

Revisions of British and Irish Lichens



*British
Lichen
Society*

Volume 9

February 2021



Peltigerales: Pannariaceae

Cover image: *Pectenia atlantica*, on bark of *Fraxinus excelsior*, Strath Croe, Kintail, Wester Ross.

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to compile new printed editions of the entire lichen biota of Britain and Ireland is extensive, and many parts are out-of-date even as they are published.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*.

Editorial Board

Dr P.F. Cannon (Department of Taxonomy & Biodiversity, Royal Botanic Gardens, Kew, Surrey TW9 3AB, UK).

Dr A. Aptroot (Laboratório de Botânica/Liquenologia, Instituto de Biociências, Universidade Federal de Mato Grosso do Sul, Avenida Costa e Silva s/n, Bairro Universitário, CEP 79070-900, Campo Grande, MS, Brazil)

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ISSN 2634-7768

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Revisions of British and Irish Lichens vol. 9

Peltigerales: Pannariaceae

including the genera *Fuscopannaria*, *Leptogidium*, *Nevesia*, *Pannaria*, *Parmeliella*, *Pectenina*, *Protopannaria* and *Psoroma*

by

Paul Cannon

Royal Botanic Gardens, Kew, Surrey TW9 3AB, UK; email p.cannon@kew.org

André Aptroot

Laboratório de Botânica/Liquenologia, Instituto de Biociências, Universidade Federal de Mato Grosso do Sul, Avenida Costa e Silva s/n, Bairro Universitário, CEP 79070-900, Campo Grande, MS, Brazil

Brian Coppins

Royal Botanic Garden, Inverleith Row, Edinburgh EH3 5LR, UK

Neil Sanderson

3 Green Close, Woodlands, Southampton, Hampshire, SO40 7HU, UK

Janet Simkin

School of Natural and Environmental Sciences, Newcastle University, Newcastle upon Tyne NE1 7RU, UK

This publication can be cited as:

Cannon, P., Aptroot, A., Coppins, B., Sanderson, N. & Simkin, J. (2021). Peltigerales: Pannariaceae, including the genera *Fuscopannaria*, *Leptogidium*, *Nevesia*, *Pannaria*, *Parmeliella*, *Pectenina*, *Protopannaria* and *Psoroma*. *Revisions of British and Irish Lichens* **9**: 1-16.

PANNARIACEAE Tuck. (1872)

Thallus squamulose to foliose, blue-grey or brownish, corticate only on the upper surface, the medulla merging into a layer of rhizine-like hyphae below, which are sometimes very well-developed and form a dark blue-grey prothallus. **Isidia** and **soredia** sometimes present. **Photobiont** mostly cyanobacteria (*Nostoc*) but in one genus with green algae (*Myrmecia*?) and cyanobacteria in cephalodia. **Ascomata** apothecia, often large and conspicuous, usually laminal. **Thalline margin** variably developed and sometimes excluded at maturity or obscured by secondarily developed thalline squamules. **True exciple** thin, pale. **Hymenium** I+ blue, sometimes turning red-brown (hemiamyloid). **Asci** cylindrical, with or without apical amyloid ring or plug structures, 8-spored. **Ascospores** colourless, aseptate, usually ellipsoidal, often with a distinct ornamented epispore and apical appendages. **Conidiomata** pycnidia, usually marginal, blackish, wart-like. **Conidia** cylindrical, produced laterally or terminally on short-celled conidiophores. **Chemistry**: predominantly pannarin and related substances giving a Pd+ red or orange reaction, sometimes with fatty acids and/or terpenoids, or without any secondary substances.

A well-defined family, of foliose or squamulose lichens without a lower cortex and usually with cyanobacterial photobionts. Most species in our area have strongly oceanic distributions, and some are of significant conservation concern. There are 27 genera according to the arrangement in Ekman *et al.* (2014) and Lücking *et al.* (2016, 2017), many of which are tropical or austral in distribution.

Changes to the arrangement in edition 2 of *Lichens of Great Britain and Ireland* include the incorporation of *Moelleropsis* into *Fuscopannaria*, the recognition of *Nevesia* for *Fuscopannaria sampaiana*, and the transfer of British and Irish species formerly treated in *Degelia* to *Pectenia*. *Massalongia* and *Vahliella* are excluded from the Pannariaceae and placed in their own families *Massalongiaceae* and *Vahliellaceae* respectively.

Literature

Ekman & Jørgensen (2002), Ekman *et al.* (2014), Jørgensen (1978), Lücking *et al.* (2016, 2017), Spribille & Muggia (2013).

- | | | |
|------|--|--------------------|
| 1 | Thallus large, foliose, plate-like and placodioid, often with distinct broad marginal lobes..... | <i>Pectenia</i> |
| | Thallus crustose-squamulose (sometimes extensive), minutely foliose or minutely fruticose | 2 |
| 2(1) | Thallus with a green algal photobiont, with cyanobacteria in cephalodia | <i>Psoroma</i> |
| | Thallus with cyanobacteria only..... | 3 |
| 3(2) | Thallus minutely filamentous, richly branched; apothecia not known in British or Irish material | <i>Leptogidium</i> |
| | Thallus crustose-squamulose to minutely foliose, usually large | 4 |
| 4(3) | Thallus minutely foliose to squamulose, often rosette-forming; usually with pannarin (Pd+ orange-red); apothecia when present with a well-developed thalline margin..... | <i>Pannaria</i> |
| | Thallus squamulose to crustose, Pd- (Pd+ in some extra-European species), apothecia when present with poorly developed, often sorediate thalline margin | 5 |
| 5(4) | Thallus isidiate (the isidia often breaking down into soredia) or initially sorediate, or with soredium-like lobules | 6 |
| | Thallus not isidiate or sorediate; often with apothecia | 8 |
| 6(5) | Thallus of closely appressed chestnut brown squamules with cream-coloured soralia; nearly always sterile..... | <i>Nevesia</i> |
| | Thallus usually blue-grey, isidia and soralia ± dark, blue-grey or violet..... | 7 |

- 7(6) Soralia grey-blue-violet; squamules ± white-felted towards and at the margins *Fuscopannaria*
 Soralia blue-grey; squamules without a felted white margin *Parmeliella*
- 8(5) Apothecia large, to 2 mm diam., disc orange-brown, hymenium amyloid *Protopannaria*
 Apothecia <1 mm diam., disc brown to blackish; hymenium hemiamyloid (if apothecia
 absent then thallus granular or nodulose, forming a thick, ± continuous crust) *Fuscopannaria*

FUSCOPANNARIA P.M. Jørg. (1994)

Thallus squamulose or crustose, the lower surface often attached by a blue to blue-black hypothallus which is sometimes visible between the squamules. **Upper surface** blueish grey to olivaceous or brown-black. **Upper cortex** composed of thick-walled cells, lower cortex absent. **Photobiont** blue-green, *Nostoc*. **Ascomata** apothecia, sessile, disc red-brown to black. **Thalline margin** variably developed and often excluded at maturity, concolorous with the thallus, the outer part pseudoparenchymatous, the inner loosely organized with densely packed photobiont cells. **True exciple** thin, pale; cells ± pseudoparenchymatous. **Hymenium** I+ blue-green, turning red-brown (hemiamyloid). **Asci** 8-spored, with an amyloid apical plug. **Ascospores** colourless, aseptate, ellipsoidal, often apiculate at one or both ends and with a warted epispore. **Conidiomata** pycnidia. **Conidia** straight, bacilliform. **Chemistry**: fatty acids and terpenes (rarely none). **Ecology**: mostly on bark, rarely on rocks or soil.

