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Ostropales: Protothelenellaceae

Cover image: *Protothelenella sphinctrinoides*, overgrowing mosses and algae on montane heath, Jämtland, Sweden. Image copyright Leif Stridvall (http://www.stridvall.se/lichens/gallery/).

Revisions of British and Irish Lichens is a free-to-access serial publication under the auspices of the British Lichen Society, that charts changes in our understanding of the lichens and lichenicolous fungi of Great Britain and Ireland. Each volume will be devoted to a particular family (or group of families), and will include descriptions, keys, habitat and distribution data for all the species included. The maps are based on information from the BLS Lichen Database, that also includes data from the historical Mapping Scheme and the *Lichen Ireland* database. The choice of subject for each volume will depend on the extent of changes in classification for the families concerned, and the number of newly recognized species since previous treatments.

To date, accounts of lichens from our region have been published in book form. However, the time taken to compile new printed editions of the entire lichen biota of Britain and Ireland is extensive, and many parts are out-of-date even as they are published. Issuing updates as a serial electronic publication means that important changes in understanding of our lichens can be made available with a shorter delay. The accounts may also be compiled at intervals into complete printed accounts, as new editions of the *Lichens of Great Britain and Ireland*.

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Ostropales: Protothelenellaceae

including the genus *Protothelenella*

by

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PROTOTHELENELLACEAE Vězda, H. Mayrhofer & Poelt (1985)

The family contains the single genus *Protothelenella*, so the generic description below constitutes that of the family.

PROTOTHELENELLA Räsänen (1943)

Thallus not lichenized, or distinctly lichenized and then crustose, granular to cracked-areolate, the margin effuse, usually bright green when fresh, whitish to grey-brown when dry, ± gelatinous when wet, anatomically hardly differentiated. **Photobiont** *Elliptochloris*, or absent. **Ascomata** perithecia, mostly single and scattered, immersed, globose to pear-shaped, dark brown to blackish. **Involucrellum** absent. **True exciple** brown to greenish blue in the upper part, mostly colourless towards the base, of strongly anastomosing conglutinate hyphae to 1 µm diam. with narrow lumina. **Hamathecium** of paraphysoids, persistent, strongly branched and anastomosed; periphysoids absent. **Hymenial gel** hemiamyloid: I+ dull red (I+ blue at low concentrations of iodine), K/I+ blue. **Asci** (6-) 8-spored, ± cylindrical, thick-walled (2-5 µm) with two functional wall layers, the outer wall layer I+ dull reddish, K/I+ blue, the apex with an I+ blue, ± layered *Xylaria*-like apical. **Ascospores** colourless, transversely multi-septate, submuriform or strongly muriform, the outer wall distinctly thicker than the septa. **Conidiomata** not known. **Chemistry**: an unidentified C+ red substance, or lichen substances absent. **Ecology**: lichenized taxa on acid substrata including rocks, soil, mosses, plant detritus or wood, in moist situations; non-lichenized taxa lichenicolous or on living mosses. **Distribution**: 11 species in N. Hemisphere and austral regions.

Protothelenella occupies a basal clade within the Ostropales (Resl *et al*. 2015) and further sampling may clarify its evolutionary ancestry.

Thelenella (Ostropales: Thelenellaceae) is similar in many respects and its species occupy similar habitats, but it differs in the I– ascus and hymenial gel. *Agonimia* (Verrucariales: Verrucariales) is unrelated but might be confused with *Protothelenella*; it differs in the absence of interascal filaments and the I– ascus. *Protothelenella leucothelia* (Nyl.) H. Mayrhofer & Poelt (1985) has been incorrectly reported from the British Isles; it has a whitish, C+ red thallus and grows on decaying bryophytes or on soil. GB records of that species are probably *P. sphinctrinoides*, which can also have a C+ red thallus (Ohmura & Mayrhofer 2016).

Literature

Mayrhofer (1987a, b), Ohmura & Mayrhofer (2016), Orange (2013), Orange *et al*. (2009), Resl *et al*. (2015), Schmitt *et al*. (2005), Zhurbenko & Pino-Bodas (2017).

