schwanberg, Weg Jägerwirt-Schwanberger Brendel Hütt, 1300–1600 m, GF 9256/1, 1991, Poelt, Scutari & Obermayer s.n. (GZU); Teigitschgarben, S Voitsberg, c. 2 km SW vom Kraftwerk Arnstein, c. 440 m, MTB 8956/4 Schluchtwald mit Silikatschrofen, auf einem Baumstrunk, 1994, Mayrhofer & Unger s.n. (GZU); Eisenerzer Alpen, im Talschluss des Gößgraben's NW von Trofaiach, am Eingang des Graskogel Grabens, c. 1080 m, 47°27'20"N, 14°51'50"E, MTB 8555/1 Fichtenwald, an morschen Koniferenstümpfen, 1997, A. Hafellner & f. Hafellner 40979 (GZU).

As part of our investigations we examined a ‘Chromatochlamys’ collection from Svalbard. This proved to be Thelenella sordidula (Th. Fr.) H. Mayrhofer, previously known only from Disko Island (Greenland) and Ellesmere Island (Canada). It is here reported for the first time from Europe.


A further, apparently undescribed, species of Thelenella is also known to us from two
collections from south-west England. It has a silvery thallus with a hint of grey-green, and 4-spored asci with ascospores mostly 36–55 × 15–14 μm. More material is required for a clearer understanding of its variation and relationships.

**Thelenella sp.** Great Britain: England: VC 3, South Devon: Pudscombe Cove, on sheltered, near vertical shale in valley, with *Leptogium teretiusculum*, 20/912.505, iv 2000, B. Benfield (E); ibid., on Lower Devonian slate in quarry, 200 m from the sea-shore, 20/912.505, 10 viii 2000, B. Benfield (E).

**Strigula Fr.**

**Strigula confusa** Fryday, Coppins & Common sp. nov.

Thallus bryicola aut saxicola, tenuis, griseus. Algae ad *Trentepohlia* pertinentes. Perithecia atrobrunnea vel atra, ½ vel ⅓ immersa, 0·3–0·5 mm diam., involucello nullo aut indistincto. Asci cylindrici vel anguste clavati, 140–160 × 25–28 μm. Ascosporae 32·5–46·6–58·0 × 11–13 μm, elongato-ellipsoideae, hyaline, submuriformes vel muriformes.


(Fig. 1)

**Thallus** (Fig. 1A) grey, continuous, thin (c. 50 μm thick). *Photobiont Trentepohlia*; cells irregularly rounded and 10–15 μm diam., or elongate and up to 21 × 12 μm.

**Perithecia** (Fig. 1A) numerous, dark brown to black, globose in section, 0·3–0·5 mm diam., half to three-quarters immersed. *Excipulum* 70–80 μm thick, dark brown above, pale-brown or hyaline below; hyphal cells in upper excipulum rounded, angular or oblong, 4–10 × 3–5 μm, with dark brown pigment granules deposited on the cell walls. *Involucellum* absent (or not well differentiated from the excipulum). *Paraphysoids* persistent, 2·0–2·5 μm wide, sparingly branched. *Asci* (Fig. 1B) cylindric (to subclavate), 140–160 × 25–28 μm; outer wall c. 2 μm thick; apex with a distinct tholus and ocular chamber, I –; contents of ascus I+ red-brown; 6–8-spored. *Ascospores* (Fig. 1B) 32·5–46·6–58·0 × 11–13 μm, elongate-ellipsoid, hyaline, submuriform to muriform, with 12–14 × 2–3 septa.

**Conidiomata** pycnidia, dark brown to black, immersed in the thallus, 0·05–0·06 mm diam. *Microconidia* short oblong-ellipsoid, 3·5–4·5 × 1·0–1·2 μm.

**Chemistry.** C –, KC –, K –, PD –, UV –. Not tested by TLC.
Notes. The large, muriform ascospores distinguish *Strigula confusa* from all other British species of the genus. The corticolous *S. tagananae* (Harm.) R. C. Harris, from the Canary Islands, Portugal and Ireland, has smaller, muriform ascospores (25–35 μm in diameter) and lateral ostioles (Aptroot & van den Boom 1995, as *S. lateralis*; Harris 1995).

McCarthy (2001) has provided a key to the saxicolous species of *Strigula*, which includes nine species with muriform ascospores. Of these, *S. johnsonii* P. M. McCarthy (McCarthy 1995), described from semi-inundated rocks in South Island, New Zealand, is the most similar to *S. confusa*, but that species has a silvery white thallus and almost completely immersed perithecia.

Because of its large, muriform ascospores, *Strigula confusa* has previously been reported as *Thelenella* (Chromatochlamys) *muscorum* var. *octospora* (Gilbert & Giavarini 1993; Gilbert & Fryday 1996), and is most likely to be confused with that species or *T. larbalestieri*. However, *Strigula confusa* differs from *Thelenella* in photobiont (*Trentepohlia* in *Strigula*, chlorococcoid in *Thelenella*) and ascus structure. Furthermore, the upper excipulum of *S. confusa*, and other members of the genus, is composed of rounded to angular or elongate cells (approximating to *textura angularis*), whereas that of *Thelenella* is composed of slender cells varying from *textura porrecta* to *textura intricata*. The brown (**K**−, **N**−) pigmentation in the excipulum of *Strigula* is laid down in pigmented granules external to the cell walls (clearly seen in mounts in **K** at **×**1000). In *Thelenella* the brown to greenish (**K**−, **N**+ greenish) pigmentation is homogeneous (no granulations visible at **×**1000), lining the outer surface of the cells or present as a dilute coloration in the gel matrix.