Fuscopannaria species are superficially quite similar to species of *Parmeliella*, which are easily distinguished when fertile in Europe by the absence of a thalline margin and the amyloid rather than hemiamyloid hymenium. When sterile, the two genera can only be reliably distinguished on an individual species basis.

In this account, *Moelleropsis* is included in *Fuscopannaria* and *F. sampaiana* placed in the separate genus *Nevesia*, following Ekman *et al.* (2014). *Vahliella* (Peltigerales, Vahliellaceae) is superficially similar to *Fuscopannaria*, but the asci have an amyloid layer in the thickened apex rather than an apical plug, the apothecia have irregularly developed thalline margins, the thallus lacks fatty acids and terpenoids and the ascospores do not have an epispore. Some species superficially resemble *Massalongia* and *Psoroma*; see also *Pectenina*.

Literature

Carlsen *et al.* (2012), Ekman *et al.* (2014), James & Jørgensen (2009), Jørgensen (2005), Paz-Bermúdez *et al.* (2008), Tripp & Lendemer (2019), Woods (2009).

The key below includes *Fuscopannaria* and other genera likely to be confused with it.

- 1 Thallus isidiate or sorediate 2
 Thallus not isidiate or sorediate; often with apothecia 9
- 2(1) Thallus isidiate 3
 Thallus sorediate 6
- 3(2) Hypothallus black, well-developed, often ± prominent *Parmeliella triptophylla*
 Hypothallus absent or poorly developed, inconspicuous 4
- 4(3) Thallus entirely crustose, effuse; apothecia common *Vahliella atlantica* (Vahliellaceae)
 Thallus crustose-squamulose to lobulate; apothecia uncommon 5

- 5(4) Thallus minutely squamulose at least at the margin; strong antiseptic smell on bruising when wet *Parmeliella testacea*
Thallus of narrow, overlapping lobes; no strong smell on bruising *Massalongia carnosa*
(Massalongiaceae)
- 6(2) Squamules pale to dull red-brown, very closely appressed, areole-like; hypothallus conspicuous; soredia cream-yellow *Nevesia sampaiana*
Squamules blue-grey, generally not strongly appressed; hypothallus inconspicuous; soredia blueish grey 7
- 7(6) Squamules small, <2 mm long, lobes elongated, grey-blue *Parmeliella parvula*
Squamules larger, >2 mm diam. 8
- 8(7) Soredia grey-blue-violet; squamules ± white-felted towards and at the margins *Fuscopannaria mediterranea*
Soralia blue-grey; squamules without felted white margins *Parmeliella testacea*
- 9(1) Thallus forming a thick, more or less continuous crust; terricolous 10
Thallus not crust-forming; saxicolous or corticolous 13
- 10(9) Thallus granular 11
Thallus isidiate or nodular 12
- 11(10) Thallus not gelatinous, pulverulent, blueish-grey, apothecia large (to 1.5 mm diam.) with a granular thalline margin; paraphyses conglutinate *Fuscopannaria nebulosa*
Thallus gelatinous, isidioid-granular, olive-brown; apothecia small (to 0.1 mm), without a granular margin, paraphyses not conglutinate *Gregorella humida* (Arctomiaceae, Arctomiales)
- 12(10) Thallus dark grey, ± isidiate; without lichen substances; western and coastal *Vahliella atlantica*
(Vahliellaceae)
Thallus brownish, with small, nodulose-imbricate squamules; with fatty acids and terpenoids; northern and montane *Fuscopannaria praetermissa*
- 13(9) Thallus green-grey to yellow-brown when dry, turning bright green when wet; photobiont green algae *Psoroma hypnorum*
Thallus grey, grey-brown to black when dry, not turning bright green when wet; photobiont cyanobacteria 14
- 14(13) Apothecia <2 mm diam.; hymenium I+ blue-black; generally over mosses..... *Protopannaria pezizoides*
Apothecia <1 mm diam.; hymenium I+ blue-green turning red-brown; rarely over mosses 15
- 15(14) Thallus with turgid, imbricate squamules (>1 mm diam.), usually brownish to black; saxicolous, rarely corticolous; apothecia mostly flat with a dark brown disc; spores with blunt apices *Vahliella leucophaea* (Vahliellaceae)
Thallus with minute (to 1 mm diam.), non-imbricate squamules, usually grey; corticolous; apothecia mostly convex with a reddish brown disc; spores acutely attenuated at one end *Fuscopannaria ignobilis*

Fuscopannaria ignobilis (Anzi) P.M. Jørg. (1994)

VU (D1)

Thallus crustose, wide-spreading, of small closely appressed ± verrucose squamules 0.5–1 mm diam. on a thin but conspicuous indigo-black hypothallus; squamules scattered or contiguous-contorted, rounded or flattened or unevenly verrucose, pale grey, blue-grey, rarely olive-brown or brown, with a paler margin, slightly indented to irregularly crenulate, contiguous and overlapping or more often widely dispersed, appearing as a cracked-rimose crust. Apothecia 0.3–0.9 mm diam., often numerous, scattered or in clusters; disc bright red-brown to chestnut-brown, soon becoming markedly convex; thalline margin sometimes incomplete, grey, secondarily granular, soon excluded, often exposing a pale red-brown true exciple. Ascospores 10–14 × 8–9 µm, including the epispore

20–28 × 9–11 µm, colourless, ellipsoidal with one or rarely both ends attenuated. Lichen products not detected by TLC. **BLS 0976**.

On bark of old trees in waysides and wood edges, especially *Fraxinus* and *Ulmus glabra*, often in fissures and drier habitats than other *Pannaria* spp.; local. C. Scotland (especially in the Great Glen area).

Characterized by the grey to olive, subcrustose thallus and the numerous small, very convex, often red-brown apothecia with a granular margin which is soon excluded. The squamules are sometimes widely dispersed, rounded with minute marginal lobes on a blue-black hypothallus.

This species and *F. mediterranea* (see below) are occasionally parasitized by *Lichenochora mediterraneae* Calat., Nav.-Ros. & E. Calvo (2000).



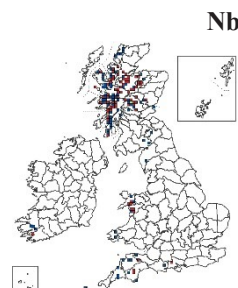
Fuscopannaria mediterranea (C. Tav.) P.M. Jørg. (1994)

Thallus minutely squamulose, crust-like, forming small patches; hypothallus inconspicuous, thin; squamules 2–3 mm diam., often irregularly rounded, contorted, deeply indented; upper surface blue-grey to olive-brown, white felted-tomentose at the margins; soralia grey or violet-grey, granular, mostly on upturned ascending margins, occasionally spreading to the upper surface, often appearing ± woolly (crystals ×50) in dried collections. Apothecia very rare, unknown in British material; disc brown; thalline margin sorediate. Ascospores 13–16 × 7–8 µm, with episore 16–24 × 8–9 µm; episore broadly attenuate. Containing fatty acids and steroids, often appearing as crystals on herbarium specimens. **BLS 0978**.