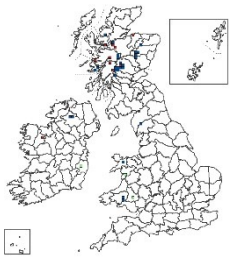
1 Lichenicolous, on terricolous *Cladonia* species ..... ***santessonii***
Lichenized, the thallus often inconspicuous 2

2(1) Thallus smooth to granular, often in dispersed areoles, often C+ red; on rocks ..... ***corrosa***
Thallus indistinct, film-like, C–; overgrowing bryophytes and decaying plants 2

3(2) Ascospores 17–25 (–27) × 8.5–11.5 µm, ellipsoidal, length/breadth ratio mostly about 2:1; on the inner surface of incurved leaves of *Polytrichum* spp. ..... ***petri***
Ascospores >22 µm long, elongate-ellipsoidal; length/breadth ratio around 3:1 4

4(3) Ascospores 22–33 × 7–10 µm, submuriform; perithecia <0.3 mm diam. ..... ***sphinctrinoidella***
Ascospores 38–50 × 10–15 µm, strongly muriform; perithecia 0.4–0.6 mm diam. ..... ***sphinctrinoides***

Protothelenella corrosa (Körb.) H. Mayrhofer & Poelt (1985) **Nb**



Thallus smooth to granular-uneven, warted, or forming a cracked crust; often in ± dispersed areoles surrounding single or several perithecia, or inconspicuous, dirty yellowish, green or brownish white. Perithecia 0.2–0.5 mm diam., scattered, rarely 2-3 contiguous, partly immersed, forming low to prominent black projections, the apex often with a small central depression, exciple pigmented in the upper half, dull greenish brown, K+ brown going into solution; lower part colourless. Ascospores 18–32 × 10–15 µm, muriform, broadly ellipsoidal or ovoid. Thallus often C+ red. **BLS 0898**.

On damp siliceous rocks on water-flushed faces, boulders, scree and beside streams; very local. Upland Britain, Ireland.

The green colour of some specimens is striking in the field, suggesting free-living algae rather than a lichen.

Protothelenella petri H. Mayrhofer & Poelt (1987) **NE**

Thallus indistinct, composed of a few algal cells (probably *Elliptochloris*) surrounded by hyphae between and around the ascomata. Perithecia 100–200 µm diam., rather irregular in form but usually ± pyriform, superficial, sessile, mostly in small clusters on the midrib region of the upper (inner) surface of inrolled leaves; dark grey to black, greenish when wet; exciple of dull green pigmented hyphae with narrow lumina, 20–30 µm thick laterally and 40–60 µm thick in the apical region. Asci 110–130 (–160) × 18–23 µm, clavate to cylindric-clavate, fairly short-stalked, thick-walled and fissitunicate, the outer gelatinous wall layer blueing in iodine and with a very faintly blue-staining apical plug, (4-) 8-spored. Ascospores 17–25 (–27) × 8.5–11.5 µm, ellipsoidal to fusiform-ellipsoidal, hyaline, muriform with 3-5 transverse septa and 1-3 incomplete longitudinal septa, the outer wall noticeably thicker than the inner septa, smooth, without a gelatinous perispore. **BLS 2751**.

On the inner surface of dead inrolled leaves of *Polytrichum juniperinum*, Cairngorms.

Similar to *P. sphinctrinoidella* but with spores that are almost always broader in relation to their length, and occupying a very distinct habitat. *P. polytrichi* (not yet recorded from Great Britain and Ireland) also occurs on dead *Polytrichum* plants, but is not lichenized and has trans-septate rather than submuriform spores.

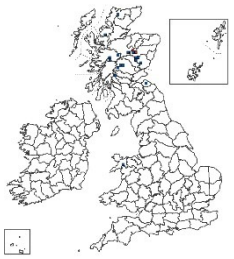
Protothelenella santessonii H. Mayrhofer (1987) **NE**

Thallus absent, lichenicolous. Perithecia scattered, semi-immersed in the host thallus, 150–200 µm diam., ovoid to subpyriform, black, glossy, the ostiole slightly sunken; exciple reddish brown, paler and thicker at the base. Asci subcylindrical, 8-spored. Ascospores (14.5–) 19.5–26 (–31.5) × (6–) 8.5–11.5 (–16) µm, length/breadth ratio mostly 1.9–2.7, ellipsoidal to lemon-shaped, submuriform with 3-5 (-7) transverse or ± oblique septa and usually one longitudinal septum in central segments. **BLS 2629**.

On squamules of terricolous *Cladonia* species, Skye.

P. leucothelia (incorrectly reported from Britain and Ireland – see above) may also be lichenicolous on *Cladonia* (Zhurbenko & Pino-Bodas 2017).