*Thelenella muscorum* var. *octospora*, which very rarely occurs in the same habitat as *S. confusa*, further differs in having a very thin, inapparent, varnish-like thallus, and smaller, paler brown, pyriform perithecia, whereas *T. larbalestieri* has a brown, rimose thallus and occurs on semi-inundated, siliceous rocks. *Thelenella larbalestieri* is known from only four collections from the western British Isles (see above). The two recent collections from Wales (Wolseley & Orange 1999; Chambers 2000) are misidentifications of *Strigula confusa* (see below). The main differences between *S. confusa* and the two *Thelenella* species are summarized in Table 1.

*Strigula confusa* is also likely to be confused with species of *Protothelenella*, (e.g. *P. sphinctinoides* (Nyl.) H. Mayrhofer & Poelt, *P. sphinctinoidella* (Nyl.) H. Mayrhofer & Poelt) but these are usually terricolous, and the asci of this genus have an amyloid tholus.
Genera of pyrenocarpous lichens with muri-form ascospores in the Verrucariales (e.g. Leucocarpon, Polyblastos, Staurothela), can be distinguished by their lack of persistent paraphysoids.

In the field, Strigula confusa is most likely to be confused with S. alpestris (Vězda) Hafellner (syn. S. stigmatella var. alpestris (Vězda) Coppins), which occurs in the same habitat, but this taxon has only transversely septate ascospores.

**Distribution and habitat.** Strigula confusa has been recorded only from the hyper-oceanic regions of the west coast of the British Isles, and appears especially frequent in North Wales. It most frequently occurs growing over bryophytes (usually *Hypnum hamulosum* Schimp.) attached to mildly basic rocks (e.g. andesite, mica-schist, basalt) in assemblages rich in rare, calcicolous lichens (e.g. Strigula alpestris, Thelopsis melathelia and Vestergrenopsis elaenia). Lichens associated with the Irish specimen included Dimerella lutea and Porocyphus kenmorensis, with Enterographa hutchinsiae, *Epigloea* sp., *Gyalecta jenensis* and *Porina guentheri* var. *guentheri* close by.

The two recent reports of *Strigula confusa* (as *Chromatochlamyds larvalestii*) from mid-Wales (Chambers 2000; Wolseley & Orange 1999) are atypical in occurring on shaded rocks and having pale, unpigmented perithecia. However, typical collections of *S. confusa* do occasionally spread onto rocks (e.g. *Fryday* 2944), and microscopic examination of one of the Welsh, saxicolous collections (Chambers 2000) revealed significant quantities of the brown granular pigment typical of *Strigula* in the exciple. As these collections also agree with *S. confusa* in all other respects, we have no hesitation in including them in the new species.

**Selected additional specimens examined.** Great Britain: Wales: V.C. 46, Cardiganshire: Devil’s Bridge, Cwm Rheidol, 22/74 71, 6 m, on shaded, slightly basic rock face in woodland, 16 ii 1998, P. Wolseley & A. Orange (NMW); Hafod, Nant Gau, 22/77 73, 240 m, on mudstone in deep, sheltered recess above narrow, wooded stream gorge, 2 ii 2000, S. P. Chambers (hb. Chambers). V.C. 49, Caernarvonshire: Cwm Idwal, N-E of Twll Du, 23/640 588, 500 m, on bryophytes on side of large, calcareous boulder, 1994, *Fryday* 5318; ibid., 1977, Coppins 2776 (E); Pass of Llanberis, Cwm Uchaf, beside Llyn Glas, 23/61 55, 650 m, on bryophytes on basic rock outcrop, 1994, *Fryday* [5698] & S. Chambers; Pass of Llanberis, Cwm Glas, 23/61 55, 750 m, on bryophytes on stratified basic rocks on back wall of cwm, 1994, *Fryday* [5711 & 5717] & S. Chambers; Pass of Llanberis, Cwm Glas-bach, 23/60 56, 600 m, on bryophytes on calcareous rock face, 1994, *Fryday* 5727, 5733 & 5740; Pass of Llanberis, Cwm Uchaf, damp, north-facing crag, 23/62 55, 825 m, on bryophytes on calcareous rock, 1995, *Fryday* 6343.


We thank Dr Helmut Mayrhofer (Graz) for his comments on our collections of *S. confusa*, and Ralph Common (East Lansing) for photography and first recognizing that the photobiont of *S. confusa* was Trentepohlia. The first author also acknowledges receipt of a Research Scholarship from the University of Sheffield. We also thank the herbarium curators and individual collectors who loaned us material.

**References**


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Accepted for publication 3 February 2004