On broad-leaved trees and rocks in relict woodlands; locally frequent in the Scottish Highlands, very rare and threatened further south, in N. Wales and Pembrokeshire, S.W. England E. to Hampshire, and S.W. Ireland.

Characterized by the blue-violet colour of the woolly-granular soralia borne on almost lip-shaped lobes of small, often inconspicuous, olive-grey squamules. The soralia are sometimes very abundant, the thallus then becoming an almost entirely grey-violet sorediate crust. *Parmeliella parvula* resembles the rarer *Fuscopannaria mediterranea* when sterile, but has smaller, (<2 mm), ± elongated, flat to concave squamules, a pale blue-grey coloration, rarely tinged fawn and pale blue-grey soralia.

The main host for *Lichenochora mediterraneae* Calat., Nav.-Ros. & E. Calvo (2000).



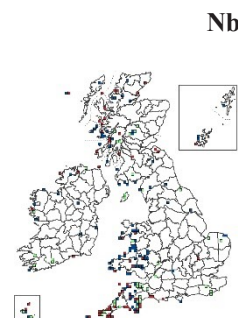
Fuscopannaria nebulosa (Hoffm.) E. Tripp & Lendemer (2019)

Moelleropsis nebulosa (Hoffm.) Gyeln. (1940)

Thallus crustose, thin to thick, irregularly cracked when well-developed, coarsely granular, the granules 30–100 µm diam., rounded or somewhat elongate, ± crowded, pale blue-grey to grey-blue-black; photobiont *Nostoc*, the chains of cells interwoven and covered by short-celled hyphae. Apothecia to 1 mm diam., sessile, sometimes ± sunken between thallus granules; disc flat to convex, orange to reddish brown; true exciple to 100 µm thick, composed of radiating hyphae, often occluded by an irregular, granular blue-grey thalline margin; hymenium to 100 µm tall; hypothecium of intricately interwoven hyphae, pale brownish, to 100 µm thick; paraphyses unbranched, straight, septate, conglutinate; the upper cells scarcely enlarged, with external brown pigmentation. Asci 60–90 × 7.5–15 µm, 8-spored, narrowly cylindrical, thin-walled; apex with a K/I+ blue apical plug, best seen in young asci. Ascospores (11–) 13–15 (–20) × 6–8 µm, uniseriate or partly biseriolate, colourless, ellipsoidal, aseptate, smooth, sometimes attenuated at one end, with a single large oil droplet. Conidiomata unknown. Lichen products not detected by TLC. **BLS 0906**.

A pioneer species on light, often sandy and well-drained, ± bare and often recently disturbed soils in open habitats, e.g. coastal cliffs, road cuttings, or earthy wall tops and with a single record from an ancient *Fraxinus* trunk. Mainly local and decreasing, although with some recent records from bare patches in the turf of excessively trimmed churchyards. Widely distributed in Britain and Ireland, but more common in the west.

Moelleropsis has long been recognized as close to *Fuscopannaria* (Ekman *et al.* 2014) and the type species *M. nebulosa* was finally transferred to that genus by Tripp & Lendemer (2019). *Vahliella atlantica*, in coastal areas of S.W. Ireland and W. Britain, is similar but has a darker grey, rather than blue-grey, thallus and coarser, coralloid, isidium-like structures. When sterile, *F. nebulosa* can also be confused with *Gregorella humida* or



Epiphloea byssinum. *Protopannaria pezizoides* has a paler grey-brown minutely flattened squamulose thallus, apothecia to 2 mm diam., and ascospores with a ridged and warted episore; it grows amongst mosses in damp situations. The granular, not squamulose, structure of the thallus of *F. nebulosa* is diagnostic.

Fuscopannaria praetermissa (Nyl.) P.M. Jørg. (1994)

Thallus thick, squamulose; squamules 1–3 mm diam., ± rounded, indented, often growing densely compacted and overlapping, forming ± continuous, compact mats; hypothallus inconspicuous; upper surface brown-black, the margins often white; lobules and knob-like protuberances frequent, scattered. Apothecia unknown in British material; disc brown. Fatty acids and steroids present, often deposited as needle-shaped crystals (×20 lens) on the thallus of dried specimens. **BLS 1030**.

On mosses in sheltered recesses of ± basic schistose rocks above ca 750 m.; very rare. Scotland (Grampian mountains, Ben Lawers range, Caenlochan).

Characterized by the tendency to form thick nodular ± continuous crusts overgrowing mosses, the presence of numerous lobules and by the dark blue-green algal layer which is readily observed when the lobules or squamules are broken. *Massalongia carnosus* has more flattened, elongate squamules, the margins of which are dissected by numerous flattened marginal accessory lobules or warts; this species occurs on non-calcareous soil or more frequently on moist, mossy, siliceous boulders often near streams.



LEPTOGIDIUM Nyl. (1873)

Thallus minutely fruticose to filamentous, the filaments terete, frequently branched, blue-grey to brown. Cortex pseudoparenchymatous. **Photobiont** *Scytonema*. **Ascomata** apothecia, erumpent initially through the surface layer of the thallus, becoming sessile or shortly stalked, discoid, orange- to red-brown. **Thalline margin** absent. **True exciple** present, composed of pitted thick-walled cells. **Hamathecium** of paraphyses, unbranched, septate; apices capitate. **Asci** 8-spored, broadly cylindrical; apices thickened, K/I+ blue, without a darker-staining apical tube. **Ascospores** aseptate, colourless, ellipsoidal. **Conidiomata** pycnidia, brown, lateral. **Conidia** bacilliform. **Chemistry**: lichen products not detected by TLC.

Separated from *Polychidium* (Massalongiaceae) by Muggia *et al.* (2011); true members of that genus have *Nostoc* rather than *Scytonema* photobionts. The genus is in need of revision, and currently includes three species, only one of which has been reported from Great Britain and Ireland.

Literature

Muggia *et al.* (2011).

Leptogidium dendriscum (Nyl.) Nyl. (1873)

Polychidium dendriscum (Nyl.) Henssen (1963)

Thallus of short, slender, richly and intricately branched filaments, (30–) 40–70 µm diam., smooth or somewhat nodulose, forming shining blue-green, blue-grey or pale brown cushions in which grey colours predominate when dry; filaments with a single-layered cortex; cells 8–15 (–18) × 6–11 µm, with ± thickened walls; photobiont *Scytonema* in distinct bluish green chains in strands of 2–5. Apothecia unknown in British Isles, to 2 mm diam., orange- to red-brown; hymenium 80–150 µm tall; true exciple with pitted, thick-walled cells. Ascospores 11–14.5 × 5–7 µm, aseptate, ellipsoidal. Pycnidia occasional; conidia 1.5–3 × ca 1 µm. **BLS 1165**.

Associated with mosses and leafy liverworts, particularly *Frullania*, on shaded, sheltered trunks of trees and shrubs in humid, undisturbed, boggy woodland; rare and local. W. Scotland, W. Ireland.