Protothelenella sphinctrinoidella (Nyl.) H. Mayrhofer & Poelt (1985) **Nb**



Thallus indistinct, thin, membrane-like or diaphanous, evanescent, pale grey or dirty white, greenish when fresh. Perithecia 0.1–0.3 mm diam., superficial, sessile to quarter-immersed, black, ± shiny, rounded to pyriform, single, very rarely 2-4 contiguous; exciple dark brown above, ± opaque, paler below and sometimes colourless, semi-opaque to translucent; ostiole sometimes extended as a short papilla. Ascospores 22–23 × 7–10 µm, elongate or elongate-ellipsoidal, submuriform, with 7-9 transverse and 4-6 longitudinal septa in optical section of each ascospore. **BLS 0902**.

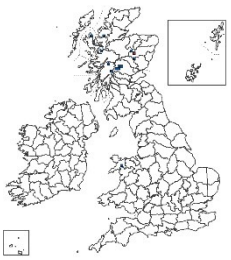
Overgrowing hepatics on acid soils or rocks, mainly above 600 m. N. Scotland (Highlands, especially Breadalbane and Cairngorm mountains), E. Lothian, N. Wales.

Differs from *P. sphinctrinoides* in the smaller perithecia and smaller, submuriform spores. The thallus may be almost absent with few associated photobiont cells, the species being partially saprotrophic.

Protothelenella sphinctrinoides (Nyl.) H. Mayrhofer & Poelt (1985) **NT**

Thallus thin, film-like to finely warted, evanescent, dirty white when dry, greenish or pale brown, at times

gelatinous when wet. Perithecia 0.4–0.6 mm diam., one-third to completely immersed, rounded or pyriform, scattered, brown to black, paler when wet; exciple densely pigmented above, brown, K–, pale brown to ± colourless below; above with a superficial colourless layer *ca* 10 µm thick; ostiole sometimes depressed. Ascospores 38–50 × 10–15 µm, ellipsoidal to broadly spindle-shaped, strongly muriform, with up to 4 longitudinal walls per tier of cells in optical section in the middle part of the ascospore. Thallus K−, Pd−, C+ red. **BLS 0903**.



Overgrowing bryophytes on acid soils or over schistose or granitic rocks, above 800 m. N. Scotland (Highlands, Breadalbane and Cairngorm mountains), N. Wales.

P. sphinctrinoidella differs in the smaller, submuriform ascospores. *Thelenella muscorum* has larger ascospores and an I– ascus apex. Drawings of the ascus apices can be found in the treatment of Thelenellaceae below.

Literature

Mayrhofer, H. (1987a). Ergänzende Studien zur Taxonomie der Gattung *Protothelenella*. *Herzogia* **7**: 313-342.

Mayrhofer, H. (1987b). Monographie der Flechtengattung *Thelenella*. *Bibliotheca lich.* **26**: 1-106.

Ohmura, Y. & Mayrhofer, H. (2016). *Protothelenella sphinctrinoides* (Protothelenellaceae) new to Japan and new chemical features for several species in the genus. *Herzogia* **29**: 137-142.

Orange, A. (2013). *British and Other Pyrenocarpous Lichens*. Cardiff: National Museum of Wales.

Orange, A., Purvis, O.W. & James, P.W. (2009). *Protothelenella*. In *Lichens of Great Britain and Ireland* (Smith, C.W., Aptroot, A., Coppins, B.J., Fletcher, A., Gilbert, O.L., James, P.W. & Wolselsey, P.A. eds): 755-757. London: British Lichen Society.

Resl, P., Schneider, K., Westberg, M., Printzen, C., Palice, Z., Thor, G., Fryday, A., Mayrhofer, H. & Spribille, T. (2015). Diagnostics for a troubled backbone: testing topological hypotheses of trapelioid lichenized fungi in a large-scale phylogeny of Ostropomycetidae (Lecanoromycetes). *Fungal Diversity* **73**: 239–258.

Schmitt, I., Mueller, G. & Lumbsch, H.T. (2005). Ascoma morphology is homoplaseous and phylogenetically misleading in some pyrenocarpous lichens. *Mycologia* **97**: 362-374.

Zhurbenko, M. & Pino-Bodas, R. (2017). A revision of lichenicolous fungi growing on *Cladonia*, mainly from the Northern Hemisphere, with a worldwide key to the known species. *Opuscula Philolichenum* **16**: 188–266.