Superficially similar to *Polychidium muscicola* (Massalongiaceae), which has *Nostoc* rather than *Scytonema* as photobiont and red-brown to black rather than greyish filaments.



NEVESIA P.M. Jørg., L. Lindblom, Wedin & S. Ekman (2014)

This is a monotypic genus, so the description below constitutes that of the genus. It occupies a sister clade to *Fuscopannaria*, *Leciophysma* and *Protopannaria* according to Ekman *et al.* (2014). It is included in a combined key to *Fuscopannaria* and similar genera; see under that genus above.

Literature

Ekman *et al.* (2014), James & Jørgensen (2009), Paz-Bermúdez *et al.* (2008).

Nevesia sampaiana (Tav.) P. M. Jørg., L. Lindblom, Wedin & S. Ekman (2014)

Fuscopannaria sampaiana (Tav.) P.M. Jørg. (1994)

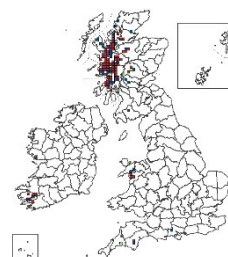
Thallus crustose, 200–250 µm thick, composed of thick coarse appressed ± rounded squamules 2–3 mm diam. that are firmly attached to the substratum, scattered or crowded, rarely with ± distinct elongate blunt marginal lobes 3–4 mm long; hypothallus blue-black, well-developed at thallus margins and in cracks of the thallus; areoles pale red-brown with paler margins and gnarled ± coarsely granular cream-coloured ± effuse marginal and laminal soralia. Mature apothecia unknown. Lichen products not detected by TLC. **BLS 0981**.

On smooth or mossy bark of mature trees, especially *Fagus*, *Ulmus* and *Fraxinus*, rarely on mossy rocks in humid, relict woodlands, occasionally on wayside trees; locally frequent in Highland Scotland but scarce and decreasing in Wales and S.W. England. Also present in S.W. Ireland.

Characterized by the pale chestnut-brown colour of the closely appressed, areole-like squamules, the cream-yellow soralia and the pavement-like, almost crustose thallus on a black hypothallus. Occasionally the soredia may cover most of the thallus in a cream-yellow crust. The similarly coloured *Parmeliella testacea* has a more closely appressed thallus, blue-grey soralia, a frequently inconspicuous black hypothallus and extended marginal lobes.

The single host for *Arthonia sampaiana* (Diederich & Etayo) Ertz & Diederich (2005).

NT IR



PANNARIA Delise ex Bory (1828)

Thallus foliose, squamulose or crustose, often forming rosettes and usually without a blue to blue-black hypothallus. **Upper surface** grey-blue to brown-black, sometimes ± pruinose. **Photobiont** cyanobacterial, *Nostoc*, but green in the *Pannaria sphinctrina* group [not present in Britain and Ireland]. **Ascomata** apothecia, sessile, disc red-brown to black. **Thalline margin** persistent, concolorous with the thallus, outer part pseudoparenchymatous, inner part loosely organized with densely packed photobiont cells. **True exciple** thin, pale; cells ± pseudoparenchymatous. **Asci** 8-spored, K/I–, without any internal amyloid apical structures (always without an amyloid plug). **Ascospores** colourless, aseptate, ellipsoidal, often apiculate at one or both ends and with a warted epispore. **Conidiomata** pycnidia. **Conidia** straight, bacilliform. **Chemistry**: lichen products mostly not detected by TLC (pannarin (Pd+ orange-red) present in some species). **Ecology**: mostly epiphytic, more rarely on rocks or soil, in sheltered, humid forest habitats.

Previously often confused with *Parmeliella* (and *Pectenina*) from which it differs in the presence of pannarin (Pd+ orange-red) and lack of inner amyloid structures in the ascus apex.

Literature

Ekman *et al.* (2014), Elvebakk *et al.* (2008), James & Purvis (2009a).

- 1 Numerous decorticated lobules (soredia) present at margins; apothecia rarely present *conoplea*
 Lobules (soredia) absent; apothecia usually present 2
- 2(1) Thallus usually corticolous, with enlarged, partly pruinose ± concave marginal
 squamules with ± raised margins *rubiginosa*
 Thallus saxicolous, entirely closely appressed, with short thick marbled radiating
 marginal lobes *hookeri*

Pannaria conoplea (Pers.) Bory (1828)

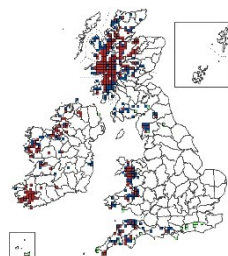
Thallus foliose, to 2–3 cm diam., rarely larger, often forming conspicuous irregular, entire or fragmentary rosettes; lobes 4–5 × 7–8 mm, deeply incised, mostly contiguous, fan-like or somewhat overlapping, ± concave, deeply indented with elongate ± ascending margins; upper surface glaucous, blue-grey to pale brown in more exposed situations, often paler and ± scabrid-pruinose towards the margins, with numerous coarse marginal and sometimes abraded knob- or squamule-like single or coralloid decorticated lobules (gymnidia) which may cover and obscure the thallus apart from the ± extended marginal lobes; hypothallus well-developed, but rarely visible as a blue-black zone surrounding the thallus. Apothecia 0.5–1.5 mm diam., very rare; disc brown-red; thalline margin distinct, usually coarsely abraded-isidiate. Ascospores 15–19 × 9–10 μm, with epispore 20–24 × 10–12 μm, colourless, ellipsoidal with a ridged epispore that is acuminate at one or both ends. Thallus Pd⁺ orange-red (pannarin). **BLS 0974.**

On mossy bark of broad-leaved trees, rarely rocks in humid, sheltered woodlands; locally abundant in Scotland and W. Ireland but declining in Wales and S.W. England.

The lobes may be much reduced, appearing ± crustose, the thallus reduced to a compacted mass of coarse blueish isidia. In exposed sites the thallus surface becomes distinctly pale brown, although the isidia always remain blueish in colour. *P. rubiginosa* lacks isidia, is usually richly fertile, and forms more distinct rosettes.

The type host for *Stigmatidium mitchellii* Cl. Roux & Bricaud (1994); *Paranectria oropensis* (Ces.) D. Hawksw. & Piroz. (1977) has also been recorded on this host.

Nb IR



Pannaria hookeri (Borrer) Nyl. (1857)

Thallus in part crustose, in part minutely lobulate in closely adpressed ± incomplete rosettes, to 2–3 cm diam.; lobes to 2 × 3 mm, thick, contiguous, convex, turgid, becoming fan-like, wider and elongate towards the margins and verrucose-gnarled and fragmented towards the centre; upper surface pale grey, sometimes tinged pale brownish, ± white striate-maculate; hypothallus thin, but often visible in between the squamules. Apothecia to 2 mm diam., abundant, often ± contiguous and angular by compression; disc black, rarely dark brown, roughened, matt, flat, conspicuous, irregularly crenulate; thalline margin usually white- to pale blue-grey; epithecium green-black, opaque; hymenium 100–200 μm tall, colourless or in part red-brown. Ascospores 11–15 × 8–11 μm, colourless, ellipsoidal to globose, smooth-walled, without an epispore but with a distinct outer wall layer. Thallus Pd⁺ faint orange (traces of pannarin). **BLS 0975.**

Predominantly on basic schist or overgrowing associated mosses, often in temporary seepage tracks on mountains above ca 300 m; local. Scotland (Isle of Skye, Ben Nevis massif, Ben Alder, Ben Lawers).

May be mistaken for a placodioid *Lecanora* because of the similar thalline appearance and black apothecial discs.

NT



Pannaria rubiginosa (Thunb.) Bory (1828)

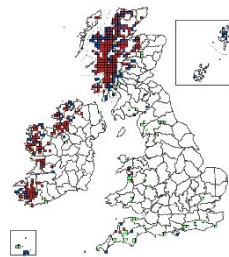
Nb IR

Thallus foliose-squamulose, often forming rosettes to 2–3 cm diam. with extended marginal lobes; upper surface whitish grey-blue to brown or olive; lobes 3–4 × 7–8 mm, deeply indented and mostly concave with thick, pale, ascending margins; surface smooth, faintly scabrid or occasionally thinly pruinose; hypothallus fibrous, well-developed, obscure or sometimes extending as a blue-black zone surrounding the thallus. Apothecia 0.5–1.5 mm diam., frequent; disc red-brown; thalline margin prominent, persistent, often crenulate. Ascospores 15–19 × 9–10 μm, with epispore 20–24 × 10–12 μm, colourless, ellipsoidal; epispore uneven, acuminate at one or both ends. Thallus Pd⁺ orange-red (pannarin). **BLS 0980.**

On mossy, broad-leaved trees, rarely on rocks in humid, sheltered woods; locally abundant in the Scottish Highlands and W. Ireland but very rare and decreasing in Wales and S.W. England.

Readily recognized by the neat foliose bluish grey thallus, usually with numerous apothecia with bright red-brown discs with a pale crenulate thalline exciple. The lobes are sometimes rather narrow and the thallus at times distinctly squamulose, especially at the centre. In exposed sites the thallus becomes darker, often with an olivaceous tinge. See also *P. conoplea*.

An unidentified species of *Xenonectriella* has been recorded several times from *Pannaria rubiginosa*. *Nectriopsis lecanodes* (Ces.) Diederich & Schroers and *Stigidium mitchellii* have also been recorded.



PARMELIELLA Müll. Arg. (1862)

Thallus foliose, squamulose or \pm crustose, often attached to the lower surface by a blue to blue-black hypothallus which is sometimes visible from above. **Upper surface** with or without soredia, isidia, or phyllidia, grey-blue to brown-black. Lower surface tomentose or \pm rhizinate, usually pale. **Photobiont** blue-green, *Nostoc*. **Ascomata** apothecia, sessile, mostly biatorine; disc red-brown to black. **Thalline margin** rarely present. **True exciple** well-developed, thick, pseudoparenchymatous; cells rounded to oblong, 15–20 μm diam. **Hamathecium** of unbranched paraphyses, not or slightly thickened at the apices, the pigment external, I+ blue. **Asci** 8-spored; apical apparatus a deeply K/I+ blue staining ring structure. **Ascospores** colourless, aseptate, ellipsoidal, often apiculate at one or both ends and with a warted or ridged epispore. **Conidiomata** pycnidia, rare. **Conidia** bacilliform. **Chemistry**: lichen products not usually detected by TLC, some species when fresh have an antiseptic smell when moistened. Pannarin [Pd+ orange-red] is present in some non-British species. **Ecology**: epiphytic or on rock, generally in humid and shaded habitats.

The species of *Parmeliella* are superficially quite similar to species of *Fuscopannaria* from which they are easily distinguished when fertile in Europe by the absence of a thalline margin and the amyloid hymenium. When sterile, they are most easily separated on an individual species basis. Some species superficially resemble *Massalongia*, *Psoroma* and *Protopannaria*; see also *Pectenaria* which is large and placodioid with a different anatomy and ascus structure.

Parmeliella species are included in the key to *Fuscopannaria* and similar genera above.

Literature

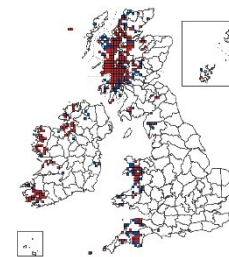
James & Purvis (2009b), Jørgensen (1978).

Parmeliella parvula P.M. Jørg. (1977)

Thallus squamulose; squamules small, 1–2 mm long, \pm elongate and indented, crenulate, flat or concave, pale blue-grey, rarely tinged fawn, scattered or contiguous and forming small patches or a continuous crust-like cover on the substrate; soralia marginal, coarsely granular-isidiate, often rounded and discrete, occasionally becoming confluent and transforming the thallus into a sorediate crust. Apothecia to 0.5 mm diam., very rare; biatorine, disc pale red-brown to blackish with a persistent paler true exciple, often becoming \pm convex. Ascospores 15–18 \times 10–12 μm , colourless, cylindrical, with a minutely warted epispore. **BLS 1028**.

On mossy broad-leaved trees, occasionally conifers, more rarely on rocks and wood, often overgrowing mosses, particularly in sheltered moist woodlands and often close to streams, extending onto more acid substrata than other epiphytic Pannariaceae; locally frequent. Scottish Highlands, Wales, S.W. England, western Ireland.

Nb IR



A small, inconspicuous and rather variable species. In exposed sites specimens are often tinged red-brown and have coarser, granular soralia, while the thalli of specimens from shaded habitats are pale blue-grey and usually have finer soralia which are often confluent, sometimes tending to form a continuous crust without marginal squamules. Resembles the rarer *Fuscopannaria mediterranea* when sterile, which differs in having larger (>2 mm) \pm rounded, more swollen, convex squamules, a dark blue-grey to olive-brown coloration and lilac-mauve-tinged soralia, which often appear woolly in dried collections due to the gradual deposition of steroid crystals.

An apparently undescribed species of *Paranectria* with 5- to 7-transseptate spores has been recorded a number of times from *Parmeliella parvula*; as has an undescribed species of *Neolamya*.

Parmeliella testacea P.M. Jørg. (1978)

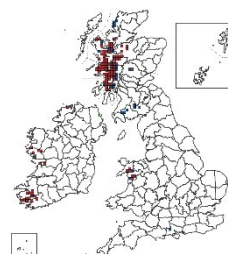
Thallus squamulose, \pm forming rosettes, closely appressed to the substrate; squamules ca 2 \times 2–3 mm, extending to 5 mm at margins; upper surface fragile, pale red-brown to smoke grey-brown, smooth or scabrid matt; soralia predominantly marginal, sometimes also laminal, coarse, knob-like, at first concolorous, sometimes breaking down into a \pm uniform surface of coralloid blue-grey granules which may become coarsely cracked-areolate; hypothallus blue-black, fimbriate, sometimes visible between cracks but seldom extending beyond squamules. Apothecia 1–1.5 mm, rare; disc red-brown, flat; true exciple rather thick, paler, persistent. Ascospores 16–20 \times 9–10 μ m, colourless, ellipsoidal, without an epispore. **BLS 1031.**

On mossy broad-leaved trees, rarely on rocks, in moist sheltered woodlands; locally abundant in western Scotland and western Ireland but scarce and decreasing in Wales. In England only reliably recorded from the New Forest, Hampshire, where it is now extinct.

Bruised fresh material smells strongly of antiseptic when wet. The size of soredia may vary considerably. Specimens with coarse knob-like soralia may resemble *P. triptophylla* which has consistently smaller squamules (to 1 mm diam.), which are grey-brown above and produce cylindrical isidia. The two species are very difficult to separate when wet. The similarly coloured *Nevesia sampaiana* has a more closely appressed, \pm areolate thallus with cream-yellow soralia and lacks extended marginal lobes on a distinctive black hypothallus.

Lichenicolous fungi reported are *Nectriopsis lecanodes* and *Sclerococcum (Dactylospora) parasitaster* (Nyl.) Ertz & Diederich (2018).

NT IR



Parmeliella triptophylla (Ach.) Müll. Arg. (1862)

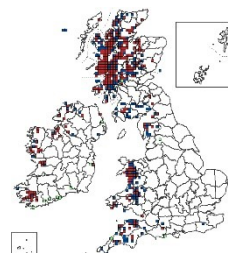
Thallus of minute indented rounded or elongate flat to concave squamules to 1 mm diam., scattered or contiguous, sometimes overlapping; hypothallus conspicuous, wide, smooth, black, giving the thallus at a distance an overall dark appearance; upper surface of squamules grey-brown, \pm shiny, with terete finger-like branched erect or decumbent isidia along the margins, often interspersed with more flattened lobules, sometimes forming a continuous isidiate crust and often completely obscuring the underlying squamules. Apothecia to 1 mm diam., infrequent; disc red-brown to black; true exciple pale. Ascospores 10–17 \times 5–8 μ m, colourless, ellipsoidal, without an epispore; outer spore wall smooth; inner wall uneven. **BLS 1032.**

On mossy trees, more rarely rocks, in damp, sheltered places; local. W. Britain and Ireland, extending very locally to central southern England (Wiltshire, Dorset).

Characterized by a prominent dark smooth hypothallus and isidia which may be rather coarse and knobby or occasionally very fine, finger-like and often branched. Fresh material may smell of antiseptic when bruised. The squamules vary from grey to black-brown; when isidia are sparse there may be a close resemblance to *Vahliella leucophaea*, which has more rounded, convex slightly swollen squamules and is usually fertile.

Lichenicolous reports on this host are *Lichenopeltella pannariacearum* Diederich (1997) [Northern Ireland], *Paranectria oropensis*, *Sclerococcum (Dactylospora) microspora* Etayo (1991) and *S. (Dactylospora) parasitaster*. The thallus also can act as a substratum for *Normandina pulchella* and the sorediate morph of *N. acrolypta*.

Nb IR



PECTENIA P.M. Jørg., L. Lindblom, Wedin & S. Ekman (2014)

Thallus foliose, lobate or placodioid, ± round to irregular, ± loosely attached by a dense felt of rhizines; lobes to 1 cm wide, mostly contiguous, laterally sometimes ± imbricate, the apices rounded, entire or notched, sometimes secondarily lobate, schizidiate or isidiate, grey-blue to pale grey when dry, sometimes with yellowish patches. **Upper surface** smooth or with distinct longitudinal ridges, sometimes scalloped, occasionally minutely scabrid. **Lower surface** pale, with dense entangled unbranched blue-black rhizines, rarely extended as a prothallus. **Upper cortex** of compacted periclinal or anticlinal hyphae. **Lower cortex** inconspicuous or lax and merging into blue-black rhizines. **Photobiont** *Nostoc*. **Medulla** of parallel, horizontally orientated hyphae. **Ascomata** apothecia, laminal, sessile, biatorine, usually with a paler margin; disc concave at first, becoming flat or ± convex, matt, non-pruinose, ± red-brown, occasionally ± blackened. **Thalline margin** absent. **True exciple** well-developed, of radiating isodiametric cells. **Hymenium** yellow-brown above, I+ deep blue. **Hamathecium** of paraphyses, unbranched, not or slightly enlarged at the apex. **Asci** 8-spored, clavate to subcylindrical, thickened at the apex with a distinct K/I+ blue plug and occasionally an external amyloid cap. **Ascospores** aseptate, ellipsoidal, colourless, without an epispore or gelatinous sheath. **Conidiomata** pycnidia, laminal to marginal, wart-like, blackish. **Conidia** bacilliform, lateral or terminal on branching short-celled conidiophores. **Chemistry**: lichen products not detected by TLC. **Ecology**: on bark and mossy rocks in oceanic environments; often a component of the *Lobarion*.

Pecten species were included in *Degelia* Arv. & D.J. Galloway as sect. *Amphiloma* (Fr.) P.M. Jørg. & P. James by James & Purvis (2009c). Ekman et al. (2014) demonstrated that *Pecten* deserved recognition at generic rank based on phylogenetic and biogeographical data. Research by Otálora et al. (2017) suggests that there are forms of both *P. atlantica* and *P. plumbea* with spatulate schizidia that are here accepted as *P. ligulata*, and that *P. cyanoloma* is a morph of *P. atlantica* that lacks isidia. This arrangement may well be accepted in further editions, but more data are required from British and Irish populations. Careful notes of lobe morphology (see couplet 2 below) in recording should be advocated, as this appears to correspond to clade membership.

The rare *Toninia plumbea* occurs on *Pecten plumbea* and possibly other *Pecten* species in both corticolous and saxicolous communities. Some species are more commonly parasitized by *Stigmatidium degelii* R. Sant. (1993), with numerous minute immersed perithecia. The thalli are frequently accompanied by squamules of *Normandina pulchella*.

Literature

Blom & Lindblom (2010), Ekman *et al.* (2014), James & Purvis (2009c), Jørgensen (2007), Jørgensen & James (1990), Otálora *et al.* (2017).

- | | | |
|------|--|------------------|
| 1 | Thallus without isidia or schizidia; apothecia usually abundant | 2 |
| | Thallus with isidia or schizidia; apothecia absent or few | 3 |
| 2(1) | Thallus with radiating, crescent-shaped and longitudinally striate depressions; apothecia dark red to almost black | <i>cyanoloma</i> |
| | Thallus ± smooth, with irregularly radiating or ± reticulately arranged maculae; apothecia pale to reddish brown | <i>plumbea</i> |
| 3(1) | With erect or ± decumbent, ± dorsiventral elongate spatulate schizidia | <i>ligulata</i> |
| | With knob-like ± erect terete branched, ± coralloid isidia | <i>atlantica</i> |

Pectenیا atlantica (Degel.) P.M. Jørg., L. Lindblom, Wedin & S. Ekman (2014)

Nb IR

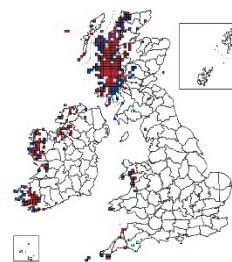
Degelia atlantica (Degel.) P.M. Jørg. & P. James (1990)

Like *P. cyanoloma*, but with the thallus thinner, more closely adpressed and sometimes with grey-yellow patches, the surface knob-like or partially coralloid due to the presence of marginal and laminal isidia, to 0.2 mm diam.; these may be very numerous and form a thick, irregular, cracked-areolate crust \pm obscuring the thallus. Apothecia very rare, usually few per thallus when present, appearance as in *P. cyanoloma*. **BLS 1027**.

On \pm shaded mossy broad-leaved trees in cool sheltered humid woodlands, more rarely on mossy rocks. W. British Isles; locally abundant in W. Scotland & Ireland, less frequent elsewhere.

Considered to be an isidiate morph of *P. cyanoloma* by Otálora *et al.* (2017), but multiple clades were detected within the putative species pair, so the traditional circumscription is maintained pending further studies on British and Irish populations.

Apart from *Stigmidium degelii*, also parasitized by *Nectriopsis lecanodes*, *Paranectria oropensis* and an unidentified *Pronectria* (or *Xenonectriella*) sp.

**Pectenیا cyanoloma** (Schaer.) P.M. Jørg., L. Lindblom, Wedin & S. Ekman (2014)

Nb IR

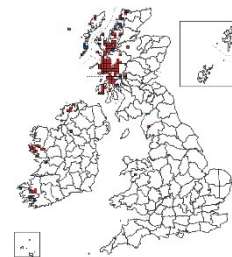
Degelia cyanoloma (Schaer.) H.H. Blom & L. Lindblom (2010)

Thallus foliose, forming rosettes, mostly 5–15 (–25) cm diam., thick, loosely attached, lobes 2.5–3.5 mm wide, pale grey or pale blueish-grey with a series of successive shallowly concave crescent-shaped depressions and fine longitudinal, parallel or weakly radiating striations ($\times 10$ lens), the margin often thickened, ascending, dark blueish-grey, smooth and glossy; squamules, schizidia and isidia absent. Apothecia usually numerous but sometimes absent, often aggregated; disc dark red-brown to almost black with a slightly darker true exciple, flat to slightly convex; hymenium colourless, 120–160 μm tall; paraphyses unbranched, tips slightly swollen, to 5 μm diam. Asci clavate-cylindrical, 8-spored. Ascospores 15–20 \times 6–8 μm , aseptate, ellipsoidal, colourless, with or without oil droplets. Conidiomata pycnidia, laminal, immersed, wart-like, the ostiole pale. Conidia bacilliform, 3–6 \times ca 1 μm . **BLS 2540**.

On mossy broad-leaved trees and rocks in \pm open relict woodlands and on coastal rocks. Locally abundant in W. Scotland from Argyll to Sutherland and the Outer Hebrides, also W. Ireland, locally abundant at least in Scotland. Very rare in the English Lake District and Wales.

Distinctive for its radially scalloped thallus lobes, and dark red apothecia. Only recently separated from *P. plumbea*, but more common than that species in hyperoceanic areas.

Apart from *Stigmidium degelii*, also parasitized by *Nectriopsis lecanodes*, *Paranectria oropensis* and an unidentified *Pronectria* (or *Xenonectriella*) sp. Once recorded with *Toninia plumbina*.

**Pectenیا ligulata** (P.M. Jørg. & P. James) P.M. Jørg., L. Lindblom, Wedin & S. Ekman (2014)

VU (D2) IR

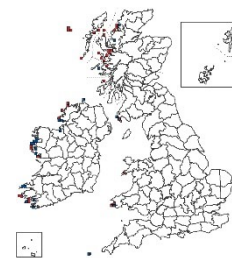
Degelia ligulata P.M. Jørg. & P. James (1990)

Like *P. plumbea*, but rarely fertile and with schizidia. Schizidia >1 mm in length, numerous, \pm flattened, ligulate to spathulate, \pm erect or randomly decumbent, usually blackened towards the apices and thus imparting an overall dark hue to the thallus. Apothecia <0.5 mm diam., very rare; disc brown, \pm blackened with age, with a paler true exciple, structure as in *P. plumbea*. **BLS 1597**.

In crevices in coastal rocks and at the bases of small trees and shrubs in dry but intermittently humid coastal lowlands, possibly dependent on onshore sea mists; rare. W. Wales (Pembroke, Gwynedd), Scilly Is, coastal W. Scotland, W. Ireland.

A distinctive morph differing from *P. atlantica* in possessing elongate, spathulate schizidia. A polyphyletic taxon according to Otálora *et al.* including populations with affinities to both *P. cyanoloma* and *P. plumbea*. More studies are needed.

A component of the Macaronesian element in the British lichen biota, which also includes *Herteliana gagei*, *Nephroma tangeriense*, *Pseudocyphellaria norvegica* and *Topeliopsis azorica*.



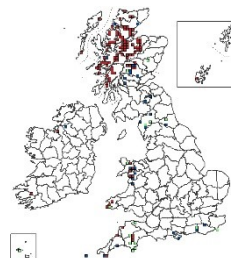
Pectenia plumbea (Lightf.) P.M. Jørg., L. Lindblom, Wedin & S. Ekman (2014)*Degelia plumbea* (Lightf.) P.M. Jørg. & P. James (1990)

Thallus plate-like, thin and adpressed, forming ± orbicular placodioid patches 5–10 cm diam.; lobes 1–2.5 mm wide, ± rounded at the apices, which tend to be irregular in outline and are not strongly thickened; upper surface blue-grey, sometimes with pale brownish or olivaceous patches, with a ± reticulate network of pale maculae but without prominent longitudinal striations and concentric depressions; lower surface with a prominent blue-black beard-like hypothallus that may extend beyond as a prothallus; soredia and isidia absent, although occasionally ± knob-like lobules may develop. Apothecia 0.5–1 mm diam., usually numerous; disc pale red to red-brown with a paler true exciple, often becoming convex. Ascospores 17–25 × 7–10 µm, colourless, ellipsoidal, smooth-walled; epispore absent. Conidiomata pycnidia, 0.1–0.2 mm diam., often produced individually in prominent warts. **BLS 2541.**

On mossy broad-leaved trees and rocks in ± open relict woodlands. Widespread in the Scottish Highlands, scattered and much reduced in distribution in upland Wales and S.W. England. The species has a less strongly oceanic distribution compared with *P. cyanoloma*.

Readily recognized by the relatively thin orbicular thallus that lacks the scalloped depressions of *P. cyanoloma*. It may also consist of small, often imbricate lobes with some knob-like lobules, but these are usually more flattened than the isidia of *P. atlantica* and more rounded and expanded than the schizidia of *P. ligulata*.

The principal host of *Toninia plumbina*, which can be mistaken for blackened apothecia of the host. The occurrence of *Stigmidium degelii* on this host requires confirmation.

**Nb IR****PROTOPANNARIA** (Gyeln.) P.M. Jørg. & S. Ekman (2000)

Thallus small-imbricate, squamulose or crustose, often attached to the substrate by a blue to blue-black hypothallus which is sometimes visible from above. **Upper surface** grey-blue to brown-black. **Photobiont** blue-green, *Nostoc*. **Ascomata** apothecia, sessile, disc red-brown to black. **Thalline margin** well-developed, persistent, concolorous with the thallus, the outer part pseudoparenchymatous, the inner loosely organized with densely packed photobiont cells. **True exciple** thin, pale; cells ± pseudoparenchymatous. **Hymenium** I+ blackish-blue. **Asci** 8-spored, without an amyloid apical apparatus, *Pannaria*-type. **Ascospores** colourless, aseptate, ellipsoidal, often apiculate at one or both ends and with a warted epispore. **Conidiomata** pycnidia. **Conidia** straight, bacilliform. **Chemistry**: lichen products not detected by TLC. **Ecology**: overgrowing bryophytes, mostly on broad-leaved mossy trees in *Lobarion* communities, more rarely on rocks.

Superficially rather like *Psoroma* which has a green photobiont and robust thalline margin to the apothecia. Previously included in *Pannaria*, but the new genus *Protopannaria* was erected for the crustose to squamulose species without any lichen substances and an I+ blackish blue hymenium with asci without amyloid apical structures.

There is only one British species. It is included in the key to *Fuscopannaria* and similar species above.

Literature

James (2009).

Protopannaria pezizoides (Weber) P. M. Jørg. & S. Ekman (2000)**LC**

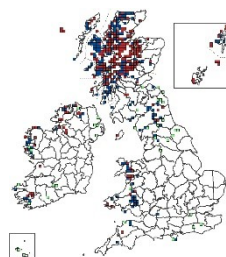
Thallus squamulose; squamules small, 0.5–1.0 mm in size, ± compacted, pale grey to dark brown, often with a red tinge, indented, sometimes finger-like, flattened, ± overlapping, granular; hypothallus usually poorly developed and inconspicuous. Apothecia to 2 mm diam., flat, often very abundant; disc bright orange-brown to dark brown; thalline margin narrow and persistent, but sometimes becoming excluded in fully hydrated material;

crenulate, granular. Ascospores $19\text{--}25 \times 8\text{--}10 \mu\text{m}$, including the episore $25\text{--}30 \times 9\text{--}12 \mu\text{m}$, colourless, ellipsoidal; episore distinctly ridged and warted. Soredia and isidia absent. **BLS 0979**.

On damp mosses on rocks, walls, trees and soil, usually in sheltered, undisturbed sites. Upland Britain and western Ireland.

Characterized by the numerous crowded conspicuous orange-brown apothecia with a persistent granular thalline exciple. The thallus in moist habitats is blue-grey and the apothecial disc pale orange-brown; in exposed sites both thallus and apothecial disc are dark brown. It closely resembles *Psoroma hypnorum* but the presence of the *Nostoc* photobiont gives the thallus of *Protopannaria pezizoides* a darker bluish colour when wet, in contrast to the brighter green of *Psoroma*. *Fuscopannaria nebulosa* has a darker, more grey-blue, uniformly granular thallus, less frequent and smaller red-brown discs ($0.5\text{--}1 \text{ mm diam.}$), lacks a thalline margin, has ascospores which lack an episore and grows on well-drained, often sandy soils.

The type host for *Lichenochora coppinsii* Etayo & Nav.-Ros. (2008). Also reported is an undescribed *Lichenochora* (with shorter ascospores than *L. coppinsii*) and an unidentified *Sclerococcum* (*Dactylospora*) with 3–7-septate ascospores. There is a single recorded occurrence of *Epilichen scabrosus* growing on this host rather than *Baeomyces* spp. as usual; its identity needs confirmation.



PSOROMA Ach. ex Michx. (1803)

Thallus small-squamulose; hypothallus indistinct. **Photobiont** green, ?*Myrmecia*. **Cephalodia** present, containing *Nostoc*. **Ascomata** apothecia, sessile, \pm cup-shaped. **Thalline margin** raised, persistent. **Hamathecium** of paraphyses, unbranched or branched near the apices, apices not thickened or capitate, I+ dingy blue. **Asci** 8-spored, long-clavate or cylindrical; apex with a K/I+ blue central tube in a paler-staining tholus, the amyloid ring distinct. **Ascospores** aseptate, colourless, often with 1–2 large oil droplets, ellipsoidal, with a warted-ridged episore, \pm apiculate. **Conidiomata** pycnidia, pale brown. **Conidia** aseptate, bacilliform, colourless. **Chemistry**: lichen products not detected by TLC, or rarely with porphyrylic acid and related substances. **Ecology**: varied.

Characterized by the presence of a green photobiont, external cephalodia and warted-ridged ascospores. Related to *Pannaria*, *Parmeliella* and *Protopannaria* whose primary photobiont is *Nostoc*. Only one species is present in our area.

Literature

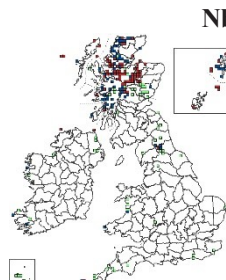
Fryday *et al.* (2019), Gilbert & Purvis (2009), Holien & Jørgensen (2000).

Psoroma hypnorum (Vahl) Gray (1821)

Thallus small-squamulose, spreading irregularly; squamules $0.2\text{--}0.5 \text{ mm diam.}$, thick, sometimes almost granular, green-grey to yellow-brown when dry, bright green when wet, on a thin, usually indistinct pale hypothallus; cephalodia usually frequent, sometimes few and inconspicuous, similar to thallus squamules, or smooth, rounded, pale red-brown, brown or blueish brown, scattered among the squamules or on the outer surface of the margin. Apothecia frequent, 1–3 (–5) mm diam., disc red-brown to dark brown; thalline margin often with numerous squamules, occasionally \pm smooth, the lower part or underside \pm densely covered by short, pale hairs; hymenium $100\text{--}120 \mu\text{m}$ tall; paraphyses to $4.5 \mu\text{m}$ diam. above, sub-moniliform; apices short-celled. Asci $70\text{--}90 \times 11\text{--}15 \mu\text{m}$. Ascospores $19\text{--}28 \times 8\text{--}10 \mu\text{m}$, including episore $22\text{--}34 \times 9\text{--}12 \mu\text{m}$, ellipsoidal or cylindrical-ellipsoidal, with an apiculus at one or both ends; episore distinctly warted-ridged. Conidiomata rare, globose, to 0.2 mm in diam., conidia bacilliform $5\text{--}6 \times 1\text{--}2 \mu\text{m}$. No lichen products detected by TLC. **BLS 1205**.

Amongst mosses at bases of old trees, on siliceous rocks, acidic dunes, by water and on montane cliff-ledges, characteristic of leached substrata in humid situations, as by streams, lakesides, N-facing hill-sides, mountain summits or coastal heathland; rather local and decreasing. Frequent in N. and W. Scotland, from sea-level to 900 m; rare in Wales, Ireland and N. England, no longer present in S. England.

Resembles the more widespread *Protopannaria pezizoides*, which has a blue-grey to red-brown thallus that is



blackish when wet, contains *Nostoc*, lacks cephalodia and has apothecia devoid of dense pale hairs on the lower side of the thalline margin and has a different ascus structure. Sometimes the cephalodia are so frequent that they may constitute the major algal component of the thallus of *P. hypnorum*, and a fully cyanobacterial morph has been found in Norway (Holien & Jørgensen 2000). Ekman *et al.* (2014) considered the species to be paraphyletic, but it is not yet clear whether the taxon needs subdivision and the phylogenetic affinities of British and Irish species need further study.

Arthonia pannariae has been recorded on the apothecia of *P. hypnorum*.

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